Exhibit No.:	
Issue:	*Rate of Return*
Witness:	*Stephen G. Hill*
Sponsoring Party:	*MoPSC Staff*
Type of Exhibit:	*Surrebuttal Testimony*
Case No.:	*ER-2010-0036*
Date Testimony Prepared:	*March 5, 2010*

SURREBUTTAL TESTIMONY

OF

STEPHEN G. HILL

ON BEHALF OF

THE MISSOURI PUBLIC SERVICE COMMISSION

UNION ELECTRIC COMPANY,
d/b/a AmerenUE

CASE NO. ER-2010-0036

Jefferson City, Missouri
March 2010

TABLE OF CONTENTS OF

SURREBUTTAL TESTIMONY OF

STEPHEN G. HILL

UNION ELECTRIC COMPANY,
d/b/a AmerenUE

CASE NO. ER-2010-0036

SURREBUTTAL TESTIMONY OF

STEPHEN G. HILL

UNION ELECTRIC COMPANY

d/b/a AmerenUE

CASE NO. ER-2010-0036

Q. PLEASE STATE YOU NAME, OCCUPATION AND ADDRESS.

A. My name is Stephen G. Hill. I am self-employed as a financial consultant, and principal of Hill Associates, a consulting firm specializing in financial and economic issues in regulated industries. My business address is P. O. Box 587, Hurricane, West Virginia, 25526 (e-mail: hillassociates@gmail.com).

Q. ARE YOU THE SAME STEPHEN HILL WHO TESTIFIED PREVIOUSLY IN THIS PROCEEDING ON BEHALF OF THE COMMISSION STAFF (STAFF) REGARDING COST OF CAPITAL ISSUES?

A. Yes, I am.

EXECUTIVE SUMMARY

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. I will respond to the Rebuttal Testimony submitted by Union Electric Company, d/b/a AmerenUE (the Company or AmerenUE) witnesses Dr. Roger Morin and Julie Cannell, which is related to the issue of the determination of the cost of equity capital.

COMPANY WITNESS CANNELL

Q. DO YOU ADDRESS MS. CANNELL'S TESTIMONY REGARDING INSTITUTIONAL INVESTOR OPINIONS?

A. No, I have no comments regarding the majority of the testimony of Company witness Cannell, who is appearing as an investor representative. Ms. Cannell supports the highest rate of return sponsored in this proceeding--that provided by the Company, which she has

always done in her investor-representative testimony.[1] In my view, it is neither surprising nor probative of any issue regarding the actual cost of capital, that an investor-representative supports the highest return available in the record. With equal authority, an unemployed single mother who is a customer of AmerenUE could testify eloquently on the appropriateness of the low-end of the recommended cost of equity range in these difficult economic times. Even Ms. Cannell, the investor spokesperson, admits that the Commission should take the current economic "realities" into account when setting rates.[2] However, neither testimony, that of Ms. Cannell nor that of an unemployed AmerenUE ratepayer would provide additional evidence as to what level of allowed return is most appropriate in meeting the requirements of *Hope* and *Bluefield*, while balancing the interests of ratepayers and investors. That issue is addressed in the cost of capital testimony before the Commission in this proceeding.

COMPANY WITNESS MORIN

Q. HAS THE TESTIMONY OF THE COMPANY'S WITNESS DR. MORIN CAUSED YOU TO ALTER YOUR CONCLUSION THAT THE STAFF TESTIMONY IN THIS PROCEEDING PROVIDES THE MOST ACCURATE ESTIMATE OF THE COST OF EQUITY CAPITAL FOR FIRMS SIMILAR IN RISK TO AMEREN-UE?

A. No, the Company witness' testimony is not persuasive in that regard.

Q. THE COMPANY'S REBUTTAL ATTEMPTS TO PAINT THE STAFF'S COST OF EQUITY ESTIMATE IN THIS CASE AS OUT OF THE MAINSTREAM OR NOT CREDIBLE. IS THAT A VALID ASSESSMENT?

A. No. Staff witness Murray has in this proceeding provided substantial, objective evidence published by reputable financial analyst research services, which show that investor return expectations for utility investments are in the 8% to 9% range. That evidence was obtained from financial analyst reports provided to Staff by AmerenUE at Ameren's

[1] Deposition of Julie M. Cannell, p. 40, ll, 14-18.
[2] Deposition of Julie M. Cannell, p. 78, l. 10-14.

corporate headquarters in St. Louis, in response to Staff Data Request No. 200. Those analyst reports cited by Staff witness Murray are not sponsored by any party in this or any other rate proceeding, represent information supplied directly to investors from the financial community (financial advisory services), and, therefore, should be considered to be representative of the type of information that influences investor opinion.[3]

The process of estimating the cost of equity capital in rate proceedings, using econometric models such as the DCF and CAPM is an effort to estimate, through the use of available market data and information provided to investors, the return that investors require in order to commit capital to a utility company. Theoretically, when that return (the cost of equity capital) is allowed in rates, regulation duplicates the conditions that would exist in the competitive marketplace and the interests of investors and ratepayers are properly balanced.

The financial analyst data presented by Staff in this proceeding cuts out the "middle-man" and the attempt to estimate investors' expectations with econometric formulas, and, instead, goes directly to the required market return financial analysts use to value electric utility stocks. As such, those reports provide legitimate evidence regarding investors' current market-based equity return requirements for utility stocks. By that direct evidence of what market-based return equity analysts' require from utility stocks (currently 8% to 9%), Mr. Murray's equity cost estimate range of 9.0% to 9.7% is not only corroborated by those data, it is shown to be conservative and allows the Company the ability to earn a return, under efficient management, that *exceeds* the return investors expect to earn from utility stock investments, according to the published opinions of equity research analysts.

Q. HOW DO COMPANY WITNESSES MORIN AND CANNELL RESPOND IN REBUTTAL TO STAFF'S REFERENCE TO EXPECTATIONAL EQUITY RETURN DATA FROM SECURITY ANALYSTS?

[3] Deposition of Julie M. Cannell, p. 59, ll. 13-16.

A. Dr. Morin states, at page 28 of his Rebuttal Testimony that "a handful of equity reports is a highly questionable source of information in assessing an appropriate ROE for a regulated utility."[4] That statement of opinion, without any supporting factual information, does not provide reliable rebuttal to the objective security analyst evidence presented by Staff. This is particularly true with regard to Dr. Morin's claim that such data are "unreliable." It is most important to recall, that it is Dr. Morin who claims that projected earnings growth rate information from security analysts is the *only* proper measure of long-term sustainable growth in the DCF. Moreover, because only a few analysts follow each company, Dr. Morin is basing his assessment of an appropriate DCF-based ROE, using projected earnings growth based on a "handful of reports" from the same types of sources cited by Mr. Murray. Dr. Morin cannot, therefore, credibly criticize Staff's use of analysts' published information while he places exclusive reliance on it in his DCF analysis. The analysts' reports cited by Mr. Murray do provide reliable evidence to determine the reasonableness of a cost of equity estimate and those data show both that Mr. Murray's estimate is very similar to actual investor expectations and that Dr. Morin's is significantly overstated.

Ms. Cannell's response to Staff's reference to analysts' reports is more interesting than Dr. Morin's, but similarly flawed:

> I also believe that Staff makes and inappropriate comparison in pointing to the discount rates employed by the investment analysts in relation to establishing the required return on equity. The discount rate used in a dividend discount model is a valuation tool, used in stock selection. That rate is part of the process that attempts to determine how stocks are valued *relative to one another*— that is, whether a specific stock is undervalued or overvalued in respect to other investment opportunities. The discount rate utilized by investors in this fashion is not an indicator or the required, fair rate of return on a utility's

[4] Dr. Morin pejoratively refers to the analyst reports reviewed by Staff witness Murray as a "handful of... reports," as if there are other analyst reports that reveal contradictory information to that cited by Staff. However, it is important to understand that Mr. Murray reviewed *all* the reports given him by AmerenUE, and, if there was any selecting involved in determining which reports were revealed it was undertaken by the Company, not Staff.

> common stock equity, which is established through consideration of various methodologies and attendant factors in rate cases. (Cannell Rebuttal, p. 33, l. 16 through p. 34, l. 2)

Ms. Cannell's Rebuttal Testimony, which attempts to construct a difference between a dividend discount model used in stock valuation and a cost of equity determination in a rate case, is factually inaccurate. The dividend discount model *is* the DCF we use to estimate the cost of equity capital in rate proceedings; they are one in the same. The DCF we use in cost of capital estimation is derived from a dividend discount valuation model in which the current value of the asset (stock price) is equal to the sum of the future income stream (dividends) discounted at the required return (the cost of capital). In rate case cost of capital analysis, the assumption is made that dividend growth is constant, and the more general dividend discount formula is re-arranged so that the cost of capital is set equal to the next period divided plus investors' long-term growth expectation.

Because they are the same model, the discount rate that analysts' use to determine an appropriate stock valuation for utility stocks provides direct evidence as to investors' expected return—the cost of equity capital for utilities. For example, let's assume that the analyst estimates a future stream of dividends for Utility X and uses an 8% discount rate (investor's market return expectation) and derives a current price (present value) for Utility X of $20/share. If the stock is currently selling at $20, he would advise investors to hold the stock because it is currently fully-valued. If, under the same circumstances, our analyst changed expectations so that investor return requirements were 10.8% (as Dr. Morin believes to be the case), then for Utility X, the present value of that future dividend stream would be substantially lower than the current $20 market price, and our analyst would advise his clients to not to buy the stock at the current price, because it is overvalued due to the higher expected return. However, a discount rate of 10.8% is not the expected rate of return equity analysts are now using. As Mr. Murray reports, the discount rates used by the analysts to assess current utility prices, which is equivalent to the cost of equity capital determined in utility rate cases, ranges from 8% to 9%.

Simply because the dividend discount model is used to assess the current stock price and the DCF is used to asses the cost of equity capital does not mean that those two mathematical models are not related to each other as Ms. Cannell seems to believe. One is an algebraic re-arrangement of the other and they are mathematically effectively equivalent. The discount rate used in a dividend discount model by financial analysts in investors service reports, and cited by Staff, is a reliable proxy for the cost of equity capital determined in a rate proceeding—it is the return investors require on utility common stock: the cost of equity capital. Investor service publications indicate that the current cost of equity capital for electric utilities, as noted by Mr. Murray is 8% to 9%. These data support the credibility and reasonableness of Staff's 9.35% equity return recommendation in this proceeding.

Finally on this point, although Ms. Cannell testifies in her Rebuttal Testimony that the expected market return rates used in the dividend discount model contained in the equity analysts reports cited by Staff witness Murray are, somehow, different from the cost of capital estimated in rate cases, she does not detail or describe any such differences. Also, when asked in her deposition to state whether or not the dividend discount model and the DCF were the same model, she was unable to do so.[5]

Q. THE STAFF ALSO CITES EXPECTED LONG TERM MARKET RETURNS OF 8.5% FROM THE MISSOURI STATE EMPLOYMENT RETIREMENT SYSTEM (MOSERS) AS CORROBORATING EVIDENCE THAT ITS 9.35% COST OF EQUITY ESTIMATE IS CREDIBLE. HOW DID THE COMPANY RESPOND IN REBUTTAL?

A. Company witness Morin, at pages 25 through 27, attempts to dismiss the expected market return contained in a report provided by Summit Strategies Group as "actuarial" data and therefore, not pertinent to the cost of capital. However, an expected long-term return on common equities in the U.S.—the data cited by Mr. Murray—is not "actuarial" data; it is

[5] Deposition of Julie M. Cannel, p. 45, l. 5-9.

what it says it is: an expected long-term return on the stock market. As such, it provides a gauge with regard to long-term stock return expectations.

While there is no doubt that the MOSERS long-term return expectation cited by Mr. Murray can be used *along with* actuarial data (e.g., mortality tables) to determine the level of the member's contribution necessary to keep the fund solvent in the future, that does not make the long-term return expectation itself "actuarial data," nor does it take that parameter out of the realm of providing a credible benchmark for investor return expectations.

The annual return on the equity portion of the MOSERS' portfolio is an objective measure of investors' long-term equity return expectations—it is what one very large institutional investor (MOSERS) believes it will earn on its equity investments over the long-term. That is precisely the parameter regulators seek to determine in setting utility profitability. Therefore, even though the expected long-term return on equity used by MOSERS to project the future value of its pension fund portfolio is only one part of a complicated process of determining the current pension funding requirements, it is a legitimate measure of investors' long-term equity return expectations, which is directly equivalent to the cost of equity capital.

Dr. Morin also raises issues related to whether or not the MOSERS' long-term return expectation is based on geometric or arithmetic averaging and references a 2007 California P.U.C. Order, which he apparently believes supports his position against reliance on reliable investor-expected long term return data. As I will show below, it does not.

Q: PRIOR TO DISCUSSING DR. MORIN'S CONCERNS REGARDING GEOMETRIC VERSUS ARITHMETIC AVERAGES OF HISTORICAL DATA, CAN YOU EXPLAIN THEM?

A: Yes. A geometric average of a set of historical return data is a compound average growth rate that, if applied to the initial value will result in the value existing at the end of the period. An arithmetic average is calculated by summing the annual returns and dividing

by the number of years. Appendix A, attached to this testimony and incorporated by reference herein, contains a description of the two types of averaging methods and the advantages and disadvantages of each.

Q: HOW DO YOU RESPOND TO DR. MORIN'S CLAIM THAT PENSION FUND RETURNS ARE BASED ON GEOMETRIC RETURNS, NOT ARITHMETIC RETURNS AND THEREFORE ARE TOO LOW?

A: MOSERS is basing its current pension fund cost estimates on an assumption that the long-term return it will earn on the common stock investments in its portfolio is 8.5 percent. Dr. Morin *assumes* that return expectation is based only on geometric averages of historical return data and, therefore, that MOSERS' "actual" return expectation should be an arithmetic mean, which would be higher. There are several problems with Dr. Morin's geometric/arithmetic averaging pension fund rationale.

First, Dr. Morin has not undertaken any specific study of MOSERS[6], and his logic that the pension fund "actually" anticipates a return based on arithmetic mean projected returns appears to be based solely on his suppositions regarding those return expectations. In fact, Dr. Morin states in response to Staff Data Request No. 354 that he is unaware of any long-term forecast of pension fund returns that uses arithmetic averages.

Second, the MOSERS' long-term equity return expectation is what it is, not something Dr. Morin believes it ought to be, theoretically. MOSERS expects to earn an 8.5 percent return on its U.S. equities in its portfolio, not something higher. If MOSERS actually expected to earn, say, a 10 percent return on its equity investments, a) its current pension contribution requirements for its members would be lower and b) it would have misrepresented its retirement portfolio return expectations in the public data cited by Mr. Murray. Therefore, the claim that MOSERS' expected long-term return on its

[6] In response to Staff Data Request No. 352, Dr. Morin states that he is not "privy" to the data reviewed by Staff witness Murray, however, as Mr. Murray noted those data are public and Mr. Murray provided the web site for the data he cites in his testimony filed with the Staff Report.

U.S. equity investments "ought to be" or "is really" something other than what it undeniably actually is, should simply be dismissed outright.

Third, Dr. Morin appears to base his claim that MOSERS' 8.5 percent equity return expectation is "really" something higher on the assumption that the expected equity return is based solely on historical earned return results. It is not the case that current return expectations for pension fund portfolios are based solely on historical return data. In making decisions with regard to the expected long-term equity investment returns, pension funds consider current yields, projected market return information, as well as historical results and statistical factors related to those historical results, not just historical results as Dr. Morin seems to assume.

Fourth, the concept of a forward-looking arithmetic mean is a mathematical *non sequitur*. Unless one elects to assume a detailed pattern of future period-by-period return volatility over a specific time period, a forward-looking arithmetic mean cannot be constructed or calculated, and there is no evidence that MOSERS or its investment fund advisor utilized any such measure of future return. An arithmetic mean is neither useful nor meaningful in a fully projected context. The arithmetic mean is useful for cost of capital purposes only in an analysis of historical returns.

In sum, MOSERS expects to earn a return on its U.S. equity investments of less than 9% over the long term. That return expectation is indicative of a broader body of information regarding investors' equity return expectations, which indicate that the Staff's recommendation in this proceeding is not only reasonable, it is conservative.

Q. DR. MORIN ALSO CITES A CALIFORNIA P.U.C. (C.P.U.C.) ORDER REGARDING PENSION FUND RETURN EXPECTATIONS. WHAT ARE YOUR COMMENTS?

A. Yes, Dr. Morin cites a portion of the California P.U.C.'s order in its most recent generic rate of return hearing. I was involved in that proceeding; Dr. Morin was not. The California Commission requested in that proceeding that all parties address the issue of expected pension fund returns, which all parties in the hearing did. Dr. Morin correctly reports that the California Commission elected not to rely on that information at that

time, unfortunately, a review of the rationale for doing so indicates that the decision is based on flawed logic.

As shown in the cite on page 26 of Dr. Morin's Rebuttal, the C.P.U.C. bases its rejection of expected pension fund return data on two points. First, that commission indicated that because pension funds are diversified portfolios and utilities are not, the risk profiles are not comparable. This is true. However, it is widely known that utility investments have lower risk than that of the broad (diversified) stock market because utility betas (measures of relative risk) are about 70% of total market betas. The pension funds invest in a diversified portfolio of common stocks that mirrors the U.S. equity market—the expected return for that portfolio of stocks provides a reasonable check of investor expectations for utility stocks because the broad market, even though diversified, has higher risk than electric utilities. Therefore, the first point on which the C.P.U.C. decision rests ignores evidence in the record of that proceeding demonstrating that electric utilities have lower risk profiles than the broad, diversified stock market, and does not support its conclusion.

Second, the C.P.U.C. rejected reliance on expected pension fund equity returns on what it terms a "more important" point: the basis that pension fund equity return projections are related to the market value of assets while a utility's ROE is applied to a book value rate base. While again this is a true statement, this logic, unfortunately, does not support the C.P.U.C.'s decision on pension fund returns for two reasons. The first reason is that *all* cost of equity estimate methodologies (DCF, CAPM, Risk Premium, etc.) are based on market value data and, as a normal course of action in regulatory proceedings, the results of those market-based analyses are applied to book value rate base. The C.P.U.C. itself, *requires* the use of market-based methods to estimate the cost of equity capital and applies the result directly to utility rate base, and cannot, therefore, logically ignore pension fund long-term equity return expectations because they are based on market value. The second reason why the C.P.U.C.'s market/book logic fails can be seen in the numerical example it uses to support its position.

The Commission claims the market/book "problem" with relying on pension funds projected equity returns is best illustrated by dividing an average projected pension fund equity return expectation (9.62%)[7] by PG&E's market-to-book ratio (1.9) (Pacific Gas & Electric was one of the electric utilities participating in the California generic ROE proceeding). In so doing, the C.P.U.C. claims the resulting return on book value is 5.06%, which would be too low to be a reasonable return for an electric utility in a regulatory setting—it would be below the cost of utility debt. Due to that result, the C.P.U.C. deemed reliance on pension fund returns to be improper.

The problem is, the C.P.U.C. math is wrong. If a utility earns a return of 9.62% on the market value of its assets (equivalent to the expected pension fund return on equity), and the utility's market value is roughly twice its book value (recall that PG&E's market-to-book ratio is 1.9), then the return on *smaller* book value must be *higher than* the market return (not lower as the C.P.U.C. incorrectly calculates). Therefore, according to the C.P.U.C.'s own example, a 9.62% return on the market value of assets where the market value is 1.9 times the book value, equates to an 18% return on book value—far in excess of that appropriate for an electric utility (and certainly no reason to reject reliance on pension fund long-term equity return expectations as being, somehow, insufficient for regulated utilities). Therefore, even if the California Commission's market-to-book logic were accurate, their math is simply wrong and when corrected, instead of supporting its position stated in the 2007 Order of denying the relevance of projected pension fund equity returns, actually refutes the denial.

In summary, pension fund equity return projections *are* reasonable benchmarks against which a cost of equity estimate provided in a utility rate proceeding can be checked. Those long-term expected equity returns are not fundamentally different from the type of long-term investor equity return expectations that rate case cost of capital witnesses are trying to estimate. The California P.U.C. decision on the relevance of pension fund long-term equity return expectations in determining the reasonableness of a

[7] This pension fund long-term equity return is from the 2006-2007 period during the time the C.P.U.C. case was heard. As the MOSERS data indicates current long-term equity return expectations are now lower (8.5%).

rate case equity cost estimate, is unfortunately incorrect. Contrary to Dr. Morin's Rebuttal Testimony, pension fund long-term common equity return expectations are reliable proxies for the cost of equity estimates provided in utility rate cases.

Q. ARE THERE OTHER ISSUES IN DR. MORIN'S REBUTTAL TESTIMONY THAT YOU WISH TO BRING TO THE ATTENTION OF THE COMMISSION?

A. Yes. One of the areas of focus in my Rebuttal Testimony in this proceeding regarding Dr. Morin's testimony was his change in methodologies designed to produce higher equity cost estimates. Interestingly, in his Rebuttal Testimony, Dr. Morin accuses MIEC witness Gorman of "lack of consistency from testimony to testimony," while ignoring the differences between his testimony in this proceeding and that which he provided in AmerenUE's last rate case. I have discussed Dr. Morin's consistency issues and have shown how they led to higher equity cost estimate results and will not revisit that discussion here.

The point of discussion here is that in his Rebuttal Testimony in this proceeding Dr. Morin has again changed his equity cost estimation methodology and, once again, that change works to raise the results of his equity cost estimate (his lower final recommendation notwithstanding). This additional change in methodology is related to the manner in which Dr. Morin calculates his DCF dividend yield. As I describe in my Rebuttal Testimony at pages 25 and 26, Dr. Morin used the following dividend yield calculation in his DCF analysis in his Direct Testimony in this proceeding: Value Line's year-ahead dividend yield x (1+ (analysts' projected earnings growth)). That is the traditional annual DCF model. As I noted, Dr. Morin's application of that method double counts dividend growth by increasing an already projected dividend yield published by Value Line by "1+g," (g= DCF growth rate), and, in so doing, adds an unnecessary 20 to 30 basis points to Dr. Morin's DCF results.

Now, in his Rebuttal Testimony, it appears that Dr. Morin has elected to change to a quarterly compounding dividend yield methodology, which produces an even higher DCF cost of equity result than his usual methodology. Moreover, Dr. Morin, in his

Rebuttal, admonishes the other witnesses in this proceeding for not using a quarterly dividend compounding calculation, when he, himself, did not use one in his Direct Testimony. Moreover, Dr. Morin has not used the quarterly compounding adjustment in his DCF analysis in any testimony he has submitted in the last five years.[8] He did not use that adjustment in his testimony in AmerenUE's last rate proceeding.

The theory behind the DCF dividend yield compounding adjustment holds that the investor will be able to re-invest his or her dividend when it is received and, thereby, earn an additional return on it prior to year-end, and that higher return is captured in a dividend compounding adjustment. Under that rubric, the DCF formula becomes relatively complicated as shown below:

$$k = [d_1(1+k)^{.75} + d_2(1+k)^{.50} + d_3(1+k)^{.25} + d_4]/P_0 + g \qquad (1)$$

This particular version of the DCF model produces cost of equity results that are higher than the standard DCF model. Aside from the obvious mathematical complexity of this model, which requires an iterative solution and makes it doubtful that the average investor actually uses it, this version of the DCF model implicitly assumes that dividends increase every quarter. However, that is not the manner in which dividends are actually paid out by utilities. Usually, after dividends are raised they are kept at a constant level for several quarters. It would be very unusual if any of the companies analyzed by the Company witness raised their dividend every quarter.

In addition, the logic supporting the use of a quarterly dividend adjustment is circular. If, for example, this Commission allowed a higher equity return based on that reinvestment logic, and the higher return translated into a larger dividend, the investor could then take the higher return (in the form of a larger dividend) and reinvest it — expecting a still higher return. Then, would it not be that higher return — drawn from reinvesting those larger dividends — that he or she really expects? Should rates not, therefore, be based on the expectation of compounding the new, larger dividend? Dr. Morin's newly-adopted compounding treatment, if taken literally, would have

[8] Morin response to Staff Data Request No. 362.

investors expecting, and regulators awarding, higher and higher rates of return to account for larger and larger dividends. The logic is circular, would lead to over-earning, and is without merit.

Q. HAVE REGULATORY BODIES SPECIFICALLY REJECTED QUARTERLY COMPOUNDING IN THE DCF MODEL?

A. Yes. The Federal Energy Regulatory Commission (FERC), in its Generic Rate of Return rulemaking proceedings held during the 1980s and early 1990s, considered and rejected the use of a DCF model that compounds the quarterly dividend. The FERC held in Order 461 (37 FERC ¶61,287) that if the allowed return were determined using a DCF model that included the dividend compounding recommended in Rebuttal by Dr. Morin, the investors would be compensated twice, "--once by the utility [through the allowed rate of return] and once through the investors' reinvestment of the dividends in some other alterative investment." In its analysis, the FERC considered the quarterly compounding of dividends for investors to be offset by the compounding of earnings by the utility through the rate year (i.e., the utility is able to re-invest the monies it receives in January for the rest of the year). As a result, the FERC determined that the appropriate DCF model to be used to calculate the cost of equity capital for electric utilities should not include dividend compounding and was, effectively, the "standard" DCF:

$$k = D(1+1/2g)/P + g.^{9}$$

Q. CAN YOU PROVIDE A NUMERICAL EXAMPLE TO SHOW THAT QUARTERLY COMOUNDING THE DIVIDEND IN A DCF ANALYSIS WILL OVERSTATE THE COST OF EQUTIY CAPITAL?

A. Yes. If quarterly dividend compounding is used to set utility rates the result will be that the actual growth rates experienced will be higher than those assumed and the utility will over-recover its cost of equity capital.

[9] The Commission should also be aware that in its Generic ROE rulemaking proceeding, the FERC determined that sustainable growth (b x r) was the best measure of investor long-term growth in the DCF, rejecting analysts' projected earnings per share growth.

Assume that the beginning-year stock price and book value of a utility are equal at \$30.00 ($P_0 = BV_0 = \$30.00$). In addition, assume that the dividend was just raised to \$0.50 per quarter (\$2.00 annually) and the expected dividend growth rate is 3%. Without quarterly compounding the cost of equity is 9.67% ((\$2.00 / \$30.00) + 3%). With quarterly compounding, the cost of equity is calculated as 10.08%.[10]

Assume now that the utility is allowed an equity return of 10.08%, based on quarterly compounding. The earnings per share in the first year equal the allowed equity return times the initial book value, or \$3.024 (\$30.00 x 10.08%). From these earnings, a dividend of \$2.00 would be paid (\$0.50 x 4), leaving \$1.024 per share in retained earnings (\$3.024 - \$2.00). The addition of these retained earnings causes the book value at the end of the first year to be \$31.024 (\$30.00 + \$1.024). The resulting growth in book value is 3.41% (\$1.024 / \$30.00), which is greater than the initially assumed 3% rate. Continuing the example into additional period shows that, as time goes on, the differential widens between the growth rate assumed in the calculation of the compounded-dividend-DCF cost of equity capital and the actual growth rate realized through the allowance of that return.

The earnings in the second period are \$3.13 (\$31.024 x 10.08%, i.e., BV_1 x ROE). The dividend in period two, according to the original assumption that produced the DCF result—a 3% growth rate—is \$2.06 (\$2.00 x 1.03). The retained earnings in period two, then, are \$1.07 (\$3.13 - \$2.06), causing the book value to rise to \$32.09 (\$31.024 + \$1.07). The growth in book value is 3.45% (\$1.07 / \$31.024). The assumed 3% growth rate is further overstated by the actual results.

In our example, in order to make the growth rate—which results from the allowance of a particular return on equity—equal the 3% growth assumed in the DCF calculation, the required retained earnings increment would be \$0.90 (3% x \$30.00, i.e., g x BV_0). Adding the dividends that will be paid in the first period (\$2.00) to the required retained earnings just derived (\$0.90) yields \$2.90, the earnings necessary to produce the

[10] Formula for quarterly compounded DCF from; $k = (d(1+k)^{.75} + d(1+k)^{.50} + d(1+k)^{.25} + d)/P_0 + g$, where d = \$0.50, P_0 = \$30.00, and g = 3%. Solve iteratively for k = 10.08%.

proper 3% growth rate. Those earnings, divided by the initial book value ($30.00) produces an equity return allowance of 9.67% -- the equity capital cost derived by the DCF model in which the quarterly dividends were not compounded.

Therefore, the dividend compounding adjustment Dr. Morin now elects to recommend would allow the Company to earn a return higher than its cost of equity capital and is improper. Moreover, Dr. Morin's change in methodology, once again, results in a higher reported cost of equity estimate and must be considered to be result-oriented, and, therefore, unreliable for ratemaking purposes.

Q. IF DR. MORIN HAD BEEN CONSISTENT IN HIS APPLICATION OF THE DCF MODEL IN HIS REBUTTAL TESTIMONY IN THIS PROCEEDING, AND HAD NOT EMPLOYED QUARTERLY COMPOUNDING ADJUSTMENT, WHAT WOULD HIS UPDATED COST OF EQUITY METHODS INDICATE FOR THE COST OF EQUITY CAPITAL?

A. Without correcting any of the shortcomings of Dr. Morin's cost of equity analyses, and ignoring other methodological inconsistencies, his updated cost of equity results, absent a quarterly dividend adjustment in the DCF would have appeared as shown in Table I below:

Table I

Adjusted Morin Updated Results

DCF Analyses Consistent With Prior Testimony

STUDY	ROE
CAPM	9.40%
Empirical CAPM	9.80%
Historical Risk Premium Elec Utility Industry	10.82%
DCF Integrated Elec Utilities Value Line Growth	10.80%
DCF Integrated Elec Utilities Zacks Growth	10.80%
DCF S&P Elec Utilities Value Line Growth	10.30%
DCF S&P Elec Utilities Zacks Growth	11.20%
Overall Average of All Results	10.45%
Average of CAPM, Risk Prem., & DCF Results	10.39%

Without the additional 20 basis points added to his DCF results to represent a quarterly compounding adjustment, the actual average of Dr. Morin's updated cost of equity estimates is 10.45%.[11] Equally-weighting Dr. Morin's CAPM, Risk Premium and DCF results (an averaging method he used in his testimony in AmerenUE's most recent rate proceeding), indicates an average equity cost estimate of 10.39%.

Q. IN HIS REBUTTAL TESTIMONY AT PAGES 10 AND 11 DR. MORIN DISCUSSES THE SUBJECTIVITY OF SELECTING A DCF GROWTH RATE. IS IT POSSIBLE TO ELIMINATE SUBJECTIVITY IN AN ESTIMATE OF THE COST OF EQUITY CAPITAL?

A. No. The determination of the cost of equity capital through economic models of investor behavior such as the DCF or CAPM is a subjective process—period. If it were not, the Commission would have no need of Dr. Morin, Mr. Murray, myself, or any cost of capital witness, as it could simply plug a few numbers into an algebraic formula and be done with it. Unfortunately, such is not the case.

With regard to the determination of a DCF growth rate, there is substantial subjectivity in making the choice to exclude all published growth rate information available to investors *except* per share earnings growth projections (Dr. Morin's methodology). There is also subjectivity involved in reviewing significantly more data, for each company in order to determine a reasonable long-term sustainable growth rate expectation (Mr. Murray's methodology). However, it is my experience that the latter methodology, relying on more data available to investors, provides a more reliable estimate of the long-term growth called for in the DCF and, thus, superior estimates of the cost of equity. Dr. Morin's position on the use of only one growth rate indicator here, runs counter to his logic that a cost of equity analysis should rely on more than one equity cost methodology because more information provides a better outcome. All DCF

[11] A review of the supporting data for Dr. Morin's updated cost of equity analysis reveals that Dr. Morin did not perform a quarterly DCF analysis in his update. Rather, he performed a standard annual DCF (as he did in his Direct Testimony) and simply added 20 basis points to the average result of each. (Staff Data Request No. 358)

growth rate determinations are subjective, but the more reliable determinations rely on more data, not less.

Dr. Morin, himself, has stated that in a regulatory setting cost of equity capital estimation methods such as the DCF cannot be undertaken as a purely objective mechanical exercise, merely plugging numbers into a formula:

> [Cost of equity capital] [e]stimation methods cannot be applied in a robotic, mechanistic manner. Mechanical approaches designed to simply insert numbers into an algebraic equation without regard to he reasonableness of such inputs in a regulatory setting must be avoided. For example, the determination of expected growth is judgmental, since expected growth lies buried in the minds of investors, unobservable. Any inconsistency between historically based growth estimates, analysts' growth forecasts, and sustainable growth estimates should be explainable by objective commons-sense reasoning. (Morin, R., New Regulatory Finance, Public Utilities Reports, Vienna, VA, 2006, p. 443)

Therefore, while Dr. Morin expresses concern in his Rebuttal Testimony in this case that Staff's growth rate analysis may not be "replicable" in a mechanical, plug-and-play fashion, he warns in his published work against relying on a methodology that merely plugs numbers into an algebraic formula—precisely the type of analysis he has used in developing his DCF equity cost estimate in this proceeding.

Finally on this point, when asked in Staff Data Request No. 347, what role judgment plays in the determination of the proper growth rate to use in a DCF equity cost estimate, Dr. Morin stated: "Informed judgment, based on solid economic principles, academic background, empirical evidence, a solid knowledge of the relevant literature and vast relevant experience plays a prominent role in determining a utility's cost of equity regardless of models employed." Therefore, even the Company would agree, judgment plays a "prominent role" in determining the cost of equity capital, and that process cannot and should not be reduced to merely plugging numbers into algebraic formulas, as evidenced in a singular reliance on projected analysts' earnings growth in the DCF.

Q. AT PAGES 38 AND 39 OF HIS REBUTTAL, DR. MORIN DISCUSSES WHAT HE BELIEVES IS THE "CIRCULAR" NATURE OF A SUSTAINABLE GROWTH ("B X R") ANALYSIS. IS DR, MORIN CORRECT ON THIS POINT?

A. Because a sustainable growth rate analysis uses projected accounting returns (returns on book value, ROEs) to estimate the current market-based cost of equity, this does not imply circularity in the estimation process. In his most recent text, Dr. Morin relies for authority on Brealey and Meyer's widely-published finance textbook. Those authors provide an example of the use of a "b x r" methodology as a methodology to estimate the expected growth rate in a DCF analysis, although their term for "b" (the retention rate) is "the plowback ratio." While Dr. Morin appears concerned about the use of expected returns on book value to assist in estimating the cost of equity (supposedly the "logically circular" part of the analysis), Brealey and Meyers do not share that concern:

> An alternative approach to estimating long-term growth starts with the **payout ratio**, the ratio of dividend to earnings per share (EPS). For Cascade [a gas distributor], this was forecasted at 66 percent. In other words, each year the company was plowing back into the business about 44 percent of earnings per share:
>
> Plowback ratio = 1-payout ratio = 1-(DIV/EPS) =1-.66 = .44
>
> Also, Cascade's ratio of earnings per share to book equity per share was about 12 percent. This is its **return on equity**, or **ROE**:
>
> Return on equity = ROE = EPS/(book equity/share) = .12
>
> If Cascade earns 12 percent of book equity and reinvests 44 percent of income, then book equity will increase by .44 x .12 = .053 or 5.3 percent. Earnings and dividends per share will also increase by 5.3 percent:
>
> Dividend growth = g = plowback ratio x ROE =.44x.12 = .053
>
> That gives a second estimate of the market capitalization rate:
>
> $r = DIV_1/P_1 + g = .046 + .053 = .099$, or 9.9%

(Brealey, R., Meyers, S., Allen, F., Principles of Corporate Finance, 8th Ed., McGraw-Hill/Irwin, New York, NY, 2006, p. 67)

Here, an authority on which Dr. Morin relies, uses an expected return on book value of 12% and an expected retention ratio (plowback ratio) of 0.44 to derive an investor expected growth rate for the DCF of 5.3%—the same methodology that Dr. Morin professes to be unreliable.

In addition, Dr. Morin substantially overstates the case against a sustainable growth rate analysis when he states in his Rebuttal Testimony at page 39 that the "empirical finance literature demonstrates" that sustainable growth is a poor explanatory variable for equity value. The literature to which Dr. Morin refers studied simple historical averages of sustainable growth and found that measure of growth was not as well correlated with stock price-earnings ratios as analysts' earnings growth projections. However, Dr. Morin is arguing against a methodology no one in this case has employed—i.e., the use of a simple historical average of sustainable growth rates as the *only* DCF growth rate. A well-balanced DCF growth rate analysis reviews a variety of available data, which does include some historical data but also examines trends in those data and includes the consideration of projected earnings, dividends, book value and sustainable growth rates for each company under review. Therefore, Dr. Morin, in referencing the findings of the financial literature regarding sustainable growth is criticizing a methodology that no one has employed.

Second, Dr, Morin offers a formula by which one can convert the book equity return published by Value Line (the ROE) from a value based on year-end book value to a value based on average book value, which, when book value is increasing, will produce a higher ROE value. Dr. Morin opines, without providing supporting calculations, that such a calculation would increase DCF results by 10 to 20 basis points. While such a calculation could, of course, be employed, there is no indication that investors elect to alter published Value Line data in the manner suggested by Dr. Morin, and he has provided no evidence that such is the case. In addition, Value Line also publishes a parameter termed "% retained to common equity," which is defined as net income less

dividends expressed as a percentage of common equity.[12] That is simply a different way to calculate a sustainable growth rate; however, Value Line does not make the sort of adjustment suggested by Dr. Morin in calculating that parameter. If we assume that investors rely on Value Line data, and, thus, Value Line data are representative of investor opinion, then, in attempting to gauge investor opinion, it is reasonable to use those data as published. Dr. Morin's suggested formulaic adjustment to the calculation of sustainable growth would not represent investor opinion and, in my view, would lead to overstated DCF equity cost estimates.

Q. AT PAGE 22 OF HIS REBUTTAL TESTIMONY, DR. MORIN CRITICIZES STAFF'S USE OF BOND RETURNS RATHER THAN BOND YIELDS IN DETERMINING THE MARKET RISK PREMIUM, INDICATING THAT STAFF'S RISK PREMIUMS ARE UNDERSTATED FOR THAT REASON. WHAT ARE YOUR COMMENTS?

A. At page 22 of his Rebuttal, Dr. Morin criticizes Staff's use of the historical difference between the returns of common stocks and the returns of Treasury bonds (T-bonds) to determine a long-term historical market risk premium of 5.6%. Dr. Morin prefers the use of long-term stock returns less average bond yields (not returns), which produces a higher market risk premium estimate of 6.1%.

The rationale for Dr. Morin's suggested methodology is that there have been unanticipated gains with bond investments and the historical yields (which are lower than historical bond returns) better represent investor expectations. However, there is no readily available analogue for stocks (i.e., there is no readily available stock "yield" parameter that can be said to measure forward-looking investor expectations). Therefore, Dr. Morin's analysis assumes that historical earned returns are representative of investor expectations for stocks, but not for bonds. If bonds have achieved higher returns than expected and risk premiums are constant (a fundamental assumption of this type of historical analysis), then it stands to reason that stock returns may also have been higher

[12] The Value Line Investment Survey, A Subscriber's Guide, 1985, New York, NY, p. 60.

than expected. This would mean that an apples-to-apples comparison of stock and bond yields could produce an historical risk premium that was at or below that utilized by Staff.

While Dr. Morin does not attempt to measure an historical expected yield for stocks, such measurements have been conducted by respected researchers in the financial literature. In 2003, Eugene Fama and Kenneth French published an article in *The Journal of Finance* focusing on the equity risk premium and measured (instead of the realized return) the expected return on the market less the expected return on bonds (the yield) over a long-term period, as well as several sub-periods. Their research, based on long-term historical expected returns, indicates that the *expected* (i.e., forward-looking) risk premium over the last half of the Twentieth Century is in the range of 2.6% to 4.3%.[13]

Therefore, Dr. Morin's preferred method of calculating the historical market risk premium miss-matches earned returns for stocks with yields for bonds. The financial literature indicates that properly matching historical stock "yields" (investor-expected returns for stocks) with historical bond yields indicates maximum market risk premiums of about 4% (well below Dr. Morin's preferred 6.1%). In that regard, Staff witness Murray's apples-to-apples comparison of historical earned stock returns and historical earned bond returns provides a reasonable, if not conservative, market risk premium estimate of 5.6%.

SUMMARY OF SURREBUTTAL TESTIMONY

Q. CAN YOU SUMMARIZE YOUR SURREBUTTAL TESTIMONY, MR. HILL?

A. In Rebuttal, the Company witnesses, Dr. Morin and Ms. Cannel, have attempted to characterize Staff's rate of return recommendation in this proceeding as insufficient to meet the needs of investors. However, the evidence provided does not support that characterization. Mr. Murray's recommended level of profit for AmerenUE—a 9.35% return on common equity capital, will provide the Company an opportunity to earn approximately one-quarter of a billion dollars annually.[14] While it is true that

[13] Fama, E., French, K., "The Equity Premium," *The Journal of Finance*, Vol. LVII, No. 2, April 2003, pp. 637-659.

[14] $267.63 Million; Hill Rebuttal Testimony, p. 6, l. 7-14.

AmerenUE's requested 10.8% return would provide about $40 million more per year in profit for the Company[15], that fact, in no way indicates that a quarter billion in annual profit is insufficient to attract investors.

Also, Mr. Murray has provided evidence directly from the financial community in the required rates of return employed by equity analysts to assess the value of electric utility stocks—evidence that Company witness Cannell believes is reliable and influential for investors—that indicates investors' current required return for electric utilities is below the 9.35% Mr. Murray recommends the Company be allowed to earn. In addition, Mr. Murray cites publicly-available information from the Missouri State Employee's Retirement System, which indicates that that particular institutional investor expects to earn a return on its common equity investments in the U.S. of 8.5% in the future. These data also confirm the reasonableness of Staff's equity return recommendation in this proceeding. Neither Company witness proffered reliable or logical rebuttal as to why this Commission should ignore publicly-available, influential data from a large institutional investor that shows investors' required returns for utility stocks to be well below 10%.

In addition, based on the cash flow coverage benchmark analysis provided by OPC witness Lawton (regarding which, the Company had no comment), amended to include a tax rate of 38%, and Staff's recommended rate base and depreciation levels, a 9.35% allowed return on equity would afford the Company an opportunity to achieve cash flow coverage metrics appropriate for a BBB-rated utility. Therefore, the equity return recommended by Staff will fulfill the requirements of *Hope* and *Bluefield* that the allowed return provide the opportunity for the Company to maintain credit and attract capital.

Finally, my Surrebuttal Testimony shows that the Company's cost of capital witness, Dr. Morin, continues to shift his equity cost methodology in order to obtain higher results.[16] In this instance, after not having done so in his Direct Testimony, or any

---

[15] $6.04 Billon Rate Base x 10.80% ROE x 47.39% Equity Ratio = $309.13 Million [$309.13 Million - $267.63 Million = $41.5 Million]

[16] Several other result-oriented changes in Dr. Morin's methodology were discussed in my Rebuttal Testimony.

testimony for the past five years, Dr. Morin adds 20 basis points to his DCF results for a "dividend compounding" adjustment. Absent that adjustment, Dr. Morin's updated cost of equity would be about 10.5%, rather than the 10.8% he supports in his Rebuttal Testimony. When asked in Staff Data Request No. 357 to explain why a lack of analytical consistency from case to case is problematic for a cost of capital witness, Dr. Morin replied: "Methodological consistency is important for reasons of professional credibility and robustness to varying economic circumstances."

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY, MR. HILL?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a AmerenUE's Tariffs to Increase its Annual Revenues for Electric Service.	)))	Case No. ER-2010-0036

AFFIDAVIT OF STEPHEN G. HILL

STATE OF WEST VIRGINIA)
) ss.
COUNTY OF PUTNAM)

Stephen G. Hill, of lawful age, on his oath states: that he has participated in the preparation of the foregoing Surrebuttal Testimony in question and answer form, consisting of 24 pages to be presented in the above case; that the answers in the foregoing Surrebuttal Testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true and correct to the best of his knowledge and belief.

STEPHEN G. HILL

Subscribed and sworn to before me this 5th day of March, 2010.

Notary Public

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
BILLY JACK GREGG
P. O. Box 107
Hurricane, WV 25526
My Commission Expires Sept. 19, 2014

ARITHMETIC AND GEOMETRIC AVERAGES

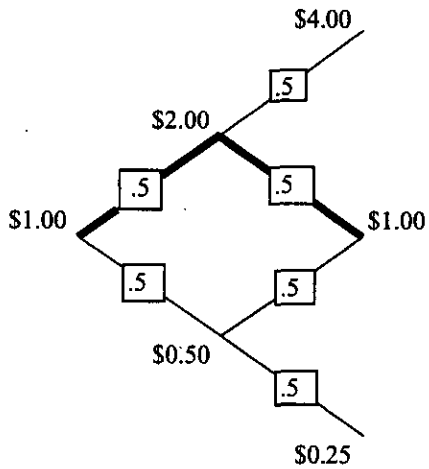
An arithmetic average of historical return data is the sum of all the periodic returns (the "period" is usually assumed to be one year), divided by the number of historical periods. A geometric average is a compound return—it is the rate of constant growth that would cause the security price at the beginning of the period to grow to the value realized at the end of the period.

The support for the use of an arithmetic mean of historical data rests in "decision tree" logic, which is demonstrated by the following example. Assume that an investor buys a stock for $1, and that stock has a 50% chance of doubling in price (increasing 100%) and a 50% chance of dropping by half (a loss of 50% of its value). Also assume that in the first year the stock price doubles from $1 to $2, but in the second year the stock price declines by 50%, resulting in a $1 price. The arithmetic average return is 25% [(100% + (-50%))/2 = 25%]. Because the investor winds up with $1 at the end of the second year after beginning with $1 at the outset, the geometric return is 0% [(1+100%)(1-50%) – 1 = 0%].

While it is counter-intuitive to state that the historical return in our example is 25% (the arithmetic average) when the investor winds up with the same amount of money at the end of two years as he or she began with, the rationale for the use of the arithmetic mean lies in the probabilities that existed for the investor at the outset. Those probabilities are best represented by the "decision tree" shown below, which displays all the possible outcomes for the investor (with the actual outcome designated by a bold line).

Chart I.

Decision Tree Example



In this example, the investors' expected return, which is calculated as the sum of all the possible outcomes, is $1.5625 [Expected Return = $(0.5)^2(\$4.00) + 2(0.5)^2(\$1.00) + (0.5)^2(\$0.25) = \$1.5625$]. The only way to calculate the $1.5625 value using historical average data is through the use of the arithmetic mean return [$1.5625 = $1.00(1.25)(1.25)]. This example provides support for the use of arithmetic averages of historical returns in estimating the cost of capital.

However, underlying the example cited above are some very strict assumptions about the relationship between year-to-year returns that are not representative of the actual nature of those returns. The "decision tree" assumes that the periodic returns are strictly independent results—each having no affect on the other. However, research indicates that such is not the case, and that period-to-period returns are inter-dependent to some degree.[1]

---

[1] E. Fama and K. French, "Dividend Yields and Expected Stock Returns," *Journal of Financial Economics* (October 1988), pp. 3-26.

Therefore, the very strict "decision tree" logic used to support sole reliance on an arithmetic market risk premium does not apply to actual historical returns because those returns are inter-related and not strictly independent. Even academics that use arithmetic means of historical data recognize that if historical returns are not strictly independent (i.e., they are "serially correlated," or are "mean reverting"), then the arithmetic mean does not provide a valid representation of the historical average return:

> If, however, the objective is to obtain the *median* future value of the investment, then the initial investment should be compounded at the geometric sample average. When returns are serially correlated, then the arithmetic average [footnote] can lead to misleading estimates and thus the geometric average may be the more appropriate statistic to use.
>
> [footnote] The point is well illustrated by the textbook example where an initial investment of $100 is worth $200 after one year and $100 after two years. The arithmetic average return is 25% whereas the geometric average return is 0%. The latter coincides with the true return.[2]

Also, in a white paper presented to the Social Security Administration in 2001 regarding expected equity returns in the 21st Century, Professor John Campbell of Harvard provided the following comments regarding geometric means:

> When returns are negatively serially correlated, however, the arithmetic average is not necessarily superior as a forecast of long-term future returns. To understand this, consider an extreme example in which prices alternate deterministically between 100 and 150. The return is 50% when prices rise, and –33% when prices fall. Over any even number of periods, the geometric average return is zero, but the arithmetic average return is 8.5%. In this case the arithmetic average return is misleading because it fails

[2] (Mehra, R., Prescott, E., "The Equity Premium in Retrospect," Handbook of the Economics of Finance, Constantinides, Harris, Stultz, Editors, 2003).

> to take account of the fact that high returns always multiply a low initial price of 100, while low returns always multiply a high initial price of 150. The geometric average is a better indication of long-term future prospects in this example. [footnote omitted]
>
> The point here is not just a theoretical curiosity, because in the historical data summarized by Siegel, there is strong evidence that the stock market is mean-reverting. That is, periods of high returns tend to be followed by periods of lower returns. This suggests that the arithmetic average return probably overstates expected future returns over long periods.[3]

Finally, there are data anomalies associated with arithmetic risk premiums. The arithmetic market risk premium is period-specific. That is, the longer the assumed holding period, the lower the arithmetic risk premium. It is commonly assumed that the holding periods (the amount of time between buying and selling the market portfolio) is one year. However, there is no magic to that particular time-span, it is simply a common assumption in the calculation. If, for example, we assume that the holding period is two years instead of three, the arithmetic average market risk premium reported by Morningstar declines by 100 basis points. If that holding period increases to three years, the market risk premium declines again.[4] Therefore, the arithmetic mean changes with a change in the length of the holding period. The geometric mean does not vary with the holding period chosen, since the beginning and ending points determine the rate of growth.

In sum, both arithmetic and geometric averages have academic support in analyzing historical return data, and both should be considered in determining the cost of equity capital.

---

[3] (Estimating the Real Rate of Return on Stocks Over the Long Term, Papers by Campbell, Diamond, Shoven, Presented to the Social Security Advisory Board, August 2001; Cambell, J., "Forecasting U.S. Equity Returns in the 21st Century", pp. 3, 4).

[4] Copeland, Koller, and Murrin, Valuation: Measuring and Managing the Value of Companies, 3rd Ed., McKinsey & Co., New York, 2006, pp. 218-221.