The Fulcrum Expected Returns Model: A Primer

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Motivation

Traditional approaches to computing longer-term expected returns rely heavily on the Dividend Discount Model proposed by Gordon (1959) and Gordon and Shapiro (1956). Often times, this involves inputing "exogenous assumptions about quantities −economic growth, the path of interest rates, the evolution of risk premia− that are thought to affect returns. This approach has several drawbacks. First, variables like economic growth, interest rates and risk premia are treated as exogenous with respect to stock returns, when clearly there are feedback loops between all of them. In other words, the variables are all simultaneously determined in equilibrium, and cannot be reasonably treated as exogenous. Second, interest rates and growth rates are assumed to be constant, so the model is best thought of as a "comparative statics" exercise about the very-long run. Therefore, the model is silent about adjustment dynamics at horizons between now and the long run, which is much more relevant for investors. Relatedly, they typically embed strong assumptions about mean reversion, both of interest rates and valuation ratios. Finally, the model is silent about the uncertainty surrounding the results, which can be quite high.

To calculate expected returns on the major asset classes, Fulcrum instead relies on dynamic multivariate models estimated using Bayesian methods, see Sims (1980), Doan et al. (1983) and Sims and Zha (1998). These methods allow us to model the joint dynamics of stock returns, dividends,

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interest rates and other macroeconomic variables in an internally consistent way without making strong assumptions about dynamics, mean reversion or the steady-state values of the variables. Furthermore, Bayesian prior information that disciplines the long-run behavior of the variables in the system can be introduced naturally.

Specifically, the model includes stock prices and dividends, as well as a set of macroeconomic variables, including short and long-term interest rates. Returns are then calculated from the model's forecasts using the Campbell-Shiller log-linearization of the one-period return,

$$r_{t+1} \approx \rho(p_{t+1} - d_{t+1}) - p_t - d_t + \Delta d_{t+1} \tag{1}$$

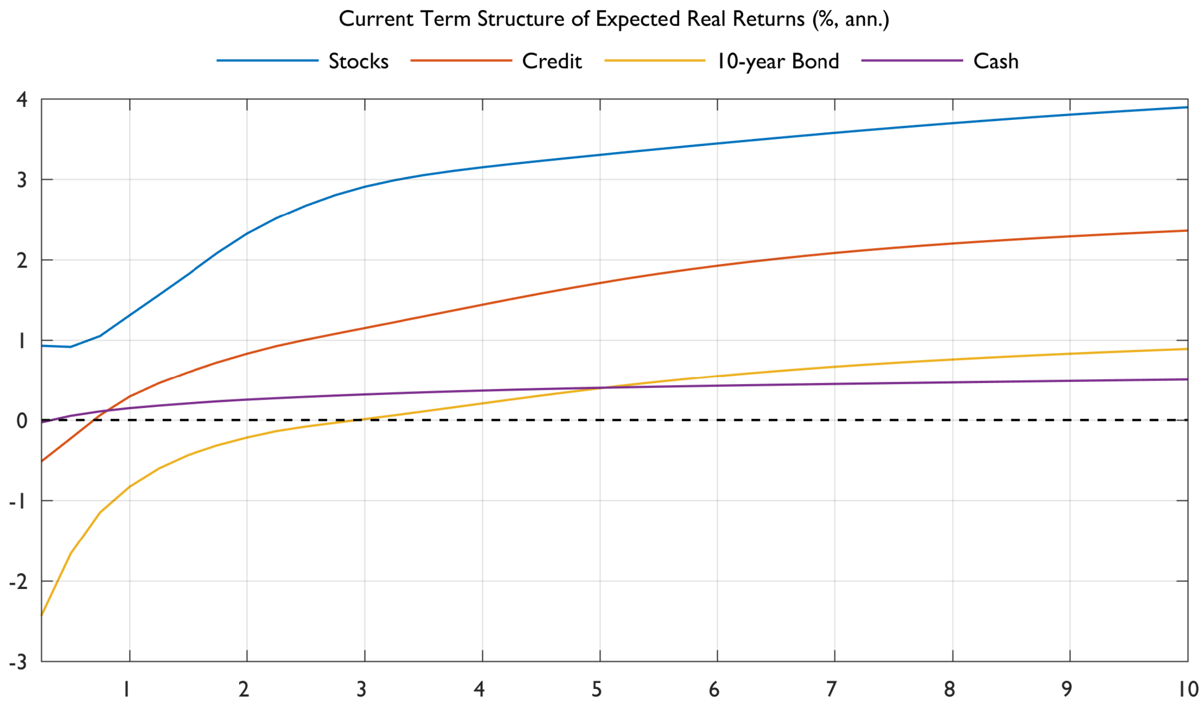
In words, higher returns come from higher future prices (relative to dividends, i.e. higher future valuations), lower initial valuations, or higher dividends. Similar equations can be used to compute returns for fixed income assets on the basis of the model's forecasts for interest rates and future long-term yields.

Results

Fulcrum maintains several versions of expected returns models. The following figures display the results of one such models, updated with data up to February 9, 2018.

Figure 1 displays the current expected holding period returns at various horizons for the major asset classes. The horizontal axis represents years and all numbers are annualized averages to ease comparisons. The model's forecast of inflation has been subtracted throughout, so all figures are real returns. The figure offers a cross-sectional view of returns across asset classes, providing us with a term structure of expected returns. A notable conclusion from the figure is that real returns to bonds are negative, and worse than holding cash instruments, for the first few years. This is the consequence of the negative term premium in long-term bonds. Second, the term structure of expected stock returns is upward sloping: returns are higher for longer holding period returns that in the immediate future.

Figure 2 instead offers the time series evolution of expected returns at the three-year horizon. This allows us to compare the expected returns of each asset class through time. The real expected

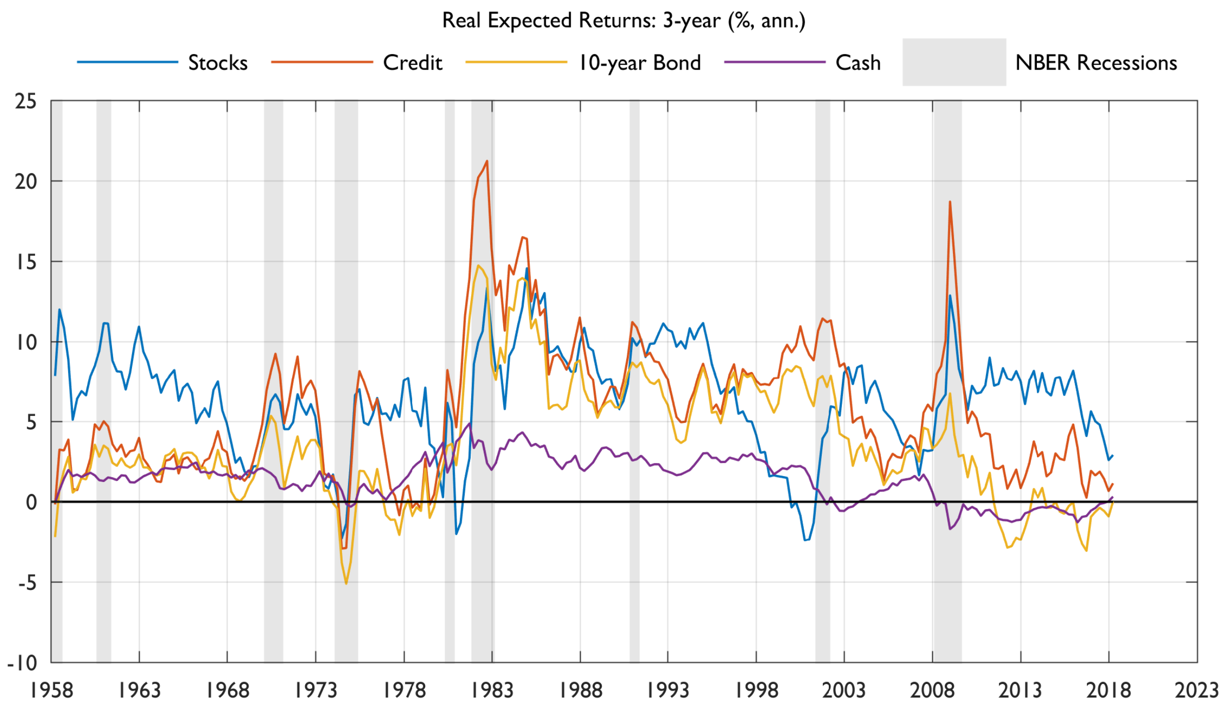


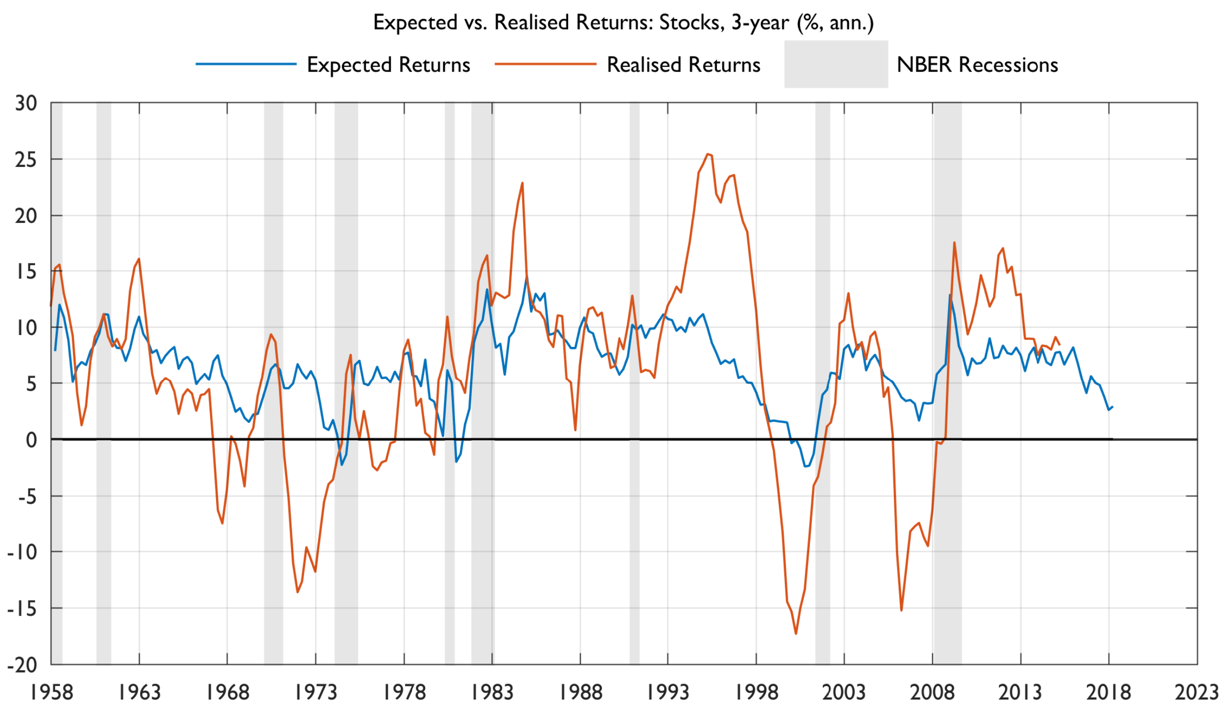
three-year return on stocks has averaged 5% over the postwar period, whereas currently it stands at around 3%. In that sense, stock prices are currently "overvalued", meaning expected returns are lower than normal. Compared with the decline in expected returns observed in the late 1990's, where expected returns turned negative, the current undervaluation is modest. It is also still better than the zero real returns expected for longer term bonds and the returns on BAA corporate bonds, just above 1%.

The final figure compares the model's ex-ante expected returns for stocks (blue) with the returns that ultimately materialized three years later (red). It serves as a reminder that the volatility of stock returns is huge, and that realized returns vary much more than expected returns. For instance, as valuations went ever higher during the late 2000s, prices kept increasing and expected returns kept going down. Ultimately, of course, the negative returns experienced by an investor who bought stocks in 1999 were much worse than the model's already negative expectation.

Decomposing Price Returns

Campbell and Shiller (1988) propose dynamic version of the dividend discount model that allows for


Real Expected Returns: 3-year (%, ann.)
Stocks
Credit
10-year Bond
Cash
NBER Recessions
25
20
15
10
5
0
-5
-10
1958
1963
1968
1973
1978
1983
1988
1993
1998
2003
2008
2013
2018
2023


Expected vs. Realised Returns: Stocks, 3-year (%, ann.)
Expected Returns
Realised Returns
NBER Recessions
30
25
20
15
10
5
0
-5
-10
-15
-20
1958
1963
1968
1973
1978
1983
1988
1993
1998
2003
2008
2013
2018
2023

dividend growth and expected returns to vary over time. We use their model to write an approximate loglinear decomposition of the present value of stock returns (in excess of the real risk-free rate). The log price-dividend ratio can be decomposed in the sum of discounted expected excess returns (or equivalently equity risk premia), expected dividend growth, and expected real (risk-free) rates:

$$p_t - d_t = \frac{k}{1-\rho} + E_t \sum_{j=0}^{\infty} \rho^j \left(\Delta d_{t+1+j} - r_{t+1+j} \right) \tag{2}$$

$$= \frac{k}{1-\rho} - \underbrace{E_t \sum_{j=0}^{\infty} \rho^j \left(r_{t+1+j} - r^f_{t+1+j} \right)}_{\text{Expected Excess Return (ERP)}} - \underbrace{E_t \sum_{j=0}^{\infty} \rho^j r^f_{t+1+j}}_{\text{Expected Real Rates (ERR)}} + \underbrace{E_t \sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j}}_{\text{Expected Div Growth (EDG)}} \tag{3}$$

where ρ is a loglinearisation parameter close to but less than one. We can then write the continuously compounded price return between time $t + H$ and time t as

$$p_{t+H} - p_t = d_{t+H} - d_t - \Delta^H ERP - \Delta^H ERR + \Delta^H EDG, \tag{4}$$

which is the sum of the dividend growth between the two time periods, and the negative change in expected future excess returns, the negative change in real rates, and the change in expected dividend growth. We estimate the expectations of all the terms in the decomposition using the Bayesian dynamic multivariate model mentioned above.

Conclusion

Dynamic multivariate models can be used to advance our knowledge of expected returns across asset classes. Relative to traditional approaches, they have the advantage of modeling the joint dynamics of asset prices and macro variables in an internally consistent way, and providing expected returns at different horizons and points in time. Estimated using Bayesian methods, they are an alternative way to judiciously incorporate prior information about the long-run behavior of returns, without resorting to restrictive assumptions about mean-reversion that are not supported by the data.

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