The Equity Premium Revisited

BRADFORD CORNELL
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CA  91125
626 564-2001
bcornell@hss.caltech.edu

ROB ARNOTT
RESEARCH AFFILIATES, LLC
Arnott@rallc.com

MAX MOROZ
RESEARCH AFFILIATES, LLC
Moroz@rallc.com

We would like to thank Eugene Fama, Kenneth French, John Hirshleifer and John Haut for helpful comments on earlier drafts of this paper. Of course, the errors remain our own.
Abstract

The recent collapse of the stock market has refocused attention on the question of the equity risk premium. One of the most comprehensive studies of the equity premium, completed by Fama and French in 2000, is now significantly out of date and requires refreshing. This article provides that update. We find that various procedures for estimating the premium from historical data are now converging to an annual equity premium over short-term commercial paper on the order of four percent.
Because the equity risk premium plays such a critical role in the application of finance theory to problems ranging from asset pricing to capital budgeting and valuation, it is worth revisiting its estimation periodically. In 2002 Fama and French [2002] published a comprehensive paper that examined unconditional equity premium over two long periods: 1872-1950 and 1951-2000. To estimate the unconditional premium, they begin with the relation that the average stock return equals the average dividend yield plus the average rate of capital gain,

\[ A(R_t) = A(D_t/P_{t-1}) + A(GP_t) \], \hspace{1cm} (1)

where \( D_t \) is the dividend for year \( t \), \( P_{t-1} \) is the price at the end of year \( t-1 \), \( GP_t = (P_t-P_{t-1})/P_{t-1} \), and \( A() \) indicates the average value. Based on equation (1) the direct way to estimate the unconditional risk premium is to sum the average dividend yield and the average capital gain and deduct the average risk-free rate. The problem with this approach is that the average capital gain is particularly noisy.

To deal with the problem of noise, Fama and French observe that if either the dividend price ratio or the earnings price ratio is stationary, then the compound rate of growth of dividends and earnings approaches the compound rate of growth of capital gain. This implies there are two alternatives to equation (1).

\[ A(R_t) = A(D_t/P_{t-1}) + A(GD_t) \]. \hspace{1cm} (2)

\[ A(R_t) = A(D_t/P_{t-1}) + A(GE_t) \]. \hspace{1cm} (3)

In equation (2), dividend growth substitutes for capital gain, while in equation (3) earnings growth is the substitute. According to Fama and French, equations (2) and (3)
have the benefit that dividend growth and earnings growth are both less variable than capital gain, and, therefore, can be estimated more precisely.

Due to limitations on earnings data, Fama and French could only use equations (1) and (2) to estimate the risk premium during the first sample period. All three equations were used during the second sample period.

For their empirical analysis, Fama and French used the S&P 500 and its antecedents as a proxy for the market portfolio. The annual real return on six-month commercial paper was used to estimate the risk-free rate. Based on this data, Fama and French found that during the first period from 1872 to 1950, the share price appreciation and dividend growth models produced similar estimates of the equity premium, 4.17% and 4.40%, respectively. For the period from 1951 to 2000, however, the results for the three approaches diverged markedly. The equity premium derived from average returns of 7.43% was almost three times the premium of 2.55% derived from the dividend growth model and close to double the premium of 4.32% produced by the earnings growth model. Of course, the difference relates to the fact that earnings growth outstripped dividend growth over this latter span, hence that payout ratios tumbled.

The mystery is why the capital gains and dividend approach yield almost identical estimates in the first period, whereas the capital gains estimate is so much higher in the later period. Fama and French spend the rest of their paper arguing that in the later period the estimates based on dividend and earnings growth are more accurate measures of the ex-ante expected risk premium. In addition to the greater precision of the estimates based on earnings and dividend growth, they base this argument on the behavior of Sharpe ratios and the return on investment.
In the seven years since the publication of the Fama-French paper, there have been some dramatic movements in stock prices. Consequently, it is worth updating the results to see if the conclusions are affected and to provide current estimates of the unconditional risk premium for financial analysis.

2. The equity risk premium revisited

As a first step, the data described by Fama and French were collected from data maintained by Research Affiliates, LLC and the Fama-French calculations were replicated for both of their sample periods. The results using the Research Affiliates data are virtually identical to those reported by Fama and French with minor deviations apparently due to the data for the risk-free rate. Based on this finding, the Research Associates data are used here to update the analysis.

Table 1 presents the updated results through the end of 2008. For comparative purposes, the original Fama-French findings are also included in Table 1. Before turning to the update, there is one aspect of the Fama-French results that the authors mention, but do not stress, that deserves further attention. Specifically, while Fama and French highlight the fact that the equity premium estimated from stock returns and from the dividend growth model are comparable in the 1872-1950 period, they pay less attention to the fact that standard deviations of 18.72% and 15.41%, respectively, are also similar. In contrast, the estimated standard deviations for the period 1951-2000 are 17.03% and 5.21% respectively. Fama and French emphasize that the lower standard deviation of dividend growth in the later period implies that estimates produced by the dividend growth model are more precise, but do not explain why the variability of dividend growth drops so sharply. In addition to updating the results, we also explore this issue further.
In Table 1, the interesting comparison is between the results for 1951-2008 and the Fama-French results for 1951-2000. Not surprisingly, the average risk premium computed using updated returns falls from 7.43% to 5.93% because the market fell substantially between the end of 2000 and the end of 2008. It is surprising, however, that the dividend growth based estimate of the risk premium actually rises from 2.55% to 3.03%. Finally, the earnings growth estimate of the premium is little changed – falling from 4.32% to 4.02%. An alert market observer will recognize that this can be traced directly to the rise in dividend distributions following the 2003 cut in dividend taxation, and to the plunge in corporate earnings in 2008, which had not yet rippled through to affect dividends. Overall, the updated results, particularly the relative decline of the return based estimate, support Fama and French’s contention that the 7.43% was not a reasonable estimate of the risk premium.

The updated data deepen the mystery regarding the observed variability of dividend growth compared to share price appreciation. The updated standard deviation of dividend growth, 4.62%, is less than that reported by Fama-French, while the standard deviation of share price appreciation, is almost four times larger at 17.49%. An explanation for this dramatic divergence is provided by the work of Brav, Graham, Harvey and Michaely [2005]. The authors find that since the passage in 1982 of SEC Rule 10b-18, which greatly reduced the legal risk associated with repurchases, there has been a pronounced trend toward repurchases as the preferred form of payout to shareholders. In particular, Brav et. al. report that managers behave as if there is a significant capital market penalty associated with cutting dividends, but not with reducing repurchases. Accordingly, dividends are set conservatively and repurchases are used to
absorb variation in total payout. As a result, the variation in dividend growth since 1982 has much less than variation in corporate performance.

Possible transition to a new payout policy is important because, as Fama and French note, during a transition to the more active use of repurchases the dividend/price ratio declines. Once the dividend/price reaches a new equilibrium, the dividend growth model works fine, but during the transition the dividend growth model is likely to underestimate the expected stock return. On this score, the earnings growth model is a better choice during the period since 1982.

With respect to the earnings growth model, Fama and French observe that it also is more precise than the model based on capital gains. Unfortunately, that finding is unique to their sample period. For the extended period, the standard deviation of earnings growth is actually slightly greater than the standard deviation of capital gains.\(^1\) Nonetheless, the consistency of the results produced by the earnings growth model is reassuring. The earnings growth model yields a premium of 4.02% for the updated sample which is close to the estimates of 4.17% and 4.41% produced by the dividend growth and the return models during the early period from 1872-1950.

The estimates presented thus far have been annual averages. As Fama and French observe, there is a downward bias in the estimates of annual simple return from the dividend and earnings growth models because of variance effect. To adjust for that bias, they use the lognormal approximation and add one-half the difference between the share

\(^1\) Using the data that were available, we also compared the standard deviation of earnings growth to the standard deviation of capital gains for periods before 1950. Once again, the two were comparable.
price appreciation variance and the variance of the growth rates to the results produced by
the dividend and earnings growth models. Applying that procedure to the updated data
yields an adjustment of 1.42% for the dividend growth model which increases the
estimated premium from 3.03% to 4.45%. With the adjustment, the dividend growth
model and the earnings growth model produce estimates that are close to each other and
close to the estimates for the prior period. No adjustment to the earnings growth model
estimate is required for the earnings growth model because for the updated sample the
variance of earnings growth is slightly greater than the variance of share price
appreciation. The convergence of the estimates provides support for the proposition that
the unconditional risk premium is between 4% and 4.5%.

These results are also consonant with the findings in Arnott and Bernstein [2002],
which derived an average ex ante risk premium for US stocks relative to US Treasury
Bonds of 2.4% on compounded long-term returns. The Arnott-Bernstein findings are
essentially identical to ours when account is taken of the difference in maturity, the fact
that we use commercial paper, and the variance effect when converting to annual
averages.

The bottom line is that there has been a remarkable convergence in the
unconditional estimates of the equity risk premium in the last eight years. Adjusted for
bias, the dividend and earnings growth models now produce estimates of between 4% and
4.5% over both extended periods from 1872 to 1950 and from 1951 to 2008. The
premium estimated from return data of 5.93% still remains outside that range, but the
discrepancy has decreased markedly since the publication of the Fama-French paper.
Because of the increasing importance of repurchases the earnings growth model appears
to be the preferred choice when using post-1980 data to estimate the unconditional risk premium, despite the relatively high variability of earnings growth.
REFERENCES


Table 1 - Equity Premium and Related Statistics for the S&P 500

RF is the real return on six-month commercial paper rolled over at mid-year; D/P is the real dividend yield; GD, GE, and GP are real growth rates in dividends, earnings and prices; RD, RE and R are the average real returns from the dividend growth model using dividends, earnings and capital gains; RXD, RXE and RX are the risk premiums measured with respect to RD, RE and R.

<table>
<thead>
<tr>
<th></th>
<th>RF</th>
<th>D/P</th>
<th>GD</th>
<th>GE</th>
<th>GP</th>
<th>RD</th>
<th>RE</th>
<th>R</th>
<th>RXD</th>
<th>RXE</th>
<th>RX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Means of Annual Values of Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1872-2000</td>
<td>3.24%</td>
<td>4.70%</td>
<td>2.08%</td>
<td>NA</td>
<td>4.11%</td>
<td>6.78%</td>
<td>NA</td>
<td>8.81%</td>
<td>3.54%</td>
<td>NA</td>
<td>5.57%</td>
</tr>
<tr>
<td>1872-1950</td>
<td>3.90%</td>
<td>5.34%</td>
<td>2.74%</td>
<td>6.13%</td>
<td>2.96%</td>
<td>8.08%</td>
<td>NA</td>
<td>8.31%</td>
<td>4.17%</td>
<td>NA</td>
<td>4.41%</td>
</tr>
<tr>
<td>1951-2000</td>
<td>2.19%</td>
<td>3.70%</td>
<td>1.05%</td>
<td>2.82%</td>
<td>5.92%</td>
<td>4.74%</td>
<td>6.51%</td>
<td>9.62%</td>
<td>2.55%</td>
<td>4.32%</td>
<td>7.43%</td>
</tr>
<tr>
<td>1872-2008</td>
<td>3.07%</td>
<td>4.63%</td>
<td>2.24%</td>
<td>NA</td>
<td>3.61%</td>
<td>6.87%</td>
<td>NA</td>
<td>8.24%</td>
<td>3.80%</td>
<td>NA</td>
<td>5.17%</td>
</tr>
<tr>
<td>1951-2008</td>
<td>2.02%</td>
<td>3.51%</td>
<td>1.54%</td>
<td>2.53%</td>
<td>4.44%</td>
<td>5.05%</td>
<td>6.04%</td>
<td>7.95%</td>
<td>3.03%</td>
<td>4.02%</td>
<td>5.93%</td>
</tr>
<tr>
<td><strong>Standard Deviations of Annual Values of Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1872-2000</td>
<td>8.48%</td>
<td>1.39%</td>
<td>12.37%</td>
<td>NA</td>
<td>17.83%</td>
<td>12.56%</td>
<td>NA</td>
<td>18.03%</td>
<td>13.00%</td>
<td>NA</td>
<td>18.51%</td>
</tr>
<tr>
<td>1872-1950</td>
<td>10.63%</td>
<td>1.12%</td>
<td>15.28%</td>
<td>NA</td>
<td>18.48%</td>
<td>15.41%</td>
<td>NA</td>
<td>18.72%</td>
<td>16.02%</td>
<td>NA</td>
<td>19.57%</td>
</tr>
<tr>
<td>1951-2000</td>
<td>2.46%</td>
<td>1.17%</td>
<td>5.09%</td>
<td>13.79%</td>
<td>16.77%</td>
<td>5.21%</td>
<td>13.51%</td>
<td>17.03%</td>
<td>5.62%</td>
<td>14.02%</td>
<td>16.73%</td>
</tr>
<tr>
<td>1872-2008</td>
<td>7.84%</td>
<td>1.55%</td>
<td>11.87%</td>
<td>NA</td>
<td>18.03%</td>
<td>12.05%</td>
<td>NA</td>
<td>18.63%</td>
<td>12.60%</td>
<td>NA</td>
<td>18.63%</td>
</tr>
<tr>
<td>1951-2008</td>
<td>2.43%</td>
<td>1.33%</td>
<td>4.62%</td>
<td>19.14%</td>
<td>17.49%</td>
<td>4.52%</td>
<td>18.99%</td>
<td>18.14%</td>
<td>4.99%</td>
<td>19.65%</td>
<td>17.92%</td>
</tr>
</tbody>
</table>