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The bond–stock mix under time-varying interest rates and predictable stock returns

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ABSTRACT

I investigate the allocation of wealth to cash, bonds, and stocks, along with the bond-to-stock ratio (BSR) when interest rates are time-varying and stock returns are predictable via the dividend-price ratio (DPR). The bond–stock mix and the BSR vary with the deviation of the current level of the DPR from its long-run mean and the correlations between all asset classes. The BSR may decrease over time, which contradicts both previously reported results on the matter as well as popular advice. Finally, I show that it is only at the investment horizon that the BSR is independent of risk aversion.

1. Introduction

A typical investor's retirement portfolio consists of cash, bonds, and stocks. Traditional finance theory – see, for example, Sharpe (1964) – suggests a constant bond–stock ratio (BSR) regardless of time to retirement or risk aversion. Investment advisors, on the other hand, suggest that young people should have a larger share of their wealth invested in stocks than in bonds, while this relationship should be reversed with an increasing BSR to reduce risk as the investor approaches retirement, or the investment horizon. Investment advisors approach to balancing the asset allocation is thus more dynamic with respect to both time to retirement and risk aversion. In this paper, I show that the

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optimal BSR might decrease over time. This means that as the investment horizon approaches, investments in stocks will increase relative to investments in bonds. However, my results also show that whether the BSR increases or decreases over time depends on the condition of the economy. When stock returns are predictable through the dividend-price ratio (DPR), it can be optimal to increase (decrease) stock (bond) investments as retirement time nears.[1]

Moreover, investment advisors suggest that the ratio of bond investments to stock investments should depend on the investor's level of risk aversion: throughout the investment period, more risk-averse investors should hold a higher ratio of bonds to stocks than less risk-averse investors. For example, investment advice by Fidelity, a financial services company, suggests an allocation of 5% in bonds and 95% in stocks for an investor with low risk aversion and approximately 30 years to retirement. For an investor with high risk aversion, the allocation should be less than 20% in stocks and the rest in bonds. Hence, the BSR increases in risk-averse investments.[2] Canner et al. (1997) observed that the advice given by investment professionals does not correspond to standard financial theory, which suggests an investment strategy that is independent of risk aversion. For example, under the assumptions of Sharpe (1964), investors should hold risky assets in the same proportion, regardless of their risk aversion. To illustrate this point, an investor with low risk aversion might keep 60% invested in stocks and 30% in bonds. An investor with high risk aversion could keep 40% in stocks and only 20% in bonds. Both investors have the same BSR, which in this example is 1:2. This contradicts the advice given by investment professionals, who suggest ratios ranging from 1:18 for low risk aversion to 4:1 for high risk aversion. Canner et al. named this the *asset allocation puzzle*, and several papers have subsequently investigated the phenomenon (see, for example, Bajeux-Besnaiou et al., 2001; Lioui, 2007).

I find that in addition to both risk aversion and time to retirement, the condition of the economy has significant implications for investors' asset allocation. I assume that stock market returns are predictable through the DPR, which indicates the state of the economy. I define an overvalued stock market as one in which the current DPR is below the long-run mean of the DPR. Conversely, the stock market is undervalued if the current DPR is above its long-run mean. I find that in an undervalued stock market, the optimal BSR may decrease over time, which contradicts previous results. The optimal asset allocation depends on the investor's risk aversion; however, I show that at the investment horizon, the optimal BSR is independent of risk aversion and hence conforms with traditional theory at that point.

Several papers have argued for and against the predictability of stock returns (see, for example, Campbell and Shiller, 1988). However, researchers report substantial variation in the DPR over time (see Guidolin et al., 2013) and across different countries (see, for example, Nagayasu, 2007). Further, an endogenous predictor like the DPR is not without controversy, and it is sometimes difficult to determine whether it actually predicts future stock returns (see Ang and Bekaert, 2007; Hjalmarson, 2008).

2. Data and methods

2.1. Data

I have applied observations on the S&P 500 index and the aggregate dividend payments of the companies in the index. I have also applied observations of the 10-Year treasury constant maturity rate (GS10), as an approximation for the interest rate. Table 1 contains the estimates of the parameters in the equations governing the financial assets of the portfolio. The parameter estimates for the loading of the DPR on stock returns are inspired by Xia (2001). All observations are obtained from Robert Shiller (http://www.econ.yale.edu/~shiller/), and the estimates are obtained applying observations ranging from January 1, 1946 through April 2012.

[1] I would like to thank an anonymous referee for clarifying this point and the differences between traditional theory, actual practice, and the results I present in this paper.

[2] See, for example, the webpages fidelity.com.