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John Bull Can't Stand 2 Percent: QE's Depressing Implications for Investment

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Abstract

Much of the existing literature misunderstands "reach for yield" behavior as an increase in risk-taking in response to low interest rates. By focusing on common stocks – where dividend yields are *inversely* related to systematic risk – I demonstrate that "reach for yield" instead reflects an increase in the marginal utility of current income relative to expected holding period returns. The monthly returns of the highest yielding 10% of stocks increase by 0.76% for every 1% decline in two-year interest rates, after controlling for known risk factors. The monthly returns of a long-short portfolio that buys the highest-yielding 10% of stocks and sells the lowest-yielding decile increase by 1.4% for every 1% decline in two-year interest rates. These effects are three-times as large when the decline in interest rates is attributable to a fall in the term premium, which suggests unconventional monetary policies may generate especially large increases in the marginal utility of current income. By increasing the market value of current income relative to future returns, unconventional policy may lead corporate managers to boost shareholder distributions at the expense of capital accumulation.

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1. Introduction

Much of the existing literature misunderstands "reach for yield" behavior as an increase in risk-taking in response to low interest rates. I demonstrate that the "reach for yield" instead involves portfolio shifts towards assets that generate more *current income*. This is an important distinction, as yields and expected holding period returns can differ substantially. When the utility function of the representative investor includes a preference for current income, portfolio choice is not limited to the marginal rate of substitution between mean (expected return) and standard deviation (risk), but also the substitution between assets that offer higher yields today relative to those with higher expected returns over the entirety of the investment horizon.

Evidence of a "risk-taking" channel of monetary policy comes predominately from fixed income markets where yield is a function of the conditional volatility of returns. This relationship does not always hold. I demonstrate that the risk-taking channel disappears when the portfolio choice problem is opened to asset classes where yields and conditional volatility are not correlated, like common stocks.

It is well known that some investors, such as seniors, prefer assets that generate current income (coupons, dividends, rents) to those assets with higher expected returns (Miller and Modigliani, 1961). I demonstrate that low real interest rates change relative prices *in the aggregate* by increasing the marginal utility investors derive from current income. Contrary to the predictions of the "risk-taking" channel, investors respond to low rates by increasing exposure to low beta stocks, *reducing* systematic risk in the search for additional yield.

I show that the relative price of dividend-paying stocks depends on the level of real interest rates and monthly returns on high-yield stocks vary in response to changes in policy-sensitive Treasury yields. The higher the dividend yield on a portfolio of stocks, the greater the sensitivity of its monthly returns to variation in interest rates. The monthly returns of a portfolio of the highest-yielding 10% of stocks increase by 0.76% for every 1% decline in two-year interest rates, after controlling for known risk factors. A long-short portfolio that buys the highest-yielding 10% of stocks and sells the lowest-yielding decile generates monthly returns that increase by 1.4% for every 1% decline in two year interest rates.

Interestingly, when the decline in two year rates is attributable to a fall in the term premium, the increase in the return on the long-short portfolio is over three-times as large. Monthly returns on the long-short portfolio rise by 4.2% for every 1% decline in the term premium, as measured by Adrian, Crump, and Moench (2013). Unconventional monetary policies like quantitative easing (QE) and forward guidance that suppress term premia may generate especially large increases in the marginal utility of current income.

If "reach for yield" involves a preference for current income rather than a change in attitudes towards risk, unconventional monetary policy could potentially depress business investment by increasing the market value of shareholder distributions relative to the expected returns from long-lived capital. Some commentators have suggested that unconventional monetary policy makes business managers more inclined to repurchase stock rather than invest in productive capital (Spence and Warsh, 2015). Unfortunately, explanations for this behavior rely on assumed frictions that somehow make corporate equities less risky than the underlying corporate assets, or generate otherwise inexplicable departures from the standard results of state-based asset pricing models.

I demonstrate that one does not need to rely on fantastical assumptions to understand why unconventional monetary may depress business investment. Production-based asset pricing models in the spirit of Cochrane (1991, 1996) make no distinction between real and financial assets. The corporate manager is assumed to pursue an investment policy that maximizes the present value of the stock price of the business, which is tied through arbitrage to the state-based payoffs of its assets. If a negative shock to real interest rates increases the representative investor's marginal utility of current income, the corporate manager would be expected to reduce planned investment in favor of higher current shareholder distributions. Such a result would be consistent with Baker and Wurgler (2004), who find that the decision to pay dividends is driven by investor demand.

2. "The Reach for Yield" in the Literature

Beginning with Rajan (2005) and Borio and Zhu (2008) researchers have observed that low interest rates provide incentives for investors, banks, and intermediaries to assume incremental risk to achieve nominal holding period return targets. This phenomenon has become known as the "reach for yield," which Becker and Ivashina (2015) define formally as "the propensity to buy riskier assets in order to achieve higher yields." In their telling, the positive relation between risk and expected return implies that increased demand for higher yielding assets *necessarily* involves increased risk-taking.

Central Banks like the U.S. Federal Reserve closely monitor financial markets for evidence of "reach for yield" behavior. According to Stein (2013), if low policy rates increase investor demand for riskier instruments in finite supply, the expected returns on such assets must fall, which reduces the compensation investors receive for bearing risk and leads to systemic mispricing. Under certain conditions, such mispricing can increase systemic fragility. Yellen (2015) cites the "compression of spreads on high-yield debt" as evidence of dangers introduced by "a reach for yield type of behavior." Martinez-Miera and Repullo (2015) offer a theoretical model of this phenomenon.

There is a tendency in this literature to conflate "yield" with "expected return." Perhaps that is because empirical studies tend to focus on fixed income markets like corporate bonds (Becker and Ivashina, 2015 and Choi and Kronlund, 2015), leveraged loans (Aramonte, Lee, Stebunovs, 2015), and bank lending (Morais, Peydro, and Ruiz, 2015) where the two concepts are practically indistinguishable. Hanson and Stein (2015) is the rare exception. In their model, a portion of investors care about current portfolio income and respond to a decline in short-term rates by increasing allocations to long-term bonds to keep the total yield on their portfolio from declining "too much." The buying pressure on long-term bonds increases their price relative to short-term bills, which lowers the real term premium, or compensation investors earn for bearing duration risk.

The existence of yield-oriented investors helps to explain how unconventional monetary policies like QE are transmitted to the real economy. Empirical research finds that by reducing the duration risk borne by private balance sheets, QE shrinks the term premium (Gagnon et al., 2010; Wu, 2014; Abrahams et al., 2013). Estimates of negative term premiums are not uncommon post-2010 (Adrian, Crump, and Moench, 2013), implying that investors are willing to accept future market value losses, in expectation, to increase current coupon income.

The suppression of risk premia is not a byproduct, or side-effect, or unconventional monetary policy, but rather a conscious objective of the policy (Bernanke, 2013). To the extent that QE succeeds in reducing risk premia, it should increase investment demand and consumption through a decline in external finance costs (Bernanke and Gertler, 1989). While QE has been an apparent success in boosting asset prices, the unresponsiveness of business investment to the substantial increase in business net worth has been a puzzle of the post-crisis period.

3. Is "Risk" a Confounding Variable?

There is not always such a close correspondence between yields – defined as the current income generated by an asset or portfolio – and expected returns. As a result, yield is not always increasing in conditional volatility (i.e. risk), as observed in fixed income markets. When the portfolio choice problem is opened to more assets and asset classes, one can conceive of any number of ways an investor (or her agent) can augment the current income of a portfolio without an increase in "risk," whether defined as the portfolio's total variance or its covariance with the market portfolio or stochastic discount factor. This possibility is largely ignored in the literature. Even Hanson and Stein (2015) restrict their model to two assets, which ensures that an increase in current income can be obtained only through an increase in risk-taking.

It is well understood among practitioners that declines in interest rates increase demand for "yield products," or securities and funds for which a large share of total returns come through cash distributions. One routinely sees articles in the popular press discussing strategies to combat low yields by diversifying into dividend-paying stocks, MLPs, REITs, leveraged mutual funds and ETFs, and Business Development Companies (BDCs).[1] Implicit to these articles is the understanding that risk-adjusted holding period returns are not the sole determinant of investor utility. Retirees, family offices, endowments, or pension funds often require a certain level of current income to fund retirees' consumption, cover expenses, or meet legal or investment policy distribution requirements. Low rates are more likely to lead these investors to rethink overall allocation targets rather than simply ramp-up risk-taking in the fixed income portion of their portfolio.

Portfolio rebalancing of this sort does not really concern substitution between "risk" and "return," but rather an increase in the marginal utility of current portfolio income relative to expected holding period returns.[2] The sale of an emerging market stock position to finance the purchase of an investment grade corporate bond would likely increase the yield of a portfolio without increasing its variance. A more common "yield-increasing, risk-decreasing" portfolio shift would involve the sale of a "high beta" growth stock to finance the purchase of a "low beta" dividend-paying stock. Available evidence suggests these kinds of portfolio shifts happen routinely in response to low rates.

Figure 1 captures the relationship between the relative price of high-yield stocks and real interest rates. The relative price of the dividend stock index – i.e. its trailing P/E ratio scaled relative to that of the S&P 500 – rises nonlinearly as real rates decline. A 100bp decline in two-year real yields is associated with a 7% increase in the relative price of dividend stocks. The price of high-yield stocks responds to the variation in rates, consistent with practitioners' experience.

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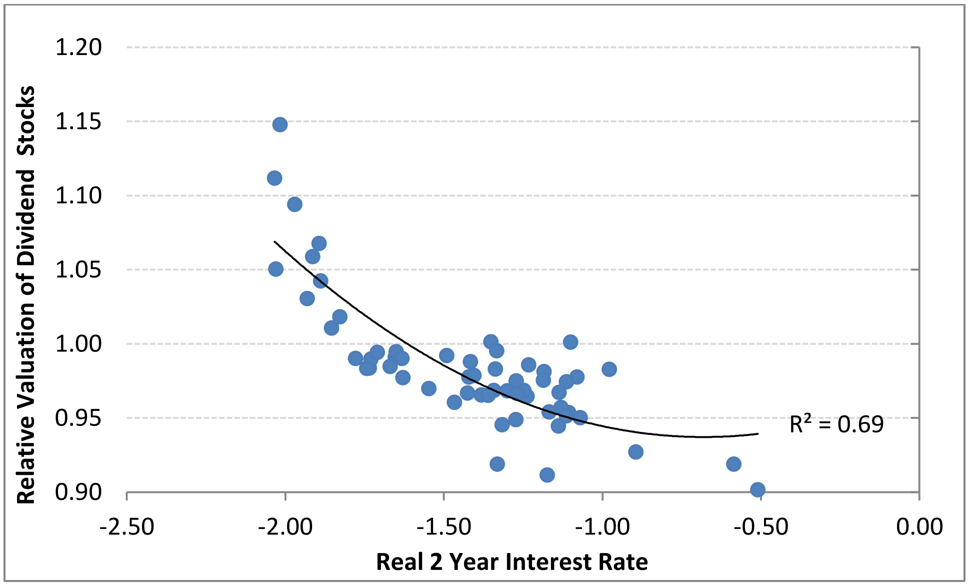
[1] C.f. "Searching for Yield, at Almost Any Price," *The New York Times*, May 1, 2014.

[2] Perhaps substitution towards assets that pay a larger share of total returns in dividends is better described as a "search for yield," as investors seek assets capable of supplementing the decline in coupon income. "Reaching" for yield implies a more conscious decision to assume more risk in the hope of higher returns. Yet, to my knowledge, there is no formal distinction between the two, with "search" and "reach" used more or less interchangeably in the literature. Rajan (2005), Borio and Zhu (2008), Aramonte, Lee, Stebunovs (2015), Martinez-Miera and Repullo (2015), and Buch, Eickmeier, and Prieto (2014), all use "search for yield" to describe the ways low rates influence risk-taking incentives of investors, banks, and other intermediaries.

Figure 1: Relative Valuation Ratio of Dividend Stocks and Real Interest Rates

Figure 1 plots the relationship between the relative valuation of dividend stocks and the real two year interest rate between 2011 and 2015. The relative valuation is the difference between the trailing twelve months' GAAP P/E ratio of the top 100 dividend yielding stocks in the S&P 500 relative to the P/E ratio of the aggregate U.S. stock market. The real two-year interest rate is calculated as the two-year constant maturity Treasury yield net of the annual change in the core consumer price index. Stock data come from S&P Capital IQ Database. The yield data come from the Federal Reserve, H.15.

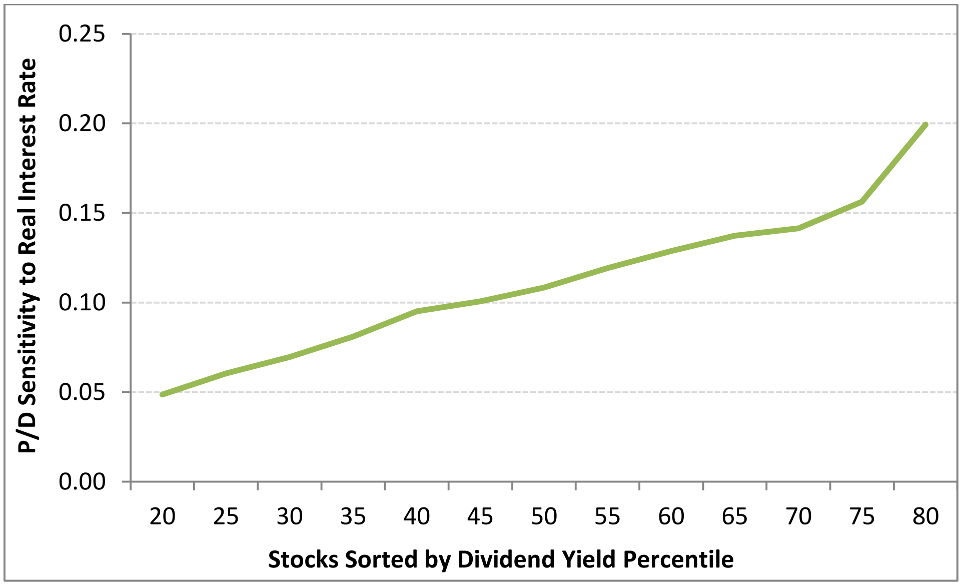


What it means to be a high-yield stock in a given year also depends on the level of real interest rates. When sorting stocks annually by dividend yield, the yield of a stock at the 80th percentile of the distribution (i.e. a stock with a dividend yield higher than 80% of other stocks that year) exhibits a sensitivity to changes in the level of real interest rates that is not observed among lower-yielding stocks. Figure 2 plots the sensitivity of dividend yields, sorted by percentile, to annual changes in two-year real interest rates.

When real two-year yields rise, high-yield stocks appear to fall out of favor with investors and their prices decline (dividend yields rise); when real rates fall, net demand for high-yield stocks increases and their prices rise (dividend yields decline). There is no similar price effect on low-dividend yield stocks, which reinforces that the observed variation is due to shifts in the net demand for current income, not the result of broader changes in discount rates or risk appetite. The dividend yield of the highest-yielding 20% of stocks is about four-times more sensitive to changes in real interest rates than stocks in the bottom quintile.

Figure 2: Stock Valuations and Real Interest Rates

Figure 2 plots the sensitivity of stock valuations to real interest rates. Stocks are sorted into percentiles by dividend yield. The sensitivity is measured by a linear regression of the real two-year interest rate on the dividend yield of a stock at a given percentile. For example, every 1 percentage point decline in the two-year real yield generates a 0.2% decline in the dividend yield of a stock at the 80th percentile of the distribution. By contrast the yield of a stock at the 20th percentile would decline by just 0.05% in response to a 1% fall in two-year yields. Data come from the CRSP and Federal Reserve (H.15) and cover 1976-2015.



4. The Marginal Utility of Current Income in the Cross-Section

This tendency for high-yield stocks to appreciate in relative terms suggests that the marginal utility of current income may shift predictably through time in response to real interest rates. If a negative interest rate shock leads to states of the world where the marginal utility of current income is high, assets that appreciate in relative terms following a negative interest rate shock should earn lower returns on average, and *vice versa*. That is, a "reach for yield" factor must be priced in the cross-section of assets. Otherwise, the observed preference for yield may disappear in the presence of other factors known to explain returns, or low rates may create arbitrage opportunities for "smart" investors to sell (temporarily overvalued) high-yield stocks, buy (temporarily undervalued) low-yield stocks, and fund current income needs through asset sales.

Shifts in investor preferences for current yield differ from the intertemporal marginal rate of substitution, which relates expected returns to consumption growth. I am not seeking to determine the yield on a portfolio that makes an investor indifferent between saving and consumption. Instead I focus on the utility derived from that portion of the expected return that comes in the form of cash distributions. Retirees, pension funds, foundations, and other institutions may derive additional utility from current income because of the difficulty calibrating asset sales (portfolio withdrawals) to fund consumption in the presence of longevity, market, and liquidity risks.

To test whether a "reach for yield" factor is observed in the cross section, I perform ordinary least square regressions on the monthly returns of stocks sorted annually by dividend yield into three, five, and ten portfolios, in addition to a portfolio of common stocks that pay no dividend. Data come from CRSP (via Ken French). I assume the expected return of each portfolio is linearly dependent on four risk factors: the CAPM market risk premium, the Fama-French book-to-market factor or "value premium" (HML), the Fama-French small stock, or "size premium" (SMB), and a momentum factor.

To test whether interest rates provide any residual explanatory power, I add the monthly return on the two-year Treasury note as an independent variable. Interest rate data are obtained through the Federal Reserve (H.15). The gross monthly return is calculated using the reported yield each month R_t as $(1 - R_t)$^2/ $(1 - R_{t-1})$^2. The two-year is the most "policy-sensitive" Treasury yield, which is both influenced by Fed policy and contains macro information likely to influence such policy (Piazzesi, 2005). The two-year yield could be thought of as the "connective tissue" that links the money and bond markets and its variation is likely to be especially significant for portfolio allocation decisions.

I also include an independent variable that captures the portion of the monthly two-year Treasury return attributable to the change in the two-year term premium. Monthly estimates of the term premium are obtained through the Federal Reserve Bank of New York website as estimated by Adrian, Crump, and Moench (2013). The return from the term premium π is calculated in the same manner as the returns on the two-year yield $(1 - \pi_t)$^2/$(1 - \pi_{t-1})$^2. Since unconventional policy aims to reduce the term premium, isolating the response of stock returns to variation in that premium may help to identify the impact of unconventional policy on asset prices.

Table 1 reports the results of the regression of the six factors on the monthly returns of four portfolios: (1) non-dividend paying stocks; (2) the lowest-yielding 30% of dividend-paying stocks; (3) the middle 40% of dividend-paying stocks; and (4) the highest-yielding 30% of dividend paying stocks. Tables 2 and 3 summarize the results of regressions of the same six factors regressed on the returns of five and ten portfolios of dividend-paying stocks, respectively, sorted by dividend yield. Finally, Table 4 reports the results from regressions of the same six factors on the returns of four long-short portfolios.

As shown in the Tables, the variation in interest rates influences the returns of high, low, and zero dividend yield portfolios to an economically and statistically significant degree. (A positive “interest rate beta” indicates that returns on the stock portfolio increase when interest rates fall, as the price of the two-year note rises as yields decline.) When controlling for other factors, a 100 basis point decline in two-year yields would be expected to increase returns by 0.76%, 0.63%, and 0.54% for portfolios of the highest-yielding 10%, 20%, and 30% of stocks, respectively. Just as significantly, the same 100bp decline in rates would be expected to *reduce* the monthly value-weighted return on the zero yield portfolio by 0.67%, and shave 0.65%, 0.46%, and 0.39% off of the returns of the portfolios of the lowest-yielding 10%, 20%, and 30% of stocks, respectively. These data provide clear support for the existence of a “reach for yield” factor that causes demand for high (low) yield assets to increase (decrease) when interest rates fall.

The Tables also reveal that yield does not depend on condition volatility. A portfolio’s market beta *declines* as dividend yield increases. The zero yield portfolio has a market beta of 1.2, while the highest yielding decile has a beta of just 0.7. Across the ten dividend portfolios, the correlation between the interest rate and the market beta is -0.94. Contrary to predictions of a “risk-taking” channel, a decline in rates in this context induces portfolio shifts that *reduce* systematic risk. Results in fixed income markets do not seem to be generalizable to broader allocation decisions.

Not surprisingly, no-and-low-yield stocks tend to be smaller (higher SMB beta) and more growth-oriented (lower HML beta). High-yield stocks tend to have a high loading on the value factor (HML) and the HML beta is nearly perfectly correlated with the interest rate beta across portfolios. It is no surprise that value stocks tend to be higher dividend payers, on average. These firms tend to have more assets-in-place and greater cash flows. What deserves attention is that the interest rate beta remains statistically significant in the presence of the value factor. The portion of high-yield stock returns unexplained by HML appears related to the “reach for yield” dynamic, as a decline in rates increases the relative price of value stocks that distribute more of their income.

While changes in the term premium only influence the returns on the highest-yielding portfolios, the returns on high-yield stocks are far more sensitive to variation in the term premium than to changes in the expected path for short-term interest rates. If the entire 100bp decline in two-year yields is attributable to a decline in the term premium, the return on the highest-yielding 10% of stocks would be expected to increase by 3.79%, nearly five-times larger than the baseline response of 0.76%. For the highest-yielding 20% of stocks, the expected response is 1.95% or three-times larger; and for the highest-yielding 30% of stocks the expected response is 1.26% or 2.3-times larger than expected for a decline in the two-year yield as a whole.

Table 1: Returns of Four Dividend Yield Portfolios

Table 1 reports the results of regressions of six factors on the monthly returns of four portfolios sorted annually by dividend yield. Data are monthly and come from the CRSP via Ken French and Federal Reserve (H.15) and cover 1976-2015. The gross monthly return is calculated using the reported yield each month R_t as $(1 - R_t)$^2/$(1 - R_{t-1})$^2. A positive "interest rate beta" indicates that returns on the stock portfolio increase when interest rates fall, as the price of the two-year note rises as yields decline. Parameters of interest significant at the 5% confidence interval are bolded; t-statistics are in parentheses.

	Portfolio			
	No Dividends	Lowest 30%	Middle 40%	Highest 30%
	Value-Weighted Portfolio			
Interest Rate Beta	***-0.31***	***-0.18***	0.12	***0.25***
	-(3.8)	***-(2.6)***	(1.8)	***(3.5)***
Term Premium Beta	-0.10	-0.15	0.15	***0.62***
	-(0.5)	-(0.8)	(0.8)	***(3.3)***
Market Beta	1.20	1.12	0.95	0.80
	(63.0)	(70.0)	(62.3)	(48.0)
SMB Beta	0.56	-0.04	-0.21	-0.18
	(19.3)	-(1.6)	-(9.2)	-(7.1)
HML Beta	-0.38	-0.04	0.19	0.50
	-(12.5)	-(1.6)	(8.0)	(19.0)
Mom Beta	-0.09	0.02	0.09	0.08
	-(4.1)	(0.8)	(5.2)	(4.2)
	Elasticity of Monthly Portfolio Return			
-100bp 2yr Yield	**-0.67%**	**-0.39%**	0.26%	**0.54%**
-100bp Term Premium	-0.21%	-0.30%	0.30%	**1.26%**
	Equal-Weighted Portfolio			
Interest Rate Beta	***-0.52***	-0.01	***0.15***	***0.38***
	-(4.3)	-(0.2)	***(2.3)***	***(5.7)***
Term Premium Beta	-0.03	0.35	***0.34***	***0.64***
	-(0.1)	(1.9)	***(2.0)***	***(3.7)***
Market Beta	1.01	0.98	0.84	0.69
	(37.0)	(60.4)	(56.8)	(45.5)
SMB Beta	1.22	0.54	0.47	0.42
	(29.3)	(22.0)	(20.6)	(18.1)
HML Beta	0.11	0.33	0.50	0.58
	(2.5)	(13.1)	(21.4)	(24.2)
Mom Beta	-0.11	0.10	0.13	0.09
	-(3.4)	(5.4)	(7.3)	(5.3)
	Elasticity of Monthly Portfolio Return			
-100bp 2yr Yield	**-1.10%**	-0.02%	**0.31%**	**0.81%**
-100bp Term Premium	-0.06%	0.70%	**0.70%**	**1.29%**

Table 2: Returns of Five Dividend Yield Portfolios

Table 2 reports the results of regressions of six factors on the monthly returns of five portfolios sorted annually by dividend yield. Data are monthly and come from the CRSP via Ken French and Federal Reserve (H.15) and cover 1976-2015. The gross monthly return is calculated using the reported yield each month R_t as $(1-R_t)^2/(1-R_{t-1})$^2. A positive "interest rate beta" indicates that returns on the stock portfolio increase when interest rates fall, as the price of the two-year note rises as yields decline. Parameters of interest significant at the 5% confidence interval are bolded; t-statistics are in parentheses.

	Quintile Portfolio				
	1	2	3	4	5
	Value-Weighted Portfolio				
Interest Rate Beta	***-0.21***	0.00	0.13	***0.14***	***0.30***
	-(2.7)	-(0.1)	(1.6)	***(2.0)***	***(3.2)***
Term Premium Beta	-0.16	0.02	0.12	0.21	***0.96***
	-(0.7)	(0.1)	(0.5)	(1.1)	***(3.9)***
Market Beta	1.15	1.04	0.95	0.91	0.77
	(63.5)	(56.6)	(49.9)	(56.5)	(35.7)
SMB Beta	0.02	-0.16	-0.23	-0.21	-0.14
	(0.8)	-(5.7)	-(8.1)	-(8.6)	-(4.2)
HML Beta	-0.08	0.08	0.18	0.35	0.60
	-(2.8)	(2.8)	(6.0)	(13.7)	(17.8)
Mom Beta	0.01	0.07	0.08	0.09	0.09
	(0.4)	(3.3)	(3.5)	(4.9)	(3.4)
	Elasticity of Monthly Portfolio Return				
-100bp 2yr Yield	***-0.46%***	-0.01%	0.29%	***0.30%***	***0.63%***
-100bp Term Premium	-0.31%	0.05%	0.24%	0.42%	***1.95%***
	Equal-Weighted Portfolio				
Interest Rate Beta	-0.06	0.08	***0.15***	***0.26***	***0.41***
	-(0.9)	(1.2)	***(2.2)***	***(3.9)***	***(5.4)***
Term Premium Beta	0.28	0.34	***0.39***	***0.34***	***0.82***
	(1.4)	(1.9)	***(2.2)***	***(1.9)***	***(4.1)***
Market Beta	1.01	0.91	0.85	0.76	0.67
	(58.7)	(57.4)	(55.6)	(48.3)	(38.0)
SMB Beta	0.55	0.50	0.47	0.44	0.40
	(21.0)	(20.7)	(20.2)	(18.6)	(15.1)
HML Beta	0.30	0.45	0.50	0.52	0.61
	(10.9)	(18.0)	(20.8)	(21.1)	(22.1)
Mom Beta	0.09	0.14	0.12	0.12	0.08
	(4.2)	(7.4)	(6.7)	(6.8)	(4.0)
	Elasticity of Monthly Portfolio Return				
-100bp 2yr Yield	-0.14%	0.18%	**0.31%**	**0.56%**	**0.88%**
-100bp Term Premium	0.56%	0.70%	**0.79%**	**0.68%**	**1.65%**

Table 3: Returns of Ten Dividend Yield Portfolios

Table 3 reports the results of regressions of six factors on the monthly returns of ten portfolios sorted annually by dividend yield. Data come from the CRSP via Ken French and Federal Reserve (H.15) and cover 1976-2015. The gross monthly return is calculated using the reported yield each month R_t as $(1 - R_t)$^2/ $(1 - R_{t-1})$^2. A positive "interest rate beta" indicates that returns on the stock portfolio increase when interest rates fall, as the price of the two-year note rises as yields decline. Parameters of interest significant at the 5% confidence interval are bolded; t-statistics are in parentheses.

	1	2	3	4	5	6	7	8	9	10
					Value-Weighted Portfolio					
Interest Rate Beta	***-0.30***	-0.11	-0.13	0.12	0.02	***0.19***	0.06	***0.20***	***0.28***	***0.35***
	-(3.1)	-(1.3)	-(1.3)	(1.3)	(.2)	***(2.1)***	(.7)	***(2.3)***	***(2.9)***	***(2.7)***
Term Premium Beta	-0.20	-0.11	-0.11	0.18	0.24	0.06	0.19	0.26	0.31	***1.87***
	-(.8)	-(.5)	-(.4)	(.7)	(.9)	(.3)	(.9)	(1.1)	(1.3)	***(5.3)***
Market Beta	1.20	1.09	1.08	0.99	1.01	0.92	0.97	0.86	0.81	0.70
	(53.2)	(53.9)	(48.7)	(46.9)	(42.8)	(43.9)	(50.4)	(44.1)	(36.7)	(22.9)
SMB Beta	0.04	0.01	-0.17	-0.14	-0.19	-0.25	-0.21	-0.21	-0.15	-0.12
	(1.1)	(.4)	-(5.0)	-(4.4)	-(5.4)	-(7.9)	-(7.3)	-(7.0)	-(4.5)	-(2.6)
HML Beta	-0.11	-0.02	0.05	0.13	0.24	0.18	0.35	0.37	0.51	0.75
	-(3.1)	-(.6)	(1.3)	(4.0)	(6.6)	(5.5)	(11.3)	(11.9)	(14.6)	(15.6)
Mom Beta	-0.01	0.04	0.02	0.11	0.08	0.06	0.11	0.08	0.07	0.11
	-(.3)	(1.6)	(.7)	(4.6)	(3.0)	(2.5)	(4.9)	(3.7)	(2.9)	(3.1)
					Elasticity of Monthly Portfolio Return					
-100bp 2yr Yield	**-0.65%**	-0.24%	-0.27%	0.25%	0.05%	**0.40%**	0.13%	**0.42%**	**0.59%**	**0.76%**
-100bp Term Prem	-0.41%	-0.22%	-0.22%	0.36%	0.49%	0.13%	0.38%	0.52%	0.64%	**3.79%**
					Equal-Weighted Portfolio					
Interest Rate Beta	***-0.17***	0.03	0.10	0.07	0.13	***0.16***	**0.20**	***0.33***	***0.33***	***0.52***
	-(2.0)	(.4)	(1.4)	(.9)	(1.8)	***(2.3)***	**(2.8)**	***(4.6)***	***(4.8)***	***(5.0)***
Term Premium Beta	0.26	0.24	***0.47***	0.21	***0.45***	0.34	0.35	0.33	***0.63***	***1.03***
	(1.2)	(1.2)	***(2.5)***	(1.1)	***(2.3)***	(1.8)	(1.9)	(1.7)	***(3.5)***	***(3.8)***
Market Beta	1.08	0.95	0.90	0.91	0.86	0.84	0.78	0.73	0.68	0.64
	(54.8)	(54.0)	(54.3)	(53.4)	(50.9)	(52.6)	(48.1)	(44.5)	(43.2)	(26.6)
SMB Beta	0.57	0.53	0.52	0.48	0.49	0.45	0.44	0.44	0.40	0.40
	(19.0)	(19.9)	(20.4)	(18.3)	(19.2)	(18.3)	(17.7)	(17.8)	(16.5)	(11.0)
HML Beta	0.26	0.33	0.41	0.49	0.50	0.50	0.51	0.52	0.59	0.63
	(8.6)	(11.9)	(15.5)	(18.1)	(18.7)	(20.0)	(20.1)	(20.2)	(23.7)	(16.7)
Mom Beta	0.07	0.10	0.14	0.14	0.12	0.12	0.13	0.12	0.10	0.06
	(2.9)	(4.8)	(6.9)	(6.9)	(5.9)	(6.6)	(6.7)	(6.2)	(5.5)	(2.1)
					Elasticity of Monthly Portfolio Return					
-100bp 2yr Yield	**-0.36%**	0.07%	0.21%	0.15%	0.28%	**0.34%**	0.43%	**0.70%**	**0.70%**	**1.11%**
-100bp Term Prem	0.54%	0.48%	**0.95%**	0.43%	**0.92%**	0.68%	0.70%	0.66%	**1.27%**	**2.09%**

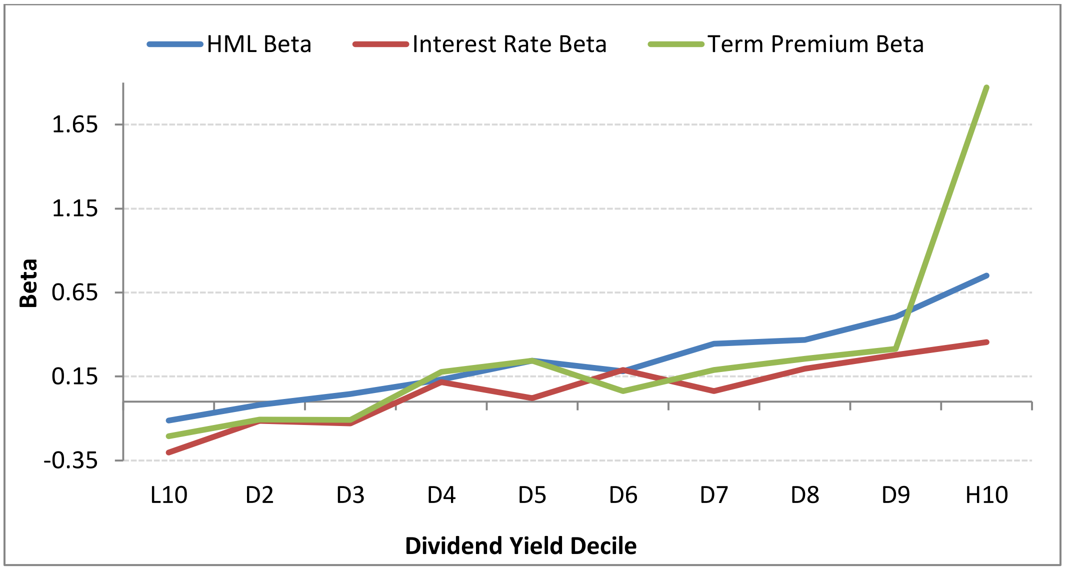
Table 4: Returns of Four Long-Short Portfolios

Table 4 reports the results of regressions of six factors on the monthly returns of four long-short portfolios sorted annually by dividend yield. Data come from the CRSP via Ken French and Federal Reserve (H.15) and cover 1976-2015. The monthly return on the portfolio is the difference between the return of the high-yield and low-yield portfolio. The gross monthly return is calculated using the reported yield each month R_t as $(1 - R_t)^2/(1 - R_{t-1})^2$. A positive "interest rate beta" indicates that returns on the stock portfolio increase when interest rates fall, as the price of the two-year note rises as yields decline. Parameters of interest significant at the 5% confidence interval are bolded; t-statistics are in parentheses.

	Long-Short Portfolio			
	Highest 30-Lowest 30	Highest 20-Lowest 20	Highest 10-Lowest 10	Highest 10-No Dividends
	Value-Weighted Portfolio			
Interest Rate Beta	***0.44***	***0.51***	***0.66***	***0.67***
	(3.8)	***(3.6)***	***(3.5)***	***(4.0)***
Term Premium Beta	***0.77***	***1.12***	***2.08***	***1.97***
	(2.6)	***(3.0)***	***(4.2)***	***(4.5)***
Market Beta	-0.32	-0.38	-0.50	-0.50
	-(12.2)	-(11.7)	-(11.7)	-(13.1)
SMB Beta	-0.14	-0.16	-0.16	-0.68
	-(3.6)	-(3.2)	-(2.4)	-(11.7)
HML Beta	0.54	0.68	0.86	1.13
	(13.1)	(13.3)	(12.8)	18.66
Mom Beta	0.07	0.08	0.12	(0.2)
	(2.2)	(2.1)	(2.4)	4.54
	Elasticity of Monthly Portfolio Return			
-100bp 2yr Yield	**0.93%**	**1.09%**	**1.40%**	**1.42%**
-100bp Term Premium	**1.56%**	**2.27%**	**4.20%**	**3.99%**
	Equal-Weighted Portfolio			
Interest Rate Beta	***0.39***	***0.48***	***0.69***	***1.04***
	(4.9)	***(4.7)***	***(5.1)***	***(6.7)***
Term Premium Beta	0.29	***0.54***	***0.77***	***1.06***
	(1.4)	***(2.0)***	***(2.2)***	***(2.6)***
Market Beta	-0.29	-0.35	-0.44	-0.37
	-(15.7)	-(15.0)	-(14.0)	-(10.4)
SMB Beta	-0.12	-0.15	-0.17	-0.82
	-(4.5)	-(4.3)	-(3.5)	-(15.1)
HML Beta	0.24	0.31	0.37	0.52
	(8.4)	(8.5)	(7.5)	(9.4)
Mom Beta	-0.01	0.00	-0.01	0.17
	-(0.4)	-(0.2)	-(0.2)	(4.0)
	Elasticity of Monthly Portfolio Return			
-100bp 2yr Yield	**0.83%**	**1.01%**	**1.48%**	**2.22%**
-100bp Term Premium	0.59%	**1.09%**	**1.55%**	**2.26%**

Figure 3: Return Sensitivity of Ten Dividend Yield Portfolios to Thee Factors of Interest

Figure 3 plots the sensitivity of ten stock portfolios to three factors: the Fama-French value factor (HML), the monthly return on the two-year Treasury note, and the monthly return on the two-year Treasury note attributable to a change in the term premium as estimated by ACM.



The results provide strong support for the proposition that the marginal utility of current income increases as interest rates fall and that the relevant price ratios reflect the marginal rate of substitution between states. When rates fall, returns on no-or-low yield stocks decline, after controlling for other factors, as investors sell these stocks, on the margin, to diversify into high-yield alternatives. As high-yield stocks possess greater value in states when the marginal utility of current income is high, average returns are lower, after controlling for other factors, on average. The "reach for yield" involves the substitution between current income and higher expected holding period returns.

The results also suggest that the "reach for yield" is amplified by unconventional monetary policy. Woodford (2012) argues that the term premium depends on investor expectations about the operative monetary policy feedback rule. If QE or forward guidance convinces investors that rates will remain lower for longer, the term premium naturally declines to reflect the diminished risk that incoming data will cause the central bank to tighten policy. The increased probability (at least in a risk-neutral sense) that rates will remain at lower levels increases the marginal utility of current income.

5. Implications of a Production-Based Asset Pricing Model

If investor preferences for current income impact asset prices, such preferences should also enter businesses' first order conditions for optimal investment demand (Cochrane, 1991). Specifically, "reach for yield" behavior should create incentives for businesses to increase distributions (dividends, share repurchases) at the expense of fixed investment because of the higher market value assigned to current income. The "catering" theory of Baker and Wurgler (2004) also anticipates that corporate managers would increase payouts if low rates increase investors' demand for distributions.

To derive a producer's first order conditions, I assume the arrival each period t of an endowment stream (net operating income) y_t and depreciated capital stock δk_{t-1}, which I assume is illiquid and cannot be sold. At the end of period t the firm can either reinvest the endowment stream in additional capital according to $k_t = I_t + \delta k_{t-1}$ or distribute the proceeds to shareholders d_t. In a dynamic setting, the firm wishes to choose an investment plan $\{I_t\}_{t=0}^{\infty}$ to maximize the discounted present value of all future dividends

$$Max\ E_0\left[\sum_{t=0}^{\infty} m_t d_t\right], \tag{1}$$

subject to

$$y_t = d_t + I_t, \tag{2}$$

and

$$y_t = f(k_t), \tag{3}$$

where m_t is the stochastic discount factor. The depreciated capital the firm inherits from $t-1$ is a state variable. The investment I_t chosen in period t together with income stream y_t are the control variables whose level determines the production in $t+1$. The intertemporal separability of the objective function and budget constraints allows (1) to be converted into a two-period problem where the discounted present value of dividends can be expressed in terms of a value function

$$V(k_t) = Max(d_t + E_t[m_{t+1}V(I_t + \delta k_t)]), \tag{4}$$

where E_t is the expectation conditional on all information available at time t. I assume returns are normally distributed and investors have standard preferences regarding risk and return. This yields stochastic discount factor

$$m_{t+1} = \beta_t \left(E_t[R_{t+1}] - \frac{1}{2}\sigma_t^2 \right), \tag{5}$$

with the expected gross return and variance of the firm's investment opportunities represented as $E_t[R_{t+1}]$ and σ_t^2, respectively. As addressed below, the discount factor $\beta_t \leq 1$ depends on time preference and the marginal utility of current income at time t. When setting $Y_t = 1$ for convenience, and multiplying I_t through (5), the firm's first order conditions become

$$\frac{\partial V(k_t)}{\partial I_t} = 1 = \beta_t(E_t[R_{t+1}] - I_t\sigma_t^2), \tag{6}$$

which is the arbitrage free equation $1 = E_t[m_{t+1}\, R_{t+1}]$, consistent with production-based asset pricing theory. Simplifying yields an Euler equation for investment I_t^* equal to

$$I_t^* = \frac{E_t[R_{t+1}]}{\sigma_t^2} - \frac{1}{\beta_t\sigma_t^2}. \tag{7}$$

According to (7), the optimal level of investment equals the difference between the expected risk-adjusted return on new investment and the reciprocal of the product of the discount factor and the conditional variance of the firm's investment return. If we assume that β_t is the reciprocal of the gross real interest rate ρ influenced by the central bank, (7) restates the standard neoclassical investment model

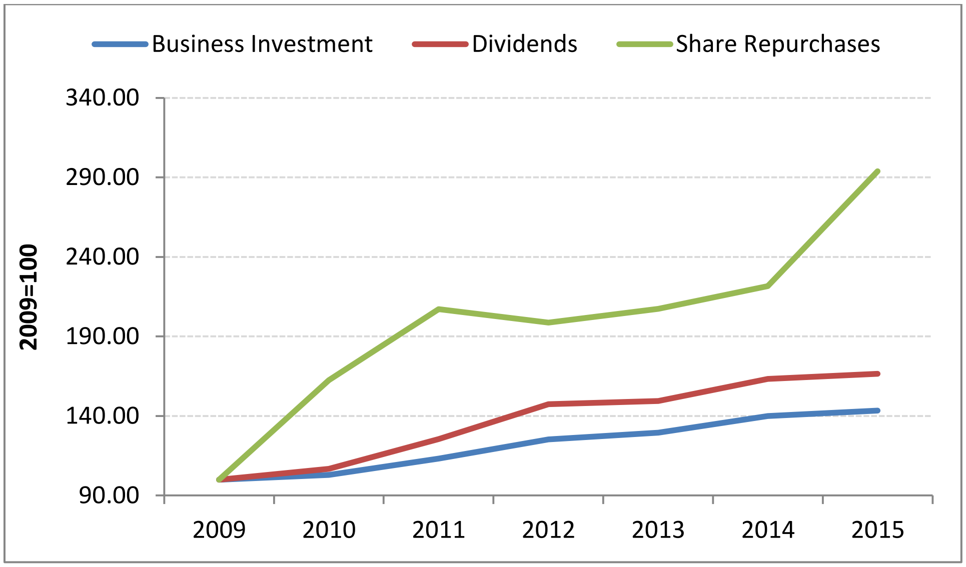
$$E_t[R_{t+1}] = \rho + I_t^*\sigma_t^2. \tag{8}$$

The firm continues to invest until marginal product $E_t[R_{t+1}]$ equals marginal cost $\rho + I_t^*\sigma_t^2$. Expected returns are a linear function of the quantity of risk I_t^* and the price of risk σ_t^2.

Despite a two percentage point fall in real yields ρ and a 55% decline in the VIX – a proxy for the conditional variance of returns σ_t^2 – investment has remained weak while distributions d_t have hit record levels (Figure 4). It may be that low inflation expectations and the effective lower bound on nominal rates combine to keep real rate ρ too high (Summers, 2014). Alternatively, $E_t[R_{t+1}]$ may have declined markedly due to slower potential GDP growth stemming from a negative productivity shock (Gordon, 2014). It is also possible that the conditional variance of stock returns differs from that of the returns on the underlying business capital, as posited by Spence and Warsh.

Figure 4: Scaled Uses of Nonfinancial Corporate Cash Flow, 2009-2015

Figure 4 plots the scaled uses of nonfinancial corporate cash flow as measured by F.103 of the Federal Reserve between 2009 and 2015. All data are in nominal terms, scaled to 100 as of June 30, 2009.



The results in the prior section suggest a fourth possibility: the variation in the marginal utility of current income enters the stochastic discount factor and therefore influences optimal investment policy.

Campbell and Cochrane (1999) introduce a "habit formation" model where investor utility depends on the difference between current consumption and a "subsistence level" that varies slowly through time. It may be that the marginal utility of current income that determines β_t depends on the level of real interest rates relative to some slow-moving "subsistence yield." Walter Bagehot's aphorism, "John Bull can stand many things but he cannot stand two per cent," captures savers' presumed refusal to accept low yields. As yields fall to subsistence levels, and are expected to remain there, the prices of high-yield assets adjust upward as investors "reach for yield."

To formalize this intuition, I assume that investor utility depends on the ratio of the real yield ρ_t relative to a subsistence yield X_t that may evolve slowly through time. I assume that allocation decisions depend not only on yields at time t, but also on expectations for yields over the entirety of the investment horizon $t+n$. The utility of current income d_t can be expressed as

$$U(d_t) = \frac{1}{1-\gamma}\left(\frac{\rho_t}{X_t}\frac{E_t\rho_{t+n}}{X_{t+n}}\right)^{1-\gamma}, \qquad (9)$$

where power parameter γ captures the sensitivity of utility to changes in yields relative to subsistence levels. If we assume, as in Hanson and Stein, that only share α of all investors derive utility from the portion of expected returns that comes in the form of current income, β_t in (7) can be expressed as

$$\beta_t = \delta\,(1-\alpha)^{\lambda}, \tag{10}$$

where δ is the subjective time discount factor and λ is the *marginal* utility of current income calculated from (9). With $r = 1/\delta$ the Euler equation for optimal investment becomes

$$I_t^* = \frac{E_t[R_{t+1}] - r(1-\alpha)^{-\lambda}}{\sigma_t^2}. \tag{11}$$

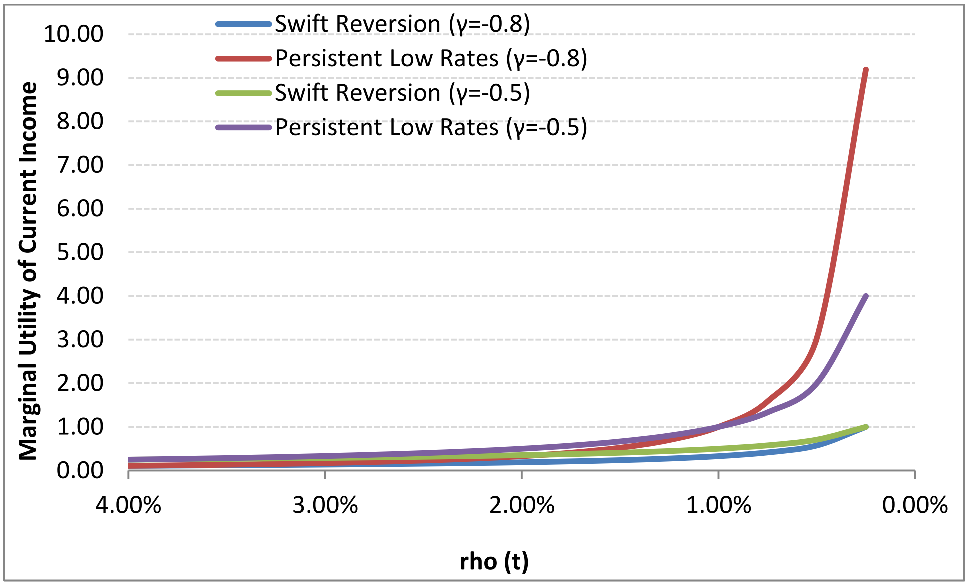
Figure 5 graphs estimates of the marginal utility of current income for two values of γ under two scenarios: (1) ρ_t declines but is expected to revert to its prior level as $t \to t+n$; and (2) ρ_t declines and the negative shock is expected to persist throughout the investment horizon. In both cases, marginal utility rises nonlinearly as yields decline, but the effect is much greater when the negative shock is expected to persist. In that scenario, the magnitude of the decline in marginal utility is squared when $\rho_t < X_t$. The model predicts an especially large increase in marginal utility when sizeable declines in rates interact with the expectation that rates will remain at depressed levels over the entirety of the investment horizon.

The model helps to explain why the returns of high-yield stocks are so sensitive to variation in the term premium. The term premium is the compensation investors earn for the risk that short-term rates may rise faster over the holding period than currently anticipated. Any policy that aims to suppress this risk *necessarily* involves convincing market participants that rates will remain lower for longer. A decline in the term premium provides information about the persistence of the rate shock, which generates the observed increase in the marginal utility of current income. For this reason, the graphic relationship between the two scenarios in Figure 5 closely resembles that of the "interest rate beta" and "term premium beta" in Figure 3.

Figure 6 graphs estimates of discount factor β_t from (10) for the same two scenarios and for two values of α. The graphs demonstrate the extent to which interest rate shock reduce the expected discounted value of fixed investment projects. The model predicts that as rates decline, the utility investors derive from illiquid capital declines nonlinearly relative to current income d_t.

Figure 5: Marginal Utility of Current Income Under Two Scenarios

Figure 5 plots the marginal utility of current income estimated from (9) under two scenarios: $E_t\rho_{t+n} = 4\%$ and $E_t\rho_{t+n} = \rho_t$ and two γ parameters: 0.8 and 0.5. In all cases $X_t = X_{t+n} = 1\%$.

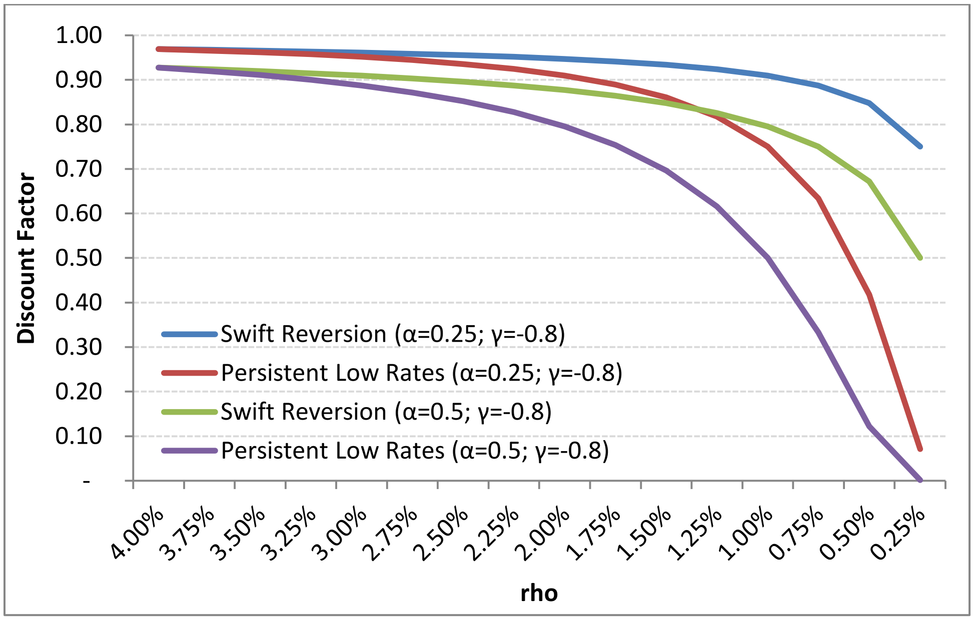


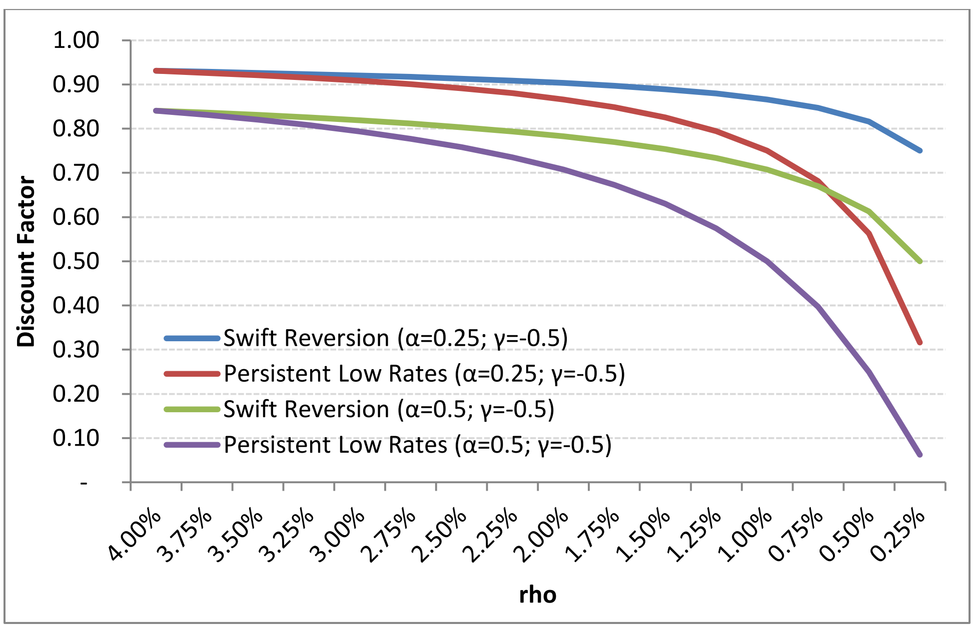
When $\alpha = 0.25, \gamma = 0.5$, and $2\% < \rho_t - X_t$, a 100bp decline in ρ_t generates a 0.8% increase in $r(1-\alpha)^{-\lambda}$, the reciprocal of β_t and the effective "hurdle rate" on investment introduced by investors' preference for current income. When the rate shock is permanent, the effective hurdle rate rises by 1.9%. As $\rho_t \to X_t$, the same 100bp decline increases the effective hurdle rate by 1.6% when rates revert and by 4.9% when low rates persist. The magnitude of the modeled interest rate response is similar to the results obtained in the empirical section. The predicted variation of the effective hurdle rate – the discount applied to illiquid capital relative to current income – generally tracks the long-short portfolio returns reported in Table 4.

In cases where $\rho_t < X_t$ and yield-oriented investors account for a large share of the total $(\alpha = 0.5)$, the model suggests that the effective hurdle rate on new investment would become nearly insurmountable. The model may have important implications for economies where societal aging has increased the share of investors dependent upon current income to fund consumption in retirement. In these cases, α and γ are likely to be highly correlated, which could render monetary policy ineffective, as investment demand would be expected to *fall* in response to further declines in rates.

Figure 6: Implied Discount Factor

Figure 6 Panels A and B plots the discount factor estimated from (10) under two scenarios: $E_t \rho_{t+n} = 4\%$ and $E_t \rho_{t+n} = \rho_t$; two γ parameter values: 0.8 and 0.5; and two α parameter values: 0.5 and 0.25. In all cases $X_t = X_{t+n} = 1\%$ and $\delta = 1$.





The close relationship between the interest rate and HML betas provides clues about the types of businesses likely to optimize investment in the manner akin to that predicted by the model. Value firms tend to have more assets-in-place, higher depreciation expenses, and greater operating cash flows to distribute to investors. As a result, their investment policy is likely to be more responsive to variation in the marginal utility of current income. By channeling increased distributions into share buybacks (which raise dividend yields by reducing shares outstanding), the firm retains greater flexibility to reduce shareholder distributions in the future when current income is less valued (Jagannathan, Stephens, and Weisbach, 2000). Growth businesses, by contrast, are generally unable to adjust investment policy in response to negative rate shocks despite the decline in market values.

6. Conclusion

The "reach for yield" is misunderstood. Low rates cause investors to rebalance portfolios towards assets that generate more *current income*. Portfolio rebalancing of this sort does not really concern substitution between "risk" and "return," but rather an increase in the marginal utility of current income relative to expected holding period returns. This is an important distinction because "yield" is not an increasing function of conditional volatility when the portfolio optimization problem is opened beyond fixed income. I demonstrate that systematic risk (market beta) actually decreases with yield in the cross-section of stocks. In this case, investors "reach for yield" by bidding up the price of low-beta stocks.

I demonstrate that the marginal utility of current income varies in response to interest rates and term premia: a 100bp decline in the two-year yield increases returns of the highest-yielding 10% of stocks by 0.76%; a 100bp decline in the term premium increases returns on this portfolio by 3.79%. When measured relative to returns on the lowest-yielding 10% of stocks, the increase in returns is 1.4% and 4.2%, respectively.

If business managers seek to maximize the value of their firm's stock price, they will respond to an increase in the relative value of current income by increasing shareholder distributions and reducing investment. I introduce a model where the effective hurdle rate on new investment increases in response to a negative interest rate shock. With plausible parameter values, the model's predictions are close to the observed increase in the relative returns on high-yield stocks. The sharp increase in shareholder distributions relative to investment since the global financial crisis may be partly explained by this phenomenon.

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