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A Conceptual Examination of Selected Research
on the "Equity Premium Puzzle"

By

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A research paper submitted in fulfillment of the requirements for 3 credits,

GRADUATE INDEPENDENT RESEARCH PROJECT Winter Term 2002,

Professor Gautam Kaul, Faculty Supervisor.

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Course grade (Excellent)

Faculty Comments

John has pulled of an outstanding piece of work. I have been an adviser / supervisor on several independent study projects, but this is by far the best.

This study has not only reviewed some very technical and difficult papers, but it has also provided some very insightful thoughts, observations, and conclusions. This work is much closer to a PhD student's work than any other I have seen. And that is a big compliment!
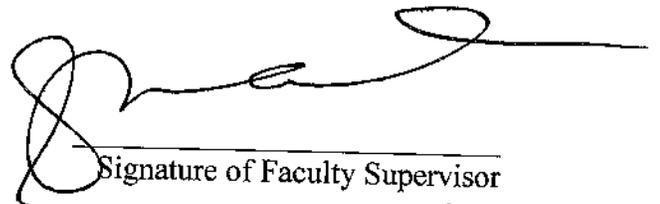
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Signature of Faculty Supervisor

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Title

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INTRODUCTION

For most of modern American history, the spread between the average real return on an equity-market portfolio and the real risk-free rate has been significantly larger than financial theory and traditional finance models would have predicted.[1] This observation was first made in 1985 and dubbed the "Equity Premium Puzzle" by Rajnish Mehra and Edward C. Prescott.[2] Since that time, academics and practitioners from the fields of finance, economics and even accounting have struggled to determine: (1) how high the equity premium was during various periods; (2) why it differed from what financial theory would have predicted, if it did; and (3) what we can reasonably expect it to do in the future. Integrally related to all of these issues is the question how the equity premium should be measured.

This paper analyzes a sample of the body of literature on this controversial subject and concludes that the methodology first used to quantify the equity premium itself created the puzzle. In other words, the question should not have been, as was asked initially and assumed to have been correct for many years, why have observed returns been so much higher than theory would have predicted. Rather, the appropriate inquiry should have been to what extent did expected equity returns in the past differ from what financial theory would have predicted. Asked this way, no puzzle is immediately evident. On the contrary, it appears that the market at all relevant times expected returns essentially identical to what financial theory predicted it should. The fact that the American equity market delivered returns vastly greater than were expected is irrelevant to this question. Expectations do not necessarily come to fruition; actual returns may

differ greatly and, apparently, they have for much of American history. In essence, actual returns in the American stock market throughout much of the twentieth century simply reflect "a large unexpected capital gain."[3]

SURVEY OF SIGNIFICANT RESEARCH

Identification of the "Equity Premium Puzzle"

In 1985, Mehra and Prescott observed that the historical average return on equity greatly exceeded the average return on short-term, essentially risk-free debt.[4] Studying the ninety-year period from 1889 to 1978 *ex post,* they calculated the real annual yield on the S&P index to be 7%, which exceeded the real return on short-term debt by over 6%. They further concluded that this differential could not be accounted for with traditional models and that some other model would be necessary to explain the phenomenon, or the "equity premium puzzle" as they dubbed it. Their work led to a significant body of research not only by other economists, but also by researchers from other areas of academia and practice, including areas as divergent in their approaches as finance and accounting. For the seventeen years that followed, researchers have struggled: (1) to confirm or disprove the existence of the puzzle; (2) to explain why it existed, if it did; and (3) to identify the future implications of their respective findings.

Early Research: The Search for a Cause *Ex Post*

Assuming the equity market's actual returns *ex post* reflect the appropriate perspective, the question remains: Why has the equity premium been so high? One possible explanation is survivorship bias. Brown, Goetzmann and Ross argued that any empirical analysis of rates of return *ex post* implicitly conditions data on each security

surviving into the sample so as to be suitable for inclusion.[5]   The effect of this bias

naturally becomes more profound to the extent researchers attempt to bolster their work

by including longer sequences of market data.   Accordingly, they observed, one would

expect that emerging capital markets would demonstrate significant equity premiums.

While not discouraging the use of historical data, they admonished researchers to beware

the existence of this bias in *ex post* analyses of observed market returns.   While the

absolute magnitude of this bias may be debated, the conclusion is logically inescapable

both that historical returns implicitly include survivorship bias and that the bias is greater

to the extent that researchers demand that their data span longer historical periods.

Whether the magnitude of this bias materially affects research results is a closer question.

In 1999, based on a similar *ex post* analysis, Siegel argued that a 5% to 6% equity

premium is neither reflective of the true historical experience, nor realistically attainable

over the next 30 years.[6]   He examined an even longer historical period for realized

returns, 196 years, and argued that previous estimates of the historical equity premium

simply overestimated it.   According to Siegel, two factors contributed to this.   First, the

relatively short, 50-year time period previously used by researchers provided an

unreasonably low return on fixed-income assets.   Two possible reasons for this, he

suggested, were bursts of unanticipated inflation following World War II and during the

1970s, and the abandonment of the gold standard.   Second, he observed that realized

returns on American equities may systematically overestimate the market's expected

returns.   Although he suggested that survivorship bias may contribute to this problem, he

argued that controlling for survivorship bias alone cannot yield an accurate estimate of

realized equity returns. Rather, one must also account for higher transactional costs and the consequent choice between expensive diversification and idiosyncratic risk without diversification. Bearing these additional factors in mind, he estimated that actual realized equity returns were "more in the neighborhood of 5% to 6% over most of the nineteenth and twentieth century rather than the 7% calculated from indexes."[7]

Finally, Siegel went a step further and addressed the future implications of his analysis for the equity premium. He observed that the then-current P-E ratio of the market based on reported earnings was already at the record level of 32. Based on basic fundamental analysis, he then noted two long-term consequences of high stock prices relative to earnings: (1) either future stock returns must be lower than the historical averages; or (2) earnings must rise at a more rapid rate in the future, and he saw no reason to believe this would occur. Accordingly, he opined that future stock returns simply must be lower than the historical average if future dividends grow no faster than they have in the past.

Siegel explicitly addressed the unreasonable premises implicit in simply assuming that the historically realized equity premium will continue indefinitely:

> All of this makes it very surprising that Ivo Welch [1999] in a survey of over 200 academic economists finds that most estimate the equity premium at 5 to 6 percentage points over the next thirty years. Such a premium would require a 9% to 10% real return on stocks, given the current real yield on Treasury inflation-indexed securities. This means that real per share dividends would have to grow by nearly 8.0% to 9.0% per year, given the current 1.2% dividend yield, to prevent the P-E ratio from rising farther from its current record levels. *This growth rate is more than six times the growth rate of real dividends since 1871 and more than triple their growth rate since the end of World War II.*[8]

Of course, fundamentals do not exist in a vacuum and should not be assumed to be fixed. The existence of a high equity premium may make it marginally more likely that fundamentals will justify the premium. As Fama and French observed in 2000, the equity premium has at least two relevant effects: (1) the market demands growth; and (2) firms respond to the market by looking harder for growth opportunities.[9]

Recent Research: Questioning the Puzzle's Existence *Ex Ante*

The majority of early work on the subject proceeded from the implicit premise that an *ex post* analysis of realized returns may be probative of the market's expectations *ex ante*. Certainly a mathematical calculation of returns from widely available data is the most expedient method of approaching the question. The assumption, however, that expected and realized returns meaningfully relate to and reflect each other, particularly in the American equities market during the historical period in which this nation rose to world dominance, is dubious at best. On the contrary, it is at least intuitively pleasing to believe, if not likely, that the market simply enjoyed gains of an unexpected magnitude during this period. It is this central assumption on which researchers have focused most recently. The implication of their collective work in this area is a bold one: The equity premium may not be a puzzle after all.

In 1993, Blanchard attempted to study the market's expectations *ex ante,* so as to calculate the market's expectations at the relevant times, *i.e.,* when market players make presumably rational investment decisions.[10] Rather than simply relying on traditional, average historical rates of return for debt and equity *ex post,* he examined historical information to deduce the market's expectations. Specifically, he calculated the expected

real rates of return on debt using commercial forecasts of inflation available for the historical period he studied. With respect to equities, he calculated implicit expected rates of return essentially by equating prices with future dividend payments discounted to present value by a rate for which he solved.

Blanchard observed that the equity premium had generally decreased steadily from the 1950s. By the early 1990s, the author calculated that the equity premium had dropped to approximately 2% to 3%. This trend, he noted, was a product of both reductions in real equity returns and increases in real bond rates throughout the world. Blanchard then attempted to rule out several possible causes for these trends, including changing levels of government debt and the relative riskiness of stocks and bonds. He noted, however, that institutional investors had steadily increased their collective share of the equities market from 1% in 1950 to nearly 30% by the date of publication. This flow of capital and concomitant long-term investment horizon, he intimated, might both be expected in light of such a high historical equity premium and explain its reduction by reference to upward equity price movements over time.

Based on his analysis, he ultimately concluded that the market's long-term expectations with respect to inflation primarily explain the long-term increase in real bond rates. This, in turn, primarily accounted for the decrease in the equity premium. Shortly after the great depression, the market expected long-term inflationary pressures to be significantly higher than were experienced for most of the period that followed. Accordingly, as inflation over time did not rise to the level that the market had expected,

real bond rates proved higher than expected *ex ante.* Thus, he reasoned that the equity premium should remain at the then-current low level, assuming inflation remained low.

In 2001, Gebhardt, Lee and Swaminathan examined the issue from an accounting perspective and suggested that the "puzzle" might be resolved by rejecting the capital asset pricing model (CAPM) itself and, indeed, the relevance of beta to expected returns generally.[11] Using a large sample of over 1000 firms and a relatively short time period, 1979 to 1995, they articulated "a new approach to estimating the cost of equity capital."[12] Specifically, they used a discounted residual income model (RIM) to discern the internal rate of return (IRR) that equates present stock prices to the present value of expected future cash flows for each firm. This IRR, they reasoned, is the market's expected return on equity *ex ante.* Thus, rather than examine what the market *should be doing* at any given time, they examine what the market *in fact is doing.* Based on this analysis, they noted that market equity prices reflected an equity premium *ex ante* of only 2% to 3%, far less than the 7% that typically flows from historical *ex post* analyses of realized returns.

Perhaps their most significant finding, however, was that a "surprisingly weak"[13] correlation exists between firms' implied cost of capital and the volatility of their stock prices. Based on this finding, they concluded that the usefulness of beta in pricing equities is significantly overstated in traditional finance theory. Quite to the contrary, they observed that the expectations of practitioners for firms' returns appear to relate much more to three variables, even controlling for industry effects: (1) book-to-market ratios; (2) forecasted growth rates; and (3) dispersion in analysts' forecasts. Beta, they found, appeared to function largely as a proxy for industry membership and lost its

significance once industry membership was controlled. Thus, they concluded that CAPM is of extremely limited value to practitioners, if any.

Of course, this new approach is not without its problems. Notably, the researchers recognized that their analysis itself depends on a number of "simplifying assumptions." The most significant of these assumptions is that earnings forecasts, dividend payout ratios and terminal value calculations reflect an accurate picture of the future, or at least the market's expectations of that future. A strong positive attribute of their approach, however, is that their use of a fairly short time period allows the creation of a moving model that reflects current market sentiment and expectations. This is far more useful in estimating a firm's true cost of capital for budgeting decisions than a CAPM approach reflecting essentially decades of historical experience. By extension, their model allows one to calculate a more relevant and timely market equity risk premium because it looks to the market's expectations *ex ante*. Nevertheless, calculation of the equity premium was not the explicit purpose of their work.

By contrast, the equity premium was the central focus of Claus and Thomas that same year.[15] Also using a RIM approach, they calculated the discount rates implied from market stock prices and analysts' forecasts with respect to cash flows. Like Gebhardt, Lee and Swaminathan, they used short time-series data relative to traditional calculations of historical returns, but argued persuasively that the RIM method makes such a long series of data unnecessary. Moreover, they noted, imposing such a requirement on one's data prevents similar calculations for equities traded on most other world markets. Thus,

their approach can be replicated throughout the world and is therefore more relevant to the global capital market throughout which investment decisions are made.

Indeed, they applied their model to five other developed nations and the results confirmed their conclusions. Ultimately, they made explicit the implicit suggestion of Gebhardt, Lee and Swaminathan that the "equity premium puzzle" may not even exist because: (1) CAPM may not truly reflect market expectations; and/or (2) an *ex post* analysis of historical returns in the American equities market probably overestimates the premium expected by the market *ex ante*. Finally, they reiterated Siegel's admonition that no principled fundamental analysis can support a 7% equity premium in the future. Rather, they concluded that a premium of roughly 3% is far more realistic and appears to have been priced into the market already.

Employing a similar methodology, Jagannathan, McGrattan and Scherbina studied the trend of the equity premium from 1926 to 1999.[16] They calculated that, although it averaged roughly 7% from 1926 to 1970, it averaged only 0.7% from 1970 onward and, in fact, has been near zero for roughly the last twenty years. Based on these findings, they presented several possible reasons for the premium, all of which constitute market imperfections. The imperfections that may have been responsible for the high equity premium of the past were systematically eliminated or at least reduced at the same time the equity premium was decreasing from 7% to near zero. Thus, at least a generally correlative relationship substantiates the plausibility of this hypothesis.

In particular, they argue that the market imperfections that drove the equity premium upward, and the elimination of which reduced the premium, were at least three-

fold: (1) the inability of investors to insure fully against major risks outside the stock markets; (2) transactional costs, both direct and indirect; and (3) incomplete knowledge about investment opportunities. Because the market recognizes and accounts for these imperfections, they add, it demands higher returns in exchange for investing in risky assets. Particularly as a result of technological advances over the last thirty years, they observe, each of these factors has been reduced as an obstacle to investing. Nevertheless, they caution that much more work must be done to derive a definitive explanation for the premium's decline and that this was not the purpose of their research.

Their calculations of the premium *ex ante* reveal that the equity premium is now approximately the magnitude that traditional financial theory suggests it should be: near zero. Again, viewing the issue from the appropriate perspective, that of the market as it looks to the future and makes investment decisions based on then-available information, it appears that no equity premium "puzzle" exists at all. Rather, this research illustrates that the "puzzle" was essentially a non-issue motivated largely by a desire to calculate the equity premium based on historically observed returns *ex post*.

Thus, they reiterate the warning that reliance on historical averages is likely to disappoint investors who simply assume that past experiences should translate into reasonable expectations for the future. In this regard, they note that even standard finance textbooks blindly extrapolate past returns forward to generate an equity premium as high as 9.2%. To justify this number, they add, one must assume long-term growth rates in dividends or earnings much faster than the growth of GNP, and this is simply unreasonable. Finally, the authors performed several sensitivity analyses to determine

the extent to which their conclusions might be affected by mistaken assumptions. Specifically, they tested for changes in dividend growth rates, dividend yields and bond yields. Somewhat surprisingly, they found that manipulating these assumptions did not materially alter their conclusions.

In 2002, Fama and French further compared and contrasted the outcomes of calculating the equity premium through average returns *ex post* with two methodologies for calculating it *ex ante,* the dividend-growth model and the earnings-growth model, both of which they believe produce unconditional expected stock returns.[17] They note that, although the two *ex ante* methods produced different estimates of the equity premium, they were both relatively similar to each other and significantly lower than the estimates produced by the average-return method *ex post.* This result is not particularly surprising, given the upward bias that is apparently inherent in the average-return method as applied to the modern American capital markets.

They further acknowledge a controversial, but potential, danger in relying upon analysts' forecasts of growth rates to generate cash-flow predictions for their dividend-growth and earnings-growth models. Namely, analysts' forecasts may cause systematic overestimation of the equity premium due to certain institutional biases related to the investment banks with which they are affiliated. As a result, their published expectations may tend to be more optimistic than those of a truly neutral observer. Thus, they use average dividend and earnings growth rates without reference to analysts' forecasts.

They argue that the average-returns method overestimates the equity premium and disregards the market's true expectations for three reasons. First, the *ex ante* methods are

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more precise and have significantly lower standard errors than the average-return method. Second, they calculated the Sharpe ratios for each method over time and found that the ratios from the *ex ante* methods were much more stable than the average-returns method. This was significant, they argued, because the Sharpe ratio relates to aggregate risk aversion, which should be relatively stable over time. The changes to the Sharpe ratio that flow from the average-returns method would indicate that the market was nearly twice as risk averse during the more recent period from 1951 to 2000 than it was from 1872 to 1950, a result they consider to be simply implausible. Third, the behavior of other fundamentals, like book-to-market ratios, suggests that the *ex ante* methods are more robust. Thus, they conclude, to the extent that average returns over the last fifty years exceeded the market's expectations according to the dividend-growth and earnings-growth methods, this simply represents an unexpected capital gain.

SYNTHESIS AND IMPLICATIONS

The assumption that what is observed *ex post* was necessarily expected by the market *ex ante* reflects a fundamental logical flaw. This error in reasoning led to the creation of the so-called "equity premium puzzle." Expectations and actual results do not necessarily resemble each other and, indeed, rarely do. Particularly where researchers use actual returns on American equities traded during a period in which the country rose to prominence and, ultimately, world domination, actual returns should and apparently do systematically overstate the market's expectations.

Moreover, the *ex ante* method offers a significant advantage impossible under the historical method: The results of this research may be replicated using market data

reflecting the economies of other major, industrialized nations with sophisticated capital markets. The historical-returns method requires many years of data. Unfortunately, the capital markets in the United States are the only ones in the world for which continuous, reliable data exist throughout most of the twentieth century. Other markets, even those in highly developed, mature European countries, were interrupted for considerable periods during wars, most notably World War II. Therefore, proponents of the historical-returns method essentially claim a "pass" on the basic tenet of research that findings should be replicated. The robustness of the expected-returns methods, by contrast, has been replicated throughout five other nations with the unanimous result that the historical method overstates the equity premium by approximately 6%.

Several possible reasons possibly account for the equity premium, whichever way it is defined. If one defines it in terms of average historical returns, survivorship bias and, quite simply, luck may explain it. Using either a dividend-growth or an earnings-growth model to deduce implied market expectations, rather than simply calculating average historical returns, avoids this pitfall. Simply relying on an *ex ante* approach, however, also exposes the researcher to potential biases, particularly in the assumptions on which future cash flows are estimated. Assuming one defines the premium in terms of expected returns implied from analyst forecasts and prevailing market prices, biases inherent in analysts' predictions may tend to cause an overestimation of expected returns. To the extent that analysts paint unrealistically rosy pictures of earnings and dividend growth, it necessarily implies that the discount rate that will equate those cash flows to

the present stock price must be higher. Accordingly, one can control for and eliminate this potential bias by relying on other estimations of dividend and earnings growth.

To the extent that historical returns since the 1920s indicate an 8% average return, this cannot possibly be supported by any reasonable assumptions about growth rates and other fundamentals into the future. Thus, even if the expected equity premium were accurately reflected by observed historical returns, and by its own terms it is not necessarily so reflected, no reasonable investor should expect such a high premium in the future. Accordingly, even if one assumes that investors expected an 8% equity premium in the past, he or she must acknowledge that the equity premium is lower now or soon will be. An investor's belief as to whether the market has already priced in reasonable expectations as to the equity premium will influence his or her approach to investing.

If one believes that the premium has yet to decline to lower levels, he or she should invest heavily in equities because a drop in the equity premium implies an increase in stock prices. Alternatively, if one believes the equity premium already reflects reasonable estimates of future fundamentals, as is likely in an efficient market, he or she will not necessarily dive into a long position in the equities market to a greater extent than usual. Rather, an investor confident in the efficiency of the American capital markets will continue to make rational decisions based on reasonable projections of future cash flows and an expected rate of return, as generations of investors have done before. This is the more likely scenario of the two. To the extent that a higher risk premium was demanded in the past due to market imperfections, those imperfections, particularly with respect to information and transactional costs, have in all material

respects been systematically and effectively eliminated from the American capital markets. Because our markets are the most efficient in the world, these beneficial changes should have been reflected in prices for many years and it appears that they have been.[19] Of course, the contrary is also true: To the extent that beliefs about the level of imperfections in the American capital markets become more pessimistic, prices must drop to reflect a higher risk premium.

CONCLUSION

It appears that the equity premium that investors truly expect in return for shouldering risk is not actually 6% to 8%, as an *ex post* analysis of historical average returns would indicate. Rather, based on a more relevant *ex ante* analysis of the expected returns implied by projected cash flows and market prices, the premium appears to be much lower and closer to what financial theory would predict. In particular, a significant and growing body of research indicates that the equity premium is between 2% and zero currently and should remain there through the foreseeable future. This is because, to the extent the premium was higher in the past, the market imperfections that justified it, like transaction costs and scarce information, have been significantly reduced and are expected to remain low.

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[1] Indeed, Fama and French found that this phenomenon applies to the period from 1872 to 2000 with a spread of 5.57%. Fama, Eugene F., and Kenneth R. French, 2002, The Equity Premium, *Journal of Finance,* Forthcoming.

[2] Mehra, Rajnish, and Edward C. Prescott, 1985, The Equity Premium: A Puzzle, *Journal of Monetary Economics* 15, 145-161.

[J] Fama and French, 2002.

[4] Mehra and Prescott, 1985, at 145.

[5] Brown, Stephen J., William N. Goetzmann and Stephen Ross, 1995, Survival, *Journal of Finance* 50, 853-873.

[6] Siegel, Jeremy J., 1999, The Shrinking Equity Premium, *Journal of Portfolio Management,* 10-17.

[1] *Id.* at 13.

Id. at 15 (emphasis added).

[9] Fama, Eugene F., and Kenneth R. French, 2001, Disappearing dividends: changing firm characteristics or lower propensity to pay?, *Journal of Financial Economics* 60, 3-43.

[10] Blanchard, Oliver J., 1993, Movements in the Equity Premium, *Brooking Papers on Economic Activity* 2, 75-138. Note that the author observed two "transitory" exceptions to this trend, during the 1970s and 1980s, both of which he argued related to inflation.

[11] Gebhardt, William R., Charles M. C. Lee and Bhaskaran Swaminathan, 2001, Toward an Implied Cost of Capital, *Journal of Accounting Research* 39, 135-176.

[12] Mat 135.

[13] Mat 138.

[14] *Id.* at 158.

[15] Claus, James, and Jacob Thomas, 2001, Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets, *The Journal of Finance* 56, 1629-1666.

[16] Jagannathan, Ravi, Ellen R. McGrattan and Anna Scherbina, 2001, The Declining U.S. Equity Premium, *NBER Working Paper* W8172.

[17] Fama and French, 2002.

[18] Claus and Thomas, 2001, at 1646-1650.

[19] Jagannathan, McGrattan and Scherbina, 2001.

Kaul, Gautam

From: traveler@worldtraveler.com
Sent: Monday, June 10, 2002 11:33 AM
Subject: Your order has been shipped!

This is to notify you that your World Traveler order (ID number: 1023204111045) has been shipped on 06/06/02.

Your order has been shipped directly from the manufacturer. Unfortunately, tracking information is not available at this time.

Thank you again for shopping World Traveler Luggage & Travelgoods! Please let us know how we may be of any assistance.

Best regards,
WorldTraveler.com
Great Prices... Service... No Pressure
Online: worldtraveler.com
Email: traveler@worldtraveler.com
Tel: 1-800-314-2247 (US & Canada) or 1-847-412-0530
Fax: 1-847-412-0398
Mail: 3501 Woodhead Drive, Northbrook, IL 60062