A Note on The “Equity Size Puzzle”*

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Abstract

This note provides a novel perspective on the implications of the equity risk premium. If current GDP macro forecasts were to come true, and if historical outflows from the public stock markets were to continue at their historical rates, and if the *geometrically* compounded equity premium were to be 4.5% per year, then annual GDP would equal the *expected* annual value *dollar return* in the stock market within about 60 years.

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This note contains an argument (about the size of the equity premium) that was contained in a paper surveying views of the equity premium by financial economists and publicly distributed in early 1998. The argument itself is currently developed into a much more solid paper by *Amit Goyal* and *Ivo Welch*. For now, this note contains a slightly edited version of the original argument as it appeared in the working paper.

1 A Macro Perspective of the Equity Premium

I now take the liberty to describe my own views on the equity premium. Instead of reiterating the arguments well-known in the equity premium puzzle literature and in the dividend forecast regressions (both well summarized in Cochrane (1997) and Siegel and Thaler (1997)), I want to discuss some macroeconomic implications of different equity premium growth estimates.

The perspective put forth below is not so much based on the difference between returns in the stock and bond markets (the "equity premium"), as it is based on the implied stock market capitalization growth, given the total stock return computed from the sum of the equity premium and current interest rates.

Assumption—Implied Equity Premium. I will discuss the implications of a **4.5% per year geometric mean** forecast of the equity premium. The reader can easily reproduce the calculations with lower forecasts.

Fact—Interest rates as of April 1998. Nominal bonds at any maturity are promising a yield of about 6% per year. The *UCLA Business Forecast*, the official forecast of the state of California, estimates inflation to be about 2.8% per year. Thus, the inflation-adjusted rate of return on bonds is about 3.2% per year. Because the inflation estimate represents an arithmetic average, the geometric inflation rate is lower, and real returns on bonds are probably higher.

U.S. Government real bonds are promising a 3.7% per year interest after inflation. For convenience, I will use a (low) **3.5% per year** real interest rate in the following calculations.

Consequence—Implied Stock Market Return. The inflation-adjusted real expected rate of return in stocks is about 4.5% + 3.5% =**8.0% per year.**

Critical Assumption—Net Flows into the Stock Market. Presume that net inflow and outflow patterns of capital to the public stock market for the next 50 years will follow the same patterns as they have historically.[1]

Table **??** computes the 1926–1996 annual return to be a geometric 10.27% per year, 12.27% per year in arithmetic terms. One can compute a similar "return" (annual percent increases) for the stock market capitalization (without ADRs). This series is readily obtained from the CRSP files ("USDVAL"), and yields equivalent 1926–1996 percent marketcap increases of 8.38% per year geometric, 10.22% per year arithmetic. In other words, net leakage from the stock market was 2.05% per year in geometric terms, 1.89% in arithmetic terms. However, the AMEX exchange was added to the CRSP files in 1962, NASDAQ in 1973. Excluding these two years both from the return and from the market cap increase computations yields a value-weighted return of 11.09%/year geometric, 13.05%/year arithmetic. The equivalent leakage increases now to 2.2%/year geometric, 2.31%/year arithmetic.[2]

In sum, if history is a guide to future leakage, a **2.5% per year** net leakage is a high estimate.

[1] I can think of two models in which net outflows would increase: The first model has demographics suggesting that the aggregate consumer saves money right now for later consumption. This would also imply that expected returns are *low* right now when there are many willing savers, and would be *higher* in the future when there will be many fewer savers. Such dynamics could either strengthen or weaken the argument made here. The second model has the economy offer agents such great storage/investment opportunities today that the representative agent voluntarily foregoes consumption today.

As to other factors, the discussion later will discuss foreign capital inflows/outflows.

[2] A regression of market capitalization growth on value-weighted returns reveals that leakage is lower when stock returns are higher. We are planning a followup paper to further investigate and predict the leakage from the stock market.

Consequence—Implied Stock Market Capitalization Growth. The inflation-adjusted real growth of the stock market (the difference between stock returns and leakage) is about $1.080/1.025 - 1 \sim 5.37\%$ per year.

Fact—GDP Forecasts. The *UCLA Business Forecast* predicts real GDP to to grow at an inflation adjusted 2.3% per year, up from 2.2% per year for the ten year-period ending at the year 2000. Consequently, a forecast **2.5% per year** *geometric* GDP growth rate is a high estimate.

Consequence—Relative Growth. Given the above, the public stock market capitalization will outpace GDP by about $1.0537/1.025 - 1 \sim$**2.8% per year**. To be even more conservative, we will also entertain a **2.5% per year** growth advantage.

Fact—Magnitudes as of December 1997. Total GDP[3] is about \$8 trillion. GDP net of government expenditures is about \$6.7 trillion. Market capitalization (without ADRs) is about \$10 trillion. As of April 1998, the stock market capitalization has already increased to about \$12.5 trillion, GDP roughly to \$6.8 trillion.

The ratio of stock market capitalization to non-government GDP is assumed to be about **1.8.**

Consequence—Future Magnitudes. At a 2.8% per year growth advantage, market capitalization will be about $1.8 \cdot 1.028^{30} \sim 4.1$ times of (estimated non-government) GDP within 30 years. Within 62 years, market capitalization would be about ten times GDP. At the more conservative assumption of a 2.5% per year growth advantage, it would take 70 years rather than 62 years for this scenario to come true.

Consequence—Implied Aggregate Stock Return. If GDP were about one-tenth of market capitalization, an inflation-adjusted rate of return of about 9.5% *per*

[3] For perspective, GDP consists of consumption, investment, government expenditures and net exports. Today, consumer durables, nondurables, and service consumption constitute just below 70% of GDP, domestic investment is below 15% (residential construction is about 5%, investment in property, plant and equipment is about 10%), and government purchases are below 20%.

year would suggest that the value of the *expected annual* stock market dollar return would be about the same as the total U.S. GDP—and it would be even larger in “good years” for the stock market!

There are two further complications worth noting. First, there are foreign inflows into the stock market. Although foreign inflows increase the stock market capitalization, they also make it more plausible to have a U.S. stock market ten times as large as GDP. Thus, foreign stock listings are likely to be roughly neutral. On the other hand, net foreign investment by U.S. corporations may make a factor ten larger market capitalization a more palatable scenario. (It is ultimately left to the reader to judge the reasonableness of the assumptions and outcomes in the comparison of GDP and the stock market.) Second, the above argument does not distinguish between medians and means,[4] and is casual in its dividing expected values, rather than in computing the expected value of the ratio. As to the median, it is true that the proposed outcome is not necessarily the most likely outcome, but it is also true that for the means to be as they are, one must believe in reasonably large probabilities for outcomes that are far more implausible than the scenario just discussed. Thus, the insight that a lower median realization is more likely than the mean realization is of little comfort. Second, as to the ratio issue, our analysis started with an assumed nominal stock value growth rate (say 11.5%), then divided out a market leakage rate (say 2.5%), then divided out an inflation rate (say 2.8%), then divided out the GDP growth rate (say 2.4%), in order to come up with a growth advantage (say 3.3%). In other words, the calculations relied on the ratios of expected growth rates, rather than the expected ratio. For the variables considered here, this issue is unlikely to play a major role.[5]

[4] Fama (1996) points out that the median (and typically the most likely scenario) growth rate is less than the mean growth rate.

[5] To judge the importance of this mistake, note that $E(G_1/G_2) \sim E(G_1) - E(G_2) \sim E(G_1)/E(G_2)$ for values of G close to 1. This omits a usually positive covariance term that reduces $E(G_1/G_2)$, and an inequality that $E(1/G_2) \geq 1/E(G_2)$. The ratios of expected values actually tends to understate the expected value of the ratios (assuming positive correlation between G variables). The difference in the 30-year backcheck below between working off ratios of means rather than means of ratios is about 0.02%.

Conveniently, the last 30 years (1967–1996, but again excluding 1972 due to NASDAQ's addition to the CRSP tapes) offered a **6.12% per year** arithmetic mean equity premium and a **2.34% per year** geometric real GDP growth. (This period was unusual in that it had both lower GDP growth rates and lower stock market volatility than earlier periods.) This allows us to backcheck the above argument for order-of-magnitude errors. Over the 1967–1996 time-period, the realized geometric growth rate of the annual equity-premium was **4.7% per year**, the value-weighted stock return compounded by 12.9%, market capitalization compounded by 10.6%, and inflation compounded by 5.3% (either arithmetic or geometric). The realized growth rate in the year-by-year inflation-adjusted market capitalization compounded by 5.05% per year. Because real GDP growth compounded by 2.34% per year, stock market capitalization outpaced GDP by **2.65% per year** in the 1967–1996 period. This is in line with the **2.8–2.5% per year** hypothetical growth advantage considered above.

The above argument suggests that one or more of the following must be true:

1. Historical net outflows from the public stock markets will be higher in the future than they have been in the past.

2. GDP growth will be higher than current forecasts of 2.3–2.5% real growth per year.

3. It is reasonable to presume that GDP will be consistently less than the annual stock market return within about 60–75 years. No law of economics would be violated if expected stock market dollar returns were to be higher than GDP *for a while*, but dividends cannot exceed either consumption or industrial activity on a systematic basis *forever*.

4. The equity premium will be less then 4.5% in geometric terms.[6] Equivalently, Steve Sharpe (`m1sas00@Frb.GOV`) suggests, using a similar argument, that the stock market is too high.

Adding the above argument to the arguments made in Cochrane (1997)'s and Siegel and Thaler (1997), I personally consider the consensus estimate of financial economists of a 6% equity risk premium—and certainly the estimates of almost a third of the profession of 8%—to be too high. Indeed, I personally consider the ten-times-GDP ratio not only to be a problematic implication for the mean outcome but even more to be a kind of "barrier"—I am more comfortable with assumptions under which such a scenario would have a very low likelihood (on the order of $< 1\%$) of ever occurring, and I would go so far as to consider a 5–8-times-GDP ratio to be uncomfortable. Therefore, I find a **3% per year** (geometric) equity risk premium estimate (in line with Blanchard (1993)) and a 5% arithmetic equity risk premium estimate to be more comfortable to recommend to my students for use in capital budgeting and investment allocation decisions.

References

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[6] The 4.5% equity premium could come about either because the arithmetic equity premium will be less than 6–8% or because market volatility will be higher than historical volatility. (A combination of higher moments could also change the wedge between the geometric and the arithmetic average, as a simple Taylor expansion can show.)

To bring about lower total stock market returns, one could also forecast that real interest rates could fall. Of course, this would indicate *interesting* trading strategies in long-term bonds today.