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The Fallacy of the Fed Model

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Managers responsible for asset allocation decisions rely on a variety of models to forecast future equity market returns. These forecasts inform policy portfolios and tactical shifts, and are used for budgeting purposes.

Most equity market valuation techniques rely on comparisons between current equity market values and equity market values observed over many decades in the past. For example, the trailing price to earnings (P/E) ratio is often compared with long-term average (P/E) ratios. James Tobin proposed an adjusted balance sheet measure called the Q Ratio (combined market value of all companies should be about equal to their replacement costs), while Warren Buffett claims to watch the level of aggregate corporate earnings to Gross Domestic Product.

In contrast, the so-called Fed Model is distinguished from other common models by its reliance on a comparison between equities and bonds. Specifically, the Fed Model compares the earnings yield (E/P) on the stock market with current nominal yields observed on 10-year Treasury bonds (Y), so that the value of a Fed Model valuation is calculated as $(E/P) - Y$.

Proponents of the Fed Model argue that stocks and bonds are competing assets so investors should prefer stocks when stock yields are high relative to bonds, and bonds when bond yields are high relative to stocks. Many augment these assertions by noting that equity prices should reflect the discounted present value of future cash flows; as the discount rate (Treasury yields) declines, so should equity valuations increase. Indeed, strategists might be forgiven for entertaining the above notions given that equity market valuations tracked interest rates quite reliably for over four decades from 1960 through 2007.

Unfortunately, the Fed Model does not hold up under more rigorous theoretical and empirical scrutiny. In fact, as we will endeavor to demonstrate in this article, the Fed Model has very little theoretical support; leads to poor allocation decisions, and; is not significantly predictive of future stock market returns.

The Fed Model is Based on a Faulty Theoretical Premise

While it might appear to the casual investor that the Fed Model deserves attention on the basis of sound intuition, the financial literature is consistent in its condemnation.

Let's take for example the suggestion that, because stocks and bonds are competing assets, investors will compare the yield on stocks, as measured by the E/P, to the nominal yield to maturity on 10-year Treasuries, and favor the asset with the highest yield. Presumably, capital would then flow from bonds into stocks, thus lowering stocks' E/P until equilibrium is achieved.

However, it is not obvious that (E/P) is the appropriate measurement of yield for stocks. Earnings yield as applied in the Fed Model is not comparable to the equivalent bond yield as only a portion of the earnings is actually distributed to shareholders. Rather, the dividend yield or total shareholder yield including share buybacks and share retirement might represent a more comparable proxy.

In addition, Asness (2003) illustrated how yield equivalency would rarely result in equivalent total returns because of the impact of inflation and growth in corporate earnings. Assume nominal bond yields are 8%, the equity market P/E is 12.5 (1/.08), inflation is 6% and expected real earnings growth is 2%. Under the standard Dividend Discount Model, it can be shown (holding payout ratios constant at 50%) that stocks are expected to deliver 12% nominal returns, implying 4% excess returns relative to Treasuries[1].

However, in the event inflation falls to 1% while nominal bond yields fall to 3% (preserving their 2% real yield) real growth rates remain constant at 2%. As a result, nominal earnings

growth falls to 3%. Recall the Fed Model assumes that the earnings yield will drop to 3% in-line with contemporaneous Treasury yields, which translates to a P/E ratio of 1/0.03 equal to 33.33. If we feed these new assumptions into our Dividend Discount Model, we observe that expected stock returns have now fallen to 4.5%, just 1.5% more than bonds.

Under the Fed Model, stocks and bonds compete for capital, yet Asness' analysis illustrates how simple shifts in inflation expectations would result in a logical inconsistency, which invalidates the basic premise of the Fed Model. Why should a shift in inflation cause expected returns to stocks to drop by more than bonds if the two should be valued exclusively on the basis of relative yields?

Moreover, why should investors expect stock earning yields to adhere to Treasuries' gravitational pull? Isn't it just as likely that Treasury yields are mispriced, and will correct to the level of earnings yields? This is an especially acute point in the current environment, where central banks have explicitly stated to artificially lower rates across the curve.

Another argument often used to support the Fed Model is that low interest rates suggest a high present value of discounted cash flows and therefore a high P/E. The problem is that all else is not equal when interest rates are low. When interest rates are low, prospective cash flows to investors are also likely to be low. The decline in prospective cash flows offsets the decline in the discount rate. Therefore, it is not necessarily true that low interest rates justify a higher P/E (i.e lower the E/P) .

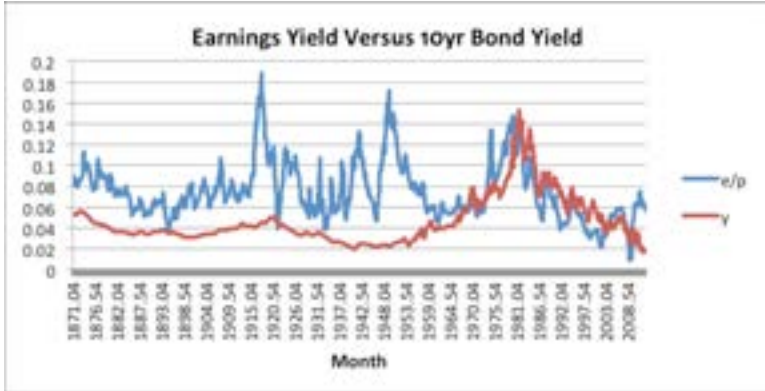### The Final Arbiter: Fed Model as a Forecasting Tool

Setting aside for a moment the weak theoretical foundation of the Fed Model, we must acknowledge that proponents of the technique appear to have a meaningful empirical argument given the strong relationship between E/P and Treasury yields over the period 1960 – 2007. However, it is worthwhile exploring whether this relationship was unique to the dominant interest rate regime over this period.

In fact, reasonably good data exists for both U.S. equity market E/P and 10-year Treasury constant maturity yields dating back to 1871, and even further with some databases. When this longer period is used, the Fed Model relationship does not hold (Exhibit 1). While the r-squared coefficient for a regression of monthly E/P on 10-Year Treasury yields between 1960 and the present is 0.49, we observe much lower explanatory power in the historical record back to 1871, with an r-squared value of just 0.03. This observation is consistent internationally: analogous data, sourced by Estrada (2005), for several other large countries and demonstrated that the insignificant statistical link between E/P and government bonds is universally persistent .

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[1]   Under the Dividend Discount Model, the expected return on the market equals the current dividend yield plus the long term nominal growth rate of dividends. The dividend yield can be expressed as the payout ratio multiplied by earnings. If we assume a constant percent of earnings then growth rate of dividends equals the growth rate of earnings. We can then express the return on the market to equal: payout ratio multiplied by the earnings yield plus the growth in nominal earnings

[2]   This also ignores changes in the risk premium associated with stocks. The risk premium can also be time-varying and affect the pricing of stocks.

[3]   In fact, if the P/E ratio in the numerical example given above remains at 12.5, not 33.33 as implied by the Fed Model, the 4% expected return of stocks over bonds would actually be preserved.

Earnings Yield Versus 10yr Bond Yield

analysis. We sorted Fed Model readings into deciles and calculated the average forward returns to stocks over 1, 5 and 10 year horizons for each decile. If the Fed Model exhibited forecasting ability, we would expect to see a somewhat linear relationship between starting Fed Model valuation level and average forward returns. In fact, there is no obvious linear relationship whatsoever (Exhibit 3).

Exhibit 3

S&P Returns

While regression analysis implies a spurious and non-stationary relationship between earnings yields and Treasury yields, the true arbiter of validity must be how well the Fed Model forecasts stock market returns. To test, we regressed forward total nominal and real returns to stocks over a variety of forecast horizons against contemporaneous Fed Model values. For comparison, we also regressed forward returns against simple trailing E/P ratios with no adjustment for the level of interest rates (Exhibit 2).

Exhibit 2

Regression of Nominal S&P Returns Against Fed Model and Earnings Yield

From Exhibit 3 we see that nominal stock market returns are high when the Fed Model indicator signals extreme levels of equity market *under-(decile 1)* or over-valuation (decile 10). There may in fact be a meaningful signal there, but clearly it is inconsistent with the theoretical foundations of the model.

Perhaps the Fed Model's most profoundly misguided signal came in 1982. The Fed Model suggested the market was fairly priced precisely when more reliable indicators suggested markets were cheapest on record. Of course, subsequent returns over horizons from 1 through 20 years were well above average.

The regression analysis shows the Fed Model has minimal predictive ability over time horizons of 5 and 10 years. In fact, univariate regression using just the E/P does a much better job in forecasting future stock market returns. If anything, adjusting for the level of interest rates destroys any predictive ability achieved by using the simple earnings yield alone.

One other way to demonstrate the fallacy of the Fed Model in making useful investment decisions is to perform a decile

Conclusion

The Fed Model implies that high stock market multiples are not a cause for concern for investors because these multiples are justified by low interest rates. Unfortunately, investors relying on such logic to invest in the stock market are likely to be very disappointed in the coming years. While low interest

rates may *explain* why investors assign such high stock market multiples, low rates do not *justify* such high multiples.

Investors would be better served by heeding the many more reliable valuation metrics currently signaling caution.

Moreover, those responsible for institutional portfolios should prepare for a lower return future for equity markets from current levels.

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