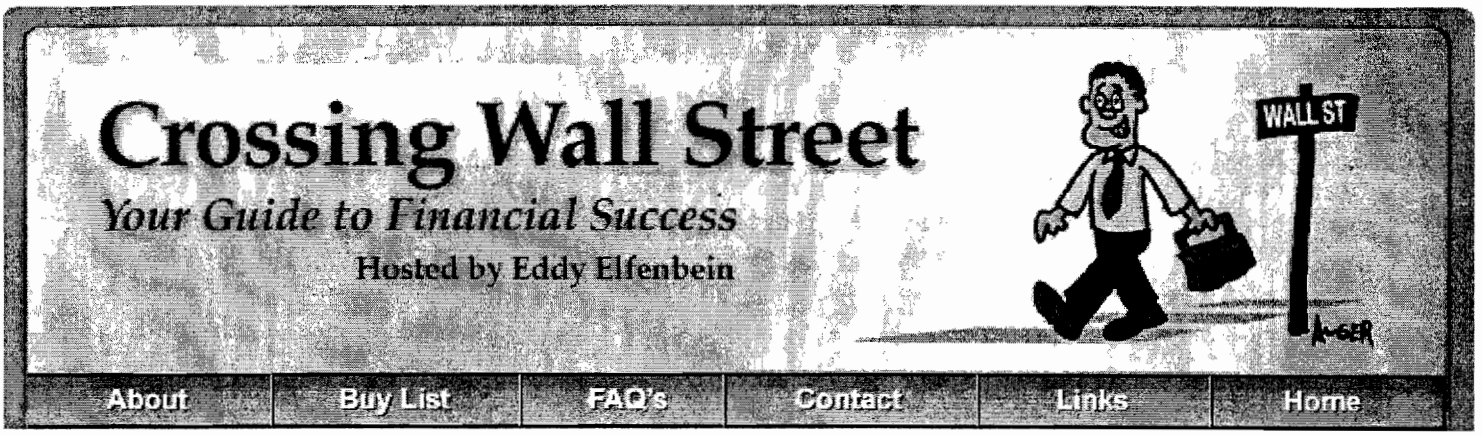

« Sorry, Folks | Main | First-Quarter Summary »

April 01, 2006 Ibbotson Yearbook

I just got my copy of the *2006 Ibbotson Yearbook* in the mail. Ibbotson is a money management firm in Chicago that's best known for keeping long-term performance information on the stock market (the company was recently bought by Morningstar).

The yearbook tracks the monthly performance of stocks, bonds, treasuries and inflation since 1925. It's a fascinating resource. The yearbooks are available at many libraries, but being a data junkie, I like to get my own copy. You can order a copy here.

The data confirms that the stock market is the best place to be. Over the last 80 years, large-cap stocks have gone up an average of 10.36% a year (dividends and capital gains). One dollar invested in 1925 would be worth over $2,600 today. On average, the market doubles every seven years. Nothing beats it.

When you look at the long-term chart, even ugly periods like 1987 appear as minor blips. It's true that bear markets can be painful, but the long-term data is clear. The market goes up, up and up. The only hitch is that you have to be patient.

Stocks are also big winners against bonds. Long-term corporate bonds have averaged 5.92% a year. Long-term Treasuries have average 5.47% a year, and T-Bills have returned just 3.71% a year.

Ibbotson also looks at small-cap stocks, and that group has done even better than the large-caps. Since 1926, small-caps have averaged 12.64% a year. By small-cap, Ibbotson generally means stocks that are in the smallest 20% of the market's universe, although they've recently altered their criteria.

Ibbotson also breaks out the performance of each size decile, or 10% slice of the market. What's interesting is that the returns are almost perfectly rank-ordered—the smallest 10% has done the best, and the largest 10% has done the worst.

Since 1926, the smallest decile has returned an average of 13.96% a year. My only caution about micro-cap investing is that although the "outperformance premium" is very real, it's not very well-behaved. The relative performance is *highly* cyclical. It's either feast or famine.

Micro-caps badly trailed the market during the 1990's, but over the last seven years, micro-caps have been stellar performers. Since 2000, the micro-cap decile is up 211%. This may be the most underreported market event of this decade.

It's almost like there's an invisible bull market going on. Interestingly, the peewees started to cream the big boys in 1999 *before* the market peaked.. Although the **S&P 100** (^OEX) is still about 29% off its all-time high, the broader indexes have been hitting new all-time highs lately. Very soon, the **Wilshire 5000 Total Return Index** (^DWCT) will hit an all-time high.

Another interesting aspect of small-caps is that the outperformance doesn't comport with the Capital Asset Pricing Model. In English, this means that the small-caps have done even better than their risk behavior suggests.

Something else I noticed from the Ibbotson data is that, in recent decades, long-term Treasuries have been surprisingly competitive against stocks. Mind you, the stock market is still the big winner. But since 1968, long-term Treasuries have averaged 8.69% a year, which is pretty good compared with the 10.52% for large-cap stocks.

Over the long-term, large-caps have averaged 4.63% a year better than long-term T-bonds. Given the current yield of the 10-year Treasury of 4.85%, this implies a market return of about 9.7% (i.e., 1.0463 * 1.0485).

The yearbook also includes a section with data going back to 1815. Personally, I tend to skeptical of those types of studies since the capital markets were so underdeveloped. During the 19th century, most stocks traded at par, meaning $100 a share. Investors were interested in dividends, not capital gains. The idea of continuously rising indexes is fairly new. Back then, stocks traded much like bonds, except that management decided what the dividend (often annual or semi-annual) would be.

Since there was little inflation (before the Fed) and generous dividend payouts, stock prices had little reason to advance much. By Ibbotson's numbers, the after-inflation return of the market over the last 80 years is only 7.10%.

Sometimes I think we'd be better off the old way. Imagine a world without inflation and you owned a stock that almost always traded around $100, and every six months you got a check for $3.50 a share. Booyah!

Posted by edelfenbein at April 1, 2006 02:42 PM

IT WORKS UNTIL IT DOESN'T

Tuesday, March 14, 2006

Over the weekend the Internet died. Its death was sudden, and for that reason our personal loss was particularly tragic.

Our computer had shown no signs of illness.The browser moved briskly between the websites of major retailers, sites I keep forgetting to block when my wife is out of town. Google searches were made with ease, bookmarked recipes were found, Dallas Mavericks schedules were checked, and weather forecasts noted.

Then, suddenly, there was no connection. No news. No weather. Even spam couldn't get through. Things had worked fine for months and months. And then they didn't.

So I called our DSL provider's tech support and got Carl. Carl sounded competent, but anyone who believes "Carl" was this guy's real name would take a firearm safety course from Dick Cheney.

I knew what Carl was going to tell me – that there was a configuration problem. It's always a configuration problem. Every six months the Wicked Witch of the Internet flies over our house under cover of darkness and casts a spell on our machine so that things suddenly need to be "reconfigured." There can be no other explanation unless Carl is sabotaging us so he can work on his English.

I don't mind talking to Carl, but it would be nice if we had an early warning system. The computer should come with a siren that goes off 10 minutes before the reconfiguration curse hits. Then we would know to forget about poking around on eBay. We might even make plans to go outside for change. Maybe take a walk. Maybe walk all the way down the street and use the neighbor's computer to see what bowling shirts eBay has in my size.

Kenneth Solow and Michael Kitces appreciate that things don't always work forever. Like asset allocation. In their article in the March issue of the *Journal of Financial Planning*, the duo dare to suggest that traditional allocation models might not fare so well in a secular bear market.

As executives for a wealth advisory group, Solow's and Kitces's interest in asset allocation is more than

Quotes delayed at least 20 minutes

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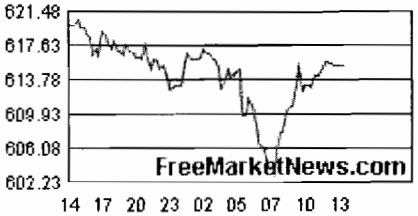
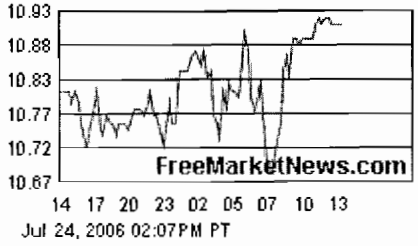


GOLD 615.40 ▼ 5.00

More Charts

Live Silver Price by GoldCentral.com



SILVER 10.91 ▲ 0.09

More Charts

academic. They fear that if their clients' money is allocated under traditional assumptions, then their returns may fall well short of expectations. After all, asset allocation decisions often are determined by evaluating a client's goals and using historical returns from various asset classes to achieve them.

Solow and Kitces figure that the assumed returns for the equity segment of client's asset mix are now around 9%-10% a year. That sounds reasonable because stocks have delivered 9-10% over the long term.

What makes Solow and Kitces question those assumptions is their suspicion that stocks are in a secular bear market. If that's the case, stocks could provide returns well below 10% for years to come. In fact a secular bear market can last as long as a client's time horizon. The last secular bear, for example, lasted from 1966-1981. And while investors are intrigued with Japanese stocks today, the Japanese bear market dragged on for almost 15 years.

Solow and Kitces understand that it is hard for investment professionals to shake the idea that stocks won't deliver 10% over the next several years. But they remind advisors that 1982-2000 was an enormous growth period for the financial planning industry. It's probably no coincidence that it was also a period of rising stock prices, thanks in large part, to rising PE ratios. Those 18-years of stock market history must *seem* long term to those who witnessed it, so plugging in 10% equity returns into asset allocation models can make perfect sense. The history of long term market cycles, our dynamic duo argue, has proven otherwise.

Still, the idea of plugging in sub-10% equity returns into an asset allocation model can sound ridiculous to advisors who quote Roger Ibbotson's numbers in their sleep, whether or not they had Jack-in-the-Box tacos for supper. But the Ibbotson's numbers, while accurate, require a disclaimer or two. Here's a suggested one: Don't bet on a repeat performance.

Ed Easterling, renowned chronicler of secular bull and bear markets and world class number cruncher, has some interesting insights into the Ibbotson equity numbers. In an article that appeared on this website last fall, Ed acknowledged that the annualized total return from stocks from 1926 through 2004 was sure enough 10.4%. And, yes, the period under consideration was "long term." But Ed's sharp eye noticed that stocks in 1926 were much cheaper than in 2004. PEs started the period at 10.4 and wound up at 20. That PE expansion accounted for 0.9% of Ibbotson's 10.4% long term return from stocks. Since PEs are still high, investors banking on continued multiple expansion to drive stock market returns are more optimistic than American Idol competitors.

Similarly, Easterling notes that the dividend yield averaged 4.5% over Ibbotson's measurement period. With yields today closer to 2.5% (at best), that's another 2% we can lop off the 10.4% historic return. That takes our best case return below 8%. And if PEs contract, rather than remain at today's elevated levels, annual returns will fall further, even if the period under consideration is a long one. The way Ed sees it, the only way for a new secular bull market to begin is to start from lower valuation levels. And that means slogging through a secular bear market to get there.

What does all this have to do with asset allocation? If the odds are that stock market returns will come in lower than "average" over the next several years, then expectations for portfolios with traditional equity asset allocations will have to come down. Either that or the odds will increase that return objectives will not be met. That makes Solow and Kitces wonder if the traditional allocation model should be altered, either by including

Table A-1 (continued)

Large Company Stocks: Total Returns

from January 1971 to December 2005

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Jan-Dec*
1971	0.0419	0.0141	0.0382	0.0377	-0.0367	0.0021	-0.0399	0.0412	-0.0056	-0.0404	0.0027	0.0877	1971	0.1431
1972	0.0194	0.0288	0.0072	0.0057	0.0219	-0.0205	0.0036	0.0381	-0.0036	0.0107	0.0505	0.0131	1972	0.1898
1973	-0.0159	-0.0333	-0.0002	-0.0395	-0.0139	-0.0051	0.0394	-0.0316	0.0415	0.0003	-0.1082	0.0183	1973	-0.1466
1974	-0.0085	0.0010	-0.0217	-0.0373	-0.0272	-0.0128	-0.0759	-0.0828	-0.1170	0.1657	-0.0448	-0.0177	1974	-0.2647
1975	0.1251	0.0871	0.0237	0.0493	0.0509	0.0462	-0.0659	-0.0144	-0.0328	0.0837	0.0313	-0.0096	1975	0.3720
1976	0.1199	-0.0058	0.0326	-0.0099	-0.0073	0.0427	-0.0068	0.0014	0.0247	-0.0208	-0.0009	0.0540	1976	0.2384
1977	-0.0489	-0.0151	-0.0119	0.0011	-0.0150	0.0475	-0.0151	-0.0133	0.0000	-0.0415	0.0370	0.0048	1977	-0.0718
1978	-0.0596	-0.0161	0.0276	0.0870	0.0136	-0.0152	0.0560	0.0340	-0.0048	-0.0891	0.0260	0.0172	1978	0.0656
1979	0.0421	-0.0284	0.0575	0.0036	-0.0168	0.0410	0.0110	0.0611	0.0025	-0.0656	0.0514	0.0192	1979	0.1844
1980	0.0610	0.0031	-0.0987	0.0429	0.0562	0.0296	0.0676	0.0131	0.0281	0.0187	0.1096	-0.0315	1980	0.3242
1981	-0.0438	0.0208	0.0380	-0.0213	0.0062	-0.0080	0.0007	-0.0554	-0.0502	0.0528	0.0441	-0.0265	1981	-0.0491
1982	-0.0163	-0.0512	-0.0060	0.0414	-0.0288	-0.0174	-0.0215	0.1267	0.0110	0.1126	0.0438	0.0173	1982	0.2141
1983	0.0348	0.0260	0.0365	0.0758	-0.0052	0.0382	-0.0313	0.0170	0.0136	-0.0134	0.0233	-0.0061	1983	0.2251
1984	-0.0065	-0.0328	0.0171	0.0069	-0.0534	0.0221	-0.0143	0.1125	0.0002	0.0026	-0.0101	0.0253	1984	0.0627
1985	0.0768	0.0137	0.0018	-0.0032	0.0615	0.0159	-0.0026	-0.0061	-0.0321	0.0447	0.0716	0.0467	1985	0.3216
1986	0.0044	0.0761	0.0554	-0.0124	0.0549	0.0166	-0.0569	0.0748	-0.0822	0.0556	0.0256	-0.0264	1986	0.1847
1987	0.1343	0.0413	0.0272	-0.0088	0.0103	0.0499	0.0498	0.0385	-0.0220	-0.2152	-0.0819	0.0738	1987	0.0523
1988	0.0427	0.0470	-0.0302	0.0108	0.0078	0.0464	-0.0040	-0.0331	0.0424	0.0273	-0.0142	0.0181	1988	0.1681
1989	0.0723	-0.0249	0.0236	0.0516	0.0402	-0.0054	0.0898	0.0193	-0.0039	-0.0233	0.0208	0.0236	1989	0.3149
1990	-0.0671	0.0129	0.0263	-0.0247	0.0975	-0.0070	-0.0032	-0.0903	-0.0492	-0.0037	0.0644	0.0274	1990	-0.0317
1991	0.0442	0.0716	0.0238	0.0028	0.0428	-0.0457	0.0468	0.0235	-0.0164	0.0134	-0.0404	0.1143	1991	0.3055
1992	-0.0186	0.0128	-0.0196	0.0291	0.0054	-0.0145	0.0403	-0.0202	0.0115	0.0036	0.0337	0.0131	1992	0.0767
1993	0.0073	0.0135	0.0215	-0.0245	0.0270	0.0033	-0.0047	0.0381	-0.0071	0.0203	-0.0094	0.0123	1993	0.0999
1994	0.0335	-0.0270	-0.0435	0.0130	0.0163	-0.0247	0.0331	0.0407	-0.0241	0.0229	-0.0367	0.0146	1994	0.0131
1995	0.0260	0.0388	0.0296	0.0291	0.0395	0.0235	0.0333	0.0027	0.0419	-0.0035	0.0440	0.0185	1995	0.3743
1996	0.0344	0.0096	0.0096	0.0147	0.0258	0.0041	-0.0445	0.0212	0.0562	0.0274	0.0759	-0.0196	1996	0.2307
1997	0.0621	0.0081	-0.0416	0.0597	0.0614	0.0446	0.0794	-0.0556	0.0548	-0.0394	0.0463	0.0172	1997	0.3336
1998	0.0111	0.0721	0.0512	0.0101	-0.0172	0.0406	-0.0107	-0.1446	0.0641	0.0813	0.0606	0.0576	1998	0.2858
1999	0.0416	-0.0311	0.0450	0.0387	-0.0236	0.0555	-0.0312	-0.0050	-0.0274	0.0633	0.0203	0.0589	1999	0.2104
2000	-0.0502	-0.0189	0.0978	-0.0301	-0.0205	0.0246	-0.0156	0.0521	-0.0528	-0.0042	-0.0788	0.0049	2000	-0.0911
2001	0.0355	-0.0912	-0.0634	0.0777	0.0067	-0.0243	-0.0098	-0.0626	-0.0808	0.0191	0.0767	0.0088	2001	-0.1188
2002	-0.0146	-0.0193	0.0376	-0.0606	-0.0074	-0.0712	-0.0780	0.0668	-0.1087	0.0880	0.0689	-0.0588	2002	-0.2210
2003	-0.0262	-0.0150	0.0097	0.0824	0.0527	0.0128	0.0176	0.0195	-0.0106	0.0566	0.0068	0.0524	2003	0.2870
2004	0.0184	0.0139	-0.0161	-0.0157	0.0137	0.0194	-0.0331	0.0040	0.0108	0.0153	0.0405	0.0340	2004	0.1087
2005	-0.0244	0.0210	-0.0177	-0.0190	0.0318	0.0014	0.0372	-0.0091	0.0081	-0.0167	0.0378	0.0003	2005	0.0491

* Compound annual return

THE WALL STREET JOURNAL.

TUESDAY, MARCH 13, 1990 C1

ONEY & INVESTING

Sizzling Stock Funds Can Often Give Warmth to Tardy Investors

MUTUAL FUNDS

By JONATHAN CLEMENTS
Staff Reporter of THE WALL STREET JOURNAL

NEW YORK—Never buy last year's hot fund. Don't run with the crowd. Be a contrarian.

If you follow mutual funds closely, that's the sort of advice you've probably heard time and again.

One little problem: It's bad advice.

The fact is, the top-scoring stock mutual funds tend to do pretty well in the year after they topped the performance charts.

Imagine the following investment strategy. On Jan. 1 of each year, you put $1,000 into each of the previous year's 10 top performing stock funds, and then hold on for the rest of the year. At year's end, you roll over your investment into the new list of top performers.

If you had followed this strategy over the past decade, your $10,000 initial investment would have ballooned into $56,180, according to Chicago's Morningstar Inc., which tracks and analyzes mutual fund performance.

For comparison, a $10,000 investment in the stocks that make up the Standard & Poor's 500-stock index would have left you with $50,388 at the end of 10 years, or $5,792 less than with the hot-fund strategy.

But most fund investors didn't even do that well. A $10,000 investment in the average stock fund would have turned into $42,233 by the end of the decade. That's because most fund managers underperform the market averages, once you deduct expenses.

"Everyone says, 'Never buy the hot funds,' but it's clearly not a disastrous strategy," says Morningstar President Joe Mansueto.

The trick, it seems, is to avoid the specialty funds, like gold funds or those that invest in single-industry sectors. If you had avoided the specialty funds, and instead just bought the previous year's top-performing diversified stock funds, you would have seen your initial $10,000 investment grow to $70,450.

Why do hot funds do so well in the year after they topped the performance charts? "It's impossible to distinguish between luck and skill," says Mr. Mansueto.

Maybe not, but you do see a lot of funds with fine long-term records, including Lindner, Pennsylvania Mutual, Windsor, Vanguard High-Yield, Mutual Qualified and Sequoia.

The conventional wisdom says that the best fund managers plod along year after year, often unnoticed because they produce consistently good but never spectacular results. For example, the decade's top-performing stock fund, Peter Lynch's Fidelity Magellan, never made it onto an annual top-ten list.

But it seems that top fund managers may well have a blowout year every once in a while, so avoiding a fund just because it was among the top performers could be a costly mistake.

But even stock funds with mediocre long-term records tend to do well in the year after they top the performance charts.

Sheldon Jacobs, editor of No-Load Fund Investor, a mutual fund newsletter, thinks he knows why. He attributes the continuing success of top-performing fund managers partly to ability and partly to stock-market trends. "Some of these market trends are pretty long-lived," he notes. "The value managers, for instance, have been doing well for quite some while."

During the past decade, there were periods that favored different types of stock-pickers. Small-company funds did well in the early 1980s, international stock funds roared ahead in 1985 and 1986, and, most recently, the market has favored buyers of

Please Turn to Page C19, Column 3

1989's Top Ten Performers

And how they have fared in 1989 and through the first two months of this year

FUND	PERFORMANCE 1989	PERFORMANCE JAN. AND FEB.
Alger Small Capitalization	64.5%	-2.6%
American Telecomm. Income	53.9	-12.9
Fidelity Energy Service	59.4	2.4
Fidelity Medical Delivery	58.0	-12.6
Financial Strategic Health	59.5	-5.0
G.T. America Growth	54.8	-4.3
G.T. Japan Growth	60.7	-3.5
Strategic Investments	61.2	-7.8
United Services Gold Shares	64.7	-5.7
Vista Growth & Income	56.9	0.2

When Figuring the Rate of Return . . .

Don't Be Confused By the Sales Hype

YOUR MONEY MATTERS

By JAMES A. WHITE
Staff Reporter of THE WALL STREET JOURNAL

When it comes to investments, you start with some money, you end with some money, and the difference determines your rate-of-return. What could be simpler?

Try brain surgery.

Mutual funds, banks, brokers, insurance companies and money managers use all sorts of methods to calculate investment returns. While the different approaches are usually perfectly legitimate, they can make comparisons difficult.

Sales hype is behind much of the confusion. "The performance figures that [investment] managers are reporting are put together for one reason, and that is marketing," says David T. Ferrier, a Merrill Lynch & Co. vice president.

GETTING STARTED

But investors aren't helpless. Those who take a lit-

Investment-Return Averages Can Mask Wide Swings

Here are six sets of investment returns totaling 27% over three years. While the average return in each case is 9% a year, compound annual returns vary. Looking at average and compound returns together gives an indication of year-to-year performance swings

	INVESTMENT PERFORMANCE					
First year	9%	5%	0%	0%	-1%	-5%
Second year	9%	10%	7%	0%	-1%	-8%
Third year	9%	12%	20%	27%	29%	40%
Average return	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Compound return	9.00%	8.96%	8.69%	8.29%	8.13%	6.96%

Source: Salomon Brothers Inc.

pound," or annualized, rate of return. This figure is the rate at which $1 would have to grow in each of several periods to reach an ending amount.

Unlike the average, the compound return takes into account the sequence of earnings or losses. That's because a gain or loss in any one year directly affects the amount of money left to build up in the next and subsequent years. Thus a big gain in an earlier year generates a higher compound return than if the same gain had occurred more recently.

In addition, the bigger the swings in returns from one period to the next, the lower the returns compared with average calculations.

Both return calculations can be useful in checking an investment's track record. "The average return is going to give you

ance of the investment manager. Because the manager can't control the size and timing of money flowing in and out of an account, a time-weighted calculation can be made to figure the value of $1 invested for the entire period, eliminating distortions from cash flows.

"For the question of how my investment manager is doing, you want a time-weighted return," says Catherine A. Higgins, a benefits-plan consultant at Towers Perrin's TPF&C unit. "Then for the question of how is my money doing, you might want to calculate the dollar-weighted rate of return."

The difference between the return calculations is illustrated by two investors, each of whom opens a $100 account with a money manager. The manager buys two shares of the same $50 stock for each cli-

Dollar Rise Continues Against Yen

U.S. Currency Hits Three-Year High; Stocks, Bonds Drift

MONDAY'S MARKETS

By DOUGLAS R. SEASE
Staff Reporter of THE WALL STREET JOURNAL

Stock and bond investors sat back to assess what appears to be a budding economic rebound, resulting in very anemic trading in both markets. But the dollar continued climbing, reaching a three-year high against the Japanese yen.

Currency traders said the dollar's recent push higher in the face of concerted selling by central banks has demonstrated the ineffectiveness of intervention in controlling the currency. With investment flowing out of Japan and West Germany because of uncertainties about economic and political policies, traders said it is difficult to predict how much higher the dollar might go.

The Dow Jones Industrial Average

performance.

For comparison, a $10,000 investment in the stocks that make up the Standard & Poor's 500-stock index would have left you

Vanguard High Yield, Mutual Qualified and Sequoia.

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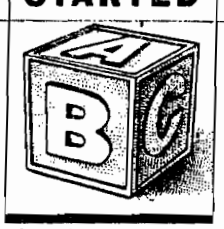
GETTING STARTED



But investors aren't helpless. Those who take a little time to get a better understanding of risk-and-return statistics can reduce their chances of falling victim to inflated sales pitches. Here are some basics:

Average vs. Compound Returns: If three years of returns on an investment total 27%, did the investment earn 9% a year or 6.96% a year? Both answers, and numerous others, are correct, as the nearby table illustrates.

The difference arises from the use of two types of return calculations. The simplest is the "average," where the returns for any number of past periods are added up and divided by the number of periods.

The second calculation, more widely used by investment firms, is the "compound," or annualized, rate of return. This figure is the rate at which $1 would have to grow in each of several periods to reach an ending amount.

Unlike the average, the compound return takes into account the sequence of earnings or losses. That's because a gain or loss in any one year directly affects the amount of money left to build up in the next and subsequent years. Thus a big gain in an earlier year generates a higher compound return than if the same gain had occurred more recently.

In addition, the bigger the swings in returns from one period to the next, the lower the returns compared with average calculations.

Both return calculations can be useful in checking an investment's track record. "The average return is going to give you some information about what is most likely to happen, but used together with the compound return, you also get the idea of the risk involved, so it is nice to look at both," says Mr. Ferrier.

Time vs. Dollar Weighting: While average and compound calculations produce different returns over several periods, the choice between so-called time-weighted and dollar-weighted calculations produces different return figures for the same period.

The dollar-weighted, or internal, calculation shows the change in value of a portfolio for the average funds invested in the period, including cash added or withdrawn by the investor. That sounds like it covers all the bases, but those cash flows can be a problem in calculating the true performance of the investment manager. Because the manager can't control the size and timing of money flowing in and out of an account, a time-weighted calculation can be made to figure the value of $1 invested for the entire period, eliminating distortions from cash flows.

"For the question of how my investment manager is doing, you want a time-weighted return," says Catherine A. Higgins, a benefits-plan consultant at Towers Perrin's TPF&C unit. "Then for the question of how is my money doing, you might want to calculate the dollar-weighted rate of return."

The difference between the return calculations is illustrated by two investors, each of whom opens a $100 account with a money manager. The manager buys two shares of the same $50 stock for each client. A year later, each share has risen to $100. Client A adds $100, which the manager uses to buy another share of the same stock. Finally, after another year, the stock is back to $50.

On a time-weighted basis, the return on both accounts is zero because $1 invested at the start of the period was still $1 at the end. But on a dollar-weighted basis, Client A's account shows a negative 18.1% return, as the $150 invested fell to $100. Client B, with $100 at the start and the end of the period with no cash flows, had a zero dollar-weighted return.

Over short periods of, say, a month, or when there aren't cash flows, the differences between time-weighted and dollar-weighted calculations usually aren't signif-

Please Turn to Page C11, Column 4

Investment-Return Averages Can Mask Wide Swings

Here are six sets of investment returns totaling 27% over three years. While the average return in each case is 9% a year, compound annual returns vary. Looking at average and compound returns together gives an indication of year-to-year performance swings

	INVESTMENT PERFORMANCE					
First year	9%	5%	0%	0%	–1%	–5%
Second year	9%	10%	7%	0%	–1%	–8%
Third year	9%	12%	20%	27%	29%	40%
Average return	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Compound return	9.00%	8.96%	8.69%	8.29%	8.13%	6.96%

Source: Salomon Brothers Inc.

Here's an Option for Betting on Rates

By STANLEY W. ANGRIST
Staff Reporter of THE WALL STREET JOURNAL

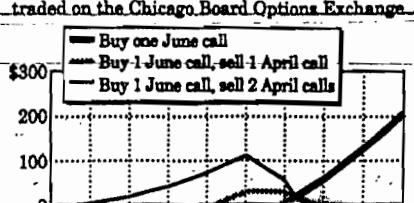
You don't need a bond to bet on your opinion of where interest rates are headed.

With the introduction last year of long-term interest-rate options on the Chicago Board Options Exchange, it's relatively easy to make an investment play.

These options, commonly called by their ticker symbol, LTX, are unique in

Interest Rate Strategies

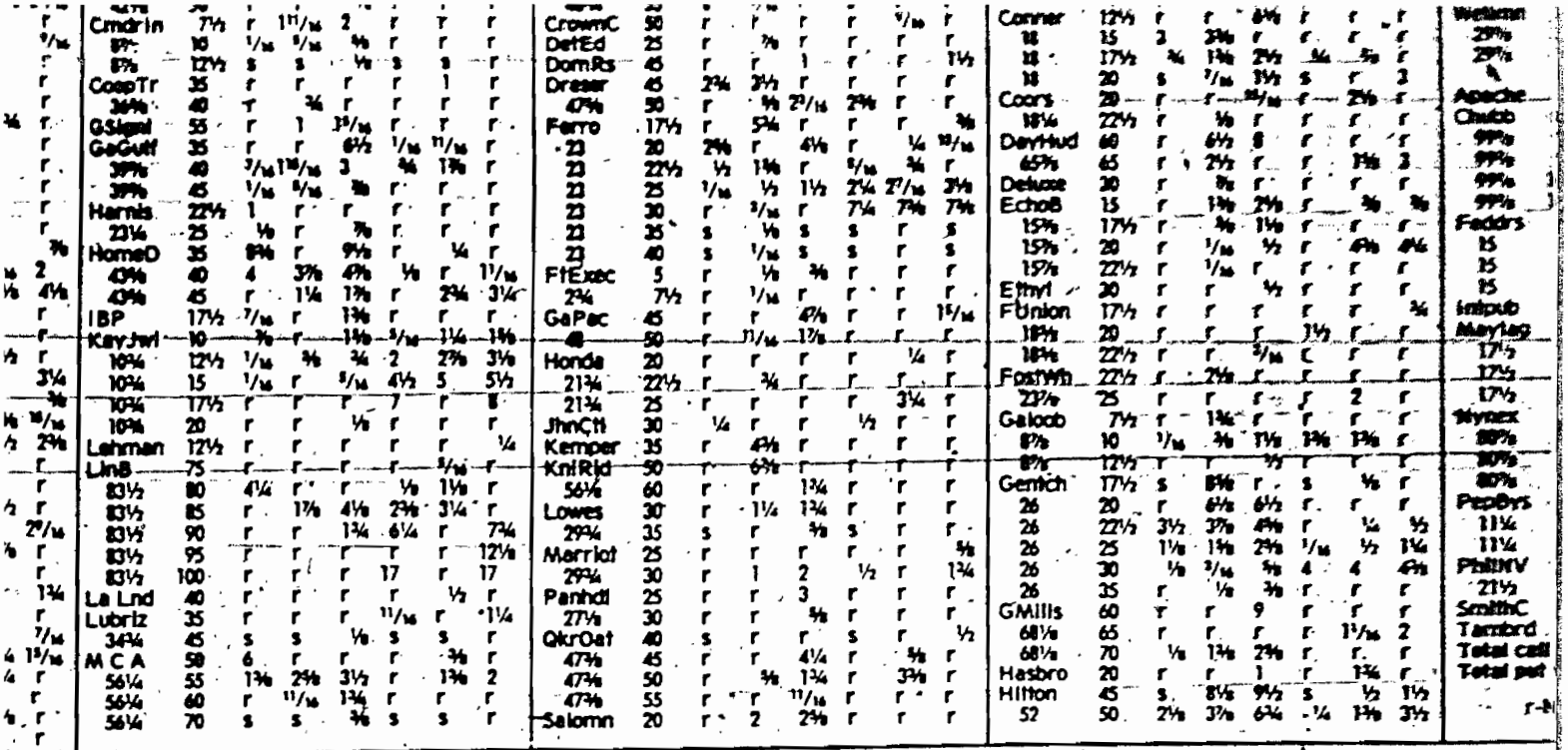
Profit-and-loss results, as of April 20, of three strategies in long-term interest rate options traded on the Chicago Board Options Exchange



would lose their total investment.

The second strategy offers an opportunity for an investor to reduce the cost of purchasing a June call. It produces a small profit if the investor wishes to close out a trade in April should interest rates remain close to current levels.

It works like this: Buy one June 87.5 call for 1.8125 ($181) and simultaneously sell one April 87.5 call for 0.8125 ($81.25). If rates stay about where they are and the in-



Figuring Rate of Return? It Helps If You Have Mind of an Einstein

YOUR MONEY MATTERS

Continued From Page C1

icant. But they grow in importance as the time and cash flows increases.

Per-share values of mutual funds are calculated on a time-weighted basis. Returns for savings accounts paying a constant rate are the same whether calculated on a time-weighted or dollar-weighted basis.

Volatility: It might appear that a 10% investment gain in one period, followed by a 10% loss the next period would leave you no worse off than when you started, but the math doesn't work out that way. What first grew to $110 in this example would then shrink to $99 in the next period.

The distortion is greater with bigger numbers. A 50% loss on $100 followed by a 50% gain leaves you at $75, still a long way from the original $100. In fact, it requires a 100% gain to get back to the original $100 investment.

Such big swings reflect high volatility that can eat deeply into portfolio results over time. Cautious investment professionals continuously warn that risk and returns are usually linked, as evidenced most recently by the performance of the high-risk, high-yield junk bond market. It's because a loss in just one year will put a dent in investment results for years to come that it's well worth reviewing volatility as closely as returns.

"By looking at only raw rates of return, you often have a very incomplete picture why the manager earned what he did," says Ms. Higgins of TPF&C. "You need to know the kinds of risk that a manager took to get that rate of return."

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Brown: Response in Part to #49

BEFORE THE TENNESSEE REGULATORY AUTHORITY

NASHVILLE, TENNESSEE

February 19, 1997

In Re:	)	
	)	**Docket No.**
Application of Nashville Gas Company, a Division of Piedmont Natural Gas Company, Inc. for an Adjustment of its Rates and Charges	)	**96-00977**

ORDER

This matter came before the Tennessee Regulatory Authority (hereafter "Authority") upon the petition of Nashville Gas Company (hereafter "Company" or "Nashville Gas"), an operating division of Piedmont Natural Gas Company, Inc. (hereafter "Piedmont") for a general rate increase. This matter was heard by the Authority on November 13 and 14, 1996.

I. PROCEDURAL BACKGROUND

On May 31, 1996, the Company filed a petition with the Tennessee Public Service Commission (hereafter "TPSC") requesting a general increase in its rates and charges for natural gas service and approval of certain changes to its rate schedules, classifications, and practices. On June 6, 1996, the Consumer Advocate Division, Office of the Attorney General (hereafter "Advocate"), entered a notice of appearance with the TPSC.

On July 29, 1996, pursuant to Administrative Order No. 1,[1] the Company filed its petition to recommence, and its agreement with the Advocate which stipulated that the record before the TPSC would be considered as the record before the Authority.

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[1] Effective July 1, 1996, the TPSC ceased to exist and the Authority was established. On July 18, 1996, the Authority issued its Administrative Order No. 1 in which it set forth the requirements upon which it would accept jurisdiction over any pending matters that had been brought before the TPSC and not completed prior to the TPSC's termination.

B. xiv. Employee Benefits Expense:

The Company has included expenses for country club dues, and fees for professional sports tickets and suites in the above-the-line utility operations. While these amounts were removed for rate case purposes, they still should not be booked as utility operating expenses. Therefore, the Authority finds and directs the Company to begin accounting for these expenses to a non-utility account.

VI. COST OF CAPITAL

The Authority in reaching a decision on a rate of return must give in-depth analysis and consideration to numerous factors, such as capital structure, cost of capital, and changes that can be reasonably anticipated in the foreseeable future.

VI. A. Capital Structure:

Company witness Dr. Murry proposes using the following capital structure based on the period ending October 31, 1997: 46.68% long term debt, 1.52% short term debt and 51.80% common stock equity. Alternatively, Advocate witness Dr. Brown suggests using the Company's 1995 capital structure of 48.8% long term debt, 1.60% short term debt and 49.6% common stock equity.

We find that the capital structure proffered by the Advocate is appropriate in this case. The Advocate's recommendation is based on verifiable and reasonably current data. Conversely, the suggested capital structure proposed by Company witness Dr. Murry is based on speculation for which he provides no convincing foundation. The table below summarizes the recommended capital structures.

Q. Please state your name.

A. Stephen N. Brown.

Q. Where do you work and what is your job title?

A. I am a Senior Economist in the Consumer Advocate Division, Office of the Attorney General.

Q. What are your responsibilities as Senior Economist?

A. I review companies' petitions for rate changes and follow the economic conditions that affect the companies.

Q. What experience do you have regarding utilities?

A. From 1986 to 1995 I was employed by the Iowa Utilities Board as Chief of the Bureau of Energy Efficiency, Auditing and Research, and Utility Specialist and State Liaison Officer to the U.S. Nuclear Regulatory Commission. From 1984 to 1986 I worked for Houston Lighting & Power as Supervisor of Rate Design. From 1982 to 1984 I worked for Arizona Electric Power Cooperative as a Rate Analyst. From 1979 to 1982 I worked for Tri-State Generation and Transmission Association as Power Requirements Supervisor and Rate Specialist. From 1979 through 1995 my work spanned many issues including cost of service studies, rate design issues, telecommunications issues and matters related to the disposal of nuclear waste.

Q. What is your educational background?

A. I have an M.S. in Regulatory Economics from the University of Wyoming, an M.A. and Ph.D. in International Relations with a specialty in International Economics from the University of Denver, and a B.A. from Colorado State University.

Q. Dr. Brown, have you authored any articles relating to your profession?

A. Yes, I've published more than fifty articles dealing with issues in the gas, electric, and telecommunications industries. My articles have appeared in Public Utilities Fortnightly, the Electricity Journal, and Lightwave Magazine. I've given several public presentations and authored many in-house documents and publications.

Q. Are you and have you been a member of any professional organizations, Dr. Brown?

A. Yes, I am a past member of the NARUC Staff Committee on Management Analysis, a past trustee of and a member of the Board for the Automatic Meter Reading Association, and a current member of the National Association of Business Economists.

Q. Have you studied mathematics and statistics as part of your education?

A. Yes.

Q. Dr. Brown, do you use mathematics and statistics in combination with economics as part of your profession?

A. Yes.

Q. What were you asked to do with respect to this case?

A. I was asked to identify the appropriate market-based common equity return, the appropriate overall cost of capital and the appropriate capital structure for Piedmont as well as to evaluate and assist in the evaluation of the rate of return proposed by other witnesses in this docket.

Q. Dr. Brown, what did you do to identify the appropriate rate of return?

A. I studied overall trends in the gas distribution industry. I gathered historical and forecasted financial data to identify the appropriate rate of return and wrote several computer programs to analyze the data.

Q. Why did you study overall market trends and gather the information you mention?

A. Piedmont is a part of the gas distribution industry, and the gas distribution industry is likely to face economic conditions similar to Piedmont. Therefore, I studied trends and gathered the information on gas distribution companies to identify companies that are comparable to Piedmont.

Q. What comparable companies did you use in your analysis?

A. I used the so-called "Moody Companies", the very same ones chosen by Dr. Murry, Piedmont's witness.

Q. Why did you use these companies?

A. Based on my analysis, those companies form a reasonable basis of comparison with Piedmont.

Q. What actions comprise your analysis?

A. I analyzed information on the eight companies chosen by Dr. Murry. I scrutinized the data and concluded that the eight companies form a reasonable basis of comparison with Piedmont.

Q. Is the rate of return you are recommending different than the return recommended by Dr. Murry?

A. Yes.

Q. Dr. Brown, based upon your analysis of comparable companies, what rate of return for equity did you determine to be appropriate?

A. I independently determined that an appropriate annual rate of return on equity is **11.00%**. The two models I used to estimate the annual return provided results of 10.64% to 11.48%, the two yellow vertical bars in Chart 1 of my exhibit CA-SNB. These two bars also have text above them indicating that they are my estimates. My recommendation of 11% is the approximate midpoint between my low and high estimates. Dr. Murry's recommendation of 13.25% is shown on the far right side of the chart.

Q. Upon what do you base your rate of return recommendation?

A. I base my recommendation on my analyses of Piedmont's market-based cost of common equity,

which is supported by my analysis of comparable companies.

Q. What do you recommend to the Tenneessee Regulatory Authority regarding your findings?

A. I recommend that the Tenneessee Regulatory Authority (TRA) adopt the return of 11%.

Q. Did you do anything to test your findings?

A. Yes. With regard to the rate of return on equity I compared my results to the information published by Merrill Lynch regarding the required rates of return for gas distribution companies in general.

Q. What was your reason for using Merrill Lynch's data?

A. Merrill Lynch's data reflects the market place for gas distribution companies, and I have used their data as a basis of comparison in prior rate cases. Since January of 1995 Merrill Lynch's estimates have ranged from a high of 11% to a low of about 9%. These are shown as the red vertical bars in Chart 1. The red bars have text above them indicating that they are Merrill Lynch's estimates. My recommendation of 11% approximates Merrill Lynch's upper limit.

I have also compared my finding to state utility commissions' allowed rates of returns, shown as the blue vertical bars in Chart 1, Exhibit CA-SNB. These rates were provided to me by Dr. Murry in response to a data request, and they represent state utility commission orders dating from February 1994 through February 1995. During that time Dr. Murry's information

shows there were 30 decisions, 15 of which allowed returns of less than 11% and another 8 decisions which allowed returns between 11% and 11.5%. Thus three-fourths of those decisions allowed returns of less than 11.5%. This is one more confirmation that my estimates of 10.64% and 11.48% are within reason, as is my recommendation of 11%.

Q. Is a rate more than 11.48% too high?

A. Yes, 11.48% is the threshold between a reasonable and unreasonable rate. As I discuss later in my testimony, 11.48% reflects the maximum dividend growth rate that could be sustained by Piedmont.

Q. Did you compare the data from Merrill Lynch and from the various states to Dr. Murry's recommended return to equity?

A. Yes. Dr. Murry's recommended returns to equity are shown as the white bars at the far right side of Chart 1. The returns he recommends are far in excess of any reasonable return for the industry.

Q. Dr. Brown, is your rate of return sufficiently high to allow the company to attract capital and to maintain creditworthiness?

A. Yes. An annual return of 11% is certainly high enough to attract capital and to maintain creditworthiness. The rate-of-return principles of capital attraction and maintenance of credit were set in the *Bluefield* decision, and the rate of return I recommend considers these factors.

Also, 11% is an understatement of the amount that the company actually has an opportunity to earn because the annual return is not collected in a single amount once a year. Instead, the rate is compounded because consumers pay the return on a monthly basis, which allows the company's annual return to be compounded monthly. Monthly compounding is a common practice in the financial world because a return that is compounded monthly grows faster than a return that is compounded yearly. If the company were awarded 11% as an annual rate of return on equity, the monthly compounding actually gives the company an opportunity to earn 11.57% annually.

Q. Dr. Brown, where does the extra one-half percent come from?

A. The extra one-half percent comes from compounding the monthly returns into an annual return. In its *1995 Yearbook* at page 93, *Ibbotson Associates* states "annual returns are formed by compounding the twelve monthly returns." The clearest illustration of the compounding process occurs in the banking industry.

For example, consider the case where a bank offers to pay an 11% annual rate of return to an investor who deposits $100,000 for one year. At the end of the year the investor would receive $11,000, but the bank could make the payment in two ways. It could pay the investor one-twelfth of 11% each month for 12 months, which is $917 monthly, and in total the investor would receive $11,000. The bank could also dispense with the monthly payments and just make one payment of $11,000 at the end

year. In either case, the bank's total payment is $11,000. However, the investor has not received the benefit of monthly compounding on the principal of $100,000. With monthly compounding the investor would have received about $11,572.

Q. Dr. Brown, where does the extra $572 come from?

A. The extra money comes from the compounding process, which means that the investor's principal grows each month by the amount of the prior month's return. For example, in the first month the bank would pay interest of one-twelfth of 11% on $100,000, which is $917. The interest is added to the original deposit and the new principal becomes $100,917. In the second month the bank would pay a one-twelfth of 11% on $100,917. In this case the payment grows to $925 and the principal grows to $101,842. Carrying this process on for 12 months gives the investor $11,572 instead of $11,000.

Q. Dr. Brown, would the investor get more money if the compounding process went on every week or every day instead of every month?

A. Yes, but not much more. The most that the investor could get would be $11,628 even if the compounding went on every day. Monthly compounding gives the investor $572, and compounding every day adds just $57 to the investor's return. Monthly compounding gives the investor 90% of what can be had if compounding went on every day.

Q. Dr. Brown, what would happen if the bank were lending $100,000 to a borrower?

A. The situation is exactly the same except this time the money flows from borrower to the bank.

Q. Is the monthly compounding process typical of the financial world?

A. Yes. *Ibbotson Associates* indicate that the compounding process is typical, as does the attached example, Schedule 1 of Exhibit CA-SNB, which shows that monthly compounding is used in the State of Tennessee's deferred income plan managed by Security First of Nashville. Schedule 1 is a copy of the Security First's information brochure sent to participants in the State's deferred income program. In the lower left hand corner, Security First indicates that it is using an 8% annual return and compounding it monthly to estimate the individual's retirement savings. Clearly, the financial world's standard practice is to view the accumulation of funds in terms of compounded monthly returns.

Q. Is monthly compounding an accurate description of how Piedmont accumulates and realizes its annual return?

A. Yes.

Q. Would monthly compounding be an accurate description of how Piedmont accumulates its annual return even when the company experiences seasonal variations in sales, revenues and expenses?

A. Yes. The returns in the months when sales are high balance the returns in the months when sale are low. This is true whether the annual return is viewed as a sum of compounded monthly

returns or as just the sum of twelve monthly returns that are not compounded. However, monthly compounding reflects the true nature of Piedmont's financial transactions. Its revenues flow in every working day and are available for immediate reinvestment. The company's stocks and bonds can be bought and sold every working day of the year. In fact, the best indication that the compounding process underlies the company's financial transactions is the company's late fee, which is applied to consumers' monthly bills if they are not paid by the past due date. The late fee truly shows that "time is money." The quicker the company has the money, the quicker it can be invested to achieve additional returns. This is a perfect fit with the monthly compounding cycle that typifies financial transactions in our economy. If monthly compounding were not how Piedmont accumulated its annual return, there would be no economic basis for charging a late fee.

Q. Dr. Brown, if a regulatory agency determined that 11.6% were the just and reasonable rate of return that a company should have the opportunity to earn, should the regulatory agency actually award 11.6% to the company?

A. No. For any annual rate of return awarded to the company, the monthly compounding process gives the company the opportunity to earn approximately one-half percent more than the allowed return. For example, if the agency awarded an 11% annual rate of return, monthly compounding gives the company an opportunity to earn 11.6%. If the agency awarded an annual return of 11.6%, the compounding process gives the company an opportunity to earn

approximately 12.2%.

Q. Is the 11% return you are recommending a fair return?

A. Yes. It is a fair return because it compensates the company for ordinary financial risks it is taking to be in the gas distribution business.

Q. What are the sources of ordinary financial risk to the company?

A. The major risk is that the company's expenses would increase faster than its revenues. However, in this case the company is basing its expenses, as well as its sales of gas, on projected amounts for a 12 month period ending October 1997. For there to be any substantial risk, the company's projected expenses would have to be far less than what actually occurs, or the company's projected sales of gas would have to very different from the actual sales. I know of no evidence suggesting that the company's forecasts will work to its financial hardship.

Q. Is Piedmont a more risky company because of so-called "industry restructuring?"

A. No. The principle feature of restructuring is that natural gas distribution companies have to find their own sources of gas supply on an unbundled basis rather than buying gas directly from the natural gas pipeline. As long as the purchased gas adjustment clause remains in effect, Piedmont is guaranteed 100% recovery of gas costs, whatever the source of Piedmont's supply. Therefore, I do not agree with Dr. Murry's assertion, which he makes at page 12,

lines 13-14 of his direct testimony, that "the local distribution companies now must acquire gas supply services on an unbundled basis, and that is a new risk to investors in LDCs."

Q. Is Piedmont a more risky company because of its equity ratio?

A. Perhaps, but if there is any risk, it is the result of the company's own actions and the company should not be rewarded for taking such action.

Q. Are you aware that Piedmont's equity ratio is lower than the average equity ratio of the Moody Companies?

A. Yes.

Q. How did Piedmont's equity ratio, which was lower than the Moody's average, affect your equity return recommendation?

A. It did not influence my recommendation because Piedmont's lower equity ratio is the direct consequence of the company's own actions. From 1991 through 1995 the company often raised its dividends faster than the company increased its earnings. When dividend growth exceeds earnings growth, the natural result is a lower equity ratio. This is proven in Piedmont's situation by Chart 5 of my exhibit, which shows that each time the company's dividend growth exceeded earnings growth, the company's equity ratio declined. The chart clearly demonstrates that the company steadily raises its dividends even in the face of declining earnings, which suggests the company's annual decision to raise dividends is not strongly affected by the

company's earning performance.

Q. Would Piedmont's lower equity ratio cause an investor to perceive the company as being more risky than comparable companies?

A. All things being equal, yes. However, all things are not equal. From 1991 through 1995, Piedmont raised its dividends nearly 3 times faster than the comparable companies, distorting the company's relationship to its peers. This is proven by Chart 6 of my exhibit, which shows Piedmont's and the Moody Companies annual percent increase in dividends from 1991 to 1995. If the company were to be more restrained in raising its dividends, it would not be perceived as a risky investment.

Q. What impact does Piedmont's declining equity ratio have on Piedmont's ability to keep raising its dividend?

A. The declining equity ratio diminishes the company's potential to raise dividends in the future. As a company's equity ratio declines the company has less ability to support its activities with its own funds. As the ratio declines the company may continue to support its activities by borrowing, but lenders usually require that they be paid before any dividends are issued to stockholders. Therefore, as equity declines and more debt is incurred, more constraints are placed on the company's ability to raise dividends. If the company wants to continue raising dividends, it has to reverse the decline of the equity ratio by improving the profit level. This can be accomplished by increasing prices, by cutting costs or by a combination of the two.

Q. Does Piedmont want to improve its equity ratio?

A. Yes. Piedmont's equity ratio was 49.6% in 1995, but Dr. Murry's Exhibit (DAM-1), Schedule 1 shows Piedmont's equity ratio as 51.8% in October 1997.

Q. Does Piedmont want to continue to raise dividends?

A. Yes, as indicated by the company's desire to improve its equity ratio.

Q. What impact does Piedmont's equity ratio have on the price of the company's stock?

A. <u>According to standard economic theory and with the qualification that all things are equal</u>, in anticipation of a declining equity ratio, the market will drive down the company's stock price, unless the company improves its earnings through cost reductions or price increases.

Q. Has the company's stock price suffered because of the equity ratio?

A. No. Charts 7 and 8 show there is no discernable relationship between Piedmont's annual equity ratio and its stock price. Chart 7 shows the annual equity ratio and the monthly stock price from January of 1991 through June of 1996. For example, from January of 1991 though December of 1993 the annual equity ratio bounced from 52% to 53.5% and back down to 50.5%. Meanwhile the monthly stock price rose steadily from $15 per share in January 1991 to about $25 in July of 1993. In October of 1993 the stock price fell, but there is nothing to suggest that investors were reacting to a change in the

company's equity ratio. Chart 8 shows how the annual equity ratio and the average annual stock price changed from January of 1991 through June of 1996. Once again, there is nothing to suggest that investors were reacting to a change in the company's equity ratio.

Q. Has Piedmont's practice of raising dividends faster than the increase of earnings contributed to a declining equity ratio?

A. Yes, the company has not moderated its dividend growth to reflect earnings performance.

Q. Has Piedmont's practice of raising dividends faster than the increase of earnings influenced Dr. Murry's conclusion that "the lower common equity ratio means that financial risk of Piedmont is greater than the risk of the average Moody company?"

A. Yes, but he fails to explain that it is the company's own practices that have lowered the equity ratio.

Q. Who is responsible for Piedmont's practice of raising dividends?

A. Piedmont's own Board has the discretion to set dividends.

Q. Has Piedmont's practice of raising dividends faster the increase of earnings contributed to its need to raise prices?

A. Yes. As long as the company raises dividends faster than earnings increase, the company's equity ratio will deteriorate if prices are not

raised. Another way to prevent the deterioration is to cut costs, but the company has not cut costs significantly to my knowledge. Piedmont's costs are addressed by my colleague, Mr. Buckner.

Q. By what means is Piedmont seeking to raise its prices to consumers?

A. One method is to seek approval for an extraordinarily high rate on common equity, such as the 13.25% return recommended by Dr. Murry.

Q. Is Dr. Murry's recommendation for a 13.25% return on equity influenced by Piedmont's equity ratio?

A. Yes. At page 7 lines 14-15 of his testimony he states: "it was a factor that influenced my decision."

Q. Do you believe Piedmont's equity ratio was the dominant influence in Dr. Murry's decision?

A. Yes.

Q. Why do you believe Piedmont's equity ratio was the dominant influence in Dr. Murry's decision?

A. Very early his in direct testimony, at page 5 line 4, Dr. Murry states that a fair return will "compensate...investors for the risks incurred..." Subsequently at page 7 lines 11-13, he offers Piedmont's equity ratio as the first and foremost threat the company's financial integrity by stating, the "lower common equity ratio means that the financial risk of Piedmont is greater than the risk of

the average Moody's Company." The other risk factors he mentions appear much later in his testimony, indicating that the other risks were not as important to him as the equity ratio.

Q. Do you agree that the equity ratio is the number one source of financial risk to Piedmont?

A. No.

Q. On a scale of 1 to 10, where 10 means very risky and 1 means just a little risky, where do you rank Piedmont's equity ratio?

A. I rank it 2 because Piedmont has considerable ability to change its equity ratio. For example, in 1992 the ratio was 53.4%, and in 1994 the ratio was 49.1%. This is a substantial drop, but it could be reversed quickly if Piedmont's dividend policy were more cognizant of earnings performance.

Q. Why have you addressed the equity ratio at this point in your testimony?

A. Early in his testimony Dr. Murry identified Piedmont's equity ratio as unhealthy and as exposing the company to greater financial risk. I decided to address the same issue early in my direct testimony rather than letting it wait to a later time. By so doing, I provide the Tennessee Regulatory Authority with evidence showing that Piedmont's own non-service related actions have adversely affected the equity ratio.

Q. Based on your findings, what do you recommend the TRA do regarding Piedmont's relatively low

equity ratio and the company's requested return?

A. I recommend that the TRA give no weight to the low equity ratio because the company's equity position and any consequent increased perception of risk are of the company's own making. The equity ratio does not justify the company's request for the excessively high return on equity, 13.25%, which the TRA should also disregard. To do otherwise is to transfer the risk, if there is any, from the company to the consumers and make them pay for a risk the company incurred through its own behavior.

Q. What other sources of risk to Piedmont did Dr. Murry identify?

A. At page 16 lines 3 to 9, Dr. Murry indicates that a change of interest rates is a financial risk to the company.

Q. Are changes in interest rates a source of financial risk to Piedmont?

A. No. For example, even though interest rates may increase, the company's long term interest expenses do not increase until the company issues new debt at the higher rate. In the meantime the company's continues to recover the current long term debt cost because that cost has already been figured into the rates the company currently charges. Short term debt cost may increase, but it is a very small portion of the company's cost. Also, neither gas sales nor the number of customers decline in direct response to interest rates. Thus there is no reason to expect a company's financial risk to shift one way or another in response to an

interest rate change.

However, even though the company is not exposed to risk, the stockholders are. But it is important for regulators to make a strong distinction between the company and the stockholders.

For example, Chart 9 also shows the behavior of monthly interest rates and Piedmont's monthly stock price from January 1991 through June 1996. Chart 9 proves that Piedmont's stock is very sensitive to changes in interest rates. When interest rates go down, the stock price goes up. When interest rates go up, the stock price goes down. Clearly the number one risk to Piedmont's stockholders is the change in interest rates. The interest rate is the single most important influence on Piedmont's stock. This is a strong contrast with the company's equity ratio and the so-called industry restructuring, which appear to have no impact on Piedmont's stock price.

Q. Should the TRA set the return on equity in order to protect Piedmont's stockholders from the risks of interest rate changes?

A. No. An investor always has the choice of the investment to be made. The investor could hold debt, treasury notes, bonds, stocks or other kinds of investments. In some of these investments the principal is guaranteed, and in others there is no such guarantee. The investments which do not guarantee the principal or the return, such as a stock investment, provide an opportunity to the investor to earn a higher return. That higher return is the trade-off for the potential loss

of principal. Protecting the stockholders from the risks of interest-rate changes removes the justification for equity returns to be set higher than debt returns.

Also, if the TRA were to raise the equity return and thus prices to protect a Piedmont stockholder from a loss of principal caused by an interest-rate increase, then fairness to ratepayers would require the equity return be lowered and thus prices lowered when interest rates decline.

Q. Should the TRA set the return on equity to reflect the capital gains a stockholder may enjoy when the stock is sold?

A. No. The rational investor sells stock in anticipation of a permanent decline of the stock's price. Rather than wait for the decline tomorrow, the investor sells stock today to capture capital gains. The unfortunate buyer, who is now the owner, bears the capital loss. Any capital gain by the first owner is nullified by the capital loss of the second owner.

For example, Chart 9 shows that over the past five years the likelihood of a capital gain for a Piedmont stockholder is about the same as the likelihood a capital loss. From April 1991 to July 1993 Piedmont's stock price increased steadily. From July 1993 to October 1993 the price reached a peak of about $25. Anyone who bought Piedmont's stock after April 1993 and then sold it experienced little gain or perhaps a capital loss.

Q. Is the cost of equity allowed by the regulatory

agency supposed to equal the historical rate of return actually achieved by the company?

A. No. Although the cost of equity and the historical return are both set in relation to book value, one does not necessarily approximate the other. For example, if the book value is $100 and the return is $30 then the historical rate of return is 30%. The regulatory body's determined cost of equity is not required to approximate 30%. The cost of equity and the historical return approximate each other only when the company's book value per share is equal to the market value per share. However, Piedmont's current market value is nearly double the book value. This indicates that investors expect to earn a return that is substantially less than the return to equity allowed by the regulatory agency.

Q. Did you perform an analysis to determine what the return to equity should be for Piedmont?

A. Yes. I performed two analyses: one based on the Discounted Cash Flow (DCF) model and another based on the risk premium model.

Q. What is the Discounted Cash Flow model?

A. The DCF model is a standard way that investors evaluate their potential returns. The model defines the cost of common equity as the dividend yield plus the dividend's expected growth rate.

Q. What is the advantage of using the DCF model?

A. It does exactly what every investor does. It pays close attention to the company's dividend

per share of common stock and to the company's ability to raise or lower the dividend and the dividend yield.

Q. What is the dividend yield?

A. Dividend yield is measured as the company's annual dividend divided by the price for the company's stock. I've used the average dividend yield of the Moody Companies as a proxy for Piedmont's dividend yield. The calculations are shown in Schedule 2. In this instance the calculated dividend yield is 5.55%.

Q. How is the dividend yield affected by brokerage fees and flotation costs?

A. Brokerage fees are those costs an investor incurs when buying stock from a broker rather than buying the stock directly from the company. Thus the investor's real cost to buy a stock **is a bit higher than the stock's market price**. If an adjustment were made to reflect the investor's real cost, the effect would be to raise the stock price and consequently lower the dividend yield.

Flotation costs refer to the expenses a company incurs when it offers a new issue of common stock to the public. The company's real cash income from selling the stock **is a bit lower than the stock's market price**. If an adjustment were made to reflect the company's real cash income, the effect would be to lower the stock price and consequently raise the dividend yield.

Q. Does your dividend yield include brokerage fees and flotation costs?

A. No. Although brokerage fees would lower the dividend yield, flotation costs would raise the dividend yield. But brokerage fees tend to outweigh flotation costs in the calculation of the dividend yield.

For example, between July 3, 1995 and July 1, 1996 approximately 6.94 million shares of Piedmont's stock changed hands. In those twelve months the average daily closing price was $21.86. Typically a broker will charge a 1.5% markup to the stock price, and 1.5% of $21.86 is 33 cents. Multiplying this amount by 6.94 million shares gives approximately $2.3 million, which is the annual amount of brokers' fees paid by investors who purchased Piedmont's stock. This amount is a recurring annual expense to the investors. On the other hand flotation costs occur only when the company issues new stock. Although flotation costs are annualized, they apply only to a very small portion of the company's overall equity balance. For example, the amount of stock created by new issues is usually very small in comparison to the amount created by stock splits. The company had a 2-1 split in 1993 and split in the mid 1980s.

The company's annualized flotation costs do not exceed $2.3 million annually. Therefore, Piedmont's dividend yield does not require an upward adjustment for flotation costs.

Q. What did you use to measure dividend growth?

A. I used Piedmont's current growth rate of 5.92% based on the 1991-1995 time frame selected by Dr. Murry, and I also included the company's

annualized quarterly dividend from July of this year. I used the company-specific data because Piedmont is in better financial condition than the Moody group. Chart 6 shows the disparity between Piedmont's dividend growth rate and those of the Moody Companies. I did not believe it was appropriate to burden Piedmont's DCF rate of return with dividend growth rates that were so far out of line with Piedmont's. Also, Piedmont's service territories are generally areas of economic growth, where the company's customer base grows by 6% annually. Piedmont has also retained a higher proportion of its earnings than the Moody group. These two facts suggest the company's future earnings will continue to grow and to sustain dividend growth. However, the dividend growth rate I am using is the maximum growth rate that could be sustained by Piedmont. The rate is higher than any dividend growth rate of the Moody Companies, and the rate is higher than any dividend growth rate used by Dr. Murry. Thus my estimated equity return of 11.48%, shown in Schedule 2, is the threshold between a reasonable and unreasonable rate of return to equity. If the company moderates dividend payments so that dividend growth does not outpace earnings growth, a 5.92% growth rate is not likely to be sustained.

Q. Did you consider using earnings growth as a substitute for dividends growth in your DCF model?

A. No. The DCF analysis that I use is based on the normal assumption that the cost of equity is based on dividend yield plus dividend growth. Current and potential investors get their return in the form of dividends not earnings.

The dividends and earnings are equivalent only in the case where all earnings are paid out as dividends. None of the Moody Companies nor Piedmont pay out all their earnings as dividends and to do so would require that the growth of dividends greatly exceed the growth of earnings.

Q. Does the DCF Model account for capital gains that may occur when an investor sells stock?

A. No. The DCF model avoids entanglement with either capital gain or capital loss because the model is tied directly to dividend yield and dividend growth. In addition, losses and gains are a matter of the investor timing the stock's purchase and sale, as I have already discussed with regard to Chart 9. The DCF model neither protects investors from risk nor penalizes them for what happens in the stock market.

Q. In addition to your DCF model, did you use another method to determine the market based cost of common equity?

A. Yes. I used the risk premium method which defines the cost of equity capital as the market's current debt yield plus an estimated risk premium. For example, a current debt yield of 7% plus an estimated market wide risk premium of 3% produces an estimated common equity cost of 10%.

Q. What is the rationale of risk premium?

A. Investors require extra payments to assume additional risk. Economists call this extra payment a risk premium. Equity investments are riskier than debt because equity investments

occasionally lose money, thus equity investors require a risk premium or a higher return than debt. For example, equity holders are last in line for the distribution of earnings and also last in line for distribution of liquidation proceeds. In both cases the debt holders are paid first. If there are any funds left, they are distributed to the equity holders. Therefore, the cost of equity is the debt yield plus a risk premium for the company.

Q. What do you use as debt yield?

A. Piedmont's bonds retain an A rating, which is a rate sufficient for attracting debt capital. I use the monthly average of A-rated bonds for July 1995 through June 1996. Those are shown in Schedule 3.

Q. Why do you use these months?

A. This is current data, and it indicates the current trend in capital cost.

Q. Has Piedmont's declining equity ratio affected the rating of the company's bonds?

A. No, to my knowledge the company's bond rating has not been affected.

Q. Why do you use the A rates as a measure of debt yield instead of Piedmont's embedded debt cost?

A. Risk premium analysis is based on market wide indicators of current debt cost instead of a company-specific embedded cost. Using a company-specific embedded cost would mean that the company with the highest debt cost would also receive the highest return to equity.

Conversely, the company with the lowest debt cost would receive the lowest return to equity. Thus using a company-specific debt cost to establish a risk premium would introduce incentives for companies to raise their debt cost as much as possible. That is unreasonable logic and unreasonable financial management. Fortunately, the markets don't work that way. A company's return to equity is not guaranteed to be a certain amount higher than the company's debt cost.

Q. **Why do you use the A bond rates as a measure of debt yield instead of the average debt cost of the Moody Companies?**

A. The Moody company average would not reflect current market rates for bonds rated as A, the current rating for Piedmont's bonds.

Q. How is a company's risk premium measured?

A. A risk premium is generally measured as the difference between a market-wide risk-free investment and the market-wide rate of return for common equity. That difference is adjusted for the specific behavior of a company.

Q. What represents the market-wide risk-free investment?

A. In this case I use three-month U.S. Treasury bills.

Q. Why is it appropriate to use that measure?

A. Investors are absolutely certain what cash flows will be received and when they will be received. There is no risk of default or loss

of principal in a three month period. The nearness of maturity eliminates the risk of price depreciation and loss of principal. In the stock market, principal loss and price drops can occur overnight. When a company's stock price is heavily influenced by the expectation of and the actual changes in interest rates, as in Piedmont's case, the risk free investment is the three month bill.

Q. What represents the market-wide rate of return for common equity?

A. I use *Ibbotson Associates'* data for the market-wide rate of return to large companies

Q. What is a large company?

A. According to *Ibbotson Associates'*, in 1995 a large company was any company that had a market capitalization greater than $171 million. A company's market capitalization on any day is equal to the company's per share price of stock multiplied by the number of shares outstanding. Ibbotson separates its market data into two categories, large and small companies. The separation is based on the market value of the companies. The companies are ranked from largest market value to smallest.

For example, referring to Schedule 9, which is a copy of page 136 of *Ibbotson Associates 1996 Yearbook*, the top part shows a column titled "Recent Number of Companies." *Ibbotson Associates'* maintains data on approximately 1700 companies ranked by size into 10 groups with about 170 companies in each group. The first eight groups represent large companies and represent approximately 1360 companies, 80%

of the total. In 1995 every large company had a market value greater than $171 million. The remaining 340 companies, which amount to 20% of the total, had market values less than $171 million, which I indicate by the arrow I have drawn in the bottom part of Schedule 9.

Q. Are Piedmont and the Moody Companies large companies?

A. Yes. The market value of those companies is well above $171 million.

Q. How do you measure the market-wide rate of return to common stock and the market-wide the risk-free rate of return?

A. I use *Ibbotson Associates'* historical data. To measure the market wide rate of return to common stock, I use *Ibbotson*'s large company total return index from 1925 through 1994. To measure the risk-free rate of return, I use the three-month Treasury Bill total return index from 1925 through 1994. These are shown as columns (2) and (3) in Schedule 4.

Q. Why are you using historical data to estimate the risk premium?

A. Historical data provides a way to smooth out the wild fluctuations in the risk premium, which is the difference between the risk-free return and market return to common equity. Since return to debt is fairly stable, the fluctuations are caused by the wide swings in the return to equity. For example, if the return to common equity is large in one year, so is the premium, if the return is small the next year, the premium will be negative.

Q. Why are you using the years from 1925 through 1995 to measure the risk premium?

A. Ibbotson provides historical information on the risk premium from 1925 through 1995, and these years represent the entire term for which information is available. Neither Ibbotson nor anyone else I know of recommends using just a portion of the data. Using the entire data avoids any element of subjectivity that may influence the selection of only a portion of the data.

Q. What did you use the historical information for?

A. I used it to develop the market-wide risk premium.

Q. Dr. Brown, does the risk premium reflect monthly compounding that you discussed earlier?

A. Yes, the risk premium reflects the monthly compounding process that typifies financial transactions in our economy. Column (7) of Schedule 4 shows the annual risk premium for each year in the historical series and the bottom of the column shows the average risk premium for the entire period.

Q. Why should the risk premium reflect monthly compounding?

A. Monthly compounding is the most accurate reflection of how monthly collection affects the annual rate of return, which I discus earlier in my testimony. Compounding also reflects the financial industry's time-honored notion that "Time is money", as I have already

described. Even the company itself acknowledges the role of compounding. For example, the company's Long Term Incentive Pay Plan, which is applied to the company's executives, describes the executives' performance goal as "being a 5% compounded, annual increase in net, real...after tax earnings." The compounding process is ubiquitous to all financial activity.

Q. Does monthly compounding overstate how frequently compounding occurs in the financial world?

A. No. In fact, monthly compounding tends to understate how frequently compounding occurs. Compounding is carried on daily. To appreciate the compounding process, you need to adopt the perspective of financial institutions and utilities that deal with thousands of customers every month. For example, Piedmont serves over 500,000 customers and those customers are billed throughout the month. The company has approximately 20 billing cycles each month. This means, on average, that during each working day 25,000 Piedmont customers are receiving bills and paying bills. The financial transactions go on constantly every working day and day after day without stop.

Q. Does monthly compounding mean that a utility would have to go to the extreme of filing a rate case every month if the company wanted to capture the benefits of the compounding process?

A. No, not at all. As I discussed earlier in my testimony for any annual rate of return awarded

to the company, the monthly compounding process raises the return by approximately one-half percent or more. As I discussed earlier, Piedmont receives payments from 25,000 customers every day. Since "time is money" the company immediately moves those funds to productive assets instead of letting them sit. Those daily cash flows and their reinvestment by Piedmont is the compounding process in action.

Q. What would happen if the risk premium did not include monthly compounding?

A. The risk premium would be greatly overestimated and the resulting cost of equity would be overstated by approximately two full percentage points.

Q. Is the market-wide risk premium the same thing as a company risk premium?

A. Not necessarily. Risk premium analysis requires estimating the statistical relationship between returns to the company stock and market wide-returns, a relationship commonly represented by the Greek letter "Beta", b.

Q. What does beta measure?

A. Beta measures how an individual company's market value changes relative to the change in the value of the entire market. For example, if a company's market value increases from $10 to $11, then the company's value increases by 10%. If the entire market's value increased from $1000 to $1200, then the entire market's value increases by 20%. The beta is calculated as .5, which is the ratio of 10% divided by 20%.

The market itself has a beta of 1. If the company's beta is one, then company risk premium is the same as market-wide risk premium. Thus if a company's beta is less than 1, then the company is judged less risky than the market. Beta is also used to compare the relative riskiness. For example, a beta of 0.4 is less risky than a beta of 0.6.

Q. Did you calculate betas for the Piedmont and the Moody Companies?

A. Yes. The betas and their tests of statistical accuracy, the T-statistic, appear in Schedule 5, pages 1 and 2 respectively. The average beta shown at the bottom of page 1 Schedule 5 is transferred to Schedule 6, which provides results of the risk premium analysis.

Q. Do you use all the betas in Schedule 6 to develop the risk premium return to equity?

A. No. I used the average betas that have an average T-statistic greater than 1.

Q. Why did you use the T-statistic?

A. In general, the T-statistic indicates how well a (summary) number represents the group from which the summary number comes. In this case the summary number is a beta, which few people are familiar with. But the T-statistic can also be explained in terms of an average, a summary number which everyone uses almost everyday.

For example, I may know that a certain group of people are, on average, 40 years old. But the average is just a short-hand description of the group. The average alone does not indicate

anything about the group's composition. The group could be composed of children younger than 10 and elderly people over 70. The group as a whole just happens to have an average age of 40 even though 40 is not at all representative of anyone in the group. In this case the T-statistic is likely be low, about 1 or less. On the other hand the group could be composed of people between 36 and 42, who as a group, just happen to have an average age of 40, but in this case 40 is fairly representative of anyone in the group. In this case the T-statistic is likely to be high, about 2 or more. The higher the T-statistic, the more likely it is that a group's summary number or average is a good representation of the parts that make up the group.

Therefore, with regard to Schedule 5, the T-statistics for Indiana Energy and LaClede Gas' indicate that the companies' betas are poor representations and should not be used.

Q. What is the economic significance of the betas' values?

A. All the values are far less than 1, which means that Piedmont and the Moody Companies are far less risky investments than the market as a whole. In addition, the values do not vary much for any particular company, which means that investors **do not** perceive any substantial change in risk for these companies.

Q. How did you derive the betas?

A. I used the monthly percentage change in the S&P 500 index to represent the market-wide return and the monthly percentage change in the

company's stock price to represent the company's return. The change is calculated as: Price at the end of the month divided by price at the beginning of the month -- the result is converted to a natural logarithm and then the beta is calculated.

Q. Why did you use natural logarithms?

A. Natural logarithms are the established way to estimate a beta. The logs reflect the compounding process I have discussed.

Q. Does any established financial firm use natural logarithms to estimate betas?

A. Yes. *Value Line* calculates its betas from natural logarithms.

Q. Do your betas have the same value as *Value Line*'s betas?

A. No. Mine are lower because *Value Line* adjusts its calculated beta by the formula: adj beta = .35 + .67(calculated beta). Schedule 7 shows the effect of *Value Line*'s adjustment is to raise the beta's value. I do not adjust the betas.

Q. What is the reason *Value Line* adjusts it betas, and what is the reason you do not adjust your betas?

A. *Value Line* believes all betas tend towards the value of 1. However, this pattern does not characterize my calculated betas, which tend to move away from 1 for the twelve month period of July 1995 through June 1996. *Value Line* bases its adjustment on an article titled "On The

Assessment Of Risk" which was authored by Marshall Blume of the University of Pennsylvania. Professor Blume's article was published in the March 1971 issue of the *Journal of Finance*. Blume's finding appeared in page 7 of his article, Table 2. A copy of the table is attached as Schedule 13 of my testimony. That table does indeed show betas gravitating towards one as the number of securities increase in an investment portfolio. However, the portfolios in Blume's article were formed between the years 1926 and 1968. His most recent portfolio is now thirty years old. His inquiry has not been updated, and there is no evidence that his portfolio included gas distribution companies. Given the antiquity of Blume's research and the fact that my results do not conform to his findings, there was no good reason to adjust the betas. In addition, *Value Line* does not provide any estimates of its betas' statistical accuracy, such as the T-statistic that I provide. The betas I calculate are more reliable than *Value Line*'s because I provide the T-statistics for each beta.

Q. How does your risk premium estimate compare to Dr. Murry's estimate?

A. My estimate is 10.64%, and Dr. Murry's risk premium estimate ranges from a high of 13.38%, shown in Schedule 16 of his Exhibit(DAM-1), to a low of 13.13% shown in his Schedule 17.

Q. Since you and Dr. Murry have both used the same companies, why is there such a large difference between your recommended risk premium return and Dr. Murry's risk premium returns?

A. Referring to Dr. Murry's Schedule 16 in Exhibit

(DAM-1), the difference stems from the numbers he uses in the column labeled "MARKET TOTAL RETURNS" and the column labeled "BETA."

Q. How does Dr. Murry develop the number for the market-total return?

A. Dr. Murry develops the market-total return of 15.1% from page 118 of *Ibbotson Associates 1996 Yearbook*. Dr. Murry provided that page in response to a data request, and I have attached that page as Schedule 8 page 1 of 2 of my direct testimony. The figure of 15.1% is an average of two numbers, Large Company Stocks: Total Returns, which is 12.5%, and Small Company Stocks: Total Returns, which is 17.7%. I have drawn a large arrow at each number. Thus 15.1% is equal to one-half of 12.5% plus one-half of 17.7%. In terms of a formula the figure of 15.1% is .5*12.5% + .5*17.7%, where the term .5 represents the mathematical weight given to the returns of the large and small companies respectively. Schedule 8 page 2 of 2 confirms that Dr. Murry develops his market-total return as the average of the returns to large and small companies.

Q. Do you disagree with the way Dr. Murry develops the market-total return?

A. Yes. Combining 12.5% and 17.7% into an average is unreasonable because Piedmont and all the Moody Companies are Large Company Stocks. None of them are Small Company Stocks. *Ibbotson Associates 1996 Yearbook*, page 136, defines a small company stock as any company with a market capitalization of less than $171 million. I have attached that page as Schedule 9 of my direct testimony and have drawn a large

arrow to the number that represents the maximum market capitalization of a small company. Schedule 10 shows the market capitalization for Piedmont and the Moody Companies. To be consistent with the comparable companies, Dr. Murry should have used 12.5% instead of 15.1% to estimate the risk premium.

Even if the so-called "small" companies are somehow construed to be representative of Piedmont, Dr. Murry applies inaccurate mathematical weights to the returns of the large and small companies. He has used .5 as the weight for each group. This is a mistake because the small companies represent less than 1% of market capitalization while the large companies represent over 99%. In Schedule 9 page 1, the top part, under the column titled "Historical Average Percentage of Total Capitalization," I have drawn a circle around the figures of .56 and .25, the sum of which represent the percent of market capitalization represented by small companies. In terms of a formula, the correct mathematical weights are .9919 for large companies and .0081 for small companies, and the overall market return formula is .9919*12.5% + .0081*17.7%. This return is, in effect, 12.5%. Dr. Murry's figure of 15.1% for the market-total return is unreasonable, no matter how it is viewed.

Q. How does Dr. Murry develop the numbers in the column labeled "BETA" in his Schedule 16?

A. He uses the betas published by *Value Line*, which I have already shown to be much larger than the calculated betas.

Q. Do you disagree with Dr. Murry's use of *Value*

Line's betas?

A. Yes. I disagree because *Value Line*'s betas lead to an inflated cost of equity. For example, Dr. Murry's Schedule 16 shows that the average beta for the Moody Companies is .62, but as shown in my Schedule 7, *Value Line*'s adjusted beta of .62 equates to a calculated beta of .4. Its betas are not only inflated, they are also unreliable because, as I have already pointed out, *Value Line* does not provide any estimates of its betas' statistical accuracy. In contrast, I provide data on statistical accuracy for my estimated betas. In sum, Dr. Murry should have used .4 for beta instead of .62.

Q. If you were to correct Dr. Murry's risk premium analysis for the objections you have raised, what would be the results?

A. The risk premium analysis would yield a result 3 percent lower. For example, Dr. Murry's Schedule 16, the lower right hand corner, shows an equity cost of 13.38%. If the large company return of 12.5% were used as the market-total return instead of 15.1%, Dr. Murry's risk premium drops to 6.5%, a figure close to my estimate of 6.63%. If the unadjusted beta of .4 were used instead of Value Line's inflated beta of .62, the final number in the risk premium analysis would drop be 10.35%, which is shown in my Exhibit CA-SNB, Schedule 11.

Q. Do you have the same objections to the risk premium analysis shown in Dr. Murry's Schedule 17?

A. Yes. Dr. Murry's schedule 17 has the same

defects as his schedule 16.

Q. What do you recommend to the TRA regarding Dr. Murry's risk premium analysis?

A. I recommend the TRA not rely on Dr. Murry's analysis as a basis to set Piedmont's cost of equity because his analysis and conclusion do not properly identify and utilize factors to arrive at a result a rational investor would find valid.

Q. What annual cost of equity are you recommending?

A. Based on my DCF and risk premium analyses, I recommend an allowed return of 11% before compounding.

Q. What compounded return can the company earn with an annual rate of 11%?

A. The compounding process gives the company an opportunity to earn 11.6%.

Q. Does that conclude the basis of your cost of equity testimony?

A. Yes.

OVERALL COST OF CAPITAL AND CAPITAL STRUCTURE

Q. What are your findings regarding Piedmont's overall cost of capital?

A. My findings appear in Exhibit CA-SNB, Schedule 12, where I use an equity ratio of 49.6% and my recommended cost of equity, 11%, to determine the overall rate of return.

Q. Why are you using 49.6% as Piedmont's equity ratio?

A. That percentage is the company's most recent annual equity ratio. I use the most recent ratio because it represents the cumulative and on-going effect of Piedmont's dividend policy. The company's board has allowed dividend growth to outpace earnings growth, which I show in my Exhibit CA-SNB, Chart 5. The adverse consequence is a declining equity ratio. If I were to use an equity ratio of 51.8%, the amount Dr. Murry uses in his analysis, or if I used the company's five-year average ratio of 50.9%, the overall capital cost would increase and prices for natural gas would be higher. Such an increase makes consumers bear any adverse consequence of the company's declining equity ratio. I do not believe this is fair to consumers because they have nothing to do with determining Piedmont's dividends.

Furthermore, if the company raises dividends in the face of declining earnings and then successfully claims later that a relatively low equity ratio justifies a price increase, there would be little reason for the company to moderate dividend growth when earnings decline. Such financial behavior would start a spiral, where this year's generous increase of dividends is followed next year by the company's attempt to raise prices. This spiral can be stopped before it starts by using the company's most recent equity ratio of 49.6%.

Q. What weighted overall capital cost do you recommend?

A. I recommend a cost of 9.61% before compounding.

Q. What compounded overall return can the company earn with an annual rate of 9.61%?

A. The company has an opportunity to earn 10.1%.

Q. Does that conclude your testimony?

A. Yes.

Q. Please state your name.

A. Stephen N. Brown.

Q. Have you prefiled testimony in this case?

A. Yes. I filed written, direct testimony.

Q. What is the purpose of this additional testimony?

A. My purpose is to comply with the TRA's request to file written rebuttal testimony regarding Dr. Murry's direct testimony offered on behalf of the company.

Q. What does your rebuttal testimony provide?

A. My rebuttal testimony provides substantial and material evidence that the 14 non-regulated companies listed in Schedule 24 in Dr. Murry's Exhibit (DAM-1) are not comparable to Piedmont and are, in fact, much more risky investments than Piedmont and its comparables, the Moody Companies. Therefore, it is unreasonable to consider Dr. Murry's companies as comparable to Piedmont or to the Moody Companies.

My rebuttal testimony also provides substantial and material evidence that Dr. Murry's use of the arithmetic mean to form a rate of return for Piedmont constitutes unjust and unreasonable preferential treatment because the arithmetic mean of market returns mean is much higher than what is normally and commonly experienced in the market. Referring to my direct testimony, page 32 lines 2 to 13, and to Schedule 9 of my direct testimony, the

arithmetic mean is derived from the market-performance of the 1360 large companies followed by Ibbotson Associates. Less than 20% of them achieve an equity return at least equal to the arithmetic mean of 12.5%. More than 80% of those companies achieve returns less than the arithmetic mean. Therefore, Dr. Murry is basing his risk premium return on those companies that are superior performers in the market rather than on the normal performers. Therefore, his risk premium analysis renders a rate of return that is not just and reasonable.

Q. Why are the 14 non-regulated companies listed in Schedule 24 of Exhibit (DAM-1) more risky than and not comparable to both Piedmont and the Moody Companies?

A. Dr. Murry's companies start off as incomparable, and he never makes adjustments to cause them to approximate reasonably the conditions and environment affecting Piedmont. None of those 14 companies are in the natural gas distribution business. They are engaged in such activities as the provision of building maintenance and janitorial services, worldwide petroleum exploration and production, the manufacture of airplane and aerospace parts, the recycling of steel and metal products, the making of paper and special paper products, maintaining railways, commercial food preparation and food distribution, selling pharmaceutical drugs, making and selling power tools, and making electronic equipment. Rebuttal Exhibit CA-SNB, Schedule 1 is a listing of those businesses and their activities.

Q. What is the source of the information in

Schedule 1?

A. The information was obtained from those companies' recent annual reports and *Value Line*.

Q. If the companies are not in the natural gas distribution business and no rational, verifiable adjustments are made to make the companies comparable, then is it reasonable to conclude that the companies are not financially comparable?

A. Yes. My conclusion of no comparability is especially valid because there are substantial and material dissimilarities, which are depicted in Rebuttal Exhibit CA-SNB, Rebuttal Charts 1 through Rebuttal Chart 8.

Q. What is each chart composed of?

A. The left side of each chart shows data for 12 of Dr. Murry's companies, as well as an average for those 12 companies. The data is arranged in ascending order from left to right. The right side of each chart shows data for the 8 Moody Companies, as well as an average for those 8 companies. The data is arranged in ascending order from left to right. The far right side of each chart shows data for Piedmont. The individual company names appear at the bottom of each chart.

Q. Why are you using only 12 of Dr. Murry's companies instead of all 14?

A. I took into account the change in Dr. Murry's explanation of how he selected the 14 companies. In his direct testimony he said he

eliminated European companies from consideration, but in response to a discovery request he said he eliminated companies that were primarily foreign.

For example, in his direct testimony, page 18 line 2, Dr. Murry explains how he picked the 14 companies: "I selected companies *Value Line* identified a group of companies as 'conservative stocks,' based on a set of criteria of timeliness, beta and the price earnings ratio. Subsequently, I removed from that list regulated companies, companies with only financial assets, and European companies."

In Consumer Advocate discovery request 86, I asked Dr. Murry to provide the criteria he used to make the determination that a company was European. Dr. Murry answered: "After eliminating all other companies based on the previous criteria identified in Direct Testimony, page 18, Dr. Murry applied the primarily-foreign criterion which removed only Cadbury Schweppes, a European company." A copy of the request and Dr. Murry's response is attached as Schedule 2 to my rebuttal testimony.

Two of the 14 companies, the Oshawa Group and George Weston, are Canadian-owned, operate mostly in Canada, and are traded on the Toronto stock exchange instead of any stock exchange in the United States. Therefore, these 2 companies are primarily foreign, so I eliminated those 2 companies from the list.

Q. What does Rebuttal Chart 1 show?

A. Rebuttal Chart 1 shows a comparison of equity

ratios among the various companies. Even a quick look at the chart shows a huge difference in the capital structure of the groups. Dr. Murry's companies have very high equity ratios. The group average is over 75%, with lowest being 50% and the highest being 100%. The gas companies have an average ratio of about 53%, with lowest being 46% and the highest being about 61%. The substantial and material difference in equity ratios is clear evidence that Dr. Murry's non-regulated companies are not comparable to Piedmont or the Moody Companies.

Q. What does the difference in equity ratios mean?

A. In comparison to Piedmont and the Moody companies, Dr. Murry's companies have significantly higher portions of equity and lower proportions of debt. Since the cost of debt is much cheaper than the cost of equity, Dr. Murry's companies have to achieve a higher overall rate of return to attract capital than do the Moody Companies and Piedmont. Since a higher return is always more difficult to achieve than a lower return, the differing capital structures necessarily make Dr. Murry's companies more risky investments than the Moody Companies and Piedmont.

Q. What other evidence do you have to support your assertion that Dr. Murry's companies are substantially and materially more risky investments than the Moody Companies and Piedmont?

A. Rebuttal Exhibit CA-SNB, Rebuttal Charts 2

though 4 prove that investors perceive greater risk in Dr. Murry's companies.

Rebuttal Chart 2 shows the average number of years a stockholder holds each company's stock. The period of time a stockholder keeps a stock indicates the holder's assessment of risk. The shorter the hold time, the greater the risk. For example, on average Dr. Murry's companies are held 2.5 years, the Moody Companies are held 3.5 years and Piedmont' stock is held over 4 years. In comparison to Piedmont and the Moody Companies, Dr. Murry's companies are speculative investments, where an investor buys stock in the hope of a quick profit through a capital gain rather than settling in for a longer holding period where income is derived through dividends.

Rebuttal Charts 3 and 4 confirm that the investors in Dr. Murry's companies look to capital gains rather than dividends as the source of income. Rebuttal Chart 3 shows that in 1995 the average dividend yield was 3% for Dr. Murry's companies, 5.5% for the Moody Companies and about 4.9% for Piedmont. The Moody Companies' and Piedmont's dividend yields are nearly twice the size of Dr. Murry's companies. A dividend yield is the company's annual dividend divided by the company's stock price. The lower the yield, the more likely it is that the investors look to capital gains rather than dividends as the source of income.

Rebuttal Chart 4 shows the 1995 payout ratios for the groups. A payout ratio indicates what proportion of a company's profits is passed on to stockholders. Once again there is a stark contrast between the groups. Dr. Murry's

companies pass on less then 40% of the profits. The Moody Companies pass on more than 80% of the profits and Piedmont passes on more than 70%. This is conclusive proof that investors in Piedmont and the Moody Companies rely on dividends for their income while investors in Dr. Murry's companies rely primarily on capital gains for their income.

The substantial and material differences shown in Rebuttal Charts 2 though 4 are further clear evidence that Dr. Murry's non-regulated companies are not comparable to Piedmont or the Moody Companies.

Q. What other evidence shows that Dr. Murry's companies are more likely to provide income from capital gains?

A. Rebuttal Exhibit CA-SNB, Rebuttal Charts 5 though 7 prove, with regard to capital gains and losses, that investors in Dr. Murry's companies are playing for much higher stakes than the investors in the Moody Companies. The stakes are higher for Dr. Murry's companies' because they are held by relatively few people in comparison to the Moody Companies and Piedmont.

Rebuttal Chart 5 shows the number of shareholders for each company. All but one of Dr. Murry' companies have less than 10,000 shareholders. The minimum is about 1000 and the maximum is about 9,800, with the exception of Atlantic Richfield Oil Company (ARCO) which has about 100,000 shareholders. ARCO makes the average number of stockholders swell to about 13,000, which is not representative of the group. The Moody Companies and Piedmont are

more widely held. All the companies have more than 10,000 shareholders. The maximum is about 34,000, the minimum is about 11,000 and the average is about 18,000, which is reasonably representative of the group.

Rebuttal Chart 6 show the shares per stockholder for each company. There is a huge difference between Dr. Murry's companies and the Moody Companies and Piedmont. On average an investor in Dr. Murry's companies owns about 4,200 shares while an investor in the Moody Companies owns about 1,800 shares.

Rebuttal Chart 7 shows the value of holdings per shareholder for Dr. Murry's companies and the Moody Companies and Piedmont. Once again there is a huge difference between Dr. Murry's companies and the others. The average value of holdings for Dr. Murry's companies is about $175,000 while the averages for the Moody Companies and Piedmont are about $50,000. The chart makes it abundantly clear that the investors in Dr. Murry's companies stand to make or lose huge amounts of capital depending on the price of the stock. Rebuttal Chart 7 reinforces the notion that Dr. Murry's companies are indeed far more risky investments than natural gas distribution companies.

Q. Is there any measure by which the Dr. Murry's non-regulated companies are comparable to Piedmont and the Moody companies?

A. Yes. As shown in Rebuttal Chart 8, eleven of the nonregulated companies had a market value exceeding $171, the threshold that distinguishes between large and small companies, which I referred to in my direct

testimony, pages 31 and 32.

Q. What is significant about Dr. Murry' use of large companies in this instance?

A. It demonstrates the inconsistency and unreasonableness of his development of the risk premium rate of return. In my direct testimony, pages 41 and 42, I explained my disagreement with his risk premium analysis by pointing out that he mixes Murry's mixes large and small companies to develop his return. However, when Dr. Murry seeks to compare Piedmont and the Moody Companies with unregulated companies, he switches back to the large companies as the basis of his comparison.

Q. Why do you disagree with Dr. Murry's development of his risk premium rate?

A. In my direct testimony I explain that mixing small and large companies, is unreasonable because the comparable companies are large not small. In my direct testimony, at page 42 lines 13-16 I stated: "To be consistent with the comparable companies, Dr. Murry should have used 12.5% instead of 15.1% to estimate the risk premium."

Q. Do you disagree with any other aspect of Dr. Murry's risk premium analysis?

A. Yes. Even if Dr. Murry had used 12.5%, I would still disagree with his use of Ibbotson Associate's so-called "arithmetic mean" in the his risk premium model. Schedule 8 of my direct testimony and Schedule 3 of rebuttal testimony are both copies of copy of Table 6-7 of Ibbotson's 1996 yearbook. Most people do not

use the term "arithmetic mean". Instead, people use the term "average," but statisticians use the term "arithmetic mean" to distinguish it from the so-called "geometric mean", which is a term describing the midpoint of a group.

Q. Why do you disagree with Dr. Murry's use of the arithmetic mean?

A. The arithmetic mean of 12.5% is an unreasonable basis for a risk premium analysis because the arithmetic mean overestimates the normal returns to equity and does not reflect the full impact of the losses which occur in the market. In the real world people and companies occasionally lose money. The loss makes financial risk real, palpable and tangible. Without the occasional loss, there would be no true risk. The loss also lowers the return to equity for investors. Their return is not as high as it would be if there were no losses. However, the arithmetic mean embodies the arbitrary and unrealistic notion that when gains and losses are weighed against each other, the net result is always a gain. This hides the effect of losses and misleads the investor into thinking that the return on an investment is higher than it truly is.

Q. Do you have an example from financial literature showing how the arithmetic mean of equity returns can mislead an investor and those people making rate of return decisions?

A. Yes. In the July-August 1979 issue of *Financial Analysts Journal* Roger Ibbotson, the principal of Ibbotson Associates, provided a revealing example of the arithmetic mean:

> "Suppose that $1.00 were invested in a common stock portfolio that experienced 100 percent price appreciation in the first year and 50 percent depreciation in the succeeding year. At the end of the first year the portfolio would be worth $2.00; at the end of the second year the portfolio would be $1.00. The annual arithmetic mean return on the portfolio would be 25 percent..."

Since the portfolio's value is again $1.00, the real return is obviously zero, not 25%. It just so happens that the geometric mean is zero, as well. Thus, the arithmetic mean clearly misleads investors and overestimates the market's return to equity, but the geometric mean does not.

Q. How does the arithmetic mean mislead investors about the market's return to equity?

A. As my example just showed, the arithmetic mean is calculated by adding the positive return, in terms of percent, to the negative return, in terms of percent, and getting a net amount, also in terms of percent. Since the value of the investment can never get below zero dollars, the loss in percentage terms can never be more than 100%. On the other hand, since the value of the investment has no upper limit, the percent gain has no limit either, it could be 1000% or more, for example. Therefore, the calculation of an arithmetic mean <u>for a rate of return always leads to an overestimate of the market's return to equity.</u> With regard to a rate of return, the arithmetic mean is not representative of the market's return to

equity.

Q. Why do you object to the use of the arithmetic mean in determining the rate of return?

A. Due to its mathematical nature the arithmetic mean does not render a just, reasonable and fair return. The notion of just, reasonable and fair suggests that the middle position is the most reasonable one to take. With regard to market returns, the middle position has the highest probability of occurring. In the example I just gave, the true middle is zero not 25%. In risk premium analysis, the arithmetic mean is not the true middle of the returns experienced by the market. The true middle divides the group so that the odds of achieving a return below the midpoint equals the odds of achieving a return above the midpoint. The true midpoint is the geometric mean.

The arithmetic mean by its logical nature is not the midpoint of the returns experienced by the market. Therefore, the arithmetic mean inaccurately represents the source-group whether the group is based on rates of returns to large companies, peoples' ages or the number of shareholders in a company. Allowing the rates of return to be influenced in any manner by the arithmetic mean is unjust and unreasonable.

Q. Do you have an example of how an arithmetic mean inaccurately represents its source?

A. Yes. Dr. Murry's sample of 12 nonregulated companies provides an excellent example. The

left side of Rebuttal Chart 5 shows the data for the number of shareholders in each of the nonregulated companies. For example, at the bottom left corner of the chart, Lawson Products has approximately 1,000 shareholders. The next company, Commercial Metals, has about 1300 shareholders. Moving to the right, each nonregulated company has more shareholders. The very last nonregulated company, Atlantic Richfield, has 100,000 shareholders. The average number of shareholders per nonregulated company is about 13,000 because Atlantic Richfield has skewed the average.

The midpoint of the group is about 4,900 shareholders per company. One half of the companies have more than 4,900 shareholders and one half of them have less than 4,900. If you think of this in terms of statistical probability, there is a 50% chance that one of Dr. Murry's companies has more than 4,900 shareholders and a 50% chance that the company has less than 4,900 shareholders. However, it would be very inaccurate to say that there is a 50% chance that one of Dr. Murry's companies has more than the average number of shareholders, which is 13,000. In fact, the odds are only 1 in 12, about 8%.

Q. What do you conclude from your example?

A. In cases where the arithmetic mean poorly represents a group, the arithmetic mean is an unreasonable basis for making decisions. This is especially accurate when the group is composed of the historical returns to common equity and the arithmetic mean does not reasonably represent the group of companies.

Q. Is a fair representation of large companies' rates of return the mid-point of the returns?

A. Yes. There is no good reason for moving away from the midpoint, otherwise the risk premium is biased one way or the other.

Q. Is Ibbotson's arithmetic mean of 12.5% the mid point of the returns experienced by the large companies?

A. No, the mid point is 10.5%, the so-called geometric mean. I have drawn a large arrow at this amount in Rebuttal Schedule 3. With regard to Ibbotson's data, the odds of achieving a return below 10.5% equal the odds of achieving a return above 10.5%.

Q. Does the arithmetic mean of 12.5% represent a balance between the high and low returns to large companies?

A. No. It would be very inaccurate to say that Ibbotson's arithmetic mean represents such a balance because less than 20% of the market returns are above the arithmetic mean and more than 80% are below. Ibbotson's arithmetic mean is a poor representation of the returns to large companies. This situation is very similar to my earlier observation about the average number of stockholders for Dr. Murry's noncomparable companies, which I refer to in Rebuttal Chart 5.

Q. What does Ibbotson say about the arithmetic and geometric means?

A. Over the years Ibbotson has said several things. Early in his career he correctly

suggested that the use of arithmetic mean was misleading. I have already discussed the example he provides in the July-August 1979 issue of *Financial Analysts Journal*.

Q. What does Ibbotson say today about the arithmetic mean?

A. He advocates the use of the arithmetic mean to determine the cost of capital. In his 1996 yearbook at page 155 he makes contradictory statements regarding the geometric and arithmetic means. He says, "...the median (middle outcome) and mode (most common outcome) are given by the geometric mean...the arithmetic return is correct because an investment with uncertain returns will have a higher expected ending value than an investment that earns with certainty its compound or geometric rate of return...in the investment markets, where returns are described by a probability distribution, the arithmetic mean is the measure that accounts for uncertainty, the arithmetic mean is the appropriate one for estimating...the cost of capital"

Q. Why do you believe Ibbotson's statement is contradictory?

A. Ibbotson describes the geometric mean as the middle outcome and as the most common outcome for equity return, but then he suggests that a geometric rate of return is the return that is "certain" while the arithmetic return is the return that is "uncertain."

Q. Is the basis for Ibbotson's explanation reasonable?

A. No. It as if he left a step out of his reasoning process. For example, Ibbotson agrees the geometric return is precisely in the middle of all the market returns. But that does not mean that the geometric return is a "certain" return. In my direct testimony, page 22 lines 1-3, I point out that returns to equity are not guaranteed. The only return that I know of which is certain is the return to debt. I have already pointed out in my direct testimony that it is the potential loss of principal that justifies a higher return to equity capital than to debt capital. But all returns to equity are not identical to each other, and the issue here is the return to equity, not the return to debt. In fact, there is a substantial chance that a large company will not achieve the market's geometric return.

With regard to the market's arithmetic mean return, it is higher than the geometric return, Clearly, a company is more likely to achieve the geometric mean return rather than arithmetic mean return. However, this does not mean that the geometric return is a "certain" return and that the arithmetic mean is the "uncertain" return.

Also, Ibbotson's statement, "in the investment markets, where returns are described by a probability distribution, the arithmetic mean is the measure that accounts for uncertainty" is completely misleading. Someone not familiar with these ideas may mistakenly think: "1. the geometric mean is certain; 2. the arithmetic mean is uncertain; 3. the returns in the investment market are described by probability; 4. since probability is another way of saying uncertainty, the arithmetic mean must be the

right measure to use and the geometric mean must be the wrong one." This reasoning would be quite wrong and a misunderstanding of probability.

Q. Why would that reasoning be wrong?

A. That reasoning is wrong because every group, whether it is stock market returns, peoples' ages or the number of stockholders in a company, has an arithmetic mean and a geometric mean. Once you know these values for a group, the group's probability distribution can be always be found. This provides the exact odds of achieving the geometric and arithmetic means.

With regard to the market's rate of returns for large companies, I have already pointed out that the geometric mean is not a return that is guaranteed or "certain." It is the midpoint of the probability distribution of returns, i.e., the odds of achieving a return below the midpoint equals the odds of achieving a return above the midpoint. The arithmetic mean is always greater than the geometric mean. In the case of Ibbotson's data, the odds are more than 80% that a large company will not achieve the arithmetic mean return and less than 20% that the company will achieve the arithmetic mean.

Q. How do you know that the odds of a large company achieving the arithmetic mean are only 20%?

A. Schedules 4 and 5 of my rebuttal testimony show where I got those figures. Schedule 4 is a copy of Ibbotson's 1996 yearbook, page 50. The top portion shows a graph depicting the growth of a

$1 investment in a large company from 1925 to 1995. The graph indicates that a $1 investment in a large company in 1925 is now worth $1113.92 in 1995. The annual return to equity for the 70 year period is 10.54%, which is also the geometric mean that I have already shown in Schedule 3.

Schedule 5 of my rebuttal testimony shows the probability distribution of Ibbotson's data on returns to large companies. I was able to construct this distribution because Ibbotson has provided the geometric and arithmetic means for his data.

Q. Why did you construct the distribution?

A. I pointed out earlier that Ibbotson's justifies his preference for the arithmetic mean by saying, "in the investment markets... returns are described by a probability distribution." This begs the question: "What distribution?" I wanted to see what Ibbotson was referring to, so I derived the distribution from the values he provides for the geometric and arithmetic means for his data.

Q. What does Schedule 5 show?

A. The schedule shows how I arrive at my conclusion that a large company has only a 20% chance of achieving the arithmetic mean return of 12.5%. Column (2) shows all the possible outcomes in 1995 from a $1 investment in 1925. The outcomes range from $0 to $618.8 million. Each of these has a corresponding annual market return, shown in column (3). The returns range from -8.5% to 33.53%. Columns (4) through (6) respectively show the odds of exactly achieving

the return in column (3), the odds of achieving a return less than the return in column (3), and the odds of achieving a return more than the return in column (3). The data in columns (3) and (4) are depicted in Rebuttal Chart 9, which shows the return at the bottom of the chart. The data in columns (3) and (6) are depicted in Rebuttal Chart 10.

Q. Does the probability distribution confirm Ibbotson's statement that "...the median (middle outcome) and mode (most common outcome) are given by the geometric mean?"

A. Yes, the distribution's true middle return is 10.54%, which is the geometric mean of column (3). Column (4) shows that of all possible outcomes, the geometric mean has the highest odds, which are 9.5%. Columns (5) and (6) also show that the odds of achieving a return below 10.54% are 45%, which equals the odds of achieving a return above 10.54%. In sum, Ibbotson's statement is absolutely correct. However, it is also clear that the geometric mean is not a "certain return." There is only one thing that is certain in Schedule 5: Since 1925 the odds are 100% that a large company has earned somewhere between -8.5% and 33.53% annually.

Q. What is your opinion about Ibbotson's recommendation that the arithmetic mean be used in risk premium analyses?

A. I disagree because it is not representative of normal returns to large companies. Schedule 5 shows that the arithmetic mean has less than a 20% chance of being achieved. Therefore, a risk premium analysis that uses the arithmetic mean,

such as Dr. Murry's, is not based on a reasonable standard. Moreover, it suggests that Dr. Murry is seeking unjust preferential treatment for Piedmont because the arithmetic mean represents a large company's superior performance in the market rather than a large company's normal and common performance.

Q. What do think is a reasonable standard for a risk premium analysis?

A. I believe the reasonable standard is the geometric mean because it is precisely in the middle of the probability distribution of market returns. There is no good reason to depart from it. Moving from the midpoint of 10.54%, which has a 50-50 chance of being achieved, to the arithmetic mean of 12.5%, which has less than a 20% chance of being achieved is no more justified than moving down to 8.18%, which has an 80% chance of being achieved.

Q. Are there people who do not agree with Ibbotson's preference for the arithmetic mean?

A. Yes. There is substantial criticism of it, and Ibbotson's preference is contrary to all the recommendations of scholars in statistics and finance that I know of. For example, in 1967 Irving Fisher, considered to be one of the world's greatest statisticians, wrote a book called *The Making of Index Numbers.* Fisher says, "*The simple arithmetic average produces one of the very worst index numbers. And if this book has no other effect than to lead to the total abandonment of the simple arithmetic type of index number, it will have served a useful purpose.*" In 1981 Richard Stevenson and

Edward Jennings published, *Fundamentals of Investment*. They say, "*Why not simply average the rates of return? Indeed, in certain instances, such a procedure would be satisfactory. However, such an average would generally be meaningless.*" In 1990, Thomas Copeland, et. al. published *Valuation: Measuring and Managing the Value of Companies*. "*Our opinion is that the best forecast of the risk premium is its long run geometric average.*"

Ibbotson's recommendation also runs counter to the general practice of investment firms. On March 13, 1990 at page C1 the Wall Street Journal ran the following story, "When Figuring the Rate of Return Don't Be Confused By The Sales Hype." The story compares the simple average with the so-called compound return, another common name for the geometric return. The WSJ story says the compound return is "more widely used by investment firms."

Q. Why do investment firms prefer the geometric mean to the arithmetic mean?

A. The firms recognize the fundamental weakness of the arithmetic mean as a guide to assessing investments.

Q. What is the fundamental weakness of the arithmetic mean as a tool to assess investments?

A. It fails to alert investors to precarious investments. It blinds investors to their own economic vulnerability and lures them into making investments that are likely to be destroyed.

Q. How does the arithmetic mean fail to alert investors to a precarious investment?

A. It fails to alert the investor because two different investments can have the same arithmetic mean even though the investments have much different odds of being successful. Therefore, a rational investor would not rely on the arithmetic mean as a tool to guide decisions about investments. As an investment gets more risky, the investor should reassess the situation, but reassessment is not possible with the arithmetic mean. In contrast, the geometric mean alerts the investor to increased risk and allows reassessment of a changing situation. This is why investment firms use the geometric mean instead the arithmetic mean.

To prove this point I'll begin with Ibbotson's example that appears on pages 154-155 of his 1996 yearbook. Those pages are attached as Schedule 6 of my rebuttal testimony. Schedules 7 through 9 of my rebuttal testimony provide the details of my proof. Whereas he use $1 to illustrate the situation I use $1000.

For example, a stockbroker who follows Ibbotson's methods advises you to invest in a stock because every year it has a 50% chance of rising by 30% and a 50% chance of falling by 10%. You say to the stockbroker:

> "I want to build a small trust fund for my granddaughter. After 30 years how much money will the stock be worth if I buy $1000 worth of shares today?"

The stockbroker who follows Ibbotson's methods says:

"If everything goes perfectly, your stock will be worth $2.6 million. If everything goes wrong, your stock will be worth $42. That's a broad range, but the most likely value is $17449."

You ask:

"How did you get that number?"

The stockbroker says:

"Since the odds of a loss are the same as the odds of a gain, your stock will grow by 10% a year. It grows by 10% because when you take a positive 30% and a negative 10%, they net to 20% but divide that by 2 because there are two possibilities, a loss or a gain, therefore, the arithmetic average is 10%. Then multiply $1000 by 1.1 for 30 years, the formula is easy: $1000 X $(1.1)^{30}$ = $17449."

You think about buying the stock, but first you check with a rational stockbroker who is skeptical of Ibbotson's methods. You get a different answer:

"You have a 50% chance of getting $10,539, that is the most likely value after 30 years. Your odds of getting $17,449 are less than 30%.

You ask:

"How did you get that number? I am supposed to make an average of 10% each year."

The rational stockbroker says:

> "Your investment is not going to grow by 10% each year. The chances are that 15 years your stock is going to lose 10% of its value and in the other 15 years it will gain 30%. When you combine those ups and downs you are going to make some money but not at the rate of 10% a year. The formula is easy: $\$1000 \times (1.3)^{15} \times (.9)^{15} =$ $10,539, which is the midpoint of the distribution. You have about a 50% chance of getting $10,539, but you have less than a 30% chance of getting $17,449."

Clearly, the arithmetic mean overestimates how quickly wealth is accumulated in comparison to the geometric mean. The arithmetic mean also fails to alert investors to a dangerous situation.

Continuing with the example, the Ibbotson follower comes back to you and says:

> "I did not hear from you about the first stock, but now I have a different stock for you. It has a 50% chance of rising by 60% each year and a 50% chance of falling by 40% each year."

You say:

> "What is in it for my granddaughter's trust fund? After 30 years how much money will the stock be worth if I buy $1000 worth of shares today?"

The stockbroker who follows Ibbotson answers:

> "There is plenty in this for the trust fund. If everything goes perfectly, your stock will be worth $1.3 billion. If everything goes wrong, your stock will be worthless. But compare that to the first stock, its high is only $2.6 million and its low is $42, which is practically worthless. So in either case, the lows are about the same but the highs are very different. Besides, the most likely value is $17,449. This investment is just as good as the first one, if not better. You can't lose."

You ask:

> "How did you get that number?"

The stockbroker, always careful to follow Ibbotson's method, says:

> "I did it just the same way as I did last time. Since the odds of a loss the odds of a gain are equal to each other, your stock will grow by 10% a year. It grows by 10% because when you take a positive 60% and a negative 40%, they net to 20% but divide that by 2 because there are two possibilities, a loss or a gain, therefore, the arithmetic mean is 10%. Then multiply $1000 by 1.1 for 30 years, the formula is easy: $1000 X $(1.1)^{30}$ = $17449."

You ask:

"Since both stocks have an arithmetic mean of $17449, which one should I buy"?

The Ibbotson follower says:

"Buy the second one. You can't lose."

You think about buying the second stock, but something does not seem right to you. Just to be safe you go back to the rational stockbroker, who says:

"The second stock is not as good as the first one. The midpoint of this distribution is much less than $10,539. The new midpoint is $542. The trust fund will probably be worth only $542 after 30 years. In addition, your odds of getting $17,449 have dropped from less than 30% to less than 10%."

You ask:

"How did you get that number? I am supposed to make an average of 10% each year."

The rational stockbroker says:

"Your investment is not going to grow by 10% each year. If things go as expected, in 15 years your stock is going to lose 40% of its value and in the other 15 it will gain 60%, but a 60% gain does not make up for 40% loss. When you combine those ups and downs you are going to lose a lot of

money. The formula is easy: \$1000 X $(1.6)^{15}$ X $(.6)^{15}$ = \$542. You have about a 50% chance of getting \$542, but you have less than a 10% chance of getting \$17,449."

The example makes it crystal clear that the arithmetic mean misleads investors and harms them as well. Schedules 7 through 9 of my rebuttal testimony lay out the steps in this example. The first stock I mentioned is represented in Schedule 7 by columns (b), (c) and (d) and (e). Taken as a group these columns represent Ibbotson's method. The second stock I mentioned is represented by columns (f), (g) and (h). Column (e) is the arithmetic mean for both stocks. Schedules 8 and 9 provide the probability distributions for each stock.

Q. What does your example prove?

A. It proves several things: The arithmetic mean return sheds no light whatsoever on an investment's riskiness; a rational investor would never rely on the arithmetic mean return as a guide to select investments; investors who rely on the arithmetic mean will be lead into risky investments and end up the poorer for it; the arithmetic mean return is not the most likely return; the arithmetic return embodies the arbitrary and unrealistic notion that when gains and losses are weighed against each other, the net result is always a gain -- an assertion I make in this rebuttal testimony at page 11 lines 23-26.

Q. Is your risk premium analysis based on the geometric mean?

A. Yes. My risk premium analysis is based on the geometric return. The test of the reasonableness of my method is available in Chart 1 of my direct testimony. My risk premium yields a 10.64% return, an amount that fits in with all the other data appearing in that chart.

Q. What do you recommend to the TRA regarding the arithmetic mean?

A. I recommend that the TRA disregard the arithmetic mean as a reasonable basis of a risk premium because the arithmetic mean is an arbitrary, unreasonable and excessive estimate of the markets' return to equity. I also recommend that the TRA disregard Dr. Murry's risk premium analysis because it is arbitrarily and unreasonably based on the arithmetic mean return, a return that represents superior market-performance, a return achieved by less than 1 in 5 companies, a return that constitutes unjust preferential treatment for Piedmont.

Q. What do you recommend to the TRA regarding the geometric mean?

A. I recommend the TRA use the geometric mean as the basis for risk premium analyses because it is the midpoint of the returns to equity actually experienced by the market, and the midpoint is the best representation of a just, reasonable and fair return for use in risk premium analyses.

Q. Does that conclude your rebuttal testimony?

A. Yes.