RESPONSE

ATTACHMENT TO 4(g)

Testimony Filed Since March 2002

TRA Docket No.	Caption	Type
01-00704	*In the Matter Of Atmos Performance Based Ratemaking*	Direct
01-00704	*In the Matter Of Atmos Performance Based Ratemaking*	Rebuttal
03-00118	*Petition of Tennessee American Water Company For A Change In Rates*	Direct
03-00118	*Petition of Tennessee American Water Company For A Change In Rates*	Rebuttal
03-00313	*Petition of Nashville Gas Company For A Change In Rates*	Direct
03-00391	*Petition for Exemption of Certain Services, Primary Rate Interface*	Direct
03-00391	*Petition for Exemption of Certain Services, Primary Rate Interface*	Rebuttal
03-00491	*Implementation Of The Federal Communications Commission's Triennial Review Order -*	Direct
03-00491	*Implementation Of The Federal Communications Commission's Triennial Review Order -*	Rebuttal
03-00491	*Implementation Of The Federal Communications Commission's Triennial Review Order -*	Surrebuttal
04-00034	*Petition of Chattanooga Gas For A ChangeIn Rates*	Direct
04-00034	*Petition of Chattanooga Gas For A Change In Rates*	Supplemental
04-00288	*Petition of Tennessee American Water Company For A Change In Rates*	Direct
05-00258	*CAPD Show Cause Petition Regarding Atmos*	Direct In Petition
05-00258	*Petition Of Consumer Advocate To Open An Investigation To Determine Whether Atmos...*	Direct In Contested Case
06-00175	*Petition of Chattanooga Gas For A Change In Rates*	Direct
06-00290	*Petition of Tennessee American Water Company For A Change In Rates*	Direct

Attachment to 22

_FedReserve _GreenSpan_200203262.pdf

The Federal Reserve Board

Remarks by Chairman Alan Greenspan

Corporate governance

At the Stern School of Business, New York University, New York, New York
March 26, 2002

Corporate governance[1] has evolved over the past century to more effectively promote the allocation of the nation's savings to its most productive uses. And, generally speaking, the resulting structure of business incentives, reporting, and accountability has served us well. We could not have achieved our current level of national productivity if corporate governance had been deeply flawed.

And yet, our most recent experiences with the bankruptcy of Enron and, preceding that, several lesser such incidents suggest that the governance of our corporations has strayed from our perceptions of how it is supposed to work. By law, shareholders own our corporations and, ideally, corporate managers should be working on behalf of shareholders to allocate business resources to their optimum use.

But as our economy has grown, and our business units have become ever larger, de facto shareholder control has diminished: Ownership has become more dispersed and few shareholders have sufficient stakes to individually influence the choice of boards of directors or chief executive officers. The vast majority of corporate share ownership is for investment, not to achieve operating control of a company.

Thus, it has increasingly fallen to corporate officers, especially the chief executive officer, to guide the business, hopefully in what he or she perceives to be in the best interests of shareholders. Indeed, the boards of directors appointed by shareholders are in the overwhelming majority of cases chosen from the slate proposed by the CEO. The CEO sets the business strategy of the organization and strongly influences the choice of the accounting practices that measure the ongoing degree of success or failure of that strategy. Outside auditors are generally chosen by the CEO or by an audit committee of CEO-chosen directors. Shareholders usually perfunctorily affirm such choices.

To be sure, a CEO can maintain control over corporate governance only so long as companies are not demonstrably in difficulty. When companies do run into trouble, the *carte blanche* granted CEOs by shareholders is withdrawn. Existing shareholders, or successful hostile bidders for the corporation, usually then displace the board of directors and the CEO. Such changes in corporate leadership have been relatively rare but, more often than not, have contributed to a more-effective allocation of corporate capital.

For the most part, despite providing limited incentives for board members to safeguard shareholder interests, this paradigm has worked well. We are fortunate, for financial markets have had no realistic alternative other than to depend on the chief executive officer to ensure an objective evaluation of the prospects of the corporation. Apart from a relatively few large institutional investors, not many existing or potential shareholders have the research capability to analyze corporate reports and thus to judge the investment value of a corporation. This vitally important service has become dominated by firms in the business of underwriting or selling securities.

But, as we can see from recent history, long-term earnings forecasts of brokerage-based

securities analysts, on average, have been persistently overly optimistic. Three- to five-year earnings forecasts for each of the S&P 500 corporations, compiled from projections of securities analysts by I/B/E/S, averaged almost 12 percent per year between 1985 and 2001. Actual earnings growth over that period averaged about 7 percent.

Perhaps the last sixteen years, for which systematic data have been available, are an historical aberration. But the persistence of the bias year after year suggests that it more likely results, at least in part, from the proclivity of firms that sell securities to retain and promote analysts with an optimistic inclination. Moreover, the bias apparently has been especially large when the brokerage firm issuing the forecast also serves as an underwriter for the company's securities.

The performance of securities analysts may improve as a result of the recent joint initiative by the National Association of Securities Dealers and the New York Stock Exchange to require brokerage firms to include in research reports the distribution of the firms' ratings, among "buy," "sell," and "hold," for example. Brokerage firms must also include in research reports a record that indicates when an analyst assigned or changed a rating for a company.

I suspect that with the underlying database publicly available, it is just a matter of time before the ex post results of analysts' recommendations are compiled and published on a regular basis. I venture to say that with such transparency, the current upward bias of analysts' earnings projections would diminish rather rapidly, because investment firms are well aware that security analysis without credibility has no market value.

* * *

Prior to the past several decades, earnings forecasts were not nearly so important a factor in assessing the value of corporations. In fact, I do not recall price-to-earnings ratios as a prominent statistic in the 1950s. Instead, investors tended to value stocks on the basis of their dividend yields. Since the early 1980s, however, corporations increasingly have been paying out cash to shareholders in the form of share repurchases rather than dividends. The marginal individual tax rate on dividends, with rare exceptions, has always been higher than the marginal tax rate on capital gains that repurchases create by raising per share earnings through share reduction. But, until the early 1980s, share repurchases were frowned upon by the Securities and Exchange Commission, and companies that repurchased shares took the risk of being investigated for price manipulation.

In 1982, the SEC gave companies a safe harbor to conduct share repurchases without risk of investigation. This action prompted a marked shift toward repurchases in lieu of dividends to avail shareholders of a lower tax rate on their cash receipts. More recently, a desire to manage shareholder dilution from the rising incidence of employee stock options has also spurred repurchases.

As a consequence, dividend payout ratios, which in decades past averaged about 55 percent, have in recent years fallen on average to about 35 percent. But because share prices have risen so much more than earnings in recent years, dividend yields--the ratio of dividends per share to a company's share price--have fallen appreciably more than the payout ratio. A half-century ago, for example, dividend yields on stocks typically averaged 6 percent. Today such yields are barely above 1 percent.

The sharp fall in dividend payout ratios and yields has dramatically shifted the focus of stock price evaluation toward earnings. Unlike cash dividends, whose value is unambiguous, there is no unambiguously "correct" value of earnings.

Although most pretax profits reflect cash receipts less out-of-pocket cash costs, a significant part results from changes in balance-sheet valuations. The values of almost all assets are based on the assets' ability to produce future income. But an appropriate judgment of that asset value depends critically on a forecast of forthcoming events, which by their nature are uncertain.

A bank, for example, books interest paid on a loan as current revenue. However, if the borrower subsequently defaults, that presumed interest payment would, in retrospect, be seen as a partial return of principal. We seek to cope with this uncertainty by constructing loan reserves, but the adequacy of those reserves is also subject to a forecast. Depreciation charges against income, based on book values, are very crude approximations of deterioration in the economic value of physical plant. The actual deterioration will not be known until the asset is retired or sold. And projections of future investment returns on defined-benefit pension plans markedly affect corporate pension contributions and, hence, pre-tax profits. Thus, how one chooses to evaluate the future income potential of the balance sheet has a significant impact on current reported earnings.

* * *

Earnings uncertainty has been particularly elevated in recent years. Improvements in information technology have created new opportunities for innovative companies, but an environment of rapid technological change is also one in which the resulting profit opportunities are difficult to assess and project. In particular, such rapid change has heightened the potential for competitors to encroach on established market positions. This process of capital reallocation has not only increased the long-term earnings growth potential of the economy as a whole, but has widened as well the degree of uncertainty for individual firms.

Not surprisingly then, with the longer-term outlook increasingly amorphous, the level and recent growth of short-term earnings have taken on especial significance in stock price evaluation, with quarterly earnings reports subject to anticipation, rumor, and "spin." Such tactics, presumably, attempt to induce investors to extrapolate short-term trends into a favorable long-term view that would raise the current stock price.

CEOs, under increasing pressure from the investment community to meet short-term elevated expectations, in too many instances have been drawn to accounting devices whose sole purpose is arguably to obscure potential adverse results. Outside auditors, on several well-publicized occasions, have sanctioned such devices, allegedly for fear of losing valued corporate clients. Thus, it is not surprising that since 1998 earnings restatements have proliferated. This situation is a far cry from earlier decades when, if my recollection serves me correctly, firms competed on the basis of which one had the most conservative set of books. Short-term stock price values then seemed less of a focus than maintaining unquestioned credit worthiness.

* * *

A change in behavior, however, may already be in train. The sharp decline in stock and bond prices following Enron's collapse has chastened many of the uncritical practitioners of questionable accounting. Corporate reputation is fortunately reemerging out of the ashes of the Enron debacle as a significant economic value. Markets are evidently beginning to put a price-earnings premium on reported earnings that appear free of spin. Likewise, perceptions of the reliability of firms' financial statements are increasingly reflected in yield spreads on corporate bonds. Corporate governance has doubtless already measurably improved as a result of this greater market discipline in the wake of recent events.

But the Congress is clearly signaling that more needs to be done. I hope that any legislative and regulatory initiatives will move to further realign current practice with the de jure governance model that served us well in generations past. Most success in that direction would seem to come primarily from changes in incentives for corporate officers.

In particular, as President Bush has suggested, defining more clearly the duties of CEOs with respect to accounting and disclosure appears appropriate. There are, doubtless, other measures that could reinforce the aforementioned Enron-induced market incentives for disclosures and thereby strengthen investors' trust, which is so essential to the effective functioning of free-market capitalism.

We have to be careful, however, not to look to a significant expansion of regulation as the solution to current problems, especially as price-earnings ratios increasingly reflect the market's perception of the quality of accounting. Regulation has, over the years, proven only partially successful in dissuading individuals from playing with the rules of accounting.

* * *

Some changes, however, appear overdue. In principle, stock-option grants, properly constructed, can be highly effective in aligning corporate officers' incentives with those of shareholders. Regrettably, the current accounting for options has created some perverse effects on the quality of corporate disclosures that, arguably, is further complicating the evaluation of earnings and hence diminishing the effectiveness of published income statements in supporting good corporate governance. The failure to include the value of most stock-option grants as employee compensation and, hence, to subtract them from pretax profits, has increased reported earnings and presumably stock prices. This would be the case even if offsets for expired, unexercised options were made. The Financial Accounting Standards Board proposed to require expensing in the early to middle 1990s but abandoned the proposal in the face of significant political pressure.

The Federal Reserve staff estimates that the substitution of unexpensed option grants for cash compensation added about 2-1/2 percentage points to reported annual growth in earnings of our larger corporations between 1995 and 2000. Many argue that this distortion to reported earnings growth contributed to a misallocation of capital investment, especially in high-tech firms.

If market participants indeed have been misled, that, in itself, should be surprising, for there is little mystery about the effect of stock-option grants on earnings reported to shareholders. Accounting rules require that enough data on option grants be reported in footnotes to corporate financial statements to enable analysts to calculate reasonable estimates of their effect on earnings.

Some have argued that Black-Scholes option pricing, the prevailing means of estimating option expense, is approximate. But so is a good deal of all other earnings estimation, as I indicated earlier. Moreover, every corporation does report an implicit estimate of option expense on its income statement. That number for most, of course, is zero. Are option grants truly without any value?

Critics of option expensing have also argued that expensing will make raising capital more difficult. But expensing is only a bookkeeping transaction. Nothing real is changed in the actual operations or cash flow of the corporation. If investors are dissuaded by lower reported earnings as a result of expensing, it means only that they were less informed than they should have been. Capital employed on the basis of misinformation is likely to be capital misused.

Critics of expensing also argue that the availability of options enables corporations to attract more-productive employees. That may well be true. But option expensing in no way precludes the issuance of options. To be sure, lower reported earnings as a result of expensing could temper stock price increases and thereby exacerbate the effects of share dilution. That, presumably, could inhibit option issuance. But again, that inhibition would be appropriate, because it would reflect the correction of misinformation.

* * *

In a further endeavor to align boards of directors with shareholders, rather than management, considerable attention has been placed on filling board seats with so-called independent directors. However, in my experience, few directors in modern times have seen their interests as separate from those of the CEO, who effectively appointed them and, presumably, could remove them from future slates of directors submitted to shareholders.

I do not deny that laws could be passed to force selection of slates of directors who are patently independent of CEO influence and thereby significantly diminish the role of the CEO. I suspect, however, that such an initiative, while ensuring independent directors, would create competing power centers within a corporation, and thus dilute coherent control and impair effective governance.

* * *

After considerable soul-searching and many congressional hearings, the current CEO-dominant paradigm, with all its faults, will likely continue to be viewed as the most viable form of corporate governance for today's world. The only credible alternative is for large--primarily institutional--shareholders to exert far more control over corporate affairs than they appear to be willing to exercise.

Fortunately, it seems clear that, if the CEO chooses to govern in the interests of shareholders, he or she can, by example and through oversight, induce corporate colleagues and outside auditors to behave in ways that produce de facto governance that matches the de jure shareholder-led model. Such CEO leadership is critical for achieving the optimum allocation of the nation's corporate capital.

* * *

Before concluding, I should like to emphasize that a market economy requires a structure of formal rules--a law of contracts, bankruptcy statutes, a code of shareholder rights--to name but a few. But rules cannot substitute for character. In virtually all transactions, whether with customers or with colleagues, we rely on the word of those with whom we do business. If we could not do so, goods and services could not be exchanged efficiently.

Companies run by people with high ethical standards arguably do not need detailed rules to act in the long-run interests of shareholders and, presumably, themselves. But, regrettably, human beings come as we are--some with enviable standards, but others who continually seek to cut corners. Yet there can be only one set of rules for corporate governance, and it must apply to all. Crafting the rules to provide the proper mix of regulatory and market-based incentives and penalties has never been easy. And I suspect that even after we get beyond the Enron debacle, crafting and updating such rules will continue to be a challenge.

Footnotes

1. On topics such as nonfinancial corporate governance, which is not in the Federal Reserve

Board's jurisdiction, I am obviously speaking for myself. In addition, my comments do not represent the official views on this subject of the President's Working Group on Financial Markets, of which I am a member. Return to text

▲ Return to top

2002 Speeches

Home | News and events
Accessibility | Contact Us
Last update: March 26, 2002, 5:00 PM

Attachment to 18

_ TWAUSHI Audit Lag.pdf

Table For Use In Response To Discovery Request 18

Analysis Of Filing Dates[YYYY MM DD] For SEC 10-K By The Comparable Water Companies And AWW - 1998-2006

Fiscal Year	THAMES WATER AQUA US HOLDINGS [INCLUDES AWW AS A SUBSIDARY]	AMERICAN WATER WORKS CO INC	Date Of Independent Auditors Report Within The 10-K Filed By AWW	AMERICAN STATES WATER CO	AQUA AMERICA INC (Formerly PHILADELPHIA SUBURBAN CORP)	CALIFORNIA WATER SERVICE GROUP	CONNECTICUT WATER SERVICE INC	MIDDLESEX WATER CO	SJW CORP	SOUTHWEST WATER CO	YORK WATER CO
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1998	Under SEC Rules The Auditors Report Is Dated Nearly At The Same Time The 10-K Is Filed. TWAUSHI's Audit Trails The Operational Results By As Much As Two Years.	1998_03_26	1998_03_23		1998_03_23	1998_03_26	1998_03_24	1998_03_27	1998_03_30		1998_03_30
1999		1999_03_25	1999_03_25	1999_03_30	1999_03_30	1999_03_16	1999_03_24	1999_03_26	1999_03_29		1999_03_26
2000		2000_03_27	2000_02_01	2000_03_21	2000_03_29	2000_03_24	2000_03_13	2000_03_27	2000_03_29		2000_03_28
2001		2001_03_28	2001_01_30	2001_02_28	2001_03_30	2001_03_27	2001_03_26	2001_03_26	2001_03_21		2001_03_30
2002		2002_03_28	2002_03_28	2002_03_05	2002_03_20	2002_03_26	2002_03_25	2002_03_29	2002_03_12	2002_03_28	2002_03_26
2003				2003_04_08	2003_03_27	2003_03_25	2003_03_26	2003_03_28	2003_03_07	2003_03_28	2003_03_28
2004	2007_01_31			2004_03_23	2004_03_15	2004_03_15	2004_03_12	2004_03_15	2004_03_12	2004_03_15	2004_03_12
2005	2007_01_31			2005_03_16	2005_03_15	2005_03_15	2005_03_31	2005_03_16	2005_03_07	2005_03_31	2005_03_15
2006	UNAVAILABLE			2006_03_15	2006_03_14	2006_03_13	2006_03_31	2006_03_16	2006_03_07	2006_03_16	2006_03_14

Prepared by/under my supervision C-1-P

January 11, 2007

As Of March 30, 2007, CAPD Has Not Received From TAWC The Audited Financial Statements For 2006. In CAPD Discovery Request Part III 5(f) CAPD Requested The Company To Provide "copies of annual audited financial statements for AWW and TWAUSHI for each fiscal year from 2004 through 2006." In its latest reply received March 9, 2007, the Company responded "The requested audited financial statements for 2006 are not yet available."

Attachment to 20

_ SP500Index.pdf

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
12/29/2006	1424.71	1427	1416.84	1418.3	1678200000	1418.3
12/28/2006	1426.77	1427.26	1422.05	1424.73	1508570000	1424.73
12/27/2006	1416.63	1427.72	1416.63	1426.84	1667370000	1426.84
12/26/2006	1410.75	1417.91	1410.45	1416.9	1310310000	1416.9
12/22/2006	1418.1	1418.82	1410.28	1410.76	1647590000	1410.76
12/21/2006	1423.2	1426.4	1415.9	1418.3	2322410000	1418.3
12/20/2006	1425.51	1429.05	1423.51	1423.53	2387630000	1423.53
12/19/2006	1422.42	1428.3	1414.88	1425.55	2717060000	1425.55
12/18/2006	1427.08	1431.81	1420.65	1422.48	2568140000	1422.48
12/15/2006	1425.48	1431.63	1425.48	1427.09	3229580000	1427.09
12/14/2006	1413.16	1427.23	1413.16	1425.49	2729700000	1425.49
12/13/2006	1411.32	1416.64	1411.05	1413.21	2552260000	1413.21
12/12/2006	1413	1413.78	1404.75	1411.56	2738170000	1411.56
12/11/2006	1409.81	1415.6	1408.56	1413.04	2289900000	1413.04
12/8/2006	1407.27	1414.09	1403.67	1409.84	2440460000	1409.84
12/7/2006	1412.86	1418.27	1406.8	1407.29	2743150000	1407.29
12/6/2006	1414.4	1415.93	1411.05	1412.9	2725280000	1412.9
12/5/2006	1409.1	1415.27	1408.78	1414.76	2755700000	1414.76
12/4/2006	1396.67	1411.23	1396.67	1409.12	2766320000	1409.12
12/1/2006	1400.63	1402.46	1385.93	1396.71	2800980000	1396.71
11/30/2006	1399.47	1406.3	1393.83	1400.63	4006230000	1400.63
11/29/2006	1386.11	1401.14	1386.11	1399.48	2790970000	1399.48
11/28/2006	1381.61	1387.91	1377.83	1386.72	2639750000	1386.72
11/27/2006	1400.95	1400.95	1381.44	1381.96	2711210000	1381.96
11/24/2006	1405.94	1405.94	1399.25	1400.95	832550000	1400.95
11/22/2006	1402.69	1407.89	1402.26	1406.09	2237710000	1406.09
11/21/2006	1400.43	1403.49	1399.99	1402.81	2597940000	1402.81
11/20/2006	1401.17	1404.37	1397.85	1400.5	2546710000	1400.5
11/17/2006	1399.76	1401.21	1394.55	1401.2	2726100000	1401.2
11/16/2006	1396.53	1403.76	1396.53	1399.76	2835730000	1399.76
11/15/2006	1392.91	1401.35	1392.13	1396.57	2831130000	1396.57
11/14/2006	1384.36	1394.49	1379.07	1393.22	3027480000	1393.22
11/13/2006	1380.58	1387.61	1378.8	1384.42	2386340000	1384.42
11/10/2006	1378.33	1381.04	1375.6	1380.9	2290200000	1380.9
11/9/2006	1385.43	1388.92	1377.31	1378.33	3012050000	1378.33
11/8/2006	1382.5	1388.61	1379.33	1385.72	2814820000	1385.72
11/7/2006	1379.75	1388.19	1379.19	1382.84	2636390000	1382.84
11/6/2006	1364.27	1381.4	1364.27	1379.78	2533550000	1379.78
11/3/2006	1367.31	1371.68	1360.98	1364.3	2419730000	1364.3
11/2/2006	1367.44	1368.39	1362.21	1367.34	2646180000	1367.34
11/1/2006	1377.76	1381.95	1366.26	1367.81	2821160000	1367.81
10/31/2006	1377.93	1381.21	1372.19	1377.94	2803030000	1377.94
10/30/2006	1377.3	1381.22	1373.46	1377.93	2770440000	1377.93
10/27/2006	1388.89	1388.89	1375.85	1377.34	2458450000	1377.34
10/26/2006	1382.21	1389.45	1379.47	1389.08	2793350000	1389.08
10/25/2006	1377.36	1383.61	1376	1382.22	2953540000	1382.22
10/24/2006	1377.02	1377.78	1372.42	1377.38	2876890000	1377.38
10/23/2006	1368.58	1377.4	1363.94	1377.02	2480430000	1377.02
10/20/2006	1366.94	1368.66	1362.1	1368.6	2526410000	1368.6

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
10/19/2006	1365.95	1368.09	1362.06	1366.96	2619830000	1366.96
10/18/2006	1363.93	1372.87	1360.95	1365.8	2658840000	1365.8
10/17/2006	1369.05	1369.05	1356.87	1364.05	2519620000	1364.05
10/16/2006	1365.61	1370.2	1364.48	1369.06	2305920000	1369.06
10/13/2006	1362.82	1366.63	1360.5	1365.62	2482920000	1365.62
10/12/2006	1349.94	1363.76	1349.94	1362.83	2514350000	1362.83
10/11/2006	1353.28	1353.97	1343.57	1349.95	2521000000	1349.95
10/10/2006	1350.62	1354.23	1348.6	1353.42	2376140000	1353.42
10/9/2006	1349.58	1352.69	1346.55	1350.66	1935170000	1350.66
10/6/2006	1353.22	1353.22	1344.21	1349.59	2523000000	1349.59
10/5/2006	1349.84	1353.79	1347.75	1353.22	2817240000	1353.22
10/4/2006	1333.81	1350.2	1331.48	1350.2	3019880000	1350.2
10/3/2006	1331.32	1338.31	1327.1	1334.11	2682690000	1334.11
10/2/2006	1335.82	1338.54	1330.28	1331.32	2154480000	1331.32
9/29/2006	1339.15	1339.88	1335.64	1335.85	2273430000	1335.85
9/28/2006	1336.56	1340.28	1333.75	1338.88	2397820000	1338.88
9/27/2006	1336.12	1340.08	1333.54	1336.59	2749190000	1336.59
9/26/2006	1326.35	1336.6	1325.3	1336.35	2673350000	1336.35
9/25/2006	1314.78	1329.35	1311.58	1326.37	2710240000	1326.37
9/22/2006	1318.03	1318.03	1310.94	1314.78	2162880000	1314.78
9/21/2006	1324.89	1328.19	1315.45	1318.03	2627440000	1318.03
9/20/2006	1318.28	1328.53	1318.28	1325.18	2543070000	1325.18
9/19/2006	1321.17	1322.04	1312.17	1317.64	2390850000	1317.64
9/18/2006	1319.85	1324.87	1318.16	1321.18	2325080000	1321.18
9/15/2006	1316.28	1324.65	1316.28	1319.66	3198030000	1319.66
9/14/2006	1318	1318	1313.25	1316.28	2351220000	1316.28
9/13/2006	1312.74	1319.92	1311.12	1318.07	2597220000	1318.07
9/12/2006	1299.53	1314.28	1299.53	1313	2791580000	1313
9/11/2006	1298.86	1302.36	1290.93	1299.54	2506430000	1299.54
9/8/2006	1294.02	1300.14	1294.02	1298.92	2132890000	1298.92
9/7/2006	1300.21	1301.25	1292.13	1294.02	2325850000	1294.02
9/6/2006	1313.04	1313.04	1299.28	1300.26	2329870000	1300.26
9/5/2006	1310.94	1314.67	1308.82	1313.25	2114480000	1313.25
9/1/2006	1303.8	1312.03	1303.8	1311.01	1800520000	1311.01
8/31/2006	1304.25	1306.11	1302.45	1303.82	1974540000	1303.82
8/30/2006	1303.7	1306.74	1302.15	1305.37	2060690000	1305.37
8/29/2006	1301.57	1305.02	1295.29	1304.28	2093720000	1304.28
8/28/2006	1295.09	1305.02	1293.97	1301.78	1834920000	1301.78
8/25/2006	1295.92	1298.88	1292.39	1295.09	1667580000	1295.09
8/24/2006	1292.97	1297.23	1291.4	1296.06	1930320000	1296.06
8/23/2006	1298.73	1301.5	1289.82	1292.99	1893670000	1292.99
8/22/2006	1297.52	1302.49	1294.44	1298.82	1908740000	1298.82
8/21/2006	1302.3	1302.3	1295.51	1297.52	1759240000	1297.52
8/18/2006	1297.48	1302.3	1293.57	1302.3	2033910000	1302.3
8/17/2006	1295.37	1300.78	1292.71	1297.48	2458340000	1297.48
8/16/2006	1285.27	1296.21	1285.27	1295.43	2554570000	1295.43
8/15/2006	1268.19	1286.23	1268.19	1285.58	2334100000	1285.58
8/14/2006	1266.67	1278.9	1266.67	1268.21	2118020000	1268.21
8/11/2006	1271.64	1271.64	1262.08	1266.74	2004540000	1266.74

Attachment For Reponse To DIscovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
8/10/2006	1265.72	1272.55	1261.3	1271.81	2402190000	1271.81
8/9/2006	1271.13	1283.74	1264.73	1265.95	2555180000	1265.95
8/8/2006	1275.67	1282.75	1268.37	1271.48	2457840000	1271.48
8/7/2006	1279.31	1279.31	1273	1275.77	2045660000	1275.77
8/4/2006	1280.26	1292.92	1273.82	1279.36	2530970000	1279.36
8/3/2006	1278.22	1283.96	1271.25	1280.27	2728440000	1280.27
8/2/2006	1270.73	1283.42	1270.73	1277.41	2610750000	1277.41
8/1/2006	1278.53	1278.66	1265.71	1270.92	2527690000	1270.92
7/31/2006	1278.53	1278.66	1274.31	1276.66	2461300000	1276.66
7/28/2006	1263.15	1280.42	1263.15	1278.55	2480420000	1278.55
7/27/2006	1268.2	1275.85	1261.92	1263.2	2776710000	1263.2
7/26/2006	1268.87	1273.89	1261.94	1268.4	2667710000	1268.4
7/25/2006	1260.91	1272.39	1257.19	1268.88	2563930000	1268.88
7/24/2006	1240.25	1262.5	1240.25	1260.91	2312720000	1260.91
7/21/2006	1249.12	1250.96	1238.72	1240.29	2704090000	1240.29
7/20/2006	1259.81	1262.56	1249.13	1249.13	2345580000	1249.13
7/19/2006	1236.74	1261.81	1236.74	1259.81	2701980000	1259.81
7/18/2006	1234.48	1239.86	1224.54	1236.86	2481750000	1236.86
7/17/2006	1236.2	1240.07	1231.49	1234.49	2146410000	1234.49
7/14/2006	1242.29	1242.7	1228.45	1236.2	2467120000	1236.2
7/13/2006	1258.58	1258.58	1241.43	1242.28	2545760000	1242.28
7/12/2006	1272.39	1273.31	1257.29	1258.6	2250450000	1258.6
7/11/2006	1267.26	1273.64	1259.65	1272.43	2310850000	1272.43
7/10/2006	1265.46	1274.06	1264.46	1267.34	1854590000	1267.34
7/7/2006	1274.08	1275.38	1263.13	1265.48	1988150000	1265.48
7/6/2006	1270.58	1278.32	1270.58	1274.08	2009160000	1274.08
7/5/2006	1280.05	1280.05	1265.91	1270.91	2165070000	1270.91
7/3/2006	1270.06	1280.38	1270.06	1280.19	1114470000	1280.19
6/30/2006	1272.86	1276.3	1270.2	1270.2	3049560000	1270.2
6/29/2006	1245.94	1272.88	1245.94	1272.87	2621250000	1272.87
6/28/2006	1238.99	1247.06	1237.59	1246	2085490000	1246
6/27/2006	1250.55	1253.37	1238.94	1239.2	2203130000	1239.2
6/26/2006	1244.5	1250.92	1243.68	1250.56	1878580000	1250.56
6/23/2006	1245.59	1253.13	1241.43	1244.5	2017270000	1244.5
6/22/2006	1251.92	1251.92	1241.53	1245.6	2148180000	1245.6
6/21/2006	1240.09	1257.96	1240.09	1252.2	2361230000	1252.2
6/20/2006	1240.12	1249.01	1238.87	1240.12	2232950000	1240.12
6/19/2006	1251.54	1255.93	1237.17	1240.13	2517200000	1240.13
6/16/2006	1256.16	1256.27	1246.33	1251.54	2783390000	1251.54
6/15/2006	1230.01	1258.64	1230.01	1256.16	2775480000	1256.16
6/14/2006	1223.66	1231.46	1219.29	1230.04	2667990000	1230.04
6/13/2006	1236.08	1243.37	1222.52	1223.69	3215770000	1223.69
6/12/2006	1252.27	1255.22	1236.43	1237.44	2247010000	1237.44
6/9/2006	1257.93	1262.58	1250.03	1252.3	2214000000	1252.3
6/8/2006	1256.08	1259.85	1235.18	1257.93	3543790000	1257.93
6/7/2006	1263.61	1272.47	1255.77	1256.15	2644170000	1256.15
6/6/2006	1265.23	1269.88	1254.46	1263.85	2697650000	1263.85
6/5/2006	1288.16	1288.16	1264.66	1265.29	2313470000	1265.29
6/2/2006	1285.71	1290.68	1280.22	1288.22	2295540000	1288.22

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
6/1/2006	1270.05	1285.71	1269.19	1285.71	2360160000	1285.71
5/31/2006	1259.38	1270.09	1259.38	1270.09	2692160000	1270.09
5/30/2006	1280.04	1280.04	1259.87	1259.87	2176190000	1259.87
5/26/2006	1272.71	1280.54	1272.5	1280.16	1814020000	1280.16
5/25/2006	1258.41	1273.26	1258.41	1272.88	2372730000	1272.88
5/24/2006	1256.56	1264.53	1245.34	1258.57	2999030000	1258.57
5/23/2006	1262.06	1273.67	1256.15	1256.58	2605250000	1256.58
5/22/2006	1267.03	1268.77	1252.98	1262.07	2773010000	1262.07
5/19/2006	1261.81	1272.15	1256.28	1267.03	2982300000	1267.03
5/18/2006	1270.25	1274.89	1261.75	1261.81	2537490000	1261.81
5/17/2006	1291.73	1291.73	1267.31	1270.32	2830200000	1270.32
5/16/2006	1294.5	1297.88	1288.51	1292.08	2386210000	1292.08
5/15/2006	1291.19	1294.81	1284.51	1294.5	2505660000	1294.5
5/12/2006	1305.88	1305.88	1290.38	1291.24	2567970000	1291.24
5/11/2006	1322.63	1322.63	1303.45	1305.92	2531520000	1305.92
5/10/2006	1324.57	1325.51	1317.44	1322.85	2268550000	1322.85
5/9/2006	1324.66	1326.6	1322.48	1325.14	2157290000	1325.14
5/8/2006	1325.76	1326.7	1322.87	1324.66	2151300000	1324.66
5/5/2006	1312.25	1326.53	1312.25	1325.76	2294760000	1325.76
5/4/2006	1307.85	1315.14	1307.85	1312.25	2431450000	1312.25
5/3/2006	1313.21	1313.47	1303.92	1308.12	2395230000	1308.12
5/2/2006	1305.19	1313.66	1305.19	1313.21	2403470000	1313.21
5/1/2006	1310.61	1317.21	1303.46	1305.19	2437040000	1305.19
4/28/2006	1309.72	1316.04	1306.16	1310.61	2419920000	1310.61
4/27/2006	1305.41	1315	1295.57	1309.72	2772010000	1309.72
4/26/2006	1301.74	1310.97	1301.74	1305.41	2502690000	1305.41
4/25/2006	1308.11	1310.79	1299.17	1301.74	2366380000	1301.74
4/24/2006	1311.28	1311.28	1303.79	1308.11	2117330000	1308.11
4/21/2006	1311.46	1317.67	1306.59	1311.28	2392630000	1311.28
4/20/2006	1309.93	1318.16	1306.38	1311.46	2512920000	1311.46
4/19/2006	1307.65	1310.39	1302.79	1309.93	2447310000	1309.93
4/18/2006	1285.33	1309.02	1285.33	1307.28	2595440000	1307.28
4/17/2006	1289.12	1292.45	1280.74	1285.33	1794650000	1285.33
4/13/2006	1288.12	1292.09	1283.37	1289.12	1891940000	1289.12
4/12/2006	1286.57	1290.93	1286.45	1288.12	1938100000	1288.12
4/11/2006	1296.6	1300.71	1282.96	1286.57	2232880000	1286.57
4/10/2006	1295.51	1300.74	1293.17	1296.62	1898320000	1296.62
4/7/2006	1309.04	1314.07	1294.18	1295.5	2082470000	1295.5
4/6/2006	1311.56	1311.99	1302.44	1309.04	2281680000	1309.04
4/5/2006	1305.93	1312.81	1304.82	1311.56	2420020000	1311.56
4/4/2006	1297.81	1307.55	1294.71	1305.93	2147660000	1305.93
4/3/2006	1302.88	1309.19	1296.65	1297.81	2494080000	1297.81
3/31/2006	1300.25	1303	1294.87	1294.87	2236710000	1294.87
3/30/2006	1302.89	1310.15	1296.72	1300.25	2294560000	1300.25
3/29/2006	1293.23	1305.6	1293.23	1302.89	2143540000	1302.89
3/28/2006	1301.61	1306.24	1291.84	1293.23	2148580000	1293.23
3/27/2006	1302.95	1303.74	1299.09	1301.61	2029700000	1301.61
3/24/2006	1301.67	1306.53	1298.89	1302.95	2326070000	1302.95
3/23/2006	1305.04	1305.04	1298.11	1301.67	1980940000	1301.67

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
3/22/2006	1297.23	1305.97	1295.81	1305.04	2039810000	1305.04
3/21/2006	1305.08	1310.88	1295.82	1297.23	2147370000	1297.23
3/20/2006	1307.25	1310	1303.59	1305.08	1976830000	1305.08
3/17/2006	1305.33	1309.79	1305.32	1307.25	2549620000	1307.25
3/16/2006	1303.02	1310.45	1303.02	1305.33	2292180000	1305.33
3/15/2006	1297.48	1304.4	1294.97	1303.02	2293000000	1303.02
3/14/2006	1284.13	1298.14	1282.67	1297.48	2165270000	1297.48
3/13/2006	1281.58	1287.37	1281.58	1284.13	2070330000	1284.13
3/10/2006	1272.23	1284.37	1271.11	1281.42	2123450000	1281.42
3/9/2006	1278.47	1282.74	1272.23	1272.23	2140110000	1272.23
3/8/2006	1275.88	1280.33	1268.42	1278.47	2442870000	1278.47
3/7/2006	1278.26	1278.26	1271.11	1275.88	2268050000	1275.88
3/6/2006	1287.23	1288.23	1275.67	1278.26	2280190000	1278.26
3/3/2006	1289.14	1297.33	1284.2	1287.23	2152950000	1287.23
3/2/2006	1291.24	1291.24	1283.21	1289.14	2494590000	1289.14
3/1/2006	1280.66	1291.8	1280.66	1291.24	2308320000	1291.24
2/28/2006	1294.12	1294.12	1278.66	1280.66	2370860000	1280.66
2/27/2006	1289.43	1297.57	1289.43	1294.12	1975320000	1294.12
2/24/2006	1287.79	1292.11	1285.62	1289.43	1933010000	1289.43
2/23/2006	1292.67	1293.84	1285.14	1287.79	2144210000	1287.79
2/22/2006	1283.03	1294.17	1283.03	1292.67	2222380000	1292.67
2/21/2006	1287.24	1291.92	1281.33	1283.03	2104320000	1283.03
2/17/2006	1289.38	1289.47	1284.07	1287.24	2128260000	1287.24
2/16/2006	1280	1289.39	1280	1289.38	2251490000	1289.38
2/15/2006	1275.53	1281	1271.06	1280	2317590000	1280
2/14/2006	1262.86	1278.21	1260.8	1275.53	2437940000	1275.53
2/13/2006	1266.99	1266.99	1258.34	1262.86	1850080000	1262.86
2/10/2006	1263.82	1269.89	1254.98	1266.99	2290050000	1266.99
2/9/2006	1265.65	1274.56	1262.8	1263.78	2441920000	1263.78
2/8/2006	1254.78	1266.47	1254.78	1265.65	2456860000	1265.65
2/7/2006	1265.02	1265.78	1253.61	1254.78	2366370000	1254.78
2/6/2006	1264.03	1267.04	1261.62	1265.02	2132360000	1265.02
2/3/2006	1270.84	1270.87	1261.02	1264.03	2282210000	1264.03
2/2/2006	1282.46	1282.46	1267.72	1270.84	2565300000	1270.84
2/1/2006	1280.08	1283.33	1277.57	1282.46	2589410000	1282.46
1/31/2006	1285.2	1285.2	1276.85	1280.08	2708310000	1280.08
1/30/2006	1283.72	1287.94	1283.51	1285.19	2282730000	1285.19
1/27/2006	1273.83	1286.38	1273.83	1283.72	2623620000	1283.72
1/26/2006	1264.68	1276.44	1264.68	1273.83	2856780000	1273.83
1/25/2006	1266.86	1271.87	1259.42	1264.68	2617060000	1264.68
1/24/2006	1263.82	1271.47	1263.82	1266.86	2608720000	1266.86
1/23/2006	1261.49	1268.19	1261.49	1263.82	2256070000	1263.82
1/20/2006	1285.04	1285.04	1260.92	1261.49	2845810000	1261.49
1/19/2006	1277.93	1287.79	1277.93	1285.04	2444020000	1285.04
1/18/2006	1282.93	1282.93	1272.08	1277.93	2233200000	1277.93
1/17/2006	1287.61	1287.61	1278.61	1283.03	2179970000	1283.03
1/13/2006	1286.06	1288.96	1282.78	1287.61	2206510000	1287.61
1/12/2006	1294.18	1294.18	1285.04	1286.06	2318350000	1286.06
1/11/2006	1289.72	1294.9	1288.12	1294.18	2406130000	1294.18

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
1/10/2006	1290.15	1290.15	1283.76	1289.69	2373080000	1289.69
1/9/2006	1285.45	1290.78	1284.82	1290.15	2301490000	1290.15
1/6/2006	1273.48	1286.09	1273.48	1285.45	2446560000	1285.45
1/5/2006	1273.46	1276.91	1270.3	1273.48	2433340000	1273.48
1/4/2006	1268.8	1275.37	1267.74	1273.46	2515330000	1273.46
1/3/2006	1248.29	1270.22	1245.74	1268.8	2554570000	1268.8
12/30/2005	1254.42	1254.42	1246.59	1248.29	1443500000	1248.29
12/29/2005	1258.17	1260.61	1254.18	1254.42	1382540000	1254.42
12/28/2005	1256.54	1261.1	1256.54	1258.17	1422360000	1258.17
12/27/2005	1268.66	1271.83	1256.54	1256.54	1540470000	1256.54
12/23/2005	1268.12	1269.76	1265.92	1268.66	1285810000	1268.66
12/22/2005	1262.79	1268.19	1262.5	1268.12	1888500000	1268.12
12/21/2005	1259.62	1269.37	1259.62	1262.79	2065170000	1262.79
12/20/2005	1259.92	1263.86	1257.21	1259.62	1996690000	1259.62
12/19/2005	1267.32	1270.51	1259.28	1259.92	2208810000	1259.92
12/16/2005	1270.94	1275.24	1267.32	1267.32	2584190000	1267.32
12/15/2005	1272.74	1275.17	1267.74	1270.94	2180590000	1270.94
12/14/2005	1267.43	1275.8	1267.07	1272.74	2145520000	1272.74
12/13/2005	1260.43	1272.11	1258.56	1267.43	2390020000	1267.43
12/12/2005	1259.37	1263.86	1255.52	1260.43	1876550000	1260.43
12/9/2005	1255.84	1263.08	1254.24	1259.37	1896290000	1259.37
12/8/2005	1257.37	1263.36	1250.91	1255.84	2178300000	1255.84
12/7/2005	1263.7	1264.85	1253.02	1257.37	2093830000	1257.37
12/6/2005	1262.09	1272.89	1262.09	1263.7	2110740000	1263.7
12/5/2005	1265.08	1265.08	1258.12	1262.09	2325840000	1262.09
12/2/2005	1264.67	1266.85	1261.42	1265.08	2125580000	1265.08
12/1/2005	1249.48	1266.17	1249.48	1264.67	2614830000	1264.67
11/30/2005	1257.48	1260.93	1249.39	1249.48	2374690000	1249.48
11/29/2005	1257.46	1266.18	1257.46	1257.48	2268340000	1257.48
11/28/2005	1268.25	1268.44	1257.17	1257.46	2016900000	1257.46
11/25/2005	1265.61	1268.78	1265.54	1268.25	724940000	1268.25
11/23/2005	1261.23	1270.64	1259.51	1265.61	1985400000	1265.61
11/22/2005	1254.85	1261.9	1251.4	1261.23	2291420000	1261.23
11/21/2005	1248.27	1255.89	1246.9	1254.85	2117350000	1254.85
11/18/2005	1242.8	1249.58	1240.71	1248.27	2453290000	1248.27
11/17/2005	1231.21	1242.96	1231.21	1242.8	2298040000	1242.8
11/16/2005	1229.01	1232.24	1227.18	1231.21	2121580000	1231.21
11/15/2005	1233.76	1237.94	1226.41	1229.01	2359370000	1229.01
11/14/2005	1234.72	1237.2	1231.78	1233.76	1899780000	1233.76
11/11/2005	1230.96	1235.7	1230.72	1234.72	1773140000	1234.72
11/10/2005	1220.65	1232.41	1215.05	1230.96	2378460000	1230.96
11/9/2005	1218.59	1226.59	1216.53	1220.65	2214460000	1220.65
11/8/2005	1222.81	1222.81	1216.08	1218.59	1965050000	1218.59
11/7/2005	1220.14	1224.18	1217.29	1222.81	1987580000	1222.81
11/4/2005	1219.94	1222.52	1214.45	1220.14	2050510000	1220.14
11/3/2005	1214.76	1224.7	1214.76	1219.94	2716630000	1219.94
11/2/2005	1202.76	1215.17	1201.07	1214.76	2648090000	1214.76
11/1/2005	1207.01	1207.34	1201.66	1202.76	2457850000	1202.76
10/31/2005	1198.41	1211.43	1198.41	1207.01	2567470000	1207.01

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
10/28/2005	1178.9	1198.41	1178.9	1198.41	2379400000	1198.41
10/27/2005	1191.38	1192.65	1178.89	1178.9	2395370000	1178.9
10/26/2005	1196.54	1204.01	1191.38	1191.38	2467750000	1191.38
10/25/2005	1199.38	1201.3	1189.29	1196.54	2312470000	1196.54
10/24/2005	1179.59	1199.39	1179.59	1199.38	2197790000	1199.38
10/21/2005	1177.8	1186.46	1174.92	1179.59	2470920000	1179.59
10/20/2005	1195.76	1197.3	1173.3	1177.8	2617250000	1177.8
10/19/2005	1178.14	1195.76	1170.55	1195.76	2703590000	1195.76
10/18/2005	1190.1	1190.1	1178.13	1178.14	2197010000	1178.14
10/17/2005	1186.57	1191.21	1184.48	1190.1	2054570000	1190.1
10/14/2005	1176.84	1187.13	1175.44	1186.57	2188940000	1186.57
10/13/2005	1177.68	1179.56	1168.2	1176.84	2351150000	1176.84
10/12/2005	1184.87	1190.02	1173.65	1177.68	2491280000	1177.68
10/11/2005	1187.33	1193.1	1183.16	1184.87	2299040000	1184.87
10/10/2005	1195.9	1196.52	1186.12	1187.33	2195990000	1187.33
10/7/2005	1191.49	1199.71	1191.46	1195.9	2126080000	1195.9
10/6/2005	1196.39	1202.14	1181.92	1191.49	2792030000	1191.49
10/5/2005	1214.47	1214.47	1196.25	1196.39	2546780000	1196.39
10/4/2005	1226.7	1229.88	1214.02	1214.47	2341420000	1214.47
10/3/2005	1228.81	1233.34	1225.15	1226.7	2097490000	1226.7
9/30/2005	1227.68	1229.57	1225.22	1228.81	2097520000	1228.81
9/29/2005	1216.89	1228.7	1211.54	1227.68	2176120000	1227.68
9/28/2005	1215.66	1220.98	1212.72	1216.89	2106980000	1216.89
9/27/2005	1215.63	1220.17	1211.11	1215.66	1976270000	1215.66
9/26/2005	1215.29	1222.56	1211.84	1215.63	2022220000	1215.63
9/23/2005	1214.62	1218.83	1209.8	1215.29	1973020000	1215.29
9/22/2005	1210.2	1216.64	1205.35	1214.62	2424720000	1214.62
9/21/2005	1221.34	1221.52	1209.89	1210.2	2548150000	1210.2
9/20/2005	1231.02	1236.49	1220.07	1221.34	2319250000	1221.34
9/19/2005	1237.91	1237.91	1227.65	1231.02	2076540000	1231.02
9/16/2005	1228.42	1237.95	1228.42	1237.91	3152470000	1237.91
9/15/2005	1227.16	1231.88	1224.85	1227.73	2079340000	1227.73
9/14/2005	1231.2	1234.74	1226.16	1227.16	1986750000	1227.16
9/13/2005	1240.57	1240.57	1231.2	1231.2	2082360000	1231.2
9/12/2005	1241.48	1242.6	1239.15	1240.56	1938050000	1240.56
9/9/2005	1231.67	1243.13	1231.67	1241.48	1992560000	1241.48
9/8/2005	1236.36	1236.36	1229.51	1231.67	1955380000	1231.67
9/7/2005	1233.39	1237.06	1230.93	1236.36	2067700000	1236.36
9/6/2005	1218.02	1233.61	1218.02	1233.39	1932090000	1233.39
9/2/2005	1221.59	1224.45	1217.75	1218.02	1640160000	1218.02
9/1/2005	1220.33	1227.29	1216.18	1221.59	2229860000	1221.59
8/31/2005	1208.41	1220.36	1204.4	1220.33	2365510000	1220.33
8/30/2005	1212.28	1212.28	1201.07	1208.41	1916470000	1208.41
8/29/2005	1205.1	1214.28	1201.53	1212.28	1599450000	1212.28
8/26/2005	1212.4	1212.4	1204.23	1205.1	1541090000	1205.1
8/25/2005	1209.59	1213.73	1209.57	1212.37	1571110000	1212.37
8/24/2005	1217.57	1224.15	1209.37	1209.59	1930800000	1209.59
8/23/2005	1221.73	1223.04	1214.44	1217.59	1678620000	1217.59
8/22/2005	1219.71	1228.96	1216.47	1221.73	1621330000	1221.73

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
8/19/2005	1219.02	1225.08	1219.02	1219.71	1558790000	1219.71
8/18/2005	1220.24	1222.64	1215.93	1219.02	1808170000	1219.02
8/17/2005	1219.34	1225.63	1218.07	1220.24	1859150000	1220.24
8/16/2005	1233.87	1233.87	1219.05	1219.34	1820410000	1219.34
8/15/2005	1230.4	1236.24	1226.2	1233.87	1562880000	1233.87
8/12/2005	1237.81	1237.81	1225.87	1230.39	1709300000	1230.39
8/11/2005	1229.13	1237.81	1228.33	1237.81	1941560000	1237.81
8/10/2005	1231.38	1242.69	1226.58	1229.13	2172320000	1229.13
8/9/2005	1223.13	1234.11	1223.13	1231.38	1897520000	1231.38
8/8/2005	1226.42	1232.28	1222.67	1223.13	1804140000	1223.13
8/5/2005	1235.86	1235.86	1225.62	1226.42	1930280000	1226.42
8/4/2005	1245.04	1245.04	1235.15	1235.86	1981220000	1235.86
8/3/2005	1244.12	1245.86	1240.57	1245.04	1999980000	1245.04
8/2/2005	1235.35	1244.69	1235.35	1244.12	2043120000	1244.12
8/1/2005	1234.18	1239.1	1233.8	1235.35	1716870000	1235.35
7/29/2005	1243.72	1245.04	1234.18	1234.18	1789600000	1234.18
7/28/2005	1236.79	1245.15	1235.81	1243.72	2001680000	1243.72
7/27/2005	1231.16	1237.64	1230.15	1236.79	1945800000	1236.79
7/26/2005	1229.03	1234.42	1229.03	1231.16	1934180000	1231.16
7/25/2005	1233.68	1238.36	1228.15	1229.03	1717580000	1229.03
7/22/2005	1227.04	1234.19	1226.15	1233.68	1766990000	1233.68
7/21/2005	1235.2	1235.83	1224.7	1227.04	2129840000	1227.04
7/20/2005	1229.35	1236.56	1222.91	1235.2	2063340000	1235.2
7/19/2005	1221.13	1230.34	1221.13	1229.35	2041280000	1229.35
7/18/2005	1227.92	1227.92	1221.13	1221.13	1582100000	1221.13
7/15/2005	1226.5	1229.53	1223.5	1227.92	1716400000	1227.92
7/14/2005	1223.29	1233.16	1223.29	1226.5	2048710000	1226.5
7/13/2005	1222.21	1224.46	1219.64	1223.29	1812500000	1223.29
7/12/2005	1219.44	1225.54	1216.6	1222.21	1932010000	1222.21
7/11/2005	1211.86	1220.03	1211.86	1219.44	1846300000	1219.44
7/8/2005	1197.87	1212.73	1197.2	1211.86	1900810000	1211.86
7/7/2005	1194.94	1198.46	1183.55	1197.87	1952440000	1197.87
7/6/2005	1204.99	1206.11	1194.78	1194.94	1883470000	1194.94
7/5/2005	1194.44	1206.34	1192.49	1204.99	1805820000	1204.99
7/1/2005	1191.33	1197.89	1191.33	1194.44	1593820000	1194.44
6/30/2005	1199.85	1203.27	1190.51	1191.33	2109490000	1191.33
6/29/2005	1201.57	1204.07	1198.7	1199.85	1769280000	1199.85
6/28/2005	1190.69	1202.54	1190.69	1201.57	1772410000	1201.57
6/27/2005	1191.57	1194.33	1188.3	1190.69	1738620000	1190.69
6/24/2005	1200.73	1200.9	1191.45	1191.57	2418800000	1191.57
6/23/2005	1213.88	1216.45	1200.72	1200.73	2029920000	1200.73
6/22/2005	1213.61	1219.59	1211.69	1213.88	1823250000	1213.88
6/21/2005	1216.1	1217.13	1211.86	1213.61	1720700000	1213.61
6/20/2005	1216.96	1219.1	1210.65	1216.1	1714530000	1216.1
6/17/2005	1210.93	1219.55	1210.93	1216.96	2407370000	1216.96
6/16/2005	1206.55	1212.1	1205.47	1210.96	1776040000	1210.96
6/15/2005	1203.91	1208.08	1198.66	1206.58	1840440000	1206.58
6/14/2005	1200.82	1207.53	1200.18	1203.91	1698150000	1203.91
6/13/2005	1198.11	1206.03	1194.51	1200.82	1661350000	1200.82

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
6/10/2005	1200.93	1202.79	1192.64	1198.11	1664180000	1198.11
6/9/2005	1194.67	1201.86	1191.09	1200.93	1824120000	1200.93
6/8/2005	1197.26	1201.97	1193.33	1194.67	1715490000	1194.67
6/7/2005	1197.51	1208.85	1197.26	1197.26	1851370000	1197.26
6/6/2005	1196.02	1198.78	1192.75	1197.51	1547120000	1197.51
6/3/2005	1204.29	1205.09	1194.55	1196.02	1627520000	1196.02
6/2/2005	1202.27	1204.67	1198.42	1204.29	1813790000	1204.29
6/1/2005	1191.5	1205.64	1191.03	1202.22	1810100000	1202.22
5/31/2005	1198.78	1198.78	1191.5	1191.5	1840680000	1191.5
5/27/2005	1197.62	1199.56	1195.28	1198.78	1381430000	1198.78
5/26/2005	1190.01	1198.95	1190.01	1197.62	1654110000	1197.62
5/25/2005	1194.07	1194.07	1185.96	1190.01	1742180000	1190.01
5/24/2005	1193.86	1195.29	1189.87	1194.07	1681000000	1194.07
5/23/2005	1189.28	1197.44	1188.76	1193.86	1681170000	1193.86
5/20/2005	1191.08	1191.22	1185.19	1189.28	1631750000	1189.28
5/19/2005	1185.56	1191.09	1184.49	1191.08	1775860000	1191.08
5/18/2005	1173.8	1187.9	1173.8	1185.56	2266320000	1185.56
5/17/2005	1165.69	1174.35	1159.86	1173.8	1887260000	1173.8
5/16/2005	1154.05	1165.75	1153.64	1165.69	1856860000	1165.69
5/13/2005	1159.36	1163.75	1146.18	1154.05	2188590000	1154.05
5/12/2005	1171.11	1173.37	1157.76	1159.36	1995290000	1159.36
5/11/2005	1166.22	1171.77	1157.71	1171.11	1834970000	1171.11
5/10/2005	1178.84	1178.84	1162.98	1166.22	1889660000	1166.22
5/9/2005	1171.35	1178.87	1169.38	1178.84	1857020000	1178.84
5/6/2005	1172.63	1177.75	1170.5	1171.35	1707200000	1171.35
5/5/2005	1175.65	1178.62	1166.77	1172.63	1997100000	1172.63
5/4/2005	1161.17	1176.01	1161.17	1175.65	2306480000	1175.65
5/3/2005	1162.16	1166.89	1156.71	1161.17	2167020000	1161.17
5/2/2005	1156.85	1162.87	1154.71	1162.16	1980040000	1162.16
4/29/2005	1143.22	1156.97	1139.19	1156.85	2362360000	1156.85
4/28/2005	1156.38	1156.38	1143.22	1143.22	2182270000	1143.22
4/27/2005	1151.74	1159.87	1144.42	1156.38	2151520000	1156.38
4/26/2005	1162.1	1164.8	1151.83	1151.83	1959740000	1151.83
4/25/2005	1152.12	1164.05	1152.12	1162.1	1795030000	1162.1
4/22/2005	1159.95	1159.95	1142.95	1152.12	2045880000	1152.12
4/21/2005	1137.5	1159.95	1137.5	1159.95	2308560000	1159.95
4/20/2005	1152.78	1155.5	1136.15	1137.5	2217050000	1137.5
4/19/2005	1145.98	1154.67	1145.98	1152.78	2142700000	1152.78
4/18/2005	1142.62	1148.92	1139.8	1145.98	2180670000	1145.98
4/15/2005	1162.05	1162.05	1141.92	1142.62	2689960000	1142.62
4/14/2005	1173.79	1174.67	1161.7	1162.05	2355040000	1162.05
4/13/2005	1187.76	1187.76	1171.4	1173.79	2049740000	1173.79
4/12/2005	1181.21	1190.17	1170.85	1187.76	1979830000	1187.76
4/11/2005	1181.2	1184.07	1178.69	1181.21	1525310000	1181.21
4/8/2005	1191.14	1191.75	1181.13	1181.2	1661330000	1181.2
4/7/2005	1184.07	1191.88	1183.81	1191.14	1900620000	1191.14
4/6/2005	1181.39	1189.34	1181.39	1184.07	1797400000	1184.07
4/5/2005	1176.12	1183.56	1176.12	1181.39	1870800000	1181.39
4/4/2005	1172.79	1178.61	1167.72	1176.12	2079770000	1176.12

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
4/1/2005	1180.59	1189.8	1169.91	1172.92	2168690000	1172.92
3/31/2005	1181.41	1184.53	1179.49	1180.59	2214230000	1180.59
3/30/2005	1165.36	1181.54	1165.36	1181.41	2097110000	1181.41
3/29/2005	1174.28	1179.39	1163.69	1165.36	2223250000	1165.36
3/28/2005	1171.42	1179.91	1171.42	1174.28	1746220000	1174.28
3/24/2005	1172.53	1180.11	1171.42	1171.42	1721720000	1171.42
3/23/2005	1171.71	1176.26	1168.7	1172.53	2246870000	1172.53
3/22/2005	1183.78	1189.59	1171.63	1171.71	2114470000	1171.71
3/21/2005	1189.65	1189.65	1178.82	1183.78	1819440000	1183.78
3/18/2005	1190.21	1191.98	1182.78	1189.65	2344370000	1189.65
3/17/2005	1188.07	1193.28	1186.34	1190.21	1581930000	1190.21
3/16/2005	1197.75	1197.75	1185.61	1188.07	1653190000	1188.07
3/15/2005	1206.83	1210.54	1197.75	1197.75	1513530000	1197.75
3/14/2005	1200.08	1206.83	1199.51	1206.83	1437430000	1206.83
3/11/2005	1209.25	1213.04	1198.15	1200.08	1449820000	1200.08
3/10/2005	1207.01	1211.23	1201.41	1209.25	1604020000	1209.25
3/9/2005	1219.43	1219.43	1206.66	1207.01	1704970000	1207.01
3/8/2005	1225.31	1225.69	1218.57	1219.43	1523090000	1219.43
3/7/2005	1222.12	1229.11	1222.12	1225.31	1488830000	1225.31
3/4/2005	1210.47	1224.76	1210.47	1222.12	1636820000	1222.12
3/3/2005	1210.08	1215.72	1204.45	1210.47	1616240000	1210.47
3/2/2005	1210.41	1215.79	1204.22	1210.08	1568540000	1210.08
3/1/2005	1203.6	1212.25	1203.6	1210.41	1708060000	1210.41
2/28/2005	1211.37	1211.37	1198.13	1203.6	1795480000	1203.6
2/25/2005	1200.2	1212.15	1199.61	1211.37	1523680000	1211.37
2/24/2005	1190.8	1200.42	1187.8	1200.2	1518750000	1200.2
2/23/2005	1184.16	1193.52	1184.16	1190.8	1501090000	1190.8
2/22/2005	1201.59	1202.48	1184.16	1184.16	1744940000	1184.16
2/18/2005	1200.75	1202.92	1197.35	1201.59	1551200000	1201.59
2/17/2005	1210.34	1211.33	1200.74	1200.75	1580120000	1200.75
2/16/2005	1210.12	1212.44	1205.06	1210.34	1490100000	1210.34
2/15/2005	1206.14	1212.44	1205.52	1210.12	1527080000	1210.12
2/14/2005	1205.3	1206.93	1203.59	1206.14	1290180000	1206.14
2/11/2005	1197.01	1208.38	1193.28	1205.3	1562300000	1205.3
2/10/2005	1191.99	1198.75	1191.54	1197.01	1491670000	1197.01
2/9/2005	1202.3	1203.83	1191.54	1191.99	1511040000	1191.99
2/8/2005	1201.72	1205.11	1200.16	1202.3	1416170000	1202.3
2/7/2005	1203.03	1204.15	1199.27	1201.72	1347270000	1201.72
2/4/2005	1189.89	1203.47	1189.67	1203.03	1648160000	1203.03
2/3/2005	1193.19	1193.19	1185.64	1189.89	1554460000	1189.89
2/2/2005	1189.41	1195.25	1188.92	1193.19	1561740000	1193.19
2/1/2005	1181.27	1190.39	1180.95	1189.41	1681980000	1189.41
1/31/2005	1171.36	1182.07	1171.36	1181.27	1679800000	1181.27
1/28/2005	1174.55	1175.61	1166.25	1171.36	1641800000	1171.36
1/27/2005	1174.07	1177.5	1170.15	1174.55	1600600000	1174.55
1/26/2005	1168.41	1175.96	1168.41	1174.07	1635900000	1174.07
1/25/2005	1163.75	1174.3	1163.75	1168.41	1610400000	1168.41
1/24/2005	1167.87	1173.03	1163.75	1163.75	1494600000	1163.75
1/21/2005	1175.41	1179.45	1167.82	1167.87	1643500000	1167.87

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
1/20/2005	1184.63	1184.63	1173.42	1175.41	1692000000	1175.41
1/19/2005	1195.98	1195.98	1184.41	1184.63	1498700000	1184.63
1/18/2005	1184.52	1195.98	1180.1	1195.98	1596800000	1195.98
1/14/2005	1177.45	1185.21	1177.45	1184.52	1335400000	1184.52
1/13/2005	1187.7	1187.7	1175.81	1177.45	1510300000	1177.45
1/12/2005	1182.99	1187.92	1175.64	1187.7	1562100000	1187.7
1/11/2005	1190.25	1190.25	1180.43	1182.99	1488800000	1182.99
1/10/2005	1186.19	1194.78	1184.8	1190.25	1490400000	1190.25
1/7/2005	1187.89	1192.2	1182.16	1186.19	1477900000	1186.19
1/6/2005	1183.74	1191.63	1183.27	1187.89	1569100000	1187.89
1/5/2005	1188.05	1192.73	1183.72	1183.74	1738900000	1183.74
1/4/2005	1202.08	1205.84	1185.39	1188.05	1721000000	1188.05
1/3/2005	1211.92	1217.8	1200.32	1202.08	1510800000	1202.08
12/31/2004	1213.55	1217.33	1211.65	1211.92	786900000	1211.92
12/30/2004	1213.45	1216.47	1213.41	1213.55	829800000	1213.55
12/29/2004	1213.54	1213.85	1210.95	1213.45	925900000	1213.45
12/28/2004	1204.92	1213.54	1204.92	1213.54	983000000	1213.54
12/27/2004	1210.13	1214.13	1204.92	1204.92	922000000	1204.92
12/23/2004	1209.57	1213.66	1208.71	1210.13	956100000	1210.13
12/22/2004	1205.45	1211.42	1203.85	1209.57	1390800000	1209.57
12/21/2004	1194.65	1205.93	1194.65	1205.45	1483700000	1205.45
12/20/2004	1194.2	1203.43	1193.36	1194.65	1422800000	1194.65
12/17/2004	1203.21	1203.21	1193.49	1194.2	2335000000	1194.2
12/16/2004	1205.72	1207.97	1198.41	1203.21	1793900000	1203.21
12/15/2004	1203.38	1206.61	1199.44	1205.72	1695800000	1205.72
12/14/2004	1198.68	1205.29	1197.84	1203.38	1544400000	1203.38
12/13/2004	1188	1198.74	1188	1198.68	1436100000	1198.68
12/10/2004	1189.24	1191.45	1185.24	1188	1443700000	1188
12/9/2004	1182.81	1190.51	1173.79	1189.24	1624700000	1189.24
12/8/2004	1177.07	1184.05	1177.07	1182.81	1525200000	1182.81
12/7/2004	1190.25	1192.17	1177.07	1177.07	1533900000	1177.07
12/6/2004	1191.17	1192.41	1185.18	1190.25	1354400000	1190.25
12/3/2004	1190.33	1197.46	1187.71	1191.17	1566700000	1191.17
12/2/2004	1191.37	1194.8	1186.72	1190.33	1774900000	1190.33
12/1/2004	1173.78	1191.37	1173.78	1191.37	1772800000	1191.37
11/30/2004	1178.57	1178.66	1173.81	1173.82	1553500000	1173.82
11/29/2004	1182.65	1186.94	1172.37	1178.57	1378500000	1178.57
11/26/2004	1181.76	1186.62	1181.08	1182.65	504580000	1182.65
11/24/2004	1176.94	1182.46	1176.94	1181.76	1149600000	1181.76
11/23/2004	1177.24	1179.52	1171.41	1176.94	1428300000	1176.94
11/22/2004	1170.34	1178.18	1167.89	1177.24	1392700000	1177.24
11/19/2004	1183.55	1184	1169.19	1170.34	1526600000	1170.34
11/18/2004	1181.94	1184.9	1180.15	1183.55	1456700000	1183.55
11/17/2004	1175.43	1188.46	1175.43	1181.94	1684200000	1181.94
11/16/2004	1183.81	1183.81	1175.32	1175.43	1364400000	1175.43
11/15/2004	1184.17	1184.48	1179.85	1183.81	1453300000	1183.81
11/12/2004	1173.48	1184.17	1171.43	1184.17	1531600000	1184.17
11/11/2004	1162.91	1174.8	1162.91	1173.48	1393000000	1173.48
11/10/2004	1164.08	1169.25	1162.51	1162.91	1504300000	1162.91

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
11/9/2004	1164.89	1168.96	1162.48	1164.08	1450800000	1164.08
11/8/2004	1166.17	1166.77	1162.32	1164.89	1358700000	1164.89
11/5/2004	1161.67	1170.87	1160.66	1166.17	1724400000	1166.17
11/4/2004	1143.2	1161.67	1142.34	1161.67	1782700000	1161.67
11/3/2004	1130.54	1147.57	1130.54	1143.2	1767500000	1143.2
11/2/2004	1130.51	1140.48	1128.12	1130.56	1659000000	1130.56
11/1/2004	1130.2	1133.41	1127.6	1130.51	1395900000	1130.51
10/29/2004	1127.44	1131.4	1124.62	1130.2	1500800000	1130.2
10/28/2004	1125.34	1130.67	1120.6	1127.44	1628200000	1127.44
10/27/2004	1111.09	1126.29	1107.43	1125.4	1741900000	1125.4
10/26/2004	1094.81	1111.1	1094.81	1111.09	1685400000	1111.09
10/25/2004	1095.74	1096.81	1090.29	1094.8	1380500000	1094.8
10/22/2004	1106.49	1108.14	1095.47	1095.74	1469600000	1095.74
10/21/2004	1103.66	1108.87	1098.47	1106.49	1673000000	1106.49
10/20/2004	1103.23	1104.09	1094.25	1103.66	1685700000	1103.66
10/19/2004	1114.02	1117.96	1103.15	1103.23	1737500000	1103.23
10/18/2004	1108.2	1114.46	1103.33	1114.02	1373300000	1114.02
10/15/2004	1103.29	1113.17	1102.14	1108.2	1645100000	1108.2
10/14/2004	1113.65	1114.96	1102.06	1103.29	1489500000	1103.29
10/13/2004	1121.84	1127.01	1109.63	1113.65	1546200000	1113.65
10/12/2004	1124.39	1124.39	1115.77	1121.84	1320100000	1121.84
10/11/2004	1122.14	1126.2	1122.14	1124.39	943800000	1124.39
10/8/2004	1130.65	1132.92	1120.19	1122.14	1291600000	1122.14
10/7/2004	1142.05	1142.05	1130.5	1130.65	1447500000	1130.65
10/6/2004	1134.48	1142.05	1132.94	1142.05	1416700000	1142.05
10/5/2004	1135.17	1137.87	1132.03	1134.48	1418400000	1134.48
10/4/2004	1131.5	1140.13	1131.5	1135.17	1534000000	1135.17
10/1/2004	1114.58	1131.64	1114.58	1131.5	1582200000	1131.5
9/30/2004	1114.8	1116.31	1109.68	1114.58	1748000000	1114.58
9/29/2004	1110.06	1114.8	1107.42	1114.8	1402900000	1114.8
9/28/2004	1103.52	1111.77	1101.29	1110.06	1396600000	1110.06
9/27/2004	1110.11	1110.11	1103.24	1103.52	1263500000	1103.52
9/24/2004	1108.36	1113.81	1108.36	1110.11	1255400000	1110.11
9/23/2004	1113.56	1113.61	1108.05	1108.36	1286300000	1108.36
9/22/2004	1129.3	1129.3	1112.67	1113.56	1379900000	1113.56
9/21/2004	1122.2	1131.54	1122.2	1129.3	1325000000	1129.3
9/20/2004	1128.55	1128.55	1120.34	1122.2	1197600000	1122.2
9/17/2004	1123.5	1130.14	1123.5	1128.55	1422600000	1128.55
9/16/2004	1120.37	1126.06	1120.37	1123.5	1113900000	1123.5
9/15/2004	1128.33	1128.33	1119.82	1120.37	1256000000	1120.37
9/14/2004	1125.82	1129.46	1124.72	1128.33	1204500000	1128.33
9/13/2004	1123.92	1129.78	1123.35	1125.82	1299800000	1125.82
9/10/2004	1118.38	1125.26	1114.39	1123.92	1261200000	1123.92
9/9/2004	1116.27	1121.3	1113.62	1118.38	1371300000	1118.38
9/8/2004	1121.3	1123.05	1116.27	1116.27	1246300000	1116.27
9/7/2004	1113.63	1124.08	1113.63	1121.3	1214400000	1121.3
9/3/2004	1118.31	1120.8	1113.57	1113.63	924170000	1113.63
9/2/2004	1105.91	1119.11	1105.6	1118.31	1118400000	1118.31
9/1/2004	1104.24	1109.24	1099.18	1105.91	1142100000	1105.91

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
8/31/2004	1099.15	1104.24	1094.72	1104.24	1138200000	1104.24
8/30/2004	1107.77	1107.77	1099.15	1099.15	843100000	1099.15
8/27/2004	1105.09	1109.68	1104.62	1107.77	845400000	1107.77
8/26/2004	1104.96	1106.78	1102.46	1105.09	1023600000	1105.09
8/25/2004	1096.19	1106.29	1093.24	1104.96	1192200000	1104.96
8/24/2004	1095.68	1100.94	1092.82	1096.19	1092500000	1096.19
8/23/2004	1098.35	1101.4	1094.73	1095.68	1021900000	1095.68
8/20/2004	1091.23	1100.26	1089.57	1098.35	1199900000	1098.35
8/19/2004	1095.17	1095.17	1086.28	1091.23	1249400000	1091.23
8/18/2004	1081.71	1095.17	1078.93	1095.17	1282500000	1095.17
8/17/2004	1079.34	1086.78	1079.34	1081.71	1267800000	1081.71
8/16/2004	1064.8	1080.66	1064.8	1079.34	1206200000	1079.34
8/13/2004	1063.23	1067.58	1060.72	1064.8	1175100000	1064.8
8/12/2004	1075.79	1075.79	1062.82	1063.23	1405100000	1063.23
8/11/2004	1079.04	1079.04	1065.92	1075.79	1410400000	1075.79
8/10/2004	1065.22	1079.04	1065.22	1079.04	1245600000	1079.04
8/9/2004	1063.97	1069.46	1063.97	1065.22	1086000000	1065.22
8/6/2004	1080.7	1080.7	1062.23	1063.97	1521000000	1063.97
8/5/2004	1098.63	1098.79	1079.98	1080.7	1397400000	1080.7
8/4/2004	1099.69	1102.45	1092.4	1098.63	1369200000	1098.63
8/3/2004	1106.62	1106.62	1099.26	1099.69	1338300000	1099.69
8/2/2004	1101.72	1108.6	1097.34	1106.62	1276000000	1106.62
7/30/2004	1100.43	1103.73	1096.96	1101.72	1298200000	1101.72
7/29/2004	1095.42	1103.51	1095.42	1100.43	1530100000	1100.43
7/28/2004	1094.83	1098.84	1082.17	1095.42	1554300000	1095.42
7/27/2004	1084.07	1096.65	1084.07	1094.83	1610800000	1094.83
7/26/2004	1086.2	1089.82	1078.78	1084.07	1413400000	1084.07
7/23/2004	1096.84	1096.84	1083.56	1086.2	1337500000	1086.2
7/22/2004	1093.88	1099.66	1084.16	1096.84	1680800000	1096.84
7/21/2004	1108.67	1116.27	1093.88	1093.88	1679500000	1093.88
7/20/2004	1100.9	1108.88	1099.1	1108.67	1445800000	1108.67
7/19/2004	1101.39	1105.52	1096.55	1100.9	1319900000	1100.9
7/16/2004	1106.69	1112.17	1101.07	1101.39	1450300000	1101.39
7/15/2004	1111.47	1114.63	1106.67	1106.69	1408700000	1106.69
7/14/2004	1115.14	1119.6	1107.83	1111.47	1462000000	1111.47
7/13/2004	1114.35	1116.3	1112.99	1115.14	1199700000	1115.14
7/12/2004	1112.81	1116.11	1106.71	1114.35	1114600000	1114.35
7/9/2004	1109.11	1115.57	1109.11	1112.81	1186300000	1112.81
7/8/2004	1118.33	1119.12	1108.72	1109.11	1401100000	1109.11
7/7/2004	1116.21	1122.37	1114.92	1118.33	1328600000	1118.33
7/6/2004	1125.38	1125.38	1113.21	1116.21	1283300000	1116.21
7/2/2004	1128.94	1129.15	1123.26	1125.38	1085000000	1125.38
7/1/2004	1140.84	1140.84	1123.06	1128.94	1495700000	1128.94
6/30/2004	1136.2	1144.2	1133.62	1140.84	1473800000	1140.84
6/29/2004	1133.35	1138.26	1131.81	1136.2	1375000000	1136.2
6/28/2004	1134.43	1142.6	1131.72	1133.35	1354600000	1133.35
6/25/2004	1140.65	1145.97	1134.24	1134.43	1812900000	1134.43
6/24/2004	1144.06	1146.34	1139.94	1140.65	1394900000	1140.65
6/23/2004	1134.41	1145.15	1131.73	1144.06	1444200000	1144.06

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
6/22/2004	1130.3	1135.05	1124.37	1134.41	1382300000	1134.41
6/21/2004	1135.02	1138.05	1129.64	1130.3	1123900000	1130.3
6/18/2004	1132.05	1138.96	1129.83	1135.02	1500600000	1135.02
6/17/2004	1133.56	1133.56	1126.89	1132.05	1296700000	1132.05
6/16/2004	1132.01	1135.28	1130.55	1133.56	1168400000	1133.56
6/15/2004	1125.29	1137.36	1125.29	1132.01	1345900000	1132.01
6/14/2004	1136.47	1136.47	1122.16	1125.29	1179400000	1125.29
6/10/2004	1131.33	1136.47	1131.33	1136.47	1160600000	1136.47
6/9/2004	1142.18	1142.18	1131.17	1131.33	1276800000	1131.33
6/8/2004	1140.42	1142.18	1135.45	1142.18	1190300000	1142.18
6/7/2004	1122.5	1140.54	1122.5	1140.42	1211800000	1140.42
6/4/2004	1116.64	1129.17	1116.64	1122.5	1115300000	1122.5
6/3/2004	1124.99	1125.31	1116.57	1116.64	1232400000	1116.64
6/2/2004	1121.2	1128.1	1118.64	1124.99	1251700000	1124.99
6/1/2004	1120.68	1122.7	1113.32	1121.2	1238000000	1121.2
5/28/2004	1121.28	1122.69	1118.1	1120.68	1172600000	1120.68
5/27/2004	1114.94	1123.95	1114.86	1121.28	1447500000	1121.28
5/26/2004	1113.05	1116.71	1109.91	1114.94	1369400000	1114.94
5/25/2004	1095.41	1113.8	1090.74	1113.05	1545700000	1113.05
5/24/2004	1093.56	1101.28	1091.77	1095.41	1227500000	1095.41
5/21/2004	1089.19	1099.64	1089.19	1093.56	1258600000	1093.56
5/20/2004	1088.68	1092.62	1085.43	1089.19	1211000000	1089.19
5/19/2004	1091.49	1105.93	1088.49	1088.68	1548600000	1088.68
5/18/2004	1084.1	1094.1	1084.1	1091.49	1353000000	1091.49
5/17/2004	1095.7	1095.7	1079.36	1084.1	1430100000	1084.1
5/14/2004	1096.44	1102.1	1088.24	1095.7	1335900000	1095.7
5/13/2004	1097.28	1102.77	1091.76	1096.44	1411100000	1096.44
5/12/2004	1095.45	1097.55	1076.32	1097.28	1697600000	1097.28
5/11/2004	1087.12	1095.69	1087.12	1095.45	1533800000	1095.45
5/10/2004	1098.7	1098.7	1079.63	1087.12	1918400000	1087.12
5/7/2004	1113.99	1117.3	1098.63	1098.7	1653600000	1098.7
5/6/2004	1121.53	1121.53	1106.3	1113.99	1509300000	1113.99
5/5/2004	1119.55	1125.07	1117.9	1121.53	1469000000	1121.53
5/4/2004	1117.49	1127.74	1112.89	1119.55	1662100000	1119.55
5/3/2004	1107.3	1118.72	1107.3	1117.49	1571600000	1117.49
4/30/2004	1113.89	1119.26	1107.23	1107.3	1634700000	1107.3
4/29/2004	1122.41	1128.8	1108.04	1113.89	1859000000	1113.89
4/28/2004	1138.11	1138.11	1121.7	1122.41	1855600000	1122.41
4/27/2004	1135.53	1146.56	1135.53	1138.11	1518000000	1138.11
4/26/2004	1140.6	1145.08	1132.91	1135.53	1290600000	1135.53
4/23/2004	1139.93	1141.92	1134.81	1140.6	1396100000	1140.6
4/22/2004	1124.09	1142.77	1121.95	1139.93	1826700000	1139.93
4/21/2004	1118.15	1125.72	1116.03	1124.09	1738100000	1124.09
4/20/2004	1135.82	1139.26	1118.09	1118.15	1508500000	1118.15
4/19/2004	1134.56	1136.18	1129.84	1135.82	1194900000	1135.82
4/16/2004	1128.84	1136.8	1126.9	1134.61	1487800000	1134.61
4/15/2004	1128.17	1134.08	1120.75	1128.84	1568700000	1128.84
4/14/2004	1129.44	1132.52	1122.15	1128.17	1547700000	1128.17
4/13/2004	1145.2	1147.78	1127.7	1129.44	1423200000	1129.44

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
4/12/2004	1139.32	1147.29	1139.32	1145.2	1102400000	1145.2
4/8/2004	1140.53	1148.97	1134.52	1139.32	1199800000	1139.32
4/7/2004	1148.16	1148.16	1138.41	1140.53	1458800000	1140.53
4/6/2004	1150.57	1150.57	1143.3	1148.16	1397700000	1148.16
4/5/2004	1141.81	1150.57	1141.64	1150.57	1413700000	1150.57
4/2/2004	1132.17	1144.81	1132.17	1141.81	1629200000	1141.81
4/1/2004	1126.21	1135.67	1126.2	1132.17	1560700000	1132.17
3/31/2004	1127	1130.83	1121.46	1126.21	1560700000	1126.21
3/30/2004	1122.47	1127.6	1119.66	1127	1332400000	1127
3/29/2004	1108.06	1124.37	1108.06	1122.47	1405500000	1122.47
3/26/2004	1109.19	1115.27	1106.13	1108.06	1319100000	1108.06
3/25/2004	1091.33	1110.38	1091.33	1109.19	1471700000	1109.19
3/24/2004	1093.95	1098.32	1087.16	1091.33	1527800000	1091.33
3/23/2004	1095.4	1101.52	1091.57	1093.95	1458200000	1093.95
3/22/2004	1109.78	1109.78	1089.54	1095.4	1452300000	1095.4
3/19/2004	1122.32	1122.72	1109.69	1109.78	1457400000	1109.78
3/18/2004	1123.75	1125.5	1113.25	1122.32	1369200000	1122.32
3/17/2004	1110.7	1125.76	1110.7	1123.75	1490100000	1123.75
3/16/2004	1104.49	1113.76	1102.61	1110.7	1500700000	1110.7
3/15/2004	1120.57	1120.57	1103.36	1104.49	1600600000	1104.49
3/12/2004	1106.78	1120.63	1106.78	1120.57	1388500000	1120.57
3/11/2004	1123.89	1125.96	1105.87	1106.78	1889900000	1106.78
3/10/2004	1140.58	1141.45	1122.53	1123.89	1648400000	1123.89
3/9/2004	1147.2	1147.32	1136.84	1140.58	1499400000	1140.58
3/8/2004	1156.86	1159.94	1146.97	1147.2	1254400000	1147.2
3/5/2004	1154.87	1163.23	1148.77	1156.86	1398200000	1156.86
3/4/2004	1151.03	1154.97	1149.81	1154.87	1265800000	1154.87
3/3/2004	1149.1	1152.44	1143.78	1151.03	1334500000	1151.03
3/2/2004	1155.97	1156.54	1147.31	1149.1	1476000000	1149.1
3/1/2004	1144.94	1157.45	1144.94	1155.97	1497100000	1155.97
2/27/2004	1145.8	1151.68	1141.8	1144.94	1540400000	1144.94
2/26/2004	1143.67	1147.23	1138.62	1144.91	1383900000	1144.91
2/25/2004	1139.09	1145.24	1138.96	1143.67	1360700000	1143.67
2/24/2004	1140.99	1144.54	1134.43	1139.09	1543600000	1139.09
2/23/2004	1144.11	1146.69	1136.98	1140.99	1380400000	1140.99
2/20/2004	1147.06	1149.81	1139	1144.11	1479600000	1144.11
2/19/2004	1151.82	1158.57	1146.85	1147.06	1562800000	1147.06
2/18/2004	1156.99	1157.4	1149.54	1151.82	1382400000	1151.82
2/17/2004	1145.81	1158.98	1145.81	1156.99	1396500000	1156.99
2/13/2004	1152.11	1156.88	1143.24	1145.81	1329200000	1145.81
2/12/2004	1157.76	1157.76	1151.44	1152.11	1464300000	1152.11
2/11/2004	1145.54	1158.89	1142.33	1157.76	1699300000	1157.76
2/10/2004	1139.81	1147.02	1138.7	1145.54	1403900000	1145.54
2/9/2004	1142.76	1144.46	1139.21	1139.81	1303500000	1139.81
2/6/2004	1128.59	1142.79	1128.39	1142.76	1477600000	1142.76
2/5/2004	1126.52	1131.17	1124.44	1128.59	1566600000	1128.59
2/4/2004	1136.03	1136.03	1124.74	1126.52	1634800000	1126.52
2/3/2004	1135.26	1137.44	1131.33	1136.03	1476900000	1136.03
2/2/2004	1131.13	1142.45	1127.87	1135.26	1599200000	1135.26

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
1/30/2004	1134.11	1134.17	1127.73	1131.13	1635000000	1131.13
1/29/2004	1128.48	1134.39	1122.38	1134.11	1921900000	1134.11
1/28/2004	1144.05	1149.14	1126.5	1128.48	1842000000	1128.48
1/27/2004	1155.37	1155.37	1144.05	1144.05	1673100000	1144.05
1/26/2004	1141.55	1155.38	1141	1155.37	1480600000	1155.37
1/23/2004	1143.94	1150.31	1136.85	1141.55	1561200000	1141.55
1/22/2004	1147.62	1150.51	1143.01	1143.94	1693700000	1143.94
1/21/2004	1138.77	1149.21	1134.62	1147.62	1757600000	1147.62
1/20/2004	1139.83	1142.93	1135.4	1138.77	1698200000	1138.77
1/16/2004	1132.05	1139.83	1132.05	1139.83	1721100000	1139.83
1/15/2004	1130.52	1137.11	1124.54	1132.05	1695000000	1132.05
1/14/2004	1121.22	1130.75	1121.22	1130.52	1514600000	1130.52
1/13/2004	1127.23	1129.07	1115.19	1121.22	1595900000	1121.22
1/12/2004	1121.86	1127.85	1120.9	1127.23	1510200000	1127.23
1/9/2004	1131.92	1131.92	1120.9	1121.86	1720700000	1121.86
1/8/2004	1126.33	1131.92	1124.91	1131.92	1868400000	1131.92
1/7/2004	1123.67	1126.33	1116.45	1126.33	1704900000	1126.33
1/6/2004	1122.22	1124.46	1118.44	1123.67	1494500000	1123.67
1/5/2004	1108.48	1122.22	1108.48	1122.22	1578200000	1122.22
1/2/2004	1111.92	1118.85	1105.08	1108.48	1153200000	1108.48
12/31/2003	1109.64	1112.56	1106.21	1111.92	1027500000	1111.92
12/30/2003	1109.48	1109.75	1106.41	1109.64	1012600000	1109.64
12/29/2003	1095.89	1109.48	1095.89	1109.48	1058800000	1109.48
12/26/2003	1094.04	1098.47	1094.04	1095.89	356070000	1095.89
12/24/2003	1096.02	1096.4	1092.73	1094.04	518060000	1094.04
12/23/2003	1092.94	1096.95	1091.73	1096.02	1145300000	1096.02
12/22/2003	1088.66	1092.94	1086.14	1092.94	1251700000	1092.94
12/19/2003	1089.18	1091.06	1084.19	1088.66	1657300000	1088.66
12/18/2003	1076.48	1089.5	1076.48	1089.18	1579900000	1089.18
12/17/2003	1075.13	1076.54	1071.14	1076.48	1441700000	1076.48
12/16/2003	1068.04	1075.94	1068.04	1075.13	1547900000	1075.13
12/15/2003	1074.14	1082.79	1068	1068.04	1520800000	1068.04
12/12/2003	1071.21	1074.76	1067.64	1074.14	1223100000	1074.14
12/11/2003	1059.05	1073.63	1059.05	1071.21	1441100000	1071.21
12/10/2003	1060.18	1063.02	1053.41	1059.05	1444000000	1059.05
12/9/2003	1069.3	1071.94	1059.16	1060.18	1465500000	1060.18
12/8/2003	1061.5	1069.59	1060.93	1069.3	1218900000	1069.3
12/5/2003	1069.72	1069.72	1060.09	1061.5	1265900000	1061.5
12/4/2003	1064.73	1070.37	1063.15	1069.72	1463100000	1069.72
12/3/2003	1066.62	1074.3	1064.63	1064.73	1441700000	1064.73
12/2/2003	1070.12	1071.22	1065.22	1066.62	1383200000	1066.62
12/1/2003	1058.2	1070.47	1058.2	1070.12	1375000000	1070.12
11/28/2003	1058.45	1060.63	1056.77	1058.2	487220000	1058.2
11/26/2003	1053.89	1058.45	1048.28	1058.45	1097700000	1058.45
11/25/2003	1052.08	1058.05	1049.31	1053.89	1333700000	1053.89
11/24/2003	1035.28	1052.08	1035.28	1052.08	1302800000	1052.08
11/21/2003	1033.65	1037.57	1031.2	1035.28	1273800000	1035.28
11/20/2003	1042.44	1046.48	1033.42	1033.65	1326700000	1033.65
11/19/2003	1034.15	1043.95	1034.15	1042.44	1326200000	1042.44

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
11/18/2003	1043.63	1048.77	1034	1034.15	1354300000	1034.15
11/17/2003	1050.35	1050.35	1035.28	1043.63	1374300000	1043.63
11/14/2003	1058.41	1063.65	1048.11	1050.35	1356100000	1050.35
11/13/2003	1058.56	1059.62	1052.96	1058.41	1383000000	1058.41
11/12/2003	1046.57	1059.1	1046.57	1058.53	1349300000	1058.53
11/11/2003	1047.11	1048.23	1043.46	1046.57	1162500000	1046.57
11/10/2003	1053.21	1053.65	1045.58	1047.11	1243600000	1047.11
11/7/2003	1058.05	1062.39	1052.17	1053.21	1440500000	1053.21
11/6/2003	1051.81	1058.94	1046.93	1058.05	1453900000	1058.05
11/5/2003	1053.25	1054.54	1044.88	1051.81	1401800000	1051.81
11/4/2003	1059.02	1059.02	1051.7	1053.25	1417600000	1053.25
11/3/2003	1050.71	1061.44	1050.71	1059.02	1378200000	1059.02
10/31/2003	1046.94	1053.09	1046.94	1050.71	1498900000	1050.71
10/30/2003	1048.11	1052.81	1043.82	1046.94	1629700000	1046.94
10/29/2003	1046.79	1049.83	1043.35	1048.11	1562600000	1048.11
10/28/2003	1031.13	1046.79	1031.13	1046.79	1629200000	1046.79
10/27/2003	1028.91	1037.75	1028.91	1031.13	1371800000	1031.13
10/24/2003	1033.77	1033.77	1018.32	1028.91	1420300000	1028.91
10/23/2003	1030.36	1035.44	1025.89	1033.77	1604300000	1033.77
10/22/2003	1046.03	1046.03	1028.39	1030.36	1647200000	1030.36
10/21/2003	1044.68	1048.57	1042.59	1046.03	1498000000	1046.03
10/20/2003	1039.32	1044.69	1036.13	1044.68	1172600000	1044.68
10/17/2003	1050.07	1051.89	1036.57	1039.32	1352000000	1039.32
10/16/2003	1046.76	1052.94	1044.04	1050.07	1417700000	1050.07
10/15/2003	1049.48	1053.79	1043.15	1046.76	1521100000	1046.76
10/14/2003	1045.35	1049.49	1040.84	1049.48	1271900000	1049.48
10/13/2003	1038.06	1048.9	1038.06	1045.35	1040500000	1045.35
10/10/2003	1038.73	1040.84	1035.74	1038.06	1108100000	1038.06
10/9/2003	1033.78	1048.28	1033.78	1038.73	1578700000	1038.73
10/8/2003	1039.25	1040.06	1030.96	1033.78	1262500000	1033.78
10/7/2003	1034.35	1039.25	1026.27	1039.25	1279500000	1039.25
10/6/2003	1029.85	1036.48	1029.15	1034.35	1025800000	1034.35
10/3/2003	1020.24	1039.31	1020.24	1029.85	1570500000	1029.85
10/2/2003	1018.22	1021.87	1013.38	1020.24	1269300000	1020.24
10/1/2003	995.97	1018.22	995.97	1018.22	1566300000	1018.22
9/30/2003	1006.58	1006.58	990.36	995.97	1590500000	995.97
9/29/2003	996.85	1006.89	995.31	1006.58	1366500000	1006.58
9/26/2003	1003.27	1003.45	996.08	996.85	1472500000	996.85
9/25/2003	1009.38	1015.97	1003.26	1003.27	1530000000	1003.27
9/24/2003	1029.03	1029.83	1008.93	1009.38	1556000000	1009.38
9/23/2003	1022.82	1030.12	1021.54	1029.03	1301700000	1029.03
9/22/2003	1036.3	1036.3	1018.3	1022.82	1278800000	1022.82
9/19/2003	1039.58	1040.29	1031.89	1036.3	1518600000	1036.3
9/18/2003	1025.97	1040.16	1025.75	1039.58	1498800000	1039.58
9/17/2003	1029.32	1031.34	1024.53	1025.97	1338210000	1025.97
9/16/2003	1014.81	1029.66	1014.81	1029.32	1403200000	1029.32
9/15/2003	1018.63	1019.79	1013.59	1014.81	1151300000	1014.81
9/12/2003	1016.42	1019.65	1007.71	1018.63	1236700000	1018.63
9/11/2003	1010.92	1020.88	1010.92	1016.42	1335900000	1016.42

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
9/10/2003	1023.17	1023.17	1009.74	1010.92	1582100000	1010.92
9/9/2003	1031.64	1031.64	1021.14	1023.17	1414800000	1023.17
9/8/2003	1021.39	1032.41	1021.39	1031.64	1299300000	1031.64
9/5/2003	1027.97	1029.21	1018.19	1021.39	1465200000	1021.39
9/4/2003	1026.27	1029.17	1022.19	1027.97	1453900000	1027.97
9/3/2003	1021.99	1029.34	1021.99	1026.27	1675600000	1026.27
9/2/2003	1008.01	1022.59	1005.73	1021.99	1470500000	1021.99
8/29/2003	1002.84	1008.85	999.52	1008.01	945100000	1008.01
8/28/2003	996.79	1004.12	991.42	1002.84	1165200000	1002.84
8/27/2003	996.73	998.05	993.33	996.79	1051400000	996.79
8/26/2003	993.71	997.93	983.57	996.73	1178700000	996.73
8/25/2003	993.06	993.71	987.91	993.71	971700000	993.71
8/22/2003	1003.27	1011.01	992.62	993.06	1308900000	993.06
8/21/2003	1000.3	1009.53	999.33	1003.27	1407100000	1003.27
8/20/2003	1002.35	1003.54	996.62	1000.3	1210800000	1000.3
8/19/2003	999.74	1003.3	995.3	1002.35	1300600000	1002.35
8/18/2003	990.67	1000.35	990.67	999.74	1127600000	999.74
8/15/2003	990.51	992.39	987.1	990.67	636370000	990.67
8/14/2003	984.03	991.91	980.36	990.51	1186800000	990.51
8/13/2003	990.35	992.5	980.85	984.03	1208800000	984.03
8/12/2003	980.59	990.41	979.9	990.35	1132300000	990.35
8/11/2003	977.59	985.46	974.21	980.59	1022200000	980.59
8/8/2003	974.12	980.57	973.83	977.59	1086600000	977.59
8/7/2003	967.08	974.89	963.82	974.12	1389300000	974.12
8/6/2003	965.46	975.74	960.84	967.08	1491000000	967.08
8/5/2003	982.82	982.82	964.97	965.46	1351700000	965.46
8/4/2003	980.15	985.75	966.79	982.82	1318700000	982.82
8/1/2003	990.31	990.31	978.86	980.15	1390600000	980.15
7/31/2003	987.49	1004.59	987.49	990.31	1608000000	990.31
7/30/2003	989.28	992.62	985.96	987.49	1391900000	987.49
7/29/2003	996.52	998.64	984.15	989.28	1508900000	989.28
7/28/2003	998.68	1000.68	993.59	996.52	1328600000	996.52
7/25/2003	981.6	998.71	977.49	998.68	1397500000	998.68
7/24/2003	988.61	998.89	981.07	981.6	1559000000	981.6
7/23/2003	988.11	989.86	979.79	988.61	1362700000	988.61
7/22/2003	978.8	990.29	976.08	988.11	1439700000	988.11
7/21/2003	993.32	993.32	975.63	978.8	1254200000	978.8
7/18/2003	981.73	994.25	981.71	993.32	1365200000	993.32
7/17/2003	994	994	978.6	981.73	1661400000	981.73
7/16/2003	1000.42	1003.47	989.3	994.09	1662000000	994.09
7/15/2003	1003.86	1009.61	996.67	1000.42	1518600000	1000.42
7/14/2003	998.14	1015.41	998.14	1003.86	1448900000	1003.86
7/11/2003	988.7	1000.86	988.7	998.14	1212700000	998.14
7/10/2003	1002.21	1002.21	983.63	988.7	1465700000	988.7
7/9/2003	1007.84	1010.43	998.17	1002.21	1618000000	1002.21
7/8/2003	1004.42	1008.92	998.73	1007.84	1565700000	1007.84
7/7/2003	985.7	1005.56	985.7	1004.42	1429100000	1004.42
7/3/2003	993.75	995	983.34	985.7	775900000	985.7
7/2/2003	982.32	993.78	982.32	993.75	1519300000	993.75

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
7/1/2003	974.5	983.26	962.1	982.32	1460200000	982.32
6/30/2003	976.22	983.61	973.6	974.5	1587200000	974.5
6/27/2003	985.82	988.88	974.29	976.22	1267800000	976.22
6/26/2003	975.32	986.53	973.8	985.82	1387400000	985.82
6/25/2003	983.45	991.64	974.86	975.32	1459200000	975.32
6/24/2003	981.64	987.84	979.08	983.45	1388300000	983.45
6/23/2003	995.69	995.69	977.4	981.64	1398100000	981.64
6/20/2003	994.7	1002.09	993.36	995.69	1698000000	995.69
6/19/2003	1010.09	1011.22	993.08	994.7	1530100000	994.7
6/18/2003	1011.66	1015.12	1004.61	1010.09	1488900000	1010.09
6/17/2003	1010.74	1015.33	1007.04	1011.66	1479700000	1011.66
6/16/2003	988.61	1010.86	988.61	1010.74	1345900000	1010.74
6/13/2003	998.51	1000.92	984.27	988.61	1271600000	988.61
6/12/2003	997.48	1002.74	991.27	998.51	1553100000	998.51
6/11/2003	984.84	997.48	981.61	997.48	1520000000	997.48
6/10/2003	975.93	984.84	975.93	984.84	1275400000	984.84
6/9/2003	987.76	987.76	972.59	975.93	1307000000	975.93
6/6/2003	990.14	1007.69	986.01	987.76	1837200000	987.76
6/5/2003	986.24	990.14	978.13	990.14	1693100000	990.14
6/4/2003	971.56	987.85	970.72	986.24	1618700000	986.24
6/3/2003	967	973.02	964.47	971.56	1450200000	971.56
6/2/2003	963.59	979.11	963.59	967	1662500000	967
5/30/2003	949.64	965.38	949.64	963.59	1688800000	963.59
5/29/2003	953.22	962.08	946.23	949.64	1685800000	949.64
5/28/2003	951.48	959.39	950.12	953.22	1559000000	953.22
5/27/2003	933.22	952.76	927.33	951.48	1532000000	951.48
5/23/2003	931.87	935.2	927.42	933.22	1201000000	933.22
5/22/2003	923.42	935.3	922.54	931.87	1448500000	931.87
5/21/2003	919.73	923.85	914.91	923.42	1457800000	923.42
5/20/2003	920.77	925.34	912.05	919.73	1505300000	919.73
5/19/2003	944.3	944.3	920.23	920.77	1375700000	920.77
5/16/2003	946.67	948.65	938.6	944.3	1505500000	944.3
5/15/2003	939.28	948.23	938.79	946.67	1508700000	946.67
5/14/2003	942.3	947.29	935.24	939.28	1401800000	939.28
5/13/2003	945.11	947.51	938.91	942.3	1418100000	942.3
5/12/2003	933.41	946.84	929.3	945.11	1378800000	945.11
5/9/2003	920.27	933.77	920.27	933.41	1326100000	933.41
5/8/2003	929.62	929.62	919.72	920.27	1379600000	920.27
5/7/2003	934.39	937.22	926.41	929.62	1531900000	929.62
5/6/2003	926.55	939.61	926.38	934.39	1649600000	934.39
5/5/2003	930.08	933.88	924.55	926.55	1446300000	926.55
5/2/2003	916.3	930.56	912.35	930.08	1554300000	930.08
5/1/2003	916.92	919.68	902.83	916.3	1397500000	916.3
4/30/2003	917.84	922.01	911.7	916.92	1788510000	916.92
4/29/2003	914.84	924.24	911.1	917.84	1525600000	917.84
4/28/2003	898.81	918.15	898.81	914.84	1273000000	914.84
4/25/2003	911.43	911.43	897.52	898.81	1335800000	898.81
4/24/2003	919.02	919.02	906.69	911.43	1648100000	911.43
4/23/2003	911.37	919.74	909.89	919.02	1667200000	919.02

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
4/22/2003	892.01	911.74	886.7	911.37	1631200000	911.37
4/21/2003	893.58	898.01	888.17	892.01	1118700000	892.01
4/17/2003	879.91	893.83	879.2	893.58	1430600000	893.58
4/16/2003	890.81	896.77	877.93	879.91	1587600000	879.91
4/15/2003	885.23	891.27	881.85	890.81	1460200000	890.81
4/14/2003	868.3	885.26	868.3	885.23	1131000000	885.23
4/11/2003	871.58	883.34	865.92	868.3	1141600000	868.3
4/10/2003	865.99	871.78	862.76	871.58	1275300000	871.58
4/9/2003	878.29	887.35	865.72	865.99	1293700000	865.99
4/8/2003	879.93	883.11	874.68	878.29	1235400000	878.29
4/7/2003	878.85	904.89	878.85	879.93	1494000000	879.93
4/4/2003	876.45	882.73	874.23	878.85	1241200000	878.85
4/3/2003	880.9	885.89	876.12	876.45	1339500000	876.45
4/2/2003	858.48	884.57	858.48	880.9	1589800000	880.9
4/1/2003	848.18	861.28	847.85	858.48	1461600000	858.48
3/31/2003	863.5	863.5	843.68	848.18	1495500000	848.18
3/28/2003	868.52	869.88	860.83	863.5	1227000000	863.5
3/27/2003	869.95	874.15	858.09	868.52	1232900000	868.52
3/26/2003	874.74	875.8	866.47	869.95	1319700000	869.95
3/25/2003	864.23	879.87	862.59	874.74	1333400000	874.74
3/24/2003	895.79	895.79	862.02	864.23	1293000000	864.23
3/21/2003	875.84	895.9	875.84	895.79	1883710000	895.79
3/20/2003	874.02	879.6	859.01	875.67	1439100000	875.67
3/19/2003	866.45	874.99	861.21	874.02	1473400000	874.02
3/18/2003	862.79	866.94	857.36	866.45	1555100000	866.45
3/17/2003	833.27	862.79	827.17	862.79	1700420000	862.79
3/14/2003	831.89	841.39	828.26	833.27	1541900000	833.27
3/13/2003	804.19	832.02	804.19	831.9	1816300000	831.9
3/12/2003	800.73	804.19	788.9	804.19	1620000000	804.19
3/11/2003	807.48	814.25	800.3	800.73	1427700000	800.73
3/10/2003	828.89	828.89	806.57	807.48	1255000000	807.48
3/7/2003	822.1	829.55	811.23	828.89	1368500000	828.89
3/6/2003	829.85	829.85	819.85	822.1	1299200000	822.1
3/5/2003	821.99	829.87	819	829.85	1332700000	829.85
3/4/2003	834.81	835.43	821.96	821.99	1256600000	821.99
3/3/2003	841.15	852.34	832.74	834.81	1208900000	834.81
2/28/2003	837.28	847	837.28	841.15	1373300000	841.15
2/27/2003	827.55	842.19	827.55	837.28	1287800000	837.28
2/26/2003	838.57	840.1	826.68	827.55	1374400000	827.55
2/25/2003	832.58	839.55	818.54	838.57	1483700000	838.57
2/24/2003	848.17	848.17	832.16	832.58	1229200000	832.58
2/21/2003	837.1	852.28	831.48	848.17	1398200000	848.17
2/20/2003	845.13	849.37	836.56	837.1	1194100000	837.1
2/19/2003	851.17	851.17	838.79	845.13	1075600000	845.13
2/18/2003	834.89	852.87	834.89	851.17	1250800000	851.17
2/14/2003	817.37	834.89	815.03	834.89	1404600000	834.89
2/13/2003	818.68	821.25	806.29	817.37	1489300000	817.37
2/12/2003	829.2	832.12	818.49	818.68	1260500000	818.68
2/11/2003	835.97	843.02	825.09	829.2	1307000000	829.2

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
2/10/2003	829.69	837.16	823.53	835.97	1238200000	835.97
2/7/2003	838.15	845.73	826.7	829.69	1276800000	829.69
2/6/2003	843.59	844.23	833.25	838.15	1430900000	838.15
2/5/2003	848.2	861.63	842.11	843.59	1450800000	843.59
2/4/2003	860.32	860.32	840.19	848.2	1451600000	848.2
2/3/2003	855.7	864.64	855.7	860.32	1258500000	860.32
1/31/2003	844.61	858.33	840.34	855.7	1578530000	855.7
1/30/2003	864.36	865.48	843.74	844.61	1510300000	844.61
1/29/2003	858.54	868.72	845.86	864.36	1595400000	864.36
1/28/2003	847.48	860.76	847.48	858.54	1459100000	858.54
1/27/2003	861.4	863.95	844.25	847.48	1435900000	847.48
1/24/2003	887.34	887.34	859.71	861.4	1574800000	861.4
1/23/2003	878.36	890.25	876.89	887.34	1744550000	887.34
1/22/2003	887.62	889.74	877.64	878.36	1560800000	878.36
1/21/2003	901.78	906	887.62	887.62	1335200000	887.62
1/17/2003	914.6	914.6	899.02	901.78	1358200000	901.78
1/16/2003	918.22	926.03	911.98	914.6	1534600000	914.6
1/15/2003	931.66	932.59	916.7	918.22	1432100000	918.22
1/14/2003	926.26	931.66	921.72	931.66	1379400000	931.66
1/13/2003	927.57	935.05	922.05	926.26	1396300000	926.26
1/10/2003	927.58	932.89	917.66	927.57	1485400000	927.57
1/9/2003	909.93	928.31	909.93	927.57	1560300000	927.57
1/8/2003	922.93	922.93	908.32	909.93	1467600000	909.93
1/7/2003	929.01	930.81	919.93	922.93	1545200000	922.93
1/6/2003	908.59	931.77	908.59	929.01	1435900000	929.01
1/3/2003	909.03	911.25	903.07	908.59	1130800000	908.59
1/2/2003	879.82	909.03	879.82	909.03	1229200000	909.03
12/31/2002	879.39	881.93	869.45	879.82	1088500000	879.82
12/30/2002	875.4	882.1	870.23	879.39	1057800000	879.39
12/27/2002	889.66	890.46	873.62	875.4	758400000	875.4
12/26/2002	892.47	903.89	887.48	889.66	721100000	889.66
12/24/2002	897.38	897.38	892.29	892.47	458310000	892.47
12/23/2002	895.74	902.43	892.26	897.38	1112100000	897.38
12/20/2002	884.25	897.79	884.25	895.76	1782730000	895.76
12/19/2002	890.02	899.19	880.32	884.25	1385900000	884.25
12/18/2002	902.99	902.99	887.82	891.12	1446200000	891.12
12/17/2002	910.4	911.22	901.74	902.99	1251800000	902.99
12/16/2002	889.48	910.42	889.48	910.4	1271600000	910.4
12/13/2002	901.58	901.58	888.48	889.48	1330800000	889.48
12/12/2002	904.96	908.37	897	901.58	1255300000	901.58
12/11/2002	904.45	909.94	896.48	904.96	1285100000	904.96
12/10/2002	892	904.95	892	904.45	1286600000	904.45
12/9/2002	912.23	912.23	891.97	892	1320800000	892
12/6/2002	906.55	915.48	895.96	912.23	1241100000	912.23
12/5/2002	917.58	921.49	905.9	906.55	1250200000	906.55
12/4/2002	920.75	925.25	909.51	917.58	1588900000	917.58
12/3/2002	934.53	934.53	918.73	920.75	1488400000	920.75
12/2/2002	936.31	954.28	927.72	934.53	1612000000	934.53
11/29/2002	938.87	941.82	935.58	936.31	643460000	936.31

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
11/27/2002	913.31	940.41	913.31	938.87	1350300000	938.87
11/26/2002	932.87	932.87	912.1	913.31	1543600000	913.31
11/25/2002	930.55	937.15	923.31	932.87	1574000000	932.87
11/22/2002	933.76	937.28	928.41	930.55	1626800000	930.55
11/21/2002	914.15	935.13	914.15	933.76	2415100000	933.76
11/20/2002	896.74	915.01	894.93	914.15	1517300000	914.15
11/19/2002	900.36	905.45	893.09	896.74	1337400000	896.74
11/18/2002	909.83	915.91	899.48	900.36	1282600000	900.36
11/15/2002	904.27	910.21	895.35	909.83	1400100000	909.83
11/14/2002	882.53	904.27	882.53	904.27	1519000000	904.27
11/13/2002	882.95	892.51	872.05	882.53	1463400000	882.53
11/12/2002	876.19	894.3	876.19	882.95	1377100000	882.95
11/11/2002	894.74	894.74	874.63	876.19	1113000000	876.19
11/8/2002	902.65	910.11	891.62	894.74	1446500000	894.74
11/7/2002	923.76	923.76	898.68	902.65	1466900000	902.65
11/6/2002	915.39	925.66	905	923.76	1674000000	923.76
11/5/2002	908.35	915.83	904.91	915.39	1354100000	915.39
11/4/2002	900.96	924.58	900.96	908.35	1645900000	908.35
11/1/2002	885.76	903.42	877.71	900.96	1450400000	900.96
10/31/2002	890.71	898.83	879.75	885.76	1641300000	885.76
10/30/2002	882.15	895.28	879.19	890.71	1422300000	890.71
10/29/2002	890.23	890.64	867.91	882.15	1529700000	882.15
10/28/2002	897.65	907.44	886.15	890.23	1382600000	890.23
10/25/2002	882.5	897.71	877.03	897.65	1340400000	897.65
10/24/2002	896.14	902.94	879	882.5	1700570000	882.5
10/23/2002	890.16	896.14	873.82	896.14	1593900000	896.14
10/22/2002	899.72	899.72	882.4	890.16	1549200000	890.16
10/21/2002	884.39	900.69	873.06	899.72	1447000000	899.72
10/18/2002	879.2	886.68	866.58	884.39	1423100000	884.39
10/17/2002	860.02	885.35	860.02	879.2	1780390000	879.2
10/16/2002	881.27	881.27	856.28	860.02	1585000000	860.02
10/15/2002	841.44	881.27	841.44	881.27	1956000000	881.27
10/14/2002	835.32	844.39	828.37	841.44	1200300000	841.44
10/11/2002	803.92	843.27	803.92	835.32	1854130000	835.32
10/10/2002	776.76	806.51	768.63	803.92	2090230000	803.92
10/9/2002	798.55	798.55	775.8	776.76	1885030000	776.76
10/8/2002	785.28	808.86	779.5	798.55	1938430000	798.55
10/7/2002	800.58	808.21	782.96	785.28	1576500000	785.28
10/4/2002	818.95	825.9	794.1	800.58	1835930000	800.58
10/3/2002	827.91	840.02	817.25	818.95	1674500000	818.95
10/2/2002	843.77	851.93	826.5	827.91	1668900000	827.91
10/1/2002	815.28	847.93	812.82	847.91	1780900000	847.91
9/30/2002	827.37	827.37	800.2	815.28	1721870000	815.28
9/27/2002	854.95	854.95	826.84	827.37	1507300000	827.37
9/26/2002	839.66	856.6	839.66	854.95	1650000000	854.95
9/25/2002	819.27	844.22	818.46	839.66	1651500000	839.66
9/24/2002	833.7	833.7	817.38	819.29	1670240000	819.29
9/23/2002	845.39	845.39	825.76	833.7	1381100000	833.7
9/20/2002	843.32	849.32	839.09	845.39	1792800000	845.39

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
9/19/2002	869.46	869.46	843.09	843.32	1524000000	843.32
9/18/2002	873.52	878.45	857.39	869.46	1501000000	869.46
9/17/2002	891.1	902.68	872.38	873.52	1448600000	873.52
9/16/2002	889.81	891.84	878.91	891.1	1001400000	891.1
9/13/2002	886.91	892.75	877.05	889.81	1271000000	889.81
9/12/2002	909.45	909.45	884.84	886.91	1191600000	886.91
9/11/2002	910.63	924.02	908.47	909.45	846600000	909.45
9/10/2002	902.96	909.89	900.5	909.58	1186400000	909.58
9/9/2002	893.92	907.34	882.92	902.96	1130600000	902.96
9/6/2002	879.15	899.07	879.15	893.92	1184500000	893.92
9/5/2002	893.4	893.4	870.5	879.15	1401300000	879.15
9/4/2002	878.02	896.1	875.73	893.4	1372100000	893.4
9/3/2002	916.07	916.07	877.51	878.02	1289800000	878.02
8/30/2002	917.8	928.15	910.17	916.07	929900000	916.07
8/29/2002	917.87	924.59	903.33	917.8	1271100000	917.8
8/28/2002	934.82	934.82	913.21	917.87	1146600000	917.87
8/27/2002	947.95	955.82	930.36	934.82	1307700000	934.82
8/26/2002	940.86	950.8	930.42	947.95	1016900000	947.95
8/23/2002	962.7	962.7	937.17	940.86	1071500000	940.86
8/22/2002	949.36	965	946.43	962.7	1373000000	962.7
8/21/2002	937.43	951.59	931.32	949.36	1353100000	949.36
8/20/2002	950.7	950.7	931.86	937.43	1308500000	937.43
8/19/2002	928.77	951.17	927.21	950.7	1299800000	950.7
8/16/2002	930.25	935.38	916.21	928.77	1265300000	928.77
8/15/2002	919.62	933.29	918.17	930.25	1505100000	930.25
8/14/2002	884.21	920.21	876.2	919.62	1533800000	919.62
8/13/2002	903.8	911.71	883.62	884.21	1297700000	884.21
8/12/2002	908.64	908.64	892.38	903.8	1036500000	903.8
8/9/2002	898.73	913.95	890.77	908.64	1294900000	908.64
8/8/2002	876.77	905.84	875.17	905.46	1646700000	905.46
8/7/2002	859.57	878.74	854.15	876.77	1490400000	876.77
8/6/2002	834.6	874.44	834.6	859.57	1514100000	859.57
8/5/2002	864.24	864.24	833.44	834.6	1425500000	834.6
8/2/2002	884.4	884.72	853.95	864.24	1538100000	864.24
8/1/2002	911.62	911.62	882.48	884.66	1672200000	884.66
7/31/2002	902.78	911.64	889.88	911.62	2049360000	911.62
7/30/2002	898.96	909.81	884.7	902.78	1826090000	902.78
7/29/2002	852.84	898.96	852.84	898.96	1778650000	898.96
7/26/2002	838.68	852.85	835.92	852.84	1796100000	852.84
7/25/2002	843.42	853.83	816.11	838.68	2424700000	838.68
7/24/2002	797.71	844.32	775.68	843.43	2775560000	843.43
7/23/2002	819.85	827.69	796.13	797.7	2441020000	797.7
7/22/2002	847.76	854.13	813.26	819.85	2248060000	819.85
7/19/2002	881.56	881.56	842.07	847.75	2654100000	847.75
7/18/2002	905.45	907.8	880.6	881.56	1736300000	881.56
7/17/2002	901.05	926.52	895.03	906.04	2566500000	906.04
7/16/2002	917.93	918.65	897.13	900.94	1843700000	900.94
7/15/2002	921.39	921.39	876.46	917.93	2574800000	917.93
7/12/2002	927.37	934.31	913.71	921.39	1607400000	921.39

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
7/11/2002	920.47	929.16	900.94	927.37	2080480000	927.37
7/10/2002	952.83	956.34	920.29	920.47	1816900000	920.47
7/9/2002	976.98	979.63	951.71	952.83	1348900000	952.83
7/8/2002	989.03	993.56	972.91	976.98	1184400000	976.98
7/5/2002	953.99	989.07	953.99	989.03	699400000	989.03
7/3/2002	948.09	954.3	934.87	953.99	1527800000	953.99
7/2/2002	968.65	968.65	945.54	948.09	1823000000	948.09
7/1/2002	989.82	994.46	967.43	968.65	1425500000	968.65
6/28/2002	990.64	1001.79	988.31	989.82	2117000000	989.82
6/27/2002	973.53	990.67	963.74	990.64	1908600000	990.64
6/26/2002	976.14	977.43	952.92	973.53	2014290000	973.53
6/25/2002	992.72	1005.88	974.21	976.14	1513700000	976.14
6/24/2002	989.14	1002.11	970.85	992.72	1552600000	992.72
6/21/2002	1006.29	1006.29	985.65	989.14	1497200000	989.14
6/20/2002	1019.99	1023.33	1004.59	1006.29	1389700000	1006.29
6/19/2002	1037.14	1037.61	1017.88	1019.99	1336100000	1019.99
6/18/2002	1036.17	1040.83	1030.92	1037.14	1193100000	1037.14
6/17/2002	1007.27	1036.17	1007.27	1036.17	1236600000	1036.17
6/14/2002	1009.56	1009.56	981.63	1007.27	1549000000	1007.27
6/13/2002	1020.26	1023.47	1008.12	1009.56	1405500000	1009.56
6/12/2002	1013.26	1021.85	1002.58	1020.26	1795720000	1020.26
6/11/2002	1030.74	1039.04	1012.94	1013.6	1212400000	1013.6
6/10/2002	1027.53	1038.18	1025.45	1030.74	1226200000	1030.74
6/7/2002	1029.15	1033.02	1012.49	1027.53	1341300000	1027.53
6/6/2002	1049.9	1049.9	1026.91	1029.15	1601500000	1029.15
6/5/2002	1040.69	1050.11	1038.84	1049.9	1300100000	1049.9
6/4/2002	1040.68	1046.06	1030.52	1040.69	1466600000	1040.69
6/3/2002	1067.14	1070.74	1039.9	1040.68	1324300000	1040.68
5/31/2002	1064.66	1079.93	1064.66	1067.14	1277300000	1067.14
5/30/2002	1067.66	1069.5	1054.26	1064.66	1286600000	1064.66
5/29/2002	1074.55	1074.83	1067.66	1067.66	1081800000	1067.66
5/28/2002	1083.82	1085.98	1070.31	1074.55	996500000	1074.55
5/24/2002	1097.08	1097.08	1082.19	1083.82	885400000	1083.82
5/23/2002	1086.02	1097.1	1080.55	1097.08	1192900000	1097.08
5/22/2002	1079.88	1086.02	1075.64	1086.02	1136300000	1086.02
5/21/2002	1091.88	1099.55	1079.08	1079.88	1200500000	1079.88
5/20/2002	1106.59	1106.59	1090.61	1091.88	989800000	1091.88
5/17/2002	1098.23	1106.59	1096.77	1106.59	1274400000	1106.59
5/16/2002	1091.07	1099.29	1089.17	1098.23	1256600000	1098.23
5/15/2002	1097.28	1104.23	1088.94	1091.07	1420200000	1091.07
5/14/2002	1074.56	1097.71	1074.56	1097.28	1414500000	1097.28
5/13/2002	1054.99	1074.84	1053.9	1074.56	1088600000	1074.56
5/10/2002	1073.01	1075.43	1053.93	1054.99	1171900000	1054.99
5/9/2002	1088.85	1088.85	1072.23	1073.01	1153000000	1073.01
5/8/2002	1049.49	1088.92	1049.49	1088.85	1502000000	1088.85
5/7/2002	1052.67	1058.67	1048.96	1049.49	1354700000	1049.49
5/6/2002	1073.43	1075.96	1052.65	1052.67	1122600000	1052.67
5/3/2002	1084.56	1084.56	1068.89	1073.43	1284500000	1073.43
5/2/2002	1086.46	1091.42	1079.46	1084.56	1364000000	1084.56

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
5/1/2002	1076.92	1088.32	1065.29	1086.46	1451400000	1086.46
4/30/2002	1065.45	1082.62	1063.46	1076.92	1628600000	1076.92
4/29/2002	1076.32	1078.95	1063.62	1065.45	1314700000	1065.45
4/26/2002	1091.48	1096.77	1076.31	1076.32	1374200000	1076.32
4/25/2002	1093.14	1094.36	1084.81	1091.48	1517400000	1091.48
4/24/2002	1100.96	1108.46	1092.51	1093.14	1373200000	1093.14
4/23/2002	1107.83	1111.17	1098.94	1100.96	1388500000	1100.96
4/22/2002	1125.17	1125.17	1105.62	1107.83	1181800000	1107.83
4/19/2002	1124.47	1128.82	1122.59	1125.17	1185000000	1125.17
4/18/2002	1126.07	1130.49	1109.29	1124.47	1359300000	1124.47
4/17/2002	1128.37	1133	1123.37	1126.07	1376900000	1126.07
4/16/2002	1102.55	1129.4	1102.55	1128.37	1341300000	1128.37
4/15/2002	1111.01	1114.86	1099.41	1102.55	1120400000	1102.55
4/12/2002	1103.69	1112.77	1102.74	1111.01	1282100000	1111.01
4/11/2002	1130.47	1130.47	1102.42	1103.69	1505600000	1103.69
4/10/2002	1117.8	1131.76	1117.8	1130.47	1447900000	1130.47
4/9/2002	1125.29	1128.29	1116.73	1117.8	1235400000	1117.8
4/8/2002	1122.73	1125.41	1111.79	1125.29	1095300000	1125.29
4/5/2002	1126.34	1133.31	1119.49	1122.73	1110200000	1122.73
4/4/2002	1125.4	1130.45	1120.06	1126.34	1283800000	1126.34
4/3/2002	1136.76	1138.85	1119.68	1125.4	1219700000	1125.4
4/2/2002	1146.54	1146.54	1135.71	1136.76	1176700000	1136.76
4/1/2002	1147.39	1147.84	1132.87	1146.54	1050900000	1146.54
3/28/2002	1144.58	1154.45	1144.58	1147.39	1147600000	1147.39
3/27/2002	1138.49	1146.95	1135.33	1144.58	1180100000	1144.58
3/26/2002	1131.87	1147	1131.61	1138.49	1223600000	1138.49
3/25/2002	1148.7	1151.04	1131.87	1131.87	1057900000	1131.87
3/22/2002	1153.59	1156.49	1144.6	1148.7	1243300000	1148.7
3/21/2002	1151.85	1155.1	1139.48	1153.59	1339200000	1153.59
3/20/2002	1170.29	1170.29	1151.61	1151.85	1304900000	1151.85
3/19/2002	1165.55	1173.94	1165.55	1170.29	1255000000	1170.29
3/18/2002	1166.16	1172.73	1159.14	1165.55	1169500000	1165.55
3/15/2002	1153.04	1166.48	1153.04	1166.16	1493900000	1166.16
3/14/2002	1154.09	1157.83	1151.08	1153.04	1208800000	1153.04
3/13/2002	1165.58	1165.58	1151.01	1154.09	1354000000	1154.09
3/12/2002	1168.26	1168.26	1154.34	1165.58	1304400000	1165.58
3/11/2002	1164.31	1173.03	1159.58	1168.26	1210200000	1168.26
3/8/2002	1157.54	1172.76	1157.54	1164.31	1412000000	1164.31
3/7/2002	1162.77	1167.94	1150.69	1157.54	1517400000	1157.54
3/6/2002	1146.14	1165.29	1145.11	1162.77	1541300000	1162.77
3/5/2002	1153.84	1157.74	1144.78	1146.14	1549300000	1146.14
3/4/2002	1131.78	1153.84	1130.93	1153.84	1594300000	1153.84
3/1/2002	1106.73	1131.79	1106.73	1131.78	1456500000	1131.78
2/28/2002	1109.89	1121.57	1106.73	1106.73	1392200000	1106.73
2/27/2002	1109.38	1123.06	1102.26	1109.89	1393800000	1109.89
2/26/2002	1109.43	1115.05	1101.72	1109.38	1309200000	1109.38
2/25/2002	1089.84	1112.71	1089.84	1109.43	1367400000	1109.43
2/22/2002	1080.95	1093.93	1074.39	1089.84	1411000000	1089.84
2/21/2002	1097.98	1101.5	1080.24	1080.95	1381600000	1080.95

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
2/20/2002	1083.34	1098.32	1074.36	1097.98	1438900000	1097.98
2/19/2002	1104.18	1104.18	1082.24	1083.34	1189900000	1083.34
2/15/2002	1116.48	1117.09	1103.23	1104.18	1359200000	1104.18
2/14/2002	1118.51	1124.72	1112.3	1116.48	1272500000	1116.48
2/13/2002	1107.5	1120.56	1107.5	1118.51	1215900000	1118.51
2/12/2002	1111.94	1112.68	1102.98	1107.5	1094200000	1107.5
2/11/2002	1096.22	1112.01	1094.68	1111.94	1159400000	1111.94
2/8/2002	1080.17	1096.3	1079.91	1096.22	1371900000	1096.22
2/7/2002	1083.51	1094.03	1078.44	1080.17	1441600000	1080.17
2/6/2002	1090.02	1093.58	1077.78	1083.51	1665800000	1083.51
2/5/2002	1094.44	1100.96	1082.58	1090.02	1778300000	1090.02
2/4/2002	1122.2	1122.2	1092.25	1094.44	1437600000	1094.44
2/1/2002	1130.2	1130.2	1118.51	1122.2	1367200000	1122.2
1/31/2002	1113.57	1130.21	1113.3	1130.2	1557000000	1130.2
1/30/2002	1100.64	1113.79	1081.66	1113.57	2019600000	1113.57
1/29/2002	1133.06	1137.47	1098.74	1100.64	1812000000	1100.64
1/28/2002	1133.28	1138.63	1126.66	1133.06	1186800000	1133.06
1/25/2002	1132.15	1138.31	1127.82	1133.28	1345100000	1133.28
1/24/2002	1128.18	1139.5	1128.18	1132.15	1552800000	1132.15
1/23/2002	1119.31	1131.94	1117.43	1128.18	1479200000	1128.18
1/22/2002	1127.58	1135.26	1117.91	1119.31	1311600000	1119.31
1/18/2002	1138.88	1138.88	1124.45	1127.58	1333300000	1127.58
1/17/2002	1127.57	1139.27	1127.57	1138.88	1380100000	1138.88
1/16/2002	1146.19	1146.19	1127.49	1127.57	1482500000	1127.57
1/15/2002	1138.41	1148.81	1136.88	1146.19	1386900000	1146.19
1/14/2002	1145.6	1145.6	1138.15	1138.41	1286400000	1138.41
1/11/2002	1156.55	1159.41	1145.45	1145.6	1211900000	1145.6
1/10/2002	1155.14	1159.93	1150.85	1156.55	1299000000	1156.55
1/9/2002	1160.71	1174.26	1151.89	1155.14	1452000000	1155.14
1/8/2002	1164.89	1167.6	1157.46	1160.71	1258800000	1160.71
1/7/2002	1172.51	1176.97	1163.55	1164.89	1308300000	1164.89
1/4/2002	1165.27	1176.55	1163.42	1172.51	1513000000	1172.51
1/3/2002	1154.67	1165.27	1154.01	1165.27	1398900000	1165.27
1/2/2002	1148.08	1154.67	1136.23	1154.67	1171000000	1154.67
12/31/2001	1161.02	1161.16	1148.04	1148.08	943600000	1148.08
12/28/2001	1157.13	1164.64	1157.13	1161.02	917400000	1161.02
12/27/2001	1149.37	1157.13	1149.37	1157.13	876300000	1157.13
12/26/2001	1144.65	1159.18	1144.65	1149.37	791100000	1149.37
12/24/2001	1144.89	1147.83	1144.62	1144.65	439670000	1144.65
12/21/2001	1139.93	1147.46	1139.93	1144.89	1694000000	1144.89
12/20/2001	1149.56	1151.42	1139.93	1139.93	1490500000	1139.93
12/19/2001	1142.92	1152.44	1134.75	1149.56	1484900000	1149.56
12/18/2001	1134.36	1145.1	1134.36	1142.92	1354000000	1142.92
12/17/2001	1123.09	1137.3	1122.66	1134.36	1260400000	1134.36
12/14/2001	1119.38	1128.28	1114.53	1123.09	1306800000	1123.09
12/13/2001	1137.07	1137.07	1117.85	1119.38	1511500000	1119.38
12/12/2001	1136.76	1141.58	1126.01	1137.07	1449700000	1137.07
12/11/2001	1139.93	1150.89	1134.32	1136.76	1367200000	1136.76
12/10/2001	1158.31	1158.31	1139.66	1139.93	1218700000	1139.93

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
12/7/2001	1167.1	1167.1	1152.66	1158.31	1248200000	1158.31
12/6/2001	1170.35	1173.35	1164.43	1167.1	1487900000	1167.1
12/5/2001	1143.77	1173.62	1143.77	1170.35	1765300000	1170.35
12/4/2001	1129.9	1144.8	1128.86	1144.8	1318500000	1144.8
12/3/2001	1139.45	1139.45	1125.78	1129.9	1202900000	1129.9
11/30/2001	1140.2	1143.57	1135.89	1139.45	1343600000	1139.45
11/29/2001	1128.52	1140.4	1125.51	1140.2	1375700000	1140.2
11/28/2001	1149.5	1149.5	1128.29	1128.52	1423700000	1128.52
11/27/2001	1157.42	1163.38	1140.81	1149.5	1288000000	1149.5
11/26/2001	1150.34	1157.88	1146.17	1157.42	1129800000	1157.42
11/23/2001	1137.03	1151.05	1135.9	1150.34	410300000	1150.34
11/21/2001	1142.66	1142.66	1129.78	1137.03	1029300000	1137.03
11/20/2001	1151.06	1152.45	1142.17	1142.66	1330200000	1142.66
11/19/2001	1138.65	1151.06	1138.65	1151.06	1316800000	1151.06
11/16/2001	1142.24	1143.52	1129.92	1138.65	1337400000	1138.65
11/15/2001	1141.21	1146.46	1135.06	1142.24	1454500000	1142.24
11/14/2001	1139.09	1148.28	1132.87	1141.21	1443400000	1141.21
11/13/2001	1118.33	1139.14	1118.33	1139.09	1370100000	1139.09
11/12/2001	1120.31	1121.71	1098.32	1118.33	991600000	1118.33
11/9/2001	1118.54	1123.02	1111.13	1120.31	1093800000	1120.31
11/8/2001	1115.8	1135.75	1115.42	1118.54	1517500000	1118.54
11/7/2001	1118.86	1126.62	1112.98	1115.8	1411300000	1115.8
11/6/2001	1102.84	1119.73	1095.36	1118.86	1356000000	1118.86
11/5/2001	1087.2	1106.72	1087.2	1102.84	1267700000	1102.84
11/2/2001	1084.1	1089.63	1075.58	1087.2	1121900000	1087.2
11/1/2001	1059.78	1085.61	1054.31	1084.1	1317400000	1084.1
10/31/2001	1059.79	1074.79	1057.55	1059.78	1352500000	1059.78
10/30/2001	1078.3	1078.3	1053.61	1059.79	1297400000	1059.79
10/29/2001	1104.61	1104.61	1078.3	1078.3	1106100000	1078.3
10/26/2001	1100.09	1110.61	1094.24	1104.61	1244500000	1104.61
10/25/2001	1085.2	1100.09	1065.64	1100.09	1364400000	1100.09
10/24/2001	1084.78	1090.26	1079.98	1085.2	1336200000	1085.2
10/23/2001	1089.9	1098.99	1081.53	1084.78	1317300000	1084.78
10/22/2001	1073.48	1090.57	1070.79	1089.9	1105700000	1089.9
10/19/2001	1068.61	1075.52	1057.24	1073.48	1294900000	1073.48
10/18/2001	1077.09	1077.94	1064.54	1068.61	1262900000	1068.61
10/17/2001	1097.54	1107.12	1076.57	1077.09	1452200000	1077.09
10/16/2001	1089.98	1101.66	1087.13	1097.54	1210500000	1097.54
10/15/2001	1091.65	1091.65	1078.19	1089.98	1024700000	1089.98
10/12/2001	1097.43	1097.43	1072.15	1091.65	1331400000	1091.65
10/11/2001	1080.99	1099.16	1080.99	1097.43	1704580000	1097.43
10/10/2001	1056.75	1081.62	1052.76	1080.99	1312400000	1080.99
10/9/2001	1062.44	1063.37	1053.83	1056.75	1227800000	1056.75
10/8/2001	1071.37	1071.37	1056.88	1062.44	979000000	1062.44
10/5/2001	1069.62	1072.35	1053.5	1071.38	1301700000	1071.38
10/4/2001	1072.28	1084.12	1067.82	1069.63	1609100000	1069.63
10/3/2001	1051.33	1075.38	1041.48	1072.28	1650600000	1072.28
10/2/2001	1038.55	1051.33	1034.47	1051.33	1289800000	1051.33
10/1/2001	1040.94	1040.94	1026.76	1038.55	1175600000	1038.55

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
9/28/2001	1018.61	1040.94	1018.61	1040.94	1631500000	1040.94
9/27/2001	1007.04	1018.92	998.24	1018.61	1467000000	1018.61
9/26/2001	1012.27	1020.29	1002.62	1007.04	1519100000	1007.04
9/25/2001	1003.45	1017.14	998.33	1012.27	1613800000	1012.27
9/24/2001	965.8	1008.44	965.8	1003.45	1746600000	1003.45
9/21/2001	984.54	984.54	944.75	965.8	2317300000	965.8
9/20/2001	1016.1	1016.1	984.49	984.54	2004800000	984.54
9/19/2001	1032.74	1038.91	984.62	1016.1	2120550000	1016.1
9/18/2001	1038.77	1046.42	1029.25	1032.74	1650410000	1032.74
9/17/2001	1092.54	1092.54	1037.46	1038.77	2330830000	1038.77
9/10/2001	1085.78	1096.94	1073.15	1092.54	1276600000	1092.54
9/7/2001	1106.4	1106.4	1082.12	1085.78	1424300000	1085.78
9/6/2001	1131.74	1131.74	1105.83	1106.4	1359700000	1106.4
9/5/2001	1132.94	1135.52	1114.86	1131.74	1384500000	1131.74
9/4/2001	1133.58	1155.4	1129.06	1132.94	1178300000	1132.94
8/31/2001	1129.03	1141.83	1126.38	1133.58	920100000	1133.58
8/30/2001	1148.6	1151.75	1124.87	1129.03	1157000000	1129.03
8/29/2001	1161.51	1166.97	1147.38	1148.56	963700000	1148.56
8/28/2001	1179.21	1179.66	1161.17	1161.51	987100000	1161.51
8/27/2001	1184.93	1186.85	1178.07	1179.21	842600000	1179.21
8/24/2001	1162.09	1185.15	1162.09	1184.93	1043600000	1184.93
8/23/2001	1165.31	1169.86	1160.96	1162.09	986200000	1162.09
8/22/2001	1157.26	1168.56	1153.34	1165.31	1110800000	1165.31
8/21/2001	1171.41	1179.85	1156.56	1157.26	1041600000	1157.26
8/20/2001	1161.97	1171.41	1160.94	1171.41	897100000	1171.41
8/17/2001	1181.66	1181.66	1156.07	1161.97	974300000	1161.97
8/16/2001	1178.02	1181.8	1166.08	1181.66	1055400000	1181.66
8/15/2001	1186.73	1191.21	1177.61	1178.02	1065600000	1178.02
8/14/2001	1191.29	1198.79	1184.26	1186.73	964600000	1186.73
8/13/2001	1190.16	1193.82	1185.12	1191.29	837600000	1191.29
8/10/2001	1183.43	1193.33	1169.55	1190.16	960900000	1190.16
8/9/2001	1183.53	1184.71	1174.68	1183.43	1104200000	1183.43
8/8/2001	1204.4	1206.79	1181.27	1183.53	1124600000	1183.53
8/7/2001	1200.47	1207.56	1195.64	1204.4	1012000000	1204.4
8/6/2001	1214.35	1214.35	1197.35	1200.48	811700000	1200.48
8/3/2001	1220.75	1220.75	1205.31	1214.35	939900000	1214.35
8/2/2001	1215.93	1226.27	1215.31	1220.75	1218300000	1220.75
8/1/2001	1211.23	1223.04	1211.23	1215.93	1340300000	1215.93
7/31/2001	1204.52	1222.74	1204.52	1211.23	1129200000	1211.23
7/30/2001	1205.82	1209.05	1200.41	1204.52	909100000	1204.52
7/27/2001	1202.93	1209.26	1195.99	1205.82	1015300000	1205.82
7/26/2001	1190.49	1204.18	1182.65	1202.93	1213900000	1202.93
7/25/2001	1171.65	1190.52	1171.28	1190.49	1280700000	1190.49
7/24/2001	1191.03	1191.03	1165.54	1171.65	1198700000	1171.65
7/23/2001	1210.85	1215.22	1190.5	1191.03	986900000	1191.03
7/20/2001	1215.02	1215.69	1207.04	1210.85	1170900000	1210.85
7/19/2001	1207.71	1225.04	1205.8	1215.02	1343500000	1215.02
7/18/2001	1214.44	1214.44	1198.33	1207.71	1316300000	1207.71
7/17/2001	1202.45	1215.36	1196.14	1214.44	1238100000	1214.44

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
7/16/2001	1215.68	1219.63	1200.05	1202.45	1039800000	1202.45
7/13/2001	1208.14	1218.54	1203.61	1215.68	1121700000	1215.68
7/12/2001	1180.18	1210.25	1180.18	1208.14	1394000000	1208.14
7/11/2001	1181.52	1184.93	1168.46	1180.18	1384100000	1180.18
7/10/2001	1198.78	1203.43	1179.93	1181.52	1263800000	1181.52
7/9/2001	1190.59	1201.76	1189.75	1198.78	1045700000	1198.78
7/6/2001	1219.24	1219.24	1188.74	1190.59	1056700000	1190.59
7/5/2001	1234.45	1234.45	1219.15	1219.24	934900000	1219.24
7/3/2001	1236.71	1236.71	1229.43	1234.45	622110000	1234.45
7/2/2001	1224.42	1239.78	1224.03	1236.72	1128300000	1236.72
6/29/2001	1226.2	1237.29	1221.14	1224.38	1832360000	1224.38
6/28/2001	1211.07	1234.44	1211.07	1226.2	1327300000	1226.2
6/27/2001	1216.76	1219.92	1207.29	1211.07	1162100000	1211.07
6/26/2001	1218.6	1220.7	1204.64	1216.76	1198900000	1216.76
6/25/2001	1225.35	1231.5	1213.6	1218.6	1050100000	1218.6
6/22/2001	1237.04	1237.73	1221.41	1225.35	1189200000	1225.35
6/21/2001	1223.14	1240.24	1220.25	1237.04	1546820000	1237.04
6/20/2001	1212.58	1225.61	1210.07	1223.14	1350100000	1223.14
6/19/2001	1208.43	1226.11	1207.71	1212.58	1184900000	1212.58
6/18/2001	1214.36	1221.23	1208.33	1208.43	1111600000	1208.43
6/15/2001	1219.87	1221.5	1203.03	1214.36	1635550000	1214.36
6/14/2001	1241.6	1241.6	1218.9	1219.87	1242900000	1219.87
6/13/2001	1255.85	1259.75	1241.59	1241.6	1063600000	1241.6
6/12/2001	1254.39	1261	1235.75	1255.85	1136500000	1255.85
6/11/2001	1264.96	1264.96	1249.23	1254.39	870100000	1254.39
6/8/2001	1276.96	1277.11	1259.99	1264.96	726200000	1264.96
6/7/2001	1270.03	1277.08	1265.08	1276.96	1089600000	1276.96
6/6/2001	1283.57	1283.85	1269.01	1270.03	1061900000	1270.03
6/5/2001	1267.11	1286.62	1267.11	1283.57	1116800000	1283.57
6/4/2001	1260.67	1267.17	1256.36	1267.11	836500000	1267.11
6/1/2001	1255.82	1265.34	1246.88	1260.67	1015000000	1260.67
5/31/2001	1248.08	1261.91	1248.07	1255.82	1226600000	1255.82
5/30/2001	1267.93	1267.93	1245.96	1248.08	1158600000	1248.08
5/29/2001	1277.89	1278.42	1265.41	1267.93	1026000000	1267.93
5/25/2001	1293.17	1293.17	1276.42	1277.89	828100000	1277.89
5/24/2001	1289.05	1295.04	1281.22	1293.17	1100700000	1293.17
5/23/2001	1309.38	1309.38	1288.7	1289.05	1134800000	1289.05
5/22/2001	1312.83	1315.93	1306.89	1309.38	1260400000	1309.38
5/21/2001	1291.96	1312.95	1287.87	1312.83	1174900000	1312.83
5/18/2001	1288.49	1292.06	1281.15	1291.96	1130800000	1291.96
5/17/2001	1284.99	1296.48	1282.65	1288.49	1355600000	1288.49
5/16/2001	1249.44	1286.39	1243.02	1284.99	1405300000	1284.99
5/15/2001	1248.92	1257.45	1245.36	1249.44	1071800000	1249.44
5/14/2001	1245.67	1249.68	1241.02	1248.92	858200000	1248.92
5/11/2001	1255.18	1259.84	1240.79	1245.67	906200000	1245.67
5/10/2001	1255.54	1268.14	1254.56	1255.18	1056700000	1255.18
5/9/2001	1261.2	1261.65	1247.83	1255.54	1132400000	1255.54
5/8/2001	1266.71	1267.01	1253	1261.2	1006300000	1261.2
5/7/2001	1266.61	1270	1259.19	1263.51	949000000	1263.51

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
5/4/2001	1248.58	1267.51	1232	1266.61	1082100000	1266.61
5/3/2001	1267.43	1267.43	1239.88	1248.58	1137900000	1248.58
5/2/2001	1266.44	1272.93	1257.7	1267.43	1342200000	1267.43
5/1/2001	1249.46	1266.47	1243.55	1266.44	1181300000	1266.44
4/30/2001	1253.05	1269.3	1243.99	1249.46	1266800000	1249.46
4/27/2001	1234.52	1253.07	1234.52	1253.05	1091300000	1253.05
4/26/2001	1228.75	1248.3	1228.75	1234.52	1345200000	1234.52
4/25/2001	1209.47	1232.36	1207.38	1228.75	1203600000	1228.75
4/24/2001	1224.36	1233.54	1208.89	1209.47	1216500000	1209.47
4/23/2001	1242.98	1242.98	1217.47	1224.36	1012600000	1224.36
4/20/2001	1253.7	1253.7	1234.41	1242.98	1338700000	1242.98
4/19/2001	1238.16	1253.71	1233.39	1253.69	1486800000	1253.69
4/18/2001	1191.81	1248.42	1191.81	1238.16	1918900000	1238.16
4/17/2001	1179.68	1192.25	1168.9	1191.81	1109600000	1191.81
4/16/2001	1183.5	1184.64	1167.38	1179.68	913900000	1179.68
4/12/2001	1165.89	1183.51	1157.73	1183.5	1102000000	1183.5
4/11/2001	1168.38	1182.24	1160.26	1165.89	1290300000	1165.89
4/10/2001	1137.59	1173.92	1137.59	1168.38	1349600000	1168.38
4/9/2001	1128.43	1146.13	1126.38	1137.59	1062800000	1137.59
4/6/2001	1151.44	1151.44	1119.29	1128.43	1266800000	1128.43
4/5/2001	1103.25	1151.47	1103.25	1151.44	1368000000	1151.44
4/4/2001	1106.46	1117.5	1091.99	1103.25	1425590000	1103.25
4/3/2001	1145.87	1145.87	1100.19	1106.46	1386100000	1106.46
4/2/2001	1160.33	1169.51	1137.51	1145.87	1254900000	1145.87
3/30/2001	1147.95	1162.8	1143.83	1160.33	1280800000	1160.33
3/29/2001	1153.29	1161.69	1136.26	1147.95	1234500000	1147.95
3/28/2001	1182.17	1182.17	1147.83	1153.29	1333400000	1153.29
3/27/2001	1152.69	1183.35	1150.96	1182.17	1314200000	1182.17
3/26/2001	1139.83	1160.02	1139.83	1152.69	1114000000	1152.69
3/23/2001	1117.58	1141.83	1117.58	1139.83	1364900000	1139.83
3/22/2001	1122.14	1124.27	1081.19	1117.58	1723950000	1117.58
3/21/2001	1142.62	1149.39	1118.74	1122.14	1346300000	1122.14
3/20/2001	1170.81	1180.56	1142.19	1142.62	1235900000	1142.62
3/19/2001	1150.53	1173.5	1147.18	1170.81	1126200000	1170.81
3/16/2001	1173.56	1173.56	1148.64	1150.53	1543560000	1150.53
3/15/2001	1166.71	1182.04	1166.71	1173.56	1259500000	1173.56
3/14/2001	1197.66	1197.66	1155.35	1166.71	1397400000	1166.71
3/13/2001	1180.16	1197.83	1171.5	1197.66	1360900000	1197.66
3/12/2001	1233.42	1233.42	1176.78	1180.16	1229000000	1180.16
3/9/2001	1264.74	1264.74	1228.42	1233.42	1085900000	1233.42
3/8/2001	1261.89	1266.5	1257.6	1264.74	1114100000	1264.74
3/7/2001	1253.8	1263.86	1253.8	1261.89	1132200000	1261.89
3/6/2001	1241.41	1267.42	1241.41	1253.8	1091800000	1253.8
3/5/2001	1234.18	1242.55	1234.04	1241.41	929200000	1241.41
3/2/2001	1241.23	1251.01	1219.74	1234.18	1294000000	1234.18
3/1/2001	1239.94	1241.36	1214.5	1241.23	1294900000	1241.23
2/28/2001	1257.94	1263.47	1229.65	1239.94	1225300000	1239.94
2/27/2001	1267.65	1272.76	1252.26	1257.94	1114100000	1257.94
2/26/2001	1245.86	1267.69	1241.71	1267.65	1130800000	1267.65

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
2/23/2001	1252.82	1252.82	1215.44	1245.86	1231300000	1245.86
2/22/2001	1255.27	1259.94	1228.33	1252.82	1365900000	1252.82
2/21/2001	1278.94	1282.97	1253.16	1255.27	1208500000	1255.27
2/20/2001	1301.53	1307.16	1278.44	1278.94	1112200000	1278.94
2/16/2001	1326.61	1326.61	1293.18	1301.53	1257200000	1301.53
2/15/2001	1315.92	1331.29	1315.92	1326.61	1153700000	1326.61
2/14/2001	1318.8	1320.73	1304.72	1315.92	1150300000	1315.92
2/13/2001	1330.31	1336.62	1317.51	1318.8	1075200000	1318.8
2/12/2001	1314.76	1330.96	1313.64	1330.31	1039100000	1330.31
2/9/2001	1332.53	1332.53	1309.98	1314.76	1075500000	1314.76
2/8/2001	1341.1	1350.32	1332.42	1332.53	1107200000	1332.53
2/7/2001	1352.26	1352.26	1334.26	1340.89	1158300000	1340.89
2/6/2001	1354.31	1363.55	1350.04	1352.26	1059600000	1352.26
2/5/2001	1349.47	1354.56	1344.48	1354.31	1013000000	1354.31
2/2/2001	1373.47	1376.38	1348.72	1349.47	1048400000	1349.47
2/1/2001	1366.01	1373.5	1359.34	1373.47	1118800000	1373.47
1/31/2001	1373.73	1383.37	1364.66	1366.01	1295300000	1366.01
1/30/2001	1364.17	1375.68	1356.2	1373.73	1149800000	1373.73
1/29/2001	1354.92	1365.54	1350.36	1364.17	1053100000	1364.17
1/26/2001	1357.51	1357.51	1342.75	1354.95	1098000000	1354.95
1/25/2001	1364.3	1367.35	1354.63	1357.51	1258000000	1357.51
1/24/2001	1360.4	1369.75	1357.28	1364.3	1309000000	1364.3
1/23/2001	1342.9	1362.9	1339.63	1360.4	1232600000	1360.4
1/22/2001	1342.54	1353.62	1333.84	1342.9	1164000000	1342.9
1/19/2001	1347.97	1354.55	1336.74	1342.54	1407800000	1342.54
1/18/2001	1329.89	1352.71	1327.41	1347.97	1445000000	1347.97
1/17/2001	1326.65	1346.92	1325.41	1329.47	1349100000	1329.47
1/16/2001	1318.32	1327.81	1313.33	1326.65	1205700000	1326.65
1/12/2001	1326.82	1333.21	1311.59	1318.55	1276000000	1318.55
1/11/2001	1313.27	1332.19	1309.72	1326.82	1411200000	1326.82
1/10/2001	1300.8	1313.76	1287.28	1313.27	1296500000	1313.27
1/9/2001	1295.86	1311.72	1295.14	1300.8	1191300000	1300.8
1/8/2001	1298.35	1298.35	1276.29	1295.86	1115500000	1295.86
1/5/2001	1333.34	1334.77	1294.95	1298.35	1430800000	1298.35
1/4/2001	1347.56	1350.24	1329.14	1333.34	2131000000	1333.34
1/3/2001	1283.27	1347.76	1274.62	1347.56	1880700000	1347.56
1/2/2001	1320.28	1320.28	1276.05	1283.27	1129400000	1283.27
12/29/2000	1334.22	1340.1	1317.51	1320.28	1035500000	1320.28
12/28/2000	1328.92	1335.93	1325.78	1334.22	1015300000	1334.22
12/27/2000	1315.19	1332.03	1310.96	1328.92	1092700000	1328.92
12/26/2000	1305.97	1315.94	1301.64	1315.19	806500000	1315.19
12/22/2000	1274.86	1305.97	1274.86	1305.95	1087100000	1305.95
12/21/2000	1264.74	1285.31	1254.07	1274.86	1449900000	1274.86
12/20/2000	1305.6	1305.6	1261.16	1264.74	1421600000	1264.74
12/19/2000	1322.96	1346.44	1305.2	1305.6	1324900000	1305.6
12/18/2000	1312.15	1332.32	1312.15	1322.74	1189900000	1322.74
12/15/2000	1340.93	1340.93	1305.38	1312.15	1561100000	1312.15
12/14/2000	1359.99	1359.99	1340.48	1340.93	1061300000	1340.93
12/13/2000	1371.18	1385.82	1358.48	1359.99	1195100000	1359.99

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
12/12/2000	1380.2	1380.27	1370.27	1371.18	1083400000	1371.18
12/11/2000	1369.89	1389.05	1364.14	1380.2	1202400000	1380.2
12/8/2000	1343.55	1380.33	1343.55	1369.89	1358300000	1369.89
12/7/2000	1351.46	1353.5	1339.26	1343.55	1128000000	1343.55
12/6/2000	1376.54	1376.54	1346.15	1351.46	1399300000	1351.46
12/5/2000	1324.97	1376.56	1324.97	1376.54	900300000	1376.54
12/4/2000	1315.18	1332.06	1310.23	1324.97	1103000000	1324.97
12/1/2000	1314.95	1334.67	1307.02	1315.23	1195200000	1315.23
11/30/2000	1341.91	1341.91	1294.9	1314.95	1186530000	1314.95
11/29/2000	1336.09	1352.38	1329.28	1341.93	402100000	1341.93
11/28/2000	1348.97	1358.81	1334.97	1336.09	1028200000	1336.09
11/27/2000	1341.77	1362.5	1341.77	1348.97	946100000	1348.97
11/24/2000	1322.36	1343.83	1322.36	1341.77	404870000	1341.77
11/22/2000	1347.35	1347.35	1321.89	1322.36	963200000	1322.36
11/21/2000	1342.62	1355.87	1333.62	1347.35	1137100000	1347.35
11/20/2000	1367.72	1367.72	1341.67	1342.62	955800000	1342.62
11/17/2000	1372.32	1384.85	1355.55	1367.72	1070400000	1367.72
11/16/2000	1389.81	1394.76	1370.39	1372.32	956300000	1372.32
11/15/2000	1382.95	1395.96	1374.75	1389.81	1066800000	1389.81
11/14/2000	1351.26	1390.06	1351.26	1382.95	1118800000	1382.95
11/13/2000	1365.98	1365.98	1328.62	1351.26	1129300000	1351.26
11/10/2000	1400.14	1400.14	1365.97	1365.98	962500000	1365.98
11/9/2000	1409.28	1409.28	1369.68	1400.14	1111000000	1400.14
11/8/2000	1431.87	1437.28	1408.78	1409.28	909300000	1409.28
11/7/2000	1432.19	1436.22	1423.26	1431.87	880900000	1431.87
11/6/2000	1428.76	1438.46	1427.72	1432.19	930900000	1432.19
11/3/2000	1428.32	1433.21	1420.92	1426.69	997700000	1426.69
11/2/2000	1421.22	1433.4	1421.22	1428.32	1167700000	1428.32
11/1/2000	1429.4	1429.6	1410.45	1421.22	1206800000	1421.22
10/31/2000	1398.66	1432.22	1398.66	1429.4	1366400000	1429.4
10/30/2000	1379.58	1406.36	1376.86	1398.66	1186500000	1398.66
10/27/2000	1364.44	1384.57	1364.13	1379.58	1086300000	1379.58
10/26/2000	1364.9	1372.72	1337.81	1364.44	1303800000	1364.44
10/25/2000	1398.13	1398.13	1362.21	1364.9	1315600000	1364.9
10/24/2000	1395.78	1415.64	1388.13	1398.13	1158600000	1398.13
10/23/2000	1396.93	1406.96	1387.75	1395.78	1046800000	1395.78
10/20/2000	1388.76	1408.47	1382.19	1396.93	1177400000	1396.93
10/19/2000	1342.13	1389.93	1342.13	1388.76	1297900000	1388.76
10/18/2000	1349.97	1356.65	1305.79	1342.13	1441700000	1342.13
10/17/2000	1374.62	1380.99	1342.34	1349.97	1161500000	1349.97
10/16/2000	1374.17	1379.48	1365.06	1374.62	1005400000	1374.62
10/13/2000	1329.78	1374.17	1327.08	1374.17	1223900000	1374.17
10/12/2000	1364.59	1374.93	1328.06	1329.78	1388600000	1329.78
10/11/2000	1387.02	1387.02	1349.67	1364.59	1387500000	1364.59
10/10/2000	1402.03	1408.83	1383.85	1387.02	1044000000	1387.02
10/9/2000	1408.99	1409.69	1392.48	1402.03	716600000	1402.03
10/6/2000	1436.28	1443.3	1397.06	1408.99	1150100000	1408.99
10/5/2000	1434.32	1444.17	1431.8	1436.28	1176100000	1436.28
10/4/2000	1426.46	1439.99	1416.31	1434.32	1167400000	1434.32

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
10/3/2000	1436.23	1454.82	1425.28	1426.46	1098100000	1426.46
10/2/2000	1436.52	1445.6	1429.83	1436.23	1051200000	1436.23
9/29/2000	1458.29	1458.29	1436.29	1436.51	1197100000	1436.51
9/28/2000	1426.57	1461.69	1425.78	1458.29	1206200000	1458.29
9/27/2000	1427.21	1437.22	1419.44	1426.57	1174700000	1426.57
9/26/2000	1439.03	1448.04	1425.25	1427.21	1106600000	1427.21
9/25/2000	1448.72	1457.42	1435.93	1439.03	982400000	1439.03
9/22/2000	1449.05	1449.05	1421.88	1448.72	1185500000	1448.72
9/21/2000	1451.34	1452.77	1436.3	1449.05	1105400000	1449.05
9/20/2000	1459.9	1460.49	1430.95	1451.34	1104000000	1451.34
9/19/2000	1444.51	1461.16	1444.51	1459.9	1024900000	1459.9
9/18/2000	1465.81	1467.77	1441.92	1444.51	962500000	1444.51
9/15/2000	1480.87	1480.96	1460.22	1465.81	1268400000	1465.81
9/14/2000	1484.91	1494.16	1476.73	1480.87	1014000000	1480.87
9/13/2000	1481.99	1487.45	1473.61	1484.91	1068300000	1484.91
9/12/2000	1489.26	1496.93	1479.67	1481.99	991200000	1481.99
9/11/2000	1494.5	1506.76	1483.01	1489.26	899300000	1489.26
9/8/2000	1502.51	1502.51	1489.88	1494.5	961000000	1494.5
9/7/2000	1492.25	1505.34	1492.25	1502.51	985500000	1502.51
9/6/2000	1507.08	1512.61	1492.12	1492.25	995100000	1492.25
9/5/2000	1520.77	1520.77	1504.21	1507.08	838500000	1507.08
9/1/2000	1517.68	1530.09	1515.53	1520.77	767700000	1520.77
8/31/2000	1502.59	1525.21	1502.59	1517.68	1056600000	1517.68
8/30/2000	1509.84	1510.49	1500.09	1502.59	818400000	1502.59
8/29/2000	1514.09	1514.81	1505.46	1509.84	795600000	1509.84
8/28/2000	1506.45	1523.95	1506.45	1514.09	733600000	1514.09
8/25/2000	1508.31	1513.47	1505.09	1506.45	685600000	1506.45
8/24/2000	1505.97	1511.16	1501.25	1508.31	837100000	1508.31
8/23/2000	1498.13	1507.2	1489.52	1505.97	871000000	1505.97
8/22/2000	1499.48	1508.45	1497.42	1498.13	818800000	1498.13
8/21/2000	1491.72	1502.84	1491.13	1499.48	731600000	1499.48
8/18/2000	1496.07	1499.47	1488.99	1491.72	821400000	1491.72
8/17/2000	1479.85	1499.32	1479.85	1496.07	922400000	1496.07
8/16/2000	1484.43	1496.09	1475.74	1479.85	929800000	1479.85
8/15/2000	1491.56	1493.12	1482.74	1484.43	895900000	1484.43
8/14/2000	1471.84	1491.64	1468.56	1491.56	783800000	1491.56
8/11/2000	1460.25	1475.72	1453.06	1471.84	835500000	1471.84
8/10/2000	1472.87	1475.15	1459.89	1460.25	940800000	1460.25
8/9/2000	1482.8	1490.33	1471.16	1472.87	1054000000	1472.87
8/8/2000	1479.32	1484.52	1472.61	1482.8	992200000	1482.8
8/7/2000	1462.93	1480.8	1460.72	1479.32	854800000	1479.32
8/4/2000	1452.56	1462.93	1451.31	1462.93	956000000	1462.93
8/3/2000	1438.7	1454.19	1425.43	1452.56	1095600000	1452.56
8/2/2000	1438.1	1451.59	1433.49	1438.7	994500000	1438.7
8/1/2000	1430.83	1443.54	1428.96	1438.1	938700000	1438.1
7/31/2000	1419.89	1437.65	1418.71	1430.83	952600000	1430.83
7/28/2000	1449.62	1456.68	1413.89	1419.89	980000000	1419.89
7/27/2000	1452.42	1464.91	1445.33	1449.62	1156400000	1449.62
7/26/2000	1474.47	1474.47	1452.42	1452.42	1235800000	1452.42

Attachment For Reponse To Discovery Request 20

S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
7/25/2000	1464.29	1476.23	1464.29	1474.47	969400000	1474.47
7/24/2000	1480.19	1485.88	1463.8	1464.29	880300000	1464.29
7/21/2000	1495.57	1495.57	1477.91	1480.19	968300000	1480.19
7/20/2000	1481.96	1501.92	1481.96	1495.57	1064600000	1495.57
7/19/2000	1493.74	1495.63	1479.92	1481.96	909400000	1481.96
7/18/2000	1510.49	1510.49	1491.35	1493.74	908300000	1493.74
7/17/2000	1509.98	1517.32	1505.26	1510.49	906000000	1510.49
7/14/2000	1495.84	1509.99	1494.56	1509.98	960600000	1509.98
7/13/2000	1492.92	1501.39	1489.65	1495.84	1026800000	1495.84
7/12/2000	1480.88	1497.69	1480.88	1492.92	1001200000	1492.92
7/11/2000	1475.62	1488.77	1470.48	1480.88	980500000	1480.88
7/10/2000	1478.9	1486.56	1474.76	1475.62	838700000	1475.62
7/7/2000	1456.67	1484.12	1456.67	1478.9	931700000	1478.9
7/6/2000	1446.23	1461.65	1439.56	1456.67	947300000	1456.67
7/5/2000	1469.54	1469.54	1442.45	1446.23	1019300000	1446.23
7/3/2000	1454.6	1469.58	1450.85	1469.54	451900000	1469.54
6/30/2000	1442.39	1454.68	1438.71	1454.6	1459700000	1454.6
6/29/2000	1454.82	1455.14	1434.63	1442.39	1110900000	1442.39
6/28/2000	1450.55	1467.63	1450.55	1454.82	1095100000	1454.82
6/27/2000	1455.31	1463.35	1450.55	1450.55	1042500000	1450.55
6/26/2000	1441.48	1459.66	1441.48	1455.31	889000000	1455.31
6/23/2000	1452.18	1459.94	1438.31	1441.48	847600000	1441.48
6/22/2000	1479.13	1479.13	1448.03	1452.18	1022700000	1452.18
6/21/2000	1475.95	1482.19	1468	1479.13	1009600000	1479.13
6/20/2000	1486	1487.32	1470.18	1475.95	1031500000	1475.95
6/19/2000	1464.46	1488.93	1459.05	1486	921700000	1486
6/16/2000	1478.73	1480.77	1460.42	1464.46	1250800000	1464.46
6/15/2000	1470.54	1482.04	1464.62	1478.73	1011400000	1478.73
6/14/2000	1469.44	1483.62	1467.71	1470.54	929700000	1470.54
6/13/2000	1446	1470.42	1442.38	1469.44	935900000	1469.44
6/12/2000	1456.95	1462.93	1445.99	1446	774100000	1446
6/9/2000	1461.67	1472.67	1454.96	1456.95	786000000	1456.95
6/8/2000	1471.36	1475.65	1456.49	1461.67	854300000	1461.67
6/7/2000	1457.84	1474.64	1455.06	1471.36	854600000	1471.36
6/6/2000	1467.63	1471.36	1454.74	1457.84	950100000	1457.84
6/5/2000	1477.26	1477.28	1464.68	1467.63	838600000	1467.63
6/2/2000	1448.81	1483.23	1448.81	1477.26	1162400000	1477.26
6/1/2000	1420.6	1448.81	1420.6	1448.81	960100000	1448.81
5/31/2000	1422.44	1434.49	1415.5	1420.6	960500000	1420.6
5/30/2000	1378.02	1422.45	1378.02	1422.45	844200000	1422.45
5/26/2000	1381.52	1391.42	1369.75	1378.02	722600000	1378.02
5/25/2000	1399.05	1411.65	1373.93	1381.52	984500000	1381.52
5/24/2000	1373.86	1401.75	1361.09	1399.05	1152300000	1399.05
5/23/2000	1400.72	1403.77	1373.43	1373.86	869900000	1373.86
5/22/2000	1406.95	1410.55	1368.73	1400.72	869000000	1400.72
5/19/2000	1437.21	1437.21	1401.74	1406.95	853700000	1406.95
5/18/2000	1447.8	1458.04	1436.59	1437.21	807900000	1437.21
5/17/2000	1466.04	1466.04	1441.67	1447.8	820500000	1447.8
5/16/2000	1452.36	1470.4	1450.76	1466.04	955500000	1466.04

Attachment For Reponse To Discovery Request 20
S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
5/15/2000	1420.96	1452.39	1416.54	1452.36	854600000	1452.36
5/12/2000	1407.81	1430.13	1407.81	1420.96	858200000	1420.96
5/11/2000	1383.05	1410.26	1383.05	1407.81	953600000	1407.81
5/10/2000	1412.14	1412.14	1375.14	1383.05	1006400000	1383.05
5/9/2000	1424.17	1430.28	1401.85	1412.14	896600000	1412.14
5/8/2000	1432.63	1432.63	1417.05	1424.17	787600000	1424.17
5/5/2000	1409.57	1436.03	1405.08	1432.63	805500000	1432.63
5/4/2000	1415.1	1420.99	1404.94	1409.57	925800000	1409.57
5/3/2000	1446.29	1446.29	1398.36	1415.1	991600000	1415.1
5/2/2000	1468.25	1468.25	1445.22	1446.29	1011500000	1446.29
5/1/2000	1452.43	1481.51	1452.43	1468.25	966300000	1468.25
4/28/2000	1464.92	1473.62	1448.15	1452.43	984600000	1452.43
4/27/2000	1460.99	1469.21	1434.81	1464.92	1111000000	1464.92
4/26/2000	1477.44	1482.94	1456.98	1460.99	999600000	1460.99
4/25/2000	1429.86	1477.67	1429.86	1477.44	1071100000	1477.44
4/24/2000	1434.54	1434.54	1407.13	1429.86	868700000	1429.86
4/20/2000	1427.47	1435.49	1422.08	1434.54	896200000	1434.54
4/19/2000	1441.61	1447.69	1424.26	1427.47	1001400000	1427.47
4/18/2000	1401.44	1441.61	1397.81	1441.61	1109400000	1441.61
4/17/2000	1356.56	1401.53	1346.5	1401.44	1204700000	1401.44
4/14/2000	1440.51	1440.51	1339.4	1356.56	1279700000	1356.56
4/13/2000	1467.17	1477.52	1439.34	1440.51	1032000000	1440.51
4/12/2000	1500.59	1509.08	1466.15	1467.17	1175900000	1467.17
4/11/2000	1504.46	1512.8	1486.78	1500.59	971400000	1500.59
4/10/2000	1516.35	1527.19	1503.35	1504.46	853700000	1504.46
4/7/2000	1501.34	1518.68	1501.34	1516.35	891600000	1516.35
4/6/2000	1487.37	1511.76	1487.37	1501.34	1008000000	1501.34
4/5/2000	1494.73	1506.55	1478.05	1487.37	1110300000	1487.37
4/4/2000	1505.98	1526.45	1416.41	1494.73	1515460000	1494.73
4/3/2000	1498.58	1507.19	1486.96	1505.97	1021700000	1505.97
3/31/2000	1487.92	1519.81	1484.38	1498.58	1227400000	1498.58
3/30/2000	1508.52	1517.38	1474.63	1487.92	1193400000	1487.92
3/29/2000	1507.73	1521.45	1497.45	1508.52	1061900000	1508.52
3/28/2000	1523.86	1527.36	1507.09	1507.73	959100000	1507.73
3/27/2000	1527.46	1534.63	1518.46	1523.86	901000000	1523.86
3/24/2000	1527.35	1552.87	1516.83	1527.46	1052200000	1527.46
3/23/2000	1500.64	1532.5	1492.39	1527.35	1078300000	1527.35
3/22/2000	1493.87	1505.08	1487.33	1500.64	1075000000	1500.64
3/21/2000	1456.63	1493.92	1446.06	1493.87	1065900000	1493.87
3/20/2000	1464.47	1470.3	1448.49	1456.63	920800000	1456.63
3/17/2000	1458.47	1477.33	1453.32	1464.47	1295100000	1464.47
3/16/2000	1392.15	1458.47	1392.15	1458.47	1482300000	1458.47
3/15/2000	1359.15	1397.99	1356.99	1392.14	1302800000	1392.14
3/14/2000	1383.62	1395.15	1359.15	1359.15	1094000000	1359.15
3/13/2000	1395.07	1398.39	1364.84	1383.62	1016100000	1383.62
3/10/2000	1401.69	1413.46	1392.07	1395.07	1138800000	1395.07
3/9/2000	1366.7	1401.82	1357.88	1401.69	1123000000	1401.69
3/8/2000	1355.62	1373.79	1346.62	1366.7	1203000000	1366.7
3/7/2000	1391.28	1399.21	1349.99	1355.62	1314100000	1355.62

Attachment For Reponse To Discovery Request 20

S&P 500 Daily History since 20000101

Date	Open	High	Low	Close	Volume	Adj Close
3/6/2000	1409.17	1409.74	1384.75	1391.28	1029000000	1391.28
3/3/2000	1381.76	1410.88	1381.76	1409.17	1150300000	1409.17
3/2/2000	1379.19	1386.56	1370.35	1381.76	1198600000	1381.76
3/1/2000	1366.42	1383.46	1366.42	1379.19	1274100000	1379.19
2/29/2000	1348.05	1369.63	1348.05	1366.42	1204300000	1366.42
2/28/2000	1333.36	1360.82	1325.07	1348.05	1026500000	1348.05
2/25/2000	1353.43	1362.14	1329.15	1333.36	1065200000	1333.36
2/24/2000	1360.69	1364.8	1329.88	1353.43	1215000000	1353.43
2/23/2000	1352.17	1370.11	1342.44	1360.69	993700000	1360.69
2/22/2000	1346.09	1358.11	1331.88	1352.17	980000000	1352.17
2/18/2000	1388.26	1388.59	1345.32	1346.09	1042300000	1346.09
2/17/2000	1387.67	1399.88	1380.07	1388.26	1034800000	1388.26
2/16/2000	1402.05	1404.55	1385.58	1387.67	1018800000	1387.67
2/15/2000	1389.94	1407.72	1376.25	1402.05	1092100000	1402.05
2/14/2000	1387.12	1394.93	1380.53	1389.94	927300000	1389.94
2/11/2000	1416.83	1416.83	1378.89	1387.12	1025700000	1387.12
2/10/2000	1411.7	1422.1	1406.43	1416.83	1058800000	1416.83
2/9/2000	1441.72	1444.55	1411.65	1411.71	1050500000	1411.71
2/8/2000	1424.24	1441.83	1424.24	1441.72	1047700000	1441.72
2/7/2000	1424.37	1427.15	1413.33	1424.24	918100000	1424.24
2/4/2000	1424.97	1435.91	1420.63	1424.37	1045100000	1424.37
2/3/2000	1409.12	1425.78	1398.52	1424.97	1146500000	1424.97
2/2/2000	1409.28	1420.61	1403.49	1409.12	1038600000	1409.12
2/1/2000	1394.46	1412.49	1384.79	1409.28	981000000	1409.28
1/31/2000	1360.16	1394.48	1350.14	1394.46	993800000	1394.46
1/28/2000	1398.56	1398.56	1356.2	1360.16	1095800000	1360.16
1/27/2000	1404.09	1418.86	1370.99	1398.56	1129500000	1398.56
1/26/2000	1410.03	1412.73	1400.16	1404.09	1117300000	1404.09
1/25/2000	1401.53	1414.26	1388.49	1410.03	1073700000	1410.03
1/24/2000	1441.36	1454.09	1395.42	1401.53	1115800000	1401.53
1/21/2000	1445.57	1453.18	1439.6	1441.36	1209800000	1441.36
1/20/2000	1455.9	1465.71	1438.54	1445.57	1100700000	1445.57
1/19/2000	1455.14	1461.39	1448.68	1455.9	1087800000	1455.9
1/18/2000	1465.15	1465.15	1451.3	1455.14	1056700000	1455.14
1/14/2000	1449.68	1473	1449.68	1465.15	1085900000	1465.15
1/13/2000	1432.25	1454.2	1432.25	1449.68	1030400000	1449.68
1/12/2000	1438.56	1442.6	1427.08	1432.25	974600000	1432.25
1/11/2000	1457.6	1458.66	1434.42	1438.56	1014000000	1438.56
1/10/2000	1441.47	1464.36	1441.47	1457.6	1064800000	1457.6
1/7/2000	1403.45	1441.47	1400.73	1441.47	1225200000	1441.47
1/6/2000	1402.11	1411.9	1392.1	1403.45	1092300000	1403.45
1/5/2000	1399.42	1413.27	1377.68	1402.11	1085500000	1402.11
1/4/2000	1455.22	1455.22	1397.43	1399.42	1009000000	1399.42
1/3/2000	1469.25	1478	1438.36	1455.22	931800000	1455.22

Attachment to 21

_ The Equity Premium - Journal of Finance

(4-02) Dr Brown.pdf

THE JOURNAL OF FINANCE • VOL. LVII, NO. 2 • APRIL 2002

The Equity Premium

EUGENE F. FAMA and KENNETH R. FRENCH*

ABSTRACT

We estimate the equity premium using dividend and earnings growth rates to measure the expected rate of capital gain. Our estimates for 1951 to 2000, 2.55 percent and 4.32 percent, are much lower than the equity premium produced by the average stock return, 7.43 percent. Our evidence suggests that the high average return for 1951 to 2000 is due to a decline in discount rates that produces a large unexpected capital gain. Our main conclusion is that the average stock return of the last half-century is a lot higher than expected.

THE EQUITY PREMIUM—the difference between the expected return on the market portfolio of common stocks and the risk-free interest rate—is important in portfolio allocation decisions, estimates of the cost of capital, the debate about the advantages of investing Social Security funds in stocks, and many other applications. The average return on a broad portfolio of stocks is typically used to estimate the expected market return. The average real return for 1872 to 2000 on the S&P index (a common proxy for the market portfolio, also used here) is 8.81 percent per year. The average real return on six-month commercial paper (a proxy for the risk-free interest rate) is 3.24 percent. This large spread (5.57 percent) between the average stock return and the interest rate is the source of the so-called equity premium puzzle: Stock returns seem too high given the observed volatility of consumption (Mehra and Prescott (1985)).

We use fundamentals (dividends and earnings) to estimate the expected stock return. Along with other evidence, the expected return estimates from fundamentals help us judge whether the realized average return is high or low relative to the expected value.

The logic of our approach is straightforward. The average stock return is the average dividend yield plus the average rate of capital gain:

$$A(R_t) = A(D_t/P_{t-1}) + A(GP_t), \tag{1}$$

* Fama is from the University of Chicago and French is from Dartmouth College. The comments of John Campbell, John Cochrane, Kent Daniel, John Heaton, Jay Ritter, Andrei Shleifer, Rex Sinquefield, Tuomo Vuolteenaho, Paul Zarowin, and seminar participants at Boston College, Dartmouth College, the NBER, Purdue University, the University of Chicago, and Washington University have been helpful. Richard Green (the editor) and the two referees get special thanks

where D_t is the dividend for year t, P_{t-1} is the price at the end of year $t-1$, $GP_t = (P_t - P_{t-1})/P_{t-1}$ is the rate of capital gain, and $A(\ )$ indicates an average value. (Throughout the paper, we refer to D_t/P_{t-1} as the dividend yield and D_t/P_t is the dividend–price ratio. Similarly, Y_t/P_{t-1}, the ratio of earnings for year t to price at the end of year $t-1$, is the earnings yield and Y_t/P_t is the earnings–price ratio.)

Suppose the dividend–price ratio, D_t/P_t, is stationary (mean reverting). Stationarity implies that if the sample period is long, the compound rate of dividend growth approaches the compound rate of capital gain. Thus, an alternative estimate of the expected stock return is

$$A(RD_t) = A(D_t/P_{t-1}) + A(GD_t), \tag{2}$$

where $GD_t = (D_t - D_{t-1})/D_{t-1}$ is the growth rate of dividends. We call (2) the dividend growth model.

The logic that leads to (2) applies to any variable that is cointegrated with the stock price. For example, the dividend–price ratio may be nonstationary because firms move away from dividends toward share repurchases as a way of returning earnings to stockholders. But if the earnings–price ratio, Y_t/P_t, is stationary, the average growth rate of earnings, $A(GY_t) = A((Y_t - Y_{t-1})/Y_{t-1})$, is an alternative estimate of the expected rate of capital gain. And $A(GY_t)$ can be combined with the average dividend yield to produce another estimate of the expected stock return:

$$A(RY_t) = A(D_t/P_{t-1}) + A(GY_t). \tag{3}$$

We call (3) the earnings growth model.[1]

We should be clear about the expected return concept targeted by (1), (2), and (3). D_t/P_t and Y_t/P_t vary through time because of variation in the conditional (point-in-time) expected stock return and the conditional expected growth rates of dividends and earnings (see, e.g., Campbell and Shiller (1989)). But if the stock return and the growth rates are stationary (they have constant unconditional means), D_t/P_t and Y_t/P_t are stationary. Then, like the average return (1), the dividend and earnings growth models (2) and (3) provide estimates of the unconditional expected stock return. In short, the focus of the paper is estimates of the unconditional expected stock return.

The estimate of the expected real equity premium for 1872 to 2000 from the dividend growth model (2) is 3.54 percent per year. The estimate from the average stock return, 5.57 percent, is almost 60 percent higher. The difference between the two is largely due to the last 50 years. The equity premium for 1872 to 1950 from the dividend growth model, 4.17 percent per year, is close to the estimate from the average return, 4.40 percent. In con-

[1] Motivated by the model in Lettau and Ludvigson (2001), one can argue that if the ratio of consumption to stock market wealth is stationary, the average growth rate of consumption is another estimate of the expected rate of capital gain. We leave this path to future work.

trast, the equity premium for 1951 to 2000 produced by the average return, 7.43 percent per year, is almost three times the estimate, 2.55 percent, from (2). The estimate of the expected real equity premium for 1951 to 2000 from the earnings growth model (3), 4.32 percent per year, is larger than the estimate from the dividend growth model (2). But the earnings growth estimate is still less than 60 percent of the estimate from the average return.

Three types of evidence suggest that the lower equity premium estimates for 1951 to 2000 from fundamentals are closer to the expected premium. (a) The estimates from fundamentals are more precise. For example, the standard error of the estimate from the dividend growth model is less than half the standard error of the estimate from the average return. (b) The Sharpe ratio for the equity premium from the average stock return for 1951 to 2000 is just about double that for 1872 to 1950. In contrast, the equity premium from the dividend growth model has a similar Sharpe ratio for 1872 to 1950 and 1951 to 2000. (c) Most important, valuation theory specifies relations among the book-to-market ratio, the return on investment, and the cost of equity capital (the expected stock return). The estimates of the expected stock return for 1951 to 2000 from the dividend and earnings growth models line up with other fundamentals in the way valuation theory predicts. But the book-to-market ratio and the return on investment suggest that the expected return estimate from the average stock return is too high.

Our motivation for the dividend growth model (2) is simpler and more general, but (2) can be viewed as the expected stock return estimate of the Gordon (1962) model. Our work is thus in the spirit of a growing literature that uses valuation models to estimate expected returns (e.g., Blanchard (1993), Claus and Thomas (2001), and Gebhardt, Lee, and Swaminathan (2001)). Claus and Thomas and Gebhardt, Lee, and Swaminathan use forecasts by security analysts to estimate expected cash flows. Their analyst forecasts cover short periods (1985 to 1998 and 1979 to 1995). We use realized dividends and earnings from 1872 to 2000. This 129-year period provides a long perspective, which is important for judging the competing expected return estimates from fundamentals and realized stock returns. Moreover, though the issue is controversial (Keane and Runkle (1998)), Claus and Thomas find that analyst forecasts are biased; they tend to be substantially above observed growth rates. The average growth rates of dividends and earnings we use are unbiased estimates of expected growth rates.

Like us, Blanchard (1993) uses dividend growth rates to estimate the expected rate of capital gain, which he combines with an expected dividend yield to estimate the expected stock return. But his focus is different and his approach is more complicated than ours. He is interested in the path of the conditional expected stock return. His conditional expected return is the sum of the fitted values from time-series regressions of the realized dividend yield and a weighted average of 20 years of future dividend growth rates on four predetermined variables (the dividend yield, the real rate of capital gain, and the levels of interest rates and inflation). He focuses on describing the path of the conditional expected return in terms of his four explanatory variables.

In contrast, our prime interest is the unconditional expected return, which we estimate more simply as the sum of the average dividend yield and the average growth rate of dividends or earnings. This approach is valid if the dividend–price and earnings–price ratios are stationary. And we argue below that it continues to produce estimates of the average expected stock return when the price ratios are subject to reasonable forms of nonstationarity. Given its simplicity and generality, our approach is an attractive addition to the research toolbox for estimating the expected stock return.

Moreover, our focus is comparing alternative estimates of the unconditional expected stock return over the long 1872 to 2000 period, and explaining why the expected return estimates for 1951 to 2000 from fundamentals are much lower than the average return. Our evidence suggests that much of the high return for 1951 to 2000 is unexpected capital gain, the result of a decline in discount rates.

Specifically, the dividend–price and earnings–price ratios fall from 1950 to 2000; the cumulative percent capital gain for the period is more than three times the percent growth in dividends or earnings. All valuation models agree that the two price ratios are driven by expectations about future returns (discount rates) and expectations about dividend and earnings growth. Confirming Campbell (1991), Cochrane (1994), and Campbell and Shiller (1998), we find that dividend and earnings growth rates for 1950 to 2000 are largely unpredictable. Like Campbell and Shiller (1998), we thus infer that the decline in the price ratios is mostly due to a decline in expected returns. Some of this decline is probably expected, the result of reversion of a high 1950 conditional expected return to the unconditional mean. But most of the decline in the price ratios seems to be due to the unexpected decline of expected returns to ending values far below the mean.

The paper proceeds as follows. The main task, addressed in Sections I and II, is to compare and evaluate the estimates of the unconditional annual expected stock return provided by the average stock return and the dividend and earnings growth models. Section III then considers the issues that arise if the goal is to estimate the long-term expected growth of wealth, rather than the unconditional expected annual (simple) return. Section IV concludes.

I. The Unconditional Annual Expected Stock Return

Table I shows estimates of the annual expected real equity premium for 1872 to 2000. The market portfolio is the S&P 500 and its antecedents. The deflator is the Producer Price Index until 1925 (from Shiller (1989)) and the Consumer Price Index thereafter (from Ibbotson Associates). The risk-free interest rate is the annual real return on six-month commercial paper, rolled over at midyear. The risk-free rate and S&P earnings data are from Shiller, updated by Vuolteenaho (2000) and us. Beginning in 1925, we construct S&P book equity data from the book equity data in Davis, Fama, and French (2000), expanded to include all NYSE firms. The data on dividends, prices, and returns for 1872 to 1925 are from Shiller. Shiller's annual data on the

Table I

Real Equity Premium and Related Statistics for the S&P Portfolio

The inflation rate for year t is $Inf_t = L_t/L_{t-1} - 1$, where L_t is the price level at the end of year t. The real return for year t on six-month (three-month for the year 2000) commercial paper (rolled over at midyear) is F_t. The nominal values of book equity and price for the S&P index at the end of year t are b_t and p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. Real rates of growth of dividends, earnings, and the stock price are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$, $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and $GP_t = (p_t/p_{t-1})*(L_{t-1}/L_t) - 1$. The real dividend yield is $D_t/P_{t-1} = (d_t/p_{t-1})*(L_{t-1}/L_t)$. The real income return on investment is $Y_t/B_{t-1} = (1 - y_t/b_{t-1})*(L_{t-1}/L_t) - 1$. The dividend growth estimate of the real S&P return for t is $RD_t = D_t/P_{t-1} - GD_t$, the earnings growth estimate is $RY_t = D_t/P_{t-1} - GY_t$, and R_t is the realized real S&P return. The dividend and earnings growth estimates of the real equity premium for year t are $RXD_t = RD_t - F_t$ and $RXY_t = RY_t - F_t$, and $RX_t = R_t - F_t$ is the real equity premium from the realized real return. The Sharpe ratio for $RD_t - F_t$ (the mean of $RD_t - F_t$ divided by the standard deviation of R_t) is SD. SY is the Sharpe ratio for $RY_t - F_t$ (the mean of $RY_t - F_t$ divided by the standard deviation of R_t), and SR is the Sharpe ratio for $R_t - F_t$ (the mean of $R_t - F_t$ divided by the standard deviation of R_t). Except for the Sharpe ratios, all variables are expressed as percents, that is, they are multiplied by 100.

	Inf_t	F_t	D_t/P_{t-1}	GD_t	GY_t	GP_t	RD_t	RY_t	R_t	RXD_t	RXY_t	RX_t	SD	SY	SR
Means of annual values of variables															
1872–2000	2.16	3.24	4.70	2.08	NA	4.11	6.78	NA	6.81	3.54	NA	5.57	0.20	NA	0.31
1872–1950	0.99	3.90	5.34	2.74	NA	2.96	8.07	NA	8.30	4.17	NA	4.40	0.22	NA	0.23
1951–2000	4.00	2.19	3.70	1.05	2.82	5.92	4.74	6.51	9.62	2.55	4.32	7.43	0.15	0.25	0.44
Standard deviations of annual values of variables															
1872–2000	7.51	8.48	1.39	12.37	NA	17.83	12.56	NA	18.03	13.00	NA	18.51			
1872–1950	9.11	10.63	1.12	15.28	NA	18.48	15.41	NA	18.72	16.02	NA	19.57			
1951–2000	3.11	2.46	1.17	5.09	13.79	16.77	5.21	13.51	17.03	5.62	14.02	16.73			
Means of annual continuously compounded returns and growth rates															
1872–2000	1.86	2.87		1.34	NA	2.48			7.00						
1872–1950	0.59	3.33		1.60	NA	1.22			6.41						
1951–2000	3.88	2.14		0.92	1.89	4.46			7.94						

	b_t/p_t	RD_t	RY_t	R_t	Y_t/B_{t-1}
Means of annual values of variables					
1951–2000	0.66	4.74	6.51	9.62	7.60

level of the S&P (used to compute returns and other variables involving price) are averages of daily January values. The S&P dividend, price, and return data for 1926 to 2000 are from Ibbotson Associates, and the returns for 1926 to 2000 are true annual returns.

Without showing the details, we can report that the CRSP value-weight portfolio of NYSE, AMEX, and Nasdaq stocks produces average returns and dividend growth estimates of the expected return close to the S&P estimates for periods after 1925 when both indices are available. What one takes to be the risk-free rate has a bigger effect. For example, substituting the one-month Treasury bill rate for the six-month commercial paper rate causes estimates of the annual equity premium for 1951 to 2000 to rise by about one percent. But for our main task—comparing equity premium estimates from (1), (2), and (3)—differences in the risk-free rate are an additive constant that does not affect inferences.

One can estimate expected returns in real or nominal terms. Since portfolio theory says the goal of investment is consumption, real returns seem more relevant, and only results for real returns are shown. Because of suspicions about the quality of the price deflator during the early years of 1872 to 2000, we have replicated the results for nominal returns. They support all the inferences from real returns.

The dividend and earnings growth models (2) and (3) assume that the market dividend–price and earnings–price ratios are stationary. The first three annual autocorrelations of D_t/P_t for 1872 to 2000 are 0.73, 0.51, and 0.47. For the 1951 to 2000 period that occupies much of our attention, the autocorrelations are 0.83, 0.72, and 0.69. The autocorrelations are large, but their decay is roughly like that of a stationary first-order autoregression (AR1). This is in line with formal evidence (Fama and French (1988), Cochrane (1994), and Lamont (1998)) that the market dividend–price ratio is highly autocorrelated but slowly mean-reverting. S&P earnings data for the early years of 1872 to 2000 are of dubious quality (Shiller (1989)), so we estimate expected returns with the earnings growth model (3) only for 1951 to 2000. The first three autocorrelations of Y_t/P_t for 1951 to 2000, 0.80, 0.70, and 0.61, are again roughly like those of a stationary AR1.

We emphasize, however, that our tests are robust to reasonable nonstationarity of D_t/P_t and Y_t/P_t. It is not reasonable that the expected stock return and the expected growth rates of dividends and earnings that drive D_t/P_t and Y_t/P_t are nonstationary processes that can wander off to infinity. But nonstationarity of D_t/P_t and Y_t/P_t due to structural shifts in productivity or preferences that permanently change the expected return or the expected growth rates is reasonable. Such regime shifts are not a problem for the expected return estimates from (2) and (3), as long as D_t/P_t and Y_t/P_t mean-revert within regimes. If the regime shift is limited to expected dividend and earnings growth rates, the permanent change in expected growth rates is offset by a permanent change in the expected dividend yield, and (2) and (3) continue to estimate the (stationary) expected stock return. (An Appendix, available on request, provides an example.) If there is a perma-

nent shift in the expected stock return, it is nonstationary, but like the average return in (1), the dividend and earnings growth models in (2) and (3) estimate the average expected return during the sample period.

Indeed, an advantage of the expected return estimates from fundamentals is that they are likely to be less sensitive than the average return to long-lived shocks to dividend and earnings growth rates or the expected stock return. For example, a permanent shift in the expected return affects the average dividend yield, which is common to the three expected return estimates, but it produces a shock to the capital gain term in the average return in (1) that is not shared by the estimates in (2) and (3). In short, the estimates of the expected stock return from fundamentals are likely to be more precise than the average stock return.

A. *The Equity Premium*

For much of the period from 1872 to 2000—up to about 1950—the dividend growth model and the average stock return produce similar estimates of the expected return. Thereafter, the two estimates diverge. To illustrate, Table I shows results for 1872 to 1950 (79 years) and 1951 to 2000 (50 years). The year 1950 is a big year, with a high real stock return (23.40 percent), and high dividend and earnings growth estimates of the return (29.96 percent and 24.00 percent). But because the three estimates of the 1950 return are similarly high, the ordering of expected return estimates, and the inferences we draw from them, are unaffected by whether 1950 is allocated to the earlier or the later period. Indeed, pushing the 1950 break-year backward or forward several years does not affect our inferences.

For the earlier 1872 to 1950 period, there is not much reason to favor the dividend growth estimate of the expected stock return over the average return. Precision is not an issue; the standard errors of the two estimates are similar (1.74 percent and 2.12 percent), the result of similar standard deviations of the annual dividend growth rate and the rate of capital gain, 15.28 percent and 18.48 percent. Moreover, the dividend growth model and the average return provide similar estimates of the expected annual real return for 1872 to 1950, 8.07 percent and 8.30 percent. Given similar estimates of the expected return, the two approaches produce similar real equity premiums for 1872 to 1950, 4.17 percent (dividend growth model) and 4.40 percent (stock returns).

The competition between the dividend growth model and the average stock return is more interesting for 1951 to 2000. The dividend growth estimate of the 1951 to 2000 expected return, 4.74 percent, is less than half the average return, 9.62 percent. The dividend growth estimate of the equity premium, 2.55 percent, is 34 percent of the estimate from returns, 7.43 percent. The 1951 to 2000 estimates of the expected stock return and the equity premium from the earnings growth model, 6.51 percent and 4.32 percent, are higher than for the dividend growth model. But they are well below the estimates from the average return, 9.62 percent and 7.43 percent.

B. Evaluating the Expected Return Estimates for 1951 to 2000

We judge that the estimates of the expected stock return for 1951 to 2000 from fundamentals are closer to the true expected value, for three reasons.

(a) The expected return estimates from the dividend and earnings growth models are more precise than the average return. The standard error of the dividend growth estimate of the expected return for 1951 to 2000 is 0.74 percent, versus 2.43 percent for the average stock return. Since earnings growth is more volatile than dividend growth, the standard error of the expected return from the earnings growth model, 1.93 percent, is higher than the estimate from the dividend growth model, but it is smaller than the 2.43 percent standard error of the average stock return. Claus and Thomas (2001) also argue that expected return estimates from fundamentals are more precise than average returns, but they provide no direct evidence.

(b) Table I shows Sharpe ratios for the three equity premium estimates. Only the average premium in the numerator of the Sharpe ratio differs for the three estimates. The denominator for all three is the standard deviation of the annual stock return. The Sharpe ratio for the dividend growth estimate of the equity premium for 1872 to 1950, 0.22, is close to that produced by the average stock return, 0.23. More interesting, the Sharpe ratio for the equity premium for 1951 to 2000 from the dividend growth model, 0.15, is lower than but similar to that for 1872 to 1950. The Sharpe ratio for the 1951 to 2000 equity premium from the earnings growth model, 0.25, is somewhat higher than the dividend growth estimate, 0.15, but it is similar to the estimates for 1872 to 1950 from the dividend growth model, 0.22, and the average return, 0.23.

In asset pricing theory, the Sharpe ratio is related to aggregate risk aversion. The Sharpe ratios for the 1872 to 1950 and 1951 to 2000 equity premiums from the dividend growth model and the earnings growth model suggest that aggregate risk aversion is roughly similar in the two periods. In contrast, though return volatility falls a bit, the equity premium estimate from the average stock return increases from 4.40 percent for 1872 to 1950 to 7.43 percent for 1951 to 2000, and its Sharpe ratio about doubles, from 0.23 to 0.44. It seems implausible that risk aversion increases so much from the earlier to the later period.

(c) Most important, the behavior of other fundamentals favors the dividend and earnings growth models. The average ratio of the book value of equity to the market value of equity for 1951 to 2000 is 0.66, the book-to-market ratio B_t/P_t is never greater than 1.12, and it is greater than 1.0 for only 6 years of the 50-year period. Since, on average, the market value of equity is substantially higher than its book value, it seems safe to conclude that, on average, the expected return on investment exceeds the cost of capital.

Suppose investment at time $t - 1$ generates a stream of equity earnings for $t, t + 1, \ldots, t + N$ with a constant expected value. The average income return on book equity, $A(Y_t/B_{t-1})$, is then an estimate of the expected return on equity's share of assets. It is an unbiased estimate when N is infinite and

it is upward biased when N is finite. In either case, if the expected return on investment exceeds the cost of capital, we should find that (except for sampling error) the average income return on book equity is greater than estimates of the cost of equity capital (the expected stock return):

$$A(Y_t/B_{t-1}) > E(R). \tag{4}$$

Table I shows that (4) is confirmed when we use the dividend and earnings growth models to estimate the expected real stock return for 1951 to 2000. The estimates of $E(R)$, 4.74 percent (dividend growth model) and 6.51 percent (earnings growth model), are below 7.60 percent, the average real income return on book equity, $A(Y_t/B_{t-1})$. In contrast, the average real stock return for 1951 to 2000, 9.62 percent, exceeds the average income return by more than 2 percent. An expected stock return that exceeds the expected income return on book equity implies that the typical corporate investment has a negative net present value. This is difficult to reconcile with an average book-to-market ratio substantially less than one.

To what extent are our results new? Using analyst forecasts of expected cash flows and a more complicated valuation model, Claus and Thomas (2001) produce estimates of the expected stock return for 1985 to 1998 far below the average return. Like us, they argue that the estimates from fundamentals are closer to the true expected return. We buttress this conclusion with new results on three fronts. (a) The long-term perspective provided by the evidence that, for much of the 1872 to 2000 period, average returns and fundamentals produce similar estimates of the expected return. (b) Direct evidence that the expected return estimates for 1951 to 2000 from fundamentals are more precise. (c) Sharpe ratios and evidence on how the alternative expected return estimates line up with the income return on investment. These new results provide support for the expected return estimates from fundamentals, and for the more specific inference that the average stock return for 1951 to 2000 is above the expected return.

II. Unexpected Capital Gains

Valuation theory suggests three potential explanations for why the 1951 to 2000 average stock return is larger than the expected return. (a) Dividend and earnings growth for 1951 to 2000 is unexpectedly high. (b) The expected (post-2000) growth rates of dividends and earnings are unexpectedly high. (c) The expected stock return (the equity discount rate) is unexpectedly low at the end of the sample period.

A. Is Dividend Growth for 1951 to 2000 Unexpectedly High?

If the prosperity of the United States over the last 50 years was not fully anticipated, dividend and earnings growth for 1951 to 2000 exceed 1950 expectations. Such unexpected in-sample growth produces unexpected cap-

ital gains. But it does not explain why the average return for 1951 to 2000 (the average dividend yield plus the average rate of capital gain) is so much higher than the expected return estimates from fundamentals (the average dividend yield plus the average growth rate of dividends or earnings). To see the point, note that unexpected in-sample dividend and earnings growth do not affect either the 1950 or the 2000 dividend–price and earnings–price ratios. (The 2000 ratios depend on post-2000 expected returns and growth rates.) Suppose D_t/P_t and E_t/P_t were the same in 1950 and 2000. Then the total percent growth in dividends and earnings during the period would be the same as the percent growth in the stock price. And (1), (2), and (3) would provide similar estimates of the expected stock return.

It is worth dwelling on this point. There is probably survivor bias in the U.S. average stock return for 1872 to 1950, as well as for 1951 to 2000. During the 1872 to 2000 period, it was not a foregone conclusion that the U.S. equity market would survive several financial panics, the Great Depression, two world wars, and the cold war. The average return for a market that survives many potentially cataclysmic challenges is likely to be higher than the expected return (Brown, Goetzmann, and Ross (1995)). But if the positive bias shows up only as higher than expected dividend and earnings growth during the sample period, there is similar survivor bias in the expected return estimates from fundamentals—a problem we do not solve. Our more limited goal is to explain why the average stock return for 1951 to 2000 is so high relative to the expected return estimates from the dividend and earnings growth models.

Since unexpected growth for 1951 to 2000 has a similar effect on the three expected return estimates, the task of explaining why the estimates are so different falls to the end-of-sample values of future expected returns and expected dividend and earnings growth. We approach the problem by first looking for evidence that expected dividend or earnings growth is high at the end of the sample period. We find none. We then argue that the large spread of capital gains over dividend and earnings growth for 1951 to 2000, or equivalently, the low end-of-sample dividend–price and earnings–price ratios, are due to an unexpected decline in expected stock returns to unusually low end-of-sample values.

B. Are Post-2000 Expected Dividend and Earnings Growth Rates Unusually High?

The behavior of dividends and earnings provides little evidence that rationally assessed (i.e., true) long-term expected growth is high at the end of the sample period. If anything, the growth rate of real dividends declines during the 1951 to 2000 period (Table II). The average growth rate for the first two decades, 1.60 percent, is higher than the average growth rates for the last three, 0.68 percent. The regressions in Table III are more formal evidence on the best forecast of post-2000 real dividend growth rates. Re-

Table II

Means of Simple Real Equity Premium and Related Statistics for the S&P Portfolio for 10-year Periods

The inflation rate for year t is $Inf_t = L_t / L_{t-1} - 1$, where L_t is the price level at the end of year t. The real return for year t on six-month (three-month for the year 2000) commercial paper (rolled over at midyear) is F_t. The nominal price of the S&P index at the end of year t is p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. Real rates of growth of dividends, earnings, and the stock price are $GD_t = (d_t/d_{t-1})(L_{t-1}/L_{t-2}) - 1$, $GY_t = (y_t/y_{t-1})(L_{t-1}/L_{t-2}) - 1$, and $GP_t = (p_t/p_{t-1})(L_{t-1}/L_{t-2}) - 1$. The real dividend yield is $D_t/P_{t-1} = (d_t/p_{t-1})(L_{t-1}/L_{t-2})$. The dividend growth estimate of the real S&P return for t is $RD_t = D_t/P_{t-1} + GD_t$, the earnings growth estimate is $RY_t = D_t/P_{t-1} + GY_t$, and R_t is the realized real S&P return. The dividend and earnings growth estimates of the real equity premium for year t are $RXD_t = RD_t - F_t$ and $RXY_t = RY_t - F_t$, and $RX_t = R_t - F_t$ is the real equity premium from the realized real return. All variables are expressed as percents, that is, they are multiplied by 100.

	Inf_t	F_t	D_t/P_{t-1}	GD_t	GY_t	GP_t	RD_t	RY_t	R_t	RXD_t	RXY_t	RX_t
1872–1880	−2.77	9.86	6.29	4.62	NA	7.13	10.91	NA	13.42	1.06	NA	3.56
1881–1890	−1.72	7.23	5.04	0.69	NA	0.04	5.73	NA	5.08	−1.51	NA	2.15
1891–1900	0.15	5.08	4.40	4.49	NA	4.75	8.89	NA	9.15	3.81	NA	4.08
1901–1910	1.95	3.18	4.45	3.25	NA	2.33	7.70	NA	6.78	4.52	NA	3.60
1911–1920	6.82	0.82	5.70	−3.43	NA	−6.52	2.27	NA	−0.83	1.45	NA	−1.64
1921–1930	−1.70	7.41	5.72	9.07	NA	11.83	14.78	NA	17.54	7.37	NA	10.13
1931–1940	−1.23	2.80	5.31	0.36	NA	2.21	5.67	NA	7.52	2.87	NA	4.72
1941–1950	6.04	−4.57	5.90	3.02	NA	2.33	8.91	NA	8.22	13.48	NA	12.79
1951–1960	1.79	1.05	4.68	1.22	0.61	10.64	5.90	5.30	15.32	4.85	4.24	14.27
1961–1970	2.94	2.27	3.21	1.98	2.07	2.69	5.19	5.27	5.90	2.92	3.01	3.63
1971–1980	8.11	−0.30	4.04	−0.86	3.47	−1.92	3.18	7.50	2.12	3.48	7.80	2.42
1981–1990	4.51	5.32	4.19	2.32	0.37	5.40	6.51	4.56	9.59	1.19	−0.75	4.28
1991–2000	2.68	2.61	2.36	0.58	7.58	12.80	2.94	9.94	15.16	0.32	7.32	12.54

Table III

Regressions to Forecast Real Dividend and Earnings Growth Rates, GD_t and GY_t

The price level at the end of year t is L_t. The nominal values of book equity and price for the S&P index at the end of year t are b_t and p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. The real dividend and earnings growth rates for year t are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$ and $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and R_t is the realized real return on the S&P portfolio for year t. The regression intercept is *Int*, and *t*-Stat is the regression coefficient (*Coef*) divided by its standard error. The regression R^2 is adjusted for degrees of freedom. Except for the dividend payout ratio, d_t/y_t, all variables are expressed as percents, that is, they are multiplied by 100.

Panel A: One Year: The Regressions Forecast Real Dividend Growth, GD_t, with Variables Known at $t - 1$

	Int	d_{t-1}/y_{t-1}	d_{t-1}/p_{t-1}	GD_{t-1}	GD_{t-2}	GD_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	R^2
1875–1950, N = 76 years										
Coef	29.56	−23.12	−2.63	−0.12	−0.07	−0.03	0.22	0.13	0.09	0.38
t-Stat	3.22	−3.17	−1.77	−1.08	−0.64	−0.29	2.24	1.37	1.01	
1951–2000, N = 50 years										
Coef	−2.16	2.97	0.11	−0.07	−0.20	−0.06	0.11	0.07	0.01	0.01
t-Stat	−0.40	0.33	0.16	−0.45	−1.57	−0.45	2.17	1.33	0.22	

Panel B: Two Years: The Regressions Forecast Real Dividend Growth, GD_t, with Variables Known at $t-2$

	Int	d_{t-2}/y_{t-2}	d_{t-2}/p_{t-2}	GD_{t-2}	GD_{t-3}	R_{t-2}	R_{t-3}	R^2
1875–1950, N = 76 years								
Coef	6.61	−11.60	0.31	−0.26	0.05	0.24	0.11	0.07
t-Stat	0.64	−1.28	0.18	−2.02	0.39	2.03	1.00	
1951–2000, N = 50 years								
Coef	−4.11	7.62	0.32	−0.14	−0.03	0.05	−0.01	−0.05
t-Stat	−0.73	0.81	0.46	−1.13	−0.28	0.99	−0.16	

Panel C. One Year: The Regressions Forecast Real Earnings Growth, GY_t, with Variables Known at $t-1$

	Int	Y_{t-1}/B_{t-2}	d_{t-1}/y_{t-1}	y_{t-1}/p_{t-1}	GY_{t-1}	GY_{t-2}	GY_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	R^2
1951–2000, N = 50 years											
Coef	5.48	0.11	13.06	−1.36	0.21	−0.13	−0.31	0.28	−0.25	0.03	0.40
t-Stat	0.33	0.11	0.52	−1.91	1.17	−0.89	−2.64	2.39	−2.18	0.26	

Panel D: Two Years: The Regressions Forecast Real Earnings Growth, GY_t, with Variables Known at $t-2$

	Int	Y_{t-2}/B_{t-3}	d_{t-2}/y_{t-2}	y_{t-2}/p_{t-2}	GY_{t-2}	GY_{t-3}	R_{t-2}	R_{t-3}	R^2
1951–2000, N = 50 years									
Coef	−7.60	0.46	2.05	−0.74	−0.16	−0.39	−0.31	−0.12	0.23
t-Stat	−0.43	1.66	0.76	−1.02	−0.92	−2.54	−2.59	−0.97	

gressions are shown for forecasts one year ahead (the explanatory variables for year t dividend growth are known at the end of year $t - 1$) and two years ahead (the explanatory variables are known at the end of year t 2).

The regression for 1875 to 1950 suggests strong forecast power one year ahead. The slopes on the lagged payout ratio, the dividend–price ratio, and the stock return are close to or more than two standard errors from zero, and the regression captures 38 percent of the variance of dividend growth. Even in the 1875 to 1950 period, however, power to forecast dividend growth does not extend much beyond a year. When dividend growth for year t is explained with variables known at the end of year t 2, the regression R^2 falls from 0.38 to 0.07. Without showing the details, we can report that extending the forecast horizon from two to three years causes all hint of forecast power to disappear. Thus, for 1875 to 1950, the best forecast of dividend growth more than a year or two ahead is the historical average growth rate.

We are interested in post-2000 expected dividend growth, and even the short-term forecast power of the dividend regressions for 1872 to 1950 evaporates in the 1951 to 2000 period. The lagged stock return has some information ($t = 2.17$) about dividend growth one year ahead. But the 1951 to 2000 regression picks up only one percent of the variance of dividend growth. And forecast power does not improve for longer forecast horizons. Our evidence that dividend growth is essentially unpredictable during the last 50 years confirms the results in Campbell (1991), Cochrane (1991, 1994), and Campbell and Shiller (1998). If dividend growth is unpredictable, the historical average growth rate is the best forecast of future growth.

Long-term expected earnings growth also is not unusually high in 2000. There is no clear trend in real earnings growth during the 1951 to 2000 period. The most recent decade, 1991 to 2000, produces the highest average growth rate, 7.58 percent per year (Table II). But earnings growth is volatile. The standard errors of 10-year average growth rates vary around 5 percent. It is thus not surprising that 1981 to 1990, the decade immediately preceding 1991 to 2000, produces the lowest average real earnings growth rate, 0.37 percent per year.

The regressions in Table III are formal evidence on the predictability of earnings growth during the 1951 to 2000 period. There is some predictability of near-term growth, but it is largely due to transitory variation in earnings that is irrelevant for forecasting long-term earnings. In the 1951 to 2000 regression to forecast earnings growth one year ahead, the slope on the first lag of the stock return is positive (0.28, t 2.39), but the slope on the second lag is negative (0.25, t 2.18) and about the same magnitude. Thus, the prediction of next year's earnings growth from this year's return is reversed the following year. In the one-year forecast regression for 1951 to 2000, the only variable other than lagged returns with power to forecast earnings growth (t 2.64) is the third lag of earnings growth. But the slope is negative, so it predicts that the strong earnings growth of recent years is soon to be reversed

In the 1951 to 2000 regression to forecast earnings one year ahead, there is a hint (t = 1.91) that the low earnings–price ratio at the end of the period implies higher than average expected growth one year ahead. But the effect peters out quickly; the slope on the lagged earnings–price ratio in the regression to forecast earnings growth two years ahead is −1.02 standard errors from zero. The only variables with forecast power two years ahead are the second lag of the stock return and the third lag of earnings growth. But the slopes on these variables are negative, so again the 2000 prediction is that the strong earnings growth of recent years is soon to be reversed. And again, regressions (not shown) confirm that forecast power for 1951 to 2000 does not extend beyond two years. Thus, beyond two years, the best forecast of earnings growth is the historical average growth rate.

In sum, the behavior of dividends for 1951 to 2000 suggests that future growth is largely unpredictable, so the historical mean growth rate is a near optimal forecast of future growth. Earnings growth for 1951 to 2000 is somewhat predictable one and two years ahead, but the end-of-sample message is that the recent high growth rates are likely to revert quickly to the historical mean. It is also worth noting that the market survivor bias argument of Brown, Goetzmann, and Ross (1995) suggests that past average growth rates are, if anything, upward biased estimates of future growth. In short, we find no evidence to support a forecast of strong future dividend or earnings growth at the end of our sample period.

C. Do Expected Stock Returns Fall during the 1951 to 2000 Period?

The S&P dividend–price ratio, D_t/P_t, falls from 7.18 percent at the end of 1950 to a historically low 1.22 percent at the end of 2000 (Figure 1). The growth in the stock price, P_{2000}/P_{1950}, is thus 5.89 times the growth in dividends, D_{2000}/D_{1950}. The S&P earnings–price ratio, Y_t/P_t, falls from 13.39 percent at the end of 1950 to 3.46 percent at the end of 2000, so the percent capital gain of the last 50 years is 3.87 times the percent growth in earnings. (Interestingly, almost all of the excess capital gain occurs in the last 20 years; Figure 1 shows that the 1979 earnings–price ratio, 13.40 percent, is nearly identical to the 13.39 percent value of 1950.)

All valuation models say that D_t/P_t and E_t/P_t are driven by expected future returns (discount rates) and expectations about future dividend and earnings growth. Our evidence suggests that rational forecasts of long-term dividend and earnings growth rates are not unusually high in 2000. We conclude that the large spread of capital gains for 1951 to 2000 over dividend and earnings growth is largely due to a decline in the expected stock return.

Some of the decline in D_t/P_t and E_t/P_t during 1951 to 2000 is probably anticipated in 1950. The dividend–price ratio for 1950, 7.18 percent, is high (Figure 1). The average for 1872 to 2000 is 4.64 percent. If D_t/P_t is mean-reverting, the expectation in 1950 of the yield in 2000 is close to the unconditional mean, say 4.64 percent. The actual dividend–price ratio for 2000 is

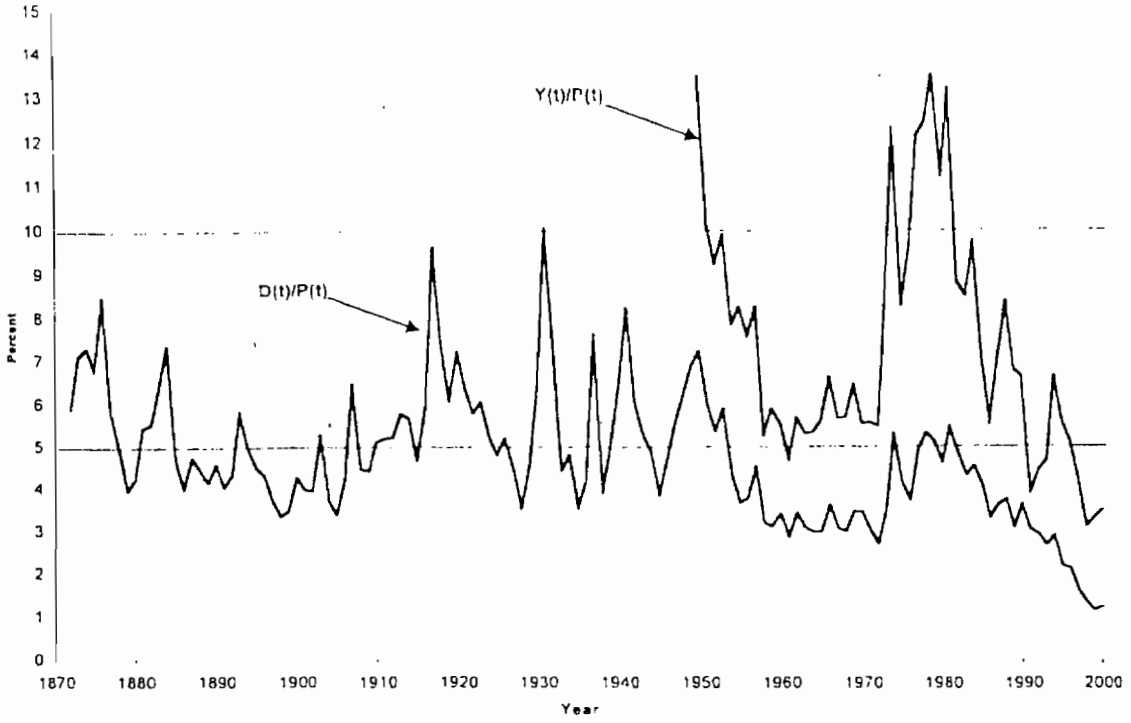

Figure 1. Dividend–price and earnings–price ratios.

1.22 percent. The 2000 stock price is thus 4.64/1.22 = 3.80 times what it would be if the dividend yield for 2000 hit the historical mean. Roughly speaking, this unexpected capital gain adds about 2.67 percent to the compound annual return for 1951 to 2000.

Similarly, part of the large difference between the 1951 to 2000 capital gain and the growth in earnings is probably anticipated in 1950. The 13.39 percent value of Y_t/P_t in 1950 is high relative to the mean for 1951 to 2000, 7.14 percent. If the earnings–price ratio is stationary, the expectation in 1950 of Y_t/P_t for 2000 is close to the unconditional mean, say 7.14 percent. The actual Y_t/P_t for 2000 is 3.46 percent. Thus, the 2000 stock price is 7.14/3.46 = 2.06 times what it would be if the ratio for 2000 hit the 7.14 percent average value for 1951 to 2000. Roughly speaking, this estimate of the unexpected capital gain adds about 1.45 percent to the compound annual return for the 50-year period.

In short, the percent capital gain for 1951 to 2000 is several times the growth of dividends or earnings. The result is historically low dividend–price and earnings–price ratios at the end of the period. Since the ratios are high in 1950, some of their subsequent decline is probably expected, but much of it is unexpected. Given the evidence that rational forecasts of long-term growth rates of dividends and earnings are not high in 2000, we conclude that the unexpected capital gains for 1951 to 2000 are largely due to a decline in the discount rate. In other words, the low end-of-sample price ratios imply low (rationally assessed, or true) expected future returns.

Like us, Campbell (1991), Cochrane (1994), and Campbell and Shiller (1998) find that, for recent periods, dividend and earnings growth are largely unpredictable, so variation in dividend–price and earnings–price ratios is largely due to the expected stock return. The samples in Campbell (1991) and Cochrane (1994) end in 1988 (before the strong subsequent returns that produce sharp declines in the price ratios), and they focus on explaining, in general terms, how variation in D_t/P_t splits between variation in the expected stock return and expected dividend growth. Campbell and Shiller (1998) focus on the low expected future returns implied by the low price ratios of recent years.

In contrast, we are more interested in what the decline in the price ratios says about past returns, specifically, that the average return for 1951 to 2000 is above the expected return. And this inference does not rest solely on the information in price ratios. We buttress it with two types of novel evidence. (a) The perspective from our long sample period that, although the average stock return for 1951 to 2000 is much higher than expected return estimates from fundamentals, the two approaches produce similar estimates for 1872 to 1950. (b) Evidence from Sharpe ratios, the book-to-market ratio, and the income return on investment, which also suggests that the average return for 1951 to 2000 is above the expected value.

III. Estimating the Expected Stock Return: Issues

There are two open questions about our estimates of the expected stock return. (a) In recent years the propensity of firms to pay dividends declines and stock repurchases surge. How do these changes in dividend policy affect our estimates of the expected return? (b) Under rather general conditions, the dividend and earnings growth models (2) and (3) provide estimates of the expected stock return. Are the estimates biased and does the bias depend on the return horizon? This section addresses these issues.

A. Repurchases and the Declining Incidence of Dividend Payers

Share repurchases surge after 1983 (Bagwell and Shoven (1989) and Dunsby (1995)), and, after 1978, the fraction of firms that do not pay dividends steadily increases (Fama and French (2001)). More generally, dividends are a policy variable, and changes in policy can raise problems for estimates of the expected stock return from the dividend growth model. There is no problem in the long-term, as long as dividend policies stabilize and the dividend–price ratio resumes its mean-reversion, though perhaps to a new mean. (An Appendix, available on request, provides an example involving repurchases.) But there can be problems during transition periods. For example, if the fraction of firms that do not pay dividends steadily increases, the market dividend–price ratio is probably nonstationary; it is likely to decline over time, and the dividend growth model is likely to underestimate the expected stock return.

Fortunately, the earnings growth model is not subject to the problems posed by drift in dividend policy. The earnings growth model provides an estimate of the expected stock return when the earnings–price ratio is stationary. And as discussed earlier, the model provides an estimate of the average expected return during the sample period when there are permanent shifts in the expected value of Y_t/P_t, as long as the ratio mean-reverts within regimes.

The earnings growth model is not, however, clearly superior to the dividend growth model. The standard deviation of annual earnings growth rates for 1951 to 2000 (13.79 percent, versus 5.09 percent for dividends) is similar to that of capital gains (16.77 percent), so much of the precision advantage of using fundamentals to estimate the expected stock return is lost. We see next that the dividend growth model has an advantage over the earnings growth model and the average stock return if the goal is to estimate the long-term expected growth of wealth.

B. The Investment Horizon

The return concept in discrete time asset pricing models is a one-period simple return, and our empirical work focuses on the one-year return. But many, if not most, investors are concerned with long-term returns, that is, terminal wealth over a long holding period. Do the advantages and disadvantages of different expected return estimates depend on the return horizon? This section addresses this question.

B.1. The Expected Annual Simple Return

There is downward bias in the estimates of the expected annual simple return from the dividend and earnings growth models—the result of a variance effect. The expected value of the dividend growth estimate of the expected return, for example, is the expected value of the dividend yield plus the expected value of the annual simple dividend growth rate. The expected annual simple return is the expected value of the dividend yield plus the expected annual simple rate of capital gain. If the dividend–price ratio is stationary, the compound rate of capital gain converges to the compound dividend growth rate as the sample period increases. But because the dividend growth rate is less volatile than the rate of capital gain, the expected simple dividend growth rate is less than the expected simple rate of capital gain.

The standard deviation of the annual simple rate of capital gain for 1951 to 2000 is 3.29 times the standard deviation of the annual dividend growth rate (Table I). The resulting downward bias of the average dividend growth rate as an estimate of the expected annual simple rate of capital gain is roughly 1.28 percent per year (half the difference between the variances of the two growth rates). Corrected for this bias, the dividend growth estimate of the equity premium in the simple returns of 1951 to 2000 rises from 2.55 to 3.83 percent (Table IV), which is still far below the estimate from the average return, 7.43 percent. Since the earnings growth rate and the annual rate of capital gain have similar standard deviations for 1951 to 2000,

Table IV

Estimates of the Real Equity Premium in Simple Annual and Long-term Returns: 1951 to 2000

The inflation rate for year t is $Inf_t = L_t/L_{t-1}$, where L_t is the price level at the end of year t. The real return for year t on six-month (three-month for the year 2000) commercial paper (rolled over at midyear) is F_t. The nominal value of the S&P index at the end of year t is p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. Real rates of growth of dividends, earnings, and the stock price are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$, $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and $GP_t = (p_t/p_{t-1})*(L_{t-1}/L_t) - 1$. The real dividend yield is $D_t/P_{t-1} = (d_t/p_{t-1})*(L_{t-1}/L_t)$. The dividend growth estimate of the real S&P return for t is $RD_t = D_t/P_{t-1} + GD_t$, the earnings growth estimate is $RY_t = D_t/P_{t-1} + GY_t$, and R_t is the realized real S&P return. The dividend and earnings growth estimates of the real equity premium for year t are $RXD_t = RD_t - F_t$ and $RXY_t = RY_t - F_t$, and $RX_t = R_t - F_t$ is the real equity premium from the realized real return. The average values of the equity premium estimates are $A(RXD_t)$, $A(RXY_t)$, and $A(RX_t)$. The first column of the table shows unadjusted estimates of the annual simple equity premium. The second column shows bias-adjusted estimates of the annual premium. The bias adjustment is one-half the difference between the variance of the annual rate of capital gain and the variance of either the dividend growth rate or the earnings growth rate. The third column shows bias-adjusted estimates of the expected equity premium relevant if one is interested in the long-term growth rate of wealth. The bias adjustment is one-half the difference between the variance of the annual dividend growth rate and the variance of either the growth rate of earnings or the rate of capital gain. The equity premiums are expressed as percents.

		Bias-adjusted	
	Unadjusted	Annual	Long-term
$A(RXD_t)$	2.55	3.83	2.55
$A(RXY_t)$	4.32	4.78	3.50
$A(RX_t)$	7.43	7.43	6.16

13.79 percent and 16.77 percent (Table I), the bias of the earnings growth estimate of the expected return is smaller (0.46 percent). Corrected for bias, the estimate of the equity premium for 1951 to 2000 from the earnings growth model rises from 4.32 to 4.78 percent (Table IV), which again is far below the 7.43 percent estimate from the average return.

B.2. Long-term Expected Wealth

The (unadjusted) estimate of the expected annual simple return from the dividend growth model is probably the best choice if we are concerned with the long-term expected wealth generated by the market portfolio. The annual dividend growth rates of 1951 to 2000 are essentially unpredictable. If the dividend growth rate is serially uncorrelated, the expected value of the compounded dividend growth rate is the compounded expected simple growth rate:

$$E\left[\prod_{t=1}^{T}(1 + GD_t)\right] = [1 + E(GD)]^T. \tag{5}$$

And if the dividend–price ratio is stationary, for long horizons the expected compounded dividend growth rate is the expected compounded rate of capital gain:

$$E\left[\prod_{t=1}^{T}(1+GD_t)\right] = E\left[\prod_{t=1}^{T}(1+GP_t)\right]. \tag{6}$$

Thus, when the horizon T is long, compounding the true expected annual simple return from the dividend growth model produces an unbiased estimate of the expected long-term return:

$$[1+E(RD)]^T = E\left[\prod_{t=1}^{T}(1+R_t)\right]. \tag{7}$$

In contrast, if the dividend growth rate is unpredictable and the dividend–price ratio is stationary, part of the higher volatility of annual rates of capital gain is transitory, the result of a mean-reverting expected annual return (Cochrane (1994)). Thus, compounding even the true unconditional expected annual simple return, $E(R)$, yields an upward biased measure of the expected compounded return:

$$[1+E(R)]^T > E\left[\prod_{t=1}^{T}(1+R_t)\right]. \tag{8}$$

There is a similar problem in using the average (simple) earnings growth rate to estimate long-term expected wealth. The regressions in Table III suggest that the predictability of earnings growth for 1951 to 2000 is due to transitory variation in earnings. As a result, annual earnings growth is 2.71 times more volatile than dividend growth (Table I). The compound growth rate of earnings for 1951 to 2000, 1.89 percent, is 2.05 times the compound dividend growth rate, 0.92 percent. But because earnings are more volatile, the average simple growth rate of earnings, 2.82 percent, is 2.69 times the average simple growth rate of dividends, 1.05 percent. As a result, the average simple growth rate of earnings produces an upward biased estimate of the compound rate of growth of long-term expected wealth.

We can correct the bias by subtracting half the difference between the variance of earnings growth and the variance of dividend growth (0.82 percent) from the average earnings growth rate. The estimate of the expected rate of capital gain provided by this adjusted average growth rate of earnings is 2.00 percent per year. Using this adjusted average growth rate of earnings, the earnings growth estimate of the expected real stock return for 1951 to 2000 falls from 6.51 to 5.69 percent. The estimate of the equity premium falls from 4.32 to 3.50 percent (Table IV), which is closer to the 2.55 percent obtained when the average dividend growth rate is used to

estimate the expected rate of capital gain. Similarly, adjusting for the effects of transitory return volatility causes the estimate of the equity premium from realized stock returns to fall from 7.43 to 6.16 percent, which is still far above the bias-adjusted estimate of the earnings growth model (3.50 percent) and the estimate from the dividend growth model (2.55 percent).

Finally, we only have estimates of the expected growth rates of dividends and earnings and the expected rate of capital gain. Compounding estimates rather than true expected values adds upward bias to measures of expected long-term wealth (Blume (1974)). The bias increases with the imprecision of the estimates. This is another reason to favor the more precise estimate of the expected stock return from the dividend growth model over the earnings growth estimate or the estimate from the average stock return.

IV. Conclusions

There is a burgeoning literature on the equity premium. Our main additions are on two fronts. (a) A long (1872 to 2000) perspective on the competing estimates of the unconditional expected stock return from fundamentals (the dividend and earnings growth models) and the average stock return. (b) Evidence (estimates of precision, Sharpe ratios, and the behavior of the book-to-market ratio and the income return on investment) that allows us to choose between the expected return estimates from the two approaches.

Specifically, the dividend growth model and the realized average return produce similar real equity premium estimates for 1872 to 1950, 4.17 percent and 4.40 percent. For the half-century from 1951 to 2000, however, the equity premium estimates from the dividend and earnings growth models, 2.55 percent and 4.32 percent, are far below the estimate from the average return, 7.43 percent.

We argue that the dividend and earnings growth estimates of the equity premium for 1951 to 2000 are closer to the true expected value. This conclusion is based on three results.

(a) The estimates from fundamentals, especially the estimate from the dividend growth model, are more precise; they have lower standard errors than the estimate from the average return.

(b) The appealing message from the dividend and earnings growth models is that aggregate risk aversion (as measured by the Sharpe ratio for the equity premium) is on average roughly similar for the 1872 to 1949 and 1950 to 1999 periods. In contrast, the Sharpe ratio for the equity premium from the average return just about doubles from the 1872 to 1950 period to the 1951 to 2000 period.

(c) Most important, the average stock return for 1951 to 2000 is much greater than the average income return on book equity. Taken at face value, this says that investment during the period is on average unprofitable (its expected return is less than the cost of capital). In contrast, the lower estimates of the expected stock return from the dividend and earnings growth models are less than the income return on investment, so the message is

that investment is on average profitable. This is more consistent with book-to-market ratios that are rather consistently less than one during the period.

If the average stock return for 1951 to 2000 exceeds the expected return, stocks experience unexpected capital gains. What is the source of the gains? Growth rates of dividends and earnings are largely unpredictable, so there is no basis for extrapolating unusually high long-term future growth. This leaves a decline in the expected stock return as the prime source of the unexpected capital gain. In other words, the high return for 1951 to 2000 seems to be the result of low expected future returns.

Many papers suggest that the decline in the expected stock return is in part permanent, the result of (a) wider equity market participation by individuals and institutions, and (b) lower costs of obtaining diversified equity portfolios from mutual funds (Diamond (1999), Heaton and Lucas (1999), and Siegel (1999)). But there is also evidence that the expected stock return is slowly mean reverting (Fama and French (1989) and Cochrane (1994)). Moreover, there are two schools of thought on how to explain the variation in expected returns. Some attribute it to rational variation in response to macroeconomic factors (Fama and French (1989), Blanchard (1993), and Cochrane (1994)), while others judge that irrational swings in investor sentiment are the prime moving force (e.g., Shiller (1989)). Whatever the story for variation in the expected return, and whether it is temporary or partly permanent, the message from the low end-of-sample dividend–price and earnings–price ratios is that we face a period of low (true) expected returns.

Our main concern, however, is the unconditional expected stock return, not the end-of-sample conditional expected value. Here there are some nuances. If we are interested in the unconditional expected annual simple return, the estimates for 1951 to 2000 from fundamentals are downward biased. The bias is rather large when the average growth rate of dividends is used to estimate the expected rate of capital gain, but it is small for the average growth rate of earnings. On the other hand, if we are interested in the long-term expected growth of wealth, the dividend growth model is probably best, and the average stock return and the earnings growth estimate of the expected return are upward biased. But our bottom line inference does not depend on whether one is interested in the expected annual simple return or long-term expected wealth. In either case, the bias-adjusted expected return estimates for 1951 to 2000 from fundamentals are a lot (more than 2.6 percent per year) lower than bias-adjusted estimates from realized returns. (See Table IV.) Based on this and other evidence, our main message is that the unconditional expected equity premium of the last 50 years is probably far below the realized premium.

REFERENCES

Bagwell, Laurie S., and John B. Shoven, 1989, Cash distributions to shareholders, *Journal of Economic Perspectives* 3, 129–149

Blanchard, Olivier J., 1993, Movements in the equity premium, *Brooking Papers on Economic Activity* 2, 75–138

Blume, Marshall, 1974, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69, 634–638.

Brown, Stephen J., William N. Goetzmann, and Stephen Ross, 1995, Survival, *Journal of Finance* 50, 853–873.

Campbell, John Y., 1991, A variance decomposition for stock returns, *Economic Journal* 101, 157–179.

Campbell, John Y., and Robert J. Shiller, 1989, The dividend price ratio and expectations of future dividends and discount factors, *Review of Financial Studies* 1, 195–228.

Campbell, John Y., and Robert J. Shiller, 1998, Valuation ratios and the long-run stock market outlook, *Journal of Portfolio Management* 24, 11–26.

Claus, James, and Jacob Thomas, 2001, Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets, *Journal of Finance* 56, 1629–1666.

Cochrane, John, 1991, Volatility tests and efficient markets: A review essay, *Journal of Monetary Economics* 27, 463–487.

Cochrane, John H., 1994, Permanent and transitory components of GNP and stock prices, *Quarterly Journal of Economics* 109, 241–265.

Davis, James L., Eugene F. Fama, and Kenneth R. French, 2000, Characteristics, covariances, and average returns, *Journal of Finance* 55, 389–406.

Diamond, Peter A., 1999, What stock market returns to expect for the future? Center of Retirement Research at Boston College, September, Number 2.

Dunsby, Adam, 1995, *Share Repurchases, Dividends, and Corporate Distribution Policy* (Ph.D. thesis, The Wharton School, University of Pennsylvania).

Fama, Eugene F., and Kenneth R. French, 1988, Dividend yields and expected stock returns, *Journal of Financial Economics* 22, 3–25.

Fama, Eugene F., and Kenneth R. French, 1989, Business conditions and expected returns on stocks and bonds, *Journal of Financial Economics* 25, 23–49.

Fama, Eugene F., and Kenneth R. French, 2001, Disappearing dividends, Changing firm characteristics or lower propensity to pay, *Journal of Financial Economics* 60, 3–43.

Gebhardt, William R., Charles M. C. Lee, and Bhaskaram Swaminathan, 2001, Toward an implied cost of capital, *Journal of Accounting Research* 39, June, 135–176.

Gordon, Myron, 1962, *The Investment Financing and Valuation of the Corporation* (Irwin, Homewood, IL).

Heaton, John, and Deborah Lucas, 1999, Stock prices and fundamentals, in Ben Bernanke and Julio Rotemberg, eds., *Macroeconomics Annual 1999* (National Bureau of Economic Research, MIT Press, Cambridge, MA).

Keane, Michael P., and David E. Runkle, 1998, Are financial analysts' forecasts of corporate profits rational? *Journal of Political Economy* 106, 768–805.

Lamont, Owen, 1998, Earnings and expected returns, *Journal of Finance* 53, 1563–1587.

Lettau, Martin, and Sydney Ludvigson, 2001, Consumption, aggregate wealth, and expected stock returns, *Journal of Finance* 56, 815–849.

Mehra, Rajnish, and Edward Prescott, 1985, The equity premium. A puzzle, *Journal of Monetary Economics* 15, 145–161.

Shiller, Robert, 1989, *Market Volatility* (MIT Press, Cambridge, MA).

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management* 26, 10–17.

Vuolteenaho, Tuomo, 2000, Understanding the aggregate book-to-market ratio, Manuscript, University of Chicago.

Attachment to 15

_ A. Post-IPO Drop in Firm Profitability.pdf

Entrepreneurial Learning, the IPO Decision, and the Post-IPO Drop in Firm Profitability

Ľuboš Pástor

Lucian Taylor

Pietro Veronesi*

December 15, 2006

Abstract

We develop a model in which an entrepreneur learns about the average profitability of a private firm before deciding whether to take the firm public. In this decision, the entrepreneur trades off diversification benefits of going public against benefits of private control. The model predicts that firm profitability should decline after the IPO, on average, and that this decline should be larger for firms with more volatile profitability and firms with less uncertain average profitability. These predictions are supported empirically in a sample of 7,183 IPOs in the U.S. between 1975 and 2004.

---

*All authors are at the Graduate School of Business, University of Chicago. Pástor and Veronesi are also affiliated with the CEPR and NBER. We thank Ray Ball, Doug Diamond, Michael Halling (discussant), John Heaton, Gene Kandel, Peter Kondor, and the audiences at the University of Chicago and the Vienna Symposia in Asset Management for helpful comments.

1. Introduction

The decision to go public is one of the most important decisions made by privately held firms. This decision can have various motives, such as to diversify the entrepreneur's holdings, to raise capital for investment, to exploit favorable market conditions, to facilitate acquisitions, to improve the liquidity of the firm's shares, to find the firm's market value, and to make the firm more visible. One complicating factor in the IPO decision is that the private firm's future cash flow is highly uncertain. This uncertainty makes it difficult for both the entrepreneur and the outside investors to value the private firm. We examine the effect of this uncertainty on the decision to go public and on firm profitability around the IPO.

We develop a model of the optimal IPO decision in the presence of learning about average profitability. In the model, the profitability of a private firm mean-reverts around an unknown mean and agents learn about this mean by observing realized profits. There are two types of risk-averse agents: investors, who are well diversified, and an entrepreneur, whose entire wealth is tied up in the private firm. The entrepreneur suffers from under-diversification but enjoys benefits of private control. If he takes his firm public, he forfeits the private benefits but achieves better diversification by investing the IPO proceeds in publicly-traded stocks and bonds. It is optimal for the entrepreneur to take his firm public when the market value of the firm (value to investors) exceeds the private value of the firm (value to the entrepreneur). We show that an IPO is more likely for firms with higher expected and current profitability, more volatile profitability, more uncertain average profitability, and lower benefits of private control.

In this model, it is optimal for an IPO to take place when the firm's expected future profitability is sufficiently high. The entrepreneur's benefits of private control are derived from assets in place rather than from future growth opportunities. The firm's private value is therefore less sensitive to expected future profitability than the firm's market value is. When expected profitability rises, the market value rises faster than the private value, and when expected profitability rises high enough, it becomes optimal for the firm to be owned publicly (by investors) rather than privately (by the entrepreneur).

The model predicts that firm profitability should drop after the IPO, on average, and that this drop should be larger for firms with more volatile profitability and firms with less uncertain average profitability. These predictions follow from the endogeneity of the IPO and from learning. For an IPO to take place, the agents' expected profitability must go up before the IPO, as explained in the previous paragraph. According to Bayes' rule, agents revise their expectations upward only if they observe realized profitability that is higher than

expected. As a result, realized profitability exceeds expected future profitability at the time of the IPO, and hence profitability is expected to drop after the IPO. The implications for volatility and uncertainty also follow from the basic properties of Bayesian updating. These results come through most clearly in the context of a toy model in Section 2.

To analyze the implications of our model, we calibrate the model and compute the expected post-IPO drop in profitability for a wide range of plausible parameter values, using a closed-form solution for this expected drop. We incorporate the endogeneity of the IPO by computing expectations conditional on an IPO being optimal. We also incorporate the endogeneity of the private firm's existence, recognizing that for some sets of parameter values it is not optimal for the entrepreneur to start the private firm in the first place. The results show that the basic intuition from the toy model applies to our richer model as well.

We test the model's predictions empirically in a sample of 7,183 IPOs in the U.S. between 1975 and 2004. Our evidence supports the model. Firm profitability, measured as return on equity (ROE), declines significantly after the IPO. The average decline in quarterly ROE is 2.7% after one year and 4.3% after three years. A post-IPO decline in profitability has already been reported by Degeorge and Zeckhauser (1993), Jain and Kini (1994), Mikkelson, Partch, and Shah (1997), and Pagano, Panetta, and Zingales (1998) but our sample is much larger.[1] More important, we also find that the post-IPO decline is larger for stocks with more volatile profitability and firms with less uncertain average profitability. These findings, which do not seem to appear in the literature, are consistent with our model.

While the volatility of profitability can be estimated directly from realized profits, uncertainty about average profitability is more difficult to measure. The common proxies for uncertainty also proxy for volatility. To separate uncertainty from volatility, we estimate the stock price reaction to earnings announcements, which should be stronger for firms with higher uncertainty and lower volatility. We find that firms with weaker price reactions tend to experience larger post-IPO drops in ROE, as predicted by the model.

The model also predicts that firm profitability increases before the IPO. We do not test this prediction due to the lack of pre-IPO data, but supporting evidence is provided by Degeorge and Zeckhauser (1993) who study 62 reverse LBOs that went public between 1983 and 1987. They find that profitability increases sharply before LBOs return to public ownership and decreases thereafter, consistent with our model.

[1] Degeorge and Zeckhauser (1993) analyze 62 reverse leveraged buyouts (LBOs) in 1983–1987, Jain and Kini (1994) study 682 IPOs in 1976–1988, Mikkelson, Partch, and Shah (1997) examine 283 IPOs in 1980–1983, and Pagano, Panetta, and Zingales (1998) investigate 69 Italian IPOs in 1982–1992.

Our model generates a rise and fall in profitability around the IPO without asymmetric information. In contrast, many IPO models assume that the entrepreneur has private information about her own firm (e.g., Chemmanur and Fulghieri, 1999). Asymmetric information may well explain some of the observed post-IPO declines in profitability, but it is not clear how it would generate higher declines for firms with more volatile profits and firms with less uncertain average profits. Another possible explanation for the profitability pattern is earnings management. Teoh, Welch and Wong (1998) argue that firms opportunistically inflate their earnings through discretionary accruals shortly before going public. However, firms that are willing to manipulate their earnings around the IPO are likely to manipulate them after the IPO as well. Such firms are likely to smooth their post-IPO earnings, given the apparent market preference for less volatile earnings.[2] Therefore, the earnings management hypothesis would seem to predict that the post-IPO decline in profitability should be larger for firms with less volatile post-IPO earnings, but we find the opposite result.[3]

The key motive for an IPO in our model is diversification. This motive is empirically important according to Bodnaruk, Kandel, Massa, and Simonov (2006), who study all Swedish IPOs in 1995–2001 and find that firms held by less diversified shareholders are more likely to go public. In the model of Benninga, Helmantel, and Sarig (2005), the IPO decision is also driven by the tradeoff between diversification benefits and private benefits, but there are important differences between their paper and ours. First, the models are different: in their model, there is no learning, the cash flow process is different (binomial with known up and down probabilities), and so are the agents' preferences. Second, Benninga et al do not examine post-IPO profitability, which is the subject of our analysis. Finally, their contribution is theoretical whereas ours is both theoretical and empirical.

This paper is also related to the theory of "rational IPO waves" of Pástor and Veronesi (2005). In their model, the entrepreneur observes time-varying market conditions before deciding when to go public. IPO waves arise because many entrepreneurs find it optimal to go public after market conditions improve (e.g., after the equity premium falls).[4] Unlike in that model, we hold market conditions constant, for simplicity, and focus instead on learning about the private firm itself. In our model, unlike in theirs, observing the private firm's profits allows the agents to learn about the firm's average future profitability. In their model, the IPO proceeds are invested in the firm to start production, whereas in our model,

[2]For example, Graham, Harvey and Rajgopal (2005) survey 401 financial executives and find that more than three quarters of them would give up economic value in exchange for smooth earnings.

[3]Ball and Shivakumar (2006) argue that the evidence of Teoh et al is unreliable and that IPO firms actually supply more conservative and higher-quality financial reports than other firms.

[4]Consistent with this argument, CFOs identify overall stock market conditions as "the single most important determinant of timing" of an IPO in Brau and Fawcett's (2006) survey.

they are invested in stocks and bonds for diversification reasons. Finally, while they focus on optimal IPO timing, we focus on the dynamics of profitability around the IPO.

The paper is organized as follows. Section 2. presents a toy model that illustrates how learning affects the post-IPO dynamics of profitability. Section 3. develops the full model. Section 4. analyzes the dynamics of profitability implied by the full model, with a focus on the expected post-IPO drop in profitability. Section 5. presents an empirical test of the main implications of the model. Section 6. concludes. All proofs are in the Appendix.

2. A Toy Model

In this section, we present a simple model that illustrates the effect of learning on the behavior of profitability after an IPO. There are two periods, 0 and 1, in which an entrepreneur decides whether to take his private firm public. This decision is made based on a cutoff rule: an IPO takes place if the firm's expected profitability exceeds a given cutoff. (This type of rule is shown to be optimal in the full model in Section 3.) Let $\underline{\rho}$ denote the cutoff, which is known, and $\overline{\rho}$ denote the firm's average profitability, which is unknown.

At time 0, the entrepreneur's prior beliefs about $\overline{\rho}$ are given by the normal distribution,

$$\overline{\rho} \sim N\left(\widehat{\rho}_0, \widehat{\sigma}_0^2\right). \tag{1}$$

At time 1, the entrepreneur observes a signal about average profitability $\overline{\rho}$, namely realized profitability ρ, whose distribution conditional on $\overline{\rho}$ is given by

$$\rho \sim N\left(\overline{\rho}, \sigma_\rho^2\right). \tag{2}$$

Result 1. Firm profitability is expected to fall after an IPO at time 1.

To prove this result, we first compute the entrepreneur's posterior beliefs after observing the signal. Using Bayes' rule, the posterior distribution of $\overline{\rho}$ is given by

$$\overline{\rho} \mid \rho \sim N\left(\widehat{\rho}, \widehat{\sigma}^2\right), \tag{3}$$

where

$$\widehat{\rho} = w_0\widehat{\rho}_0 + (1 - w_0)\rho \tag{4}$$

$$w_0 = \frac{1/\widehat{\sigma}_0^2}{1/\widehat{\sigma}_0^2 + 1/\sigma_\rho^2}. \tag{5}$$

An IPO takes place at time 1 if expected profitability exceeds the cutoff $\underline{\rho}$:

$$\widehat{\rho} > \underline{\rho}\,. \tag{6}$$

Since the IPO takes place at time 1, there is no IPO at time 0, so that

$$\widehat{\rho}_0 < \underline{\rho} \,. \tag{7}$$

Combining equations (6) and (7), we have $\widehat{\rho} > \widehat{\rho}_0$. It then follows from equation (4) that

$$\rho > \widehat{\rho} \,. \tag{8}$$

In words, for an IPO to take place at time 1, realized profitability ρ must exceed expected future profitability $\widehat{\rho}$. As a result, the post-IPO profitability is expected to be lower than ρ. At time 0, the expected post-IPO drop in profitability is $\mathrm{E}_0(\rho - \widehat{\rho} \mid \text{IPO at time 1}) > 0$.

To simplify the algebraic exposition, add the assumption that $\widehat{\rho}_0 = 0$.

Result 2. The post-IPO drop in profitability is expected to be large when the volatility of profitability (σ_ρ) is high and when prior uncertainty about average profitability ($\widehat{\sigma}_0$) is low.

To prove this result, rewrite equation (4) as

$$\rho - \widehat{\rho} = w_0 \, (\rho - \widehat{\rho}_0) \,. \tag{9}$$

The assumption $\widehat{\rho}_0 = 0$ implies $\rho > 0$, so the expected percentage drop in profitability is

$$\mathrm{E}_0 \left(\frac{\rho - \widehat{\rho}}{\rho} \mid \text{IPO at time 1} \right) = w_0. \tag{10}$$

From equation (5), w_0 increases with σ_ρ and decreases with $\widehat{\sigma}_0$. As a result, the expected percentage drop in profitability after the IPO is high when profitability is highly volatile and when there is low uncertainty about average profitability.

The intuition behind both results is simple. For an IPO to take place at time 1, expected profitability must go up between times 0 and 1, so realized profitability at time 1 must exceed expected profitability to "pull it up" via Bayesian updating. Since realized profitability exceeds expected profitability at the IPO, profitability is expected to fall after the IPO (Result 1). If volatility is higher, realized profitability is a less precise signal, so it must rise by more to pull expected profitability above the IPO cutoff. Similarly, if uncertainty is lower, realized profitability must rise by more to overcome stronger prior beliefs. In both cases, the gap between realized and expected profitability widens, so the post-IPO drop in profitability is larger (Result 2). This intuition applies not only to the percentage drop but also to the absolute drop in profitability. Note that our arguments rely only on the endogeneity of the IPO decision (equation (6)), the endogeneity of the private firm's existence before the IPO (equation (7)), and Bayesian updating (equation (3)).

In the next section, we develop a richer model with more realistic dynamics for profitability and additional assumptions about agent preferences and investment opportunities. In that model, we show that a version of the IPO rule in equation (6) is optimal, with an endogenous cutoff $\underline{\rho}$ that depends on uncertainty and volatility. The endogeneity of $\underline{\rho}$ complicates the analysis, but we show that Results 1 and 2 hold also in the full model for plausible parameter values. For the reader's convenience, the full model uses some of the same notation as the toy model to denote the same concepts, but none of the above equations apply outside of Section 2.

3. The Full Model

We consider an economy with two types of agents, investors and an entrepreneur. The agents can invest in two assets, risky public equity ("stocks") and a risk-free bond ("bonds"). A third asset, risky private equity, can be created by the entrepreneur at time 0.

At time 0, investors are endowed with a large amount of stocks and bonds. The entrepreneur is endowed with a patent-protected technology and the initial wealth W_0. To produce a stream of profits, the technology requires an initial lump-sum investment of $B_0 = W_0$. The entrepreneur has three choices at time 0: start a private firm that implements the technology, sell the patent, or discard the patent. If the entrepreneur chooses to start a firm, he invests his wealth in the technology and begins producing. He also acquires an option to take the firm public at a future time τ, $0 < \tau < T$. We assume that τ is exogenously given, for simplicity, and that this is the only time when an IPO can take place. If the entrepreneur chooses to go public at time τ, he sells the firm to investors for its fair market value.[5] The entrepreneur's decisions at times 0 and τ are irreversible.

The firm owning the patent-protected technology uses capital B_t to produce earnings at the rate Y_t. The firm's profitability $\rho_t = Y_t/B_t$ follows the mean-reverting process

$$d\rho_t = \phi\left(\overline{\rho} - \rho_t\right) dt + \sigma_{\rho,1} dX_{1,t} + \sigma_{\rho,2} dX_{2,t}, \quad 0 \leq t \leq T, \tag{11}$$

where $\overline{\rho}$ denotes average profitability, ϕ denotes the speed of mean reversion, and $X_{1,t}$ and $X_{2,t}$ are uncorrelated Brownian motions that capture systematic ($X_{1,t}$) and firm-specific ($X_{2,t}$) shocks to firm profitability.[6] The firm reinvests all of its earnings. The patent expires at time T, at which point the firm's market value equals the book value, $M_T = B_T$.[7]

[5] In reality, the entrepreneur often retains a substantial part of equity after an IPO. Assuming that the entrepreneur sells the whole firm simplifies both the calculations and the exposition. We believe that none of our qualitative results would change if we allowed the entrepreneur to retain some equity.

[6] Empirically, firm profitability is mean-reverting, e.g., Beaver (1970) and Fama and French (2000).

[7] See Pástor and Veronesi (2003) for a more detailed justification of the terminal value assumption.

Both the entrepreneur and investors are fully rational utility-maximizing agents. Investor preferences are characterized by a pricing kernel π_t, which follows the stochastic process

$$\frac{d\pi_t}{\pi_t} = -rdt - \sigma_{\pi,1} dX_1, \tag{12}$$

where r is the risk-free rate and dX_1 is perfectly correlated with the return on public equity. The entrepreneur's preferences at time t are given by

$$\max \; E_t \left[\int_t^T e^{-\beta(u-t)} \frac{c_u^{1-\gamma}}{1-\gamma} du + \eta e^{-\beta(T-t)} \frac{W_T^{1-\gamma}}{1-\gamma} \right] \tag{13}$$

where c_u denotes consumption, $\gamma > 1$ is the local curvature of the utility function, β is the intertemporal discount, η is a constant, and W_T is the entrepreneur's terminal wealth. For simplicity, we assume that the entrepreneur retires at time T (when the patent expires).

As long as the entrepreneur owns the private firm, he consumes benefits of private control. These benefits include any costs saved by a firm that is not publicly traded (e.g., the costs of separating ownership from control, reporting costs, administrative costs, auditing costs, etc.) as well as benefits commonly referred to as private benefits of control (e.g., Dyck and Zingales, 2004). We distinguish benefits of private control from private benefits of control because the latter benefits can be consumed not only by entrepreneurs but also by managers of publicly traded firms. There are no benefits of private control if the firm is owned by (disperse) investors. For simplicity, we assume that the consumption flow from benefits of private control is proportional to the size of the firm as measured by assets in place,

$$c_t = \alpha B_t, \tag{14}$$

and that the entrepreneur consumes nothing else while managing the private firm. The entrepreneur cannot alter this consumption path by borrowing or lending.[8]

There is no asymmetric information. Average profitability $\overline{\rho}$ in equation (11) is unknown to all agents, investors and entrepreneurs alike. All other parameters are known. Agent beliefs about $\overline{\rho}$ at time $t = 0$ are represented by the normal prior distribution,

$$\overline{\rho} \sim N\left(\widehat{\rho}_0, \widehat{\sigma}_0^2\right). \tag{15}$$

All agents observe realized profitability ρ_t as well as π_t and they update their beliefs about $\overline{\rho}$ dynamically following Bayes' rule.

Under the assumptions detailed above, we solve for the following:

[8] Allowing limited borrowing and lending would not alter our basic intuition (and hence the conclusions) but it would significantly complicate the calculations.

(a) The dynamics of the agents' beliefs about $\overline{\rho}$ (Section 3.1.)

(b) The value of the firm to investors (Section 3.2.)

(c) The value of the firm to the entrepreneur (Section 3.3.)

(d) The conditions under which the entrepreneur finds it optimal to take the firm public at time τ (Section 3.4.)

(e) The conditions under which the entrepreneur finds it optimal to start a private firm at time 0 (Section 3.5.)

(f) The dynamics of firm profitability after the IPO (Section 4.)

3.1. Learning

Following standard results on Bayesian updating in continuous time, the agents' posterior beliefs about average profitability $\overline{\rho}$ at time t are summarized by the normal distribution,

$$\overline{\rho} \sim N\left(\widehat{\rho}_t, \widehat{\sigma}_t^2\right), \tag{16}$$

where the posterior mean and variance evolve over time according to

$$d\widehat{\rho}_t = \widehat{\sigma}_t^2 \frac{\phi}{\sigma_{\rho,2}} d\widehat{X}_{2,t} \tag{17}$$

$$\widehat{\sigma}_t^2 = \frac{1}{\frac{1}{\widehat{\sigma}_0^2} + \left(\frac{\phi}{\sigma_{\rho,2}}\right)^2 t}, \tag{18}$$

and $d\widehat{X}_{2,t}$ is a Brownian motion defined as the normalized expectation error of the idiosyncratic shock. See Lemma 1 of Pástor and Veronesi (2003).

3.2. Value of the Firm to Investors ("Market Value")

The outside investors value the firm as the present value of the terminal payoff B_T. Given the investors' preferences, the market value of the firm at any time t is given by $M_t = E_t\left[\pi_T B_T\right]/\pi_t$, where π_t follows the process in equation (12) and B_t follows the process

$$dB_t = \rho_t B_t dt. \tag{19}$$

Our assumptions allow us to obtain a closed-form solution for the firm's market value:

$$M_t = B_t \, e^{Q_0(T-t)+Q_1(T-t)\rho_t+Q_2(T-t)\widehat{\rho}_t+\frac{1}{2}Q_2(T-t)^2\widehat{\sigma}_t^2}, \tag{20}$$

where the functions of time $Q_0(s)$, $Q_1(s)$, $Q_2(s)$, and $Q_3(s)$ are given in the Appendix. This result corresponds to Proposition 2 of Pástor and Veronesi (2003). At this point, the overlap with Pástor and Veronesi (2003) ends.

3.3. Value of the Firm to the Entrepreneur

At time τ, the entrepreneur must decide whether to take his private firm public. This decision is made by comparing two utility values:

1. The utility resulting from selling the firm in an IPO at time τ and investing the proceeds in stocks and bonds until time T
2. The utility resulting from owning the firm between times τ and T

We compute the two utility values in Sections 3.3.1. and 3.3.2., respectively.

3.3.1. Utility Value of Selling the Firm in an IPO

If the entrepreneur sells the firm at time τ, he receives the fair market value M_τ given in equation (20) and invests M_τ in publicly-traded stocks and bonds. To compute the utility value of selling the firm, we first compute the utility value of any generic amount of wealth W_t under the assumption that this wealth is invested in stocks and bonds. This task is made simple by the fact that we have complete markets, in which the stock and bond investment opportunities are captured by the state price density π_t in equation (12). Cox and Huang (1989) show that the dynamic maximization problem of an agent deciding between consumption and investment at time t can be written in a static form as

$$\max_{c,W_T} E_t\left[\int_t^T e^{-\beta(u-t)}\frac{c_u^{1-\gamma}}{1-\gamma}du + \eta e^{-\beta(T-t)}\frac{W_T^{1-\gamma}}{1-\gamma}\right]$$

subject to the static budget constraint

$$E_t\left[\int_t^T \frac{\pi_u}{\pi_t}c_u du + \frac{\pi_T}{\pi_t}W_T\right] \leq W_t.$$

The optimal consumption stream and final wealth are given by

$$c_u = \left(\frac{\pi_u}{\pi_t}\right)^{-\frac{1}{\gamma}}\lambda^{-\frac{1}{\gamma}}e^{-\frac{\beta}{\gamma}(u-t)} \qquad \text{and} \qquad W_T = \left(\frac{\pi_T}{\pi_t}\right)^{-\frac{1}{\gamma}}\lambda^{-\frac{1}{\gamma}}\eta^{\frac{1}{\gamma}}e^{-\frac{\beta}{\gamma}(T-t)},$$

where λ is the constant Lagrange multiplier from the maximization problem. The resulting value function for the intertemporal utility is given in the following proposition.

Proposition 1: Let W_t denote the entrepreneur's financial wealth, which can be allocated to stocks or bonds in any proportions. The value function from optimal investment is

$$\begin{aligned} V(W_t,t) &= \max E_t\left[\int_t^T e^{-\beta(u-t)}\frac{c_u^{1-\gamma}}{1-\gamma}du + \eta e^{-\beta(T-t)}\frac{W_T^{1-\gamma}}{1-\gamma}|W_t\right] \\ &= \frac{W_t^{1-\gamma}}{1-\gamma}\left(\frac{\left(1+\eta^{\frac{1}{\gamma}}\frac{1-\gamma}{\gamma}\left(r-\frac{\beta}{1-\gamma}+\frac{1}{2}\frac{1}{\gamma}\sigma_{\pi,1}^2\right)\right)e^{\frac{1-\gamma}{\gamma}\left(r-\frac{\beta}{1-\gamma}+\frac{1}{2}\frac{1}{\gamma}\sigma_{\pi,1}^2\right)(T-t)}-1}{\frac{1-\gamma}{\gamma}\left(r-\frac{\beta}{1-\gamma}+\frac{1}{2}\frac{1}{\gamma}\sigma_{\pi,1}^2\right)}\right)^{\gamma} \end{aligned} \quad (21)$$

Thus, selling the firm at time τ gives the entrepreneur utility equal to $V(M_\tau,\tau)$.

3.3.2. Utility Value of Keeping the Firm Private

If the entrepreneur decides not to go public at time τ, he will continue consuming benefits of private control and his final wealth will be equal to B_T. Thus, according to equations (13) and (14), his utility is given by

$$V^O(B_\tau, \tau) = E_\tau \left[\int_\tau^T e^{-\beta(u-\tau)} \frac{(\alpha B_u)^{1-\gamma}}{1-\gamma} du + \eta e^{-\beta(T-\tau)} \frac{B_T^{1-\gamma}}{1-\gamma} \right].$$

This utility is characterized explicitly in the following proposition.

Proposition 2: The utility from owning the firm from time τ to time T is given by

$$V^O(B_\tau, \tau) = \frac{B_\tau^{1-\gamma}}{1-\gamma} \left\{ \alpha^{1-\gamma} \int_\tau^T Z^O\left(\rho_\tau, \widehat{\rho}_\tau, \widehat{\sigma}_\tau^2; u-\tau\right) du + \eta Z^O\left(\rho_\tau, \widehat{\rho}_\tau, \widehat{\sigma}_\tau^2; T-\tau\right) \right\}, \quad (22)$$

where the function Z^O is given in the Appendix.

3.4. The IPO Decision

The IPO decision reflects the tradeoff between diversification benefits of going public and benefits of private control. The entrepreneur will sell the firm at time τ if the utility from investing the IPO proceeds in stocks and bonds is higher than the utility from continuing to run the firm and consume private benefits. The entrepreneur will go public if and only if

$$V(M_\tau, \tau) > V^O(B_\tau, \tau), \quad (23)$$

where $V(M_\tau, \tau)$ is given in Proposition 1 and $V^O(B_\tau, \tau)$ is given in Proposition 2. Let

$$P_\tau = V^{-1}\left(V^O(B_\tau, \tau), \tau\right) \quad (24)$$

define the firm's "private value" at time τ. (The entrepreneur is indifferent between owning the private firm and having P_τ dollars optimally invested in stocks and bonds.) We can then restate condition (23) as $M_\tau > P_\tau$. That is, an IPO takes place if and only if the firm's market value exceeds the private value.

Proposition 3: An IPO takes place at time τ if and only if

$$f(T-\tau, \widehat{\sigma}_\tau, \sigma_\rho) < \alpha^{1-\gamma} \int_\tau^T \widehat{Z}(\rho_\tau, \widehat{\rho}_\tau, \widehat{\sigma}_\tau, \sigma_\rho; u-\tau; T)\, du, \quad (25)$$

where $f(T-\tau, \widehat{\sigma}_\tau, \sigma_\rho)$ and $\widehat{Z}(\rho_\tau, \widehat{\rho}_\tau, \widehat{\sigma}_\tau, \sigma_\rho; u-\tau; T)$ are functions given in the Appendix. Note that f is decreasing in both $\widehat{\sigma}_\tau$ and $\sigma_{\rho,2}$, $\widehat{Z}$ is increasing in both ρ_τ and $\widehat{\rho}_\tau$, and $\widehat{Z} > 0$.

Corollary 1: An IPO at time τ is more likely when

(a) benefits of private control, α, are lower

(b) uncertainty about average profitability, $\widehat{\sigma}_\tau$, is higher

(c) the idiosyncratic component of the volatility of profitability, $\sigma_{\rho,2}$, is higher

(d) current and/or expected profitability, ρ_τ and $\widehat{\rho}_\tau$, are higher

Part (a) follows immediately from the fact that private benefits can be consumed by the entrepreneur but not by the disperse group of investors. Mathematically, the right-hand side of (25) decreases with α but the left-hand side does not depend on α.

The intuition behind parts (b) and (c) is also simple. If the firm is privately owned, higher uncertainty $\widehat{\sigma}_\tau$ or idiosyncratic volatility $\sigma_{\rho,2}$ make the entrepreneur's future consumption more volatile. The risk-averse entrepreneur dislikes this volatility because he is not diversified (formally, V^O is decreasing in both $\widehat{\sigma}_\tau$ and $\sigma_{\rho,2}$), and the only way he can diversify is by selling the firm in an IPO. Since investors are well diversified, they are in a better position to bear the risk associated with the private firm's cash flow process. (The firm can be thought of as small relative to the investors' other holdings since π_t in equation (12) does not depend on $\widehat{\sigma}_\tau$ or $\sigma_{\rho,2}$.) In fact, if the firm is publicly owned, its market value in equation (20) increases with both uncertainty and idiosyncratic volatility, due to the convexity effect discussed in Pástor and Veronesi (2003, 2006). In short, parts (b) and (c) follow because the entrepreneur dislikes uncertainty and idiosyncratic volatility but investors don't.

For most plausible parameter values, part (c) holds not only for idiosyncratic volatility $\sigma_{\rho,2}$ but also for total volatility $\sigma_\rho\sigma_\rho' = \sigma_{\rho,1}^2 + \sigma_{\rho,2}^2$. When $\sigma_{\rho,2}$ increases, the left-hand side of (23) increases while the right-hand side decreases, making an IPO more likely. When $\sigma_{\rho,1}$ increases, both sides of (23) tend to decrease because systematic volatility generally reduces market value. The right-hand side typically decreases by more, so an IPO is usually more likely also after $\sigma_{\rho,1}$ increases. Combining the effects of $\sigma_{\rho,1}$ and $\sigma_{\rho,2}$, we find for most parameter values that an IPO is more likely when total volatility $\sigma_\rho\sigma_\rho'$ is higher.

Although the right-hand side of (25) is always positive, the left-hand side becomes negative when uncertainty and/or volatility are sufficiently high. That is, for any α, there exist levels of uncertainty and volatility above which an IPO always takes place.

Part (d) follows from the fact that the right-hand side of (25) is increasing in both ρ_τ and $\widehat{\rho}_\tau$ (because $\partial\widehat{Z}/\partial\rho_\tau > 0$ and $\partial\widehat{Z}/\partial\widehat{\rho}_\tau > 0$) while the left-hand side is independent of both quantities. Put differently, the market value of the firm increases with ρ_τ and $\widehat{\rho}_\tau$ more rapidly than the private value does. The effect of expected future profitability, $\widehat{\rho}_\tau$, is

stronger and easier to explain. Recall from equation (14) that benefits of private control are derived from assets in place (B_t) rather than from future growth opportunities. The firm's private value is therefore less sensitive to $\widehat{\rho}_\tau$ than the firm's (more forward-looking) market value is. Increases in $\widehat{\rho}_\tau$ push up the private value (because B_t grows at the rate of ρ_t) but they push up the market value even more. Therefore, higher $\widehat{\rho}_\tau$ makes an IPO more likely: The entrepreneur becomes more willing to forego private benefits in exchange for financial wealth, because doing so moves him to a more valuable consumption path.

The new consumption path is more valuable in part because it is smoother over the entrepreneur's lifetime. When $\widehat{\rho}_\tau$ increases, the entrepreneur expects higher consumption in the future. He wants to smooth his consumption by consuming more today but he cannot; his consumption is given by private benefits in equation (14). If $\widehat{\rho}_\tau$ is sufficiently high, the entrepreneur's consumption path under private ownership becomes so unattractively steep that he finds it optimal to sell the firm. After cashing out in an IPO, the entrepreneur can smooth his consumption by trading stocks and bonds.

3.4.1. The Endogenous Cutoff Rule for an IPO

Next, we modify the condition in Proposition 3 to obtain an equivalent condition that resembles the cutoff rule in the toy model in Section 2. Define 'excess profitability' as $x_\tau = \rho_\tau - \widehat{\rho}_\tau$. The condition (25) can be restated in terms of x_τ as follows:

$$f\left(T-\tau,\widehat{\sigma}_\tau,\sigma_\rho\right) < h\left(x_\tau,\widehat{\rho}_\tau\right) \equiv \alpha^{1-\gamma}\int_\tau^T \overline{Z}\left(x_\tau,\widehat{\rho}_\tau,\widehat{\sigma}_\tau^2,u-\tau,T\right)du, \tag{26}$$

where $\overline{Z}\left(x_\tau,\widehat{\rho}_\tau,\widehat{\sigma}_\tau,\sigma_\rho,u-\tau,T\right)$ is a function similar to $\widehat{Z}$ (see Appendix). We show in the Appendix that $h\left(x_\tau,\widehat{\rho}_\tau\right)$ is monotonically increasing in x_τ and $\widehat{\rho}_\tau$. Assuming that $f\left(T-\tau,\widehat{\sigma}_\tau,\sigma_\rho\right)$ is sufficiently large, we can define the cutoff $\underline{\rho}\left(x_\tau;\widehat{\sigma}_\tau,\sigma_\rho\right)$ such that

$$h\left(x_\tau,\underline{\rho}\left(x_\tau;\widehat{\sigma}_\tau,\sigma_\rho\right)\right) = f\left(T-\tau,\widehat{\sigma}_\tau,\sigma_\rho\right).$$

If $f\left(T-\tau,\widehat{\sigma}_\tau,\sigma_\rho\right)$ is too low for such a cutoff to exist, we set $\underline{\rho}\left(x_\tau;\widehat{\sigma}_\tau,\sigma_\rho\right) = -\infty$.

Corollary 2: An IPO takes place at time τ if and only if

$$\widehat{\rho}_\tau > \underline{\rho}\left(x_\tau;\widehat{\sigma}_\tau,\sigma_\rho\right). \tag{27}$$

In words, an IPO takes place if expected profitability is sufficiently high. This rule is similar to the cutoff rule assumed in the toy model in Section 2. except that the cutoff $\underline{\rho}\left(x_\tau;\widehat{\sigma}_\tau,\sigma_\rho\right)$ here is endogenous: it depends on the model parameters including uncertainty and volatility, and it is also decreasing in x_τ. (If the current excess profitability x_τ is high, the expected

long-run profitability $\widehat{\rho}_\tau$ need not be as high for an IPO to occur.) The intuition behind Corollary 2 is the same as that behind Corollary 1(d). When $\widehat{\rho}_\tau$ rises, the market value rises faster than the private value because the former value is more sensitive to $\widehat{\rho}_\tau$. When $\widehat{\rho}_\tau$ rises sufficiently, it becomes optimal for the firm to be owned publicly rather than privately.[9]

In Section 4., we use Corollary 2 to compute the expected drop in profitability after an IPO, or $E_t\left[x_\tau|\widehat{\rho}_\tau > \underline{\rho}\left(x_\tau;\widehat{\sigma}_\tau,\sigma_\rho\right)\right]$. But first, we step back to time 0. Having characterized the optimal decision at time τ, we can solve for the optimal decision at time 0.

3.5. The Decision to Start a Private Firm

In this section, we solve for the conditions under which the entrepreneur finds it optimal to start a private firm at time 0. These conditions restrict the parameter space, allowing us to incorporate the endogeneity of the private firm's existence in the following section.

At time $t = 0$, the entrepreneur has three choices:

(A) Start a private firm. (Invest W_0 in the technology to start production, keep the firm.)
(B) Sell the patent to investors. (Invest W_0 in the technology to start production, sell it to investors for its fair market value M_0, invest M_0 in stocks and bonds.)
(C) Discard the patent. (Invest W_0 in stocks and bonds.)

The entrepreneur makes a utility-maximizing choice between (A), (B), and (C). Under choice (C), his expected utility is $V\left(B_0,0\right)$, where V is given in Proposition 1 (recall that $B_0 = W_0$). Under choice (B), his utility is $V\left(M_0,0\right)$, where M_0 comes from equation (20). Under choice (A), his expected utility, which we denote by $V_0^O\left(B_0,0\right)$, is given by

$$\begin{aligned} V_0^O\left(B_0,0\right) &= E_0\left[\int_0^T e^{-\beta t}\frac{c_t^{1-\gamma}}{1-\gamma}dt + \eta e^{-\beta T}\frac{W_T^{1-\gamma}}{1-\gamma}\right] \\ &= E_0\left[\int_0^\tau e^{-\beta t}\frac{(\alpha B_t)^{1-\gamma}}{1-\gamma}dt\right] + e^{-\beta\tau}E_0\left[V\left(M_\tau,\tau\right)|\widehat{\rho}_\tau > \underline{\rho}\right]\Pr\left(\widehat{\rho}_\tau > \underline{\rho}\right) \\ &\quad + e^{-\beta\tau}E_0\left[V^O\left(B_\tau,\tau\right)|\widehat{\rho}_\tau < \underline{\rho}\right]\Pr\left(\widehat{\rho}_\tau < \underline{\rho}\right), \end{aligned} \tag{28}$$

where "Pr" stands for "probability" as of time 0. There are three terms on the right-hand side. The first term reflects the benefits of private control that the entrepreneur consumes while running the firm between times 0 and τ. The second term is the present value of

[9] Ours is unlikely to be the only mechanism that can deliver a cutoff rule for an IPO. For example, consider a model a la Leland and Pyle (1977) in which an entrepreneur seeking IPO financing must signal high effort to outside investors. It seems plausible for high average profitability to serve as a signal of high effort, which could make an IPO optimal if average profitability exceeds a cutoff. Our primary interest is in the implications of the cutoff rule, however this rule is rationalized, for firm profitability around the IPO.

expected utility conditional on an IPO taking place at time τ, which happens if and only if $\widehat{\rho}_\tau > \underline{\rho}$ (see Corollary 2). Recall that in an IPO, the entrepreneur sells the firm to investors for M_τ and invests the proceeds in stocks and bonds. The third term is the utility obtained if no IPO takes place, in which case the entrepreneur remains non-diversified after time τ but continues enjoying private benefits until time T. The calculation of $V_0^O(B_0, 0)$ in equation (28) is challenging, but we have obtained a closed-form solution. Since the formula for $V_0^O(B_0, 0)$ takes up a full page of text, we relegate it to the Appendix.

The necessary and sufficient condition for (A) to be the optimal choice is

$$V_0^O(B_0, 0) > \max\{V(M_0, 0), V(B_0, 0)\}. \tag{29}$$

This is the condition that we impose in the calibration. Due to the complicated formula for $V_0^O(B_0, 0)$, this condition is not transparent. To gain more insight into the decision at time 0, we examine a simpler sufficient condition for (A) to be the optimal choice:

$$V^O(B_0, 0) > \max\{V(M_0, 0), V(B_0, 0)\}. \tag{30}$$

This condition is identical to condition (29) except that $V_0^O(B_0, 0)$ is replaced by $V^O(B_0, 0)$. The left-hand side of condition (30) is the entrepreneur's expected utility from running the private firm between times 0 and T. If the inequality (30) holds, then choice (A) is superior to both (B) and (C) even without taking into account the value of the entrepreneur's option to sell the firm at time τ. This option makes choice (A) more attractive, so that $V_0^O(B_0, 0) > V^O(B_0, 0)$, making condition (30) sufficient but not necessary. We do not use condition (30) for anything other than providing intuition through the following corollary.

Corollary 3: Condition (30) is more likely to be satisfied if

- (a) benefits of private control, α, are higher
- (b) uncertainty about average profitability, $\widehat{\sigma}_0$, is lower
- (c) the idiosyncratic component of the volatility of profitability, $\sigma_{\rho,2}$, is lower

The entrepreneur is more likely to start a private firm if benefits of private control are larger and if the cash flow stream is more stable. The intuition is similar to that behind Corollary 1. When private benefits increase, private value increases relative to market value because these benefits can be consumed by the entrepreneur but not by the outside investors. Private value also increases relative to market value when uncertainty and volatility decrease, because the entrepreneur is not diversified whereas the investors are. However, the negative effects of uncertainty and volatility are likely to be mitigated by the fact that uncertainty and volatility increase the value of the IPO option that is omitted from condition (30).

4. Profitability Dynamics Around an IPO

In this section, we analyze the evolution of profitability around an IPO. Without conditioning on an IPO, profitability ρ_t follows the simple mean-reverting process in equation (11) and expected profitability $\widehat{\rho}_t$ follows the martingale process in equation (17). Conditioning on an IPO changes the dynamics of ρ_t and $\widehat{\rho}_t$ in an interesting way, as we show below.

4.1. Endogeneity of an IPO

To analyze the profitability dynamics around an IPO, we simulate many paths of shocks from the model, and then we average the profitability paths across those simulations in which it is optimal for an IPO to take place. Such an approach produces the model-implied expected pattern in profitability while incorporating the endogeneity of the IPO decision.

Table 1 reports the baseline parameter values used in the simulations. The parameters for the profitability process ($\sigma_{\rho,1}$, $\sigma_{\rho,2}$, and ϕ) are taken from Pástor and Veronesi (2003) who estimate them from the return on equity data of all U.S. public firms in 1962–2000. We also choose the same risk-free rate $r = 0.03$ per year, the same pricing kernel volatility $\sigma_\pi = 0.6$, and the same horizon $T = 15$ years as Pástor and Veronesi. These authors report the grand median of profitability of 0.11 per year for public firms. For a typical private firm, the average profitability $\overline{\rho}$ should be lower than 0.11 because only private firms whose average profitability is perceived to be sufficiently high go public in the model. Therefore, we choose a lower prior mean of $\overline{\rho}$, $\widehat{\rho}_0 = 0.07$. We set the prior uncertainty equal to $\widehat{\sigma}_0 = 0.05$, so the two-standard-deviation prior bounds for $\overline{\rho}$ are -0.03 and 0.17 per year. We pick $\tau = 5$ years, which is close to the median age of IPO firms in the 1990s (Loughran and Ritter, 2004). We choose risk aversion $\gamma = 2$ and the subjective discount rate $\beta = 0.03$. We consider two values of initial profitability, $\rho_0 = \widehat{\rho}_0 = 0.07$ and $\rho_0 = 0$. The latter choice is motivated by the fact that private firms typically do not produce any profits when they are started. Measuring the benefits of private control is difficult. We choose $\alpha = 0.10$, a round number.[10] Later on, we analyze the sensitivity of our results to α and we also average across many plausible values of α when analyzing the expected post-IPO drop in profitability.

We conduct simulations as follows. First, we draw $\overline{\rho}$ from its prior distribution in equation (15). Starting from ρ_0, we simulate the realizations of ρ_t between times 0 and T by discretizing the process (11) and randomly drawing the Brownian shocks $dX_{1,t}$ and $dX_{2,t}$. Analogously, we simulate the realizations of the pricing kernel π_t from the process (12). Given the series of ρ_t and π_t, we compute the dynamics of the posterior beliefs from equa-

[10] Benninga et al (2005) use a range of private benefits centered on 10% of cash flow in their simulations.

tions (17) and (18). We then check whether the IPO condition (23) is satisfied at time τ. If it is, we keep the simulated path; otherwise we discard it. We repeat this procedure until we generate 10,000 simulated paths for which an IPO occurred at time τ.

Figure 1 plots the average paths of realized profitability (ρ_t; solid line) and expected profitability ($\widehat{\rho}_t$; dashed line), where the averages are computed across the 10,000 simulations in which an IPO takes place at time $\tau = 5$. Given the large number of simulations, these paths represent the expected patterns in ρ_t and $\widehat{\rho}_t$ conditional on an IPO. In Panel A, the initial profitability $\rho_0 = \widehat{\rho}_0$; in Panel B, $\rho_0 = 0$. In both panels, the figure shows that realized profitability ρ_t rises sharply before the IPO and declines after the IPO, on average. Expected profitability $\widehat{\rho}_t$ also rises before the IPO but it remains flat after the IPO.

To understand the pattern in expected profitability, $\widehat{\rho}_t$, recall from Corollary 2 that in order for an IPO to take place at time τ, $\widehat{\rho}_\tau$ must exceed a cutoff: $\widehat{\rho}_\tau > \underline{\rho}$. Ex ante, $\widehat{\rho}_t$ is a martingale (equation (17)), but the ex-post conditioning on $\widehat{\rho}_\tau > \underline{\rho}$ implies that $\widehat{\rho}_t$ is expected to increase before the IPO. Indeed, in Figure 1, $\widehat{\rho}_t$ rises from 0.07 to almost 0.09 between times 0 and τ. After the IPO, there is no more conditioning on an ex post event, so $\widehat{\rho}_t$ is constant in expectation due to its martingale property.

The pattern in realized profitability, ρ_t, is also intuitive. As discussed above, expected profitability $\widehat{\rho}_t$ increases before the IPO, on average. In a rational model of learning, an expectation is revised upward only if the realization is higher than expected. To cause upward revisions in $\widehat{\rho}_t$, realized profitability must rise faster than expected under its mean-reverting process. This is why ρ_t rises so sharply before the IPO.

Why does ρ_t typically fall after the IPO? We answer in two steps: first, we explain why it is likely that $\rho_\tau > \widehat{\rho}_\tau$, and second, why $\rho_\tau > \widehat{\rho}_\tau$ implies a post-IPO decline in ρ_t. First, as argued above, ρ_t must rise before the IPO to cause upward revisions in $\widehat{\rho}_t$ so that $\widehat{\rho}_\tau$ can exceed the IPO cutoff. When $\rho_0 = \widehat{\rho}_0$ (Panel A), realized profitability must rise above expected profitability in order to "pull it up" via Bayesian updating, making $\rho_\tau > \widehat{\rho}_\tau$ very likely. When $\rho_0 = 0$ (Panel B), ρ_t must rise faster than expected given its rate of mean reversion. Given the parameter values in Table 1, ρ_t rises so fast that it "catches up" with $\widehat{\rho}_t$ (i.e., $\rho_t = \widehat{\rho}_t$) before time τ. After that point, the only way for ρ_t to pull $\widehat{\rho}_t$ higher toward the cutoff is for ρ_t to rise above $\widehat{\rho}_t$. Again, $\rho_\tau > \widehat{\rho}_\tau$ seems likely. Second, $\rho_\tau > \widehat{\rho}_\tau$ means that ρ_τ exceeds its expected long-run mean, $\widehat{\rho}_\tau$, at the time of the IPO. Since $\widehat{\rho}_t$ has no expected drift after the IPO, $\rho_\tau > \widehat{\rho}_\tau$ implies that ρ_t is expected to fall after the IPO.

Note that the same basic pattern in ρ_t can obtain even in the absence of learning, simply

as a result of mean reversion in profitability and the endogeneity of the IPO decision.[11] The case of no learning is a special case of our framework in which average profitability $\overline{\rho}$ is a known constant, so that $\widehat{\rho}_t = \overline{\rho}$ and $\widehat{\sigma}_t = 0$ for all t. In that case, it is useful to restate the condition (26) in terms of ρ_τ. Since $h\left(x_\tau, \widehat{\rho}_\tau\right)$ is monotonically increasing in x_τ, there exists a cutoff $\underline{\underline{\rho}}\left(\overline{\rho}\right)$ such that an IPO takes place at time τ if and only if ρ_τ exceeds this cutoff:

$$\rho_\tau > \underline{\underline{\rho}}\left(\overline{\rho}\right). \tag{31}$$

For many plausible parameter values, this cutoff is larger than ρ_0, $\underline{\underline{\rho}} > \rho_0$, which implies that ρ_t must rise between times 0 and τ to exceed $\underline{\underline{\rho}}$. Whether ρ_t falls after the IPO is not clear but for many parameter values it does. If $\underline{\underline{\rho}} > \overline{\rho}$ then ρ_t is almost guaranteed to fall after the IPO in the long run because its value at the IPO exceeds its long-run mean: $\rho_\tau > \underline{\underline{\rho}} > \overline{\rho}$. Even if $\underline{\underline{\rho}}$ is smaller than $\overline{\rho}$ but not much smaller, ρ_t will fall after the IPO, on average.

Also note that if we average ρ_t and $\widehat{\rho}_t$ across the simulations in which no IPO takes place at time τ, the resulting patterns are opposite to those in Figure 1: $\widehat{\rho}_t$ falls before time τ and stays constant after time τ, on average, and ρ_t also falls before time τ but rises slowly after time τ, mean-reverting toward the higher value of $\widehat{\rho}_t$.

We also examine the sensitivity of the profitability pattern to changes in the baseline parameters from Table 1. We change one parameter at a time, rerun the simulations, compute averages across the simulations in which an IPO took place, and plot the resulting average paths of ρ_t in Figure 2. For comparison, the solid line plots the baseline case, already described in Figure 1. The dash-dot line plots ρ_t for a higher value of private benefits, $\alpha = 0.11$. The pattern in realized profitability is more pronounced than in the baseline case: a steeper pre-IPO increase in ρ_t is followed by a larger post-IPO decrease. As α increases, the private value of the firm increases but the market value does not, so the entrepreneur becomes less willing to sell the firm in an IPO (see Corollary 1). To induce the entrepreneur to sell, $\widehat{\rho}_t$ must rise by more than in the baseline case because it must exceed a higher hurdle in Corollary 2. A larger increase in $\widehat{\rho}_t$ can only be induced by a larger increase in ρ_t, hence ρ_t rises by more than in the baseline case. Given the basic properties of Bayesian updating, the pre-IPO increase in ρ_t must also be larger than the pre-IPO increase in $\widehat{\rho}_t$, so the post-IPO decline in ρ_t (toward its long-run mean $\widehat{\rho}_t$) is steeper.

The dotted line plots ρ_t for a lower value of prior uncertainty, $\widehat{\sigma}_0 = 0.04$. The post-IPO fall in ρ_t is slightly larger than in the baseline case. This result is driven by learning: when uncertainty is lower, prior beliefs about $\overline{\rho}$ are stronger, so ρ_t must rise higher relative to $\widehat{\rho}_t$ in

[11] Similar mean-reversion arguments have been proposed by Degeorge and Zeckhauser (1993) for reverse LBOs and by Li, Livdan, and Zhang (2006) for SEOs. Mean reversion does not have the same predictions as learning, e.g., it does not predict a larger post-IPO drop in ROE for firms with lower uncertainty.

order to pull $\widehat{\rho}_t$ above any given IPO cutoff. One complication is that this cutoff endogenously depends on uncertainty. Lower uncertainty makes private ownership more valuable to the entrepreneur (Corollary 1), which raises the IPO cutoff for $\widehat{\rho}_t$. The higher cutoff typically amplifies the post-IPO drop in profitability.[12]

The dashed line plots ρ_t for more volatile profitability, which we obtain by increasing both $\sigma_{\rho,1}$ and $\sigma_{\rho,2}$ to 0.065. The rise and fall in ρ_t are steeper than in the baseline case. The main reason for this result is learning: higher volatility makes ρ_t a less precise signal about $\overline{\rho}$, so ρ_t must rise higher relative to $\widehat{\rho}_t$ in order to pull $\widehat{\rho}_t$ above a given IPO cutoff. We also recognize that this cutoff endogenously depends on volatility. When $\sigma_{\rho,2}$ increases, the firm's private value is reduced relative to its market value, making an IPO more attractive, thus reducing the IPO cutoff. The cutoff also depends on $\sigma_{\rho,1}$, but this dependence is ambiguous. Overall, the dependence of the cutoff on volatility typically weakens the tent-shape pattern in ρ_t around the IPO. In subsequent analysis, we work with total volatility of profitability, in part because the empirical separation of $\sigma_{\rho,1}$ from $\sigma_{\rho,2}$ is difficult and in part because the theoretical effect of $\sigma_{\rho,1}$ on the IPO decision is ambiguous.

4.2. Endogeneity of the Private Firm's Existence

In Section 4.1., we analyze IPO profitability for plausible sets of parameter values. Some parameter sets are inadmissible, though, because the condition (29) is not satisfied, meaning that it is not optimal to start a private firm at time 0. For example, it is optimal to start the private firm for the parameters in Panels A of Figures 1 and 2, but not for the parameters in Panels B (where it is optimal to discard the patent at time 0). This consideration can affect the expected post-IPO drop in profitability. For example, Figure 2 shows that this drop is lower if private benefits are lower. However, if private benefits are too low, it is not optimal for the entrepreneur to start a private firm at time 0. Therefore, private firms characterized by very low benefits of private control do not exist, and the fact that the post-IPO drop would be low for such firms is nothing more than an intellectual curiosity.

In this section, we account for the endogeneity of the private firm's existence by averaging results across sets of parameters for which it is optimal to start a private firm at time 0. The quantity whose average we calculate is the expected post-IPO drop in profitability. We compute this expectation in closed form and analyze its dependence on the key parameters,

[12]Interestingly, uncertainty has an ambiguous effect on the long-run expectation of ρ_t, which is equal to $\mathrm{E}(\widehat{\rho}_\tau|\widehat{\rho}_\tau > \underline{\rho})$. On one hand, lower uncertainty raises the IPO cutoff $\underline{\rho}$, which pushes $\mathrm{E}(\widehat{\rho}_\tau|\widehat{\rho}_\tau > \underline{\rho})$ up. On the other hand, for any given cutoff, lower uncertainty pushes $\mathrm{E}(\widehat{\rho}_\tau|\widehat{\rho}_\tau > \underline{\rho})$ down due to basic properties of the truncated normal distribution (because the dispersion of $\widehat{\rho}_\tau$ is smaller). The relative importance of the two effects depends on the sensitivity of $\underline{\rho}$ to uncertainty. In Figure 2, the second effect prevails.

uncertainty and volatility. The expected post-IPO drop in profitability is given by

$$E_t\left[\rho_\tau - \widehat{\rho}_\tau | \text{IPO at } \tau\right] = E_t\left[x_\tau | \widehat{\rho}_\tau > \underline{\rho}\left(x_\tau; \widehat{\sigma}_\tau, \sigma_\rho\right)\right], \tag{32}$$

where $x_\tau = \rho_\tau - \widehat{\rho}_\tau$ and the IPO condition is from Corollary 2. Since x_t mean-reverts around zero, a positive expected value of x_τ implies that x_τ is expected to fall after the IPO, so that ρ_τ is expected to fall toward the expectation of its long-run mean, $\widehat{\rho}_\tau$. We do not focus on the expected percentage drop as in equation (10) because profitability can be negative.

Proposition 4: At time $t < \tau$, the expected post-IPO drop in profitability is given by

$$E_t\left[\rho_\tau - \widehat{\rho}_\tau | \text{IPO at } \tau\right] = \frac{e^{-\phi(\tau-t)}x_t - \int x_\tau \mathcal{N}\left(k\left(x_\tau, \tau; t, x_t, \widehat{\rho}_t, \widehat{\sigma}_t^2\right)\right)\Phi\left(x_\tau; \mu_x, \sigma_x^2\right) dx_\tau}{1 - \int \mathcal{N}\left(k\left(x_\tau, \tau; t, x_t, \widehat{\rho}_t, \widehat{\sigma}_t^2\right)\right)\Phi\left(x_\tau; \mu_x, \sigma_x^2\right) dx_\tau} \tag{33}$$

where $\mathcal{N}(.)$ is the cumulative density function of the standard normal distribution and $\Phi\left(.; \mu_x, \sigma_x^2\right)$ is the probability density function of the normal distribution with mean μ_x and variance σ_x^2. The formulas for $k(.)$, μ_x, and σ_x^2 are given in the Appendix.

Proposition 4 provides a closed-form expression for the expected post-IPO drop in profitability. The expected drop depends mostly on uncertainty, volatility, and $\tau - t$. Since this dependence is too complicated to be characterized analytically, we examine it by computing the expected drop as of time $t = 0$ for a wide range of parameter values. We vary uncertainty $\widehat{\sigma}_0$ from 0 to 10% per year, and both components of volatility, $\sigma_{\rho,1} = \sigma_{\rho,2}$, from 1% to 10% per year. We average the results across a range of values for benefits of private control, α, and the prior mean, $\widehat{\rho}_0$ (because these two parameters seem the hardest to choose a priori). We assume that α is uniformly distributed in $[5\%, 15\%]$ and $\widehat{\rho}_0$ is uniformly distributed in $[-20\%, 40\%]$. We take $\rho_0 = 0$ and the remaining parameters are from Table 1. For each set of parameters, we check whether the condition (29) is satisfied; if it is, we compute the expected post-IPO drop in profitability following Proposition 4 with $t = 0$ and $\tau = 5$. For each combination of uncertainty and volatility, we average the expected drops across all values of α and $\widehat{\rho}_0$ for which the condition (29) is satisfied. This calculation produces the expected drop that accounts not only for the endogeneity of the IPO decision but also for the endogeneity of the private firm's existence and for uncertainty about α and $\widehat{\rho}_0$.

Table 2 shows the results. Almost all entries in Panel A are positive, confirming that the expected post-IPO drop in profitability is generally positive. The expected drop can be as large as 23.5% per year, which obtains for $\widehat{\sigma}_0 = 2\%$ and $\sigma_{\rho,1} = \sigma_{\rho,2} = 10\%$. However, there exist parameter values for which the expected drop is zero or even slightly negative; when profitability exhibits very little volatility ($\sigma_{\rho,1} = \sigma_{\rho,2} = 1\%$), we expect profitability to increase after the IPO, although only by less than 1%. The reason is that when volatility is low, signals are precise, so learning is fast and $\widehat{\rho}_t$ rises rapidly toward the IPO cutoff.

Realized profitability ρ_t, which is initiated at $\rho_0 = 0$, may not "catch up" with $\widehat{\rho}_t$, in which case we have $\rho_\tau < \widehat{\rho}_\tau$ at time τ, after which we expect an increase in profitability.

Panel A also shows that the expected drop in profitability tends to be high when volatility is high and when uncertainty is low, as expected from Sections 2. and 4.1. The volatility pattern is stronger and it obtains even for $\widehat{\sigma}_0 = 0$ when the main force is mean reversion in profitability. Both effects are non-monotonic, though. For example, when volatility increases from 9% to 10%, the expected drop decreases in some cases, as it does when uncertainty drops below 2%. This non-monotonicity is largely due to the endogeneity of the private firm's creation at time 0. For example, when uncertainty is higher, a private firm is less likely to be created at time 0, at least according to the sufficient condition (Corollary 3). The firms that are created tend to compensate for the higher uncertainty with higher values of α, for which the drop is generally larger. This firm-selection effect contributes to the reversal of the basic pattern in Table 2 for the lowest values of $\widehat{\sigma}_0$. The firm-selection effect is complicated, in part because we do not have explicit comparative statics for the necessary and sufficient condition (29); we can only partially characterize the sufficient condition (Corollary 3). Panel A of Table 2 provides an imperfect but useful substitute for this intractable theoretical analysis. The basic patterns in the table confirm the implications of the toy model.

In addition to some sets of parameters being inadmissible due to failing the condition (29), other sets of parameters seem implausible because they imply unrealistic properties for the dynamics of the firm's market value. To analyze these properties, Panel B of Table 2 reports the average volatility of the firm's stock returns and Panel C reports the average expected excess return on the firm's stock. Both averages are computed as in Panel A, across all admissible values of α and $\widehat{\rho}_0$, conditional on an IPO at time τ and also on the creation of a private firm at time 0. Note that the expected excess return, which is given by $Q_1(T-t)\sigma_{\rho,1}\sigma_\pi$, does not depend on uncertainty. Panels B and C show that many combinations of volatility and uncertainty in which volatility exceeds 3% produce reasonable properties for stock returns, with return volatility ranging from 14% to 45% per year and the expected excess return ranging from 5.9% to 14.8% per year. However, lower values of the volatility of profitability seem implausible. For example, for $\sigma_{\rho,1} = \sigma_{\rho,2} = 1\%$, return volatility ranges from only 3.5% to 6.6% and the expected excess return is only 1.5%. These values seem unrealistically low, suggesting that profitability must be more volatile than $\sigma_{\rho,1} = \sigma_{\rho,2} = 1\%$ per year. Since the expected drop in Panel A is non-positive only for the lowest values of the volatility of profitability, this additional return-based evidence strengthens the conclusion that the expected drop is positive in this model.

Table 3 is a counterpart of Table 2 with $\tau = 5$ replaced by $\tau = 7$.[13] The results are quite similar to those in Table 2. Although the expected drop is generally smaller than in Table 2, it is overwhelmingly positive. The only exceptions occur for the smallest values of the volatility of profitability, which seem implausible because they produce stock returns whose volatility is less than 10% per year and whose mean is less than 3% in excess of the risk-free rate. Although there are some non-monotonicities due to the private-firm selection at time 0, the expected drop generally increases with volatility and decreases with uncertainty.

5. Empirical Analysis

In this section we test the main predictions of our model: Firm profitability drops after the IPO on average, and this decline is larger for firms with more volatile profitability and lower uncertainty about average profitability.

5.1. Data

Our data sources include CRSP, Compustat, IBES, SDC, and Jay Ritter's IPO database. Our sample contains 7,183 firms that had IPOs in the U.S. from 1975–2004. We include an IPO firm in the sample if it meets all of the following criteria: (1) it appears in either Jay Ritter's 1975-1984 IPO database or in SDC's U.S. Public Common Stock New Issues database with an offer date between 1/1/1985 and 12/31/2004; (2) it had a firm-commitment IPO; (3) it is not a closed-end fund, trust, unit, ADR, ADS, or REIT; and (4) the IPO's offer price was at least one dollar per share.

Guided by the model, we measure profitability as earnings scaled by the book value of equity, or return on equity (ROE). $ROE_{i,s}$ is computed for firm i in the fiscal quarter that is s quarters after the IPO. The dependent variable in our tests is $ROE_{i,s} - ROE_{i,0}$, the change in ROE over the first s quarters after firm i's IPO. ROE equals income before extraordinary items available for common stock plus deferred taxes, divided by book equity. We calculate earnings using quarterly Compustat data, and book value using both quarterly and annual Compustat data. Further details on the construction of $ROE_{i,s}$ are in the Appendix.

We estimate the volatility of ROE by the standard deviation of quarterly ROE over a five-year period after the IPO. Specifically, $VOL(i; s_0)$, or $VOL(s_0)$ for short, is the standard deviation of $ROE_{i,s}$ in quarters $s = s_0, ..., s_0 + 19$, assuming that at least 12 observations are available. We use two values of s_0. The natural choice is $s_0 = 0$ because $VOL(0)$ uses data as

[13] In the full sample of Loughran and Ritter (2004), the median firm age at the IPO is 7 years.

close to the IPO as possible. Under this choice, some of the earnings data used to compute $VOL(0)$ are also used to compute the dependent variable, $ROE_{i,s} - ROE_{i,0}$. Although there is no obvious bias, firms with large post-IPO increases or decreases in ROE are likely to have large values of $VOL(0)$. To address this concern, we also use $s_0 = s + 1$. There is no overlap between the earnings data used to calculate $VOL(s+1)$ and $ROE_{i,s} - ROE_{i,0}$.

5.2. Separating Uncertainty from Volatility

To test the model's prediction regarding uncertainty, we need a proxy. Commonly used proxies for uncertainty such as firm age, size, return volatility, or analyst coverage are inadequate here because they proxy not only for uncertainty but also for the volatility of profitability, which has an opposite theoretical effect on the post-IPO drop in profitability. In general, firms with high uncertainty also tend to have high volatility, which presents an estimation challenge. However, we have found an empirical proxy whose value should be high when uncertainty is high and when volatility is low: the stock price reaction to post-IPO earnings announcements. In fact, we can link this proxy directly to our model.

Corollary 4: If the model's assumptions hold and, in addition, $\sigma_{\rho,1} = 0$, then

$$dR_t - E_t\left[dR_t\right] = M\left(\sigma_{\rho,2}, \widehat{\sigma}_0^2; \phi, t\right)\left(d\rho_t - E_t\left[d\rho_t\right]\right), \tag{34}$$

where

$$M\left(\sigma_{\rho,2}, \widehat{\sigma}_0^2; \phi, t\right) = Q_1\left(T-t\right) + Q_2\left(T-t\right)\phi\frac{\widehat{\sigma}_t^2}{\sigma_{\rho,2}^2}. \tag{35}$$

The quantity M represents the stock price reaction to earnings surprises. M is positive (i.e., earnings surprises and the associated abnormal returns have the same sign), increasing in uncertainty ($\widehat{\sigma}_t$), and decreasing in volatility ($\sigma_{\rho,2}$). The intuition is clear. Realized earnings are a noisy signal about average future profitability. Upon observing a given signal, investors update their beliefs about the firm value more when they are more uncertain and when the signal is less noisy (i.e., when earnings are less volatile).

Our model predicts that firms with higher values of M have smaller post-IPO drops in profitability, because such firms have higher uncertainty, lower volatility, or both (holding ϕ and t constant). Once we control for profit volatility, the regression of $ROE_{i,s} - ROE_{i,0}$ on M_i can be interpreted as a test of the model's prediction regarding uncertainty. The theoretical motivation for M is only approximate because Corollary 4 requires $\sigma_{\rho.1} = 0$. This assumption is unrealistic but its violation need not impair the usefulness of M by much because we estimate M in short periods around firm-level earnings announcements, during

which firm-specific earnings news is likely to be the main driver of unexpected stock returns. While we are aware that M is not a perfect proxy, we find it satisfactory to use an empirical proxy that is directly motivated by the theoretical model being tested.

We estimate M_i for each IPO firm i based on earnings announcement data. On the left-hand side of equation (34), we interpret $dR_t - E_t[dR_t]$ as the abnormal return due to an earnings announcement. We measure this quantity by AR_{it}, the cumulative return of stock i in excess of stock i's industry's return starting one trading day before the firm's t-th post-IPO earnings announcement and ending one trading day after the same announcement. Quarterly earnings announcement dates are from IBES. Daily stock returns are from CRSP, and daily returns of 49 value-weighted industry portfolios are from Ken French's website. On the right-hand side of equation (34), we interpret $d\rho_t - E_t[d\rho_t]$ as unexpected quarterly profitability, which we compute as $(EPS_{it} - \mathrm{E}[EPS_{it}])/BE_{it}$. EPS_{it} denotes the quarterly earnings per share of firm i announced in its t-th post-IPO earnings announcement, from the IBES unadjusted actuals file. $\mathrm{E}[EPS_{it}]$ is the mean of all analyst forecasts of EPS_{it} using IBES's last pre-announcement set of forecasts for the given fiscal quarter. BE_{it} is book equity per share of firm i, using the most recent pre-announcement measurement.

To estimate M_i, we compute two measures, $ERC_1(i)$ and $ERC_2(i)$, which we refer to as the "earnings response" coefficients, or ERCs. First, we compute

$$RC_{it} = \frac{AR_{it}}{(EPS_{it} - \mathrm{E}[EPS_{it}])/BE_{it}}, \tag{36}$$

excluding observations where the denominator equals zero. From equation (34), RC_{it} is a proxy for M_i. Since RC_{it} is quite noisy (especially if the denominator is close to zero), we winsorize the highest 5% and lowest 5% of RC_{it} observations, and we also average the quarterly RC_{it}'s over the first three years after the IPO to increase precision:

$$ERC_1(i) = \frac{1}{13}\sum_{t=0}^{12} RC_{it}. \tag{37}$$

We compute $ERC_1(i)$ only if there are at least six valid observations of RC_{it}. To define $ERC_2(i)$, consider the following regression over the five-year period after the IPO:

$$(EPS_{it} - \mathrm{E}[EPS_{it}])/BE_{it} = \gamma_{i0} + \gamma_{i1} AR_{it} + \varepsilon_{it}, \qquad t = 0, 1, ..., 20. \tag{38}$$

According to equation (34), $\gamma_{i1} = 1/M_i$ but we do not measure M_i as $1/\hat{\gamma}_{i1}$ because $\hat{\gamma}_{i1}$ can be close to zero, producing outliers in $1/\hat{\gamma}_{i1}$. Instead, we define

$$ERC_2(i) = -\hat{\gamma}_{i1}, \tag{39}$$

with a minus sign so that large earnings responses are associated with large values of ERC_2. Unlike ERC_1, ERC_2 is not a direct estimate of M, but it preserves the same cross-sectional ranking. We make earnings surprises the dependent variable in equation (38) to mitigate the attenuation bias, since we believe there is more measurement error in earnings surprises than in abnormal returns. Since equation (34) indicates $\gamma_{i0} = 0$, we estimate the regressions in (38) without the intercept. We require at least 10 observations to estimate these regressions. Before running the regressions, we winsorize the highest and lowest 5% values of both AR_{it} and $(EPS_{it} - \mathrm{E}[EPS_{it}])/BE_{it}$ across all firms and quarters $t = 0, 1, ..., 32$. ERC_2 is similar to the earnings response coefficient of Easton and Zmijewski (1989) and others.

5.3. Summary Statistics

Table 4 reports some summary statistics. The three-year change in ROE, $ROE_{i,12} - ROE_{i,0}$, can be computed for 3,964 firms. The mean and median of $ROE_{i,12} - ROE_{i,0}$ are both negative, consistent with the model's prediction. In addition, $ROE_{i,12} - ROE_{i,0}$ is negatively correlated with the volatility of ROE and positively correlated with the ERCs. These correlations foreshadow our main empirical results.

Profitability in the quarter of the IPO, $ROE_{i,0}$, can be calculated for 5,795 of the 7,183 firms in our sample.[14] The median $ROE_{i,0}$ is 1.84% per quarter (or 7.4% per year), but the mean is only -0.79%, indicating a left-skewed distribution of ROE. This left skewness has been documented by Fama and French (2004) who attribute this pattern to small IPOs that are highly unprofitable. The low $ROE_{i,0}$ seems inconsistent with our model. In the model, the realized ROE typically exceeds expected long-run ROE at the IPO (this is why ROE declines after the IPO), so we would expect the ROE of IPOs to exceed the ROE of comparable non-IPO firms. Supporting evidence is provided by Jain and Kini (1994) who find that when firms go public, they are more profitable than the median firm in the same industry. To reconcile Jain and Kini's evidence with ours, note that their sample period is 1976–1988, which is roughly the first half of our sample (1975–2004). Fama and French (2004) show that IPO profitability declined in the 1990s. Indeed, in our sample, the medians of $ROE_{i,0}$ in three sub-periods, 1975–1984, 1985–1994, and 1995–2004, are 3.36%, 2.57%, and 0.40%, respectively (the corresponding means are 2.24%, 0.23%, and -2.83%). The low $ROE_{i,0}$ in Table 4 is thus driven by the most recent sub-period, which was unusual in many aspects. For example, in the late 1990s, firms went public at a younger age than ever before (Loughran and Ritter, 2004). It is not surprising that such young firms are less profitable than the more mature firms that went public in the earlier decades.

[14] In contrast, ROE for the quarter immediately preceding the IPO quarter can be computed for only 31 firms, so we cannot test the model's prediction that profitability increases shortly before the IPO.

Our model can be extended to accommodate the low $ROE_{i,0}$ in the 1990s. The model assumes that ROE mean-reverts around a constant mean $\overline{\rho}$, but in reality, this mean is likely to rise while the firm is very young. The start-up costs of a private firm often predictably exceed revenues, making ROE mean-revert around a negative mean $\overline{\rho}_t$ for t close to zero. Over time, $\overline{\rho}_t$ increases until it stabilizes as the firm matures. As long as the unknown value of $\overline{\rho}_t$ varies deterministically, our basic mechanism works also in this extended model. An IPO occurs if the perception of $\overline{\rho}_\tau$, $\widehat{\rho}_\tau$, is sufficiently high. To push $\widehat{\rho}_\tau$ up, realized profits must be higher than expected, which typically leads to $\rho_\tau > \widehat{\rho}_\tau$, which in turn induces a drop in ρ_t immediately after time τ. After the initial post-IPO decline, ρ_t either stabilizes or rises, depending on the extent to which $\overline{\rho}_t$ rises after time τ. When τ is low, $\widehat{\rho}_\tau$ is lower than in our model and it can even be negative. As a result, $\rho_\tau = ROE_{i,0}$ can also be negative, especially if τ (firm age at the IPO) is low, as it was in the late 1990s. To summarize, this realistic extension of our model, in which $\overline{\rho}_t$ increases while the private firm is very young, has the same basic implications while allowing $ROE_{i,0}$ to be low and even negative.

Back to Table 4, ERC_1 and ERC_2 can be computed for almost 40% of firms. (IBES coverage begins in 1982 and is poor for most of the 1980s.) The mean of ERC_1 shows that a 1% earnings surprise (scaled by book equity) is associated with a 3.13% abnormal stock return, on average. Theoretically, earnings surprises and stock returns should have the same sign, so ERC_1 should be positive and ERC_2 negative. However, ERC_1 is negative for 33% of firms, and ERC_2 is positive for 22% of firms. These unexpected signs are probably due to measurement error in expected earnings and non-earnings related news. The cross-sectional means of ERC_1 and ERC_2 do have the predicted signs and high statistical significance. Since ERC_1 and ERC_2 proxy for uncertainty divided by volatility, we expect them to be negatively correlated with the volatility of ROE, and they indeed are. However, ERC_1 and ERC_2 are almost uncorrelated with each other. This unexpected result is due to the observations of ERC_1 and ERC_2 that do not have the predicted signs (i.e., $ERC_1 < 0$ and $ERC_2 > 0$).[15] When these observations are excluded, the correlation increases. We define ERC_1^+ and ERC_2^- in the same way as ERC_1 and ERC_2, except we delete observations with $ERC_1 < 0$ and $ERC_2 > 0$, respectively. The correlation between ERC_1^+ and ERC_2^- is 0.3.

Figure 3 plots the change in ROE, $ROE_{i,s} - ROE_{i,0}$, in event time following the IPO. The top panel shows that average ROE drops steadily after the IPO, leveling off after about eight quarters. The median change in ROE, plotted in the middle panel, is also negative but

[15]Under the assumptions that deliver equation (34), ERC_1 and ERC_2 are approximate estimates of M and $-1/M$, respectively, so $ERC_2 \approx -1/ERC_1$. The function $f(x) = -1/x$ is monotonically increasing for $x > 0$ (which is the predicted sign of ERC_1), making x and $f(x)$ perfectly positively correlated, but the presence of negative values of x (i.e., values of ERC_1 with unpredicted signs) destroys this relation since we observe both branches of the hyperbola instead of just the branch with $x > 0$ and $f(x) < 0$.

smaller in magnitude than the mean change. The 75th percentile line shows that for more than a quarter of firms, ROE actually increases following the IPO. This is not inconsistent with the model, which makes predictions only about the average post-IPO change in ROE. The bottom panel shows the mean change in ROE in the sub-samples of firms that had IPOs in 1975–1984, 1985–1994, and 1995–2004. The patterns are remarkably similar across the three sub-samples, and they are also similar to the model-implied pattern in Figure 1.

Figure 4 compares the post-IPO average changes in ROE between firms with high and low values of volatility and the ERCs. We split all firms into two equally large sub-samples based on whether the firms' $VOL(0)$ is larger or smaller than the cross-sectional median of $VOL(0)$, and we do the same for ERC_1. (The results based on $VOL(13)$ and ERC_2 lead to the same conclusions.) We calculate each sub-sample's mean change in ROE at various horizons. We plot these changes in Panels A and B and we also plot their differences, along with 95% confidence intervals, in Panels C and D. Panels A and C show that mean profitability drops for both high- and low-$VOL(0)$ firms, the drop is significantly larger for firms with high $VOL(0)$, and the difference grows with the horizon. Similarly, Panels B and D show that mean profitability drops for both high- and low-ERC_1 firms, the drop is larger for low-ERC_1 firms, and the difference generally grows with the horizon. Both results are consistent with the model. However, since ERC_1 depends on both uncertainty and volatility, it is unclear which of the two variables drives the difference between the high- and low-ERC_1 firms. In the following section, we attempt to disentangle these effects by including both volatility and the ERCs in a multiple regression.

5.4. Regression Analysis

We estimate the following regression across all IPO firms with available data:

$$ROE_{i,s} - ROE_{i,0} = X_i\beta + \varepsilon_i, \tag{40}$$

where the vector X_i contains a constant and various combinations of our measures of ROE volatility and earnings response. We consider two horizons, $s = 4$ and $s = 12$ quarters. In each specification, we use as many observations as possible, so the sample is not necessarily the same across specifications. We estimate β by ordinary least squares and calculate its standard error by clustering the regression residuals in calendar time.[16]

Table 5 shows the results. First, we estimate the unconditional mean change in ROE over

[16]We allow non-zero correlations between the residuals of firms whose IPOs were $s/2$ or fewer quarters apart in calendar time. Specifically, we assume that $\mathrm{E}[\varepsilon_i\varepsilon_j]$ is equal to σ^2 for $i = j$ and to σ_t^2 for $i \neq j$, where t is the number of quarters between i and j's IPOs. For $t \leq s/2$, we estimate σ_t^2 from the relevant subset of the estimated OLS residuals; for $t > s/2$, we set $\sigma_t^2 = 0$.

the first 4 and 12 post-IPO quarters, respectively. The average value of $ROE_{i,4} - ROE_{i,0}$ is -2.68% per quarter ($t = -11.2$) and the average value of $ROE_{i,12} - ROE_{i,0}$ is -4.29% per quarter ($t = -16.2$). On average, firm profitability clearly drops after the IPO, consistent with the model and also with the earlier empirical studies.

Second, we test the model's prediction that ROE drops more for firms with more volatile ROE. Indeed, the slope coefficients on both $VOL(0)$ and $VOL(s+1)$ are negative and highly statistically significant, with t-statistics exceeding 7.4 in absolute value at both horizons. The relation is also economically significant: a one-standard-deviation cross-sectional increase in $VOL(0)$ is associated with a 1.74% per quarter larger four-quarter drop in ROE and a 5.01% per quarter larger twelve-quarter drop in ROE (not tabulated). The corresponding numbers for $VOL(s+1)$ are 1.48% and 1.88% per quarter, respectively.

Third, we test the prediction that ROE drops more for firms with smaller earnings response measures. Indeed, we observe positive slope coefficients on ERC_1 and ERC_2 in all four specifications (two horizons, two ERCs), and three of the four coefficients are statistically significant. A one-standard-deviation decrease in ERC_1 is associated with a 0.69% per quarter larger four-quarter drop in ROE and a 0.97% larger twelve-quarter drop in ROE. The corresponding numbers for ERC_2 are 0.20% and 0.58%, respectively.

Fourth, since firms with smaller ERC_1 and ERC_2 should have either lower uncertainty or higher volatility or both, we attempt to isolate the impact of uncertainty by including controls for volatility. In these multiple regressions, the slope coefficients on volatility remain negative and highly significant. The slope coefficients on ERC_1 and ERC_2 are positive in all eight specifications (two horizons, two ERCs, two volatility measures), but only three of these coefficients are statistically significant, and barely so. These results are consistent with the model's uncertainty prediction, but the evidence is not overwhelming.

The ERCs may contain substantial estimation error due to mismeasurement of investors' earnings expectations and to non-earnings-related news. This error is likely to affect especially the coefficient estimates that do not have the predicted signs (i.e., $ERC_1 < 0$ and $ERC_2 > 0$); in fact, this error is the most likely reason why these signs are opposite to what basic economics would predict. Therefore, we repeat the tests from Table 5 using ERC_1^+ and ERC_2^-, the ERCs that exclude observations that do not have the predicted signs.

Table 6 is an equivalent of Table 5 with ERC_1 and ERC_2 replaced by ERC_1^+ and ERC_2^-. First, consider the simple regressions of $ROE_{i,s} - ROE_{i,0}$ on either ERC_1^+ or ERC_2^-. The results show that ROE drops more for firms with smaller ERCs, and the evidence is even stronger than in Table 5: the slope coefficients on ERC_1^+ and ERC_2^- are significantly positive

in all four univariate specifications, with t-statistics ranging from 2.30 to 6.68. Second, consider the same regressions but control for the volatility of ROE. The slope coefficients on ERC_1^+ and ERC_2^- are positive in all specifications, and five of the eight coefficients are statistically significant. These results are stronger than in Table 5; for example, the t-statistic for ERC_2 in the last specification increases from 1.97 in Table 5 to 4.77 in Table 6.[17] This increase in significance suggests that the decrease in precision resulting from a smaller number of observations is more than offset by the increase in precision resulting from using the ERCs that contain less measurement error. These results support the model's prediction that the post-IPO drop in ROE should be larger for firms with less uncertainty.

We conduct additional robustness tests. First, it makes little difference whether we use the median instead of the mean of analyst forecasts when estimating $\mathrm{E}[EPS_{it}]$, or whether we require at least two forecasts to compute the mean. Second, changing the number of post-IPO quarters over which ERC_1 and ERC_2 are computed leads to similar results. The tradeoff is that as we use more quarters, the ERCs become less noisy but we also lose more observations and we need to assume that observations several years after the IPO are equally informative about uncertainty and volatility at the time of the IPO. Third, changing the horizon over which we measure the post-IPO drop in ROE to two years or four years does not change any of our conclusions. Fourth, we obtain very similar results when we free up the intercept in the regression (38) used to estimate ERC_2, and also when we redefine ERC_2 as the slope in the reverse regression of abnormal returns on earnings surprises. Fifth, in the regression used to calculate ERC_2, we include an additional regressor, the cumulative stock return starting one day after IBES records the analyst forecasts and ending two trading days before the earnings announcement. The idea is to soak up some of the news that comes out before the earnings announcement but after analysts form their forecasts (about two weeks earlier, on average). The resulting modification of ERC_2 enters our regressions with the same sign but slightly lower statistical significance than the original ERC_2. However, the modified ERC_2 has the predicted sign less often than the original ERC_2, so including the additional regressor seems to reduce rather than increase precision. Sixth, controlling for firm-level sample estimates of the mean reversion coefficient ϕ leads to exactly the same conclusions. Overall, our empirical evidence seems reasonably robust.

[17] We obtain similar results when we winsorize the ERCs with unpredicted signs at zero instead of eliminating them. The slope coefficients on the ERCs are significantly positive in all four univariate specifications, and they are also positive in all eight specifications that control for the volatility of ROE, with four of the eight coefficients being statistically significant.

6. Conclusions

This paper develops a model of the optimal IPO decision, analyzes the model's novel predictions, and tests these predictions empirically. In the model, two types of agents, well-diversified investors and an under-diversified entrepreneur, both learn about the average profitability of a private firm by observing realized profits. There is no asymmetric information. The entrepreneur making the IPO decision faces a tradeoff between benefits of private control and diversification benefits of going public. It is optimal for the entrepreneur to take his firm public if the firm's market value exceeds the firm's private value. We show that an IPO takes place if the agents learn that the firm's average profitability is sufficiently high. The model predicts that firm profitability should decline after the IPO, on average, and that this decline should be larger for firms with more volatile profitability and firms with less uncertain average profitability. We test these predictions empirically and find significant support for them in the data. High volatility and high uncertainty tend to go together, but we separate them by estimating the stock price reaction to earnings announcements, which should be strong when uncertainty is high and when volatility is low.

In the model, IPO firms cannot return to private ownership, but the model's logic seems relevant for the going private decision (e.g., Zingales, 1995, Benninga et al, 2005, Bharath and Dittmar, 2006). Reversing our arguments for going public, a firm is taken private if the benefits of private control exceed the diversification benefits of public ownership, which happens when the agents learn that average profitability is sufficiently low. Such an extension of our model would predict that firms tend to experience declines in profitability before going private and increases in profitability after going private. Consistent with the first prediction, Halpern et al (1999) find that stock returns before leveraged buyouts are unusually low. We leave this model extension as well as its empirical testing for future research.

There is no role for venture capitalists (VCs) in our simple model. It would be interesting to add VCs to the model and analyze their effect on the IPO decision. Lerner (1994) is an early empirical study on the effect of VCs on the IPO timing. A simpler way to extend the model is to relax the assumption that the time of the IPO decision is given. This extension can be solved numerically in a way analogous to solving for the optimal time to exercise an American option. (Pástor and Veronesi (2005) follow this route in a related framework in their analysis of IPO waves.) The key implications of the model are preserved in that (more complex) framework. The entrepreneur chooses to go public immediately after expected profitability exceeds a cutoff, which happens after unexpected increases in profitability. Profitability is expected to decline after the IPO due to the same effects of learning and mean reversion that we describe here. This extension also generates IPO waves

among firms in industries that recently became more profitable, as well as industry-wide post-wave declines in profitability. We do not pursue this extension formally because our focus is on learning whose implications come through also in the simpler model.

Our model assumes that the entrepreneur sells the entire private firm in an IPO. It would be interesting to extend the model to allow the entrepreneur to sell only a fraction of the firm. Such a model might allow one to solve for the optimal fraction to be sold in an IPO, and to relate this fraction to the firm's characteristics and to its post-IPO performance.

Although our model is designed for IPOs, it has some relevance for seasoned equity offerings (SEO) as well. If a shareholder owns a substantial fraction of a firm's shares, she faces a similar tradeoff as our entrepreneur: issuing equity makes the shareholder more diversified while reducing her control over the firm. Following the logic of the model, the shareholder may find it optimal to issue more equity after a sufficiently large improvement in profitability and, as a result, profitability should subsequently fall for the same reasons as in the model. Indeed, Loughran and Ritter (1997) find that firm profitability tends to increase before an SEO and decline thereafter, exactly as the model would imply. It would be interesting to test whether this pattern in profitability around SEOs is related to volatility, uncertainty, and to the fraction of equity held by the firm's largest shareholder.

Loughran and Ritter (1997) also argue that "The most salient feature concerning firms' equity issuance behavior is that most firms issue equity after large stock price increases." For example, Asquith and Mullins (1986) and Loughran and Ritter (1995) report that firms engaging in SEOs tend to exhibit high stock returns prior to the SEO. This empirical fact is also consistent with our model. In the model, an issue of equity is induced by recent unexpected increases in profitability, which should coincide with high stock returns. We cannot test this prediction on IPOs since pre-IPO stock returns are obviously unavailable, but the SEO evidence seems comforting. Also note that our model makes no unusual predictions regarding the post-issue stock returns, which are actively debated in the literature.[18] We have nothing to add to this debate. In our model, expected stock returns are not anomalous; they are determined by the covariances between returns and the stochastic discount factor. We analyze operating performance rather than stock performance.

[18]For example, Ritter (1991) and Loughran and Ritter (1995) show that stock returns of firms that recently went public are lower on average than returns of seasoned firms, while Brav and Gompers (1997) and Brav, Géczy, and Gompers (2000) argue that most IPOs are small growth stocks and such stocks have had low returns regardless of whether they recently went public. Degeorge and Zeckhauser (1993) find that after they go public, reverse LBOs actually have slightly higher stock returns than comparison firms.

Appendix.

Detailed Definitions of the Empirical Measures.

Profitability, ROE_{is}, equals $[I_{is} + DT_{is}]/BE_{is}$. The subscript s denotes the s-th fiscal quarter after the fiscal quarter of firm i's IPO. The fiscal quarter containing the IPO is quarter zero. I_{is} equals the income before extraordinary items available for common stock (Compustat quarterly item 25) for firm i in quarter s. DT_{is} equals deferred taxes from income account (Compustat quarterly item 35); we impute a zero value if this item is missing. BE_{is} is the book value of equity of firm i in quarter s. BE_{is} is calculated either from the previous fiscal quarter, previous fiscal year, current fiscal quarter, or current fiscal year, taken in that order depending on availability. Following Fama and French (1993), book value of equity equals stockholders' equity plus deferred taxes minus book value of preferred stock. If any of these three items is missing, then book value of equity is treated as missing. We treat negative or zero values of BE as missing. Stockholders' equity equals either "total stockholders' equity" (quarterly item 60, annual item 216), "total common equity" (quarterly item 59, annual item 60) + "carrying value of preferred stock" (quarterly item 55, annual item 130), "total assets" (quarterly item 44, annual item 6) - "total liabilities" (quarterly item 54, annual item 181), or missing, in that order depending on availability. Deferred taxes equals "deferred tax and investment tax credit" (quarterly item 52, annual item 35), or if that is missing, then zero. Annual book value of preferred stock equals either "redemption value of preferred stock" (annual item 56), "liquidating value of preferred stock" (annual item 10), "carrying value of preferred stock" (annual 130), or zero, in that order depending on availability. Quarterly book value of preferred stock equals "book value of preferred stock" (quarterly item 55), or zero if item 55 is missing. We eliminate firm-quarter observations where ROE_{is} is outside [-100%, +100%].

Abnormal stock return, AR_{it}, is the cumulative return of stock i in excess of stock i's industry, starting one day before the stock's t-th post-IPO earnings announcement and ending one day after the same announcement. Since the industry portfolios were constructed using Compustat SIC codes, we link firms to industries using the most recent annual Compustat SIC code (item 324), soonest future Compustat annual SIC code, most recent CRSP SIC code (SICCD), or soonest future CRSP SIC code, in that order depending on availability. Earnings announcement date is variable REPDATS from the IBES unadjusted actuals file.

Earnings per share, EPS_{it}, is the quarterly EPS of firm i announced in its t-th post-IPO earnings announcement (variable VALUE in the IBES unadjusted actuals file). $\mathrm{E}[EPS_{it}]$ is the mean of all analyst forecasts of EPS_{it} using IBES's last pre-announcement set of forecasts for the given fiscal quarter (variable MEANEST in the IBES unadjusted summary file). We eliminate observations for which the earnings announcement date is more than 60 days after the most recent set of earnings forecasts (roughly 1% of observations are eliminated).

Theoretical Results.

This appendix contains the formulas that we refer to in the text. The proofs of all propositions are contained in the Technical Appendix that is available on the authors' websites.

Market value: Let $\sigma_\pi = (\sigma_{\pi,1}, \sigma_{\pi,2})$ and $\sigma_\rho = (\sigma_{\rho,1}, \sigma_{\rho,2})$. In equation (20), we have

$$\begin{aligned} Q_0(s) &= -rs + \frac{\sigma_\rho \sigma_\rho'}{2\phi^2} Q_3(s) - \frac{\sigma_\pi \sigma_\rho'}{\phi} Q_2(s); \qquad Q_1(s) = \frac{1}{\phi}\left(1 - e^{-\phi s}\right) > 0; \\ Q_2(s) &= s - Q_1(s) > 0; \qquad Q_3(s) = s + \frac{1 - e^{-2\phi s}}{2\phi} - 2Q_1(s). \end{aligned}$$

Proposition 2: The utility from owning the firm from τ to T is given by (22), where

$$Z^O\left(\rho_t, \widehat{\rho}_t, \widehat{\sigma}_t^2; s\right) = e^{\overline{Q}_0(s) + (1-\gamma)Q_1(s)\rho_t + (1-\gamma)Q_2(s)\widehat{\rho}_t + \frac{1}{2}(1-\gamma)^2 Q_2(s)^2 \widehat{\sigma}_t^2} \tag{41}$$

in which $Q_i(.)$ are given above and $\overline{Q}_0(s) = -\beta s + (1-\gamma)^2 \frac{\sigma_\rho \sigma_\rho'}{2\phi^2} Q_3(s)$.

Proposition 3: An IPO takes place if and only if condition (25) is satisfied, where

$$f(T-\tau, \widehat{\sigma}_\tau, \sigma_\rho) = e^{(1-\gamma)\left(-\left(r - \frac{\beta}{1-\gamma}\right)(T-\tau) + \gamma \frac{\sigma_\rho \sigma_\rho'}{2\phi^2} Q_3(T-\tau) - \frac{\sigma_\pi \sigma_\rho'}{\phi} Q_2(T-\tau)\right) + \frac{1}{2}\gamma(1-\gamma)Q_2(T-\tau)^2 \widehat{\sigma}_\tau^2} g(T-\tau) - \eta$$

$$\widehat{Z}(\rho_\tau, \widehat{\rho}_\tau, \widehat{\sigma}_\tau; u-\tau; T) = e^{\widehat{Q}_0(u-\tau;T) + (1-\gamma)\widehat{Q}_1(u-\tau;T)\rho_\tau + (1-\gamma)\widehat{Q}_2(u-\tau;T)\widehat{\rho}_\tau + \frac{1}{2}(1-\gamma)^2 \widehat{Q}_3(u-\tau;T)\widehat{\sigma}_\tau^2}$$

Above,

$$g(T-t) = \left(\frac{\left(1 + \eta^{\frac{1}{\gamma}} \frac{1-\gamma}{\gamma}\left(r - \frac{\beta}{1-\gamma} + \frac{1}{2}\frac{1}{\gamma}\sigma_{\pi,1}^2\right)\right) e^{\frac{1-\gamma}{\gamma}\left(r - \frac{\beta}{1-\gamma} + \frac{1}{2}\frac{1}{\gamma}\sigma_{\pi,1}^2\right)(T-t)} - 1}{\frac{1-\gamma}{\gamma}\left(r - \frac{\beta}{1-\gamma} + \frac{1}{2}\frac{1}{\gamma}\sigma_{\pi,1}^2\right)} \right)^\gamma$$

and

$$\begin{aligned} \widehat{Q}_0(u-\tau;T) &= \overline{Q}_0(u-\tau) - \overline{Q}_0(T-\tau) \\ \widehat{Q}_1(u-\tau;T) &= Q_1(u-\tau) - Q_1(T-\tau) < 0 \\ \widehat{Q}_2(u-\tau;T) &= Q_2(u-\tau) - Q_2(T-\tau) < 0 \\ \widehat{Q}_3(u-\tau;T) &= Q_2(u-\tau)^2 - Q_2(T-\tau)^2 < 0 \end{aligned}$$

IPO decision: An IPO takes place if and only if condition (26) holds, where

$$\overline{Z}(x_\tau, \widehat{\rho}_\tau, \widehat{\sigma}_\tau, u-\tau, T) = e^{\widehat{Q}_0(u-\tau,T) + (1-\gamma)\left(\widehat{Q}_1(u-\tau,T)x_\tau + (u-T)\widehat{\rho}_\tau\right) + \frac{1}{2}(1-\gamma)^2 \widehat{Q}_3(u-\tau,T)\widehat{\sigma}_\tau^2}$$

Proposition 4: The expected drop in profitability is given in equation (33), where

$$k\left(x_\tau, \tau; t, x_t, \widehat{\rho}_t, \widehat{\sigma}_t^2\right) = \frac{\underline{\rho}(x_\tau) - \widehat{\rho}_t - a\left(t, \tau; \widehat{\sigma}_t^2\right)\left(x_\tau - e^{-\phi(\tau-t)}x_t\right)}{\sqrt{\left(\widehat{\sigma}_t^2 - \widehat{\sigma}_\tau^2\right)\left(1 - b\left(t, \tau; \widehat{\sigma}_t^2\right)^2\right)}} \tag{42}$$

$$\mu_x = e^{-\phi(\tau-t)}x_t; \qquad \sigma_x^2 = \frac{1-e^{2\phi(\tau-t)}}{2\phi}\left(\sigma_{\rho,1}^2+\sigma_{\rho,2}^2\right)+\left(e^{-2\phi(\tau-t)}\widehat{\sigma}_t^2-\widehat{\sigma}_\tau^2\right) \tag{43}$$

and $a\left(t,\tau;\widehat{\sigma}_t^2\right)$ and $b\left(t,\tau;\widehat{\sigma}_t^2\right)$ are given by

$$\begin{aligned} a\left(t,\tau;\widehat{\sigma}_t^2\right) &= \frac{\widehat{\sigma}_\tau^2-e^{-\phi(\tau-t)}\widehat{\sigma}_t^2}{\frac{1-e^{2\phi(\tau-t)}}{2\phi}\left(\sigma_{\rho,1}^2+\sigma_{\rho,2}^2\right)+\left(e^{-2\phi(\tau-t)}\widehat{\sigma}_t^2-\widehat{\sigma}_\tau^2\right)} \\ b\left(t,\tau;\widehat{\sigma}_t^2\right) &= \frac{\widehat{\sigma}_\tau^2-e^{-\phi(\tau-t)}\widehat{\sigma}_t^2}{\sqrt{\frac{1-e^{2\phi(\tau-t)}}{2\phi}\left(\sigma_{\rho,1}^2+\sigma_{\rho,2}^2\right)+\left(e^{-2\phi(\tau-t)}\widehat{\sigma}_t^2-\widehat{\sigma}_\tau^2\right)}\sqrt{\widehat{\sigma}_t^2-\widehat{\sigma}_\tau^2}} \end{aligned}$$

Proposition 5: The value function at time 0 is given in equation (28), where

$$\begin{aligned} V_0^O\left(B_0,0\right) &= \frac{B_0^{1-\gamma}}{1-\gamma}\times\left\{\alpha^{1-\gamma}\int_0^\tau Z^O\left(\rho_0,\widehat{\rho}_0,\widehat{\sigma}_\tau^2;u\right)du\right. \\ &+e^{-\beta\tau}\left[g\left(T-\tau\right)e^{G_0(\tau,T)+G_1(\tau,T)x_0+G_2(\tau,T)\widehat{\rho}_0}H^y\left(x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2,\tau,T\right)\right. \\ &+\int_\tau^T\alpha^{1-\gamma}e^{\overline{G}_0(\tau,u)+G_1(\tau,u)x_0+G_2(\tau,u)\widehat{\rho}_0}H^n\left(x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2,\tau,u\right)du \\ &\left.\left.+\eta e^{\overline{G}_0(\tau,T)+G_1(\tau,T)x_0+G_2(\tau,T)\widehat{\rho}_0}H^n\left(x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2,\tau,T\right)\right]\right\} \end{aligned}$$

where

$$\begin{aligned} H^y\left(x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2,\tau,u\right) &= \int e^{G_3(\tau,u)x_\tau}\left(1-\mathcal{N}\left(k_2\left(x_\tau,\tau,u;0,x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2\right)\right)\right)\Phi\left(x_\tau;\mu_x\left(x\right),\sigma_x^2\left(t,\tau\right)\right)dx \\ H^n\left(x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2,\tau,u\right) &= \int e^{G_3(\tau,u)x_\tau}\mathcal{N}\left(k_2\left(x_\tau,\tau,u;0,x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2\right)\right)\Phi\left(x_\tau;\mu_x\left(x\right),\sigma_x^2\left(t,\tau\right)\right)dx_\tau \end{aligned}$$

$$k_2\left(x_\tau,\tau,u;x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2\right)=k\left(x_\tau,\tau;0,x_0,\widehat{\rho}_0,\widehat{\sigma}_0^2\right)-\left(1-\gamma\right)a_2\left(\tau,u\right)\sqrt{\left(\widehat{\sigma}_0^2-\widehat{\sigma}_\tau^2\right)\left(1-b\left(0,\tau;\widehat{\sigma}_0^2\right)^2\right)}$$

and $G_i(\tau,u)$, $i=0,..,3$, $\overline{G}_0(\tau,u)$, and $a_2(\tau,u)$ are given in the Technical Appendix.

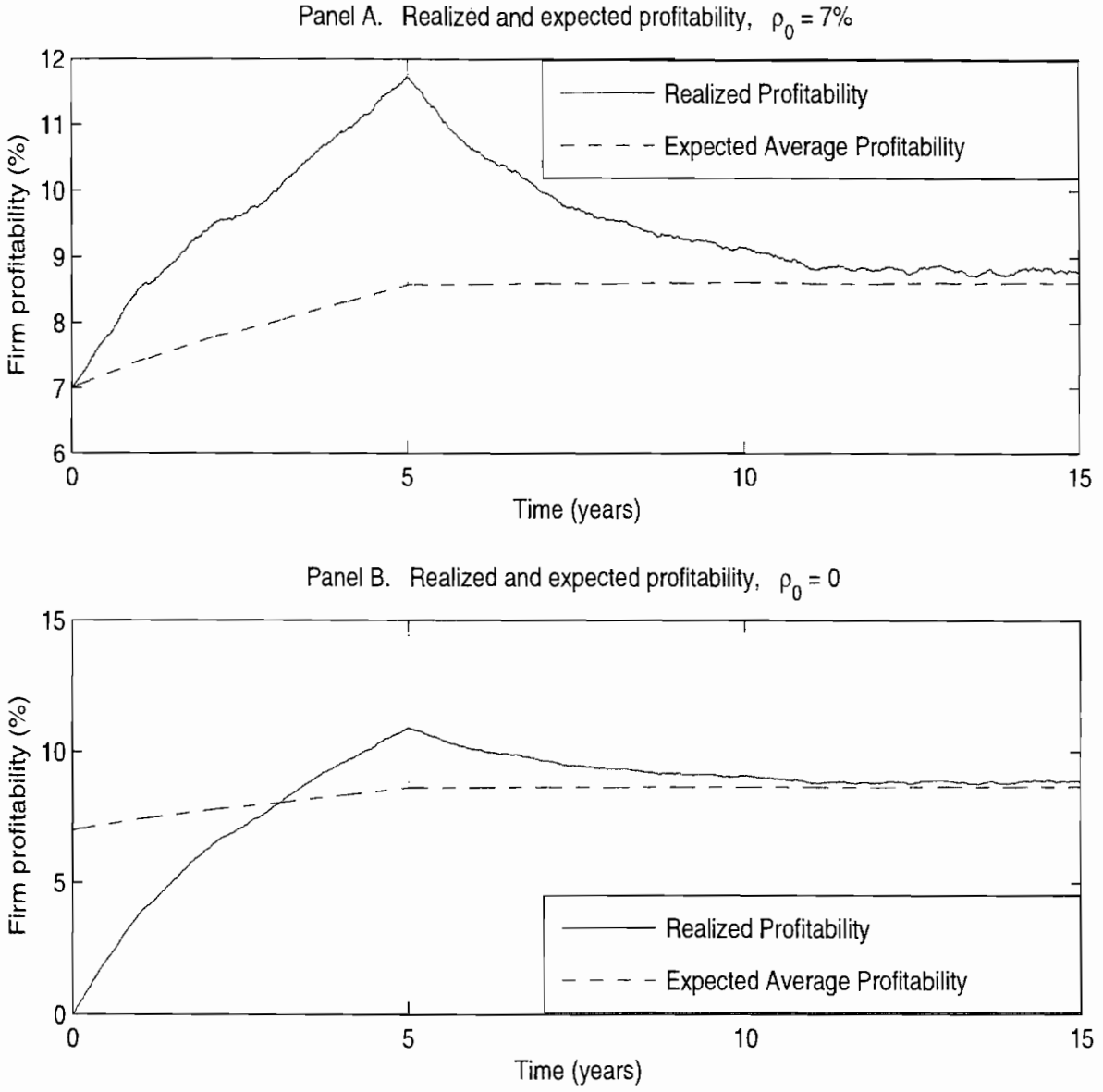

Figure 1. Model-Implied Expected and Realized Profitability Around an IPO. This figure plots the average paths of realized profitability (ρ_t; solid line) and expected average profitability ($\widehat{\rho}_t$; dashed line), in percent per year, where the paths are averaged across 10,000 simulations of our model in which an IPO takes place at time $\tau = 5$. Given the large number of simulations, these average paths represent expected patterns in ρ_t and $\widehat{\rho}_t$ conditional on an IPO. In Panel A, the initial profitability $\rho_0 = \widehat{\rho}_0 = 7\%$; in Panel B, $\rho_0 = 0$. The remaining model parameters are from Table 1.

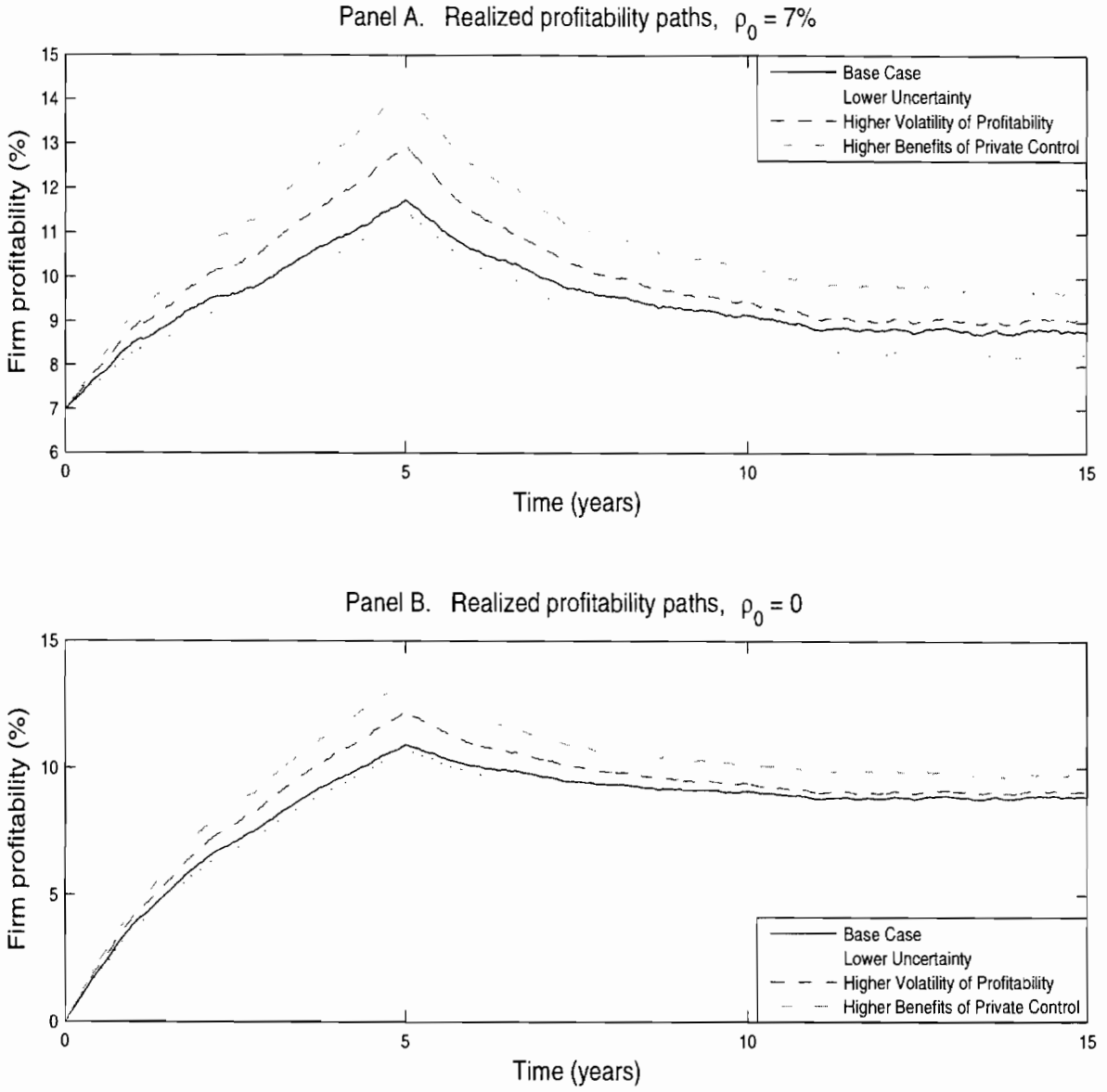

Figure 2. Model-Implied Realized Profitability Around an IPO. This figure plots the average paths of realized profitability, ρ_t, in percent per year, where the average is computed across 10,000 simulations of our model in which an IPO takes place at time $\tau = 5$. Given the large number of simulations, these average paths represent expected patterns in ρ_t conditional on an IPO. In Panel A, the initial profitability $\rho_0 = \widehat{\rho}_0 = 7\%$; in Panel B, $\rho_0 = 0$. The solid line corresponds to the baseline case, in which the model parameters are from Table 1. The other lines correspond to one-parameter deviations from Table 1: private benefits are increased to $\alpha = 0.11$ (dashed-dot line), uncertainty is reduced to $\widehat{\sigma}_0 = 0.04$ (dotted line), and volatility of profitability is increased to $\sigma_{\rho,1} = \sigma_{\rho,2} = 0.065$ (dashed line).

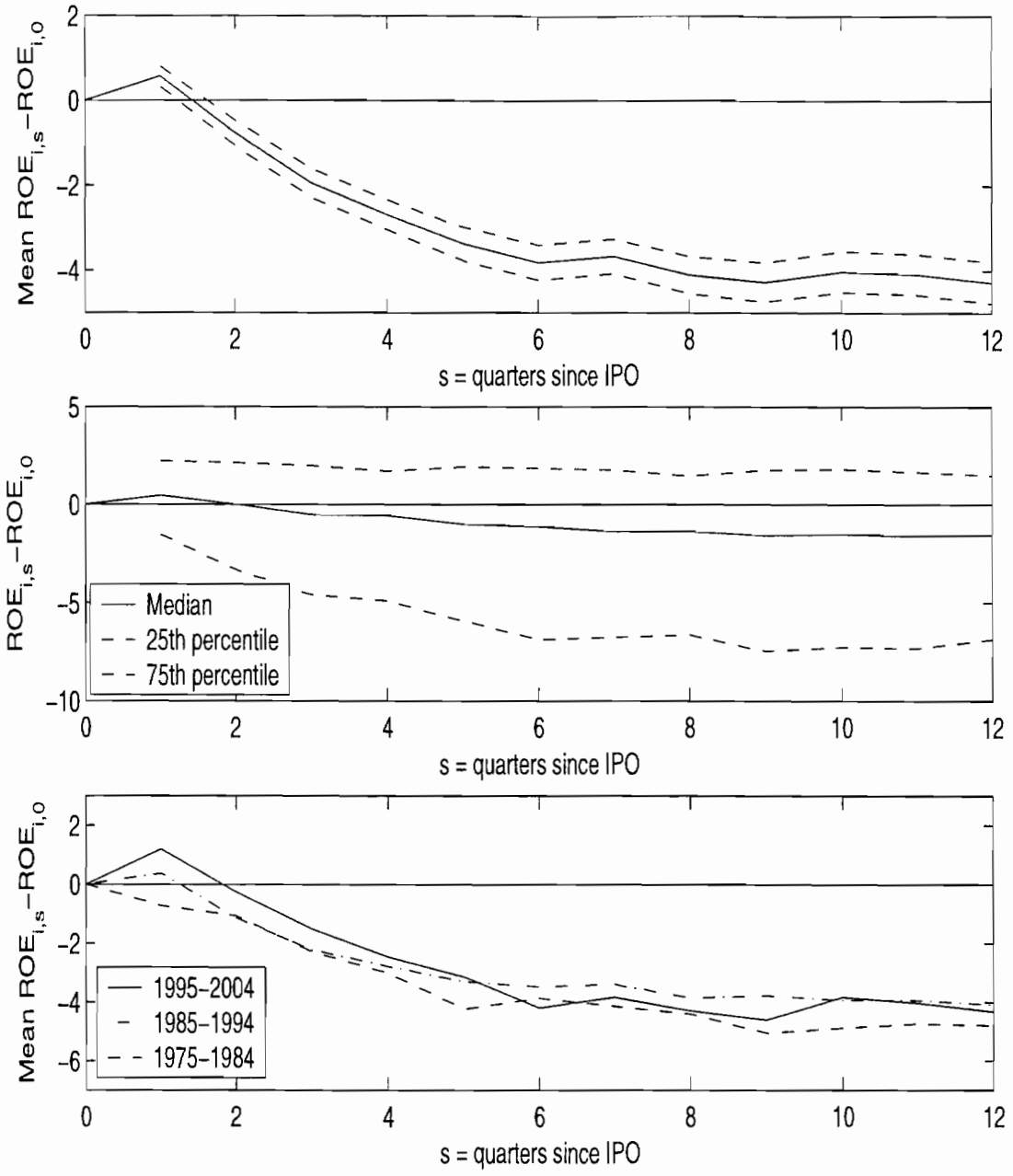

Figure 3. Post-IPO Changes in Profitability. This figure plots the post-IPO changes in firm profitability, measured as return on equity (ROE), for our sample of 7,183 IPOs in the U.S. from 1975–2004. Time 0 is the quarter of the IPO. $ROE_{i,s}$ is firm i's profitability s quarters after its IPO, in percent per quarter. The top panel plots the equal-weighted average of $ROE_{i,s} - ROE_{i,0}$ across all firms for which both $ROE_{i,s}$ and $ROE_{i,0}$ can be computed (solid line), as well as the 95% confidence interval for the mean (dashed lines). The middle panel plots the median value of $ROE_{i,s} - ROE_{i,0}$ (solid line), as well as the 25th and 75th percentiles (dashed lines). The bottom panel plots the equal-weighted average of $ROE_{i,s} - ROE_{i,0}$ across IPOs in three sub-samples: 1975–1984, 1985–1994, and 1995–2004.

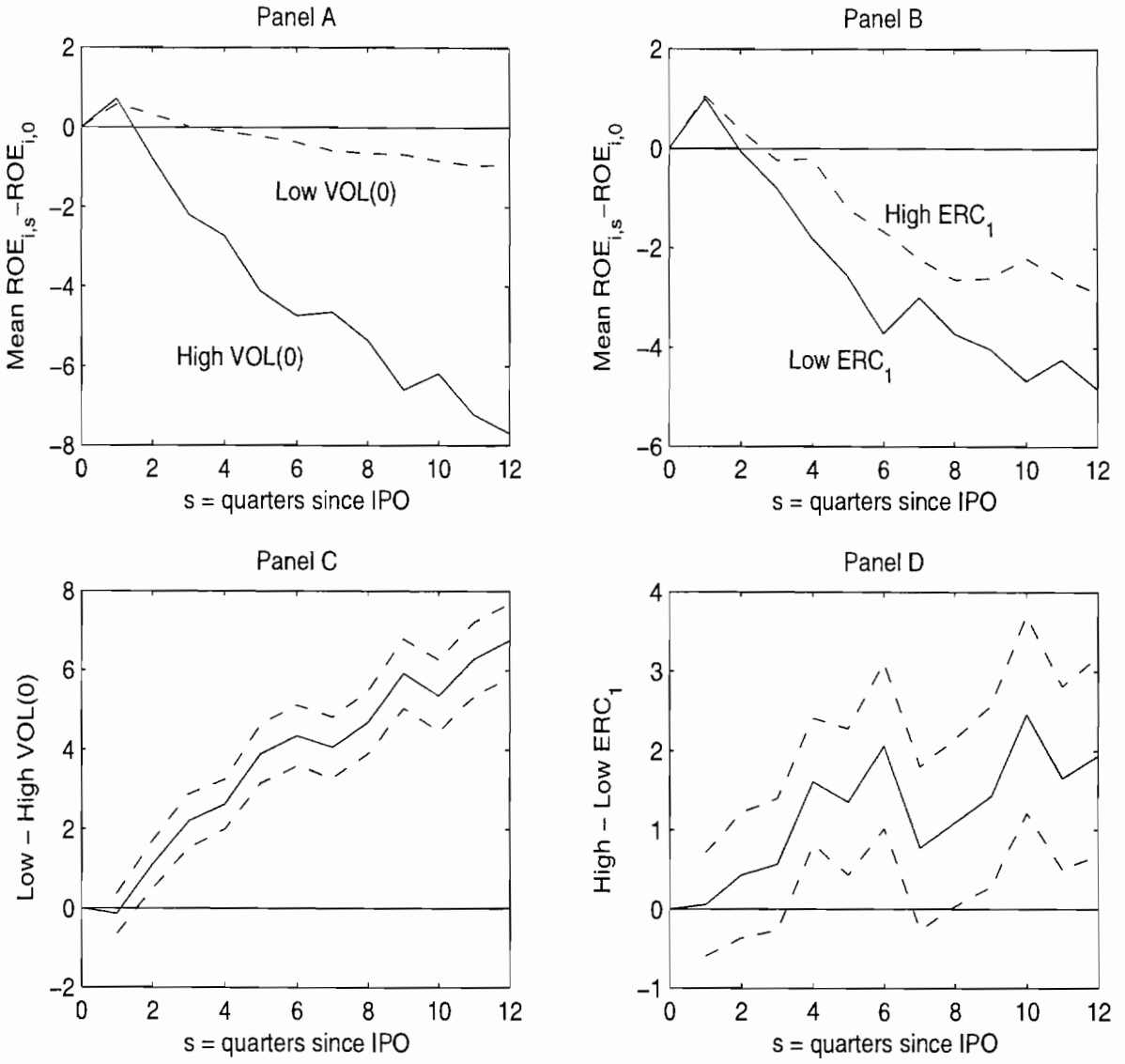

Figure 4. Post-IPO Changes in Profitability: Volatility vs. Uncertainty. We split our sample of 7,183 IPOs in 1975–2004 into high-volatility IPOs and low-volatility IPOs, and also into high-ERC_1 IPOs and low-ERC_1 IPOs. The left-hand panels split the sample using the median of $VOL(0)$, 5.28% per quarter. The right-hand panels split the sample using the median of ERC_1, 2.19. ERC_1 measures firm i's average stock price reaction to earnings surprises; $ROE_{i,s}$ is firm i's profitability s quarters after its IPO, in percent per quarter; and $VOL(0)$ is the standard deviation of $ROE_{i,s}$ for $s = 0, ..., 19$ quarters. Time 0 is the quarter of the IPO. Panels A and B plot the means of $ROE_{i,s} - ROE_{i,0}$ across the firms in the respective sub-samples split by volatility (Panel A) and ERC_1 (Panel B). Panel C plots the low volatility sub-sample's mean $ROE_{i,s} - ROE_{i,0}$ minus the high volatility sub-sample's mean $ROE_{i,s} - ROE_{i,0}$. Panel D plots the high ERC_1 sub-sample's mean $ROE_{i,s} - ROE_{i,0}$ minus the low ERC_1 sub-sample's mean $ROE_{i,s} - ROE_{i,0}$. The dashed lines denote the 95% confidence interval for this difference in differences.

Table 1
Parameter Values used in Simulations

This table contains the baseline parameter values used in simulations from the model. T is the time until the patent expiration, τ is the time until the IPO decision, r is the risk-free rate, σ_π determines the volatility of the stochastic discount factor, $\sigma_{\rho,1}$ is systematic volatility of profitability, $\sigma_{\rho,2}$ is idiosyncratic volatility of profitability, ϕ is the mean reversion coefficient for profitability, $\widehat{\rho}_0$ is the prior mean of $\overline{\rho}$, $\widehat{\sigma}_0$ is the prior standard deviation of $\overline{\rho}$, α captures the entrepreneur's consumption due to private control, γ denotes risk aversion, η determines the relative importance of terminal wealth in the entrepreneur's utility function, and β is the entrepreneur's subjective discount rate. All values are expressed in annual terms.

T	τ	r	σ_π	$\sigma_{\rho,1}$	$\sigma_{\rho,2}$	ϕ	$\widehat{\rho}_0$	$\widehat{\sigma}_0$	α	γ	η	β
15	5	0.03	0.60	0.0584	0.0596	0.3968	0.07	0.05	0.10	2	1	0.03

Table 2
The Average Expected Post-IPO Drop in Profitability ($\tau = 5$)

Panel A shows the average expected post-IPO drop in profitability, computed at time 0 conditional on an IPO at time $\tau = 5$. Panel B shows the average volatility of the firm's stock returns, and Panel C reports the average expected excess return on the firm's stock. For any given combination of prior uncertainty, $\widehat{\sigma}_0$, and the volatility of profitability, $\sigma_{\rho,1} = \sigma_{\rho,2}$, all three averages are computed across all admissible values of benefits of private control, α, and the prior mean, $\widehat{\rho}_0$. The admissible values of α and $\widehat{\rho}_0$ are subsets of the intervals $[5\%, 15\%]$ and $[-20\%, 40\%]$, respectively, that include only the sets of parameters for which the condition (29) is satisfied. The initial profitability is $\rho_0 = 0$ and all remaining parameters are in Table 1.

		$\sigma_{\rho,1} = \sigma_{\rho,2}$ (% per year)									
		1	2	3	4	5	6	7	8	9	10
		Panel A: Average Expected Drop in Profitability (% per year).									
	0	0.28	0.64	2.78	4.82	6.26	7.97	10.44	16.20	17.46	21.78
	1	-0.01	1.87	3.89	4.87	6.83	8.02	12.50	16.77	19.77	22.02
	2	-0.22	1.13	3.58	6.78	10.88	11.53	15.92	19.29	22.73	23.49
	3	-0.55	1.13	3.44	5.10	8.45	10.58	15.24	16.37	21.68	20.55
$\widehat{\sigma}_0$	4	-0.78	0.30	2.15	3.34	5.97	8.94	12.19	15.19	19.05	21.25
	5	-0.99	-0.12	1.17	2.78	4.61	7.12	9.67	13.86	14.29	18.94
(% p.a.)	6	-	-0.63	0.52	2.14	4.13	6.44	8.43	10.57	12.23	13.34
	7	-	-0.92	0.11	1.70	3.89	5.18	7.17	9.15	11.99	10.74
	8	-	-	-0.24	1.12	3.00	5.37	8.59	9.29	8.95	10.42
	9	-	-	-	-	2.27	4.12	6.76	-	-	-
	10	-	-	-	-	-	-	-	-	-	-
		Panel B: Average Stock Return Volatility (% per year).									
	0	3.50	6.99	10.49	13.99	17.48	20.98	24.48	27.97	31.47	34.97
	1	4.83	7.92	11.16	14.50	17.90	21.33	24.78	28.24	31.70	35.18
	2	5.90	9.65	12.75	15.85	19.04	22.31	25.64	29.00	32.39	35.79
	3	6.30	10.97	14.48	17.59	20.66	23.77	26.95	30.19	33.47	36.78
	4	6.48	11.79	15.89	19.30	22.43	25.50	28.58	31.70	34.87	38.09
$\widehat{\sigma}_0$	5	6.57	12.29	16.94	20.77	24.13	27.27	30.34	33.40	36.50	39.62
	6	-	12.61	17.69	21.95	25.62	28.95	32.10	35.18	38.24	41.32
(% p.a.)	7	-	12.81	18.22	22.87	26.88	30.47	33.78	36.94	40.02	43.09
	8	-	-	18.62	23.58	27.93	31.79	35.31	38.60	41.77	44.86
	9	-	-	-	-	28.78	32.92	36.67	-	-	-
	10	-	-	-	-	-	-	-	-	-	-
		Panel C: Average Expected Excess Stock Return (% per year).									
Any $\widehat{\sigma}_0$		1.48	2.97	4.45	5.93	7.42	8.90	10.38	11.87	13.35	14.84

Table 3
The Average Expected Post-IPO Drop in Profitability ($\tau = 7$)

Panel A shows the average expected post-IPO drop in profitability, computed at time 0 conditional on an IPO at time $\tau = 7$. Panel B shows the average volatility of the firm's stock returns, and Panel C reports the average expected excess return on the firm's stock. For any given combination of prior uncertainty, $\widehat{\sigma}_0$, and the volatility of profitability, $\sigma_{\rho,1} = \sigma_{\rho,2}$, all three averages are computed across all admissible values of benefits of private control, α, and the prior mean, $\widehat{\rho}_0$. The admissible values of α and $\widehat{\rho}_0$ are subsets of the intervals $[5\%, 15\%]$ and $[-20\%, 40\%]$, respectively, that include only the sets of parameters for which the condition (29) is satisfied. The initial profitability is $\rho_0 = 0$ and all remaining parameters are in Table 1.

		$\sigma_{\rho,1} = \sigma_{\rho,2}$ (% per year)									
		1	2	3	4	5	6	7	8	9	10
		Panel A: Average Expected Drop in Profitability (% per year).									
	0	0.09	1.14	2.94	5.15	6.87	9.24	10.78	13.25	13.69	12.92
	1	-0.15	0.62	2.34	4.61	6.39	8.72	10.42	12.82	14.77	12.78
	2	-0.01	1.42	2.57	3.96	6.01	7.39	9.26	11.74	13.81	13.40
	3	-0.14	0.85	2.03	4.17	4.83	6.32	9.16	9.94	13.59	12.27
$\widehat{\sigma}_0$	4	-0.22	0.46	1.73	2.27	4.04	5.91	8.03	9.16	12.87	14.71
	5	-0.28	0.30	1.13	2.27	3.57	5.25	6.95	10.05	10.37	14.09
(% p.a.)	6	-	0.00	0.80	1.95	3.61	5.33	6.82	8.30	9.51	10.38
	7	-	-0.10	0.63	1.87	3.60	4.76	7.04	7.95	10.29	9.04
	8	-	-	0.52	1.57	3.12	5.09	7.93	8.61	8.47	10.50
	9	-	-	-	-	2.70	4.20	6.57	-	-	-
	10	-	-	-	-	-	-	-	-	-	-
		Panel B: Average Stock Return Volatility (% per year).									
	0	3.42	6.83	10.25	13.66	17.08	20.49	23.91	27.32	30.74	34.15
	1	4.23	7.47	10.72	14.03	17.38	20.75	24.12	27.51	30.91	34.31
	2	4.72	8.45	11.73	14.94	18.17	21.44	24.74	28.06	31.40	34.76
	3	4.88	9.09	12.68	15.99	19.20	22.41	25.64	28.89	32.16	35.46
	4	4.95	9.44	13.37	16.91	20.23	23.46	26.67	29.88	33.10	36.34
$\widehat{\sigma}_0$	5	4.98	9.64	13.84	17.63	21.13	24.47	27.72	30.93	34.14	37.35
	6	-	9.76	14.16	18.17	21.88	25.36	28.71	31.97	35.19	38.40
(% p.a.)	7	-	9.84	14.37	18.57	22.47	26.12	29.59	32.94	36.22	39.45
	8	-	-	14.53	18.87	22.93	26.74	30.35	33.81	37.17	40.46
	9	-	-	-	-	23.30	27.26	31.00	-	-	-
	10	-	-	-	-	-	-	-	-	-	-
		Panel C: Average Expected Excess Stock Return (% per year).									
Any $\widehat{\sigma}_0$		1.45	2.90	4.35	5.80	7.24	8.69	10.14	11.59	13.04	14.49

Table 4
Summary Statistics for the IPO Sample

Panel A contains summary statistics (means, standard deviations, percentiles) for the 7,183 firms in our sample of IPOs from 1975-2004. N is the number of firms for which the given variable can be calculated. t-stat is the t-statistic testing the hypothesis that the mean of the given variable is equal to zero. $ROE_{i,s}$ is the return on equity of firm i computed s quarters after the firm's IPO, in percent per quarter. $VOL(s_0)$ is the standard deviation of $ROE_{i,s}$ for $s = s_0, \ldots, s_0 + 19$. ERC_1 is the average of the first 12 post-IPO stock price reactions to earnings surprises. ERC_1^+ is equal to ERC_1 when $ERC_1 > 0$ and missing otherwise. ERC_2 is the negative of the regression slope of earnings surprises on abnormal stock returns using firm i's first 20 post-IPO quarters of earnings surprises. ERC_2^- is equal to ERC_2 when $ERC_2 < 0$ and missing otherwise. Panel B shows pairwise correlations computed across firms.

Panel A. Summary Statistics.

					Percentiles		
Variable	N	Mean	Std. dev.	t-stat	25th	50th	75th
$ROE_{i,0}$	5,795	-0.79	12.57	-4.8	-3.81	1.84	4.62
$ROE_{i,12} - ROE_{i,0}$	3,964	-4.29	15.56	-17.4	-6.85	-1.51	1.48
$VOL(0)$	4,546	8.03	7.45	72.7	2.52	5.28	11.11
$VOL(13)$	2,606	7.65	7.74	50.5	2.30	4.61	10.35
ERC_1	2,773	3.13	6.86	24.1	-1.06	2.19	6.79
ERC_2	2,588	-0.035	0.067	-26.7	-0.064	-0.026	-0.002
ERC_1^+	1,855	6.46	5.59	49.8	2.16	5.17	9.00
ERC_2^-	2,007	-0.056	0.056	-44.7	-0.078	-0.040	-0.018

Panel B. Cross-Sectional Correlations.

	$ROE_{i,12} - ROE_{i,0}$	$VOL(0)$	$VOL(13)$	ERC_1	ERC_2	ERC_1^+	ERC_2^-
$ROE_{i,12} - ROE_{i,0}$	1.00						
$VOL(0)$	-0.33	1.00					
$VOL(13)$	-0.15	0.65	1.00				
ERC_1	0.07	-0.16	-0.11	1.00			
ERC_2	0.04	-0.14	-0.06	-0.05	1.00		
ERC_1^+	0.08	-0.25	-0.14	1.00	0.14	1.00	
ERC_2^-	0.16	-0.31	-0.18	0.16	1.00	0.30	1.00

Table 5
Cross-Sectional Regressions

This table reports OLS estimates of β from the model $ROE_{i,s} - ROE_{i,0} = \beta X_i + \epsilon_i$. The sample contains 7,183 IPO firms from 1975-2004 less any firms for which at least one variable is missing, for a total of N firms. $ROE_{i,s}$ is the return on equity of firm i computed s quarters after the firm's IPO, in percent per quarter. X_i contains combinations of the following variables: a constant, $VOL(s_0)$ (the standard deviation of $ROE_{i,s}$ for $s = s_0, \ldots, s_0 + 19$), ERC_1 (the average of firm i's first 12 post-IPO stock price reactions to earnings surprises), and ERC_2 (minus the regression slope of firm i's earnings surprises on firm i's abnormal stock returns around earnings announcements). The t-statistics, shown in parentheses, are computed by clustering the error terms in calendar time.

Panel A. One-Year Horizon. (Regressand: $ROE_{i,4} - ROE_{i,0}$)

Constant	-2.68	0.48	0.35	-1.33	-0.44	0.38	0.54	0.51	0.58
	(-11.2)	(1.65)	(1.31)	(-4.08)	(-1.49)	(0.97)	(1.52)	(1.34)	(1.74)
$VOL(0)$		-0.238				-0.186	-0.163		
		(-10.8)				(-5.93)	(-5.00)		
$VOL(5)$			-0.198					-0.177	-0.123
			(-9.04)					(-5.64)	(-3.89)
ERC_1				0.100		0.063		0.028	
				(3.35)		(2.08)		(0.88)	
ERC_2					3.05		1.30		6.58
					(1.04)		(0.44)		(2.10)
R^2	0.000	0.028	0.024	0.004	0.000	0.021	0.012	0.019	0.011
N	5,340	4,124	3,353	2,526	2,373	2,211	2,301	1,816	1,978

Panel B. Three-Year Horizon. (Regressand: $ROE_{i,12} - ROE_{i,0}$)

Constant	-4.29	1.20	-0.70	-4.32	-2.76	1.71	1.20	-0.99	-0.41
	(-16.2)	(3.86)	(-2.01)	(-9.66)	(-7.36)	(2.97)	(2.63)	(-2.09)	(-0.83)
$VOL(0)$		-0.708				-0.820	-0.659		
		(-21.8)				(-17.8)	(-14.8)		
$VOL(13)$			-0.248					-0.268	-0.230
			(-7.48)					(-6.11)	(-5.31)
ERC_1				0.144		0.020		0.060	
				(3.05)		(0.46)		(1.32)	
ERC_2					8.71		1.57		8.67
					(2.04)		(0.38)		(1.97)
R^2	0.000	0.108	0.024	0.004	0.002	0.140	0.092	0.033	0.024
N	3,964	3,940	2,312	2,121	2,239	2,118	2,238	1,224	1,379

Table 6
Cross-Sectional Regressions, Excluding ERCs with Unpredicted Signs

This table reports OLS estimates of β from the model $ROE_{i,s} - ROE_{i,0} = \beta_s X_i + \epsilon_i$. The sample contains 7,183 IPO firms from 1975-2004 less any firms for which at least one variable is missing, for a total of N firms. $ROE_{i,s}$ is the return on equity of firm i computed s quarters after the firm's IPO, in percent per quarter. X_i contains combinations of the following variables: a constant, $VOL(s_0)$ (the standard deviation of $ROE_{i,s}$ for $s = s_0, \ldots, s_0 + 19$), ERC_1^+ (the average of firm i's first 12 post-IPO stock price reactions to earnings surprises, excluding negative values), and ERC_2^- (minus the regression slope of firm i's earnings surprises on firm i's abnormal stock returns around earnings announcements, excluding positive values). The t-statistics, shown in parentheses, are computed by clustering the error terms in calendar time.

Panel A. One-Year Horizon. (Regressand: $ROE_{i,4} - ROE_{i,0}$)

Constant	-2.68	0.48	0.35	-1.76	-0.07	-0.55	0.68	-0.43	0.66
	(-11.2)	(1.65)	(1.31)	(-4.87)	(-0.18)	(-1.08)	(1.62)	(-0.86)	(1.65)
$VOL(0)$		-0.238				-0.092	-0.167		
		(-10.8)				(-2.46)	(-4.23)		
$VOL(5)$			-0.198					-0.118	-0.098
			(-9.04)					(-3.26)	(-2.64)
ERC_1^+				0.164		0.111		0.101	
				(3.87)		(2.51)		(2.24)	
ERC_2^-					9.09		3.97		11.34
					(2.30)		(0.93)		(2.69)
R^2	0.000	0.028	0.024	0.009	0.003	0.011	0.014	0.016	0.013
N	5,340	4,124	3,353	1,692	1,847	1,484	1,789	1,230	1,554

Panel B. Three-Year Horizon. (Regressand: $ROE_{i,12} - ROE_{i,0}$)

Constant	-4.29	1.20	-0.70	-4.60	-0.83	1.26	1.51	-0.86	0.19
	(-16.2)	(3.86)	(-2.01)	(-8.51)	(-1.78)	(1.58)	(3.21)	(-1.54)	(0.38)
$VOL(0)$		-0.708				-0.688	-0.545		
		(-21.8)				(-12.4)	(-10.6)		
$VOL(13)$			-0.248					-0.230	-0.157
			(-7.48)					(-5.01)	(-3.41)
ERC_1^+				0.203		0.001		0.045	
				(3.08)		(0.01)		(0.78)	
ERC_2^-					36.48		18.55		25.52
					(6.68)		(3.34)		(4.77)
R^2	0.000	0.108	0.024	0.007	0.025	0.106	0.083	0.031	0.036
N	3,964	3,940	2,312	1,425	1,747	1,424	1,747	832	1,094

REFERENCES

Asquith, Paul, and David W. Mullins, 1986, "Equity issues and offering dilution", *Journal of Financial Economics* 15, 61–89.

Ball, Ray, and Lakshmanan Shivakumar, 2006, "Earnings quality at initial public offerings", Working paper, University of Chicago.

Beaver, William H., 1970, "The time series behavior of earnings", *Journal of Accounting Research* 8, 62–89.

Benninga, Simon, Mark Helmantel, and Oded Sarig, 2005, "The timing of initial public offerings", *Journal of Financial Economics* 75, 115–132.

Bharath, Sreedhar T., and Amy K. Dittmar, 2006, "To Be or Not to Be (Public)", Working paper, University of Michigan.

Bodnaruk, Andriy, Eugene Kandel, Massimo Massa, and Andrei Simonov, 2006, "Shareholder diversification and the decision to go public", *Review of Financial Studies*, forthcoming.

Brau, James C., and Stanley E. Fawcett, 2006, "Initial public offerings: An analysis of theory and practice", *Journal of Finance* 61, 399–436.

Brav, Alon, Christopher C. Géczy, and Paul A. Gompers, 2000, "Is the Abnormal Return Following Equity Issuances Anomalous?", *Journal of Financial Economics* 56, 209-249.

Brav, Alon, and Paul A. Gompers, 1997, "Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies", *Journal of Finance* 52, 1791–1821.

Chemmanur, Thomas J., and Paolo Fulghieri, 1999, "A Theory of the Going-Public Decision," *Review of Financial Studies* 12, 249–279.

Cox, John C., and Chi-fu Huang, 1989, "Optimal consumption and portfolio choices when asset prices follow a diffusion process", *Journal of Economic Theory* 49, 33–83.

Degeorge, Francois, and Richard Zeckhauser, 1993, "The reverse LBO decision and firm performance: Theory and evidence", *Journal of Finance* 48, 1323–1348.

Dyck, Alexander, and Luigi Zingales, 2004, "Private Benefits of Control: An International Comparison", *Journal of Finance* 59, 537–600.

Easton, Peter D., and Mark E. Zmijewski, 1989, "Cross-Sectional Variation in the Stock Market Response to the Announcement of Accounting Earnings," *Journal of Accounting and Economics* 11, 117–141.

Fama, Eugene F. and Kenneth R. French, 1993, "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics* 33, 3–56.

Fama, Eugene F., and Kenneth R. French, 2000, "Forecasting profitability and earnings", *Journal of Business* 73, 161–175.

Fama, Eugene F. and Kenneth R. French, 2004, "New Lists: Fundamentals and Survival Rates", *Journal of Financial Economics* 72, 229–269.

Graham, John R., Cam Harvey, and Shiva Rajgopal, 2005, "The Economic Implications of Corporate Financial Reporting", *Journal of Accounting and Economics* 40, 3–73.

Halpern, Paul, Robert Kieschnick, and Wendy Rotenberg, 1999, "On the heterogeneity of leveraged going private transactions," *Review of Financial Studies* 12, 281–309.

Jain, Bharat A., and Omesh Kini, 1994, "The post-issue operating performance of IPO firms", *Journal of Finance* 49, 1699–1726.

Leland, Hayne E., and David H. Pyle, 1977, "Informational asymmetries, financial structure, and financial intermediation", *Journal of Finance* 32, 371–387.

Lerner, Joshua, 1994, "Venture capitalists and the decision to go public", *Journal of Financial Economics* 35, 293–316.

Li, Erica X. N., Dmitry Livdan, and Lu Zhang, 2006, "Optimal market timing", Working paper, University of Rochester.

Loughran, Tim, and Jay R. Ritter, 1995, "The new issues puzzle", *Journal of Finance* 50, 23–51.

Loughran, Tim, and Jay R. Ritter, 1997, "The operating performance of firms conducting seasoned equity offerings", *Journal of Finance* 52, 1823–1850.

Loughran, Tim, and Jay R. Ritter, 2004, "Why has IPO underpricing changed over time?", *Financial Management* 33, 5–37.

Mikkelson, Wayne H., M. Megan Partch, and Kshitij Shah, 1997, "Ownership and operating performance of companies that go public", *Journal of Financial Economics* 44, 281–307.

Pagano, Marco, Fabio Panetta, and Luigi Zingales, 1998, "Why do companies go public? An empirical analysis", *Journal of Finance* 53, 27–64.

Pástor, Ľuboš, and Pietro Veronesi, 2003, "Stock valuation and learning about profitability", *Journal of Finance* 58, 1749–1789.

Pástor, Ľuboš, and Pietro Veronesi, 2005, "Rational IPO waves", *Journal of Finance* 60, 1713–1757.

Pástor, Ľuboš, and Pietro Veronesi, 2006, "Was there a Nasdaq bubble in the late 1990s?", *Journal of Financial Economics* 81, 61–100.

Ritter, Jay R., 1991, "The long-run performance of initial public offerings", *Journal of Finance* 46, 3–27.

Teoh, Siew Hong, Ivo Welch, and T. J. Hong, 1998, "Earnings management and the long-run market performance of initial public offerings ", *Journal of Finance* 53, 1935–1974.

Zingales, Luigi, 1995, "Insider ownership and the decision to go public", *Review of Economic Studies* 62, 425–448.

Attachment to 15

_ B. Public Equity Issues and The Scope.pdf

Public Equity Issues and the Scope for Market Timing

Hannes F. Wagner*
LONDON BUSINESS SCHOOL

Job Market Paper

This version: January 20, 2007

ABSTRACT: This paper studies the relevance of market timing in public equity issues. Prior research has argued that equity is mispriced in public equity issues and that managers' successful attempts to take advantage of mispricing has persistent effects on firms' capital structure. Using a sample of seasoned equity offerings and initial public offerings by U.S. firms over the period 1970 to 2004, I find no empirical support for these hypotheses. Specifically, I find that equity issuing firms are not mispriced relative to firms with similar risk characteristics. Further, there are no performance spreads between firms with differing ex-ante idiosyncratic opportunities to time the market. Timing opportunities are measured by financial constraints, valuation uncertainty, the informational content of stock prices and price momentum. I also do not find high persistence of changes in capital structure as firms instead actively releverage through increased debt issuance following equity issues. I do however find evidence consistent with equity issues being motivated both by the financing of investment and equity market conditions.

JEL Classification: G14, G32

Keywords: capital structure, initial public offering, seasoned equity offering, market timing

*I am grateful for helpful suggestions from workshop participants at the University of Oxford and London Business School and to Viral Acharya, Julian Franks, Alexander Gümbel, Denis Gromb, Chris Malloy, Colin Mayer, Anna Pavlova, Tarun Ramadorai, Henri Servaes, Oren Sussman, Jos van Bommel and Paolo Volpin. I thank Jay Ritter for providing corrections to the SDC Platinum database and Kenneth French for providing the Fama-French benchmark factors. Financial support from the Fritz Thyssen Foundation is gratefully acknowledged. Correspondence address: Hannes Wagner, Institute of Finance and Accounting, London Business School, Sussex Place, Regent's Park, London NW1 4SA, England. Phone +44 (0)20 7000 8245. Email: hwagner@london.edu.

Market timing in a corporate finance context has received considerable attention in recent years.[1] On the one hand, studies of initial public offerings (IPOs) (e.g. Ritter (1991)), seasoned equity offerings (SEOs) (e.g. Marsh (1982)), equity repurchases (Ikenberry, Lakonishok, and Vermaelen (1995)) and equity-financed acquisitions (Shleifer and Vishny (2003)) suggest that it is generally possible to sell equity when it is expensive and refrain from issuing or actively buying back equity when it is cheap. More recently, an influential paper by Baker and Wurgler (2002) suggests that the capital structure of firms is the result of repeated successful attempts at market timing. Generally, a significant number of empirical studies is consistent with the view that equity market timing is an essential part of firms' financial policies.

On the other hand, researchers have remained sceptical about whether managers are systematically successful in selling overvalued equity to less informed investors, using superior insider information. Several studies show that evidence consistent with successful market timing can be explained in the absence of irrational investors (Hennessy and Whited (2005)) or even in the absence of managers possessing any insider information (Schultz (2003), Jenter (2005)).

This paper uses a comprehensive sample of 5,300 SEOs and 2,400 IPOs by U.S. firms and data from January 1970 to December 2005 to address two apparent links between market timing, capital structure and firm performance. First, have been argued to successfully time equity issues to coincide with periods of overvaluation. Equity issues therefore would appear to be driven by mispricing. The apparent negative abnormal long-term performance of issuing firms has been interpreted as evidence in support of this view (e.g. Ritter (1991), Loughran and Ritter (1995)). Under this view firms time their equity offerings to market conditions, which are consequently reflected in post-offering capital structures (e.g. Pagano, Panetta, and Zingales (1998)). Second, market timing has been argued to have highly persistent effects on capital structure (Baker and Wurgler (2002)). If this is the case, firms do not undo changes caused by market timing and consequently have loose leverage targets. Market timing under this view is a better explanation of firms' capital structure policy than traditional theories of capital structure.

The goal of this paper is to construct a cleaner test of market timing and its relation to capital structure and firm performance than has previously been possible. To do so the paper directly addresses the two main questions which are at the heart of the market timing hypothesis. First, does market timing determine equity issues and is this driven by the mispricing of equity? Second, does market timing have an impact on capital structure and are these effects persistent?

To answer the first question the paper analyzes whether the characteristics of public equity issues are consistent with market timing motives and inconsistent with alternative motives for raising equity, such as anticipated investment. It uses proxy variables for ex-ante opportunities of individual firms to time the market and links them to the issuing policy of a firm. Assuming that ex ante all firms attempt to time the market, we should observe stronger market timing for the ex ante likely market timers and less market timing for the unlikely market timers. Ex ante timing opportunities are measured by financial constraints, valuation uncertainty, the

[1] The following section provides a short summary of previous theoretical and empirical work. Recent literature reviews are contained in Jenter (2005) and Alti (2006).

informational content of stock prices and stock price momentum. The measures are described in detail in the next section. The paper then verifies the mispricing argument of equity issuance by analyzing long-term returns of issuing firms. Previous research has interpreted abnormal performance of equity issuers as evidence of mispricing at the time of the offering. I verify whether equity issues are mispriced and whether there is empirical support for the view that managers successfully sell overvalued equity or if there is in fact no such evidence.

To answer the second question the paper analyzes capital structure changes in the wake of the public equity issues. One would expect market timing to have at least a short-term impact on capital structure. The more important matter however is whether these effects are persistent or whether firms actively unwind leverage changes caused by equity issuances. Persistent timing effects are difficult to reconcile with traditional determinants of capital structure. Active rebalancing of leverage on the other hand would imply that firms take advantage of current market conditions but in the long term do not have loose leverage targets.

In the first set of results I find that in the short run, equity issuances are motivated both by taking advantage of favourable market conditions and financing of investment opportunities. In the cross-section both IPO and SEO firms take advantage of high valuations caused by increases in equity prices and issue more equity than their long-term capital structure dictates. This is confirmed by firms with higher valuation uncertainty and larger financial slack issuing more equity. The evidence is consistent with the view that firms with the opportunity to time public equity issues to market conditions in fact do so. IPO and SEO firms appear not to be financially constrained prior to the offering. The consequent use of funds however shows that equity issues do fund investment. SEO firms, and to a lesser degree IPO firms, issue equity in anticipation of future imbalances caused by increased investment. While for both firm types issued capital adds to cash balances and to equity repurchases, there is also a strong increase in capital expenditure and acquisitions.

The second set of results shows that SEO and IPO firms however do not exhibit negative abnormal performance following their equity issuances. Factor regression approaches calculated in calendar-time are used to detect abnormal performance within the CAPM, Fama and French three-factor and four-factor models. While IPO firms exhibit neutral or even positive performance and SEO firms exhibit negative abnormal performance in event time, abnormal performance disappears in calendar time. The lack of negative abnormal performance is inconsistent with the hypothesis that firms initially sell overvalued equity. This result not only holds for the cross-section of firms but also holds for subsamples defined by their relative market timing opportunities. For example, hot-market issuers and firms that have experienced strong price run-ups prior to the issue exhibit no abnormal risk-adjusted performance over a five-year period following the offering. Generally, neither likely nor unlikely market-timing issuer subsamples exhibit abnormal performance nor are there performance spreads between subsamples. The results hold independently of how subsamples are formed.

Finally, the third set of results shows that changes in capital structure are not persistent effects. In the fiscal year following the offering a reversal of changes in leverage sets in for SEO

and IPO firms. As a result, the explanatory power of market timing opportunity variables with regard to capital structure declines rapidly. The coefficients that initially explain individual offering characteristics, capital structure changes and post-issue capital structure become insignificant within two years of the offering for IPO firms and within three years for SEO firms. The reversal in capital structure comes through debt issues. The previously large extent of equity issuance disappears almost completely in relative terms. The previously active issuers of equity instead become issuers of debt. After two years this active releveraging renders the initial impact of market timing insignificant in almost all cases for both SEO and IPO firms.

In summary, I find that firms with the opportunity to issue equity under favorable market conditions do so and issue equity to fund investment. Equity issuance does not lead to underperformance of firms suggesting that equity is not mispriced. Moreover even perceived market-timing firms show no different performance from non market-timing firms. Further, immediately following the offerings firms actively undo the changes in leverage caused by the equity inflow. The results therefore also do not support the view that the capital structure of firms is determined by past attempts to time the market.

Two studies are closely related to this paper. Baker and Wurgler (2002) show that a historic weighted average of the market-to-book ratio explains capital structure changes over long time periods, implying a strong effect of market timing on capital structure that is very persistent. While I replicate the results of that study, in this study I do not rely on the market-to-book ratio as a measure of relative pricing but instead directly measure mispricing through stock price performance. I also develop proxy variables to determine the ex ante likelihood of a firm being able to time the market. Alti (2006) uses IPO firms to analyze whether market timing can be attributed to whether the firm goes public in a hot or cold issue market to verify the results of Baker and Wurgler (2002). If issuers regard hot markets as windows of opportunity they should react by issuing more equity than they would in a cold market. The paper finds support for this hypothesis. It shows however that the initial impact on leverage is consequently balanced away by hot-market IPO firms. Although I do not specifically focus on hot versus cold markets in this paper, I show that a similar hot-market effect exists for both IPOs and SEOs, which however is not particularly robust once ex ante market timing opportunities are controlled for.

The paper is also related to Ovtchinnikov (2003), Hovakimian (2004), Mayer and Sussman (2004) Leary and Roberts (2005) and Flannery and Rangan (2006). Ovtchinnikov (2003) analyzes whether aggregate market timing opportunities explain the tradeoff between issuing short and long term debt and equity in SEOs but finds no supporting evidence. Hovakimian (2004) analyzes target capital structures of firms raising external financing and shows that equity issues as opposed to debt issues do not undo accumulated deviations from leverage targets, as issuing firms are underleveraged rather than overleveraged prior to the issue. This is consistent for example with my results of low leverage of SEO and IPO growth firms and financially unconstrained firms issuing more equity. Unlike this study, the paper does not address ex ante timing opportunities and stock price performance. Mayer and Sussman (2004) study how firms finance large investment projects, which due to their size are likely to require external financing.

While their paper does not analyze market timing behavior, their results are consistent with this paper. They show that firms do not exhaust internal resources before turning to external financing, that small firms have a preference for equity financing relative to large firms and that long-term leverage reverts to previous levels after outside financing causes deviations.

Finally, Leary and Roberts (2005) and Flannery and Rangan (2006) analyze partial adjustment of capital structure with regard to target capital structure using the COMPUSTAT cross-section of firms. The papers find that firms revert to target capital structure over time, and that market timing is only a temporary or secondary effect. Both studies however rely on the Baker and Wurgler (2002) historic weighted-average of market-to-book to measure market timing and do not address whether the measure is related to actual mispricing.

The remainder of the paper is structured as follows. The following section outlines the testable propositions. Section 2 provides summary statistics for the sample and describes the methodology. Section 3 analyzes the characteristics of equity issuances, their impact on capital structure and future financing, and long-term firm performance. Section 4 discusses the results, while Section 5 concludes.

1 Market timing of equity issues

Generally, market timing means predicting general market price movements (Fama (1972)). In a corporate finance context market timing is "the practice of issuing shares at high prices and repurchasing at low prices to exploit temporary fluctuations in the costs of equity relative to other forms of capital" (Baker and Wurgler (2002)). A substantial body of previous research suggests that it is generally possible to sell equity when it is expensive and refrain from issuing or actively buy back equity when it is cheap. With regard to equity issuances, firms seem to issue equity when they are overvalued. For example, evidence for IPOs and SEOs shows that equity issuance is concentrated in times of high valuations.[2] Similarly, firms repurchase equity when they are potentially undervalued (Ikenberry, Lakonishok, and Vermaelen (1995)). Further, high valuation firms use equity as inflated acquisition currency (Shleifer and Vishny (2003)). Finally, Graham and Harvey (2001) report that CFOs seem to place considerable weight on market timing corporate financing decisions. In their survey of 392 U.S. and Canadian CFOs, 67 percent of CFOs state that "the amount by which our stock is undervalued or overvalued is an important or very important consideration in issuing equity". A common theme of many studies is that "managers tend to view high valuation firms as overvalued and low valuation firms as undervalued. Consequently they try to take advantage of [perceived] misvaluations through their capital structure and investment decisions" (Jenter (2005)).

However objections have been made to these findings. Previous methodological approaches may be biased towards finding evidence of market timing. For example, long-run underperfor-

[2]Evidence on IPOs is provided, among other, by Ritter (1991), Lerner (1994), Loughran, Ritter, and Rydqvist (1994), Loughran and Ritter (1995) and Pagano, Panetta, and Zingales (1998). Evidence on SEOs is provide for example by Taggart (1977), Marsh (1982), Jung, Kim, and Stulz (1996), Loughran and Ritter (1997) and Hovakimian, Opler, and Titman (2001).

mance of equity issuing firms is the result of insufficient control for risk factors (Eckbo, Masulis, and Norli (2000)), bad-model bias (Fama (1998)) and firm-size effects (Brav, Geczy, and Gompers (2000), Gompers (2003)). More importantly however, several studies show that evidence consistent with successful market timing, particulary historical patterns of market-to-book ratios and long-term abnormal returns, can be explained even in the absence of irrational investors or managers timing the market using insider information. Jenter (2005) provides evidence of both corporate financing decisions taken by managers and their own trading behavior. While he finds that managers in high market-to-book firms sell more shares than those in low market-to-book firms and vice versa, the evidence also shows that these trading strategies yield no abnormal performance. This suggests that managers are not using inside information in their decisions but rather issue equity on behalf of the firm and sell their own shares when price variables such as market-to-book are high. This finding is closely related to the phenomenon of pseudo market timing in Schultz (2003). He shows that long-run underperformance of IPOs can arise out of purely mechanistic managerial behavior. As long as rising share prices result in larger number of IPOs, negative abnormal performance will be observed ex post in event time. This is because firms are more likely to sell equity when they can receive a high price for it. The effect does not rely on managers having superior information or in fact any notion of whether their company is over- or undervalued.[3] Finally, Hennessy and Whited (2005) show that even in the absence of market timing opportunities, market-to-book ratios may influence firm leverage ex post through tax considerations. They therefore argue that the results of Baker and Wurgler (2002) do not necessarily provide evidence of market timing attempts.

One way of addressing the market timing identification problem is to ask the following question: Is the market timing potential that firms have related to the eventual outcomes? If equity issuances are in fact timed to the market we would expect those firms that have large potential for timing also to have a higher probability of success. I use several measures of a firm's scope for market timing to identify likely and unlikely market timing firms ex ante. These measures, which I describe in more detail in the following section, are whether a firm is financially constrained, how much of the value of the firm consists of strongly subjective future growth opportunities, how much private information is incorporated in the stock price of the firm and whether the firm can profit from recent stock price increases.

On the other hand, equity issuance and capital structure decisions could be driven by different motives as well. While one would possibly expect market timing to contribute to capital structure policy in the short-term, the real test is the persistence of these effects. Baker and Wurgler (2002) argue that market timing effects on capital structure are highly persistent. According to their findings, which I replicate, capital structure in year t is explained by market timing attempts dating back to as far as year $t - 10$. Their finding is inconsistent with both the pecking order theory and the (static or dynamic) trade-off theory, the two main alternative explanations for capital structure.

[3] In Schultz (2003), IPOs cluster around market peaks ex post. This in turn mechanically leads to significantly negative aftermarket performance. This however requires the implicit assumption of stationarity of the IPO process. Viswanathan and Wei (2005) and Dahlquist and de Jong (2004) address this issue and show that if the number of IPOs is stationary, pseudo market timing is a small-sample problem only.

2 Data and methodology

2.1 Sample construction and characteristics

The initial sample contains all COMPUSTAT firms, that issued equity between 1 January 1970 and 31 December 2002. I consider both IPOs and SEOs. Regarding IPOs, I identify true IPOs from the Securities Data Company (SDC) Platinum database. This sample of IPOs excludes all secondary offerings, unit offers, closed-end funds, financial institutions (SIC codes 6000-6999), ADRs, limited partnerships and offerings with an offer price below USD 5. SDC data are manually corrected for the data errors identified by Jay Ritter.[4] Further, I exclude firms if COMPUSTAT data is not available in the year prior to the IPO. Also, return data must be available on CRSP within 18 months after the IPO.

Regarding SEOs, I select only true secondary offerings from SDC, again excluding unit offers, closed-end funds, ADRs, limited partnerships and penny stocks. Complete COMPUSTAT data must be available both in the year before the offering and in the year of the offering. CRSP data must be available during the month of the offering.

Additionally, in both samples I drop firms with total assets smaller than 10 million US$ (in 2004 dollars). Firms are not required to have complete data for all used variables available on COMPUSTAT every year. A number of IPOs meet all of the above criteria and are classified as original IPOs on SDC but have CRSP data available prior to the IPO. Since these firms are not true IPOs they are dropped. Firms from the IPO sample can enter the SEO sample if they are contained in the SDC database with seasoned offerings. IPOs in this case can enter the SEO sample from five calendar years after the IPO onwards, but not before. All firms are included in the sample until the year they exit COMPUSTAT. COMPUSTAT and CRSP data end in December 2005. While IPOs by definition can only be observed once per firm, many firms in the sample are multiple issuers of seasoned equity. 2,193 (67.9%) firms perform a single seasoned equity offering; 631 (19.5%) firms perform two issues; 198 (6.13%) firms issue three times, 82 (2.5%) firms issue four times, 36 (1.1%) firms issue five times and 90 (2.8%) firms issue six times or more.[5] Over time, SEOs shift from mostly NYSE firms during the 1970s to a high fraction of NASDAQ firms from the 1980s onwards.

Firm-year observation outliers are dropped according to certain restrictions as described below. Variable definitions mostly follow Baker and Wurgler (2002). Book equity E is defined as total assets A (COMPUSTAT item 6) minus total liabilities (item 181) and preferred stock (item 10) plus deferred taxes (item 35) and convertible debt (item 79). If preferred stock is missing it is replaced with the redemption value of preferred stock (item 56). Book debt D is

[4] Documentation of errors in the SDC database and corrections are available on Jay Ritter's website at http://bear.cba.ufl.edu/ritter/SDC%20corrections.pdf.

[5] SDC Platinum's coverage appears to be very similar both in width of coverage, i.e. the number of issuers covered, and the depth of coverage, i.e. the number of issues covered per issuer, as compared to the *Investment Dealer's Digest of Corporate Financing*. Brav, Geczy, and Gompers (2000) (BGG) use the latter source and identify 4,526 offerings made by 2,772 firms from 1975-1992. For the same time period I find raw counts of 4,167 offerings made by 2,478 firms. In BGG, 3.0 percent of firms issue 5 times ore more. In my sample this percentage is comparable at 3.9 percent of firms with 5 or more issues.

defined as total assets minus book equity. Book leverage D/A is defined as book debt divided by total assets. The normalization of book leverage as well as all consequent normalizations is by total assets at the end of the fiscal year. Market equity ME is defined monthly as the number of common shares outstanding times the stock price at the end of the preceding month, both items are from CRSP. As a robustness check I also define a second yearly measure of market equity ME^A as the number of common shares outstanding (item 25) times the share price (item 199), both items are from COMPUSTAT. I do this to check whether differences to previous studies, which have not used CRSP data may be due to differences between COMPUSTAT and CRSP, which are small but frequent. Market leverage M/A is defined as book debt divided by the sum of total assets minus book equity plus market equity. The market-to-book ratio M/B is the sum of total assets minus book equity plus market equity all divided by total assets.

Net debt issuance d/A is the change in book debt from fiscal year $t-1$ to t divided by assets. Book equity equals balance sheet retained earnings plus paid-in share capital. Net equity issuance e/A is therefore defined as the change in book equity minus the change in balance sheet retained earnings (item 36), all divided by assets. Newly retained earnings $\Delta RE/A$ are defined as the change in retained earnings divided by assets. Profitability $EBITDA/A$ is defined as earnings before interest, taxes and depreciation (item 13) divided by assets. Firm size is measured by $SIZE$, the logarithm of net sales (item 12). Tangibility of assets PPE/A is defined as net plant, property and equipment (item 8) over assets. Research and development expense $R\&D/A$ (item 46) is divided by assets and replaced by zero when missing. In the consequent regressions the dummy variable $R\&Dd$ is equal to one if $R\&D/A$ was replaced to zero from missing. Dividend payments Div/E are measured by common dividends (item 21) divided by year-end book equity. $CASH/A$ is defined as cash and short-term investments (item 1) divided by assets.

Firm year observations are dropped if any of the variables M/B, d/A, e/A, $\Delta RE/A$, $EBITDA/A$, D/A, $SIZE$, PPE/A, RD/A, INV/A, DIV/E or $CASH/A$ are missing in any fiscal year. For IPOs observations the variables d/A, e/A and $\Delta RE/A$ can be and M/B must be missing for the IPO year and the preceding year. Observations are dropped where M/B exceeds 10, as in Baker and Wurgler (2002). Observations are also dropped where D/A, d/A, e/A, $\Delta RE/A$, $EBITDA/A$, DIV/E or INV/A exceed 100 percent.

Table 1 reports summary statistics for both samples. Results for IPOs in Panel A show the impact of the offering on the cross-section of firms. Leverage drops from 67.5 percent before the IPO to 37.9 percent in the fiscal year of the IPO and increases slightly over the next years up to 44.5 percent seven years after the offerings. Market-to-book is high at 2.3 after the offering and declines in the following years. The large contribution of equity financing to overall financing is clearly visible from net equity financing e/A which is 41.9 percent in the year of the offering and declines rapidly. Interestingly debt financing d/A is slightly negative in the IPO year and quickly rises to 10.6 percent one year after the offering. The building up of financial slack is visible in cash balances $Cash/A$, which double from 11 percent pre-IPO to 23.2 percent post-IPO.

The summary statistics of SEOs are very similar to IPOs, although less pronounced. As

Panel B reports, SEOs similarly experience a large drop in leverage. Market-to-book is also highest in the year prior to the offering, declining consequently. Cash reserves only increase from 11.1 percent pre-offering to 15.1 percent post-offering. Overall however, the impact of SEOs on capital structure seems to be very similar to that of IPOs.

It is well established that IPOs take place in waves, which are often concentrated within industries. Figure 1 shows the strong fluctuation in the numbers of SEOs and IPOs during the sample period. The figure reports the three-month moving average number of SEOs and IPOs, detrended with the average growth rate of the economy at 0.25 percent per month during that period as in Alti (2006). The strong synchronization of primary and secondary issue markets is striking, particularly after 1985. The correlation coefficient is 0.65 for the whole sample and 0.78 for offerings from 1985 onwards. Lowry (2003), Rajan and Servaes (1997), Pagano, Panetta, and Zingales (1998) and Ritter (1984) as well as most practitioners suggest that industry effects influence individual public issues. It is therefore important to meaningfully capture dynamics at the industry level. Typically, studies use SIC codes at the time of the offering for this purpose, which however do not capture functional or vertical relationships. I instead use the 48 aggregate industries defined by Fama and French (1997). Table A1 shows the resulting industry breakdown by four-digit SIC codes. The sample contains firms from 41 out of 48 industries.

In unreported results I also analyze the distribution of IPOs and SEOs by size and market-to-book at the time of the offering. To do this I match size (market equity) and market-to-book with monthly precision, taking changing fiscal year ends into account.[6] Size and market-to-book breakpoints are formed quarterly by dividing all NYSE stocks into quintiles with equal numbers of firms. The intersection of the breakpoints results in 25 possible portfolio allocations for all IPO and SEO firms, following Brav, Geczy, and Gompers (2000). The results show that 51 percent of the SEO sample are within the two smallest size quintiles and regarding market-to-book, 41 percent are in the highest quintile. Only 22 percent are in the two lowest market-to-book quintiles. For IPOs the concentration in high market-to-book and small size quintiles is even more pronounced, consistent with the results of Brav, Geczy, and Gompers (2000). Both IPO and SEO firms in my sample systematically differ from the cross-section of NYSE firms at the time of the offering in having smaller size and higher market-to-book.

2.2 Measuring market timing opportunity

This section describes the previously outlined ex ante measures of market timing opportunity in more detail. For a firm to successfully time the market the opportunity to do so must arise. I use four approaches to address firm-specific market timing opportunities ex ante as follows.

First, the market timing hypothesis argues that firms issue equity when their equity is overvalued. I use a scaled version of the standard concept *present value of growth opportunities*

[6] Throughout the paper monthly precision is used to match market and accounting data and to take changing fiscal year ends into account. Years relative to the offering therefore do not necessarily contain 12 month period. To be consistent, absolute time periods are referred to by months throughout the paper.

($PVGO$) to measure how susceptible firm value is to overvaluation.[7] The current stock price of a firm P_0 is the capitalized value of its average earnings per share assuming zero growth plus the present value of future growth opportunities:

$$P_0 = \frac{EPS}{R} + PVGO,$$

where R is the firm's capitalization rate. *Relative* $PVGO$ ($RPVGO$) consequently is

$$RPVGO = \frac{E[P] - EPS/R}{E[P]}.$$

The $PVGO$ component is larger for growth stocks and smaller for value stocks. Consider a young, unprofitable, extreme growth firm. It will exhibit a high $PVGO$ relative to its stock price, as new shareholders are predominantly buying cash flows expected from future projects, not from assets in place. In this case information asymmetries between investors and managers are at their greatest and market timing opportunities arise. On the other hand, if firm value entirely depends on assets in place and no future growth opportunities exist, firms will not be subject to informational asymmetries and market timing opportunities do not exist. This is because the value of a firm with a history of positive earnings and little growth phantasies is much less subjective and therefore its value is much less likely to be affected by general market fluctuations. I calculate $PVGO$ using the middle of the original filing price range as the expected offer price $E[P]$. Industry costs of capital R is estimated from a market model at the industry level using the 48 Fama and French (1997) industries and a 25-month window around the offering.

I use two alternative measures of earnings per share (EPS). Earnings before interest and taxes (EBIT) from the fiscal year end preceding (following) the offering (COMPUSTAT item 178) are divided by shares outstanding before (following) the offering (item 25). The second lagged measure may be a better estimate of the $RPVGO$ assumed by investors and managers, as earnings for both SEOs and IPOs decrease substantially following the offerings in my sample, consistent with prior IPO research. The results are not affected by the use of either measure.[8] To eliminate extreme observations caused by large negative earnings ($RPVGO > 1$) and large positive earnings ($RPGVO < 0$) I winsorize both measures at the 1 and 99 percentiles for both IPOs and SEOs. To illustrate the measure, I calculate industry rankings based on average and median RPVGO ratios for the 48 Fama-French industries. The rankings confirm the intuition of the measure. The lowest-ranked industries are utilities, coal mines, tobacco, and shipping. High-

[7] See Brealey, Myers, and Allen (2006), pp.73-76. The $RPVGO$ measure is used for example by Benveniste, Wilhelm, and Yu (2003) to calculate firm-value uncertainty.

[8] I also use EBITDA (item 13) to calculate earnings per share as well as basic earnings per share (item 53) and basic earnings per share excluding extraordinary items (item 58), all from COMPUSTAT. Results are unchanged by this. Similarly I calculate earnings per share using shares outstanding prior to the offering (variable OUT) and shares outstanding after the offering (variable OUTPF) from SDC. However these data are frequently missing or inconsistent. For example, shares outstanding prior to the offering may be larger than shares outstanding after the offering. Alternatively calculating shares outstanding after the offering as shares outstanding prior to the offering plus all shares sold (including any overallotment) in all markets (TOTSHSOVSLD) frequently do not match OUTPF by a wide margin. See also Ljungqvist and Wilhelm (2003) for a discussion of SDC quality issues.

ranked industries are pharmaceuticals, precious metals, medical equipment, business services, entertainment and personal services. Generally, nascent industries score highly on the $RPVGO$ ratio.

Second, under the market timing hypothesis a firm will time equity issues to coincide with market peaks (Baker and Wurgler (2002)). The likelihood of being able to do so depends on financing constraints of the firm. A financially unconstrained firm will be more likely to be able to time its equity issues to coincide with peaks in equity prices. A financially constrained firm on the other hand will be less likely to wait for the optimal point in time for an equity issue. To illustrate this point, consider an equity carve-out as compared with a normal IPO. It is frequently claimed that equity carve-outs do differ from stand-alone IPOs in their greater opportunities for market timing (e.g. Pagano, Panetta, and Zingales (1998) and Tuna (2003)). The rationale is that subsidiaries to be taken public in a carve-out on average can rely on substantially larger financial resources through the internal capital market of the parent firm than a stand-alone IPO and are therefore less capital-constrained. Pagano, Panetta, and Zingales (1998) argue that "it follows that [the parent firm] has greater freedom to time the IPO to take advantage of a favorable market valuation in its particular sector". The same argument applies even more strongly to seasoned equity offerings, which predominantly finance investment from internal funds.

I measure financial constraints by using the Kaplan and Zingales (1997) index, recalculated by Steven Kaplan for the use of publicly available information in Lamont, Polk, and Saa-Requejo (2001). The index takes on larger values with increasing constraints and consists of cash flow to total capital (decreases constraints), market-to-book (increases constraints), book leverage (increases constraints), dividends to total capital (decreases constraints), and cash holdings to capital (decreases constraints). Since the market-to-book ratio is a separate variable in my analysis I construct two version of the KZ index, one with and one without the market-to-book ratio. Cash flow is defined as earnings before extraordinary items (item 18) plus depreciation (item 14) divided by total assets. Market-to-book and book leverage are used as previously defined. Dividends to total capital are common dividends (item 19) over total assets. Cash holdings are defined as cash and marketable securities (item 1) over total assets.[9][10]

Third, it is well documented that equity issues are influenced by the past history of security prices and that equity issues are preceded by price run-ups (e.g. Marsh (1982), Korajczyk, Lucas, and McDonald (1990)). Firms are more likely to be able to time the market if they have recently experienced price increases. This may not require superior information and is in the

[9]Using the coefficients provided in Lamont, Polk, and Saa-Requejo (2001) the full KZ index is $-1.001909 \times$ (cash flow) $- 0.2826389 \times (M/B) + 0.3139$(book leverage) $- 39.368 \times$ (dividends) $- 1.314759 \times$ (cash holdings).

[10]To make sure that my results do not rely on the construction of this particular index I also construct two alternative measures of financial constraints. I create deciles for IPOs and SEOs separately in the fiscal year preceding the offering using interest coverage, defined as EBITDA (item 13) over interest expenses (item 15), cash holdings, cash flow and book leverage. Kaplan and Zingales (1997) find that interest coverage ratios significantly determine financial distress. As book leverage increases financial constraints its ranking is reversed. I add up the decile scores of the four variables and divide the total score by 40. This creates an alternative index variable ranging from 0.1 to 1, with higher scores indicating larger constraints. As a second alternative I repeat this process but exclude book leverage from the index. All results of the analysis derive independently of which variable I use.

spirit of the pseudo-market timing argument by Schultz (2003). Ex ante, a firm is likelier to issue equity close to price peaks after periods of increasing share price. I measure abnormal pre-issue performance by calculating cumulative abnormal returns YT for every firm for the event window from $t-12$ to $t-2$ months, where t is the offering month. Normal returns are estimated from a market model using $t-36$ to $t-13$ month returns.

Fourth, and related to pre-issue performance, the likelihood of successfully timing the market may also depend on the incorporation of private information into the stock price of the firm. Roll (1988) proposes R^2 as a useful measure of investor's private information about a firm. If more firm-specific information is incorporated in the stock price, R^2 will be lower as more information causes more firm-specific return variation. Recent research has focused on the informational content of R^2 (e.g. Durnev, Morck, and Yeung (2004). Hou, Peng, and Xiong (2005) also show that R^2 is negatively related to momentum. Ex ante, a firm therefore is likelier to issue equity when its R^2 is low. At the same time, pre-issuance momentum should be positive, as previously described. If favorable firm-specific information gets incorporated in the share price, a firm will be able to profit from increasing firm value if it is able to time the idiosyncratic component of firm value. I use R-squared from time-series regressions preceding the offering to measure this information effect. The drawback of this measure is that it is only available for SEOs. High R-squared indicates that little firm-specific information is incorporated in the stock price. Following Roll (1988) I regress stock returns on industry returns and market returns. The specification is

$$r_{j,t} = \beta_{j,0} + \beta_{j,m} r_{m,t} + \beta_{j,i} r_{i,t} + \epsilon_{j,t}, \tag{1}$$

for each firm j, where t is the time index, $r_{j,t}$ is the return of firm j, $r_{m,t}$ is a market return and $r_{i,t}$ is an industry return for industry i, to which firm j belongs.The market return is the value weighted CRSP index, industry returns are calculated using value weighted averages of the 48 Fama and French (1997) industries. To avoid spurious correlations between firm returns and industry returns in industries with small numbers of firms, industry returns $r_{i,t}$ are calculated for industry portfolios that exclude all issuing firms as well as firm j for 60 months years after their offering dates. Regressions are estimated using weekly returns from $t-52$ to $t-1$.

It should be noted that these measures clearly do not capture the full extent of market timing opportunities for the cross-section of firms. Also, the proxies are necessarily noisy. The $RPVGO$ measure calculates the net present value of cash flows from assets in place as a perpetuity, which is a strong assumption on the firm level. Also, the industry costs of capital will not necessarily reflect the cost of capital of projects in place. While this introduces noise, a systematic bias is unlikely. Also, SEOs and particularly IPOs may be endogenous events in the sense that the observation of equity issuances itself is conditional on market conditions. This endogeneity is difficult to resolve. Particularly studying the decision of companies to go public has proved to be elusive with the notable exception of Pagano, Panetta, and Zingales (1998). They find that for both stand-alone IPOs and equity carve-outs market conditions matter for the decision to go public. Since this may bias my results towards detection of market timing, a finding of no

long-term effects of market timing would be even stronger.

2.3 Measuring market timing

To measure market timing, one line of research utilizes the tendency of firms to issue equity when their market valuations are high relative to book values or past market values. While earlier studies have relied on past share performance prior to issuances, more recent studies have focused on scaled price variables, i.e. variations of market-to-book. An alternative approach to capture market timing is to analyze risk-adjusted stock price performance for post-issue firms. The observation of negative abnormal performance exhibited by IPO firms post-issue by Ritter (1991) has been confirmed by several studies for IPO as well as for SEOs and is widely interpreted as evidence of market timing.[11] This paper implements both approaches as well as the approach of classifying market timing attempts by whether equity offerings take place in hot or cold markets (Alti (2006)).

2.3.1 Event-time returns and factor regression analysis

There is a continuing debate how to appropriately measure long-term performance of stock prices against various benchmarks and so far, no consensus exists. Indeed, Lyon, Barber, and Tsai (1999) state that the "analysis of long-run abnormal returns is treacherous". The issues to be resolved are measurement of performance and benchmark selection. To address this concern IPO and SEO long-run performance is measured both in event-time using cumulative abnormal returns (CARs) and buy-and-hold abnormal returns (BHARs) and in calendar-time using CAPM, Fama and French (1993) three-factor and Carhart (1997) four-factor rolling portfolio regressions.

Event-time CARs and BHARs are calculated relative to several benchmarks. First I calculate abnormal returns relative to several broad market indices. Then I form dynamic benchmark portfolios by size and market-to-book using NYSE quintile breakpoints and allocate all CRSP firms into the resulting 25 (5×5) portfolios. Portfolios are reformed quarterly and equal weighted returns are calculated for the next three months for every portfolio. This procedure is repeated in January, April, July and October of each year from 1969 to 2005. I excluding all IPO and SEO firms for five years following the offering from the pool of benchmark firms to avoid any new listing bias.[12].

I repeat this procedure forming dynamic benchmark portfolios by size, market-to-book and momentum. In this case I use quartile breakpoints instead of quintiles because a finer separation leaves some portfolios with few stocks during the sample period. Momentum breakpoints are

[11] Negative abnormal stock-price performance following IPOs and SEOs is reported by Ritter (1991), Loughran and Ritter (1995), Ikenberry, Lakonishok, and Vermaelen (1995), Spiess and Affleck-Graves (1995), and Eberhart and Siddique (2002). Schultz (2003) provides an overview of long-term abnormal performance in other countries.

[12] Loughran and Ritter (2000) argue that if issuing firms exhibit long-term underperformance, including issuing firms in benchmark returns will create a downward bias of the benchmark return and therefore a bias against detection of abnormal returns. Consistent with Brav, Geczy, and Gompers (2000) I find in unreported results that the bias is negligible however.

defined by calculating buy-and-hold returns over the preceding 12 months excluding the month before the sorting date, i.e. I follow the procedure suggested by Carhart (1997). Momentum matching is performed monthly, size and market-to-book matching is performed quarterly. Every IPO and SEO observation is assigned to one of the 64 ($4 \times 4 \times 4$) portfolios.

Finally, benchmark returns are also calculated using predictions from a market model estimated with pre-issue data for month $t - 36$ to $t - 13$. Since price momentum portfolios and pre-issue market model estimation requires price data for issuing firms prior to the event, these benchmarks can only be calculated for the sample of SEOs.

In addition to event-time return CARs and BHARs I also calculate abnormal returns in calendar time. It is well known that correlations of returns across events pose a particular problem in studies of long-term returns (Fama (1998)). No full solution to this problem is available when calculating returns in event-time.[13] Mitchell and Stafford (2000) show that significance levels of all returns calculated in event-time are greatly overstated with even moderate cross-sectional correlation. Using abnormal returns calculated in calendar-time avoid the problem of cross-correlation of returns as the time-series variation of the monthly abnormal returns does accurately capture the effects of the correlation of returns across event stocks. Abnormal returns calculated in calendar-time are also robust to the detection of pseudo-market timing in Schultz (2003).

I calculate the monthly return of a portfolio consisting of firms which have previously issued equity in a specified period τ, which here is 60 months. The calendar-time portfolios therefore include varying numbers of firm observations for different months during the sampling period. Using this portfolio return I follow the suggestion of Fama (1998) and estimate the following model for abnormal stock price performance:

$$R_{pt} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + pPR12_t + \varepsilon_t, \tag{2}$$

where R_{pt} is the raw return on the calendar-time portfolio in month t (i.e. of firms for which month t falls in the time period τ), R_{ft} is the one-year risk-free interest rate, R_{mt} is the value weighted return on a market index composed of all firms trading in month t, SMB_t is the return on a portfolio of small stocks minus the return on a portfolio of large stocks, HML_t is the return on a portfolio of low market-to-book stocks minus the return on a portfolio of high market-to-book stocks and $PR12_t$ is the return on a portfolio of high past return stocks minus the return on a portfolio of low past return stocks. The intercept estimate (α) provides a test

[13] Lyon, Barber, and Tsai (1999) discuss several possible adjustments to the variance-covariance matrix of event returns to account for cross-sectional dependence of firm observations. They find that the adjustments do not eliminate the problem of cross-sectional dependence.

of the null hypothesis that the mean monthly abnormal portfolio return is zero.[14] I use both value and equal weighted portfolio returns in my analysis, with the total market value of equity as weights.[15]

2.3.2 Scaled price variables

Previous research has used the market-to-book ratio as a proxy for mispricing of equity issues (Rajan and Zingales (1995), Pagano, Panetta, and Zingales (1998), Baker and Wurgler (2002) and Kayhan and Titman (2006)). I use the normal market-to-book ratio M/B_t in year t as well as the historic weighted average of market-to-book $M/B_{efwa,t}$ from Baker and Wurgler (2002):

$$M/B_{efwa,t} = \sum_{s=0}^{t} \left[(e/A_s + d/A_s) \,/ \sum_{\tau=0}^{t} e/A_\tau + d/A_\tau \right] M/B_s \tag{3}$$

where e/A and d/A are yearly net equity issues and net debt issues as previously defined. Weights smaller than zero are set to zero and weighted averages of M/B larger than 10 are dropped, following Baker and Wurgler (2002).

2.3.3 Hot-issue markets

Identifying market timing firms as those that go public during hot markets is suggested by Alti (2006). He studies hot versus cold-market IPOs and finds evidence consistent with hot-market IPOs taking advantage of windows of opportunity and issuing significantly more equity than cold-market firms. At the same time, Helwege and Liang (2004) show that hot-market and cold-market IPO firms exhibit almost no discernible differences across a large range of firm characteristics. Further, the hot market effect is robust to a large number of control variables accounting for capital structure decision. Following Alti (2006) I define a hot SEO (IPO) market month as one where the number of SEOs (IPOs) reported on SDC exceeds the sample median. The number of issuances is de-trended by 0.25 percent per month and smoothed by calculating a three-month centered moving average of the de-trended monthly number of issues over the sample period. I use HOT as a dummy variable that equals 1 for SEOs (IPOs) during hot SEO (IPO) markets.

[14] The downside of calendar-time returns is that they do not represent a straightforward investment strategy. Unlike buy-and-hold returns, which measure the return of an investor who buys shares in the secondary market at time s and holds them for the specified period of time τ, calendar-time portfolios measure the return of a portfolio bought at a specified point in time, which is consequently rebalanced to buy IPO firms and sell them after the specified period of time. Also, Loughran and Ritter (2000) argue that calendar-time returns have low power to detect abnormal performance in the first place, because they average across months of "hot" and "cold" issuing activity. Further, Lyon, Barber, and Tsai (1999) argue that calendar-time portfolios often yield misspecified test statistics in nonrandom samples. On the other hand, they show that the portfolios performs well when cross-sectional dependence is severe.

[15] Fama (1998) argues in favor of using value-weighted portfolio returns. because they reflect the actual wealth effects experienced by investors and because they reduce bad-model problems introduced by various asset pricing models, which seem to systematically underestimate the performance of small firms. Loughran and Ritter (2000), on the other hand, argue in favor of using equal-weighted portfolios because they precisely do not obscure the mispricing that is more likely to occur with smaller firms.

2.3.4 Control variables

In the consequent analysis I run traditional capital structure regressions to determine the impact of market timing on capital structure. I use the following control variables that have been found to determine capital structure.

Rajan and Zingales (1995) find that the main determinants of capital structure are firm size, tangibility of assets, profitability and market-to-book. Size tends to reduce leverage. It may also lower market-to-book if larger and more mature firms are less likely to have high market valuation to book value. I calculate $SIZE$ as the log of net sales. Higher profitability reduces leverage through retained earnings. It may also increase market-to-book if operationally profitable firms are valued higher by the market. I measure profitability $EBITDA/A$ as previously defined. Tangibility of assets tends to increase leverage as it reduces the costs of financial distress. I measure tangibility PPE/A as previously defined.

Additionally, dividends to book equity Div/E are similarly regarded as a proxy for profitability by Fama and French (2002) and Baker and Wurgler (2002). Regarding investment opportunities, research and development expenses $R\&D/A$ is a proxy for investment opportunities (Fama and French (2002)).

3 Results

3.1 Equity issuance

Equity issuances differ widely in relative size and composition. The sample contains primary offerings, in which new shares are sold as well as mixed offerings, in which both new shares are sold (the primary component) and existing shareholders sell some of their shares (the secondary component). This approach is conservative since in a Myers and Majluf (1984) world insiders sell their shares when they perceive them to be overvalued. Market timing therefore will be stronger for a sample of offerings that contains primary as well as mixed offerings than for a sample containing only primary offerings. Regarding their long-term stock price performance, mixed offerings should perform even worse than primary offerings in the presence of market timing. Including them therefore biases the results even in favor of detecting market timing.[16] Total proceeds from the offering, $Proceeds^T$, are therefore decomposed into primary proceeds $Proceeds^P$ and secondary proceeds $Proceeds^S$.

The amount of equity issued may potentially be influenced by differing firm characteristics between likely and unlikely market timers. To address this concern, I run the following regression

[16] Differences in any case are likely to be small. Brav, Geczy, and Gompers (2000) show that long-term performance of secondary issues is identical whether mixed issues are included or excluded.

which controls for various determinants of equity issuance:

$$
\begin{aligned}
Y_t = {} & c_0 + c_1 RPVGO_{t=-1} + c_2 IPO + c_3 IPO \times RPVGO_{t=-1} + c_4 YT + c_5 RSQ_{YT} \\
& + c_6 KZ\ Index_{t-1} + c_7 HOT + c_8 M/B_t + c_9 EBITDA/A_{t-1} + c_{10} SIZE_{t-1} \\
& + c_{11} PPE/A_{t-1} + c_{12} R\&D/A_{t-1} + c_{13} R\&D\ d_{t-1} + \varepsilon_t,
\end{aligned} \tag{4}
$$

where the dependent variable Y_t is one of several measures of the relative size and price of the offering proceeds. Offering proceeds are scaled by year-end total assets of the IPO year. The offering year t is the fiscal year during which the offering takes place. The regression in columns one to three include only SEO observations, columns four to six include both SEO and IPO observations. The variables proxying for market timing opportunities are the relative value of future growth opportunities, pre-offering performance, R^2 of pre-issue time-series regressions of firm returns, and the Kaplan and Zingales (1997) index of financial constraints. Market timing variables are the hot market dummy and the market-to-book ratio. Control variables are profitability, size, tangibility of assets and research and development expense. Previous research has identified these control variables as the main determinants of financing policy (Rajan and Zingales (1995), Fama and French (2002)). To control for industry-induced heterogeneity, all regressions are estimated with industry fixed effects using the Fama and French (1997) 48 industry definitions. $RPVGO_{t-1}$, YT, RSQ_{YT} and HOT are measured at the offering date, M/B is measured at year-end of the offering year and $KZ\ Index$, $EBITDA/A_t$, $SIZE_t$, PPE/A_t, $R\&D/A_t$ and $R\&Dd_t$ are lagged one year. The dummy variable $R\&Dd$ is equal to one if $R\&D/A$ is missing on COMPUSTAT, which is the case in 51 percent of firm-year observations. This controls for the possibility that firms for which R&D expense data is missing could exhibit systematically different characteristics from firms that report R&D expenses of zero.

Table 2 reports the results. The market timing opportunity measures all have a significant impact on equity issuance. In column one for example, a one standard deviation increase in $RPVGO$ is associated with a 0.84 percent increase in total proceeds $Proceeds^P$.[17] Similarly, a one standard deviation increase in YT is associated with a 1.1 percent increase in total proceeds. A one-standard deviation increase in RSQ_{YR} is even associated with a 2.4 percent increase in total proceeds. The impact of hot versus cold markets is similarly positive but not significant for SEOs. The significance of relative future growth opportunities and hot markets is driven by primary proceeds, not by secondary proceeds. Growth-firm insiders do not sell significant amounts of equity in SEOs. The $KZ\ index$ coefficient is positive and highly significant, confirming that the less financially constrained a firm is, the more equity it issues in an SEO. The results for the combined sample of SEOs and IPOs (columns 4-6) are very similar. IPOs issue a much larger fraction of equity however. The interaction term of $RPVGO$ and the IPO dummy does not eliminate the effect of $RPVGO$, confirming that the effect of growth firms is not due to IPOs only.

[17] Comparative statics in this section are calculated multiplying the standard deviation of the independent variable (not reported) with its coefficient. E.g. the standard deviation of $WRPVGO_{t=-1}$ in column one is 3.0946, therefore $0.270 * 3.0946 = 0.836$.

That firms which are likely to time the market are also issuing more equity could be due to two factors. First, firms could issue more equity and second, they could issue at higher prices. Following Alti (2006) I decompose the offering proceeds into two components, a price component and a quantity component:

$$\frac{Proceeds}{Total\ assets} = \frac{Number\ of\ shares\ issued}{Total\ shares\ outstanding} \times \frac{Offer\ price}{Total\ assets\ per\ share} \tag{5}$$

Panel B reports the results for this decomposition of the issued amount for total proceeds and primary proceeds. The results show that the timing character of SEOs mostly derives from selling equity at higher prices, not from selling larger amounts of equity. Growth opportunities, pre-issue stock performance and being financially unconstrained are all positively related the price component and unrelated to the quantity component. The pattern of RSQ_{YT} is slightly different but consistent with this. Its coefficient is positive for the price component of primary proceeds (column 4), while it is strongly negative for both the quantity and the price component of secondary proceeds (not reported).

The hot market dummy has a negative sign for the price component, meaning that hot market SEOs sell shares at significantly lower prices. This shows that the hot-market effect among IPOs documented by Alti (2006) does not similarly extend to SEOs.

Columns 5 to 8 report results for IPOs, which are generally very similar to those of SEOs. Again, firms with larger growth opportunities and financially unconstrained firms issue more equity. The hot market effect of IPOs however is now visible in both quantity and price components. This is entirely consistent with the market timing hypothesis.

In summary, firms with large market timing opportunities issue more equity at higher prices. This effect is more pronounced in hot markets for IPOs, but not for SEOs. Firms issue more equity if they are hard-to-value growth firms, if they are financially unconstrained, if they have experienced positive abnormal stock price performance prior to the issue and if private information has been incorporated into the stock price.

3.2 Announcement effects of equity issuances

To address the question of whether investors perceive equity issuers to be of bad quality, Table 3 reports event-study results for announcement effects for the sample of SEOs. Abnormal returns are calculated using a market model estimated over $t-250$ to $t-10$ trading days before the announcement. Panel A reports single event day returns, Panel B reports CARs for different event windows. Consistent with previous SEO announcement return studies I find an announcement return of -0.83 percent on the day of the announcement and a cumulative abnormal return of -1.58 percent for the $(0,+1)$. Both returns are statistically significant with a p-value smaller than 0.001. To confirm whether investors perceive firms with high market timing potential to be of low quality I divide SEO observations by whether they are during hot or cold markets and ranked by $RPVGO$ quintiles with equal number of SEOs in each decile.

Unreported results show that market reactions to hot-market firms are not different from those for cold-market firms. Significant differences exist between high and low-growth companies. The lowest $RPVGO$ quintile of firms has returns of -0.2 percent, while the highest $RPVGO$ quintile has returns of -1.0 percent, in both cases measured for the [0,+1] event window. Cross-sectional regressions with event returns as the dependent variable further show that tangibility of assets PPE/A always has a positive coefficient, independent of the event window. $RPVGO$ only has a negative coefficient for the [-1,0] and [-1,+1] windows. These results should be treated with caution due to the well-known limitations of event studies. Still, they suggest that differences in announcement returns are small and provide at best weak evidence of quality differences between firms as perceived by investors.

3.3 Long-term performance

Having established that SEO and IPO firms' equity issuances are influenced by market conditions, I address the question of what the consequent long-term stock price performance of these firms is. This is important, since equity issues may be an overoptimistic reaction of managers to rising stock prices or in fact the selling of overvalued equity. If equity issues are not mispriced, then we would not expect to observe underperformance of issuing firms. If market timing however means successfully redistributing wealth from new shareholders to existing shareholders we would expect to observe negative abnormal performance following equity issuances. Indeed, previous results of negative abnormal performance have been interpreted as evidence of market timing of IPOs (e.g. Ritter (1991)).

In a first step I report event-time returns and in a second step calendar-time factor regressions, which circumvent some of the problems associated with event-time returns.

Table 4 reports results for SEOs in Panels A and B and for IPOs in Panels C and D. Panels A and C report CARs, Panels B and D report BHARs, against broad-index benchmarks as well as against quarterly adjusted size and market-to-book benchmark portfolios (25 portfolios) and monthly adjusted size, market-to-book and momentum benchmark portfolios (64 portfolios). Issuer-performance is calculated equal weighted and value weighted over 60 months following the offering, as described in Section 2.3.1. The table highlights several important results.

First, the addition of the 1970-1975 and 1995-2002 periods to the results of Brav, Geczy, and Gompers (2000) generally reduces the performance of SEOs and IPOs. The reduction is larger for IPOs and amplified when using buy-and-hold returns. Compared to the results of Brav et al, for example value weighted raw SEO buy-and-hold returns decline from a minimum of 72.5 percent to just 31.8 percent in my sample (Panel B). Value weighted raw IPO buy-and-hold returns decline from a minimum of 52.6 percent (Brav, Geczy, and Gompers (2000), Table 4, Panel A) to just 6.5 percent in my sample (Panel D). Second, since benchmarks mostly do not experience similar declines when using buy-and-hold returns, abnormal returns similarly turn more negative. I winsorize both issuer returns and benchmark returns at the 5 and 95 percentiles to reduce the influence of outliers, particularly during the hot- and cold-market periods from 1995 to 1999 bias the results. Still, negative performance when using buy-and-hold returns is as

large as -60.9 percent for SEOs (value weighted) and -72.4% for IPOs (equal weighted).

Third, cumulative abnormal returns measured against size, market-to-book and momentum matched benchmarks for SEOs and size and market-to-book matched benchmarks for IPOs are almost identical to the results of Brav, Geczy, and Gompers (2000). Equal weighted cumulative abnormal returns for SEOs are negative at -14.6 percent when size, market-to-book and momentum matched portfolio benchmarks are used and positive for IPOs at 8.4 percent when size and market-to-book matched portfolio benchmarks are used. Similarly, value weighted cumulative abnormal returns are negative at -17.1 percent for SEOs and slightly negative at -4.7 percent for IPOs. This corresponds to a monthly abnormal return for SEOs of minus 26 basis points (equal weighted) or minus 31 basis points (value weighted) and a monthly abnormal return for IPOs of plus 13 basis points (equal weighted) or minus 8 basis points (value weighted). In other words, SEOs seem to slightly underperform firms with similar size, market-to-book and momentum characteristics, while the return of IPOs is identical to firms with similar size and market-to-book characteristics. This is consistent with previous results by Brav and Gompers (1997) and Brav, Geczy, and Gompers (2000). The reason why market-to-book matching eliminates the underperformance of IPOs is that IPO firms are mostly firms with small size and high market-to-book, as shown above. Small size and high market-to-book firms however tend to exhibit low absolute performance, independently of issuing equity.

Fourth, SEO firms experience strong positive momentum before the offering and negative momentum following the offering. In line seven of both Panels A and B I calculate benchmark returns using predictions from a market model estimated with pre-issue data for month $t - 36$ to $t - 13$. A firm's post-issue returns are therefore benchmarked against a market model estimated using its own pre-issue returns, capturing long-term momentum. As the results for cumulative abnormal returns show in Panel A, benchmark returns almost double from 64.9 percent when using size and market-to-book matching benchmarks portfolios to 128.7 percent when using benchmark returns calculated from the pre-issue market model parameters. Value weighted benchmark returns are still very large at 92.5 percent. Abnormal returns consequently are -73.8 percent (equal weighted) and -43.1 percent (value weighted). Panel B underlines how the compounding when using buy-and-hold returns amplifies extreme returns. Benchmark returns using BHARs are 972.5 percent (equal weighted) and 624.3 percent (value weighted). These results are in line with those of Mitchell and Stafford (2000) of strong pre-issuance SEO performance.

Next, in order to be able to draw inferences I use the alternative approach of factor regressions calculated in calendar-time from Equation (2) to confirm the previous results. The results are reported in Table 5. Panel A reports results for SEOs, Panel B reports results for IPOs.

The intercept estimates (*Alpha*) show whether the CAPM, three-factor Fama and French and four-factor models are able to price the portfolios of issuing firms. Not surprisingly, the CAPM is unable to price the IPO portfolio, with a large negative unexplained return. More surprisingly, SEOs are even priced by the CAPM.

The three-factor model leaves a large negative intercept for the equal weighted SEO portfolio,

and a similarly large negative intercept for the value weighted IPO portfolio. Both the three-factor and the four-factor model show that SEO and IPO portfolios load positively on the SMB factor. Equal weighted SEOs load marginally positively on the HML factor, while IPOs load consistently negatively on the HML factor, the factor loading strongly increases when value weighted returns are used. In other words, SEO stocks behave like small value stocks when equal weighted, and like small growth stocks when value weighted. IPOs behave like small value stocks.

In the four-factor model, factor loadings are similar, while both SEOs and IPOs show large negative factor loads for the $PR12$ factor when equal weighted returns are used and small negative loadings for value weighted returns. Both SEO and IPO stocks covary positively with low momentum stocks. Although SEO firms have high returns prior to the equity issue, as shown in Table 4, following the offering their returns look like the returns of low past return stocks. Post-issue, IPOs similarly behave like past loser stocks. A risk-based interpretation of the negative $PR12$ factor loading would be that SEO and IPO firms are less risky following the offering. An investor overoptimism interpretation would be that $PR12$ is picking up mispricing. In any case, the four-factor model is able to price SEO and IPO portfolios, both equal and value weighted. Estimates of *alpha* are economically small and not significantly different from zero. Abnormal monthly returns for SEOs are -0.040 percent (equal weighted) and -0.139 percent (value weighted), for IPOs they are 0.104 percent (equal weighted) and -0.247 percent (value weighted). Adjusted R^2 from all regressions ranges from a low of 70.1 percent for the CAPM to a high of 87.3 percent for the four-factor model, averaged across all regressions.

In summary, SEO and IPO firms do not exhibit negative abnormal performance following their equity issuances. IPOs exhibit neutral or even positive performance in event time, SEOs exhibit negative performance. In calendar time however abnormal performance disappears. IPO and SEO stock returns covary positively with returns of past loser stocks. The result that equity issuing firms do not exhibit abnormal performance is inconsistent with the hypothesis that equity is overvalued in the transactions. I later address the possibility that subsamples may exhibit different risk characteristics, which factor models are unable to price.

3.4 Alternative motives for equity issues

Having established that market conditions explain equity issuance, but that equity is not mis-priced in these issues, I check whether alternative explanations for the observed patterns exist by following two separate approaches. First, I analyze pre-issuance leverage, post-issue investment, post-issue profitability and pre-and post-issue dividend policy, following a similar approach to Alti (2006). Second, I explicitly address to what uses companies are putting the financing raised in the issue, and how they use financing raised in an equity offering relative to other financing. The analysis reveals that important differences exist between SEOs and IPOs. In the following results are therefore reported separately for the two offering types.

First, it could be that differences in pre-issue leverage drive the results. Firms with high market timing potential could also be firms which are overleveraged prior to the issuance and

aim at reverting this imbalance by issuing equity. Table 6 reports results for SEOs in Panel A and results for IPOs in Panel B. The results reject the hypothesis that growth firms issue equity to offset excess leverage accumulated in pre-issue years. As the first column in Panel A shows, high $RPVGO$ companies are leveraged significantly lower rather than higher prior to the issue. The regression also shows that as expected firms with higher market-to-book have lower leverage pre-issuance. On the other hand, hot market firms and firms which have experienced price run-ups are more highly leveraged. Together with the negative sign of RSQ_{YT} this is consistent with the hypothesis that low-quality firms take advantage of windows of opportunity during which costs of adverse selection are reduced to issue equity and decrease leverage.

Regarding investment, columns two to four show that growth firms show strong investment from year $SEO+1$ onwards. The coefficient of YT is similarly positive. The hot market variable on the other hand has no significant influence. This means that while hot-market SEO raise more equity, as shown in Table 2, this is not followed by actual investment. Also, low RSQ_{YT} firms invest significantly less following the offering. While growth firms therefore invest more following the offering, this does not apply to hot market firms and firms about which more private information is incorporated in the stock price. SEO firm behavior therefore is only partly consistent with market timing behavior, as equity issuance also seems to be driven by consequent investment of growth firms.

The results for profitability in columns five to seven show that as one would expect, growth firms are less profitable. Interestingly, neither YT nor RSQ_{YT} have any effect on profitability, suggesting that the pre-issue stock-price increase is not due to increased profitability. On the other hand hot-market firms are more profitable than cold-market firms, although the effect disappears within two years.

Regarding dividend payments, Alti (2006) argues that dividend payout patterns around hot-market IPOs are evidence of market timing. Although I get a similar effect for the sample of IPOs, my evidence shows that this effect does not extend to SEOs. Among SEOs, dividend payments are significantly higher among hot-market firms prior to the offering, in the offering year and for the next two years. On the other hand they are significantly lower for growth firms. The effects of YT and RSQ_{YT} are negligible. This is not consistent with dividend payments being used to redistribute market timing gains from new shareholders to existing shareholders.

IPO offerings in Panel B show that equity issuing firms are not overleveraged prior to the issue. Growth firms, hot-market firms and high market-to-book firms are not leveraged differently from other firms. Regarding investment, the difference to SEOs is that equity issuance has no impact on investment for IPOs, consistent with market timing. This raises the question of what issuing proceeds are used for in IPOs, which I address next. Regarding dividends, growth firms do not have significantly different payout ratios. They also significantly decrease dividends after the offering. The hot-market coefficient on the other hand is positive, but unreported results show that the hot-market coefficient is positive even prior to the offering, which again is difficult to reconcile with the view that dividends are used to redistribute wealth from new to existing shareholders, as argued by Alti (2006). A simpler explanation is that hot-market firms

use pre-issue dividends and the promise of post-issue dividends to attract investors.

Next, I turn to the immediate impact of equity issues on capital structure and how proceeds are used by firms. Table 7 reports results for SEOs in Panel A and for IPOs in Panel B.

The first variable of interest is the change in leverage induced by the equity issue. In the first column of Panels A and B, the dependent variable is the change in leverage in the offering year:

$$\begin{aligned}\frac{D}{A_t} - \left(\frac{D}{A}\right)_{t-1} &= c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{YT} + c_4 KZ\ Index_{t-1} \\ &+ c_5 HOT + c_6 M/B_t + c_7 EBITDA/A_{t-1} + c_8 SIZE_{t-1} \\ &+ c_9 PPE/A_{t-1} + c_{10} R\&D/A_{t-1} + c_{11} R\&D\ d_{t-1} + c_{12} D/A_{Pre} + \varepsilon_t,\end{aligned} \tag{6}$$

Leverage decrease is increasing in $RPVGO$, growth firms are therefore decreasing their leverage ratios more aggressively in the offerings. The same is true for firms with recent price run-ups and hot-market firms. Again, RSQ_{YT} has a positive coefficient–firms with low R^2 decrease leverage more strongly. The evidence therefore suggests that firms with the opportunity to do so strongly decrease their leverage. Finally, opposed to relative issuance amounts, financial constraints here result in a larger decrease in leverage. While financial constraints therefore are negatively related to equity issuance as a percentage of assets, they are positively related to the reduction in leverage.

Next, the change in leverage in (6) is decomposed as

$$\begin{aligned}\frac{D}{A_t} - \left(\frac{D}{A}\right)_{t-1} &= -\left[\left(\frac{E}{A}\right)_t - \left(\frac{E}{A}\right)_{t-1}\right] \\ &= -\left(\frac{e}{A}\right)_t - \left(\frac{\Delta RE}{A}\right)_t - \left[E_{t-1}\left(\frac{1}{A_t} - \frac{1}{A_{t-1}}\right)\right] \\ &= -\left(\frac{e}{A}\right)_t - \left(\frac{\Delta RE}{A}\right)_t + \left[\left(\frac{E}{A}\right)_{t-1}\left(\frac{\Delta Cash + \Delta Non - Cash}{A_t}\right)\right].\end{aligned} \tag{7}$$

The change in leverage is therefore minus net equity issuance minus the change in retained earnings plus the third term, which is the residual change in leverage, decomposed into the change in cash and the change in non-cash assets. Market timing firms would be expected to mostly add to cash, not to non-cash assets. [18] Columns two to five report the results for the three factors, with the last one divided into cash and non-cash components. As expected, equity issuance is positively influenced by $RPVGO$ and YT and negatively influenced by RSQ_{YT}. For example, for SEOs a one standard deviation increase in $RPVGO$ increases net equity issuance by 1.1 percent, a one standard deviation increase in pre-issue returns increases equity issuance by 1.02 percent. The hot market effect again disappears after controlling for these measures of market timing opportunity. For IPOs in Panel B $RPVGO$ similarly has a negative sign.

[18] I also try further splits of the change in assets using data on intangibles and acquisitions from the cash flow statements. Data however are frequently missing, particularly for IPOs.

The hot-market coefficient now is significant. This again suggests that the hot-market effect is important in the IPO market, but not in the SEO market.

The third and fourth columns show that the uses of proceeds are balanced between cash and non-cash assets for SEO firms and mostly cash for IPO firms. SEO growth firms do not add to cash, consistent with the previous evidence that they finance investment with the proceeds. SEO firms with price run-ups however funnel proceeds significantly more into cash. IPO funnel proceeds into cash if they are growth firms and if they go public in hot markets. This is consistent with the market timing hypothesis.

Finally, post-issue leverage confirms the previous findings. For SEOs the significantly positive coefficient of YT from Table 6 disappears, the significantly negative coefficient of RSQ_{YT} decreases further, the positive coefficient of HOT disappears and the significantly negative coefficient of M/B decreases further, while the coefficient of $RPVGO$ remains unchanged. For IPOs the insignificant coefficients of both $RPVGO$ and M/B become significantly negative.

So far the evidence suggests that firms are able to take advantage of market conditions in equity issues, but also that investment opportunities matter, as firms subsequently invest. The effect is more pronounced for SEO than for IPO firms. To more closely identify these two motives I use an alternative approach and analyze both financing sources and uses more directly. To do this I use additional data from cash flow statements and follow the COMPUSTAT definitions of sources and uses of funds. The goal is to identify whether the financing raised in the offering results in cash flow changes following the offering, that are attributable to investment activity rather than purely financial uses. I consider nine different variables, which are the change in assets as a benchmark and eight possible uses of funds–capital expenditure, increase in investments, acquisitions, changes in cash holdings, dividends, debt reductions, equity repurchases or other uses. The empirical specification is as follows:

$$Y_t = c_0 + c_1 \left(Proceeds^P / A_{t=-1}\right) + c_2 (Residual\ sources / A_{t=-1}) + c_3 SIZE_{t-1} + \epsilon_t,$$

where the dependent variable Y_t is the cumulative change in assets from pre-offering to post-offering year t scaled by pre-offering assets, i.e. $Y_t = (A_t - A_{t=-1})/A_{t=-1}$ or capital expenditures (COMPUSTAT item 128), increase in investment (item 113), acquisitions (item 129), changes in cash holdings (item 274), dividends (item 127), debt reductions (item 114), equity repurchases (item 115) and other uses (item 218) summarized from year 0 to post-offering year t and scaled by assets, i.e. $Y_t = \sum_{i=0}^{t} y_t / A_{t=-1}$. As before, $Proceeds^P$ are primary issue proceeds from SDC. *Residual sources* include all financing sources of the firm except the equity issued in the IPO or SEO.[19] This specification allows to separately analyze how different possible uses of funds react to equity issues and other sources of funding available to the firm and is similar to those of Kim and Weisbach (2006). *Residual sources* are summarized from year 0 to post-offering year t, i.e.

[19]Total sources of funds (item 112) are frequently missing on COMPUSTAT, even if individual subitems are not missing or do not match the sum of individual items (items 107 through 111, 218). I replace total sources of funds with the sum of individual fund sources in these cases.

$Residual\ sources = \sum_{i=0}^{t} Total\ sources\ of\ funds - Proceeds^p$.

The results are reported in Table 8. The table reports marginal effects dy/dx calculated at the sample median rather than regression coefficients. Marginal effects are useful in this setting as they can be easily interpreted. They show how an increase of one unit in the independent variable affects the dependent variable under the linear model. To illustrate reading the table, in the offering year one dollar of issued equity (primary capital) increases a firm's cash holdings by 38.6 cents in SEOs and by 64 cents in IPOs. The table documents three main results. First, the evidence for both SEOs and IPOs shows that the most important uses of issued equity are increased spending on capital expenditure, acquisitions and equity repurchases. Over a four-year period, one dollar of issued equity results in 36 cents spent on capital expenditure, 30 cents spent on acquisitions and 15 cents spent on equity repurchases for SEOs. For IPOs spending increases by 16 cents for capital expenditure, 18 cents for acquisitions and 9 cents for equity repurchases. Second, companies keep a significant proportion of issued equity in cash, and while noisy this proportion still declines over time. Third, the reaction for all variables is not immediate, i.e. firms do not immediately spend the proceeds but rather over an extended time period of several years. Taken together, the evidence suggests that firms use the issuing proceeds partly for investment and keep them partly in cash. The evidence therefore confirms the results of Table 7, namely that firms indeed subsequently increase investment but not in a one-for-one relationship.

To summarize, SEO growth firms are leveraged significantly lower prior to the issuance, while IPOs become that way through the issue. Although dividends disappear for IPOs from year $IPO + 1$ onwards, dividend patterns of both SEOs and IPOs do not suggest that wealth is redistributed from new shareholders to existing shareholders through a dividend mechanism. Offering proceeds are funneled partly into cash for IPOs and SEOs and partly into consequent investment in real assets and acquisitions. The evidence is consistent with both investment financing and utilizing favourable market conditions being motives for the equity issuance.

3.5 Long-term effects on capital structure and external financing

Next, I turn to the long-term capital structure effects of equity issuances. Since one would expect market timing to have at least a short-term impact on capital structure, the more relevant question is whether the effects are persistent.

In Table 9 I follow the approach of Baker and Wurgler (2002) and regress the cumulative change in leverage, i.e. contemporaneous leverage minus pre-offering leverage, on several control variables, while controlling for pre-offering leverage D/A_{Pre}. The specification is

$$\begin{aligned}\frac{D}{A}_t - \left(\frac{D}{A}\right)_{Pre} &= c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{YT} + c_4 KZ\ Index_{t-1} \\ &+ c_5 HOT + c_6 M/B_t + c_7 EBITDA/A_{t-1} + c_8 SIZE_{t-1} \\ &+ c_9 PPE/A_{t-1} + c_{10} R\&D/A_{t-1} + c_{11} R\&D\ d_{t-1} + c_{12} D/A_{Pre} + \varepsilon_t.\end{aligned} \tag{8}$$

If there is a long-term effect of market timing, the cumulative change in leverage should continue to reflect the differences in leverage caused by market timing as reported in the previous tables. The results however show that this is not the case.

In Panel A the dependent variable is the cumulative change in leverage $D/A_t - (D/A)_{Pre}$ for one year and three years following the offering. Recall from Table 7, where the dependent variable is the change in leverage $D/A_t - (D/A)_{Pre}$ in year zero, i.e. during the offering year, the coefficients for $RPVGO$ as -0.18, for YT as -0.62, for RSQ_{YT} as 0.45, for $KZ\ Index$ as -0.75 and HOT as insignificant. One year after the offering the coefficients have moved in the direction of decreased market timing impact. For example, $RPVGO$ increases to -0.13, YT increases to 0.54, while HOT even becomes significantly positive. Further, while some of the market timing opportunity measures remain significant in year $t+2$ (not reported), the table shows that in year $t+3$ with the exception of RSQ_{YT} all coefficients have further diminished and are no longer significantly different from zero.[20] In other words, leverage differences have dissipated.

One concern is that this effect may be influenced on the one hand by the interaction between $KZ\ Index$ and $D/A_{Pre-SEO}$ and on the other hand by the market-to-book ratio. Columns three and four therefore report estimation results without these two variables. The $RPVGO$ coefficient increases due to the correlation with M/B but becomes insignificant from year $t+2$ onwards. RSQ_{YT} becomes significant as it picks up the effect of M/B due to their correlation. Recall that the coefficient of RSQ_{YT} was strongly positive for the change in leverage from year $SEO-1$ to the SEO year. One year later it is significantly negative at -0.25 and the coefficient further decreases until year $SEO+3$ to -0.323. SEO firms with high pre-issue R^2 are more highly leveraged pre-issue and significantly lower leveraged post-issue. However, as I show later on, even this effect is not persistent in the long-run.

Columns five to eight report results for IPOs. The coefficient of $RPVGO$ becomes insignificant from year $IPO+2$ onwards. The hot-market coefficient already turns insignificant in year $IPO+1$. The financial constraints coefficient is insignificant from year $IPO+2$ onwards. Overall, the evidence shows that the market timing effects on cumulative changes in leverage disappear within two years for IPOs and within three years for SEOs.

Why does the impact on capital structure disappear? The evidence suggests that firms are rebalancing their capital structure. If that is the case, the crucial element is whether the change comes through the net effect of equity or through the net effect of debt.

Table 10 analyzes the long-term issuance policy of firms. As Panel A shows for SEOs, the strong decrease in leverage in the offering year is followed by an even larger increase in leverage over the next three years for high $RPVGO$ firms. From year $SEO+1$ onwards, $RPVGO$ has a positive coefficient. Similarly, the reduction in leverage experienced by high RSQ_{YT} firms turns into an increase from year $SEO+2$ onwards. Hot-market firms also increase leverage from year $SEO+1$ onwards. Financially constrained firms decrease leverage in the offering, but the coefficient changes sign in year $SEO+1$ and firms increase leverage. Finally, the negative

[20]The coefficient of RSQ_{YT} is insignificant from year $SEO+5$ onwards.

coefficient of YT is only significant in the SEO year and does not turn positive later. All of this suggests that firms actively releverage for two years following the offering.

The evidence for IPOs in Panel B again is similar and the reversal of capital structure is even more pronounced. Growth firms strongly increase leverage in year $IPO+1$. Beyond year one there is no effect. Similarly, hot-market firms releverage in the year following the offering, but not beyond.

Next, columns six to thirteen in Panel A and five to ten in Panel B show that the reversal in capital structure comes through debt issues. Regarding equity issues the pattern is as follows. Growth firms that issue large amounts of equity in the SEO cease equity issuance almost completely from year $SEO+1$ onwards. The strongly positive coefficient from the SEO year disappears. Firms with recent price increases show an even more pronounced pattern, equity issues in year $SEO+2$ are even significantly negative. RSQ_{YT} is very similar and financially constrained firms similarly cease to issue equity in year $SEO+1$, although they resume issuance in year $SEO+2$. Hot-market firms, which showed no significantly positive equity issuance in the SEO year in Table 7, show a significantly negative coefficient in years $SEO+1$ and $SEO+2$, meaning that companies are actively reducing outstanding equity.

The usefulness of these measures in explaining capital structure as compared to contemporaneous market-to-book is obvious. The market-to-book coefficient is significantly positive in all years and does not diminish in size. High market-to-book firms therefore consistently issue equity, which makes M/B less useful in explaining equity issue motives.

The pattern for debt issues is almost exactly reversed, i.e. after the SEO year firms undo the impact on capital structure by issuing debt. Growth firms, which do not issue any debt in the SEO year, issue significant amounts of debt in year $SEO+1$. A similarly strong reaction is visible for hot-market and financially distressed firms. No active rebalancing on the other hand is observed for firms with price run-ups and firms with high pre-issue R^2. Low R^2 only leads to significantly lower debt issuance in the offering year, but no consequent rebalancing. In other words, low R^2 firms substitute equity for debt in the SEO year but do not undo the resulting change in capital structure.

For IPOs in Panel B, results again are very similar and even more pronounced. Equity issuance for high $RPVGO$ firms, which was highly significant in the offering year, disappears and the $RPVGO$ coefficient becomes insignificantly negative in year $IPO+1$. Similarly, the previously highly significant hot market effect of equity issuance disappears from year $IPO+1$ onwards. Financially constrained firms, just like high market-to-book firms, consistently issue equity, independent of the relative IPO year.

Further, high $RPVGO$ firms issue highly significant amounts of debt in year $IPO+1$. The same is true for hot-market firms. Subsequently there is no effect on debt issuance.

In summary, the evidence shows that the impact of market timing rapidly unwinds in both SEOs and IPOs. While companies issue large amounts of equity in the offering year, equity issuance almost completely subsides in relative terms afterwards. The previous equity issuers become debt issuers in the year following the offering. After two years this active releveraging

renders the initial impact of market timing insignificant in almost all cases both for SEOs and IPOs.

4 Discussion

This section compares the results of the preceding analysis with those of Baker and Wurgler (2002) and replicates their results. I then show that my results of no abnormal performance of equity issuers similarly hold when dividing firms into subsamples by their initial market timing behavior. This confirms that equity issuance is not due to mispricing. After that I report the results of several robustness tests. Finally, I discuss whether the results regarding capital structure that do not support the market timing theory are instead consistent with the pecking order and the trade-off theory.

4.1 Comparative persistence of capital structure effects

The previous section shows that market timing effects have a short-run impact on capital structure. In the long-run however firms actively rebalance their capital structure and timing effects dissipate. Also, issuing firms do not subsequently underperform the market. The active rebalancing of leverage contrasts with the findings of Baker and Wurgler (2002). To demonstrate the different interpretations I replicate their design and add my market timing opportunity proxies while controlling for pre-issue leverage.

Table 11 reports results of cross-sectional regressions of the following form:

$$\begin{aligned}(D/A)_t - (D/A)_{Pre} = {} & c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{YT} + c_4 KZIndex_{t=-1} \\ & + c_5 HOT + c_6 M/B_{efwa,t-1} + c_7 M/B_{t-1} + c_8 EBITDA/A_{t-1} \\ & + c_9 SIZE + c_{10} PPE/A_{t-1} + c_{11} R\&D/A_{t-1} + c_{12} R\&Dd_{t-1} \\ & + c_{13} D/A_{Pre} + \epsilon_t,\end{aligned} \tag{9}$$

where $MB_{efwa,t-1}$ is the historic weighted average of market-to-book from Equation (3). Results are shown for relative offering years one to ten. The results illustrate the very different conclusions. The opportunity measures, which explain market timing behavior initially lose significance over time and do not explain capital structure past the offerings as firms actively rebalance their leverage through debt issues. Five years after the SEO or IPO they have no explanatory power.[21] The historic market-to-book measure however is highly significant from the post-offering year onwards for both IPOs and SEOs. As in Baker and Wurgler, the coefficient

[21] Note however that for SEOs, the coefficients for YT and $KZIndex$ become significant after ten years, while being insignificant before. The reason for this seems to be a survival effect however, not a market timing effect.

actually increases over time and renders contemporaneous M/B_{t-1} insignificant.[22] The effect is clearly visible even in univariate results for the SEO sample. Figure 2 plots R^2 of univariate regressions of the form

$$D/A_t = c_0 + c_1 X + \varepsilon_t, \tag{10}$$

where X in the left graph is alternatively $RPVGO_{t=-1}$, HOT, RSQ_{YT}, YT and $KZIndex$. In the right graph X is $EBITDA/A_{t-1}$, M/B_{t-1} and $M/B_{efwa,t-1}$. The explanatory power of the different variables for firm leverage declines over time, with the exception of $M/B_{efwa,t-1}$. The low persistence of market timing effects on leverage and the cumulative change in leverage makes it unlikely that M/B_{efwa} truly captures the impact of historic market timing attempts. If capital structure was as persistent as suggested by the highly significant coefficient of M/B_{efwa} even ten years after the offering, it should be picked up by the other proxy variables as well. One explanation for this is that the persistent effect of the historic market-to-book measure may not be due to its correlation with leverage. Kayhan and Titman (2006) suggest that it is in fact the persistence of both capital structure and M/B_{efwa} that drives the results, but not the covariance of the two measures. Also, Hennessy and Whited (2005) develop a model in which the explanatory power of M/B_{efwa} can be derived from a tax optimization policy in the presence of market timing considerations.

4.2 Long-term performance of subsamples

The previous section show that issuers do not exhibit abnormal negative performance over five years following the offering. This is inconsistent with the view that equity is overpriced at the time of the offering. I show in the following that this result not only holds for the cross-section, but also for subsamples of firms. If mispricing was the true explanation of firm behavior then one would expect mispricing to be detectable for the cross-section of firms. Since I show above that this not the case, one further step is to test whether differences exist between subsamples defined by their market timing characteristics. One would at least expect a performance spread between the most extreme market timing firms and those firms that do not time that market at all or very little.

Table 12 reports four-factor model results for subsamples formed by growth versus value firms, low-volume issuers versus high-volume issuers, hot-market firms versus cold-market firms, high versus low pre-issue R^2 firms, high versus low pre-issue performance firms and financially constrained versus non-financially constrained firms.

The results show that the results are robust to even this classification of firms. In 35 out of 40 regressions *Alpha* is not significantly different from zero. In four cases it is marginally significant, one of which is attributable to the lowest $RPVGO$ quintile of SEOs, which are

[22] The inclusion of $M/B_{efwa,t-1}$ does not influence the results for the $RPVGO_{t=-1}$ coefficient, but does strongly influence the M/B_{t-1} coefficient. Excluding $M/B_{efwa,t-1}$ from the regression renders contemporaneous M/B_{t-1} significant. Significance of $RPVGO$ is unchanged, i.e. its coefficient still becomes insignificant from year $IPO+1$ and $SEO+2$ onwards.

unlikely market timers. The three cases in which likely market timer subsamples underperform are value-weighted hot-market IPOs with a negative return of 89 basis points per month, value-weighted highest $RPVGO$ quintile IPOs with a negative return of of 75 basis points and financially constrained IPOs, both equal- and value-weighted. Equal-weighted returns for hot-market IPOs and the highest $RPVGO$ quintile however are not significantly different from zero. Only financially constrained IPOs exhibit consistently negative abnormal performance, which on the other hand is consistent with previous findings for firms in financial distress (Fama and French (1993).)

Finally, I test whether there are significant spreads between subsamples by estimating pooled regressions of the respective subsamples with a dummy variable MT for market timing firms and its interactions terms with MKT_t, SMB_t, HML_t and $PR12_t$ as follows:

$$\begin{aligned} R_{pt} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + sSMB_t + hHML_t + pPR12_t \\ + d_1 MT + d_2 MT \times (R_{mt} - R_{ft}) + d_3 MT \times SMB_t \\ + d_4 MT \times HML_t + d_5 MT \times PR12_t + \varepsilon_t, \end{aligned} \tag{11}$$

where MT is a dummy variable that equals 1 for the observations in the likely market timing category and 0 otherwise. This results in six pooled samples for SEOs (high versus low $RPVGO$, high versus low $Proceeds^t/A$, hot versus cold market firms, high versus low $KZIndex$, high versus low RSQ_{YT} and high versus low YT) and four pooled samples for IPOs (high versus low $RPVGO$, high versus low $Proceeds^t/A$, hot versus cold market firms and high versus low $KZIndex$). *Alpha* is now an estimate of abnormal performance of the base case (unlikely market timers) and d_1 is an estimate of the differential performance of likely market timers as defined by the various characteristics. Again, results are calculated separately for equal weighted and value weighted returns, resulting in 20 regression models. The results are not reported to conserve space. They show that in four out of the 20 specifications d_1 is significant, i.e. likely market timers' performance is significantly different. In one of these cases likely market timers actually perform significantly better than unlikely market timers (equal weighted high-volume IPOs). In the remaining three cases market timers perform worse (value weighted high $RPVGO$ IPOs, equal weighted financially constrained IPOs and value weighted financially constrained SEOs). The difference however becomes insignificant in the corresponding equal or value weighted regression. The evidence therefore confirms that no consistently significant performance spreads between likely and unlikely market timing firms exist, neither for SEOs nor for IPOs.

In summary, there is no consistent evidence of abnormal performance of equity issuers, even when split into subsamples by their market timing characteristics.

4.3 Additional robustness tests

First, I re-examine the results in Tables 3 and 4. They show that market timing opportunity has a significant impact on equity issuance in both SEOs and IPOs. The results are driven by primary proceeds and by higher prices at which firms issue. One concern is that the price effect could be driven by the fact that intangible assets play a larger role in firms that issue more equity. Indirectly this is shown through the positive coefficients of $RPVGO$ and M/B, which are likely to capture this effect, however imperfectly. An alternative approach is to use the relative amount of secondary proceeds as a percentage of total proceeds in estimation of equation (4). If market timing is the motivation for equity issuance, the market timing opportunity measures should continue to explain equity issuance. I therefore re-estimate equation (4), using $Proceeds^S/Proceeds^T$ as the dependent variable. $Proceeds^S/Proceeds^T$ is low on average at 10.2 percent for SEOs and 14.9 percent for IPOs. The results indeed are almost identical and do not differ between the SEO sample and the combined SEO and IPO sample. The coefficients for $RPVGO$ and YT are significantly positive, the coefficient of $KZIndex$ is negative but not significant and the coefficient for RSQ_{YT} is significantly negative. Therefore market timing opportunity variables have exactly the same pattern as in Tables 3 and 4. The only difference is the coefficient for the hot-market dummy, which is significantly negative, whereas it was significantly positive before. Consistent with my previous results, this again shows that the hot-market effect in my sample is more ambiguous than in Alti (2006).

Next, Table A2 in the appendix reports results for re-estimating equation (8) with the i) cumulative change in leverage, ii) net equity issues and iii) net debt issues as the dependent variables. This replicates the results of Tables 9 and 10. In Panels A and C SEO-year and IPO-year fixed effects are included as additional control variables. Because of the small number of IPOs in some years five-year interval dummy variables are used in the case of IPOs. The results are consistent with the results previously reported in Tables 9 and 10. In Panels B and D balanced SEO and IPO panels are used, i.e. the sample is conditional on survival of the firm. Again, the results are consistent with the results previously reported.

Finally, one concern is how comparable the results are to the population of non-issuers. Table A3 contrasts the SEO firm sample with a random firm sample drawn from the matched CRSP and COMPUSTAT firm universe. For this every SEO sample firm is matched by its offer date with all firms active on CRSP on that date. Benchmark firms satisfy the requirements of not having performed an IPO or SEO within the prior 60 months, not performing an SEO for the next 12 months and having price history available on CRSP for 36 months prior to the matched offer date. From the available benchmark firms two firms are randomly drawn for every SEO firm. For these firms the market timing opportunity measures RSQ_{YT} and YT are calculated. RSQ_{YT} is calculated as the time-series R^2 from equation (1) using weekly returns from $t-52$ to $t-1$ relative to the matched offer date. For YT cumulative abnormal returns are calculated using monthly returns for the event window from $t-12$ to $t-2$ and normal returns are estimated from a market model using returns from $t-36$ to $t-13$.

The univariate results in Columns one and two and the multivariate results from a Probit

regression in Columns three to five show that firms are likelier to announce an SEO after recent price increases and if R^2 is higher. Price run-ups therefore generally predict SEOs, while low R^2 does not. Price run-ups therefore positively predict both within-variation of equity issuance and variation between issuers and non-issuers. R^2 on the other hand predicts positive within-variation of equity issuance and negative variation between issuers and non-issuers. Market-to-book, profitability, R&D expenses and asset tangibility similarly raise the likelihood of an SEO. Interestingly, the negative but very small effect of leverage disappears after controlling for industry and offer-year fixed effects, indicating that SEO firms are not leveraged differently from non-SEO firms.

4.4 Alternative capital structure theories

The results of the capital structure analysis do not support the view that the capital structure of firms is determined by past attempts to time the market. Are the results regarding capital structure instead consistent with the pecking order and the trade-off theory? While the aim of the paper is primarily to test the market timing hypothesis, the evidence should also be interpreted in light of the main alternative explanations of capital structure.

Under the pecking order (Myers and Majluf (1984) and Myers (1984)), firms are financially constrained due to asymmetric information between investors and managers and require external financing to fund investment. If firms are required to raise equity to finance investment projects, new shareholders will demand compensation for potentially investing in a bad firm, which may render even positive-NPV projects unattractive. Underinvestment can be avoided if debt is issued instead of equity, since as opposed to equity, debt does not suffer from mispricing. Firms should therefore only resort to outside financing after exhausting their internal sources and their debt capacity. I find however that with high uncertainty about future growth opportunities issue more equity. Also, leverage ratios of growth firms appear to be too low rather than too high prior to the issue. Finally, firms are not financially constrained when issuing equity. In fact I show that equity issuance is decreasing when financial constraints increase. The evidence therefore does not support a pecking order view of firms raising external financing as a last resort to finance investment.

The trade-off theory on the other hand argues that capital structure is determined by the costs and benefits of debt versus equity and firms tend to follow an optimal target capital structure that minimizes a firm's costs of capital (Myers (1977) and Bradley, Jarrell, and Kim (1984)). More realistic dynamic trade-off models with adjustment costs have provided a rational for temporary deviations from optimal leverage targets (e.g. Fischer, Heinkel, and Zechner (1989), Strebulaev (2006)). My results are generally consistent with a dynamic trade-off model. The results suggest that firms balance away the impact of equity issuances, i.e. decreased leverage is actively rebalanced with higher debt issues following the offerings. Also consistent with the trade-off theory, I find that unprofitable (growth) firms seem to rely primarily on equity financing, while (value) companies with safer assets and larger positive income seem to prefer larger leverage ratios. While this is consistent with a trade-off view of capital structure, in which

firms undo deviations from target leverage ratios, the theory would have to explain the initial deviations as well. The results therefore suggest a dynamic trade-off model of capital structure, in which firms consider market timing as a short-term factor.

5 Conclusion

This paper analyzes the relevance of market timing for public equity issues with regard to changes in capital structure, consequent financing policy and firm performance. It shows that equity issuing firms do not exhibit long-term abnormal performance relative to non-issuing firms. While this in itself is an important result, the evidence also shows that there are no performance spreads between firms with differing ex-ante idiosyncratic opportunities to time the market. Finally the paper addresses the persistence of the impact of market timing on capital structure. Contrary to previous interpretations the evidence shows that following the offering year, firms actively rebalance the leverage changes. Companies revert their issuance policy and equity issuing firms become debt issuing firms. This active rebalancing causes the impact on leverage to dissipate.

The results of the paper are consistent with previous evidence that deviations from a target capital structure caused by taking advantage of favorable market conditions are only temporary. As the capital structure tests of the paper are primarily designed to confirm or reject the predictions of the market timing theory, it is beyond the scope of the paper to explicitly test alternative theories of capital structure. Still, the rebalancing evidence is easiest to reconcile with a dynamic trade-off model, that includes market timing as a short term factor.

References

ALTI, A. (2006): "How Persistent is the Impact of Market Timing on Capital Structure?," *Journal of Finance*, forthcoming.

BAKER, M., AND J. WURGLER (2002): "Market Timing and Capital Structure," *Journal of Finance*, 57, 1–32.

BENVENISTE, LAWRENCE M., L. A., W. J. WILHELM, AND X. YU (2003): "Evidence of Information Spillovers in the Production of Investment Banking Services," *Journal of Finance*, 58, 577–608.

BRADLEY, M., G. JARRELL, AND H. E. KIM (1984): "On the Existence of an Optimal Capital Structure: Theory and Evidence," *Journal of Finance*, 39, 857–878.

BRAV, A., C. GECZY, AND P. A. GOMPERS (2000): "Is the Abnormal Return Following Equity Issuances Anomalous?," *Journal of Financial Economics*, 56, 209–249.

BRAV, A., AND P. A. GOMPERS (1997): "Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies," *Journal of Finance*, 52, 1791–1821.

BREALEY, R. A., S. C. MYERS, AND F. ALLEN (2006): *Corporate Finance*. McGraw-Hill, New York, NY, 8th edn.

CARHART, M. (1997): "On Persistence in Mutual Fund Performance," *Journal of Finance*, 52, 57–82.

DAHLQUIST, M., AND F. DE JONG (2004): "Pseudo Market Timing: Fact or Fiction?," Unpublished working paper, Stockholm Institute for Financial Research et al.

DURNEV, A., R. MORCK, AND B. YEUNG (2004): "Does Firm-Specific Information in Stock Prices Guide Capital Budgeting?," *Journal of Finance*, 59, 65–105.

EBERHART, A. C., AND A. R. SIDDIQUE (2002): "The Long-Term Performance of Corporate Bonds (and Stocks) Following Seasoned Equity Offerings," *Review of Financial Studies*, 15, 1385–1406.

ECKBO, B. E., R. W. MASULIS, AND O. NORLI (2000): "Seasoned Public Offerings: Resolution of the 'New Issues Puzzle'," *Journal of Financial Economics*, 56, 251–291.

FAMA, E., AND F. FRENCH (1993): "Common Risk Factors in the Returns of Stocks and Bonds," *Journal of Financial Economics*, 33, 3–55.

FAMA, E. F. (1972): "Components of Investment Performance," *Journal of Finance*, 27, 551–567.

——— (1998): "Market Efficiency, Long-Term Returns, and Behavioral Finance," *Journal of Financial Economics*, 49, 283-306.

FAMA, E. F., AND K. R. FRENCH (1997): "Industry Costs of Equity," *Journal of Financial Economics*, 43, 153–194.

——— (2002): "Testing Trade-Off and Pecking Order Predictions About Dividends and Debt," *Review of Financial Studies*, 15, 1–33.

FISCHER, E. O., R. HEINKEL, AND J. ZECHNER (1989): "Dynamic Capital Structure Choice: Theory and Tests," *Journal of Finance*, 44, 19–40.

FLANNERY, M. J., AND K. P. RANGAN (2006): "Partial Adjustment Toward Target Capital Structures," *Journal of Financial Economics*, 79, 469-506.

GOMPERS, P. A. (2003): "The Really Long-Run Performance of Initial Public Offerings: The Pre-Nasdaq Evidence," *Journal of Finance*, 58, 1355–1392.

GRAHAM, J. R., AND C. R. HARVEY (2001): "The Theory and Practice of Corporate Finance: Evidence from the Field," *Journal of Financial Economics*, 60, 187–243.

HELWEGE, J., AND N. LIANG (2004): "Initial Public Offerings in Hot and Cold Markets," *Journal of Financial and Quantitative Analysis.*

HENNESSY, C. A., AND T. M. WHITED (2005): "Debt Dynamics," *Journal of Finance*, 60, 1129–1165.

HOU, K., L. PENG, AND W. XIONG (2005): "R^2 and Momentum," Ohio State University, Unpublished working paper.

HOVAKIMIAN, A. (2004): "The Role of Target Leverage in Security Issues and Repurchases," *Journal of Business*, 77, 1041–1071.

HOVAKIMIAN, A., T. OPLER, AND S. TITMAN (2001): "The Debt-Equity Choice," *Journal of Financial and Quantitative Analysis*, 36, 1–24.

IKENBERRY, D., J. LAKONISHOK, AND T. VERMAELEN (1995): "Market Underreaction to Open Market Share Repurchases," *Journal of Financial Economics*, 39, 181–208.

JENTER, D. (2005): "Market Timing and Managerial Portfolio Decisions," *Journal of Finance*, 60, 1903–1949.

JUNG, K., Y. C. KIM, AND R. STULZ (1996): "Timing, Investment Opportunities, Managerial Discretion, and the Security Issue Decision," *Journal of Financial Economics*, 42, 159–185.

KAPLAN, S., AND L. ZINGALES (1997): "Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?," *Quarterly Journal of Economics*, 112, 169–215.

KAYHAN, A., AND S. TITMAN (2006): "Firms' Histories and their Capital Structures," *Journal of Financial Economics*, forthcoming.

KIM, W., AND M. S. WEISBACH (2006): "Motivations for Public Equity Offers: An International Perspective," *Journal of Financial Economics*, forthcoming.

KORAJCZYK, R., D. LUCAS, AND R. L. MCDONALD (1990): "Understanding Stock Price Behavior Around the Time of Equity Issues," in *Asymmetric Information, Corporate Finance, and Investment*, ed. by R. G. Hubbard. University of Chicago Press, Chicago, IL.

LAMONT, O., C. POLK, AND J. SAA-REQUEJO (2001): "Financial Constraints and Stock Returns," *Review of Financial Studies*, 14, 529–554.

LEARY, M. T., AND M. R. ROBERTS (2005): "Do Firms Rebalance their Capital Structures?," *Journal of Finance*, 60, 2575–2619.

LERNER, J. (1994): "Venture Capitalists and the Decision to Go Public," *Journal of Financial Economics*, 35, 293–316.

LJUNGQVIST, A., AND W. J. J. WILHELM (2003): "IPO Pricing in the Dot-Com Bubble," *Journal of Finance*, 58, 723–752.

LOUGHRAN, T., AND J. R. RITTER (1995): "The New Issues Puzzle," *Journal of Finance*, 50, 23–51.

——— (1997): "The Operating Performance of Firms Conducting Seasoned Equity Offerings," *Journal of Finance*, 52, 1823–1850.

——— (2000): "Uniformly Least Powerful Test of Market Efficiency," *Journal of Financial Economics*, 55, 361–389.

LOUGHRAN, T., J. R. RITTER, AND K. RYDQVIST (1994): "Initial Public Offerings: International Insights," *Pacific-Basin Finance Journal*, 2, 165–199.

LOWRY, M. (2003): "Why Does IPO Volume Fluctuate so Much?," *Journal of Financial Economics*, 67, 3–40.

LYON, JOHN, D., B. M. BARBER, AND C.-L. TSAI (1999): "Improved Methods for Tests of Long-Run Abnormal Stock Returns," *Journal of Finance*, 54, 165–201.

MARSH, P (1982): "The Choice Between Equity and Debt: An Empirical Study," *Journal of Financial Economics*, 37, 121–144.

MAYER, C., AND O. SUSSMAN (2004): "A New Test of Capital Structure," Discussion Paper No. 4239, Centre for Economic Policy Research.

MITCHELL, M. L., AND E. STAFFORD (2000): "Managerial Decisions and Long-Term Stock Price Performance," *Journal of Business*, 73, 287–329.

MYERS, S. C. (1977): "Determinants of Corporate Borrowing," *Journal of Financial Economics*, 5, 147–175.

——— (1984): "The Capital Structure Puzzle," *Journal of Finance*, 39, 575–592.

MYERS, S. C., AND N. S. MAJLUF (1984): "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Finance*, 13, 187–221.

OVTCHINNIKOV, A. V. (2003): "Does Market Timing Explain Capital Structure Choices?," Unpublished working paper, Purdue University.

PAGANO, M., F. PANETTA, AND L. ZINGALES (1998): "Why Do Companies Go Public? An Empirical Analysis," *Journal of Finance*, 53, 27–64.

RAJAN, R. G., AND H. SERVAES (1997): "Analyst Following of Initial Public Offerings," *Journal of Finance*, 52, 507–530.

RAJAN, R. G., AND L. ZINGALES (1995): "What Do We Know About Capital Structure? Some Evidence from International Data," *Journal of Finance*, 50, 1421–1460.

RITTER, J. R. (1984): "Signaling and the Valuation of Unseasoned New Issues: A Comment," *Journal of Finance*, 39, 1231–1237.

——— (1991): "The Long-Run Performance of Initial Public Offerings," *Journal of Finance*, 46, 3–27.

ROLL, R. (1988): "R^2," *Journal of Finance*, 43, 541–566.

SCHULTZ, P. (2003): "Pseudo Market Timing and the Long-Run Underperformance of IPOs," *Journal of Finance*, 58, 483–517.

SHLEIFER, A., AND R. W. VISHNY (2003): "Stock Market Driven Acquisitions," *Journal of Financial Economics*, 70, 295–311.

SPIESS, D. K., AND J. AFFLECK-GRAVES (1995): "Underperformance in Long-Run Stock Returns Following Seasoned Equity Offerings," *Journal of Financial Economics*, 38, 243–267.

STREBULAEV, I. A. (2006): "Do Tests of Capital Structure Theory Mean What They Say?," *Journal of Finance*, forthcoming.

TAGGART, R. A. (1977): "A Model of Corporate Financing Decisions," *Journal of Finance*, 32, 1467–1484.

TUNA, I. (2003): "Determinants and Consequences of Equity Restructurings: How are Tracking Stocks Different to Equity Carve-Outs and Spin-Offs?," Unpublished working paper, University of Michigan.

VISWANATHAN, S., AND B. WEI (2005): "Endogenous Events and Long Run Returns," Unpublished working paper, Duke University.

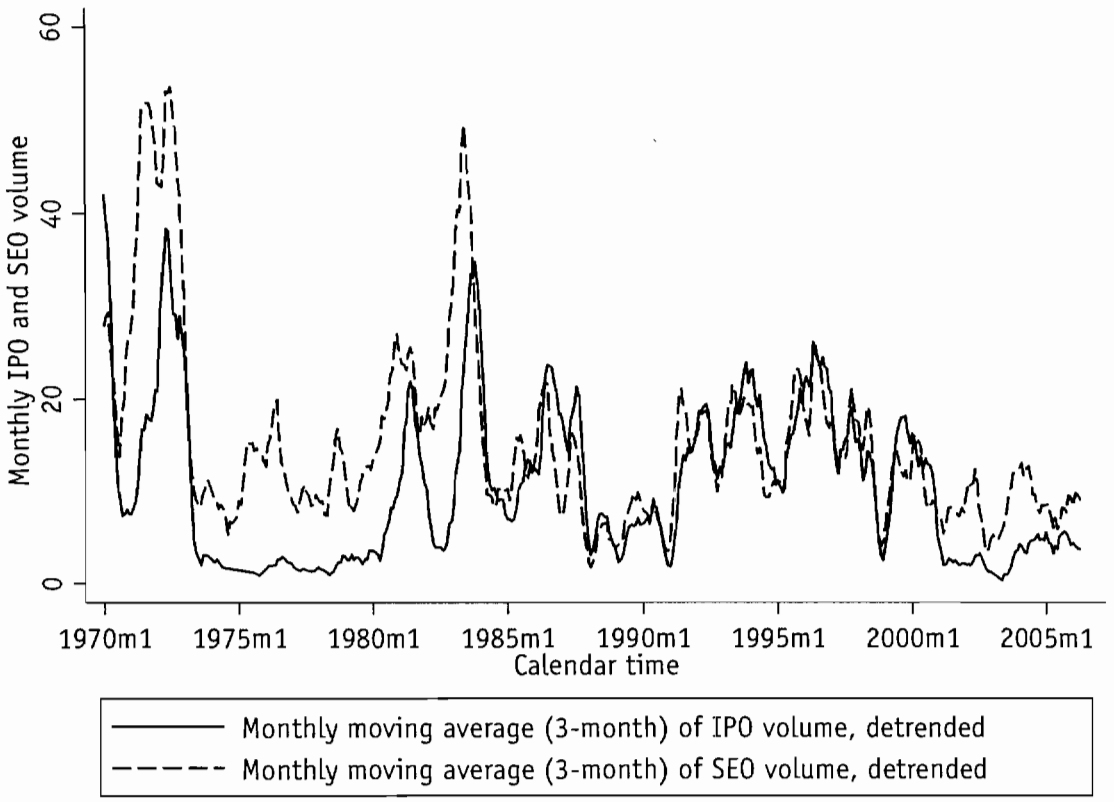

Figure 1 Time Series of Monthly Average Volume of Equity Issues 1970-2006

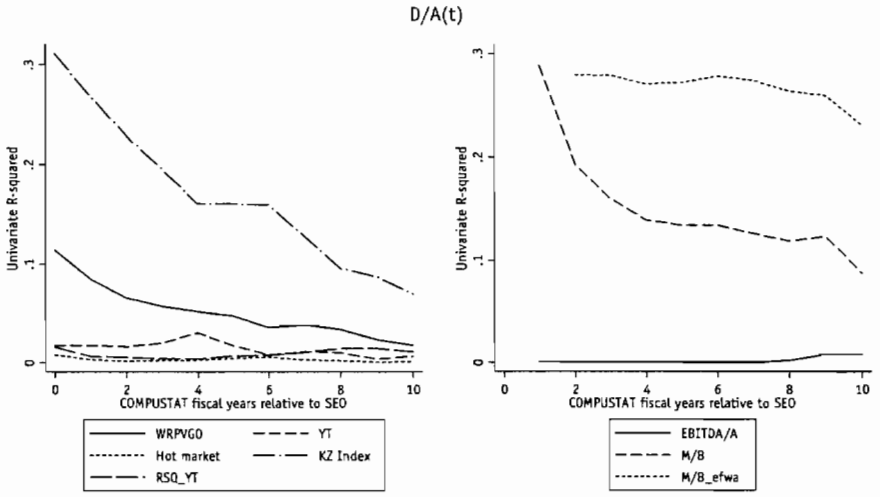

Figure 2 Explanatory Power of Determinants of Leverage in SEO firms

The figure plots R^2 from univariate regressions of the form

$$D / A_t = c_0 + c_1 X + \varepsilon_t,$$

where X in the left graph is the relative value of future growth opportunities ($WRPVGO_{t=-1}$), the hot-market dummy (HOT), R^2 from time-series regressions over t-52 to t-1 weeks pre-issue (RSQ_{YT}), abnormal returns from t-12 to t-1 months pre-issue (YT) and the Kaplan and Zingales index of financial constraints ($KZ\ Index$). In the right graph X is lagged earnings over assets ($EBITDA/A_{t-1}$), lagged market-to-book (M/B_{t-1}) and the lagged Baker and Wurgler historic weighted average of market-to-book ($MB_{efwa,-1}$).

Table 1 Sample Summary Statistics

This table reports descriptive statistics for the whole sample in IPO time. The sample consists of IPOs between 1 January 1970 and 31 December 2002 from SDC. The sample excludes secondary offerings, unit offers, closed-end funds, financial institutions (SIC codes 6000-6999), ADRs, limited partnerships, offerings with an offer below 5 US$ and firms with assets smaller than 10 million US$ (in 2004 dollars) at the end of the IPO fiscal year. SDC entries are manually corrected for data errors as explained in the text. Firms must have COMPUSTAT data available for the pre-IPO fiscal year. IPO time is defined relative to the IPO year, which is the fiscal year during which the IPO takes place. Firm-specific fiscal year ends and fiscal year changes are accounted for. With the exception of M/B and SIZE all variables are reported in percentage terms. D/A is book debt to assets (book leverage). M/B is assets minus book equity plus market equity all divided by assets, where book equity is defined as total assets minus total liabilities and preferred stock plus deferred tax and convertible debt. d/A is the residual change in assets divided by assets. e/A is the change in book equity minus the change in balance sheet retained earnings divided by assets. ΔRE/A is the change in retained earnings divided by assets. EBITDA/A is earnings before interest, taxes and depreciation divided by assets. SIZE is the log of net sales. PPE/A is net property, plant and equipment divided by assets. R&D/A are research and development expenses over assets. Inv/A is capital expenditures over assets. Div/E is dividends on common shares over book equity. Cash/A is cash and short-term investments over assets.

Panel A: Initial public offerings

Year	N		*D/A*	*M/B*	*d/A*	*e/A*	*ΔRE/A*	*EBITDA/A*	*SIZE*	*PPE/A*	*R&D/A*	*Inv/A*	*Div/E*	*Cash/A*
IPO-1	2,439	Mean	67.45					19.80	3.66	28.59	5.24	10.56	3.91	11.03
		Median	70.86					19.31	3.59	21.68	0.00	6.68	0.00	4.51
		SD	(20.83)					(17.97)	(1.49)	(22.64)	(10.88)	(11.66)	(12.94)	(15.37)
IPO	2439	Mean	37.86	2.32	-0.69	41.85	3.18	15.24	4.06	25.34	3.08	10.25	2.90	23.24
		Median	35.02	1.90	0.30	39.96	5.00	15.89	4.01	18.02	0.00	6.18	0.00	15.17
		SD	(19.88)	(1.42)	(19.77)	(21.25)	(10.92)	(11.52)	(1.38)	(21.62)	(5.72)	(11.24)	(9.96)	(22.99)
IPO+1	2268	Mean	40.69	1.91	10.57	7.37	1.22	11.36	4.33	27.60	3.82	10.30	0.29	17.96
		Median	38.55	1.51	7.18	1.43	4.65	13.29	4.33	21.14	0.00	6.99	0.00	9.24
		SD	(21.34)	(1.26)	(16.93)	(14.19)	(16.83)	(14.98)	(1.39)	(21.89)	(7.47)	(10.18)	(1.18)	(20.3)
IPO+2	2065	Mean	42.10	1.79	7.08	6.22	-1.11	9.81	4.50	28.23	4.10	8.55	0.37	16.57
		Median	40.21	1.38	5.15	1.13	3.32	12.28	4.53	21.21	0.00	5.85	0.00	7.86
		SD	(22.)	(1.24)	(16.87)	(14.38)	(19.98)	(16.01)	(1.46)	(22.17)	(8.12)	(8.75)	(2.52)	(19.83)
IPO+3	1816	Mean	43.21	1.66	4.98	4.72	-1.00	9.82	4.65	28.23	4.14	7.37	0.33	15.14
		Median	42.06	1.27	3.79	0.96	3.03	12.14	4.68	21.68	0.00	5.04	0.00	6.58
		SD	(22.12)	(1.13)	(19.17)	(12.41)	(17.81)	(14.98)	(1.42)	(21.82)	(8.15)	(7.66)	(1.34)	(18.36)
IPO+5	1378	Mean	43.09	1.56	2.44	4.01	-1.79	9.85	4.85	28.17	4.28	6.77	0.42	15.08
		Median	42.05	1.21	2.38	0.66	2.32	11.48	4.92	22.20	0.00	4.65	0.00	6.92
		SD	(21.89)	(1.08)	(15.89)	(12.78)	(18.22)	(14.89)	(1.51)	(21.73)	(8.14)	(6.93)	(1.89)	(18.15)
IPO+7	1052	Mean	44.53	1.55	1.52	2.84	-1.40	10.33	5.05	28.39	4.34	6.51	0.60	14.88
		Median	43.43	1.18	1.90	0.57	2.76	11.72	5.10	22.59	0.00	4.57	0.00	7.62
		SD	(21.83)	(1.1)	(19.73)	(11.3)	(20.8)	(14.81)	(1.51)	(21.83)	(8.51)	(6.74)	(2.9)	(17.52)

Panel B: Seasoned equity offerings														
Year	N		*D/A*	*M/B*	*d/A*	*e/A*	*ΔRE/A*	*EBITDA/A*	*SIZE*	*PPE/A*	*R&D/A*	*Inv/A*	*Div/E*	*Cash/A*
SEO-1	4,852	Mean	51.80	1.87	9.71	8.45	1.57	12.04	5.08	44.71	3.59	10.51	2.35	11.06
		Median	55.12	1.31	7.52	2.67	2.42	12.49	5.09	37.76	0.00	8.28	0.00	3.43
		SD	(19.3)	(1.4)	(15.77)	(15.85)	(12.37)	(13.31)	(1.83)	(29.69)	(9.27)	(9.5)	(3.4)	(17.53)
SEO	5,304	Mean	44.40	1.79	5.02	20.58	1.87	11.63	5.34	42.97	2.68	10.15	2.19	15.14
		Median	46.96	1.34	4.24	14.46	2.54	12.08	5.36	35.21	0.00	7.96	0.00	5.27
		SD	(20.27)	(1.23)	(13.88)	(18.9)	(10.81)	(10.88)	(1.76)	(30.03)	(6.63)	(9.26)	(3.26)	(20.36)
SEO+1	5,083	Mean	46.29	1.55	7.08	5.61	-0.03	10.32	5.56	44.60	3.04	10.10	2.32	12.11
		Median	49.59	1.17	5.56	2.15	1.76	11.61	5.62	38.06	0.00	8.11	0.00	3.69
		SD	(20.07)	(1.06)	(16.43)	(15.84)	(13.74)	(12.68)	(1.72)	(29.6)	(8.08)	(8.52)	(3.1)	(17.85)
SEO+2	4,756	Mean	47.20	1.44	5.33	4.86	-0.80	9.83	5.72	45.75	3.09	8.96	2.45	11.03
		Median	50.94	1.10	4.36	1.95	1.42	11.32	5.79	40.12	0.00	7.18	0.46	3.27
		SD	(19.84)	(.97)	(13.64)	(11.7)	(14.49)	(13.25)	(1.71)	(29.46)	(8.49)	(7.66)	(3.28)	(16.9)
SEO+3	4,358	Mean	47.99	1.38	3.87	4.07	-1.24	9.89	5.83	46.76	3.08	8.22	2.56	10.24
		Median	51.88	1.05	3.59	1.64	1.25	11.29	5.89	41.99	0.00	6.70	0.67	3.02
		SD	(19.49)	(.93)	(23.27)	(10.88)	(15.49)	(12.52)	(1.68)	(29.45)	(8.58)	(6.79)	(3.49)	(15.95)
SEO+5	3,636	Mean	49.21	1.32	2.53	3.32	-1.01	10.41	6.08	48.34	2.76	7.63	2.80	9.23
		Median	52.56	1.03	2.70	1.31	1.29	11.60	6.16	45.32	0.00	6.14	1.18	2.90
		SD	(18.91)	(.89)	(14.4)	(10.98)	(14.19)	(11.84)	(1.66)	(29.11)	(7.89)	(6.48)	(3.45)	(14.81)
SEO+7	3,050	Mean	50.32	1.31	1.40	2.97	-0.94	10.75	6.28	49.44	2.57	7.19	3.07	8.60
		Median	52.95	1.02	2.23	1.16	1.22	11.75	6.37	48.68	0.00	5.82	1.80	2.72
		SD	(18.4)	(.89)	(35.37)	(10.05)	(15.96)	(12.11)	(1.66)	(28.66)	(7.58)	(5.93)	(3.57)	(13.79)

Table 2 Equity Issuance Characteristics

This table reports cross-sectional regressions results for the combined sample of SEOs and IPOs. The specifications are of the form

$$Y_t = c_0 + c_1 RPVGO_{t=-1} + c_2 IPO + c_3 IPO \times RPVGO_{t=-1} + c_4 YT + c_5 RSQ_{YT} + c_6 KZ\ \text{Index}_{t=-1} + c_7 HOT$$
$$+ c_8 M/B_t + c_9 EBITDA/A_{t-1} + c_{10} SIZE_{t-1} + c_{11} PPE/A_{t-1} + c_{12} R\&D/A_{t-1} + c_{13} R\&Dd + \varepsilon_t,$$

where Y_t is the dependent variable indicated in the column title and $t=0$ is the fiscal year of the SEO or IPO. $Proceeds^T$ are total offering proceeds, $Proceeds^P$ are primary proceeds, $Proceeds^S$ are secondary proceeds. The scaling variable for proceeds is total assets at the end of the offering fiscal year. The dummy variable IPO equals one for IPO observations and zero otherwise. In Panel B the proceeds variables are decomposed as $\frac{Proceeds}{Total\ assets} = \frac{Number\ of\ shares\ issued}{Total\ shares\ outstanding} \times \frac{Middle\ of\ filing\ range\ price}{Total\ assets\ per\ share}$, where *Quantity* $P^T/A_{t=}0$ is the first component and *Price* $P/A_{t=0}$ is the second component. All variables are expressed in percentage terms with the exception of *Price* $P/A_{t=0}$. All regressions are estimated with industry fixed effects using Fama and French (1997) 48 industry definitions. The regressions contain an unreported constant. Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Offering proceeds

	$Proceeds^T/A_{t=0}$	$Proceeds^P/A_{t=0}$	$Proceeds^S/A_{t=0}$	$Proceeds^T/A_{t=0}$	$Proceeds^P/A_{t=0}$	$Proceeds^S/A_{t=0}$
$RPVGO_{t=-1}$	0.243***	0.125***	0.050*	0.232***	0.104***	0.066**
	[0.046]	[0.033]	[0.030]	[0.048]	[0.035]	[0.029]
IPO	-	-	-	17.010***	13.453***	1.377***
	-	-	-	[0.655]	[0.513]	[0.355]
$IPO*RPVGO_{t=-1}$	-	-	-	0.071	0.133**	-0.062
	-	-	-	[0.079]	[0.059]	[0.047]
YT	0.910**	0.642**	0.286*	-	-	-
	[0.454]	[0.326]	[0.149]	-	-	-
RSQ_{YT}	-1.252***	-0.558***	-0.448***	-	-	-
	[0.137]	[0.097]	[0.090]	-	-	-
$KZ\ Index_{t=-1}$	-1.345***	-0.870***	-0.342*	-1.527***	-1.142***	-0.225
	[0.288]	[0.218]	[0.191]	[0.295]	[0.247]	[0.206]
HOT	0.486	0.493*	-0.108	1.577***	1.256***	0.052
	[0.374]	[0.284]	[0.242]	[0.407]	[0.315]	[0.238]
M/B_t	4.988***	2.663***	1.717***	5.271***	2.737***	1.721***
	[0.325]	[0.220]	[0.245]	[0.286]	[0.196]	[0.207]
$EBITDA/A_{t-1}$	-0.015	-0.136***	0.118***	0.104***	-0.080***	0.172***
	[0.028]	[0.022]	[0.016]	[0.023]	[0.017]	[0.013]
$SIZE_{t-1}$	-4.097***	-3.374***	-0.584***	-4.780***	-3.988***	-0.670***
	[0.132]	[0.099]	[0.071]	[0.130]	[0.104]	[0.063]
PPE/A_{t-1}	-0.129***	-0.085***	-0.035***	-0.127***	-0.090***	-0.028***
	[0.012]	[0.009]	[0.009]	[0.012]	[0.009]	[0.007]
$R\&D/A_{t-1}$	0.139***	0.145***	0.011	0.230***	0.151***	0.074***
	[0.050]	[0.042]	[0.027]	[0.041]	[0.030]	[0.023]
$R\&D\ Dummy_{t-1}$	1.219**	0.194	0.656*	-0.153	-0.332	-0.109
	[0.575]	[0.403]	[0.367]	[0.626]	[0.491]	[0.335]
N	5291	5291	5291	7676	7676	7676
$Adj.\ R^2$	0.619	0.645	0.177	0.6	0.582	0.202
$RMSE$	13.149	9.468	8.276	17.923	13.625	10.028
F-stat	146.898	145.118	19.119	266.344	251.73	34.486

Panel B: Decomposition of offering proceeds								
	Seasoned equity offerings				Initial public offerings			
	$Proceeds^T/A_{t=0}$		$Proceeds^P/A_{t=0}$		$Proceeds^T/A_{t=0}$		$Proceeds^P/A_{t=0}$	
	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
$RPVGO_{t=-1}$	-116.873	0.239***	-101.148	0.170***	-0.028	0.095***	-0.047	0.085***
	[119.971]	[0.025]	[104.272]	[0.024]	[0.044]	[0.019]	[0.039]	[0.017]
YT	10.189	0.369**	9.981	0.220*	-	-	-	-
	[11.927]	[0.144]	[11.682]	[0.115]	-	-	-	-
RSQ_{YT}	-94.789	0.003	-77.204	0.225***	-	-	-	-
	[135.221]	[0.094]	[118.908]	[0.084]	-	-	-	-
$KZ\ Index_{t=-1}$	-28.855	-1.914***	-28.681	-1.357***	0.207	-0.552***	0.135	-0.466***
	[29.289]	[0.246]	[28.887]	[0.241]	[0.139]	[0.087]	[0.115]	[0.093]
HOT	371.914	-0.945***	329.28	-0.727***	1.311*	1.756***	1.258**	1.355***
	[327.799]	[0.256]	[285.766]	[0.245]	[0.712]	[0.465]	[0.574]	[0.451]
M/B_t	20.598	7.315***	15.662	5.184***	-1.530***	3.143***	-1.719***	1.950***
	[40.680]	[0.248]	[36.123]	[0.249]	[0.184]	[0.196]	[0.146]	[0.177]
$EBITDA/A_{t-1}$	-5.934	-0.068***	-5.373	-0.130***	0.041**	0.027*	-0.047***	-0.046***
	[5.068]	[0.019]	[4.447]	[0.018]	[0.017]	[0.016]	[0.014]	[0.014]
$SIZE_{t-1}$	89.091	-0.274***	79.386	-0.227***	-1.264***	-1.343***	-1.469***	-1.300***
	[79.206]	[0.076]	[69.207]	[0.071]	[0.206]	[0.140]	[0.175]	[0.135]
PPE/A_{t-1}	-1.091	-0.045***	-0.975	-0.021***	-0.012	-0.029***	-0.007	-0.029***
	[1.123]	[0.007]	[1.009]	[0.007]	[0.015]	[0.009]	[0.013]	[0.009]
$R\&D/A_{t-1}$	1.809	0.128***	1.516	0.139***	-0.015	0.092***	-0.052**	0.054**
	[2.492]	[0.044]	[2.183]	[0.040]	[0.031]	[0.024]	[0.023]	[0.025]
$R\&D\ Dummy_{t-1}$	102.133	0.852**	91.717	0.215	-0.549	-0.687*	0.394	-0.101
	[84.217]	[0.368]	[74.623]	[0.323]	[0.715]	[0.368]	[0.577]	[0.356]
N	5288	5288	5288	5288	2356	2356	2356	2356
$Adj.\ R^2$	0.013	0.679	0.013	0.598	0.079	0.439	0.125	0.329
$RMSE$	7064.942	8.514	6269.077	7.871	12.826	8.036	10.12	7.554
F-stat	0.05	179.783	0.048	109.256	6.117	30.258	8.288	18.836

Table 3 Announcement Event Returns of Seasoned Equity Offerings

Event-study abnormal stock returns for SEO announcements. Abnormal returns are adjusted by a market model estimated over the 250 trading days ending 10 days before the announcement with the value-weighted CRSP daily index as the market index. Cumulative announcement period returns in Panel B are defined as the cumulative abnormal returns over the respective event windows. The *t*-statistics and *z*-statistics are tests whether the abnormal returns and cumulative abnormal returns are significantly different from zero. *t*-statistics are adjusted for serial correlation.

Panel A: Abnormal event day returns

Day	*N*	Percent negative	Abnormal return in %		*t*-statistic	*p*-value	*z*-statistic	*p*-value
			Mean	Median				
-5	5,342	53.8	0.05	-0.12	0.74	0.228	0.01	0.504
-4	5,342	54.8	-0.11	-0.16	-1.20	0.115	-0.97	0.166
-3	5,342	55.6	-0.13	-0.17	-2.30	0.011	-1.46	0.072
-2	5,343	55.8	-0.16	-0.19	-3.63	0.000	-1.91	0.029
-1	5,342	55.6	-0.09	-0.18	-2.36	0.009	-1.47	0.072
0	5,341	61.8	-0.83	-0.47	-17.50	0.000	-8.07	0.000
1	5,340	62.0	-0.75	-0.49	-16.81	0.000	-8.50	0.000
2	5,341	55.6	-0.10	-0.18	-3.46	0.000	-1.84	0.034
3	5,342	55.5	-0.10	-0.16	-2.90	0.002	-1.61	0.055
4	5,341	54.1	-0.04	-0.15	-1.12	0.131	-0.85	0.197
5	5,341	54.3	0.05	-0.13	-0.71	0.240	-0.63	0.265

Panel B: Cumulative abnormal event window returns

Event window	*N*	Percent negative	Abnormal return in %		*t*-statistic	*p*-value	*z*-statistic	*p*-value
			Mean	Median				
(-1,+1)	5,342	66.0	-1.67	-1.22	-22.07	0.000	-10.42	0.000
(-1,0)	5,342	61.1	-0.92	-0.64	-14.75	0.000	-6.75	0.000
(0,+1)	5,342	66.4	-1.58	-1.15	-24.48	0.000	-11.72	0.000
(-3,+3)	5,343	65.2	-2.16	-1.59	-20.42	0.000	-9.39	0.000
(-5,+5)	5,343	63.2	-2.21	-1.66	-17.43	0.000	-8.23	0.000

Table 4 Long-Run Event-Time Performance of Public Equity Offerings

This table reports the event-time long-run performance for the sample of SEOs in Panels A and B and for IPOs in Panels C and D. Issuer performance is calculated equal-weighted and value-weighted over 60 months following the offering. The table reports the comparative performance of several benchmarks and calculates abnormal returns of issuers relative to the benchmarks. Panels A and C report cumulative returns for issuers and benchmarks and cumulative abnormal returns of issuers, Panels B and D report buy-and-hold returns for issuers and benchmarks and buy-and-hold abnormal returns of issuers.. In each panel, the first four rows report results using the S&P 500, NASDAQ Composite, CRSP value weighted and CRSP equal weighted indices as benchmarks. The fifth and sixth rows use size and market-to-book and price momentum matched portfolios as benchmarks, which are calculated as follows. NYSE firms are used to create size quartile breakpoints. These size quartiles are further split into market-to-book quartiles, using NYSE market-to-book quartile breakpoints. All NYSE, AMEX and NASDAQ firms are consequently sorted into the resulting 16 (4x4) size and market-to-book portfolios. Within each portfolio additional quartile breakpoints are calculated, based on prior year returns excluding the previous month following Carhart (1997). Equal-weighted portfolio average returns are calculated for the resulting 64 portfolios. Momentum breakpoints are recalculated monthly, market-to-book and size breakpoints are recalculated quarterly. Buy-and-hold returns are calculated by compounding monthly returns for 60 months. Cumulative returns are calculated by summing monthly returns for 60 months. If the issuing firm delists before the 60th month returns are calculated up to the last available month. Abnormal returns are the difference between issuer 60 month cumulative or buy-and-hold returns and benchmark returns. All IPO and SEO firms are excluded from the calculation of benchmarks for 60 months following their equity issuance.

Benchmarks	Equal weighted				Value weighted			
	No. obs.	Issuer	Bench-mark	Abnormal return	No. obs.	Issuer	Bench-mark	Abnormal return
Panel A: Sesoned equity offerings, cumulative abnormal returns (CARs)								
S&P 500	5,304	54.6%	48.3%	6.4%	5,300	49.4%	37.2%	12.2%
NASDAQ Composite	5,304	54.6%	66.2%	-11.6%	5,300	49.4%	55.2%	-5.8%
CRSP Value weighted	5,304	54.6%	63.6%	-9.0%	5,300	49.4%	50.0%	-0.6%
CRSP Equal weighted	5,304	54.6%	73.6%	-19.0%	5,300	49.4%	67.5%	-18.0%
Size and market-to-book (5x5)	5,302	54.6%	64.9%	-10.3%	5,298	49.4%	64.2%	-14.8%
Size, market-to-book, momentum (4x4x4)	5,299	54.6%	69.2%	-14.6%	5,295	49.4%	66.5%	-17.1%
Pre-issue market model parameters	5,134	55.0%	128.7%	-73.8%	5,134	49.3%	92.5%	-43.1%
Panel B: Seasoned equity offerings, buy-and-hold abnormal returns (BHARs)								
S&P 500	5,304	41.3%	59.0%	-17.7%	5,300	31.8%	46.0%	-14.2%
NASDAQ Composite	5,304	41.3%	84.2%	-42.9%	5,300	31.8%	67.8%	-36.1%
CRSP Value weighted	5,304	41.3%	85.3%	-43.9%	5,300	31.8%	66.8%	-35.1%
CRSP Equal weighted	5,304	41.3%	96.7%	-55.4%	5,300	31.8%	85.8%	-54.1%
Size and market-to-book (5x5)	4,960	43.2%	88.2%	-45.0%	4,957	34.1%	89.0%	-54.9%
Size, market-to-book, momentum (4x4x4)	3,481	50.7%	111.0%	-60.2%	3,478	33.0%	93.8%	-60.9%
Pre-issue market model parameters	5,134	41.3%	972.5%	-931.2%	5,134	31.3%	624.3%	-593.0%
Panel C: Initial public offerings, cumulative abnormal returns (CARs)								
S&P 500	2,439	48.0%	54.8%	-6.9%	2,411	39.4%	38.7%	0.7%
NASDAQ Composite	2,439	48.0%	67.3%	-19.3%	2,411	39.4%	51.9%	-12.5%
CRSP Value weighted	2,439	48.0%	67.6%	-19.6%	2,411	39.4%	49.3%	-9.9%
CRSP Equal weighted	2,439	48.0%	69.8%	-21.8%	2,411	39.4%	61.6%	-22.2%
Size and market-to-book (5x5)	2,435	48.1%	39.7%	8.4%	2,407	39.4%	44.1%	-4.7%
Panel D: Initial public offerings, buy-and-hold abnormal returns (BHARs)								
S&P 500	2,439	19.8%	68.9%	-49.1%	2,411	6.5%	48.7%	-42.2%
NASDAQ Composite	2,439	19.8%	84.8%	-65.0%	2,411	6.5%	62.7%	-56.2%
CRSP Value weighted	2,439	19.8%	92.2%	-72.4%	2,411	6.5%	65.8%	-59.3%
CRSP Equal weighted	2,439	19.8%	89.9%	-70.1%	2,411	6.5%	74.9%	-68.4%
Size and market-to-book (5x5)	1,859	20.7%	43.9%	-23.2%	1,839	11.3%	52.7%	-41.4%

Table 5 Long-Term Calendar-Time Performance of Public Equity Offerings

This table reports calendar-time factor regression for the full sample of SEOs and IPOs. SEO (IPO) rolling portfolios are formed monthly by including all SEO (IPO) firms that issued equity within the previous 60 months. The dependent variable is the equal or value weighted average rolling portfolio return in excess of the risk-free rate. RMRF is the value-weight return on all NYSE, AMEX, and NASDAQ stocks minus the one-month Treasury bill rate. SMB is the monthly excess return of a portfolio of small firms versus a portfolio of big firms. HML is the monthly excess return of a portfolio of high book-to-market firms versus a portfolio of low book-to-market firms. These three factors follow Fama and French (1993). PR12 is the excess return of a portfolio of past winners versus a portfolio of past losers based on the previous 12 month returns excluding the preceding month as in Carhart (1997). Newey-West standard errors adjusted for heteroskedasticity and autocorrelation of up to five lags are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Calendar-time return factor regressions for seasoned equity offerings						
	Equal weighted			Value weighted		
	CAPM	FF	Carhart	CAPM	FF	Carhart
Alpha (%)	-0.2013	-0.2981**	-0.0397	-0.1928	-0.1585	-0.1393
	[0.1612]	[0.1161]	[0.1040]	[0.1363]	[0.1535]	[0.1381]
MKT	1.1376***	1.0575***	1.0305***	1.0099***	0.9491***	0.9471***
	[0.0388]	[0.0394]	[0.0318]	[0.0426]	[0.0377]	[0.0385]
SMB		0.7190***	0.7482***		0.2315***	0.2337***
		[0.0575]	[0.0464]		[0.0508]	[0.0489]
HML		0.0949*	0.0354		-0.0693	-0.0738
		[0.0511]	[0.0462]		[0.0784]	[0.0737]
PR12			-0.2540***			-0.0189
			[0.0298]			[0.0523]
N	419	419	419	419	419	419
Adjusted R^2 (%)	74.6	88.7	91.8	76.4	78.9	78.8
Panel B: Calendar-time return factor regressions for initial public offerings						
	Equal weighted			Value weighted		
	CAPM	FF	Carhart	CAPM	FF	Carhart
Alpha (%)	-0.4463*	-0.2438	0.1039	-0.6608***	-0.2639*	-0.2471
	[0.2600]	[0.1770]	[0.1909]	[0.2350]	[0.1424]	[0.1504]
MKT	1.2675***	1.1318***	1.0976***	1.4115***	1.1549***	1.1533***
	[0.0525]	[0.0443]	[0.0413]	[0.0509]	[0.0343]	[0.0344]
SMB		0.9498***	0.9761***		0.6568***	0.6581***
		[0.1093]	[0.0826]		[0.0630]	[0.0625]
HML		-0.0292	-0.113		-0.4552***	-0.4592***
		[0.0790]	[0.0766]		[0.0683]	[0.0683]
PR12			-0.3371***			-0.0163
			[0.0864]			[0.0491]
N	395	395	395	395	395	395
Adjusted R^2 (%)	64.7	85.2	88.9	73.8	89.8	89.8

Table 6 Pre-Issuance Leverage and Post-Issuance Investment, Profitability and Dividends

This table reports cross-sectional regressions results for SEOs in Panel A and for IPOs in Panel B. The specifications are of the form

$$Y_t = c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{YT} + c_4 KZ\ \text{Index}_{t=-1} + c_5 HOT + c_6 M/B_t + c_7 EBITDA/A_{t-1} + c_8 SIZE_{t-1} + c_9 PPE/A_{t-1} + c_{10} R\&D/A_{t-1} + c_{11} R\&Dd + \varepsilon_t,$$

where Y_t is the dependent variable indicated in the column title. Regressions in Panel B do not contain the variables YT and RSQ_{YT}. All regressions are estimated with industry fixed effects and contain a constant (not reported). Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Seasoned equity offerings

Dependent variable	D/A_t	Inv/A_t	Inv/A_t	Inv/A_t	$EBITDA/A_t$	$EBITDA/A_t$	$EBITDA/A_t$	Div/E_t	Div/E_t	Div/E_t	Div/E_t
Relative SEO year	*SEO-1*	*SEO*	*SEO+1*	*SEO+2*	*SEO*	*SEO+1*	*SEO+2*	*SEO-1*	*SEO*	*SEO+1*	*SEO+2*
$RPVGO_{t=-1}$	-0.507***	0.045	0.099***	0.095***	-0.221***	-0.141***	-0.137***	-0.021**	-0.033***	-0.046***	-0.052***
	[0.060]	[0.030]	[0.027]	[0.023]	[0.034]	[0.036]	[0.035]	[0.009]	[0.010]	[0.008]	[0.009]
YT	0.514**	-0.111	0.213***	0.156***	0.185	-0.035	-0.117	-0.081*	-0.046*	-0.046*	-0.058
	[0.203]	[0.128]	[0.051]	[0.049]	[0.148]	[0.154]	[0.187]	[0.044]	[0.024]	[0.024]	[0.038]
RSQ_{YT}	-1.385***	0.319***	0.260***	0.047	-0.029	0.157	-0.034	0.058**	0.097***	0.079***	0.071**
	[0.171]	[0.082]	[0.073]	[0.071]	[0.090]	[0.103]	[0.118]	[0.026]	[0.026]	[0.023]	[0.030]
$KZ\ Index_{t=-1}$	-	0.028	0.052	0.183	-	-	-	-	-	-	-
	-	[0.126]	[0.123]	[0.112]	-	-	-	-	-	-	-
HOT	1.238**	0.002	0.238	0.294	0.774***	0.887***	0.415	0.351***	0.244***	0.340***	0.363***
	[0.495]	[0.229]	[0.205]	[0.184]	[0.283]	[0.336]	[0.371]	[0.079]	[0.083]	[0.057]	[0.071]
M/B_t	-2.712***	0.276***	0.769***	0.549***	1.694***	2.695***	2.773***	0.087	-0.041**	-0.024	0.014
	[0.265]	[0.103]	[0.115]	[0.109]	[0.195]	[0.259]	[0.428]	[0.062]	[0.020]	[0.028]	[0.037]
$EBITDA/A_{t-1}$	-0.180***	0.103***	0.178***	0.158***	-	-	-	0.020***	0.005**	0.018***	0.014***
	[0.027]	[0.015]	[0.015]	[0.013]	-	-	-	[0.004]	[0.002]	[0.004]	[0.003]
$SIZE_{t-1}$	2.211***	-1.132***	-1.159***	-0.759***	0.870***	1.425***	1.456***	0.300***	0.307***	0.219***	0.218***
	[0.155]	[0.078]	[0.075]	[0.069]	[0.094]	[0.118]	[0.129]	[0.025]	[0.034]	[0.022]	[0.025]
PPE/A_{t-1}	0.091***	0.196***	0.193***	0.168***	0.072***	0.100***	0.098***	0.019***	0.021***	0.024***	0.022***
	[0.015]	[0.009]	[0.009]	[0.008]	[0.008]	[0.010]	[0.010]	[0.002]	[0.002]	[0.002]	[0.002]
$R\&D/A_{t-1}$	-0.225***	-0.001	0.072***	0.092***	-0.540***	-0.935***	-0.947***	0.005	0.005	0.007	0.005
	[0.055]	[0.015]	[0.023]	[0.018]	[0.044]	[0.080]	[0.083]	[0.004]	[0.003]	[0.005]	[0.004]
$R\&Dd_t$	0.954	-0.144	-0.255	-0.026	-1.149***	-1.007**	-1.937***	-0.095	-0.096	-0.032	-0.156
	[0.698]	[0.314]	[0.305]	[0.285]	[0.380]	[0.431]	[0.488]	[0.120]	[0.085]	[0.086]	[0.114]
N	5291	5291	5070	4715	5291	5070	4715	4606	5291	5070	4715
Adj. R^2	0.356	0.387	0.412	0.402	0.371	0.366	0.369	0.500	0.551	0.629	0.557
RMSE	15.68	7.296	6.567	5.954	8.668	10.15	10.498	2.365	2.194	1.9	2.197
F-stat	67.239	53.762	47.499	45.401	29.755	31.818	26.993	225.532	288.268	283.655	257.146

Panel B: Initial public offerings										
Dependent variable	*DA*	*Inv/A$_t$*	*Inv/A$_t$*	*Inv/A$_t$*	*EBITDA/A$_t$*	*EBITDA/A$_t$*	*EBITDA/A$_t$*	*Div/E$_t$*	*Div/E$_t$*	*Div E$_t$*
Relative IPO year	*IPO -1*	*IPO*	*IPO +1*	*IPO +2*	*IPO*	*IPO +1*	*IPO +2*	*IPO*	*IPO +1*	*IPO +2*
RPVGO$_{t-1}$	0.031	0.033	0.013	0.013	-0.093***	-0.100***	-0.027	-0.019	-0.010**	-0.015**
	[0.028]	[0.028]	[0.027]	[0.027]	[0.028]	[0.034]	[0.044]	[0.043]	[0.005]	[0.006]
KZ Index$_{t-1}$	-	0.140*	0.042	0.109	-	-	-	-	-	-
	-	[0.080]	[0.078]	[0.079]	-	-	-	-	-	-
HOT	0.281	0.306	0.417	0.489	-1.056*	-0.402	-0.977	1.242**	-0.150*	-0.124
	[0.495]	[0.495]	[0.421]	[0.420]	[0.613]	[0.887]	[0.784]	[0.498]	[0.081]	[0.132]
M/B$_t$	0.168	0.2	0.503***	0.617***	2.357***	3.838***	4.122***	0.826***	0.027	0.009
	[0.128]	[0.130]	[0.129]	[0.128]	[0.207]	[0.333]	[0.411]	[0.209]	[0.021]	[0.050]
EBITDA/A$_{t-1}$	0.048***	0.053***	0.090***	0.079***	-	-	-	0.038***	0.009***	0.010***
	[0.011]	[0.012]	[0.021]	[0.011]	-	-	-	[0.011]	[0.002]	[0.003]
SIZE$_{t-1}$	-1.278***	-1.288***	-1.409***	-0.472***	1.797***	2.723***	3.369***	0.748***	0.087***	0.017
	[0.144]	[0.144]	[0.149]	[0.131]	[0.182]	[0.236]	[0.325]	[0.145]	[0.022]	[0.066]
PPE/A$_{t-1}$	0.258***	0.257***	0.257***	0.204***	0.062***	0.139***	0.155***	0.006	0.001	-0.003
	[0.014]	[0.014]	[0.014]	[0.013]	[0.012]	[0.015]	[0.018]	[0.011]	[0.002]	[0.003]
R&D A$_{t-1}$	-0.049***	-0.046***	-0.042	-0.02	-0.185***	-0.502***	-0.502***	-0.011	-0.003	-0.01
	[0.018]	[0.018]	[0.028]	[0.020]	[0.033]	[0.097]	[0.097]	[0.021]	[0.003]	[0.008]
R&Dd$_{t-1}$	0.434	0.462	0.095	-0.057	0.334	-0.162	-0.146	0.278	0.07	0.256*
	[0.484]	[0.485]	[0.413]	[0.409]	[0.560]	[0.761]	[0.899]	[0.482]	[0.074]	[0.151]
N	2359	2358	2194	1977	2359	2194	1977	2359	2194	1977
Adj. R^2	0.424	0.424	0.417	0.397	0.235	0.244	0.272	0.093	0.089	0.025
RMSE	8.613	8.611	7.815	6.811	10.193	13.255	13.838	9.271	1.12	2.402
F-stat	24.41	23.922	22.208	16.907	12.848	13.726	12.417	3.098	3.233	2.821

Table 7 Uses of Proceeds and Capital Structure Impact

This table reports cross-sectional regressions results for SEOs in Panel A and for IPOs in Panel B. The specifications are of the form

$$Y_t = c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{YT} + c_4 KZ\ Index_{t=-1} + c_5 HOT + c_6 M/B_t + c_7 EBITDA/A_{t-1} + c_8 SIZE_{t-1} + c_9 PPE/A_{t-1} + c_{10} R\&D/A_{t-1} + c_{11} R\&Dd_{t-1} + c_{12} D/A_{Pre} + \varepsilon_t,$$

where Y_t is the dependent variable indicated in the column title. Regressions in Panel B do not contain the variables *YT* and RSQ_{YT}. All regressions are estimated with industry fixed effects and contain a constant (not reported). Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	$D/A_t - D/A_{t-1}$	e/A_t	Δ Cash $/A_t(E/A)_{t-1}$	Δ Non-Cash$_t$ $/(E/A)_{t-1}$	Δ RE/A_t	D/A_t	D/A_t
Panel A: Seasoned equity offerings							
$RPVGO_{t=-1}$	-0.182***	0.298***	0	0.147***	0.031	-0.182***	-0.181***
	[0.040]	[0.046]	[0.000]	[0.041]	[0.031]	[0.040]	[0.040]
YT	-0.622**	0.819**	0.007**	0.029	0.566*	-0.622**	-0.628**
	[0.306]	[0.396]	[0.003]	[0.121]	[0.329]	[0.306]	[0.309]
RSQ_{YT}	0.450***	-0.502***	0	0.019	0.023	0.450***	0.460***
	[0.098]	[0.123]	[0.001]	[0.110]	[0.101]	[0.098]	[0.098]
$KZ\ Index_{t=-1}$	-0.747***	1.174***	0	0.910*	0.494*	-0.747***	-
	[0.267]	[0.444]	[0.003]	[0.490]	[0.285]	[0.267]	-
HOT	-0.37	0.081	0.001	0.27	0.685**	-0.37	-0.336
	[0.300]	[0.352]	[0.002]	[0.308]	[0.321]	[0.300]	[0.300]
M/B_t	-1.917***	3.356***	0.017***	0.345**	0.637***	-1.917***	-1.895***
	[0.168]	[0.232]	[0.002]	[0.172]	[0.181]	[0.168]	[0.168]
$EBITDA/A_{t-1}$	-0.163***	-0.162***	0	0.115***	0.429***	-0.163***	-0.156***
	[0.018]	[0.023]	[0.000]	[0.021]	[0.027]	[0.018]	[0.018]
$SIZE_{t-1}$	1.712***	-3.262***	-0.008***	-0.792***	-0.013	1.712***	1.739***
	[0.104]	[0.134]	[0.001]	[0.108]	[0.082]	[0.104]	[0.104]
PPE/A_{t-1}	0.026***	-0.094***	-0.000***	-0.052***	-0.007	0.026***	0.026***
	[0.010]	[0.011]	[0.000]	[0.009]	[0.007]	[0.010]	[0.010]
$R\&D/A_{t-1}$	-0.069**	0.218***	0.001***	-0.083**	-0.092**	-0.069**	-0.067**
	[0.030]	[0.038]	[0.000]	[0.033]	[0.038]	[0.030]	[0.030]
$R\&D\ Dummy_{t-1}$	0.887**	0.675	-0.006**	2.459***	0.281	0.887**	0.892**
	[0.444]	[0.505]	[0.003]	[0.439]	[0.379]	[0.444]	[0.444]
D/A_{Pre}	-0.332***	-0.116***	-0.002***	-0.287***	-0.012	0.668***	0.639***
	[0.015]	[0.021]	[0.000]	[0.023]	[0.018]	[0.015]	[0.011]
N	5291	5291	5291	5291	5291	5291	5291
Adj. R^2	0.371	0.638	0.492	0.313	0.377	0.782	0.781
RMSE	9.519	11 414	0.076	9.37	8.578	9.519	9.527
F-stat	47.913	149.49	49.203	40.045	38.955	529.09	539.399
Panel B: Initial public offerings							
$RPVGO_{t=-1}$	-0.250***	0.188***	0.000*	-0.008	0.092**	-0.250***	-0.249***
	[0.053]	[0.056]	[0.000]	[0.023]	[0.039]	[0.053]	[0.053]
$KZ\ Index_{t=-1}$	-0.279*	-1.222***	-0.001	0.012	1.376***	-0.279*	-
	[0.154]	[0.211]	[0.001]	[0.100]	[0.145]	[0.154]	-
HOT	-1.043	4.186***	0.009*	0.778*	-1.494***	-1.043	-0.964
	[0.876]	[1.014]	[0.005]	[0.427]	[0.543]	[0.876]	[0.875]
M/B_t	-2.784***	3.415***	0.009***	0.2	0.482**	-2.784***	-2.735***
	[0.243]	[0.290]	[0.002]	[0.136]	[0.192]	[0.243]	[0.243]
$EBITDA/A_{t-1}$	-0.137***	-0.116***	0	0.017	0.276***	-0.137***	-0.129***
	[0.019]	[0.026]	[0.000]	[0.015]	[0.019]	[0.019]	[0.019]
$SIZE_{t-1}$	3.052***	-5.280***	-0.012***	-1.013***	-0.02	3.052***	3.067***
	[0.249]	[0.273]	[0.001]	[0.134]	[0.173]	[0.249]	[0.250]
PPE/A_{t-1}	0.056***	-0.093***	-0.000***	-0.016*	-0.020*	0.056***	0.055***
	[0.018]	[0.021]	[0.000]	[0.008]	[0.011]	[0.018]	[0.018]
$R\&D/A_{t-1}$	-0.256***	0.242***	0.002***	-0.083***	0.120**	-0.256***	-0.252***
	[0.032]	[0.065]	[0.000]	[0.027]	[0.051]	[0.032]	[0.032]
$R\&D\ d_{t-1}$	-0.073	0.127	0.005	0.318	0.73	-0.073	-0.016
	[0.793]	[0.997]	[0.005]	[0.424]	[0.596]	[0.793]	[0.791]
D/A_{Pre}	-0.642***	0.153***	-0.003***	-0.222***	-0 003	0.358***	0.344***
	[0.018]	[0.023]	[0.000]	[0.013]	[0.016]	[0 018]	[0.016]
N	2358	2358	2358	2358	2358	2358	2359
Adj. R^2	0.496	0.399	0.576	0.34	0.251	0.488	0.488
RMSE	14.358	16.585	0.072	7.214	9 433	14.358	14.361
F-stat	54.548	35.937	31.217	13.807	14.037	55.864	56.814

Table 8 Sources and Uses of Funds for Seasoned Equity Offerings and Initial Public Offerings

The table reports cross-sectional regressions for independent variables change in assets, capital expenditures (capex), increase in investment, acquisitions, cash changes, cash dividends, debt reductions, equity repurchases and other uses:

$$Y_t = c_0 + c_1(Proceeds^{P}/A_{t=-1}) + c_2(Residual\ sources / A_{t=-1}) + c_3 SIZE_t + \varepsilon_t,$$

where residual sources are all financing sources except primary offering proceeds. Cash flow variables conform to COMPUSTAT definitions. All dependent and independent variables are scaled by assets in year t=-1. Changes in dependent variables are summarized over the indicated time period, i.e. $Y_t = \Sigma_{t=0}^{t} y_t / A_{t=-1}$. Coefficients for SIZE are omitted for brevity. Marginal effects *dy/dx* are the implied changes in the dependent variables when increasing primary capital or residual sources by one unit at the sample median. p-value Diff is the significance level of a t-test of equal coefficients for primary capital and residual financing. All regressions are estimated with industry fixed effects and contain a constant (not reported). Standard errors are robust to heteroskedasticity. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

		Seasoned equity offerings				*p*-value	Initial public offerings				*p*-value
Use of funds	Time	Primary capital		Residual financing		Diff	Primary capital		Residual financing		Diff
	period	*dy/dx*	*se*	*dy/dx*	*se*		*dy/dx*	*se*	*dy/dx*	*se*	
ΔAssets	[0]	1.203	0.041***	0.633	0.107***	0.000	1.447	0.150***	0.618	0.210***	0.021
Capex	[0]	0.029	0.011***	0.061	0.007***	0.015	-0.066	0.081	0.190	0.120	0.205
Investment	[0]	0.108	0.058*	0.369	0.109***	0.068	0.002	0.026	0.069	0.038*	0.305
Acquisitions	[0]	0.046	0.019**	0.088	0.027***	0.248	0.018	0.023	-0.022	0.032	0.463
ΔCash	[0]	0.386	0.063***	0.019	0.007***	0.000	0.640	0.053***	0.180	0.075**	0.000
Dividends	[0]	-0.001	0.001	0.002	0.001	0.084	0.017	0.009*	-0.024	0.013*	0.069
Debt reduction	[0]	-0.032	0.011***	0.191	0.029***	0.000	-0.074	0.016***	0.109	0.023***	0.000
Equ. Repur.	[0]	0.008	0.005*	0.000	0.001	0.112	0.014	0.012	-0 020	0.016	0.225
Other uses	[0]	-0.004	0.003	0.013	0.008*	0.070	0.006	0.014	-0.008	0.020	0.672
ΣΔAssets	[0;1]	1.365	0.083***	0.569	0.045***	0.000	0.361	0.068***	0.856	0.094***	0.002
ΣCapex	[0;1]	0.089	0.040**	0.099	0.016***	0.840	0.022	0.012*	0.135	0.017***	0.000
ΣInvestment	[0;1]	0.399	0.142***	0.174	0.038***	0.138	0.098	0.030***	0.180	0.044***	0.263
ΣAcquisitions	[0;1]	0.143	0.047***	0.145	0.020***	0 968	-0.058	0.020***	0.111	0.027***	0.000
ΣΔCash	[0;1]	0.159	0.093*	0.074	0.019***	0.402	0.216	0.024***	0.167	0.035***	0 403
ΣDividends	[0,1]	-0.003	0.002	0.000	0.001	0.372	0.001	0.001	-0.001	0.002	0.537
ΣDebt reduction	[0;1]	-0.190	0.031***	0.269	0.028***	0.000	-0.132	0.019***	0.189	0.027***	0.000
ΣEqu. Repur.	[0;1]	0.039	0.018**	-0.003	0.002*	0.029	0.015	0.006***	-0.007	0.007	0.090
ΣOther uses	[0;1]	-0.015	0.006**	0.018	0.006***	0.003	-0.005	0.002***	0.007	0.002***	0.001
ΣΔAssets	[0;2]	1.324	0.163***	0.664	0.054***	0.000	1.509	0.178***	1.007	0.072***	0.016
ΣCapex	[0;2]	0.101	0.063	0.136	0.020***	0.630	0.179	0.052***	0.170	0.023***	0.879
ΣInvestment	[0;2]	0.523	0.196***	0.205	0.043***	0.108	0.295	0.108***	0.145	0.042***	0.226
ΣAcquisitions	[0;2]	0.151	0.055***	0.153	0.025***	0.969	0.074	0.089	0.155	0.042***	0.475
ΣΔCash	[0;2]	0.161	0.033***	0.040	0.013***	0.002	0.299	0.097***	0 177	0.029***	0.233
ΣDividends	[0;2]	-0.006	0.002***	0.000	0.001	0.002	0.021	0.009**	0.000	0.001	0.017
ΣDebt reduction	[0;2]	-0.345	0.049***	0.309	0.028***	0.000	-0.197	0.051***	0.198	0.028***	0.000
ΣEqu. Repur.	[0;2]	0.056	0.014***	0.004	0.002*	0.000	0.047	0.026*	0.002	0.003	0.066
ΣOther uses	[0;2]	-0.030	0.007***	0.017	0.004***	0.000	0.142	0.143	0.022	0.013*	0.360
ΣΔAssets	[0;3]	1.673	0.393***	0.574	0.082***	0.012	1.644	0.359***	1.067	0.081***	0.138
ΣCapex	[0;3]	0.247	0.108**	0.121	0.027***	0.298	0.292	0.082***	0.199	0.026***	0.359
ΣInvestment	[0;3]	0.244	0.259	0.350	0.083***	0.729	0.247	0.223	0.170	0.077**	0.780
ΣAcquisitions	[0;3]	0.216	0.069***	0.125	0.025***	0.270	-0.005	0.120	0.177	0.042***	0.225
ΣΔCash	[0;3]	0.242	0.050***	0.031	0.007***	0.000	0.225	0.068***	0.168	0.066**	0.623
ΣDividends	[0;3]	-0.007	0.002***	0.000	0.001	0.003	0.025	0.011**	0.000	0.001	0.029
ΣDebt reduction	[0;3]	-0.340	0.109***	0.285	0.048***	0.000	-0.176	0.075**	0.160	0.035***	0.000
ΣEqu. Repur.	[0;3]	0.105	0.018***	0.008	0.005	0.000	0.106	0.082	0.003	0.003	0.213
ΣOther uses	[0;3]	-0.095	0.062	0.047	0.035	0.140	0.184	0.185	0.011	0.007	0.343
ΣΔAssets	[0;4]	0.948	1.092	1.376	0.638**	0.788	2.311	0.610***	1.006	0.082***	0.039
ΣCapex	[0;4]	0.359	0.159**	0.105	0.027***	0.135	0.543	0.160***	0.196	0.037***	0.054
ΣInvestment	[0;4]	-0.285	0.310	0.527	0.082***	0.024	-0.068	0.319	0.250	0.081***	0.394
ΣAcquisitions	[0;4]	0.299	0.072***	0.087	0.019***	0.008	0.180	0.170	0.163	0.046***	0.935
ΣΔCash	[0;4]	0.306	0.058***	0.036	0.009***	0.000	0.439	0.139***	0.098	0.037***	0.025
ΣDividends	[0;4]	-0.009	0.004**	0.000	0.000	0.009	0.022	0.012*	0.001	0.001	0.117
ΣDebt reduction	[0;4]	-0.180	0.150	0.202	0.048***	0.043	-0.160	0.145	0.169	0.037***	0.048
ΣEqu. Repur.	[0;4]	0.151	0.041***	0.005	0.003*	0.001	0.094	0.118	0.034	0.019*	0.632
ΣOther uses	[0,4]	-0.145	0.114	0.057	0.046	0.204	-0.053	0.331	0.074	0.065	0.739

Table 9 The Persistence of Capital Structure

This table reports cross-sectional regressions results for SEOs and IPOs. The specifications are of the form

$$\left(\frac{D}{A}\right)_t - \left(\frac{D}{A}\right)_{Pre} = c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{YT} + c_4 KZ\ Index_{t=-1} + c_5 HOT + c_6 M/B_t + c_7 EBITDA/A_{t-1}$$
$$+ c_8 SIZE_{t-1} + c_9 PPE/A_{t-1} + c_{10} R\&D/A_{t-1} + c_{11} R\&Dd_{t-1} + c_{12} D/A_{Pre} + \varepsilon_t.$$

D/A_{Pre} is pre-offering book leverage. D/A_t-$D/A_{Pre\text{-}SEO}$ and D/A_t-$D/A_{Pre\text{-}IPO}$ is the cumulative change in book leverage from the pre-offering year to year relative to the offering indicated in the column title. All regressions are estimated with industry fixed effects and contain a constant (not reported). Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	Seasoned equity offerings: Cumulative change in leverage D/A_t-$D/A_{Pre\text{-}SEO}$				Initial public offerings: Cumulative change in leverage D/A_t-$D/A_{Pre\text{-}IPO}$			
Relative year	*SEO+1*	*SEO+3*	*SEO+1*	*SEO+3*	*IPO+1*	*IPO+3*	*IPO+1*	*IPO+3*
$RPVGO_{t=-1}$	-0.125***	0.01	-0.200***	-0.005	-0.165***	-0.062	-0.205***	-0.067
	[0.048]	[0.056]	[0.049]	[0.057]	[0.055]	[0.058]	[0.057]	[0.060]
YT	-0.542*	-0.508	-0.578	-0.385	-	-	-	-
	[0.307]	[0.403]	[0.354]	[0.429]	-	-	-	-
RSQ_{YT}	-0.193	-0.376**	-0.251**	-0.323**	-	-	-	-
	[0.125]	[0.161]	[0.127]	[0.163]	-	-	-	-
$KZ\ Index_{t=-1}$	0.015	0.195	-	-	-0.493**	-0.341	-	-
	[0.278]	[0.376]	-	-	[0.203]	[0.211]	-	-
HOT	0.874**	0.414	0.837**	0.459	0.381	1.133	0.336	1.222
	[0.366]	[0.470]	[0.373]	[0.471]	[0.975]	[1.287]	[0.994]	[1.303]
M/B_t	-2.355***	-2.274***	-	-	-3.101***	-2.552***	-	-
	[0.207]	[0.319]	-	-	[0.274]	[0.434]	-	-
$EBITDA/A_{t-1}$	-0.373***	-0.322***	-0.427***	-0.379***	-0.326***	-0.333***	-0.417***	-0.402***
	[0.027]	[0.041]	[0.026]	[0.041]	[0.037]	[0.040]	[0.036]	[0.038]
$SIZE_{t-1}$	1.789***	1.920***	1.973***	1.950***	2.818***	2.609***	3.230***	2.756***
	[0.128]	[0.162]	[0.129]	[0.163]	[0.291]	[0.370]	[0.296]	[0.368]
PPE/A_{t-1}	0.086***	0.067***	0.114***	0.082***	0.177***	0.172***	0.215***	0.186***
	[0.012]	[0.016]	[0.012]	[0.016]	[0.023]	[0.027]	[0.023]	[0.027]
$R\&D/A_{t-1}$	0.005	-0.058	-0.104*	-0.170***	-0.265***	-0.149	-0.382***	-0.245**
	[0.062]	[0.070]	[0.062]	[0.065]	[0.079]	[0.094]	[0.076]	[0.096]
$R\&D\ d_{t-1}$	1.258**	0.756	1.378**	0.747	0.756	2.692**	0.881	2.839**
	[0.564]	[0.731]	[0.576]	[0.739]	[0.968]	[1.242]	[0.998]	[1.269]
D/A_{Pre}	-0.434***	-0.533***	-0.407***	-0.513***	-0.646***	-0.650***	-0.669***	-0.663***
	[0.018]	[0.023]	[0.014]	[0.017]	[0.021]	[0.026]	[0.019]	[0.023]
N	5070	4299	5070	4299	2194	1742	2194	1742
Adj. R^2	0.341	0.323	0.317	0.311	0.459	0.401	0.429	0.386
RMSE	11.531	13.329	11.737	13.44	16.182	17.862	16.619	18.073
F-stat	33.503	25.335	30.348	24.373	44.186	25.921	39.985	25.07

Table 10 Changes in Leverage, Net Equity Issues and Net Debt Issues

This table reports cross-sectional regressions results for SEOs in Panel A and for IPOs in Panel B. The specifications are of the form

$$Y_t = c_0 + c_1 RPVGQ_{t-1} + c_2 YT + c_3 RSQUARED + c_4 KZIndex_{t-1} + c_5 HOT + c_6 M/B_{t-1}$$
$$+ c_7 EBITDA/A_{t-1} + c_8 SIZE_{t-1} + c_9 PPE/A_{t-1} + c_{10} R\&D/A_{t-1} + c_{11} R\&Dd_{t-1} + c_{12} D/A_{Pre} + \varepsilon_t,$$

where Y_t is the dependent variable indicated in the column title. Regressions in Panel B do not contain the variables *RSQUARED* and *YT*. All regressions are estimated with industry fixed effects and contain a constant (not reported). Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Seasoned equity offerings

Dependent variable	Change in leverage D/A_t-D/A_{t-1}					Net equity issues e/A_t				Net debt issues d/A_t			
Relative year	*SEO*	*SEO+1*	*SEO+2*	*SEO+3*	*SEO+4*	*SEO*	*SEO+1*	*SEO+2*	*SEO+3*	*SEO*	*SEO+1*	*SEO+2*	*SEO+3*
$RPVGO_{t=-1}$	-0.242***	0.126***	0.088**	0.137***	0.036	0.497***	-0.006	-0.054	-0.048	0.043	0.150**	0.028	0.112
	[0.044]	[0.040]	[0.036]	[0.037]	[0.040]	[0.050]	[0.043]	[0.037]	[0.036]	[0.069]	[0.067]	[0.059]	[0.077]
YT	-0.707*	-0.023	0.159*	0.028	-0.093	1.036*	0.215	-0.361***	0.101	-0.098	-0.02	0 085	0.329*
	[0.372]	[0.089]	[0.086]	[0.105]	[0 083]	[0.544]	[0.186]	[0.136]	[0.121]	[0.154]	[0 127]	[0.126]	[0.188]
RSQ_YT	0.419***	-0.440***	-0.137	0.038	0.005	-0.470***	0.203	0.072	0.15	0.508***	-0.219	-0.089	0.082
	[0.100]	[0.099]	[0.100]	[0.101]	[0.109]	[0.122]	[0.250]	[0.124]	[0.114]	[0.147]	[0.241]	[0.146]	[0 142]
$KZ\ Index_{t=-1}$	-0.783***	0.676***	-0.451	0.187	-0.088	1.609***	-0.087	0.667***	0.434**	0.098	0.884**	0.109	0.580*
	[0.268]	[0.204]	[0.303]	[0.178]	[0.203]	[0.479]	[0.658]	[0.250]	[0.214]	[0.346]	[0.397]	[0.451]	[0.333]
HOT	-0.47	1.236***	0.707**	-0.525*	-0.264	0.201	-1.205***	-0.637*	0.297	-0.02	1.493***	0.847*	-0.012
	[0.306]	[0.286]	[0.291]	[0.306]	[0.314]	[0.350]	[0.398]	[0.334]	[0.351]	[0.434]	[0.458]	[0.455]	[0.441]
M/B_t	-1.057***	-0.628***	-0.486**	-0.389	-0.915***	3.662***	2.443***	2.999***	2.925***	0.530***	0.213	0.919***	1.356***
	[0 142]	[0.150]	[0.194]	[0.251]	[0.251]	[0.208]	[0.271]	[0.313]	[0.385]	[0.153]	[0.205]	[0.294]	[0.287]
$EBITDA/A_{t-1}$	-0.178***	-0.105***	-0.064**	-0.054**	-0.033	-0.147***	-0.068**	-0.099***	-0.129***	-0.047**	0.110***	0.151***	0.125***
	[0.018]	[0.022]	[0.026]	[0.025]	[0.026]	[0.022]	[0.035]	[0.032]	[0.031]	[0.021]	[0.037]	[0.032]	[0.029]
$SIZE_{t-1}$	1.717***	-0.269***	-0.196*	-0.285**	-0.136	-2.998***	-0.572***	-0.387***	-0.181	-0.001	-0.637***	-0.507***	-0.171
	[0.105]	[0.098]	[0.108]	[0.115]	[0.109]	[0.133]	[0.207]	[0.119]	[0.119]	[0.155]	[0.219]	[0.156]	[0.170]
PPE/A_{t-1}	0.029***	0.002	-0.027***	-0.002	-0.004	-0.078***	-0.013	0.029***	0.029***	-0.012	0.007	0	0.030**
	[0 010]	[0.010]	[0.010]	[0.010]	[0 011]	[0.011]	[0.020]	[0.011]	[0.010]	[0.015]	[0.021]	[0.016]	[0 014]
$R\&D\ A_{t-1}$	-0.103***	0.008	0.068	-0.092	-0.061	0.216***	0.284***	0.217***	0.305***	-0.044	0.039	0.079	0.013
	[0.029]	[0.052]	[0.054]	[0.061]	[0.055]	[0.037]	[0.066]	[0.066]	[0.084]	[0.028]	[0.078]	[0.106]	[0.075]
$R\&D\ d_{t-0}$	0.882**	0.6	0.241	-0.559	0.231	0.667	1.611**	1.922***	1.562***	2.489***	1.894**	0.451	-0.262
	[0.450]	[0.436]	[0.458]	[0.472]	[0.497]	[0.493]	[0.634]	[0 466]	[0.476]	[0.648]	[0.755]	[0.709]	[0.673]
$D\ A_{Pre\text{-}SEO}$	-0.326***	-0.108***	-0.030*	-0.057***	-0.036***	-0.115***	0.049	-0.017	0.005	-0.112***	-0.03	-0.003	-0 033*
	[0.015]	[0.014]	[0.016]	[0.013]	[0.014]	[0.022]	[0.031]	[0.017]	[0.014]	[0 020]	[0.025]	[0.024]	[0.020]
N	5288	5069	4715	4300	3930	5288	5069	4715	4300	5288	5069	4715	4300
Adj. R^2	0.356	0.088	0.059	0.043	0.031	0.654	0.09	0.164	0.205	0.058	0.035	0.045	0.039
RMSE	9.633	9.009	8.821	8.632	8.529	11.169	15.203	10.545	9.557	13.553	16.24	13.408	12.914
F-stat	45.222	14.552	8.118	3.915	2.236	164.269	8.576	7.007	6.356	5.459	4.663	3.903	2.997

Panel B: Initial public offerings

Dependent variable	Change in leverage D/A_t-D/A_{t-1}				Net equity issues e/A_t			Net debt issues d/A_t		
Relative year	*IPO+1*	*IPO+2*	*IPO+3*	*IPO+4*	*IPO+1*	*IPO+2*	*IPO+3*	*IPO+1*	*IPO+2*	*IPO+3*
$RPVGO_{t=-1}$	2.008***	0.425	0.334	-0.044	-0.193	0.329	0.505	1.634***	0.164	0.594
	[0.308]	[0.351]	[0.320]	[0.334]	[0.362]	[0.350]	[0.319]	[0.473]	[0.486]	[0.516]
$KZ\ Index_{t=-1}$	-0.123	0.05	-0.101	0.113	0.404***	0.409***	0.326***	0.052	0.318*	0.124
	[0.150]	[0.129]	[0.158]	[0.107]	[0.122]	[0.123]	[0.120]	[0.179]	[0.169]	[0.204]
HOT	1.082*	0.594	0.169	-0.196	0.287	0.91	-1.937**	2.413**	0.912	-0.645
	[0.630]	[0.799]	[0.794]	[0.747]	[0.820]	[0.870]	[0.808]	[0.936]	[1.028]	[1.031]
M/B_t	-0.433**	-0.549**	0.023	-0.218	2.677***	2.891***	2.753***	-0.05	0.526*	1.347***
	[0.199]	[0.257]	[0.266]	[0.255]	[0.290]	[0.391]	[0.342]	[0.239]	[0.279]	[0.400]
$EBITDA/A_{t-1}$	-0.080***	-0.033	-0.031	-0.025	-0.161***	-0.089**	-0.110***	0.079*	0.187***	0.191***
	[0.029]	[0.034]	[0.028]	[0.030]	[0.040]	[0.037]	[0.030]	[0.043]	[0.044]	[0.055]
$SIZE_{t-1}$	-0.929***	-0.760***	-0.682**	-0.184	-0.061	0.028	0.221	-0.569*	-0.375	-0.394
	[0.206]	[0.232]	[0.268]	[0.241]	[0.224]	[0.247]	[0.287]	[0.314]	[0.322]	[0.478]
PPE/A_{t-1}	0.007	0.007	-0.019	0.006	0.015	0.016	0.036**	0.070***	0.047**	-0.018
	[0.016]	[0.016]	[0.016]	[0.016]	[0.017]	[0.017]	[0.016]	[0.022]	[0.023]	[0.027]
$R\&D/A_{t-1}$	-0.038	0.009	0.033	-0.011	0.207**	0.191**	0.093	-0.012	0.034	0.07
	[0.059]	[0.069]	[0.057]	[0.107]	[0.088]	[0.090]	[0.069]	[0.070]	[0.076]	[0.080]
$R\&D\ d_{t-0}$	0.449	0.303	0.02	-0.476	1.249*	1.445*	1.982***	1.13	0.441	1.608
	[0.684]	[0.800]	[0.784]	[0.897]	[0.750]	[0.833]	[0.768]	[1.051]	[1.081]	[1.218]
$D\ A_{Pre\text{-}IPO}$	-0.004	0.028*	0.005	-0.009	0.025	-0.013	0.007	0.079***	0.052**	-0.007
	[0.015]	[0.016]	[0.016]	[0.016]	[0.018]	[0.018]	[0.017]	[0.019]	[0.021]	[0.025]
N	2247	2021	1776	1554	2247	2021	1776	2247	2021	1776
Adj. R^2	0.078	0.048	0.034	0.027	0.118	0.101	0.115	0.077	0.064	0.053
RMSE	11.933	12.07	11.663	10.973	13.505	13.422	11.521	16.433	16.485	18.508
F-stat	4.665	2.505	1.243	1.248	5.199	5.229	4.745	5.025	2.796	2.881

Table 11 Capital Structure and Historical Weighted Average Market-to-Book Ratios

Cross-sectional regressions with the following specifications:

$$\left(\frac{D}{A}\right)_t - \left(\frac{D}{A}\right)_{Pre} = c_0 + c_1 RPVGO_{t=-1} + c_2 YT + c_3 RSQ_{1T} + c_4 KZ\ Index_{t=-1} + c_5 HOT + c_6 M/B_{efwa,t-1}$$
$$+ c_7 M/B_{t-1} + c_8 EBITDA/A_{t-1} + c_9 SIZE_{t-1} + c_{10} PPE/A_{t-1} + c_{11} R\&D/A_{t-1} + c_{12} R\&Dd_{t-1} + c_{13} D/A_{Pre} + \varepsilon$$

where the dependent variable is book leverage. $RPVGO_{t=-1}$, RSQ_{YT}, $KZ\ Index_{t=-1}$ and D/A_{Pre} are measured in the pre-offering year. $M/B_{efwa,t-1}$ is calculated as in Baker and Wurgler (2002). All regressions are estimated with industry fixed effects and contain a constant (not reported). Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

	Seasoned equity offerings				Initial public offerings			
Relative offering year	*SEO + 1*	*SEO + 3*	*SEO + 5*	*SEO + 10*	*IPO + 1*	*IPO + 3*	*IPO + 5*	*IPO − 10*
$RPVGO_{t=-1}$	-0.125***	0.08	0.046	0.09	-0.165***	-0.018	-0.018	-0.035
	[0.048]	[0.056]	[0.061]	[0.076]	[0.055]	[0.057]	[0.075]	[0.102]
YT	-0.542*	-0.431	-0.407	-1.517**	-	-	-	-
	[0.307]	[0.343]	[0.271]	[0.697]	-	-	-	-
RSQ_{YT}	-0.193	-0.287*	-0.136	0.088	-	-	-	-
	[0.125]	[0.158]	[0.180]	[0.237]	-	-	-	-
$KZ\ Index_{t=-1}$	0.015	0.051	-0.578	-3.468***	-0.493**	-0.575***	-0.086	-0.038
	[0.278]	[0.359]	[0.551]	[0.812]	[0.203]	[0.213]	[0.236]	[0.437]
HOT	0.874**	0.343	0.576	0.321	0.381	0.936	-1 751	0.366
	[0.366]	[0.463]	[0.494]	[0.604]	[0.975]	[1.265]	[1.445]	[1.913]
$M/B_{efwa,\ t-1}$	-	-3.807***	-4.547***	-6.845***	-	-3.862***	-4.161***	-
	-	[0 357]	[0.500]	[0.639]	-	[0.521]	[0.586]	-
M/B_{t-1}	-2.355***	0.278	0.242	0.838	-3.101***	-0.271	-1.274***	-2.464***
	[0.207]	[0.415]	[0.483]	[0.559]	[0.274]	[0.524]	[0.477]	[0.702]
$EBITDA/A_{t-1}$	-0.373***	-0.326***	-0.390***	-0.485***	-0.326***	-0.335***	-0.334***	-0.367***
	[0.027]	[0.041]	[0 042]	[0.054]	[0.037]	[0.040]	[0.049]	[0.089]
$SIZE_{t-1}$	1.789***	1.810***	1.897***	2.615***	2.818***	2.518***	2.648***	2.237***
	[0.128]	[0.161]	[0.185]	[0.240]	[0.291]	[0.366]	[0.427]	[0.584]
PPE/A_{t-1}	0.086***	0.055***	0.029	-0.073***	0.177***	0.163***	0 166***	0.132***
	[0.012]	[0.016]	[0.018]	[0.024]	[0.023]	[0.026]	[0.031]	[0.046]
$R\&D/A_{t-1}$	0.005	-0.051	-0.055	-0.07	-0.265***	-0.081	-0.078	0.11
	[0.062]	[0.071]	[0.086]	[0.120]	[0.079]	[0.089]	[0.094]	[0.120]
$R\&D\ d_{t-1}$	1.258**	0.574	2.202***	2.302**	0.756	2.608**	-0.099	1.33
	[0.564]	[0.716]	[0.842]	[1.173]	[0.968]	[1.207]	[1.419]	[2.040]
D/A_{Pre}	-0.434***	-0.560***	-0.565***	-0.606***	-0.646***	-0.644***	-0.759***	-0.787***
	[0.018]	[0.022]	[0.030]	[0.044]	[0.021]	[0.025]	[0.030]	[0.048]
N	5070	4299	3562	2276	2194	1742	1313	617
Adj. R^2	0.341	0.344	0.343	0.447	0.459	0.424	0.464	0.49
RMSE	11.531	13.114	13.433	13.1	16.182	17.517	17.844	17.938
F-stat	33.503	27.202	22.051	33.803	44.186	26.795	34.14	12.907

Table 12 Long-Run Calendar-Time Performance by Subsamples

Calendar-time Carhart (1997) four-factor regression for the full sample of SEOs and IPOs on RMRF, SMB, HML and PR12 are performed as in Table 8. SEOs and IPOs are divided into subsamples as follows. *RPVGO Q1* and *Q5* are the lowest and highest RPVGO quintile, quintiles are determined for SEOs and IPOs separately using RPVGO calculated in the fiscal year preceding the offering. *Proceeds^T/A Q1* and *Q5* are the lowest and highest quintiles of total offering proceeds, quintiles are determine for SEOs and IPOs separately. Hot market and cold market are subsamples divided by whether the issuing date is in a hot or cold issuing month, hot and cold markets are determined for SEOs and IPOs separately. *High KZ Index and Low KZ Index* are subsamples formed by whether *KZ Index* in the pre-offer year is above or below the median of the IPO and SEO subsamples, respectively. *High RSQ$_{YT}$* and *Low RSQ$_{YT}$* are subsamples formed by whether *RSQ$_{YT}$* is above or below the median of the SEO sample. *High YT* and *Low YT* are subsamples formed by whether *YT* is above or below the median of the SEO sample. Newey-West standard errors adjusted for heteroskedasticity and autocorrelation of up to five lags are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Panel A: Seasoned equity offerings

	RPVGO Q1		*RPVGO Q5*		*Proceeds^T/A Q1*		*Proceeds^T/A Q5*	
	VW	EW	VW	EW	VW	EW	VW	EW
Alpha (%)	-0.2928*	-0.0147	-0.3026	-0.4167	-0.2171	-0.068	0.2997	-0.0323
	[0.1728]	[0.1549]	[0.3349]	[0.3421]	[0.1638]	[0.1726]	[0.2382]	[0.2063]
MKT	0.8871***	0.9099***	1.3079***	1.2547***	0.8313***	0.8562***	1.2820***	1.2783***
	[0.0774]	[0.0661]	[0.0738]	[0.0627]	[0.0548]	[0.0496]	[0.0734]	[0.0520]
SMB	-0.115	0.2117*	0.4888***	1.2242***	-0.0038	0.1204**	0.9173***	1.2401***
	[0.0995]	[0.1153]	[0.0943]	[0.0880]	[0.0842]	[0.0557]	[0.0829]	[0.0656]
HML	0.4805***	0.3150***	-0.4561***	-0.1643	0.3905***	0.5677***	-0.9675***	-0.3306***
	[0.0872]	[0.0848]	[0.1232]	[0.1018]	[0.0894]	[0.0752]	[0.1253]	[0.0835]
PR12	-0.0279	-0.1148*	-0.0007	-0.2186***	-0.0774	-0.1870***	0.0167	-0.1988***
	[0.0649]	[0.0651]	[0.0822]	[0.0679]	[0.0553]	[0.0491]	[0.0931]	[0.0497]
N	406	406	393	393	417	417	419	419
Adjusted R^2 (%)	0.579	0.651	0.658	0.724	0.609	0.633	0.801	0.852
	Hot market		*Cold market*		*High KZ Index*		*Low KZ Index*	
	VW	EW	VW	EW	VW	EW	VW	EW
Alpha (%)	-0.0289	0.0785	-0.1062	0.0155	-0.2547	-0.0719	0.1296	0.1786
	[0.1489]	[0.1398]	[0.1339]	[0.1400]	[0.1548]	[0.1284]	[0.1621]	[0.1416]
MKT	1.0108***	1.0742***	0.8466***	0.9564***	1.0133***	1.0589***	0.9026***	1.0120***
	[0.0479]	[0.0333]	[0.0406]	[0.0397]	[0.0495]	[0.0378]	[0.0451]	[0.0377]
SMB	0.2621***	0.7955***	0.0714	0.5299***	0.2600***	0.7291***	0.1571*	0.7456***
	[0.0608]	[0.0478]	[0.0668]	[0.0745]	[0.0451]	[0.0668]	[0.0828]	[0.0553]
HML	-0.1423*	0.0457	0.047	-0.0143	0.1732***	0.1626**	-0.3265***	-0.1107**
	[0.0792]	[0.0522]	[0.0653]	[0.0588]	[0.0650]	[0.0637]	[0.1102]	[0.0501]
PR12	-0.0904	-0.2760***	-0.0511	-0.1695***	-0.1150**	-0.2981***	-0.0251	-0.2316***
	[0.0683]	[0.0368]	[0.0476]	[0.0564]	[0.0463]	[0.0376]	[0.0837]	[0.0473]
N	412	412	392	392	418	418	419	419
Adjusted R^2 (%)	0.834	0.904	0.746	0.812	0.838	0.895	0.791	0.888
	High RSQ$_{YT}$		*Low RSQ$_{YT}$*		*High YT*		*Low YT*	
	VW	EW	VW	EW	VW	EW	VW	EW
Alpha (%)	-0.0036	0 0927	-0.1266	0.0242	-0.0555	0.1623	-0.0597	-0.0133
	[0.1533]	[0.1303]	[0.1274]	[0.1148]	[0.1496]	[0 1334]	[0.1352]	[0.1252]
MKT	0.9502***	1.0645***	0.9498***	1.0044***	0.9933***	1.0689***	0.9106***	0.9967***
	[0.0431]	[0.0383]	[0.0441]	[0.0302]	[0.0450]	[0.0325]	[0.0404]	[0.0335]
SMB	0.1816***	0.6720***	0.2430***	0.7794***	0.2481***	0.8275***	0.1076**	0.6247***
	[0.0637]	[0.0445]	[0.0675]	[0.0436]	[0.0644]	[0.0403]	[0.0481]	[0.0523]
HML	-0.1315	-0.0236	-0.005	0.0709	-0.3317***	-0.1273***	0.1619***	0.2056***
	[0.0929]	[0.0532]	[0.0680]	[0.0461]	[0.0908]	[0.0409]	[0.0566]	[0.0584]
PR12	-0.056	-0.2885***	-0.0244	-0.2181***	0.0204	-0.2385***	-0.1370***	-0.2696***
	[0.0738]	[0.0406]	[0.0505]	[0.0282]	[0.0709]	[0.0335]	[0.0418]	[0.0351]
N	419	419	416	416	419	419	419	419
Adjusted R^2 (%)	0.824	0.893	0.83	0.908	0.818	0.911	0.805	0.883

Panel B: Initial public offerings

	RPVGO Q1		*RPVGO Q5*		*Proceeds^T/A Q1*		*Proceeds^T A Q5*	
	VW	EW	VW	EW	VW	EW	VW	EW
Alpha (%)	-0.051	-0.1384	-0.7542*	-0.0075	-0.3382	-0.1041	-0.1229	0.3884
	[0.2893]	[0.2366]	[0.3933]	[0.3797]	[0.2370]	[0.2812]	[0.1849]	[0.2696]
MKT	1.1176***	1.1675***	1.2555***	1.0864***	1.1723***	1.0960***	1.1203***	1.0692***
	[0.1054]	[0.0866]	[0.0863]	[0.0865]	[0.0983]	[0.1079]	[0.0642]	[0.0625]
SMB	0.9306***	1.1024***	0.6676***	1.1551***	0.4749***	0.7324***	0.9660***	1.0879***
	[0.1689]	[0.1572]	[0.1285]	[0.1428]	[0.1527]	[0.1839]	[0.0881]	[0.1324]
HML	-0.4931**	0.2333	-0.6416***	-0.4946***	-0.1164	0.0324	-0.7994***	-0.3576***
	[0.1965]	[0.1561]	[0.1473]	[0.1744]	[0.1671]	[0.2182]	[0.0949]	[0.1099]
PR12	0.2057	-0.2704***	-0.0162	-0.2841	0.1528*	-0.0912	-0.0156	-0.2814**
	[0.1341]	[0.0890]	[0.1129]	[0.1841]	[0.0877]	[0.1255]	[0.0644]	[0.1109]
N	395	395	306	306	387	387	306	306
Adjusted R^2 (%)	0.473	0.565	0.601	0.64	0.538	0.565	0.689	0.723
	Hot market		*Cold Market*		*High KZ Index*		*Low KZ Index*	
	VW	EW	VW	EW	VW	EW	VW	EW
Alpha (%)	-0.8879**	-0.495	-0.0421	0.2983	-0.7035*	-0.6440*	-0.1629	0.2553
	[0.4127]	[0.4102]	[0.2628]	[0.3509]	[0.3826]	[0.3729]	[0.2276]	[0.2874]
MKT	1.3213***	1.2014***	1.1248***	1.0672***	1.4029***	1.2380***	1.0165***	1.0330***
	[0.1912]	[0.1736]	[0.1071]	[0.1179]	[0.1795]	[0.1638]	[0.0944]	[0.1086]
SMB	1.1551***	1.3963***	0.5235***	0.7816***	1.1268***	1.3765***	0.6931***	0.8892***
	[0.3407]	[0.3208]	[0.1730]	[0.1919]	[0.3205]	[0.3002]	[0.1252]	[0.1635]
HML	0.1466	0.3895	-0.2892	-0.3126	0.2013	0.4423	-0.5261***	-0.3320*
	[0.4136]	[0.3757]	[0.1834]	[0.2097]	[0.3779]	[0.3496]	[0.1633]	[0.1959]
PR12	-0.1185	-0.3977***	0.1278	-0.1285	-0.1276	-0.3541**	0.0955	-0.1405
	[0.1452]	[0.1427]	[0.1018]	[0.1361]	[0.1371]	[0.1437]	[0.0831]	[0.1092]
N	359	359	356	356	395	395	387	387
Adjusted R^2 (%)	0.413	0.432	0.561	0.583	0.429	0.447	0.616	0.638

Appendix

Table A1 Industry Classification of 4-Digit SIC Codes

Issuing firms are assigned to one of the 48 industries used by Fama and French (1997) using their 4-digit primary SIC codes reported by SDC. SEO and IPO observations satisfy the data requirements of Table 1.

Industry abbreviation	Industry name	SIC Codes	SEOs		IPOs	
			Total	Percent	Total	Percent
Aero	Aircraft	3720-3729	29	0.5	14	0.57
Agric	Agriculture	0100-0799, 2048	20	0.4	6	0.25
Autos	Automobiles and trucks	2296, 2396, 3010-3011, 3537, 3647, 3694, 3700-3716, 3790-3792, 3799	78	1.5	35	1.44
Banks	Banking	6000-6099, 6100-6199	excluded			
Beer	Alcoholic beverages	2080-2085	0	0	0	0
BldMt	Construction materials	0800-0899, 2400-2439, 2450-2459, 2490-2499, 2950-2952, 3200-3219, 3240-3259, 3261, 3264, 3270-3299, 3420-3442, 3446-3452, 3490-3499, 3996	86	1.6	49	2.01
Books	Printing and publishing	2700-2749, 2770-2799	28	0.5	20	0.82
Boxes	Shipping companies	2440-2449, 2640-2659, 3210-3221, 3410-3412	12	0.2	5	0.21
BusSv	Business services	2750-2759, 3993, 7300-7372, 7374-7394, 7379, 7399, 7510-7519, 8700-8748, 8900-8999	419	7.8	435	17.84
Chem	Chemicals	2800-2829, 2850-2899	73	1.4	24	0.98
Chips	Electronic equipment	3922, 3661-3679, 3810, 3812	384	7.2	195	8
Clths	Apparel	2300-2390, 3020-3021, 3100-3111, 3130-3159, 3965	49	0.9	42	1.72
Cnstr	Construction	1500-1549, 1600-1699, 1700-1799	47	0.9	36	1.48
Coal	Coal	1200-1299	4	0.1	3	0.12
Comps	Computers	3570-3579, 3680-3689, 3695, 7373	237	4.4	161	6.6
Drugs	Pharmaceutical products	2830-2836	276	5.2	67	2.75
ElcEq	Electrical equipment	3600-3621, 3623-3929, 3640-3646, 3648-3649, 3660, 3691-3692, 3699	48	0.9	27	1.11
Enrgy	Petroleum and natural gas	1310-1389, 2900-2911, 2990-2999	280	5.2	54	2.21
FabPr	Fabricated products	3400, 3443-3444, 3460-3479	10	0.2	3	0.12
Fin	Trading	6200-6299, 6700-6799	excluded			
Food	Food products	200-2046, 2050-2063, 2070-2097, 2090-2095, 2098-2099	45	0.8	35	1.44
Fun	Entertainment	7800-7841, 7900-7999	75	1.4	44	1.8
Gold	Precious metals	1040-1049	24	0.5	3	0.12
Guns	Defense	3480-3489, 3760-3769, 3795	7	0.1	2	0.08
Hlth	Healthcare	8000-8099	148	2.8	97	3.98

Hshld	Consumer goods	2047, 2391-2392, 2510-2519, 2590-2599, 2840-2844, 3160-3199, 3229-3231, 3260, 3262-3263, 3269, 3630-3639, 3750-3751, 3800, 3860-3879, 3910-3919, 3960-3961, 3991, 3995	51	1.0	57	2.34
Insur	Insurance	6300-6399, 6400-6411		excluded		
LabEq	Measuring and control Equipment	3811, 3820-3830	108	2.0	57	2.34
Mach	Machinery	3510-3536, 3540-3569, 3580-3599	178	3.3	79	3.24
Meals	Restaurants, hotel, motel	5800-5813, 5890, 700-7019, 7040-7049, 7213	142	2.7	84	3.44
MedEq	Medical equipment	3693, 3480-3851	143	2.7	63	2.58
Mines	Nonmetallic mining	1000-1039, 1060-10999, 1400-1499	10	0.2	2	0.08
Misc	Miscellaneous	3900, 3990, 3999, 9900-9999	2	0.0	1	0.04
Paper	Business supplies	2520-2549, 2600-2639, 2670-2699, 2760-2761, 3950-3955	39	0.7	22	0.9
PerSv	Personal services	7020-7021, 7030-7039, 3200-7212, 7215-7299, 7395, 7500, 7520-7549, 7600-7699, 8100-8199, 8200-8299, 8300-8399, 8400-8499, 8600-8699, 8800-8899	49	0.9	29	1.19
RlEst	Real estate	6500-6553		excluded		
Rtail	Retail	5200-5299, 5300-5399, 5400-5499, 5500-5599, 5600-5699, 5700-5736, 5900-5999	305	5.7	200	8.2
Rubbr	Rubber and plastic products	3000, 3050-3099	34	0.6	24	0.98
Ships	Shipbuilding, railroad equipment	3730-3731, 3740-3743	4	0.1	8	0.33
Smoke	Tobacco products	2100-2199	3	0.1	0	0
Soda	Candy and soda	2064-2086, 2086-2087, 2098-2097	11	0.2	6	0.25
Steel	Steel works etc.	3300-3369, 3390-3399	77	1.4	36	1.48
Telcm	Telecommunications	4800-4899	178	3.3	78	3.2
Toys	Recreational products	0900-0999, 3650-3652, 3732, 3930-3949	38	0.7	44	1.8
Trans	Transportation	4000-4099, 4100-4199, 4200-4299, 4400-4499, 4500-4599, 4600-4699, 4700-4799	166	3.1	87	3.57
Txtls	Textiles	2200-2295, 2297-2299, 2393-2395, 2397-2399	35	0.7	21	0.86
Util	Utilities	4900-4999	1,236	23.1	48	1.97
Whlsl	Wholesale	5000-5099, 5100-5199	173	3.2	136	5.58
Total			5361	100	2439	100

Table A2 Cumulative Changes in Leverage, Net Equity Issues and Net Debt Issues: Robustness Tests

This table reports results for estimating equation (8) with the cumulative change in leverage as the dependent variable in Panels A and B and net equity issues and debt issues as the dependent variable in Panels C and D. All regressions contain the variables *HOT*, M/B_t, $EBITDA/A_{t-1}$, $SIZE_{t-1}$, PPE/A_{t-1}, $R\&D/A_{t-1}$, $R\&Dd_{t-1}$, D/A_{pre}, and industry fixed effects. Panels A and C add SEO-year and IPO-year fixed effects. Panels B and D condition of survival of the firm until year *SEO+3* and *IPO+3*. Robust standard errors are reported in brackets. *, **, and *** denote the parameter is significantly different from 0 at the 10%, 5%, and 1% level, respectively.

Dep. variable	Relative year	$RPVGO_{t=-1}$		YT		RSQ_{YT}		$KZ\ Index_{t=-1}$		N	$Adj.\ R^2$
Panel A: SEO-year and IPO-year fixed effects											
D/A_t $D/A_{Pre\text{-}SEO}$	SEO	-0 187***	[0.072]	-0.483*	[0.257]	0.213*	[0.114]	-0.439**	[0.222]	5,291	0.39
	SEO+1	-0.201**	[0.085]	-0.379**	[0.187]	-0.523***	[0.145]	0.366	[0.240]	5,070	0.36
	SEO+3	0.104	[0.116]	-0.199	[0.292]	-0.490***	[0.190]	0.399	[0.390]	4,299	0.34
D/A_t $D/A_{Pre\text{-}IPO}$	IPO	-0.218***	[0.055]	-	-	-	-	-0.649***	[0.153]	2,358	0.54
	IPO+1	-0.183***	[0.057]	-	-	-	-	-0.644***	[0.197]	2,194	0.49
	IPO+3	-0.066	[0.063]	-	-	-	-	-0.475**	[0.213]	1,742	0.43
Panel B: Balanced SEO and IPO panels											
D/A_t $D/A_{Pre\text{-}SEO}$	SEO	-0.231***	[0.040]	-0.538*	[0.316]	0.410***	[0.103]	-0.570**	[0.259]	4,329	0.39
	SEO+1	-0.175***	[0.047]	-0.666**	[0.332]	-0.260**	[0.126]	0.101	[0.256]	4,291	0.36
	SEO+3	0.007	[0.057]	-0.425	[0.411]	-0.375**	[0.162]	0.188	[0.381]	4,299	0.32
D/A_t $D/A_{Pre\text{-}IPO}$	IPO	-0.212***	[0.055]	-	-	-	-	-0.352**	[0.173]	1,761	0.52
	IPO+1	-0.167***	[0.057]	-	-	-	-	-0.445**	[0.213]	1,731	0.47
	IPO+3	-0.055	[0.059]	-	-	-	-	-0.28	[0.212]	1,742	0.40
Panel C: SEO-year and IPO-year fixed effects											
e/A_t	SEO	0 492***	[0.083]	0.686*	[0.405]	0.401***	[0.136]	0.835**	[0.354]	5,288	0.69
	SEO+1	-0.101	[0.089]	0.165	[0.167]	0.256	[0.260]	-0.092	[0.636]	5,069	0.10
	SEO+3	0.005	[0.081]	0.151	[0.109]	0.153	[0.136]	0.475**	[0.216]	4,300	0.22
d/A_t	SEO	0.081	[0.120]	-0.008	[0.140]	0.661***	[0.169]	0.237	[0.344]	5,288	0.10
	SEO+1	0.195*	[0.116]	0.148	[0.120]	-0.159	[0.256]	0.997***	[0.381]	5,069	0.05
	SEO+3	0.336***	[0.129]	0.284	[0.217]	0.061	[0.160]	0.670**	[0.324]	4,300	0.06
e/A_t	IPO+1	-0.085	[0.395]	-	-	-	-	0.505***	[0.126]	2,247	0.13
	IPO+3	0.517	[0.352]	-	-	-	-	0.367***	[0.125]	1,776	0.12
d/A_t	IPO+1	1.322***	[0.503]	-	-	-	-	0.15	[0.181]	2,247	0.09
	IPO+3	0.763	[0.551]	-	-	-	-	0.173	[0.209]	1,776	0.06
Panel D: Balanced SEO and IPO panels											
e/A_t	SEO	0.469***	[0.046]	0.92	[0.585]	-0.449***	[0.127]	1.579***	[0.545]	4,328	0.7
	SEO+1	-0.04	[0.046]	0.151	[0.166]	0.015	[0.126]	0.109	[0.693]	4,292	0.1
	SEO+3	-0.048	[0.036]	0.101	[0.121]	0.15	[0.114]	0.434**	[0.214]	4,300	0.2
d/A_t	SEO	-0.095	[0.067]	-0.071	[0.140]	0.586***	[0.149]	0.336	[0.388]	4,328	0.1
	SEO+1	0.190***	[0.070]	-0.111	[0.148]	-0.224	[0.139]	1.131***	[0.371]	4,292	0.1
	SEO+3	0.112	[0.077]	0.329*	[0.188]	0.082	[0.142]	0.580*	[0.333]	4,300	0.0
e/A_t	IPO+1	-0.437	[0.382]	-	-	-	-	0.424***	[0.135]	1,765	0.1
	IPO+3	0.505	[0.319]	-	-	-	-	0.326***	[0.120]	1,776	0.1
d/A_t	IPO+1	1.153**	[0.511]	-	-	-	-	-0.023	[0.200]	1,765	0.1
	IPO+3	0.594	[0.516]	-	-	-	-	0.124	[0.204]	1,776	0.1

Table A3 SEO Firm Sample Versus Random Sample

The table reports differences between the SEO firm sample and a random sample drawn from the matched CRSP and COMPUSTAT firm universe. Every SEO sample firm is matched by its offer date with all available benchmark firms on that date. Benchmark firms satisfy the requirements of not having performed an IPO or SEO within the prior 60 months, not performing an SEO for the next 12 months and having price history available on CRSP for 36 months prior to the matched offer date. From the available benchmark firms two firms are randomly drawn for every SEO firm. Columns 3 to 5 report the results of a probit regression, where the dependent variable *SEO* equals one if the firm is included in the sample of SEO firms, zero otherwise. Coefficients are reported as marginal effects. All dependent variables with the exception of *M/B* and *SIZE* are reported as a percentage. Robust asymptotic standard errors are in brackets. *, **, and *** denote the parameter is statistically significant different from 0 at the 10%, 5%, and 1% level, respectively. *Prob* denotes the significance level of the asymptotic χ^2–statistic, which tests the hypothesis that all parameters in the model are simultaneously equal to zero.

	SEO Firms	Random Sample	Probit		
	Mean (Median)	Mean (Median)	*dF/dx* [se]	*dF/dx* [se]	*dF/dx* [se]
RSQ_{YT}	23.93	19.39	0.003***	0.003***	0.004***
	(21.41)	(15.54)	[0.000]	[0.000]	[0.000]
YT	21.70	0.56	0.001**	0.001**	0.001**
	(12.75)	(0.00)	[0.000]	[0.000]	[0.000]
M/B_{t-1}	1.48	1.63	0.031***	0.029***	0.024***
	(1.09)	(1.13)	[0.005]	[0.005]	[0.004]
D/A_{t-1}	48.85	56.04	-0.000**	-0.000***	0
	(52.39)	(50.10)	[0.000]	[0.000]	[0.000]
$EBITDA/A_{t-1}$	11.30	7.29	0.004***	0.004***	0.004***
	(11.90)	(10.95)	[0.000]	[0.000]	[0.000]
$SIZE_{t-1}$	5.72	4.91	0.006**	0.003	-0.004
	(5.82)	(4.95)	[0.002]	[0.002]	[0.003]
$R\&D/A_{t-1}$	2.73	2.82	0.006***	0.005***	0.004***
	(0.00)	(0.00)	[0.001]	[0.001]	[0.001]
$R\&D\ d_{t-0}$	0.55	0.49	0.109***	0.094***	0.089***
	(1.00)	(0.00)	[0.009]	[0.011]	[0.011]
PPE/A_{t-1}	47.44	30.63	0.003***	0.003***	0.003***
	(43.36)	(25.01)	[0.000]	[0.000]	[0.000]
Industry fixed effects	-	-	NO	YES	YES
Offer year fixed effects	-	-	NO	NO	YES
N	5,298	10,425	14674	14674	14674
Pseudo-R^2	-	-	0.068	0.11	0.162
χ^2	-	-	833.069	1593.403	2218.788
Prob	-	-	0.000	0.000	0.000