# Disagreement about Inflation and the Yield Curve*

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**Abstract**

We show that inflation disagreement, not just expected inflation, has an impact on nominal interest rates. In contrast to expected inflation, which mainly affects the wedge between real and nominal yields, inflation disagreement affects nominal yields predominantly through its impact on the real side of the economy. We show theoretically and empirically that inflation disagreement raises real and nominal yields and their volatilities. Inflation disagreement is positively related to consumers' cross-sectional consumption growth volatility and trading in fixed income securities. Calibrating our model to disagreement, inflation, and yields reproduces the economically significant impact of inflation disagreement on yield curves.

**Keywords:** Inflation disagreement, real and nominal yields, yield volatilities, cross-sectional consumption growth volatility, speculative trade

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# 1. Introduction

Inflation expectations affect consumption and investment decisions and are important in determining nominal interest rates. Likewise, central banks base decisions about short-term interest rate changes on their inflation views. Inflation expectations and the compensation for inflation risk are also important drivers of long-term borrowing costs for households, firms, and governments. However, not everyone has the same expectation about inflation as the early work of Mankiw, Reis, and Wolfers (2004) shows. For example in December 2015, the interquartile range of annual inflation expectations is 0.9% to 4.6% according to the Michigan Surveys of Consumers, and 1.87% to 2.25% according to the Survey of Professional Forecasters.

Inflation disagreement can lead to different investment and consumption decisions. For example, Malmendier and Nagel (2015) show that households who think that inflation will be high are more likely to borrow using fixed-rate mortgages and less likely to invest in long-term bonds.[1] Professional investors struggle with their inflation views too. PIMCO's Total Return Fund shunned nominal U.S. treasuries after the Great Recession to bet on increased inflation which never materialized for example.[2] Given the evidence that households and professionals have different views about inflation and the important role that inflation plays for fixed income investments, we consider an equilibrium model where investors have heterogeneous beliefs about inflation and test its implications for interest rates.

We show that inflation disagreement, and not just expected inflation, has an impact on nominal interest rates. The effect through which inflation disagreement operates is different than that for expected inflation. While expected inflation mainly impacts the wedge between real and nominal interest rates, inflation disagreement predominantly works through the real side of the economy. The mechanism is as follows. When investors disagree about inflation, they perceive different real returns on investments. Hence, they differ in their consumption-savings decisions because they take different positions in inflation-sensitive securities. For instance, consider two otherwise identical investors with different views about long-term inflation. In equilibrium, the investor who thinks inflation will be high will buy Treasury inflation protected securities or chose a fixed rate mortgage whereas an investors with the opposite view will buy nominal Treasury bonds or borrow at floating rates. If inflation turns out to be high, then the investor who thought inflation would be low loses wealth relative

[1] Piazzesi and Schneider (2012) show that inflation disagreement among younger and older households may reconcile their different investment decisions. Doepke and Schneider (2006) show that even moderate inflation episodes lead to sizable wealth redistributions of U.S. households.

[2] See, for example, thereformedbroker.com/2014/09/28/do-we-need-to-fire-pimco/.

to the other investor. Ex-ante, each investor expects to capture wealth from the other investor and, hence, they expect future consumption to be higher than without inflation disagreement. When the income effect dominates the substitution effect, then the desire to consume more today drives an increased demand for borrowing. If aggregate consumption cannot fully adjust to the increased consumption demand, then the real interest rate increases for markets to clear.

We formalize this intuition in a tractable model with transparent economic forces. Specifically, we assume complete markets in a pure exchange economy where two investors differ in their beliefs about the distribution of inflation, not just expected inflation.[3] There are no frictions and, thus, inflation has no effect on real quantities when there is no inflation disagreement. In this case, money is neutral and expected inflation has a well-known one-to-one effect on nominal yields. In contrast, inflation disagreement leads to a feedback into the real economy which increases the cross-sectional consumption volatility and the level and volatility of real yields.[4] We show that this feedback effect, induced by heterogeneity in investor's consumption and investment decisions driven by their different inflation views, unambiguously increases nominal interest rates even though the effects of inflation disagreement on the inflation risk premium are ambiguous.

Empirically, we find that inflation disagreement has a strong impact on the nominal yield curve. We use the Surveys of Consumers from the University of Michigan (MSC) and the Survey of Professional Forecasters (SPF) to compute one-year expected inflation disagreement measures for households and professionals, respectively. These surveys differ with respect to the sophistication of the constituency, the size of the survey, and the data frequency; thus, they provide complementary support for our predictions. We show that there exists a statistically and economically positive relation between inflation disagreement and nominal yields across all maturities after controlling for expected inflation. For instance, an increase in disagreement of households/professionals by one standard deviation (1.9%/0.3%) raises the five-year nominal yield by 59%/38% of their standard deviations. Inflation disagreement remains economically and statistically significant after accounting for other theories or views about interest rates. Moreover, the volatilities of nominal yields increase with inflation disagreement and the coefficient estimates also have large economic significance.

Our empirical results show that inflation disagreement has a strong effect on nominal interest rates that is distinctly different from the effect of expected inflation. To empirically

[3] The economic mechanism that increases interest rates also works in a production economy with positive capital adjustment costs.

[4] If the substitution effect dominates the income effect, the real yield is decreasing with inflation disagreement.

test the channel through which inflation disagreement impacts nominal yields, we consider different proxies for the real yield and show that inflation disagreement has an economically and statistically positive effect on real yields.[5] For instance, using real yield data from Chernov and Mueller (2012), we find that an increase in disagreement of households/professionals by one standard deviation (1.6%/0.3%) raises the real five-year yield by 60%/38% of its standard deviation. In addition, consistent with our theory, real yield volatilities increase with inflation disagreement and the coefficient estimates also have large economic significance.

In our model, inflation disagreement affects yields because it leads to heterogeneity in consumption and investment decisions. To empirically test the economic channel through which inflation disagreement operates, we verify, using the Consumer Expenditure Survey (CEX), that there is indeed a positive relation between cross-sectional consumption growth volatility and inflation disagreement. We also show that inflation disagreement has a statistically positive effect on trading in nominal Treasury bonds, fixed income futures, and inflation swaps. These securities have a significant inflation exposure and, thus, investors may use them to directly trade on their inflation beliefs.[6] Moreover, this evidence alleviates the concern that inflation disagreement impacts yields because of its correlation with disagreement about other economic quantities such as GDP growth or earnings.[7] To conclude, the fact that inflation disagreement is positively related with the level and volatility of real yields, the cross-sectional consumption growth volatility, and trading in fixed income securities including inflation swaps makes it less likely that inflation disagreement does not operate through our economic channel and unambiguously raises nominal yields.

We derive theoretical predictions for interest rates without imposing restrictions on investors' beliefs about the distribution of future inflation which is a generalization to existing, typically tightly parameterized, disagreement models. For example, investors can have beliefs that differ by more than one parameter or even belong to different classes of distributions. In particular, disagreement about higher order moments of inflation, not just expected inflation, raises interest rates. To test this prediction, we use the probability distribution forecasts for one-year inflation rates from the SPF to calculate disagreement about the variance and skewness of inflation. We find that there is an economically and statistically positive relation between real and nominal yields and disagreement about the variance and skewness of inflation.

[5] We show in the Internet Appendix that inflation disagreement also has an economically and statistically positive effect on the break-even inflation rate and the inflation risk premium.

[6] Armantier, de Bruin, Topa, van der Klaauw, and Zafar (2015) show that consumers act on the inflation expectations they report in the MSC.

[7] We also show in the Internet Appendix that real and nominal yields and their volatilities are higher when inflation disagreement is high after controlling for disagreement about real GDP growth and earnings.

Consumers' preference to smooth consumption over time implies that interest rates are high when expected economic growth is high and thus a correlation between expected growth and inflation disagreement, if not properly accounted for, may lead to the incorrect inference that inflation disagreement affects interest rates. To address this concern, we construct different measures for expected economic growth and show that inflation disagreement remains statistically significant after controlling for expected growth and the mean and volatility of inflation. Similarly, interest rates are volatile when growth rates are volatile and thus we show that inflation disagreement remains statistically significant after controlling for the volatility of economic growth, in addition, to the mean and volatility of inflation.

A large literature in economics and finance uses inflation disagreement as a measure of inflation uncertainty, or more generally, economic uncertainty.[8] First, there is no clear theoretical link between disagreement and uncertainty and the empirical support for this assumption is mixed.[9] Second, the impact of uncertainty on yields is fundamentally different than that of disagreement.[10] While higher disagreement is associated with higher yields, higher uncertainty typically lowers yields through the precautionary savings channel. Nevertheless, to address the concern that economic uncertainty, not inflation disagreement, could be driving our results, we show that all our empirical findings are robust to controlling for inflation volatility. Moreover, we show that the impact of inflation disagreement on yields is robust to including five different measures of economic uncertainty (real consumption growth volatility, real GDP growth volatility, industrial production growth volatility, the Jurado, Ludvigson, and Ng (2015) Uncertainty Measure, and the Baker, Bloom, and Davis (2015) Uncertainty Measure).

In the final part of the paper, we show, by imposing more structure on our model, that it quantitatively matches our empirical results. Specifically, we consider two investors who disagree about the dynamics of expected inflation and are endowed with habit-forming preferences which helps to match asset pricing moments. The model admits closed-form solutions for bond prices, is rich enough to capture average yields and yield volatilities, and

[8]For example, Bloom (2009) and Wright (2011) use disagreement among forecasters as a measure of uncertainty and Ilut and Schneider (2014) and Branger, Schlag, and Thimme (2016) use disagreement as a measure of uncertainty aversion.

[9]Figure 17.1 in Zarnowitz (1992) shows simple examples of distributions where high and low disagreement is associated with either high or low uncertainty. While some papers empirically show that there is a very high correlation between inflation disagreement and measures of economic uncertainty which justifies the use of inflation disagreement as measure for economic uncertainty, other works argue that inflation disagreement is distinctly different from inflation uncertainty and other forms of economic uncertainty.

[10]Similarly, if one interprets forecast dispersion as uncertainty in Gao, Lu, Song, and Yan (2016), then the main predictions are exactly the opposite of the prediction based on disagreement which is inconsistent with that paper's empirical evidence.

generates upward sloping real and nominal yield curves. We calibrate the model to the data by matching the average and volatility of inflation disagreement and the mean and volatility of consensus inflation in the SPF. The calibrated model shows that inflation disagreement has a significant impact on real and nominal yields and their volatilities with a plausible risk premium and Sharpe ratio for inflation risk. Moreover, performing our main empirical tests on simulated data leads to statistical and economic significance of inflation disagreement that is consistent with the data.

For yields to increase with inflation disagreement as our empirical results show, the EIS has to be less than one as in a power utility model with risk aversion greater than one or in a habit model (see Abel (1990), Campbell and Cochrane (1999), and Chan and Kogan (2002)). This is opposite from the long-run risk literature (see Bansal, Kiku, and Yaron (2010) and the references therein) that assumes an EIS well above one. Although the empirical evidence on the EIS is mixed, the majority of estimates suggests an EIS less than one.[11] For instance, Havranek, Horvath, Irsova, and Rusnak (2015) consider 169 published studies that provide 2,735 estimates for the EIS for 104 countries and report an average EIS of 0.5; the average for the United States is 0.6. Recently, Gao, Lu, Song, and Yan (2016) study the role of macro disagreement in the cross-section of stock returns. They show that a stock with a high covariance with macro disagreement, i.e., a high disagreement-beta stock, commands a higher risk premium. Their mechanism is similar to ours as high macro disagreement is associated with higher perceived trading profits, and as long as the EIS is less than one, a high disagreement-beta stock also earns a high expected return.

Our paper relates to the literature on speculative trade with short-sale constraints. Miller (1977), Harrison and Kreps (1978), and Scheinkman and Xiong (2003) show that asset prices increase with disagreement as optimists hold the asset when pessimists are prohibited from shorting. Gallmeyer and Hollifield (2008) point out that short-sale constraints can have the opposite effect in a dynamic model with intermediate consumption. Our empirical evidence shows that inflation disagreement lowers bond prices, which is consistent with our frictionless model, but it does not rule out that constraints might mitigate or strengthen this effect. In concurrent work, Hong, Sraer, and Yu (2016) focus on the effects of short-sale constraints in the U.S. Treasury bond market and show that inflation disagreement lowers expected excess bond returns in the presence of short-sale constraints.

Our paper is also part of a growing literature that studies how disagreement impacts

[11] Thimme (2016) provides a review of the literature on the EIS and discusses several recent advances of the theory and highlights estimation challenges since the early, close to zero, EIS estimates by Hall (1988).

bond markets.[12] Xiong and Yan (2010) show that a moderate amount of heterogeneous expectations about inflation can quantitatively explain bond yield volatilities, the failure of the expectations hypothesis, and the predictability of the Cochrane and Piazzesi (2005) factor. Buraschi and Whelan (2013) use survey data about various macroeconomic quantities to study the effects of disagreement on yield curve properties. Giacoletti, Laursen, and Singleton (2015) study the impact of yield disagreement in a dynamic arbitrage-free term structure model. Our paper differs from all of these works as we derive novel theoretical predictions that we empirically test on quantities including real and nominal yield levels, their volatilities, and the cross-sectional consumption growth volatility. Another aspect of our work that differs from the literature is that we calibrate our model to disagreement data.

This paper is also part of the large literature on heterogeneous beliefs models that mainly focuses on disagreement about real quantities.[13] We focus on inflation disagreement because inflation views have a significant impact on the value of many widely held securities, such as nominal Treasury bonds, fixed/floating interest rate mortgages, and fixed income derivatives among others and hence strongly impact nominal interest rates. Our contribution to this literature is threefold. First, we provide novel predictions for the effects of inflation disagreement on interest rates. Second, our analysis is not limited to a tightly parameterized inflation disagreement model. Third, we provide a methodological contribution to the literature, that does not rely on continuous-time finance techniques and, hence, is accessible to a broader audience.

# 2. Theoretical Results

We present in this section a general model of inflation disagreement that generates testable predictions for interest rates.

Our model is a pure exchange economy with a single perishable consumption good. The time horizon $T'$ of the economy can be finite or infinite. Real prices are measured in units of the consumption good and nominal prices are quoted in dollars. Let $C_t$ denote the exogenous real aggregate consumption process and $\Pi_t$ the exogenous price process that converts real

[12]Other papers that empirically explore the role of inflation beliefs on the term structure include Ang, Bekaert, and Wei (2007), Adrian and Wu (2010), Chun (2011), and Chernov and Mueller (2012).

[13]See for example Harris and Raviv (1993), Detemple and Murthy (1994), Zapatero (1998), Basak (2000), Jouini and Napp (2006), Jouini and Napp (2007), Yan (2008), Gallmeyer and Hollifield (2008), Dumas, Kurshev, and Uppal (2009), Cvitanić, Jouini, Malamud, and Napp (2012), Chen, Joslin, and Tran (2010, 2012), Jouini and Napp (2007), and Bhamra and Uppal (2014). Basak (2005) provides a survey of this literature.

prices into nominal prices, that is, nominal consumption is $\Pi_t C_t$. The sample space $\Omega$ and the information set $\mathcal{F}_t$ on which we define all random variables and probability measures, in short beliefs, represent the uncertainty in the economy.

Two investors share a common subjective discount factor $\rho$, a Bernoulli utility function $u(C/H) = \frac{1}{1-\gamma}(C/H)^{1-\gamma}$ with $\gamma > 0$, and an exogenous habit process or, more generally, a preference shock $H_t$. Let $\mathbb{P}^i$ denote investor $i$'s belief about inflation $\Pi_t$, consumption $C_t$, and the preference shock $H_t$. The investors have the same information set $\mathcal{F}_t$ and agree on the events of $\mathcal{F}_t$ that cannot occur. Hence, there is no asymmetric information and the likelihood ratio defined as $\lambda_t \equiv \frac{d\mathbb{P}^2}{d\mathbb{P}^1}$ is strictly positive and finite.

Both investors trade a complete set of Arrow-Debreu (AD) securities. There is a unique equilibrium AD pricing functional that both investors agree on and that will be determined in Proposition 1. Let $\xi_t^i$ denote the state price density that represents the AD pricing functional under the probability measure $\mathbb{P}^i$ and $\mathbb{E}^i$ the expectation under $\mathbb{P}^i$. Each investor chooses a consumption process $C_t^i$ to maximize

$$\mathbb{E}^i\left[\sum_{t=0}^{T'} e^{-\rho t} u\left(\frac{C_t^i}{H_t}\right)\right] \qquad \text{s.t.} \qquad \mathbb{E}^i\left[\sum_{t=0}^{T'} \xi_t^i C_t^i\right] \leq w_0^i, \tag{2.1}$$

where $w_0^i$ denotes initial wealth of investor $i$.[14] If time is continuous, then replace the sums in equation (2.1) with integrals.

To focus on inflation disagreement, we make the following assumption.

**Assumption 1.** *There is no disagreement about the distribution of consumption and the preference shock, that is, investors have identical joint distributions of $\frac{C_T}{C_t}$ and $\frac{H_T}{H_t}$ conditional on $\mathcal{F}_t$, for all, $t < T \leq T'$.*

Assumption 1 rules out any effects of disagreement about real quantities on yields and their volatilities. However, it allows for disagreement about higher order moments of inflation, not just expected inflation, and it allows for disagreement about the correlation of inflation and consumption. We formalize the implications of Assumption 1 in the next definition.

**Definition 1** (Inflation Disagreement)**.** *Assumption 1 implies that any disagreement is about inflation and not consumption growth or preference shocks. There is no disagreement if $\lambda_t = 1$ for all $t$. There is inflation disagreement if $\lambda_t \neq 1$ for some $t$.*

[14]Investors are either endowed with shares of a claim on aggregate consumption or with a fraction of the aggregate consumption process.

We determine the equilibrium consumption allocations $C_t^1$ and $C_t^2$ and state price densities $\xi_t^1$ and $\xi_t^2$ in the next proposition.

**Proposition 1** (Consumption Allocations and State Price Densities)**.** *Optimal consumption allocations are* $C_t^1 = f(\lambda_t)C_t$ *and* $C_t^2 = (1 - f(\lambda_t))C_t$ *with*

$$f(\lambda_t) = \frac{1}{1 + (y\lambda_t)^{\frac{1}{\gamma}}}, \tag{2.2}$$

*where* $y = \frac{y^2}{y^1}$ *and* $y^i$ *is the constant Lagrange multiplier from the static budget constraint given in equation (2.1). The state price densities are*

$$\xi_t^1 = (y^1)^{-1} e^{-\rho t} C_t^{-\gamma} H_t^{\gamma-1} f(\lambda_t)^{-\gamma}, \qquad \xi_t^2 = (y^2)^{-1} e^{-\rho t} C_t^{-\gamma} H_t^{\gamma-1} (1 - f(\lambda_t))^{-\gamma}. \tag{2.3}$$

The likelihood ratio $\lambda_t$ summarizes the impact of inflation disagreement on the consumption allocations and state prices. To derive the equilibrium in Proposition 1, we do not impose any restrictions on the likelihood ratio $\lambda_t$. It can be driven by a Brownian motion or a Poisson process where only one of the investors will survive in the long run. It can also be driven by a bounded martingale to guarantee the survival of all investors in the long run.[15]

**Example 1. Edgeworth Box:** *Consider an economy with two dates. Let the subjective discount factor be zero and normalize aggregate consumption and the habit or preference shock to one. The price level today is normalized to one and the price level tomorrow is either* $\Pi_u$ *or* $\Pi_d$*. There are two investors with different beliefs* $\mathbb{P}^i = (p^i, 1-p^i)$*. The likelihood ratio* $\lambda$ *equals* $\frac{p^2}{p^1}$ *with probability* $p^1$ *and* $\frac{1-p^2}{1-p^1}$ *with probability* $1 - p^1$*. Define the inflation disagreement parameter as* $\Delta = \frac{p^2 - p^1}{p_1}$*.*[16] *The baseline parameters for the Edgeworth box example are* $p^1 = 0.4, p^2 = 0.6, \Pi_u = 1.25,$ *and* $\Pi_d = 0.9$*.*

*Since there is no uncertainty about consumption in this example, full insurance is Pareto efficient if there is no disagreement about inflation* ($\lambda_u = \lambda_d = 1$)*. Hence, each investor consumes the same share of consumption in the high and low inflation state in equilibrium. This is no longer true when investors disagree about inflation. For instance, if the first investor thinks that the low inflation state is more likely, then she consumes a larger fraction of consumption in this state because* $\lambda_u > \lambda_d$ *and, thus,* $f_u < f_d$*. Therefore, full insurance is no longer an equilibrium and inflation disagreement affects state prices.*

[15] See Basak (2005) and the references therein for a discussion of heterogenous beliefs models when the likelihood ratio is driven by Brownian motions and there is effectively only disagreement about means. For details on investors' survival in heterogenous beliefs models see Fedyk, Heyerdahl-Larsen, and Walden (2013) and the references therein.

[16] We divide by $p_1$ to make the inflation disagreement parameter comparable across examples.

We consider two additional examples, where the economy is dynamic and the likelihood ratio is unbounded, to illustrate the generality of our results. In both examples, the consumption and habit process are normalized to one. The three examples allow us to focus on how inflation disagreement impacts real and nominal bonds because $\xi_t^1 = \xi_t^2 = 1$ if there is no inflation disagreement.

**Example 2. Geometric Brownian Motion:** *Consider a continuous-time economy in which the price level $\Pi_t$ follows a geometric Brownian motion and two investors disagree on the expected inflation rate. The dynamics of the price level are*

$$d\Pi_t = x^i \Pi_t \, dt + \sigma_\Pi \Pi_t \, dz_t^i, \tag{2.4}$$

*where $x^i$ denotes the expected inflation rate and $z_t^i$ denotes the perceived nominal shock of investor $i$. The dynamics of the likelihood ratio $\lambda_t$ are*

$$d\lambda_t = \Delta \lambda_t \, dz_t^1, \qquad \Delta = \frac{x^2 - x^1}{\sigma_\Pi}. \tag{2.5}$$

*The baseline parameters for the GBM example are $\sigma_\Pi = 2\%$, $x^1 = 1.5\%$, and $x^2 = 2.5\%$.*

**Example 3. Poisson Process:** *Consider a continuous-time economy in which the dynamics of the price level are*

$$d\Pi_t = x \Pi_{t-} \, dt + \theta \Pi_{t-} dN_{t-}^i, \tag{2.6}$$

*where $x$ denotes a constant and $\theta$ denotes the constant jump size with $\theta \neq 0$ and $\theta > -1$. The two investors agree on the jump times of the Poisson process but disagree on the jump intensity $l^i$. Hence, they disagree on the expected inflation rate $x + \theta l^i$. The dynamics of the likelihood ratio $\lambda_t$ are*

$$d\lambda_t = \Delta \lambda_{t-} \left( dN_{t-}^1 - l^1 dt \right), \qquad \Delta = \frac{l^2 - l^1}{l^1}. \tag{2.7}$$

*The baseline parameters for the Poisson example are $x = 6\%, \theta = -10\%, l^1 = 12.5\%$, and $l^2 = 27.5\%$.*

The Edgeworth box example is simple and transparent and allows us to illustrate the effects of inflation disagreement without relying on continuous-time finance techniques. The GBM example, where (log) inflation rates are normally distributed with a constant mean and volatility, focuses on the effects of disagreement about expected inflation on consumption allocations and asset prices. The Poisson example illustrates how disagreement about expected inflation and higher-order moments of inflation affect consumption allocations and asset prices. The three examples also illustrate that we do not impose any restrictions on the likelihood ratio. Specifically, the likelihood ratio is a bounded martingale in the Edgeworth box example, a martingale with unbounded variation in the GBM example, and a martingale with finite variation in the Poisson example. We determine bond prices in all three examples in closed form (see the Internet Appendix).

## 2.1. Definitions

All bonds are default-free zero-coupon bonds, in zero-net supply, and are priced using the state price densities from Proposition 1. A nominal bond pays one dollar at maturity and its nominal price is $P_{t,T} = \mathbb{E}_t^i \left[ \frac{\xi_T^i}{\xi_t^i} \frac{\Pi_t}{\Pi_T} \right]$. A real bond pays one unit of the consumption good at maturity and its real price is $B_{t,T} = \mathbb{E}_t^i \left[ \frac{\xi_T^i}{\xi_t^i} \right]$. The continuously-compounded yields of a nominal and real bond maturing at $T$, where $T \in [t, T']$, are $y_{t,T}^P = -\frac{1}{T-t} \log(P_{t,T})$ and $y_{t,T}^B = -\frac{1}{T-t} \log(B_{t,T})$, respectively. The relation between the yields on a real and nominal bond with maturity $T$ is

$$y_{t,T}^P = y_{t,T}^B + \underbrace{\text{EINFL}_{t,T}^i + \text{IRP}_{t,T}^i}_{\text{BEIR}_{t,T}}, \qquad i = 1, 2, \tag{2.8}$$

where $\text{IRP}_{t,T}^i \equiv \frac{1}{T-t} \log\left(\mathbb{E}_t^i [\text{RX}_{t,T}]\right) = y_{t,T}^P - y_{t,T}^B - \text{EINFL}_{t,T}^i$ denotes the annualized log inflation risk premium and $\text{EINFL}_{t,T}^i \equiv -\frac{1}{T-t} \log\left(\mathbb{E}_t^i \left[\frac{\Pi_t}{\Pi_T}\right]\right)$ denotes the annualized expected log inflation rate perceived by investor $i = 1, 2$.[17] Note that investors agree on prices, so they agree on the break-even inflation rate denoted by $\text{BEIR}_{t,T} = y_{t,T}^P - y_{t,T}^B$. Hence, inflation disagreement affects the nominal yield through two channels: (i) the real yield and (ii) the break-even inflation rate. We discuss the two channels in the remainder of this section.

## 2.2. Real Yields and the Cross-Sectional Consumption Volatility

The next theorem shows how inflation disagreement affects the level and volatility of real yields.

[17] The real gross return on a nominal bond in excess of the real gross return on a real bond both maturing at $T$ is $\text{RX}_{t,T} = \frac{\Pi_t}{\Pi_T} e^{(y_{t,T}^P - y_{t,T}^B)(T-t)}$ and Jensen inequality implies that

$$\text{EINFL}_{t,T} = -\frac{1}{T-t} \log\left(\mathbb{E}_t\left[\frac{\Pi_t}{\Pi_T}\right]\right) \leq \frac{1}{T-t} \mathbb{E}_t\left[\log\left(\frac{\Pi_T}{\Pi_t}\right)\right] \leq \frac{1}{T-t} \log\left(\mathbb{E}_t\left[\frac{\Pi_T}{\Pi_t}\right]\right),$$

and, thus, $\text{IRP}_{t,T}$ is higher than the inflation risk premium implied by other measures for expected inflation.

**Theorem 1** (Real Yields)**.** *If Assumption 1 is satisfied, then*

1. *real yields and their volatilities do not depend on inflation disagreement if* $\gamma = 1$*,*
2. *real yields are higher with inflation disagreement if* $\gamma > 1$ *(the opposite is true if* $\gamma < 1$*), and*
3. *the volatility of real yields is higher with inflation disagreement if* $\gamma \neq 1$ *and* $\lambda_t$ *is independent of* $C_t$ *and* $H_t$*.*

Why are real yields higher with inflation disagreement if $\gamma > 1$ and lower if $\gamma < 1$? Intuitively, investors make different consumption and savings decisions based on their differing views about inflation. Both investors think they will capture consumption from the other investor in the future; hence, classical income and substitution effects impact the demand for consumption today. If $\gamma > 1$, then the real interest rate rises to counterbalance increased demand for borrowing. If $\gamma < 1$, then the real interest rate falls to counterbalance lowered demand for borrowing.[18] There is no effect on real yields if the income and substitution effects exactly offset ($\gamma = 1$), as in Xiong and Yan (2010).[19]

When investors make different consumption and savings decisions based on their differing views about inflation, then individual consumption growth should be more volatile. Formally, the cross-sectional consumption growth variance from time $t$ to $T$ is

$$\sigma^2_{\mathrm{CS}}(\lambda_t, \lambda_T) = \frac{1}{4}\left(\log\left(\frac{C^1_T}{C^1_t}\right) - \log\left(\frac{C^2_T}{C^2_t}\right)\right)^2 = \frac{1}{4\gamma^2}\left(\log\left(\frac{\lambda_T}{\lambda_t}\right)\right)^2. \tag{2.9}$$

There are no fluctuations in the cross-sectional consumption distribution when there is no disagreement ($\lambda_T = \lambda_t = 1$). Moreover, there is less variation in cross-sectional consumption allocations if investors are more risk averse because they trade less aggressively on their beliefs. Trading on beliefs not only increases the cross-sectional consumption growth volatility, but it also leads to more volatile real yields.

We generalize the real yield and cross-sectional consumption growth volatility results by defining a measure of inflation disagreement to study the effects of changes in inflation disagreement on real yield levels and the cross-sectional consumption growth volatility. Measuring disagreement is straightforward in all three examples because investors' beliefs belong

[18]See Epstein (1988) or Gallmeyer and Hollifield (2008) for additional details.

[19]If there is disagreement about real quantities, then real yields and their volatilities are affected by this disagreement even if $\gamma = 1$. We focus on inflation disagreement in this paper and hence we rule out disagreement about real quantities with Assumption 1.

to the same class of distributions and there is only disagreement about a single parameter. To measure inflation disagreement among investors more generally, we define it as relative entropy per year.[20] This measure allows us to study the effects of inflation disagreement on bond yields when investors have beliefs that differ by more than one parameter or do not even belong to the same class of distributions.

**Definition 2** (Inflation Disagreement Measure)**.** *Consider a belief structure $\mathcal{B}_{t,T} = (\mathbb{P}^1, \mathbb{P}^2)$ with the likelihood ratio $\lambda_u = \frac{d\mathbb{P}^2}{d\mathbb{P}^1} |_{\mathcal{F}_u}$ for all $t \leq u \leq T$. Define inflation disagreement as*

$$\mathcal{D}_{t,T} = -\frac{1}{T-t}\mathbb{E}_t^1\left[\log\left(\frac{\lambda_T}{\lambda_t}\right)\right]. \tag{2.10}$$

Inflation disagreement $\mathcal{D}_{t,T}$ is nonnegative. It is zero if and only if the two investors have the same belief, in which case $\lambda_t = \lambda_T = 1$. It is straightforward to show that the inflation disagreement measures strictly increases in the inflation disagreement parameter, $\Delta$, in all three examples and that it is zero if and only if $\Delta = 0$.

We show in the next theorem that all results of Theorem 1, except for the yield volatility result, generalize when we compare economies with differing levels of inflation disagreement (holding everything else fixed including $\gamma$ and $\rho$).

**Theorem 2.** *Adopt Assumption 1 and consider two economies $\mathcal{E} = (\mathcal{B}_{t,T}, f(\lambda_t))$ and $\mathcal{E}_\eta = \left(\mathcal{B}^\eta_{t_\eta,T_\eta}, f(\eta_{t_\eta})\right)$ with*

- *the same time horizon, that is, $\tau = T_\eta - t_\eta = T - t$,*
- *the same current consumption allocations, that is, $f_t = f(\lambda_t) = f(\eta_{t_\eta})$,*
- *the same distribution of real quantities, that is, the joint distribution of $\frac{C_{T_\eta}}{C_{t_\eta}}$ and $\frac{H_{T_\eta}}{H_{t_\eta}}$ conditional on $\mathcal{F}_{t_\eta}$ is equal to the joint distribution of $\frac{C_T}{C_t}$ and $\frac{H_T}{H_t}$ conditional on $\mathcal{F}_t$, and*
- *$\lambda_t$ second-order stochastically dominates $\eta_{t_\eta}$.*[21]

*Then, there is more inflation disagreement in economy $\mathcal{E}_\eta$ than in economy $\mathcal{E}$, that is, $\mathcal{D}^\eta_{t_\eta,t_\eta+\tau} \geq \mathcal{D}_{t,t+\tau}$, and*

[20]The relative entropy or Kullback-Leibler divergence is widely used in statistics and information theory to measure the difference between two probability distributions (see Kullback (1959)). While this measure is not symmetric, the results do not change if we compute the relative entropy with respect to the second investor. Similarly, all our results still follow if we consider other divergence measures suggested in the literature (see Csiszár and Shields (2004)).

[21]See Remark 2 in the Appendix for details.

1. *real yields are the same in both economies if $\gamma = 1$,*

2. *real yields are higher in economy $\mathcal{E}_\eta$ than in economy $\mathcal{E}$ if $\gamma > 1$ (the opposite is true if $\gamma < 1$), and*

3. *the expected cross-sectional consumption growth volatility is higher in economy $\mathcal{E}_\eta$ than in economy $\mathcal{E}$ if $\frac{\lambda_T}{\lambda_t}$ and $\varepsilon$ are independent.*

The concept of second-order stochastic dominance allows us to focus on one-dimensional decompositions of the conditional distribution of $\frac{\eta_{T_\eta}}{\eta_{t_\eta}}$. This one-dimensional multiplicative decomposition nevertheless covers a large class of stochastic processes.[22] Intuitively, one can think of $\eta_{T_\eta}$ as a noisy version of $\lambda_T$. For instance, $\lambda_t$ second-order stochastic dominates $\eta_t$ in all three examples if $\Delta_\eta \geq \Delta$ and, thus, real yields and the expected cross-sectional consumption growth volatility are increasing functions of inflation disagreement as shown in the first and second plot of Figure 1, respectively.

The third plot of Figure 1 shows that real yield volatility is also increasing in inflation disagreement. The black star and black diamond lines represent the Poisson example with $\gamma = 2$ and $\gamma = 0.5$, respectively. The green dash-dotted star and the green dash-dotted diamond lines represent the GBM example with $\gamma = 2$ and $\gamma = 0.5$, respectively. Real yield volatility in the GBM and Poisson example is higher for $\gamma = 0.5$ than for $\gamma = 2$ since the expected cross-sectional consumption growth volatility is decreasing with risk aversion.

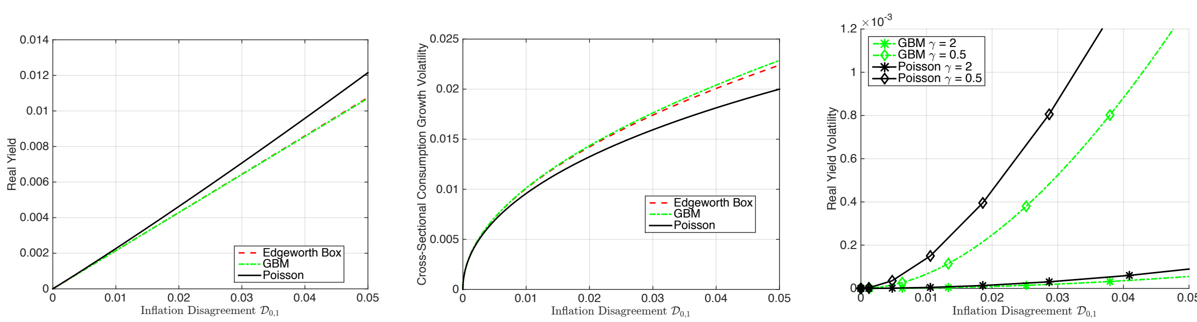


Figure 1: Real Yield and Consumption Volatility

The first plot shows that real yields are increasing in inflation disagreement $\mathcal{D}_{0,1}$ when $\gamma = 7$. The second and third plot show the expected cross-sectional consumption growth volatility and real yield volatility as strictly increasing function of inflation disagreement $\mathcal{D}_{0,1}$. The expected cross-sectional consumption growth volatility is decreasing in risk aversion and, thus, real yield volatility is lower with $\gamma = 2$ than with $\gamma = 0.5$.

[22] All results still follow if we consider additive mean-independent and comonotone decompositions of the conditional distribution of $\frac{\eta_{T_\eta}}{\eta_{t_\eta}}$.

## 2.3. Nominal Yields

We already know how expected inflation affects nominal yields and, thus, we fix the market view or belief about expected inflation to provide a meaningful comparison between nominal yields with and without inflation disagreement. Before we define and discuss the market view about the expected real value of one dollar, recall the decomposition of nominal bond yields:

$$y^P_{t,T} = y^B_{t,T} + \mathrm{BEIR}_{t,T} = y^B_{t,T} + \mathrm{EINFL}^i_{t,T} + \mathrm{IRP}^i_{t,T}, \qquad i = 1, 2. \tag{2.11}$$

Investors agree on the real yield and the break-even inflation rate, but they may have different beliefs about inflation and the compensation for inflation risk. If they disagree about the expected real value of one dollar, then by equation (2.11) they disagree on the inflation risk premium. For example, consider the case when the first investor predicts lower inflation than the second investor, that is, $\mathrm{EINFL}^1_{t,T} < \mathrm{EINFL}^2_{t,T}$. Subtracting the expected inflation rate from the agreed upon break-even inflation rate leads to a higher perceived compensation for inflation risk for the first investor, that is, $\mathrm{IRP}^1_{t,T} > \mathrm{IRP}^2_{t,T}$.[23]

If investors agree on the expected real value of one dollar, that is, $\mathrm{EINFL}^1_{t,T} = \mathrm{EINFL}^2_{t,T}$, then they agree on the inflation risk premium. Hence, the nominal yield is higher with inflation disagreement if the real yield plus the inflation risk premium is higher with inflation disagreement. However, if $\mathrm{EINFL}^1_{t,T} \neq \mathrm{EINFL}^2_{t,T}$, then inflation disagreement affects the nominal yield through three channels: (i) the real yield, (ii) the perceived inflation risk premium, and (iii) perceived expected inflation.

To study the effects of inflation disagreement, rather than the effects of an overall change in the expected real value of one dollar on the nominal yield, we would like to hold a "market view" about the expected real value of one dollar constant. However, it is not obvious which belief to hold constant when increasing inflation disagreement in a heterogeneous beliefs economy. We could consider a mean-preserving spread while keeping the average belief about the expected real value of one dollar constant to unambiguously increase inflation disagreement. Still, this does not take into account that the belief of a wealthier investor has a stronger impact on real and nominal yields than the belief of a poorer investor. Hence, to take into account that a wealthier investor has a larger impact on prices, we define the market view as the weighted average across each investor's expected real value of a dollar, where the weights are given by the fraction of output that each investor consumes $(f(\lambda_t), 1 - f(\lambda_t))$.

[23]See Section 1.5 of the Internet Appendix for a detailed discussion of the inflation risk premium.

**Definition 3** (Market View)**.** *Let $\mathbb{P}^0$ denote the market view that satisfies*

$$\mathbb{E}_t^0\left[\frac{\Pi_t}{\Pi_T}\right] = f(\lambda_t)\mathbb{E}_t^1\left[\frac{\Pi_t}{\Pi_T}\right] + (1 - f(\lambda_t))\mathbb{E}_t^2\left[\frac{\Pi_t}{\Pi_T}\right]. \tag{2.12}$$

In the remainder of this section, we hold the market view about inflation fixed when we increase inflation disagreement and thus any changes in the break-even inflation rate are due to changes in the inflation risk premium and not expected inflation. To simplify the analysis, we rule out any risk premia for inflation risk when there is no inflation disagreement and, thus, we make the following assumption.[24]

**Assumption 2.** *Inflation $\Pi_t$ is independent of consumption $C_t$ and the habit $H_t$.*

We show in the next theorem that inflation disagreement has qualitatively the same effect on nominal yields as on real yields even though the effects on the inflation risk premium are ambiguous.

**Theorem 3** (Nominal Yield)**.** *Fix the market view as in Definition 3 and suppose Assumptions 1 and 2 are satisfied, then*

1. *the break-even inflation rate and nominal yields do not depend on inflation disagreement if $\gamma = 1$ and*

2. *nominal yields are higher with inflation disagreement if $\gamma > 1$ (the opposite is true if $\gamma < 1$) even though the effects of inflation disagreement on the break-even inflation rate are ambiguous if $\gamma \neq 1$.*

The first plot of Figure 2 shows nominal one-year yields as a function of risk aversion $\gamma$. The red dashed circle, green dash-dotted circle, and black circle lines represent the Edgeworth box, GBM, and Poisson examples, respectively, when there is no inflation disagreement. The corresponding lines without circles represent the examples when there is inflation disagreement and the market view is fixed. The plot shows that in all three examples nominal yields are higher with inflation disagreement than without it if $\gamma > 1$ and lower if $\gamma < 1$.

We discuss the implications for nominal yields for different market views by means of the GBM example. Investors share aggregate consumption equally, that is, $f = 0.5$. The

[24]We relax this assumption in the appendix at the cost of an additional restriction on the perceived covariances between $\frac{\Pi_t}{\Pi_T}$ and $\frac{\xi_T^0}{\xi_t^0}$ when defining the market view (see Definition 4 of the modified market view).

expected inflation rate is two percent $\bar{x} = 2\%$, if there is no inflation disagreement in which case the nominal yield is 1.96% (green dash-dotted circle line). We consider three different cases with inflation disagreement: (i) baseline with $x^1 = 1.5\%$ and $x^2 = 2.5\%$ (green dash-dotted line), (ii) $x^1 = 1\%$ and $x^2 = 2\%$ (green dash-dotted plus line), and (iii) $x^1 = 2\%$ and $x^2 = 3\%$ (green dash-dotted cross line). In all three cases the inflation disagreement parameter, $\Delta$, is the same but the market view is different. The consumption share weighted-average belief in the first case is approximately 2% and, thus, the market view is the same with and without inflation disagreement.[25] If the consumption share weighted-average belief is below 2%, then inflation disagreement lowers nominal yields if $\gamma < 1$, but does not always increase nominal yields if $\gamma > 1$. Intuitively, inflation disagreement pushes up real yields, but lowers the expected inflation rate. If the second effect dominates the first, then nominal yields are lower than in the no disagreement economy. The intuition is similar for the third case.

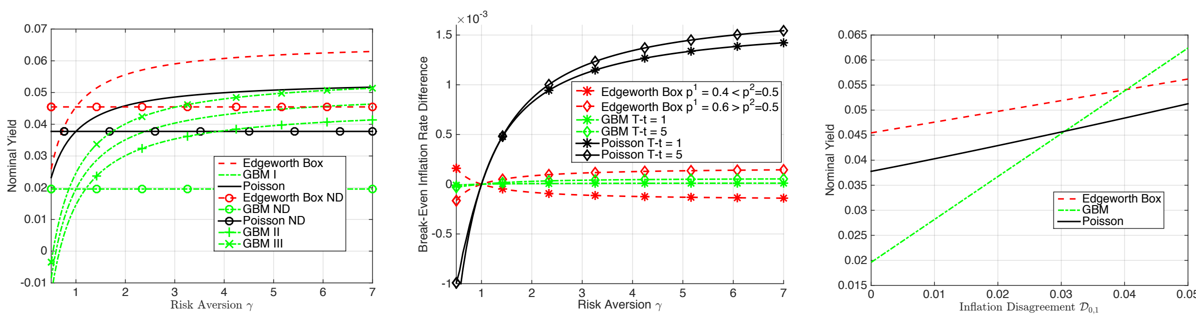


Figure 2: Nominal Yield and Break-Even Inflation

The first and third plot show the nominal yield as strictly increasing function of risk aversion $\gamma$ and inflation disagreement $\mathcal{D}_{0,1}$, respectively. In the first plot nominal yields are higher (lower) with than without inflation disagreement when $\gamma \geq (\leq) 1$ except for the cases GBM II and III, where the market view is not fixed. The left plot shows the difference between the break-even inflation rate in an economy with and without disagreement as a function of risk aversion $\gamma$. If $\gamma \geq 1$, then the break-even inflation rate is higher with disagreement in the GBM, Poisson, and second Edgeworth box examples. The opposite is true in the first Edgeworth box example.

**Remark 1** (Market View)**.** *There is more than one belief in economies with disagreement and thus the concept of a single market view is essential to make sensible predictions for any effects of disagreement on yields, or asset prices more generally. Specifically, nominal yields rise when the market view about the expected real value of one dollar is fixed or increases with inflation disagreement ($\gamma > 1$). The effect of inflation disagreement needs to outweigh any*

[25] In this example, we have that $0.5e^{-1.5\%} + 0.5e^{-2.5\%} \approx e^{-2\%}$.

*decrease in the market view in order for nominal yields to go up with inflation disagreement. Inflation has no effect on real yields when there is no inflation disagreement and hence inflation disagreement raises real yields regardless of its effect on the market view. This is in stark contrast to economies with disagreement about real quantities such as expected output growth. In this case, it is necessary to define a market view about expected output growth to unambiguously sign the effect of disagreement about output growth on real yields.*

The second plot of Figure 2 shows the difference between the break-even inflation rate in an economy with and without inflation disagreement as a function of risk aversion. If $\gamma = 1$, then the break-even inflation rate does not depend on inflation disagreement. Thus, the red dashed lines (Edgeworth Box example), the green dash-dotted lines (GBM example), and the black lines (Poisson example) all intersect at zero. If $\gamma > 1$, then the break-even inflation rate is higher with inflation disagreement in the GBM and Poisson examples. The quantitative effect is smaller for the short-end of the yield curve and it is larger in the Poisson example than the GBM example. In contrast to real yields, the effects of inflation disagreement on the break-even inflation rate are ambiguous. For instance, consider an Edgeworth box example where risk aversion is greater than one and the second investor thinks that the high and low inflation state are equally likely. If the first investor thinks that the high inflation state is less likely (red dashed star line), than the break-even inflation rate is lower with than without inflation disagreement. The opposite is true when the first investor thinks that the high inflation state is more likely (red dashed diamond line).

Nominal yields are always higher with inflation disagreement when $\gamma > 1$ even though the speculative trade induced by inflation disagreement may lead to a lower inflation risk premium and, thus, a lower break-even inflation rate because the market view about expected inflation is fixed. The third plot of Figure 2 shows that nominal yields in all three examples are strictly increasing in inflation disagreement $\mathcal{D}_{0,1}$ when $\gamma > 1$ and while keeping the consumption-share weighted expected value of one dollar fixed.

# 3. Empirical Evidence

To validate the theory, we use the Survey of Professional Forecasters (SPF) and the Michigan Surveys of Consumers (MSC) to empirically test whether disagreement about expected inflation affects nominal and real yields (Table 2), nominal and real yield volatilities (Table 3), the cross-sectional consumption growth volatility (Table 4), and trading on inflation disagreement (Table 4). The two surveys differ with respect to the sophistication of their constituencies, the survey size, and the data frequency. Thus, they provide complementary support for our predictions.

## 3.1. Data

**Inflation Disagreement.** Disagreement about inflation, our main explanatory variable, is the cross-sectional standard deviation of one year ahead inflation forecasts abbreviated as DisInf. Disagreement of consumers is directly taken from the MSC database (Table 32: Expected Change in Prices During the Next Year) and disagreement of professionals is computed from their individual responses for the CPI Inflation Rate taken from the SPF database (series CPI).[26] The MSC inflation forecasts, conducted at a monthly frequency, are available since January 1978 while the SPF inflation forecasts, conducted at a quarterly frequency, are available since September 1981. The GDP deflator forecasts for the current and next calendar year are also available since September 1981.

**Yields.** The U.S. Treasury only began issuing TIPS in 1997, so we merge the implied real yields in Chernov and Mueller (2012), which are available at quarterly frequency from $Q3$-1971 to $Q4$-2002, with real yields on Treasury Inflation Protected Securities (TIPS) to build a longer time series of real bond yields. The available real yield maturities are 2, 3, 5, 7, and 10 years.[27] Monthly nominal Fama-Bliss discount bond yields are from CRSP.[28] The Fama-Bliss discount bond file contains yields with 1 to 5 year maturities with data going back to 1952, where we focus on the 1 and 5 year maturities. Lastly, from the real and the nominal yield series, we compute the time series of real and nominal yield volatilities by estimating a GARCH$(1, 1)$ model with an AR(1) mean equation. We use all available data in the GARCH estimation.

**Consumption and Industrial Production.** We calculate monthly cross-sectional consumption growth volatility, starting from April 1984, from consumption growth rates of consumers using data from the Consumer Expenditure Survey (CEX) of the Bureau of

[26]See www.philadelphiafed.org/research-and-data for a detailed description of the Survey of Professional Forecasters, which is conducted by the Federal Reserve Bank of Philadelphia. The website www.sca.isr.umich.edu/ contains detailed information regarding the Michigan Surveys of Consumers.

[27]The real yield data are available at personal.lse.ac.uk/muellerp/RealYieldAOT5.xls. The TIPS data are available from Gürkaynak, Sack, and Wright (2010). For 5, 7, and 10 year maturities, we use TIPS data from 2003 onwards. Given that ex ante real yields are not directly observable for most of the sample, but estimated using a term structure model, we show in the Internet Appendix that the results are robust to various alternative measures of ex ante real yields. For the 2 and 3 year maturity, we interpolate the rates for 2003 with cubic splines.

[28]The Fama-Bliss discount bond file is available from wrds-web.wharton.upenn.edu/wrds.

Labor Statistics.[29] For further information regarding the CEX data and how to construct consumption growth rates of households from the raw data, see Malloy, Moskowitz, and Vissing-Jorgensen (2009) and the references therein. We obtain aggregate quarterly real personal consumption expenditures per capita for non-durables and services from the US. Bureau of Economic Analysis and compute consumption growth rates as logarithmic changes starting in January 1947. We estimate a GARCH$(1,1)$ model with an ARMA$(1,1)$ mean equation using the whole sample, to obtain a time series of quarterly expected consumption growth and consumption growth volatility forecasts over multiple horizons. Consumption data is not available at the monthly frequency and, thus, we use industrial production growth rates instead. We obtain the industrial production index at the monthly frequency from FRED starting in January 1919.

**Trading on Inflation Disagreement.** We construct three measures for trading on inflation disagreement. First, we use the volatility of total Treasury volume scaled by outstanding Treasuries.[30] The trading volume data and the outstanding amount of Treasuries are available from the Securities Industry and Financial Markets Association (SIFMA) at a monthly frequency since January 2001.[31] To measure the volatility of trading in Treasuries, we estimate a GARCH$(1,1)$ model with a constant mean term. Second, we use the open interest in interest rate futures and scale it by the open interest of all financial futures to account for increased security trade over time. The open interest data for interest rate and financial futures are from the U.S. Commodity Futures Trading Commission (CFTC) at a monthly frequency since April 1986.[32] Third, we use de-trended log inflation swap notionals available at the monthly frequency since December 2005.[33] The monthly notional amounts correspond to averages of daily brokered inflation swap activity.

**Inflation.** We obtain quarterly and monthly CPI data from the Federal Reserve Economic Data to compute inflation rates as logarithmic changes starting in January 1947. We estimate a GARCH$(1,1)$ model with an ARMA$(1,1)$ mean equation using the whole sample to obtain a time series of monthly and quarterly expected inflation and inflation volatility forecasts over multiple horizons.

[29]We thank Jing Yu for advising us on the use of the CEX data including how to compute the cross-sectional consumption growth volatility.

[30]We follow Grossman and Zhou (1996), Longstaff and Wang (2013), and Ehling and Heyerdahl-Larsen (2016) to capture the intensity of trading by using the volatility of turnover because turnover is not defined in a frictionless economy.

[31]The data are from SIFMA's website at this link: www.sifma.org.

[32]CFTC data are available from www.cftc.gov.

[33]See Fleming and Sporn (2013) for a description of the data. We thank Michael Fleming for sharing the aggregated inflation swap notional data with us.

**Summary Statistics.** We conclude this subsection with summary statistics of all variables in Table 1 and a discussion of the main variables of interest, that is, inflation disagreement and real and nominal yields plotted in Figure 3. The blue solid line in Figure 3 shows inflation disagreement of consumers in the left plot and professionals in the right plot, respectively. There are three important takeaways. First, there is substantial inflation disagreement among consumers and professionals, that is, the average is 5.19% for MSC and 66*bp* for SPF. Second, inflation disagreement varies substantially over time, that is, the volatility is 1.58% for MSC and 34*bp* for SPF. Third, large and volatile inflation disagreement across consumers and professionals is not restricted to the Volker experiment of the early 1980s where interest rates were high and volatile.

Table 1: **Descriptive Statistics.** The table reports the mean (%), median (%), standard deviation (Std, (%)), and number of observations (N) of quarterly real yields with 2-year and 5-year maturities, SPF based inflation disagreements (DisInf), nominal yields with 2-year and 5-year maturities and monthly nominal yields with 2-year and 5-year maturities, MSC based inflation disagreements (DisInf), and CEX cross-sectional consumption growth volatility (CEX C) and income growth volatility (CEX I). Quarterly sample: $Q3$-1981 to $Q2$-2014. Monthly sample: January 1978 to June 2014.

| Quarterly: | Real Yields | | SPF | MSC | Nominal Yields | |
|---|---|---|---|---|---|---|
| | 2y | 5y | DisInf | DisInf | 2y | 5y |
| Mean | 1.93 | 2.26 | 0.66 | 5.19 | 5.16 | 5.81 |
| Median | 2.37 | 2.43 | 0.56 | 4.90 | 5.08 | 5.59 |
| Std | 1.98 | 1.59 | 0.34 | 1.58 | 3.42 | 3.22 |
| N | 132 | 132 | 132 | 132 | 132 | 132 |
| Monthly: | Nominal Yields | | | MSC | CEX C | CEX I |
| | 2y | 5y | | DisInf | | |
| Mean | 5.67 | 6.22 | | 5.54 | 36.67 | 89.81 |
| Median | 5.56 | 5.97 | | 5.20 | 36.60 | 90.15 |
| Std | 3.63 | 3.33 | | 1.95 | 2.22 | 17.78 |
| N | 438 | 438 | | 438 | 345 | 330 |

The red line in Figure 3 shows the nominal two-year yield adjusted for expected inflation in the left plot and the two-year real yield in the right plot. We plot two-year yields because there is no one-year real yield available. We subtract the annualized expected inflation rate based on an ARMA(1,1) model from the two-year nominal yield to account for the market view of expected inflation which always raises nominal yields. Figure 3 shows that the expected inflation-adjusted two-year nominal yield and the two-year real yield covaries significantly with inflation disagreement and this relation is not solely driven by the Volker experiment. In fact, the correlation between MSC inflation disagreement and the expected inflation-adjusted two-year nominal yield is 50% over the entire sample, while it is slightly higher at 53% since the start of the financial crisis in the fourth quarter of 2007. The SPF inflation disagreement correlation with the real interest rate tells a similar story. Over the entire sample, the correlation is 41%, while it is slightly higher at 54% since the start of the financial crisis.

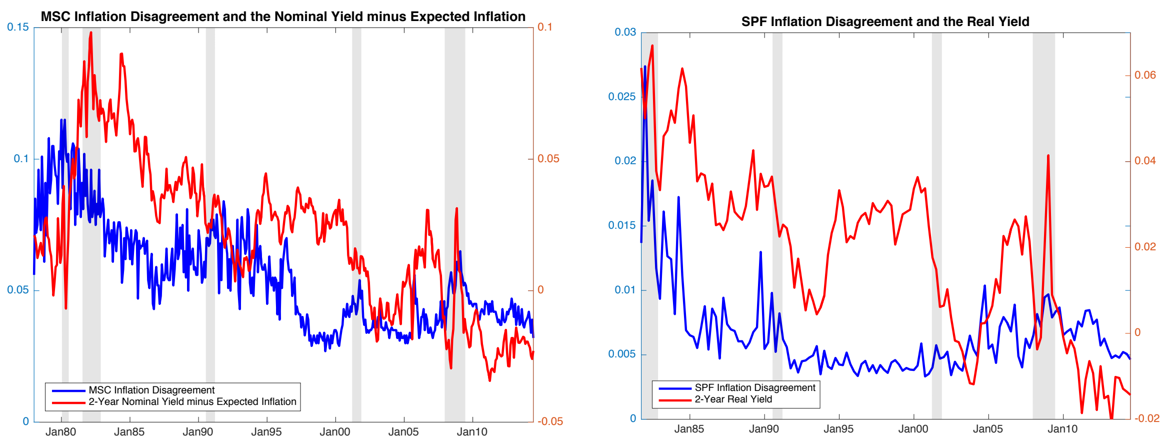


Figure 3: Inflation Disagreement and Interest Rates
The blue solid line shows the cross sectional standard deviation of one-year ahead inflation expectations from the MSC at the monthly frequency in the left plot and from the SPF at the quarterly frequency in the right plot. The correlation between both inflation disagreement measures is 43%. The red line shows the nominal two-year yield adjusted for expected inflation based on an ARMA(1,1) model in the left plot and the real yield based on Chernov and Mueller (2012) and TIPS in the right plot. The grey shaded areas are NBER recessions.

## 3.2. Nominal Yields

We show in this subsection that an increase in inflation disagreement raises nominal yields of all maturities when controlling for expected inflation. This is consistent with our theory which predicts that nominal yields increase with disagreement when the consumption weighted-average inflation belief, in short the market view, does not change with disagreement. Yields of different maturities are highly correlated and, thus, we only report results for the two- and five-year nominal yields in this section and defer the reader to the Internet Appendix (IA) for Fama-Bliss nominal yield results with maturities ranging from one to five years and Gürkaynak, Sack, and Wright (2007) nominal yield results with maturities ranging from one to fifteen years.

Univariate regressions of nominal yields on inflation disagreement (not reported) lead to statistically and economically positive coefficients. Theoretically, this increase in nominal yields could be due to an increase in the market view about inflation rather than an increase in disagreement. To rule this out, we need to control for the market view about inflation which, unfortunately, is unobservable. Hence, we use annualized expected inflation rates over the corresponding yield maturities based on an ARMA(1,1) model as a proxy for the unobservable market view.[34]

Table 2 shows the slope coefficients, t-statistics, the adjusted $R^2$'s, and the number of observations (N) for three multivariate regression models. We regress nominal two- and five-year yields on inflation disagreement (DisInf) based on the SPF (columns 2 and 3) and the MSC (columns 4 and 5). To facilitate a comparison between the SPF and the MSC, we standardize the regression coefficients in all tables. To correct for serial correlation in error terms, we compute Newey-West corrected t-statistics with 12 lags in all regressions. We control for expected inflation (ExpInf) in regression model 1, ExpInf and inflation volatility (SigInf) in regression model 2, and ExpInf, SigInf, and expected consumption or industrial production growth (ExpC or ExpIP) in regression model 3. The forecast horizons for ExpInf, SigInf, ExpC, and ExpIP correspond to the yield maturity in each regression. Specifically, we control for inflation volatility to address concerns that inflation disagreement raises nominal yields because of its positive correlation with inflation volatility.[35] We also control for the annualized estimator of expected consumption growth (ExpC) over the corresponding yield maturity based on an ARMA(1,1) time series model of quarterly consumption growth.[36] Controlling for expected consumption growth addresses the concern that interest rates are high because of high expected growth. Hence, if expected consumption growth and inflation disagreement are correlated, then omitting expected consumption growth when regressing real and nominal yields on inflation disagreement leads to a biased estimate for the coefficient on disagreement and perhaps to the incorrect inference that inflation disagreement affects interest rates. Nominal yields are available at the monthly frequency and, thus, we use monthly data starting in January 1978 for the MSC. In this case, we replace expected consumption growth with expected growth in industrial production (ExpIP) as consumption growth data is not available at the monthly frequency. Hence, the sample size using the MSC is 438 and it is 132 when using the SPF.

[34]In Section 4, we calibrate a dynamic model where investors disagree about the expected inflation rate to disagreement, inflation, and yield data and show that using expected inflation, estimated as an ARMA(1,1) model instead of the consumption share weighted-average belief, does not cause a bias in the estimated coefficient and t-statistic of inflation disagreement.

[35]We also normalize inflation disagreement by inflation volatility and show in Table IA.38 of the IA that inflation disagreement remains economically and statistically significant. For a detailed discussion of this measure, see Section 4.

[36]The popular long-run risk model assumes an ARMA(1,1) model for consumption/GDP growth.

Table 2: **Inflation Disagreement and Yields.** The table reports results from OLS regressions of two- and five-year nominal and real yields on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth (ExpC). Real consumption data is not available at the monthly frequency and, thus, we instead use expected industrial production growth (ExpIP) in nominal yield regressions with MSC inflation disagreement. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Quarterly sample: $Q3$-1981 to $Q2$-2014. Monthly sample: January 1978 to June 2014.

| | Nominal Yields | | | | Real Yields | | | |
|---|---|---|---|---|---|---|---|---|
| | SPF | | MSC | | SPF | | MSC | |
| Maturity | 2y | 5y | 2y | 5y | 2y | 5y | 2y | 5y |
| DisInf | 0.36 | 0.38 | 0.51 | 0.59 | 0.41 | 0.39 | 0.56 | 0.58 |
| t-stat | 3.60 | 3.88 | 4.39 | 5.05 | 3.48 | 3.23 | 3.04 | 3.29 |
| ExpInf | 0.45 | 0.42 | 0.30 | 0.20 | | | | |
| t-stat | 4.37 | 4.19 | 2.73 | 1.62 | | | | |
| adj. $R^2$ | 0.40 | 0.39 | 0.56 | 0.55 | 0.16 | 0.14 | 0.31 | 0.33 |
| N | 132 | 132 | 438 | 438 | 132 | 132 | 132 | 132 |
| DisInf | 0.37 | 0.40 | 0.54 | 0.64 | 0.29 | 0.28 | 0.45 | 0.49 |
| t-stat | 3.50 | 3.63 | 4.55 | 5.42 | 2.27 | 2.12 | 2.55 | 3.00 |
| ExpInf | 0.43 | 0.40 | 0.26 | 0.14 | 0.35 | 0.36 | 0.25 | 0.24 |
| t-stat | 3.07 | 2.83 | 2.41 | 1.24 | 2.19 | 2.03 | 1.98 | 1.87 |
| SigInf | -0.04 | -0.05 | -0.09 | -0.13 | 0.10 | 0.07 | 0.11 | 0.06 |
| t-stat | -0.40 | -0.47 | -1.31 | -1.97 | 0.71 | 0.48 | 1.04 | 0.62 |
| adj. $R^2$ | 0.39 | 0.39 | 0.57 | 0.56 | 0.24 | 0.24 | 0.34 | 0.36 |
| N | 132 | 132 | 438 | 438 | 132 | 132 | 132 | 132 |
| DisInf | 0.34 | 0.37 | 0.55 | 0.65 | 0.25 | 0.24 | 0.46 | 0.49 |
| t-stat | 3.54 | 3.95 | 4.75 | 5.57 | 2.21 | 2.18 | 3.25 | 4.23 |
| ExpC (ExpIP) | 0.37 | 0.38 | 0.10 | 0.09 | 0.41 | 0.45 | 0.44 | 0.48 |
| t-stat | 2.38 | 2.30 | 1.24 | 1.12 | 2.46 | 2.67 | 3.56 | 3.97 |
| ExpInf | 0.49 | 0.46 | 0.27 | 0.15 | 0.41 | 0.43 | 0.29 | 0.29 |
| t-stat | 3.29 | 3.07 | 2.53 | 1.34 | 2.43 | 2.29 | 2.21 | 2.21 |
| SigInf | 0.17 | 0.17 | -0.04 | -0.07 | 0.34 | 0.33 | 0.34 | 0.32 |
| t-stat | 0.92 | 0.87 | -0.49 | -1.09 | 1.42 | 1.37 | 2.04 | 2.01 |
| adj. $R^2$ | 0.49 | 0.49 | 0.57 | 0.57 | 0.36 | 0.39 | 0.49 | 0.54 |
| N | 132 | 132 | 438 | 438 | 132 | 132 | 132 | 132 |

The coefficients for disagreement are positive as well as economically and statistically significant for the SPF and MSC at all maturities, as shown in the top panel of Table 2. An increase in disagreement by one standard deviation for the SPF (0.34%) and the MSC (1.95%) raises the two-year nominal yield by 36% and 51% of its standard deviation (3.42% and 3.63%, respectively). The economic significance of inflation disagreement is large and comparable to that of expected inflation, which is 45% and 30% respectively across the two surveys. The second panel of Table 2 shows that the coefficient estimates for disagreement remain positive and statistically significant when we control for the mean and volatility of inflation.[37] All coefficient estimates for inflation volatility are negative and insignificant, except for the 5-year nominal yield in the MSC regression which is negative and significant at the 5% level. Finally, the bottom panel of Table 2 shows that the coefficient estimates for disagreement remain positive and statistically significant when we control for expected inflation, inflation volatility, and expected consumption growth.[38]

## 3.3. Real Yields

We show that an increase in inflation disagreement raises real yields at all maturities. This is consistent with our theoretical prediction when investors have power utility with risk aversion greater than one or habit forming preferences. Moreover, it confirms the economic channel through which nominal yields increase. All results presented in this section are based on the two- and five-year real yields from Chernov and Mueller (2012), but they are robust to other maturities and proxies for the real rate.[39]

Table 2 shows the slope coefficients, t-statistics, the adjusted $R^2$'s, and the number of observations (N) for a univariate and two multivariate regression models. We regress the two- and five-year real yields on disagreement about inflation (DisInf) based on the SPF (columns 6 and 7) and the MSC (columns 8 and 9). To facilitate a comparison between the SPF and the MSC, we use the sample period $Q3$-1981 to $Q2$-2014 and standardize the regression coefficients in all tables. To correct for serial correlation in error terms, we compute Newey-West corrected t-statistics with 12 lags in all regressions. The top panel of Table 2 shows the univariate regression results. The coefficient estimates for disagreement are positive and statistically significant for the SPF and the MSC. Inflation disagreement is also economically significant, that is, an increase in disagreement by one standard deviation of the SPF (0.34%) and the MSC (1.58%) raises the two-year real yield by 41% and 56% of its standard deviation (1.98%). The results are similar for the five-year real yield.

[37] The results are similar for other maturities as Table IA.6 for Fama-Bliss data and Tables IA.32 and IA.33 for Gurkaynack, Sack, and Wright data in the IA show.

[38] Tables IA.7–IA.13 in the IA show that inflation disagreement remains positive and statistically significant when controlling for other estimators of expected consumption growth.

[39] We report results for the two-, three-, five-, seven-, and ten-year real yields from Chernov and Mueller (2012) in Table IA.14 of the Internet Appendix (IA). Moreover, we subtract two different measures of expected inflation from nominal yields to compute two additional proxies for real yields and report the results in Tables IA.34 and IA.35 of the IA. Both tables show that inflation disagreement has an economically and statistically positive impact on real yields for all maturities.

Inflation disagreement may be significant in a univariate regression because it correlates with other variables that impact real yields. For instance, empirical evidence such as in Christiano, Eichenbaum, and Evans (1999) shows that money is not neutral and, thus, expected inflation and inflation volatility can affect real yields. As both of these quantities are positively correlated with inflation disagreement in our data, we control for expected inflation (ExpInf) and inflation volatility (SigInf) in regression model 2. The second panel of Table 2 shows that the coefficient estimates for disagreement remain positive and statistically significant when we control for the mean and volatility of inflation. Expected inflation is positively related to real yields and borderline statistically significant, whereas inflation volatility produces statistically insignificant coefficient estimates in all regressions. We control for expected inflation, inflation volatility, and expected consumption growth in the bottom panel of Table 2. The coefficient on expected consumption growth has the expected statistically positive sign. More importantly, the coefficient on inflation disagreement for consumers and professionals remains positive and statistically significant. The results for other maturities and when using expected GDP growth instead of expected consumption growth, shown in Tables IA.15 and IA.16 of the IA, are similar and thus omitted.

## 3.4. Real and Nominal Yield Volatilities

We now test whether real and nominal yield volatilities increase with inflation disagreement. Table 3 presents standardized coefficients and Newey-West adjusted t-statistics with 12 lags for the SPF in columns 2, 3, 6, and 7, and for the MSC in columns 4, 5, 8, and 9 for two multivariate regression models. Specifically, the top panel of Table 3 shows results when we control for expected inflation and inflation volatility. Like the real and nominal yield levels, the coefficients for disagreement are positive and economically significant for the SPF and the MSC for all maturities. Table 3 shows that an increase in disagreement by one standard deviation for the SPF (0.34%) and the MSC (1.58%) raises the two-year real yield volatility by 52% and 33% of its standard deviation (0.30%) and the two-year nominal yield volatility by 61% and 46% of its standard deviation (0.26%). The results are similar for five-year yields and the second regression model.

In the bottom panel of Table 3, we also control for the volatility of economic growth measured as the GARCH(1,1) estimate of consumption volatility. From the panel, we see that there is a significant positive relation between the volatility of real and nominal yields and inflation disagreement even after controlling for consumption volatility. The only exception is the volatility of the real two-year yield using MSC inflation disagreement, where the coefficient is still positive but the t-statistic is only 1.45. For nominal yields and MSC inflation disagreement, we control for SigIP, instead of SigC, as consumption data is not available at the monthly frequency.[40]

Table 3: **Inflation Disagreement and Real and Nominal Yield Volatilities.** The table reports results from OLS regressions of two- and five-year real and nominal yield volatilities on disagreement about inflation (DisInf), expected inflation (ExpInf), inflation volatility (SigInf), and consumption growth volatility (SigC). Real consumption data are not available at the monthly frequency and thus we instead use volatility of industrial production growth (SigIP) in nominal yield volatility regressions with MSC inflation disagreement. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Quarterly sample: $Q3$-1981 to $Q2$-2014. Monthly sample: January 1978 to June 2014.

| | Nominal Yields | | | | Real Yields | | | |
|---|---|---|---|---|---|---|---|---|
| | SPF | | MSC | | SPF | | MSC | |
| Maturity | 2y | 5y | 2y | 5y | 2y | 5y | 2y | 5y |
| DisInf | 0.61 | 0.64 | 0.46 | 0.51 | 0.52 | 0.62 | 0.33 | 0.42 |
| t-stat | 5.20 | 8.13 | 4.03 | 3.65 | 8.13 | 8.61 | 1.97 | 2.15 |
| ExpInf | 0.26 | 0.20 | 0.26 | 0.13 | 0.02 | 0.08 | 0.07 | 0.14 |
| t-stat | 2.74 | 2.31 | 1.44 | 0.68 | 0.20 | 0.94 | 0.61 | 1.20 |
| SigInf | 0.12 | 0.06 | 0.17 | 0.11 | 0.24 | 0.18 | 0.39 | 0.35 |
| t-stat | 1.21 | 0.81 | 2.26 | 1.45 | 2.17 | 1.84 | 2.87 | 2.66 |
| adj. R2 | 0.54 | 0.53 | 0.47 | 0.38 | 0.40 | 0.50 | 0.28 | 0.34 |
| N | 132 | 132 | 438 | 438 | 132 | 132 | 132 | 132 |
| DisInf | 0.49 | 0.53 | 0.45 | 0.41 | 0.45 | 0.54 | 0.17 | 0.26 |
| t-stat | 4.16 | 6.02 | 4.45 | 4.03 | 6.24 | 8.02 | 1.45 | 2.05 |
| SigC (SigIP) | 0.33 | 0.32 | 0.16 | 0.18 | 0.23 | 0.25 | 0.27 | 0.28 |
| t-stat | 2.40 | 2.23 | 1.73 | 1.74 | 1.56 | 1.70 | 1.54 | 1.60 |
| ExpInf | 0.23 | 0.17 | 0.28 | 0.27 | -0.00 | 0.06 | 0.09 | 0.15 |
| t-stat | 3.60 | 2.95 | 1.60 | 1.49 | -0.04 | 0.76 | 0.82 | 1.46 |
| SigInf | 0.00 | -0.06 | 0.09 | 0.06 | 0.16 | 0.10 | 0.30 | 0.26 |
| t-stat | 0.06 | -0.92 | 1.43 | 0.86 | 1.63 | 1.13 | 2.14 | 1.86 |
| adj. R2 | 0.61 | 0.60 | 0.54 | 0.48 | 0.43 | 0.54 | 0.31 | 0.38 |
| N | 132 | 132 | 438 | 438 | 132 | 132 | 132 | 132 |

[40] The results for all maturities in this case are shown in Table IA.23 in the IA. The results for all nominal and real yield maturities are shown in Tables IA.21 and IA.27 in the IA when controlling for the mean and volatility of inflation. Tables IA.22 and IA.28 in the IA show it when also controlling for the volatility of consumption growth.

## 3.5. Economic Channel

Testing for the economic channel through which disagreement affects yields, we find that inflation disagreement raises the cross-sectional consumption growth volatility. The top panel of Table 4 shows two regression specifications (columns 2 to 3). In the first specification, we regress the CEX cross-sectional consumption growth volatility on the MSC inflation disagreement and time-dummies that control for changes in the definition of food consumption and for missing data at the beginning of 1986 and 1996 due to changes in the household identification numbers. The second specification contains the CEX cross-sectional income growth volatility as a control. The coefficient estimates on inflation disagreement in both regressions are positive with t-statistics of 2.22 and 2.89, respectively. Adding expected inflation and the volatility of inflation as additional explanatory variables into both regressions, shown in the bottom panel of Table 4 (columns 2 to 3), produces slightly lower coefficient estimates with t-statistics of 1.94 and 2.29. In the regressions shown in Table 4, we lag DisInf by two months. We motivate lagging DisInf given the quarterly frequency of the CEX interviews for a household. Even if the survey participants adjust consumption contemporaneously with inflation beliefs, current innovations in consumption due to DisInf are reflected in the CEX the earliest within the same month and the latest with a two month lag.

To provide further evidence for our economic channel, we consider three different classes of securities for which we expect increased trading when inflation disagreement is high. First, inflation disagreement increases trading in nominal Treasury bonds. Column 4 in Table 4 shows a statistically positive relation between the MSC inflation disagreement and trading in Treasuries measured by the volatility of total Treasury volume scaled by outstanding Treasuries. The regressions differ in that in the bottom regression we add in ExpInf and SigInf as controls. The univariate regression produce a t-statistic of 2.33, while the multivariate regression produces a t-statistic of 3.78.

Second, inflation disagreement increases trading in interest rate futures. We use open interest in interest rate futures scaled by open interest in financial futures and present the evidence for this trading channel in column 5 of Table 4. The t-statistics for the regression coefficients on the MSC inflation disagreement are 2.60 (univariate) and 2.99 (multivariate using ExpInf and SigInf), respectively.

Third, inflation disagreement raises trading in inflation swaps. We measure inflation swap trading by detrending aggregated inflation notionals in both regressions. The univariate regression of inflation swap trading on the MSC DisInf produces a t-statistics of 4.35. The multivariate regression, shown in the bottom panel of Table 4, does not yield a statistically significant coefficient estimate, which is likely caused by multicollinearity.[41]

Table 4: **Cross-Sectional Consumption Growth Volatility and Trading.** The table reports OLS regression results. Dependent variables are cross-sectional consumption growth volatility, volatility of U.S. government bond trading volume, open interest of interest rate futures scaled by open interest in financial futures, and detrended inflation swap notional amounts. Explanatory variables are disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and CEX cross-sectional income growth volatility (SigInc). The CEX based regression contains a time-dummy and DisInf, ExpInf, and SigInf are lagged by two months. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Montly samples: April 1984 - December 2012, January 2001 - August 2013, April 1986 - December 2013, May 2005 - February 2012.

| | CEX Consumption Volatility I | CEX Consumption Volatility II | Volatility of Volume | Open Interest Ratio | Inflation Swaps |
|---|---|---|---|---|---|
| DisInf | 0.162 | 0.146 | 0.332 | 0.314 | 0.265 |
| t-stat | 2.22 | 2.89 | 2.33 | 2.60 | 4.35 |
| SigInc | | 0.303 | | | |
| t-stat | | 4.31 | | | |
| adj. $R^2$ | 0.37 | 0.49 | 0.10 | 0.10 | 0.06 |
| N | 345 | 330 | 151 | 333 | 70 |
| DisInf | 0.145 | 0.127 | 0.549 | 0.282 | 0.153 |
| t-stat | 1.94 | 2.29 | 3.78 | 2.99 | 1.34 |
| ExpInf | 0.036 | 0.068 | -0.356 | 0.080 | 0.080 |
| t-stat | 0.43 | 1.06 | -2.45 | 0.66 | 0.67 |
| SigInf | -0.159 | -0.069 | -0.577 | -0.402 | 0.228 |
| t-stat | -2.24 | -0.96 | -3.15 | -3.70 | 1.27 |
| SigInc | | 0.281 | | | |
| t-stat | | 3.92 | | | |
| adj. $R^2$ | 0.40 | 0.50 | 0.31 | 0.28 | 0.05 |
| N | 345 | 330 | 151 | 333 | 70 |

## 3.6. Additional Results and Robustness

We conduct several robustness checks of our empirical results that we summarize in this section. Due to space constraints, we report the results in the Internet Appendix (IA).

Section 3.2 and 3.3 illustrate that disagreement about expected inflation increases the nominal and real yields. Our theory in Section 2 also shows that real and nominal yields

[41] The regression produces a high F-statistic with an insignificant t-statistic for each variable.

increase when there is disagreement about other moments of inflation, not just the mean. To empirically test this prediction, we use the SPF to compute disagreement about the mean (DisInfMean), which serves as a robustness check for the results of Subsections 3.2 and 3.3, disagreement about the variance (DisInfVar), and disagreement about the skewness (DisInfSkew) of the one year inflation rate based on the probability forecasts for the GDP deflator. We discuss this in detail in Section 3 of the Internet Appendix where Table IA.2 shows that the coefficient on DisInfMean, DisInfVar, and DisInfSkew are positive and statistically significant in real and nominal yield regressions.

In a model with power utility, higher expected consumption growth leads to higher real yields. Hence, a possible concern is that inflation disagreement is high in times of high expected consumption growth. In Table 2, we control for expected consumption growth estimated as an ARMA(1,1) model. However, this might not be sufficient if expected consumption growth impacts inflation disagreement or vice versa. For instance, if aggregate consumption can adjust to increased consumption demand due to higher inflation disagreement, then investment drops, and consequently, expected consumption growth decreases. If the aggregate production function shows a decreasing marginal product of capital or there are investment adjustment costs, then both consumption and real yields change. To address this concern, we regress future quarterly consumption growth on current consumption growth, current disagreement, current inflation, and the instrumented current real yield (the current real yield lagged by one quarter). While past quarter's consumption growth is a strong predictor and the instrumented real interest rate is a weak predictor (significant at the 10% level), inflation disagreement does not predict future consumption growth. This mitigates the concern that the classical relation—high interest rates with high expected growth—holds in the data and inflation disagreement is significant in our yield regression because we did not control for an estimator of expected consumption growth that reflects its predictive relation.[42]

There are several empirical studies that use disagreement to proxy for economic uncertainty and, thus, one might be concerned that it is economic uncertainty and not disagreement that drives our results. For example, Bloom (2009) and Wright (2011) use disagreement among forecasters to measure uncertainty. Therefore, to address a possible omitted variable problem in our main regression specifications, we consider five different measures of economic uncertainty: i) real consumption growth volatility estimated by a GARCH(1,1) model (Table

[42]We discuss this concern in more detail in the IA where we consider four different predictive regressions for consumption growth and show in Tables IA.17, IA.18, IA.19, and IA.20, that inflation disagreement remains positive and statistically significant when controlling for the resulting estimators of expected consumption growth.

IA.45), ii) real GDP growth volatility estimated by a GARCH(1,1) model (Table IA.46), iii) industrial production growth volatility estimated by a GARCH(1,1) model (Table IA.47), iv) the Jurado, Ludvigson, and Ng (2015) Uncertainty Measure (Table IA.48), and v) the Baker, Bloom, and Davis (2015) Uncertainty Measure (Table IA.49). Inflation disagreement is still statistically and economically significant after controlling for each of the first four uncertainty measures. Baker, Bloom, and Davis (2015) use the SPF-based inflation disagreement to construct their uncertainty measure and, thus, it is not surprising that inflation disagreement is insignificant after controlling for it.

In addition to consumption growth volatility, we use other measures for the volatility of economic growth to address the concern that there is an omitted variable that drives both inflation disagreement and real and nominal yield volatilities. Tables IA.26 and IA.31 in the IA show that the coefficient on inflation disagreement for nominal and real yield volatilities is positive, but not always significant when controlling for the VXO, the old VIX.[43] The weaker results are not surprising as the VXO incorporates information about the volatility of the stochastic discount factor which in our model would lead to a high endogenous correlation between the VXO and inflation disagreement. Tables IA.25 and IA.30 in the IA show that inflation disagreement remains positive and statistically significant when controlling for the mean and volatility of consumption growth and inflation.

To address the concern that the real yields data of Chernov and Mueller (2012) are measured with error that may correlate with inflation disagreement, we show that our results remain robust when we consider two alternative proxies for real yields constructed by subtracting two different measures of expected inflation from nominal yields. We consider an ARMA(1,1) expected inflation estimate in Table IA.34 and a VAR expected inflation estimate in Table IA.35. Specifically, expected inflation in Table IA.35 is predicted by regressing future inflation over the horizon of each bond on current inflation and yields with maturities ranging from one to five years.

The advantage of using the nominal zero-coupon yields data extracted from U.S. Treasury security prices by the method of Fama and Bliss (1987) in the main text is that yields are not computed through a fitted function which smooths across maturities. However, the disadvantage of the Fama and Bliss (1987) data are that the maturities only range until year five. Hence, we consider zero-coupon bond yields ranging from 1 year to 15 years extracted from U.S. Treasury security prices by the method of Gürkaynak, Sack, and Wright (2007).[44]

[43]We use the VXO which is the CBOE volatility index based on trading S&P 100 (OEX) options taken from the CBOE because the new VIX is only available since January 1990.

[44]Maturities beyond 15 years are not available before November 1985.

The SPF-based regressions are in Table IA.32 and the MSC-based regressions are in Table IA.33.

Tables IA.36 and IA.37 show that all our results are robust if we consider the cross-sectional variance and the interquartile range of individual forecasters as measures of disagreement, instead of the cross-sectional standard deviation. We also scale our disagreement measure by inflation volatility to address the concern that in times when inflation volatility and disagreement is high (low), the risk-return trade-off for trading on inflation beliefs is low (high), and linearly controlling for inflation volatility (as done in our main regression specifications) may not be enough. Tables IA.38, IA.39, and IA.40 confirm that our results are robust when scaling inflation disagreement by inflation volatility. Additionally in Table IA.41, we construct the first principal component from the SPF and the MSC inflation disagreement to show that our results are robust to this alternative disagreement measure.

Disagreement about real quantities also raises interest rates and hence we address the concern that this form of disagreement, that is correlated with inflation disagreement, may drive our results. Specifically, Tables IA.42 and IA.43 show that inflation disagreement still has an economically and statistically positive impact on the level and volatility of yields when controlling for disagreement about real GDP growth based on the SPF. Disagreement about real GDP is statistically significant for the real and nominal yields levels and nominal yield volatility regressions, but insignificant for the real yield volatility regressions. Table IA.44 shows that our results are robust to controlling for disagreement about earnings among analysts. Disagreement among analysts has a negative, but insignificant, relation with real and nominal yield levels.

Finally, as interest rates may depend on the output gap in a New-Keynesian model, or more generally, the state of the economy, we show that our results are robust to controlling for the output gap as constructed in Cooper and Priestley (2009) (Table IA.50) and the Stock and Watson quarterly measure of the NBER business cycle indicator (Table IA.51).

# 4. Model-Based Quantitative Evidence

Based on our theoretical and empirical evidence, we present a dynamic model that fits moments of inflation, inflation disagreement, and real and nominal yields and implies plausible Sharpe ratios for inflation risk to quantitatively reproduce the impact of inflation disagreement on yield curves.

## 4.1. Model

The exogenous real aggregate output process $C_t$ follows a geometric Brownian motion with dynamics given by

$$dC_t = \mu_C C_t\, dt + \sigma_C C_t\, dz_{C,t}, \qquad C_0 > 0, \tag{4.1}$$

where $z_C$ represents a real shock. The dynamics of the price level $\Pi_t$ and the unobservable expected inflation rate $x_t$ are

$$d\Pi_t = x_t \Pi_t\, dt + \sigma_\Pi \Pi_t\, dz_{\Pi,t}, \qquad dx_t = \kappa\left(\bar{x} - x_t\right)\, dt + \sigma_x\, dz_{x,t}, \qquad \Pi_0 = 1, \tag{4.2}$$

where $z_{\Pi,t}$ represents a nominal shock. The three Brownian motions $z_{C,t}$, $z_{\Pi,t}$, and $z_{x,t}$ are uncorrelated.

To obtain zero inflation disagreement in the steady state and a tractable stochastic disagreement process, we assume that investors agree on the long run mean $\bar{x}$ and the speed of mean reversion $\kappa$, but differ in their beliefs about the volatility of expected inflation, $\sigma_x$.[45] The dynamics of the price level and the best estimator for expected inflation as perceived by investor $i$ are given by (Liptser and Shiryaev (1974a,b)):

$$d\Pi_t = x_t^i \Pi_t\, dt + \sigma_\Pi \Pi_t\, dz_{\Pi,t}^i, \quad dx_t^i = \kappa\left(\bar{x} - x_t^i\right)\, dt + \hat{\sigma}_x^i\, dz_{\Pi,t}^i, \quad x_0^i \sim N\left(\mu_{\bar{x},0}^i, \sigma_{x_0^i}^2\right). \tag{4.3}$$

The volatility $\hat{\sigma}_x^i$ is a function of $\kappa$ and $\sigma_x^i$. Investors observe the price level for a sufficiently long time so that the perceived volatility, $\hat{\sigma}_x^i$, has reached its steady state level.[46]

Investors' nominal innovation processes are linked through the inflation disagreement process $\Delta_t = \frac{x_t^2 - x_t^1}{\sigma_\Pi}$, which summarizes current disagreement about expected inflation. Specifically, the perceived shock of investor 2 is related to that of investor 1 through $dz_{\Pi,t}^2 = dz_{\Pi,t}^1 - \Delta_t dt$. As a consequence, the dynamics of the likelihood ratio are $d\lambda_t = \Delta_t \lambda_t dz_{\Pi,t}^1$. The inflation disagreement process $\Delta_t$ follows an Ornstein-Uhlenbeck process

$$d\Delta_t = -\beta \Delta_t dt + \sigma_\Delta dz_{\Pi,t}^1, \qquad \beta = \frac{\kappa \sigma_\Pi + \hat{\sigma}_x^2}{\sigma_\Pi}, \qquad \sigma_\Delta = \frac{\hat{\sigma}_x^2 - \hat{\sigma}_x^1}{\sigma_\Pi}. \tag{4.4}$$

We determine the inflation disagreement measure of Definition 2 in the next proposition.

[45] The inflation disagreement process is deterministic if there is only disagreement about the long run mean and it is not Markov if there is disagreement about the speed of mean reversion.

[46] The steady state level is $\hat{\sigma}_x^i = \sigma_\Pi \left( \sqrt{\kappa^2 + \left(\frac{\sigma_x^i}{\sigma_\Pi}\right)^2} - \kappa \right)$.

**Proposition 2.** *The inflation disagreement measure is*

$$\mathcal{D}_{t,T} \equiv \mathcal{D}\left(\Delta_t^2, T-t\right) = \frac{\sigma_\Delta^2}{4\beta} + \frac{1}{4\beta\,(T-t)}\left(\Delta_t^2 - \frac{\sigma_\Delta^2}{2\beta}\right)\left(1 - e^{-2\beta(T-t)}\right). \qquad (4.5)$$

Inflation disagreement is strictly increasing in $\Delta_t^2$ and converges to $\frac{1}{2}\Delta_t^2$ and $\frac{\sigma_\Delta^2}{4\beta}$ as $T$ goes to $t$ and infinity, respectively. Hence, the instantaneous inflation disagreement measure is given by $\frac{1}{2}\Delta_t^2$ and the long-run inflation disagreement measure equals $\frac{\sigma_\Delta^2}{4\beta}$. In Section 3, we measure inflation disagreement as the standard deviation of expected inflation across investors, which in the model is $\frac{1}{2}\sigma_\Pi \frac{1}{\kappa}\left(1-e^{-\kappa}\right)|\Delta_t|$. Therefore, the empirical inflation disagreement measure is strictly increasing in $\mathcal{D}\left(\Delta(t)^2, T-t\right)$ for any maturity $T-t$.

Each investor solves the consumption-savings problem given in equation (2.1). We conclude the description of the model by specifying an external habit process to help match asset pricing moments.[47] Specifically,

$$\log(H_t) = \log(H_0)e^{-\delta t} + \delta \int_0^t e^{-\delta(t-a)} \log(C_a)\, da, \qquad \delta > 0, \qquad (4.6)$$

where $\delta$ describes the dependence of $H_t$ on the history of aggregate output. Relative log output $\omega_t = \log(C_t/H_t)$, a state variable in the model, follows a mean reverting process

$$d\omega_t = \delta(\bar{\omega} - \omega_t)\, dt + \sigma_C\, dz_{C,t}, \qquad \bar{\omega} = (\mu_C - \sigma_C^2/2)/\delta. \qquad (4.7)$$

Equilibrium consumption allocations and state price densities are given in Proposition 1.

In the Internet Appendix, we provide closed-form solutions for real bond prices and show that both real and nominal bond prices can be represented as weighted averages of artificial bond prices that belong to the class of quadratic Gaussian term structure models.[48]

## 4.2. Calibration

We set the preference parameters $(\rho, \gamma, \delta)$ to match the level of nominal yields. The consumption parameters $(\mu_C, \sigma_C)$ are from Chan and Kogan (2002). The inflation parameters $(\bar{x}, \kappa, \sigma_x)$ and the inflation disagreement parameters $(\sigma_x^1, \sigma_x^2)$ match the mean, standard deviation, and autocorrelation of the consensus belief and disagreement in the SPF. We set the

[47] See Abel (1990), Abel (1999), Chan and Kogan (2002), and Ehling and Heyerdahl-Larsen (2016).

[48] Our solution method relies on a binomial expansion similar to the approach in Yan (2008), Dumas, Kurshev, and Uppal (2009), and Bhamra and Uppal (2014).

belief of the econometrician such that $\hat{\sigma}_x$ equals $(\hat{\sigma}_x^1 + \hat{\sigma}_x^2)/2$. We use the SPF instead of the MSC as the SPF explicitly asks professionals about CPI growth and, thus, leads to lower inflation disagreement. The last parameter $\sigma_\Pi$ matches the volatility of inflation. Panel A in Table 5 reports the parameters.

To analyze the quantitative implications of the model, we generate 10,000 sample paths that are 50 years long by simulating from the model under the belief of the econometrician ($\sigma_x$) instead of the belief of one of the investors ($\sigma_x^1$ or $\sigma_x^2$). All statistics are based on averages across the 10,000 sample paths.[49] Panel B in Table 5 shows the mean, volatility, and autocorrelation of the consensus forecast and inflation disagreement. We compute the mean and volatility of expected inflation across investors to determine the consensus belief and inflation disagreement. The model matches the mean, volatility, and to a lesser extent the autocorrelation of the consensus belief and inflation disagreement. Panel C in Table 5 reports the mean, standard deviation, and autocorrelation of real and nominal yields in the model and in the data. The model matches the level and volatility of real and nominal yields. The persistence of nominal yields in the model is lower than in the data, that is, the average autocorrelation across maturities is 0.68 in the model and 0.77 in the data.[50]

## 4.3. Quantitative Effects of Inflation Disagreement

Figure 4 shows real and nominal yields with maturities ranging from 1 to 5 years for two realizations of current inflation disagreement $\Delta$. In the two plots, the black solid line corresponds to the steady state level of $\Delta$, which is 0, and the blue dashed line corresponds to a one standard deviation increase in $\Delta$, which is 0.5143. The plots show that inflation disagreement has an economically significant impact on real and nominal yields comparable to the data. Specifically, an increase in inflation disagreement by one standard deviation raises the two-year real yield by 0.94% and the two-year nominal yield by 0.82%. The effects in the data are $0.407 \times 1.976 = 0.80\%$ for the two-year real yield and $0.356 \times 3.424 = 1.22\%$ for the two-year nominal yield. The economic significance for longer maturities is lower in the model than in the data as inflation disagreement is less persistent in the model.

Table 6 shows regression results of real and nominal yields and their volatilities on inflation disagreement and the econometrician's view about expected inflation. Coefficients and t-statistics for expected inflation are omitted to save space. As in the empirical analysis,

[49]This version of our model, as most continuous-time heterogeneous belief models, is not stationary and, thus, we cannot compute unconditional moments.

[50]The mean, volatility, and Sharpe ratio of the market portfolio defined as a claim to aggregate output are 3.8%, 16.4%, and 0.23, respectively.

Table 5: *Calibration*. This table reports the calibration results. Panel A reports the parameter values. Panel B reports the annual mean, volatility, and autocorrelation for the consensus belief and inflation disagreement. Panel C reports summary statistics for real and nominal yields. The data are described in Section 3. Model coefficients and standardized t-statistics are based on averages across 10,000 sample paths of 50 years of simulated real and nominal yields and their volatilities under the belief of the econometrician.

Panel A: Parameters

| | | | | | | |
|---|---|---|---|---|---|---|
| | $\mu_C$ | $\sigma_C$ | $\sigma_\Pi$ | $\bar{x}$ | $\kappa$ | $\hat{\sigma}_x$ |
| *Consumption and Inflation* | 0.0172 | 0.0332 | 0.02 | 0.0317 | 0.19 | 0.01 |
| | $\rho$ | $\gamma$ | $\delta$ | $f_0$ | $\hat{\sigma}_x^1$ | $\hat{\sigma}_x^2$ |
| *Preferences and Beliefs* | 0.006 | 7 | 0.05 | 0.5 | 0.0044 | 0.0156 |

Panel B: Consensus and Disagreement

| | *Consensus* | | | *Disagreement* | | |
|---|---|---|---|---|---|---|
| | Average | Volatility | Autocorrelation | Average | Volatility | Autocorrelation |
| SPF | 0.031 | 0.012 | 0.683 | 0.007 | 0.003 | 0.190 |
| Model | 0.032 | 0.013 | 0.703 | 0.005 | 0.004 | 0.168 |

Panel C: Yields in the Model and the Data

| | *Average* | | *Volatility* | | *Autocorrelation* | |
|---|---|---|---|---|---|---|
| *Real* | 2 year | 5 year | 2 year | 5 year | 2 year | 5 year |
| Data | 0.019 | 0.023 | 0.020 | 0.016 | 0.66 | 0.73 |
| Model | 0.021 | 0.024 | 0.023 | 0.019 | 0.59 | 0.76 |
| *Nominal* | 2 year | 5 year | 2 year | 5 year | 2 year | 5 year |
| Data | 0.052 | 0.058 | 0.034 | 0.032 | 0.76 | 0.78 |
| Model | 0.053 | 0.055 | 0.025 | 0.020 | 0.60 | 0.76 |

the t-statistics are Newey-West corrected with 12 lags and coefficients are standardized in all four regressions. The coefficients, $t$-statistics, and $R^2$'s for the real and nominal level and volatility regressions are similar to the data. In the second column of the nominal yield regression, we control for the market view about expected inflation instead of the econometrician's view. Using the econometrician's view instead of the market view about expected inflation does not lead to any noticeable differences and, hence, alleviates the concern that measurement error may lead to biased coefficients and t-statistics in the empirical analysis.

## 4.4. Inflation Risk Premium and Trade

To study investors' exposure to inflation shocks and their perceived inflation risk premia and Sharpe ratios, we specify a simple asset structure that dynamically completes the market. Specifically, there is an inflation-protected money market account with real price $B_t$, a claim

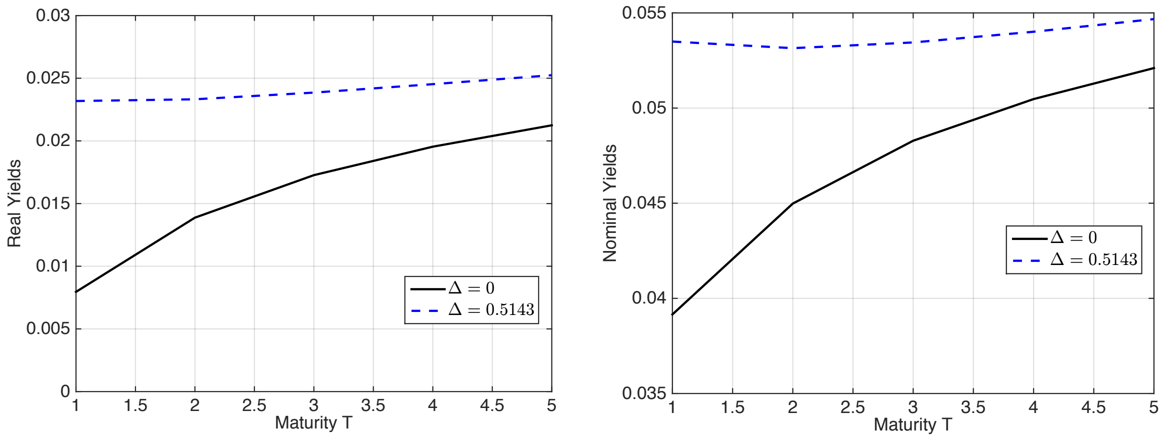


Figure 4: Real and Nominal Yields

The left plot shows real yields and the right plot shows nominal yields as function of time to maturity for two realizations of current inflation disagreement $\Delta$. The black solid line corresponds to the steady state level of $\Delta$ and the blue dashed line corresponds to a one standard deviation increase in $\Delta$.

Table 6: **Inflation Disagreement Regressions.** The table reports results from OLS regressions of the level and volatility of real and nominal yields on disagreement about inflation and the econometrician's view about expected inflation. In the second column of the nominal yield regression, we control for the market view about expected inflation instead of the econometrician's view. Coefficients and t-statistics for expected inflation are omitted. The data are described in Section 3. Model coefficients and standardized t-statistics are based on averages across 10,000 sample paths of 50 years of simulated real and nominal yields and their volatilities under the belief of the econometrician. The t-statistics (t-stat) are Newey-West corrected with 12 lags.

| | Real Yields | | | | Nominal Yields | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Level | | Volatility | | Level | | | Volatility | |
| Maturity | Model | SPF | Model | SPF | Model | | SPF | Model | SPF |
| 2 year | 0.49 | 0.33 | 0.53 | 0.64 | 0.46 | 0.46 | 0.41 | 0.48 | 0.67 |
| t-stat | 5.67 | 3.09 | 7.17 | 8.10 | 5.66 | 5.65 | 3.60 | 6.62 | 5.96 |
| adj. $R^2$ | 0.34 | 0.24 | 0.35 | 0.38 | 0.41 | 0.41 | 0.40 | 0.38 | 0.56 |
| 5 year | 0.27 | 0.31 | 0.37 | 0.72 | 0.25 | 0.25 | 0.38 | 0.30 | 0.68 |
| t-stat | 2.82 | 2.89 | 4.40 | 7.94 | 2.81 | 2.80 | 3.88 | 3.97 | 8.95 |
| adj. $R^2$ | 0.18 | 0.24 | 0.21 | 0.50 | 0.27 | 0.27 | 0.39 | 0.32 | 0.55 |

to aggregate consumption $S_t$, and a nominal money market account with real price $p_t$. The real and nominal money market accounts are in zero net supply and the aggregate consumption claim is in unit supply. The perceived equilibrium asset price dynamics of investor $i \in \{1,2\}$ are[51]

$$\begin{aligned}
dB_t &= r_t B_t dt, \qquad B_0 = 1, \\
dS_t &= \left(\left(r_t + \theta_{C,t}\sigma^S_{C,t} + \sigma^S_{\Pi,t}\theta^i_{\Pi,t}\right) - C_t\right) S_t \, dt + \sigma^S_{C,t} S_t \, dZ_{C,t} + \sigma^S_{\Pi,t} S_t \, dZ^i_{\Pi,t}, \qquad S_0 > 0 \\
dp_t &= \left(r_t - \sigma_\Pi \theta^i_{\Pi,t}\right) p_t \, dt - \sigma_\Pi p_t \, dZ^i_{\Pi,t}, \qquad p_0 = 1.
\end{aligned}$$

Investors agree on the market price of risk for the real shock, $\theta_{C,t} = \gamma\sigma_C$, but perceive different market price of risks for the inflation shocks, that is, $\theta^1_{\Pi,t} = (f_t - 1)\,\Delta_t$ and $\theta^2_{\Pi,t} = f_t\Delta_t$, respectively. Hence, agent $i$ perceives the inflation risk premia to be $IRP^i_t = -\sigma_\Pi\theta^i_{\Pi,t}$, which is non-zero, as long as there is inflation disagreement. In particular, the investor who perceives a positive inflation risk premium invests cash at the nominal short rate (longs the money market account) whereas the investors who perceives a negative inflation risk premium borrows at the nominal short rate (shorts the money market account).

We focus on the case where investor 1 perceives a positive inflation risk premium due to a lower expected inflation rate than investor 2, that is, $\Delta \geq 0$. The top left plot of Figure 5 shows that the inflation risk premium and the Sharpe ratio perceived by investor 1 are strictly increasing in inflation disagreement $\Delta$. The maximal Sharpe ratio and inflation risk premium when both investors share output equally ($f = 0.5$) and $\Delta = 0.5143$, which corresponds to a one standard deviation increase from the steady state of zero, are 0.2571 and 0.0051, respectively. As shown more generally in Proposition 1 of the Internet Appendix, the top right plot of Figure 5 confirms that the inflation risk premium and the Sharpe ratio perceived by investor 1 declines when her consumption share in the economy increases. When her consumption share is close to one, then prices reflect only her view about inflation, and thus, the inflation risk premium and the Sharpe ratio are close to zero. However in this case, investor 2 perceives the highest Sharpe ratio and inflation risk premium in absolute terms because she is short the nominal money market account.

Investors perceive different inflation risk premiums and, thus, they trade with each other. That is, one investor borrows cash from the other investor. The bottom two plots of Figure 5 show open interest, defined as the dollar amount invested in the nominal money market account, scaled by total wealth. Open interest is increasing in inflation disagreement, $\Delta$, which is shown in the left bottom plot of Figure 5 when both investors have the same consumption shares. The right plot of Figure 5 shows that in this case, open interest attains

[51]Denote the nominal price of the nominal money market account as $P_t$ with dynamics $dP_t = r_{P,t}P_t dt$, then $p_t = \frac{P_t}{\Pi_t}$. Hence, while the nominal value of the nominal money market account is locally risk-free, the real value of the nominal money market account is locally perfectly negatively correlated with inflation. Thus, it has the same local volatility as inflation.

its maximum. While the effects of inflation disagreement on trade are consistent with the empirical findings reported in Table 4, the actual open interest numbers are difficult to compare to the model because in reality, investors trade many different inflation sensitive securities such as cash, nominal bonds, mortgages, and interest rate derivatives. Trading on inflation disagreement leads to an annual cross-sectional consumption growth volatility of 3.22%. This is significantly lower than the 44.65% in the data, but roughly a quarter of the cross-sectional consumption volatility once measurement error is taken into account (Constantinides and Ghosh (2016)).

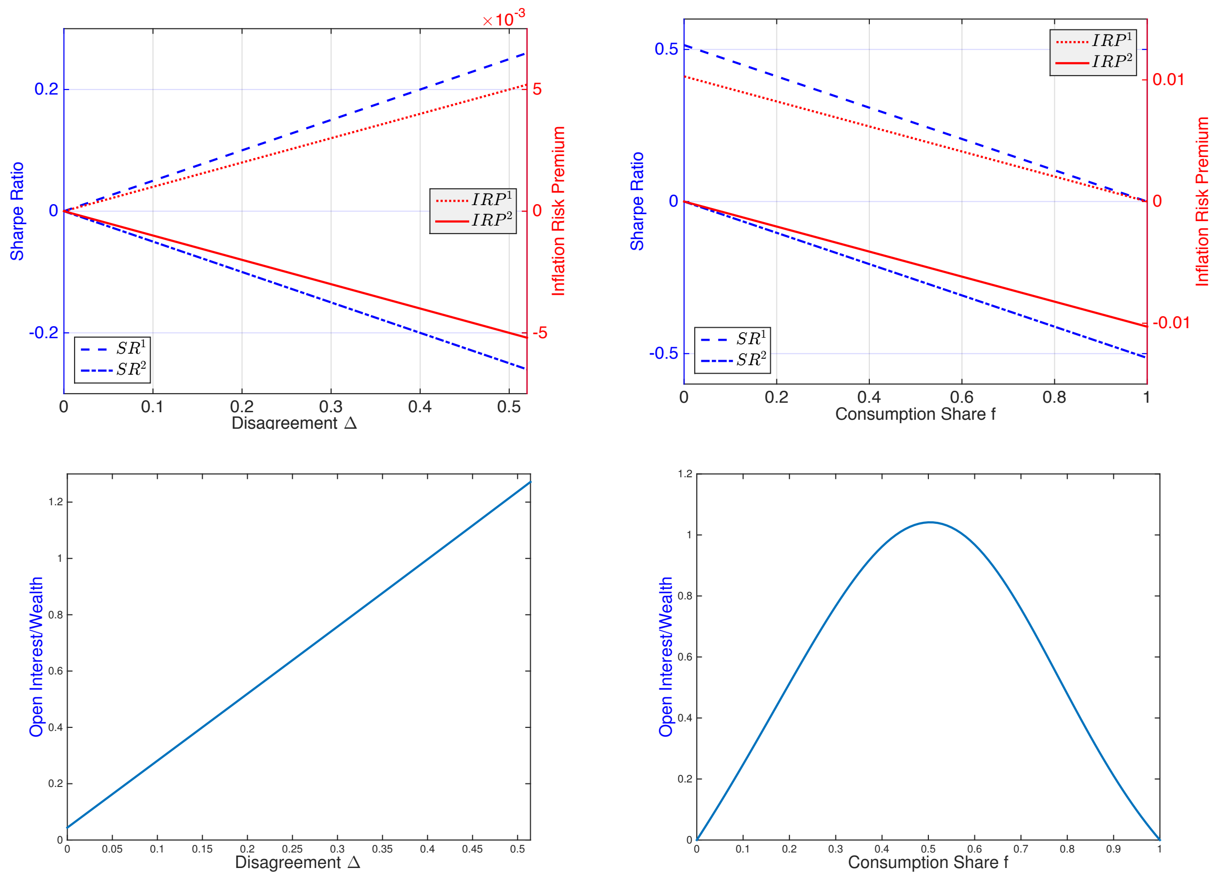


Figure 5: Sharpe Ratio, Inflation Risk Premium, and Open Interest

# 5. Concluding Remarks

Surveys of consumers and professionals show that there is disagreement about inflation. But does this disagreement affect asset prices or individual consumption? We consider a pure exchange economy with frictionless complete markets to answer this question theoretically. We show that inflation disagreement has a strong impact on the cross-sectional consumption growth volatility as well as real and nominal yield curves. Intuitively, investors make different consumption-savings decisions based on their different beliefs about real returns on investments which raises the volatility of individual consumption and yields. Investors think that the high real returns on their investments will make them wealthier and, thus, interest rates have to rise for consumption markets to clear.

We find empirical support for our theoretical predictions using a survey of consumers and a survey of professionals. Specifically, real and nominal yields are higher and more volatile with inflation disagreement. The effects are economically and statistically significant. An inflation disagreement increase of one standard deviation raises real and nominal yields and their volatilities by at least 38% of their respective standard deviations. We provide empirical support for the economic channel through which inflation disagreement affects asset prices by showing that there is more trade in nominal Treasuries, interest rate derivatives, and inflation swaps as well as higher cross-sectional consumption growth volatility when inflation disagreement is high. Calibrating a dynamic model where investors disagree about the dynamics of expected inflation to disagreement, inflation, and yield data reproduces the economically and statistically significant impact of inflation disagreement on real and nominal yield curves.

We document that inflation disagreement raises individual consumption volatilities as well as real interest rates and their volatilities which seems to be an undesirable outcome for policymakers. Clearly, it is optimal for investors to trade on their inflation beliefs in our complete market economy. However, all investors cannot have correct beliefs and, thus, it is not clear whether trading on their beliefs is ex-post welfare improving. Recent studies such as Brunnermeier, Simsek, and Xiong (2014), Gilboa, Samuelson, and Schmeidler (2014), and Heyerdahl-Larsen and Walden (2016) show that policies that reduce disagreement or restrict trade on disagreement and, hence, avoid an increase in individual consumption volatilities, may be socially optimal in this case. Better understanding how central banks respond to inflation disagreement and potentially impact bond markets could be fruitful for future work.

# References

Abel, A. B., 1990. Asset prices under habit information and catching up with the Joneses. American Economic Review 80, 38–42.

Abel, A. B., 1999. Risk premia and term premium in general equilibrium. Journal of Monetary Economics 43, 3–33.

Adrian, T., Wu, H. Z., 2010. The term structure of inflation expectations, federal Reserve Bank of New York.

Ang, A., Bekaert, G., Wei, M., 2007. Do macro variables, asset markets, or surveys forecast inflation better? Journal of Monetary Economics 54, 1163–1212.

Armantier, O., de Bruin, W. B., Topa, G., van der Klaauw, W., Zafar, B., 2015. Inflation expectations and behavior: Do survey respondents act on their beliefs? International Economic Review 56, 505–536.

Baker, S. R., Bloom, N., Davis, S. J., 2015. Measuring economic policy uncertainty, stanford University.

Bansal, R., Kiku, D., Yaron, A., 2010. Long-run risks, the macroeconomy, and asset prices. American Economic Review 100, 542–546.

Basak, S., 2000. A model of dynamic equilibrium asset pricing with heterogeneous beliefs and extraneous risk. Journal of Economic Dynamics and Control 24, 63–95.

Basak, S., 2005. Asset pricing with heterogeoneous beliefs. Journal of Banking and Finance 29, 2849–2881.

Bhamra, H., Uppal, R., 2014. Asset prices with heterogeneity in preferences and beliefs. Review of Financial Studies 27, 519–580.

Bloom, N., 2009. The impact of uncertainty shocks. Econometrica 77, 623–685.

Branger, N., Schlag, C., Thimme, J., 2016. Does ambiguity about volatility matter empirically?, goethe University.

Brunnermeier, M. K., Simsek, A., Xiong, W., 2014. A welfare criterion for models with distorted beliefs. Quarterly Journal of Economics 129, 1753–1797.

Buraschi, A., Whelan, P., 2013. Term structure models and differences in beliefs, imperial College London.

Campbell, J. Y., Cochrane, J. H., 1999. By force of habit: A consumption-based explanation of aggregate stock market behavior. The Journal of Political Economy 107, 205–251.

Chan, Y. L., Kogan, L., 2002. Catching up with the Joneses: Heterogeneous preferences and the dynamics of asset prices. Journal of Political Economy 110, 1255–1285.

Chen, H., Joslin, S., Tran, N.-K., 2010. Affine disagreement and asset pricing. American Economic Review 100, 522–256.

Chen, H., Joslin, S., Tran, N.-K., 2012. Rare disasters and risk sharing with heterogeneous beliefs. Review of Financial Studies 25, 2189–2224.

Chernov, M., Mueller, P., 2012. The term structure of inflation expectations. Journal of Financial Economics 106, 367–394.

Christiano, L. J., Eichenbaum, M., Evans, C. L., 1999. Monetary policy shocks: What have we learned and to what end? In: Taylor, J., Woodford, M. (eds.), *Handbook of Macroeconomics 1A*, Elsevier Science, Amsterdam.

Chun, A. L., 2011. Expectations, bond yields, and monetary policy. Review of Financial Studies 24, 208–247.

Cochrane, J. H., Piazzesi, M., 2005. Bond risk premia. American Economic Review 95, 138–160.

Constantinides, G. M., Ghosh, A., 2016. Asset pricing with countercyclical household consumption risk. The Journal of Finance forthcoming.

Cooper, I., Priestley, R., 2009. Time-varying risk premiums and the output gap. Review of Financial Studies 22, 2601–2633.

Csiszár, I., Shields, P. C., 2004. Information theory and statistics: A tutorial. In: Verdú, S. (ed.), *Foundations and Trends in Communications and Information Theory*, NOW Publishers Inc.

Cvitanić, C., Jouini, E., Malamud, S., Napp, C., 2012. Financial markets equilibrium with heterogeneous agents. Review of Finance 16, 285–321.

Detemple, J. B., Murthy, S., 1994. Intertemporal asset pricing with heterogeneous beliefs. Journal of Economic Theory 62, 294–320.

Doepke, M., Schneider, M., 2006. Inflation and the redistribution of nominal wealth. Journal of Political Economy 114, 1069–1097.

Dumas, B., Kurshev, A., Uppal, R., 2009. Equilibrium portfolio strategies in the presence of sentiment risk and excess volatility. The Journal of Finance 64, 579–629.

Ehling, P., Heyerdahl-Larsen, C., 2016. Correlations. Management Science forthcoming.

Epstein, L. G., 1988. Risk aversion and asset prices. Journal of Monetary Economics 22, 179–192.

Fama, E. F., Bliss, R. R., 1987. The information in long-maturity forward rates. American Economic Review 77, 680–692.

Fedyk, Y., Heyerdahl-Larsen, C., Walden, J., 2013. Market selection and welfare in a multi-asset economy. Review of Finance 17, 1179–1237.

Fleming, M., Sporn, J., 2013. How liquid is the inflation swap market?, federal Reserve Bank of New York Liberty Street Economics Blog.

Gallmeyer, M. F., Hollifield, B., 2008. An examination of heterogeneous beliefs with a short-sale constraint in a dynamic economy. Review of Finance 12, 323–264.

Gao, G., Lu, X., Song, Z., Yan, H., 2016. Macro-disagreement beta, dePaul University.

Giacoletti, M., Laursen, K. T., Singleton, K. J., 2015. Learning, dispersion of beliefs, and risk premiums in an arbitrage-free term structure model, stanford University.

Gilboa, I., Samuelson, L., Schmeidler, D., 2014. No-betting-pareto dominance. Econometrica 82, 1405–1442.

Gollier, C., 2001. The Economics of Risk and Time. MIT Press.

Grossman, S. J., Zhou, Z., 1996. Equilibrium analysis of portfolio insurance. Journal of Finance 51, 1379–1403.

Gürkaynak, R. S., Sack, B., Wright, J. H., 2007. The U.S. treasury yield curve: 1961 to the present. Journal of Monetary Economics 54, 2291–2304.

Gürkaynak, R. S., Sack, B., Wright, J. H., 2010. The tips yield curve and inflation compensation. American Economic Journal: Macroeconomics 2, 70–92.

Hall, R., 1988. Intertemporal substitution in consumption. Journal of Political Economy 96, 339–357.

Harris, M., Raviv, A., 1993. Differences of opinion make a horse race. Review of Financial Studies 6, 473–506.

Harrison, J. M., Kreps, D. M., 1978. Speculative investor behavior in a stock market with heterogeneous expectations. Quarterly Journal of Economics 92, 323–336.

Havranek, T., Horvath, R., Irsova, Z., Rusnak, M., 2015. Cross-country heterogeneity in intertemporal substitution. Journal of International Economics 96, 100–118.

Heyerdahl-Larsen, C., Walden, J., 2016. Welfare in economies with production and heterogeneous beliefs, london Business School.

Hong, H., Sraer, D., Yu, J., 2016. Inflation bets on the long bond. Review of Financial Studies forthcoming.

Ilut, C., Schneider, M., 2014. Ambiguous business cycles. American Economic Review 104, 2368–2399.

Jouini, E., Napp, C., 2006. Aggregation of heterogeneous beliefs. Journal of Mathematical Economics 42, 752–770.

Jouini, E., Napp, C., 2007. Consensus consumer and intertemporal asset pricing with heterogeneous beliefs. Review of Economic Studies 74, 1149–1174.

Jurado, K., Ludvigson, S. C., Ng, S., 2015. Measuring uncertainty. American Economic Review 105, 1177–1216.

Kullback, S., 1959. Information Theory and Statistics. John Wiley and Sons.

Liptser, R., Shiryaev, A. N., 1974a. Statistics of Random Processes I General Theory. Springer, second ed.

Liptser, R., Shiryaev, A. N., 1974b. Statistics of Random Processes II Applications. Springer, second ed.

Longstaff, F. A., Wang, J., 2013. Asset pricing and the credit market. Review of Financial Studies 25, 3169–3215.

Malloy, C. J., Moskowitz, T. J., Vissing-Jorgensen, A., 2009. Long-run stockholder consumption risk and asset returns. Journal of Finance 64, 2427–2479.

Malmendier, U., Nagel, S., 2015. Learning from inflation experiences. The Quarterly Journal of Economics p. forthcoming.

Mankiw, N. G., Reis, R., Wolfers, J., 2004. Disagreement about inflation expectations. In: *NBER Macroeconomics Annual 2003*, National Bureau of Economic Research, vol. 18 of *NBER Chapters*.

Miller, E. M., 1977. Risk, uncertainty, and divergence of opinion. Journal of Finance 32, 1151–1168.

Piazzesi, M., Schneider, M., 2012. Inflation and the price of real assets, stanford University.

Scheinkman, J., Xiong, W., 2003. Overconfidence and speculative bubbles. Journal of Political Economy 111, 1183–1219.

Stock, J. H., Watson, M. W., 1999. Forecasting inflation. Journal of Monetary Economics 44, 293–335.

Thimme, J., 2016. Intertemporal substitution in consumption: A literature review. Journal of Economic Surveys pp. 1–32.

Wright, J. H., 2011. Term premia and inflation uncertainty: Empirical evidence from an international panel dataset. American Economic Review 101, 1514–1534.

Xiong, W., Yan, H., 2010. Heterogeneous expectations and bond markets. Review of Financial Studies 23, 1433–1466.

Yan, H., 2008. Natural selection in financial markets: Does it work? Management Science 54, 1935–1950.

Zapatero, F., 1998. Effects of financial innovations on market volatility when beliefs are heterogeneous. Journal of Economic Dynamics and Control 22, 597–626.

Zarnowitz, V., 1992. Consensus and uncertainty in economic prediction. In: Zarnowitz, V. (ed.), *Business Cycles: Theory, History, Indicators, and Forecasting*, University of Chicago Press.

# A. Theoretical Results

*Proof of Proposition 1.* See Detemple and Murthy (1994) or Basak (2005). □

*Proof of Theorem 1.* We split this proof into three parts

1. Real Yields:

Let $\xi_T^0$ denote the state price density when there is no disagreement. Specifically,

$$\xi_t^0 = e^{-\rho t} C_t^{-\gamma} H_t^{\gamma-1}.$$

By Assumption 1, investors have identical joint distributions of $\frac{C_T}{C_t}$ and $\frac{H_T}{H_t}$ conditional on $\mathcal{F}_t$ and, thus, the real price of a real bond when there is no disagreement and the representative investor has belief $\mathbb{P}^0$ is

$$B_{t,T}^0 = \mathbb{E}_t^0\left[\frac{\xi_T^0}{\xi_t^0}\right] = \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\right] = \mathbb{E}_t^2\left[\frac{\xi_T^0}{\xi_t^0}\right].$$

The real price of a real bond with disagreement is

$$B_{t,T} = \mathbb{E}_t^1\left[\frac{\xi_T^1}{\xi_t^1}\right] = \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\left(\frac{f(\lambda_T)}{f(\lambda_t)}\right)^{-\gamma}\right],$$

where $f(\cdot)$ is the consumption sharing rule given in equation (2.2). We have that

$$\left(\frac{f(\lambda_T)}{f(\lambda_t)}\right)^{-\gamma} = \left(\frac{1+(y\lambda_T)^{\frac{1}{\gamma}}}{1+(y\lambda_t)^{\frac{1}{\gamma}}}\right)^{\gamma} = \left(f_t + (1-f_t)\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma},$$

and, hence,

$$B_{t,T} = \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\left(f_t + (1-f_t)\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right].$$

Suppose $\gamma = 1$. Then the bond price simplifies to

$$\begin{aligned} B_{t,T} &= \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\left(f_t + (1-f_t)\left(\frac{\lambda_T}{\lambda_t}\right)\right)\right] = f_t\mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\right] + (1-f_t)\mathbb{E}_t^1\left[\frac{\lambda_T}{\lambda_t}\frac{\xi_T^0}{\xi_t^0}\right] \\ &= f_t\mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\right] + (1-f_t)\mathbb{E}_t^2\left[\frac{\xi_T^0}{\xi_t^0}\right] = f_t B_{t,T}^0 + (1-f_t)B_{t,T}^0 = B_{t,T}^0. \end{aligned}$$

This concludes the proof of the case $\gamma = 1$.

Consider the function $h(x) = x^{\frac{1}{\gamma}}$, which is strictly increasing and convex if $\gamma < 1$ and strictly concave if $\gamma > 1$. Suppose $\gamma > 1$ and, thus, $h(x)$ is strictly concave. The case of $\gamma < 1$ is similar and, thus, omitted.

The real price of a real bond with disagreement is

$$B_{t,T} = \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\left(f_t + (1-f_t)\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right] = \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\right]\mathbb{E}_t^1\left[\frac{\frac{\xi_T^0}{\xi_t^0}}{\mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\right]}\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right]$$
$$= B_{t,T}^0\,\hat{\mathbb{E}}_t^1\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right],$$

where $\hat{\mathbb{E}}_t^1$ denotes the conditional mean using the bond price $B_{t,T}^0$ as numeraire. Specifically,

$$\frac{\zeta_T^1}{\zeta_t^1} \equiv \frac{d\hat{\mathbb{P}}^1}{d\mathbb{P}^1} = \frac{\xi_T^0}{\xi_t^0}\frac{1}{B_{t,T}^0}.$$

We have that

$$\hat{\mathbb{E}}_t^1\left[\frac{\lambda_T}{\lambda_t}\right] = \mathbb{E}_t^1\left[\frac{\lambda_T}{\lambda_t}\frac{\zeta_T^1}{\zeta_t^1}\right] = \mathbb{E}_t^2\left[\frac{\zeta_T^1}{\zeta_t^1}\right] = \frac{\mathbb{E}_t^2\left[\frac{\xi_T^0}{\xi_t^0}\right]}{B_{t,T}^0} = \frac{B_{t,T}^0}{B_{t,T}^0} = 1.$$

Strict concavity of $h(\cdot)$ and $0 < f_t < 1$ leads to

$$f_t h(1) + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right) < h\left(f_t \cdot 1 + (1-f_t)\cdot\frac{\lambda_T}{\lambda_t}\right).$$

Hence,

$$B_{t,T} = B_{t,T}^0\,\hat{\mathbb{E}}_t^1\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right] < B_{t,T}^0\,\hat{\mathbb{E}}_t^1\left[h\left(f_t\cdot 1 + (1-f_t)\cdot\frac{\lambda_T}{\lambda_t}\right)^{\gamma}\right]$$
$$= B_{t,T}^0\,\left(f_t + (1-f_t)\hat{\mathbb{E}}_t^1\left[\frac{\lambda_T}{\lambda_t}\right]\right) = B_{t,T}^0\,\left(f_t + (1-f_t)\right) = B_{t,T}^0.$$

This concludes the proof of the case $\gamma > 1$.

2. *Real Yield Volatility*

If $\gamma = 1$, then real yields with disagreement are equal to real yields when there is no disagreement and, thus, the volatility of yields does not depend on disagreement.

Suppose $\gamma \neq 1$. The real price of a real bond with disagreement is

$$B_{t,T} = B_{t,T}^0\,\hat{\mathbb{E}}_t^1\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right],$$

where $\hat{\mathbb{E}}_t^1$ denotes the conditional mean using the real bond price without disagreement, $B_{t,T}^0$, as numeraire. Let $y_{t,T}^B$ denote the real yield when there is disagreement and $y_{t,T}^{B^0}$

the real yield when there is no disagreement. We have that

$$
\begin{aligned}
y^{B}_{t,T} &= -\frac{1}{T-t}\log\left(B_{t,T}\right) = -\frac{1}{T-t}\log\left(B^{0}_{t,T}\right) - \frac{1}{T-t}\log\left(\hat{\mathbb{E}}^{1}_{t}\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right]\right) \\
&= y^{B^0}_{t,T} - \frac{1}{T-t}\log\left(\hat{\mathbb{E}}^{1}_{t}\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right]\right),
\end{aligned}
\tag{A.1}
$$

and $\lambda_t$ is independent of $C_t$ and $H_t$ and, hence,

$$
\mathbb{V}^{i}\left[y^{B}_{t,T}\right] \geq \mathbb{V}^{i}\left[y^{B^0}_{t,T}\right], \qquad \forall i = 0,1,2,
$$

with equality if the conditional expectation in equation (A.1) is constant.

□

To prove the results in Theorem 2 without imposing any parametric restrictions on investors inflation beliefs, we link the belief structure $\mathcal{B}_{t,T}$ with the likelihood ratio $\lambda_t$ to the belief structure $\mathcal{B}^{\eta}_{t_\eta,T_\eta}$ with the likelihood ratio $\eta_{t_\eta}$ such that $\mathcal{B}^{\eta}_{t_\eta,T_\eta}$ represents more disagreement than $\mathcal{B}_{t,T}$. We accomplish this by assuming that $\lambda_t$ second-order stochastically dominates $\eta_{t_\eta}$. We chose second-order stochastic dominance because it is a well known concept in finance and economics (see Gollier (2001) and the references therein) and, hence, the reader is familiar with its implications, summarized in Remark 2, with proofs deferred to the Internet Appendix. There are other links between the two belief structures that can be used to prove Theorem 2, e.g., an additive comonotone decomposition of the likelihood ratio $\eta_{t_\eta}$.

**Remark 2.** *[Second-Order Stochastic Dominance]*

*Consider the probability space $(\Omega, \mathcal{F})$ and the three strictly positive random variables $\tilde{x}, \tilde{y}$, and $\tilde{\varepsilon}$ with corresponding probability measures $\mathbb{P}^x$, $\mathbb{P}^y$, and $\mathbb{P}^{\varepsilon}$. Let $\tilde{y}$ and $\tilde{x}$ have unit mean, that is, $\mathbb{E}^y[\tilde{y}] = \mathbb{E}^x[\tilde{x}] = 1$ and suppose $\tilde{x}$ second-order stochastically dominates $\tilde{y}$. Then, $\tilde{y}$ and $\tilde{x}\,\tilde{\varepsilon}$ are equal in distribution, that is, $\tilde{y} \overset{d}{=} \tilde{x}\,\tilde{\varepsilon}$ and $\tilde{x}$ and $\tilde{\varepsilon}$ are mean independent, that is, $\mathrm{E}^{\varepsilon}[\tilde{\varepsilon} \mid \tilde{x} = x] = \mathrm{E}^{\varepsilon}[\tilde{\varepsilon}] = 1$, $\forall x$. Moreover, the following three statements hold:*

1.
$$
\mathbb{E}^y\left[g\left(\tilde{y}\right)\right] \leq \mathbb{E}^x[g(\tilde{x})],
$$
*for all concave functions $g$,*

2.
$$
\mathbb{V}^y\left[\tilde{y}\right] \geq \mathbb{V}^x\left[\tilde{x}\right],
$$

3. *and*
$$
\mathbb{E}^y\left[\left(\log\left(\tilde{y}\right)\right)^2\right] \geq \mathbb{E}^x\left[\left(\log\left(\tilde{x}\right)\right)^2\right],
$$
*if $\tilde{x}$ and $\tilde{\varepsilon}$ are independent.*

*Proof.* See Internet Appendix. □

*Proof of Theorem 2.* We split this proof into three parts

1. Disagreement:

   We need to show that if $\lambda_t$ second order stochastically dominates $\eta_t$, then the belief structure $\mathcal{B}^{\eta}_{t_\eta,T_\eta}$ exhibits more disagreement than the belief structure $\mathcal{B}_{t,T}$, that is, $\mathcal{D}^{\eta}_{t_\eta,T_\eta} \geq \mathcal{D}_{t,T}$. Specifically,

$$\mathcal{D}_{t_\eta,t_\eta+\tau} = -\frac{1}{\tau}\mathbb{E}^{\eta,1}_{t_\eta}\left[\log\left(\frac{\eta_{t_\eta+\tau}}{\eta_{t_\eta}}\right)\right] \geq -\frac{1}{\tau}\mathbb{E}^{1}_{t}\left[\log\left(\frac{\lambda_{t+\tau}}{\lambda_t}\right)\right] = \mathcal{D}_{t,t+\tau},$$

   which is equivalent to showing that

$$\mathbb{E}^{\eta,1}_{t_\eta}\left[\log\left(\frac{\eta_{t_\eta+\tau}}{\eta_{t_\eta}}\right)\right] \leq \mathbb{E}^{1}_{t}\left[\log\left(\frac{\lambda_{t+\tau}}{\lambda_t}\right)\right]. \tag{A.2}$$

   The function $g(x) = \log(x)$ is concave and, thus, it follows from Remark 2 that inequality (A.2) is satisfied if $\lambda_t$ second order stochastically dominates $\eta_t$.

2. Real Yields:

   We need to show that if $\lambda_t$ second order stochastically dominates $\eta_t$, then the real yield in economy $\mathcal{E}_\eta = \left(\mathcal{B}^{\eta}_{t_\eta,T_\eta}, f(\eta_{t_\eta})\right)$ exceeds the real yield in economy $\mathcal{E} = (\mathcal{B}_{t,T}, f(\lambda_t))$ if $\gamma > 1$, that is, $y_{t_\eta,T_\eta} > y_{t,T} \Leftrightarrow B_{t_\eta,T_\eta} < B_{t,T}$. If $\gamma < 1$, the opposite needs to be shown and if $\gamma = 1$, then we need to show equality.

   Let $\xi^0_T$ denote the state price density when there is no disagreement. Specifically,

$$\xi^0_t = e^{-\rho t} C_t^{-\gamma} H_t^{\gamma-1}.$$

   The joint distribution of $\frac{C_{T_\eta}}{C_{t_\eta}}$ and $\frac{H_{T_\eta}}{H_{t_\eta}}$ conditional on $\mathcal{F}_{t_\eta}$ is equal to the joint distribution of $\frac{C_T}{C_t}$ and $\frac{H_T}{H_t}$ conditional on $\mathcal{F}_t$ and, thus, the real price of a real bond when there is no disagreement and the representative investor has belief $\mathbb{P}^0$ is the same in both economies, that is,

$$B^0_{t,T} = \mathbb{E}^0_t\left[\frac{\xi^0_T}{\xi^0_t}\right] = \mathbb{E}^1_t\left[\frac{\xi^0_T}{\xi^0_t}\right] = \mathbb{E}^2_t\left[\frac{\xi^0_T}{\xi^0_t}\right] = B^0_{t_\eta,T_\eta}.$$

   The likelihood ratio $\lambda_t$ is independent of $\xi^0_t$ and, thus, the real price of a real bond with disagreement is

$$\begin{aligned} B_{t,T} &= \mathbb{E}^1_t\left[\frac{\xi^0_T}{\xi^0_t}\left(f(\lambda_t) + (1-f(\lambda_t))\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right] = \mathbb{E}^1_t\left[\frac{\xi^0_T}{\xi^0_t}\right]\mathbb{E}^1_t\left[\left(f(\lambda_t) + (1-f(\lambda_t))\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right] \\ &= B^0_{t,T}\mathbb{E}^1_t\left[\left(f(\lambda_t) + (1-f(\lambda_t))\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right]. \end{aligned}$$

Similarly,

$$B^{\eta}_{t_\eta,T_\eta} = B^0_{t_\eta,T_\eta}\mathbb{E}^{\eta,1}_{t_\eta}\left[\left(f(\eta_{t_\eta}) + (1 - f(\eta_{t_\eta}))\left(\frac{\eta_{T_\eta}}{\eta_{t_\eta}}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right].$$

We have that $\tau = T_\eta - t_\eta = T - t$ and, thus, $B^0_{t,t+\tau} = B^0_{t_\eta,t_\eta+\tau}$. Moreover, $0 < f_t = f(\lambda_t) = f(\eta_{t_\eta}) < 1$, and, hence,

$$B_{t,t+\tau} = B^0_{t,t+\tau}\mathbb{E}^1_t\left[\left(f_t + (1 - f_t)\left(\frac{\lambda_{t+\tau}}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right],$$

$$B^{\eta}_{t_\eta,t_\eta+\tau} = B^0_{t,t+\tau}\mathbb{E}^{\eta,1}_{t_\eta}\left[\left(f_t + (1 - f_t)\left(\frac{\eta_{t_\eta+\tau}}{\eta_{t_\eta}}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right].$$

Suppose $\gamma = 1$. Then the bond prices simplify to

$$B_{t,t+\tau} = B^0_{t,t+\tau}\mathbb{E}^1_t\left[f_t + (1 - f_t)\frac{\lambda_{t+\tau}}{\lambda_t}\right] = B^0_{t,t+\tau},$$

$$B^{\eta}_{t_\eta,t_\eta+\tau} = B^0_{t,t+\tau}\mathbb{E}^{\eta,1}_{t_\eta}\left[f_t + (1 - f_t)\frac{\eta_{t_\eta+\tau}}{\eta_{t_\eta}}\right] = B^0_{t,t+\tau}.$$

This concludes the proof for the case when $\gamma = 1$.

Define the function $g(x) = \left(f + (1 - f)x^{\frac{1}{\gamma}}\right)^{\gamma}$ with $0 < f < 1$, which is strictly concave if $\gamma > 1$ and strictly convex if $\gamma < 1$. Suppose $\gamma > 1$ and, thus, $h(x)$ is strictly concave. The case of $\gamma < 1$ is similar and, thus, omitted. We need to show that $B^{\eta}_{t_\eta,t_\eta+\tau} < B_{t,t+\tau}$, which is equivalent to showing that

$$\mathbb{E}^{\eta,1}_{t_\eta}\left[g\left(\frac{\eta_{t_\eta+\tau}}{\eta_{t_\eta}}\right)\right] < \mathbb{E}^1_t\left[g\left(\frac{\lambda_{t+\tau}}{\lambda_t}\right)\right],$$

which follows directly from second-order stochastic dominance (see Remark 2).

3. *Consumption Growth Volatility:*

   We need to show that if $\lambda_t$ second order stochastically dominates $\eta_t$ and $\frac{\lambda_T}{\lambda_t}$ and $\varepsilon$ are independent, then expected cross-sectional variance of consumption growth from time $t$ to $T$ in economy $\mathcal{E}_\eta = \left(\mathcal{B}^{\eta}_{t_\eta,T_\eta}, f(\eta_{t_\eta})\right)$ is at least as large as in economy $\mathcal{E} = (\mathcal{B}_{t,T}, f(\lambda_t))$. Specifically,

$$\mathbb{E}^{\eta,1}_{t_\eta}\left[\sigma^2_{\mathrm{CS}}(\eta_{t_\eta}, \eta_{t_\eta+\tau})\right] \geq \mathbb{E}^1_t\left[\sigma^2_{\mathrm{CS}}(\lambda_t, \lambda_{t+\tau})\right]. \tag{A.3}$$

   Inserting $\sigma^2_{\mathrm{CS}}(\cdot,\cdot)$, which is given in equation (2.9), into equation (A.3) leads to

$$\mathbb{E}^{\eta,1}_{t_\eta}\left[\left(\log\left(\frac{\eta_{t_\eta+\tau}}{\eta_{t_\eta}}\right)\right)^2\right] \geq \mathbb{E}^1_t\left[\left(\log\left(\frac{\lambda_{t+\tau}}{\lambda_t}\right)\right)^2\right]. \tag{A.4}$$

If $\lambda_t$ second-order stochastic dominates $\eta_t$ (see Remark 2) and if $\varepsilon$ and $\lambda_{t+\tau}$ are independent, then inequality (A.4) follows from Point 3 in Remark 2.

□

We generalize Theorem 3 of the main text by dropping Assumption 2 which rules out any risk premia for inflation when there is no inflation disagreement. In this case, we also require that the weighted average across each investor's inflation risk premium belief is fixed when inflation disagreement changes. Hence, we define the modified market view by adding the restriction (A.6) to Definition 3. Specifically,

**Definition 4** (Modified Market View)**.** *Let $\mathbb{P}^0$ denotes the market belief that satisfies*

$$\mathbb{E}_t^0\left[\frac{\Pi_t}{\Pi_T}\right] = f(\lambda_t)\mathbb{E}_t^1\left[\frac{\Pi_t}{\Pi_T}\right] + (1-f(\lambda_t))\mathbb{E}_t^2\left[\frac{\Pi_t}{\Pi_T}\right], \tag{A.5}$$

$$\mathbb{C}ov_t^0\left[\frac{\Pi_t}{\Pi_T}, \frac{\xi_T^0}{\xi_t^0}\right] = f(\lambda_t)\mathbb{C}ov_t^1\left[\frac{\Pi_t}{\Pi_T}, \frac{\xi_T^0}{\xi_t^0}\right] + (1-f(\lambda_t))\mathbb{C}ov_t^2\left[\frac{\Pi_t}{\Pi_T}, \frac{\xi_T^0}{\xi_t^0}\right], \tag{A.6}$$

*where $\xi_t^0 = e^{-\rho t}C_t^{-\gamma}H_t^{\gamma-1}$ is the state price density when there is no inflation disagreement.*

If inflation is independent of consumption and the preference shock (Assumption 2) or if there is only disagreement about expected inflation, then equation (A.6) is trivially satisfied. We also allow for disagreement about higher order moments of inflation and the joint distribution of inflation and real quantities and, hence, the beliefs $\mathbb{P}^1$ and $\mathbb{P}^2$ about the covariances in equation (A.6) do not have to be the same.

**Theorem 4** (Nominal Yield)**.** *Fix the modified market view of Definition 4 and suppose Assumption 1 is satisfied, then*

1. *the break-even inflation rate and nominal yields do not depend on inflation disagreement if $\gamma = 1$ and*

2. *nominal yields are higher with than without inflation disagreement if $\gamma > 1$ (the opposite is true if $\gamma < 1$) even though the effects of inflation disagreement on the break-even inflation rate are ambiguous if $\gamma \neq 1$.*

*Proof of Theorem 4.* Let $\xi_T^0$ denote the state price density when there is no disagreement and the representative investor has belief $\mathbb{P}^0$. Specifically,

$$\xi_t^0 = e^{-\rho t}C_t^{-\gamma}H_t^{\gamma-1}.$$

The nominal price of a nominal bond when there is no disagreement and the representative investor has belief $\mathbb{P}^i$ is

$$\bar{P}_{t,T}^i = \mathbb{E}_t^i\left[\frac{\xi_T^0}{\xi_t^0}\frac{\Pi_t}{\Pi_T}\right], \qquad i = 0, 1, 2.$$

The nominal price of a nominal bond with disagreement is

$$P_{t,T} = \mathbb{E}_t^1 \left[ \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \left( f_t + (1 - f_t) \left( \frac{\lambda_T}{\lambda_t} \right)^{\frac{1}{\gamma}} \right)^{\gamma} \right].$$

Suppose $\gamma = 1$. Then, the bond price simplifies to

$$\begin{aligned} P_{t,T} &= \mathbb{E}_t^1 \left[ \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \left( f_t + (1 - f_t) \left( \frac{\lambda_T}{\lambda_t} \right) \right) \right] = f_t \mathbb{E}_t^1 \left[ \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \right] + (1 - f_t) \mathbb{E}_t^1 \left[ \frac{\lambda_T}{\lambda_t} \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \right] \\ &= f_t \mathbb{E}_t^1 \left[ \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \right] + (1 - f_t) \mathbb{E}_t^2 \left[ \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \right] = f_t \bar{P}_{t,T}^1 + (1 - f_t) \bar{P}_{t,T}^2. \end{aligned}$$

We need to show that

$$f_t \bar{P}_{t,T}^1 + (1 - f_t) \bar{P}_{t,T}^2 = \bar{P}_{t,T}^0.$$

We have for all beliefs indexed by $i = 0, 1, 2$ that

$$\bar{P}_{t,T}^i = \mathbb{E}_t^i \left[ \frac{\xi_T^0}{\xi_t^0} \frac{\Pi_t}{\Pi_T} \right] = \mathbb{C}ov_t^i \left[ \frac{\xi_T^0}{\xi_t^0}, \frac{\Pi_t}{\Pi_T} \right] + \mathbb{E}_t^i \left[ \frac{\xi_T^0}{\xi_t^0} \right] \mathbb{E}_t^i \left[ \frac{\Pi_t}{\Pi_T} \right].$$

By Assumption 1, investors have identical joint distributions of $\frac{C_T}{C_t}$ and $\frac{H_T}{H_t}$ conditional on $\mathcal{F}_t$ and, hence,

$$B_{t,T} \equiv \mathbb{E}_t^i \left[ \frac{\xi_T^0}{\xi_t^0} \right], \qquad \forall i = 0, 1, 2.$$

Therefore,

$$\bar{P}_{t,T}^1 = \mathbb{C}ov_t^1 \left[ \frac{\xi_T^0}{\xi_t^0}, \frac{\Pi_t}{\Pi_T} \right] + B_{t,T} \mathbb{E}_t^1 \left[ \frac{\Pi_t}{\Pi_T} \right], \quad \text{and} \quad \bar{P}_{t,T}^2 = \mathbb{C}ov_t^2 \left[ \frac{\xi_T^0}{\xi_t^0}, \frac{\Pi_t}{\Pi_T} \right] + B_{t,T} \mathbb{E}_t^2 \left[ \frac{\Pi_t}{\Pi_T} \right].$$

Multiplying the first equation with $f_t$ and the second equation with $(1 - f_t)$, adding them up, and imposing that the modified market view of Definition 4 does not change with disagreement, leads to

$$\begin{aligned} P_{t,T} &= f_t \bar{P}_{t,T}^1 + (1 - f_t) \bar{P}_{t,T}^2 = f_t \mathbb{C}ov_t^1 \left[ \frac{\xi_T^0}{\xi_t^0}, \frac{\Pi_t}{\Pi_T} \right] + (1 - f_t) \mathbb{C}ov_t^2 \left[ \frac{\xi_T^0}{\xi_t^0}, \frac{\Pi_t}{\Pi_T} \right] \\ &+ B_{t,T} \left( f_t \mathbb{E}_t^1 \left[ \frac{\Pi_t}{\Pi_T} \right] + (1 - f_t) \mathbb{E}_t^2 \left[ \frac{\Pi_t}{\Pi_T} \right] \right) = \mathbb{C}ov_t^0 \left[ \frac{\xi_T^0}{\xi_t^0}, \frac{\Pi_t}{\Pi_T} \right] + B_{t,T} \mathbb{E}_t^0 \left[ \frac{\Pi_t}{\Pi_T} \right] = \bar{P}_{t,T}^0. \end{aligned}$$

This concludes the proof of the case $\gamma = 1$.

Consider the function $h(x) = x^{\frac{1}{\gamma}}$, which is strictly convex if $\gamma < 1$ and strictly concave if $\gamma > 1$. Suppose $\gamma > 1$. The case of $\gamma < 1$ is similar and, thus, omitted.

The nominal price of a nominal bond with disagreement is

$$\begin{aligned}
P_{t,T} &= \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\frac{\Pi_t}{\Pi_T}\left(f_t + (1-f_t)\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{1}{\gamma}}\right)^{\gamma}\right] \\
&= \mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\frac{\Pi_t}{\Pi_T}\right]\mathbb{E}_t^1\left[\frac{\frac{\xi_T^0}{\xi_t^0}\frac{\Pi_t}{\Pi_T}}{\mathbb{E}_t^1\left[\frac{\xi_T^0}{\xi_t^0}\frac{\Pi_t}{\Pi_T}\right]}\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right] \\
&= \bar{P}_{t,T}^1\,\hat{\mathbb{E}}_t^1\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right],
\end{aligned}$$

where $\hat{\mathbb{E}}_t^1$ denotes the conditional mean using the bond price $\bar{P}_{t,T}^1$ as numeraire. Specifically,

$$\frac{\zeta_T^1}{\zeta_t^1} \equiv \frac{d\hat{\mathbb{P}}^1}{d\mathbb{P}^1} = \frac{\xi_T^0\Pi_T^{-1}}{\xi_t^0\Pi_t^{-1}}\frac{1}{\bar{P}_{t,T}^1}.$$

We have that

$$\hat{\mathbb{E}}_t^1\left[\frac{\lambda_T}{\lambda_t}\right] = \mathbb{E}_t^1\left[\frac{\lambda_T}{\lambda_t}\frac{\zeta_T^1}{\zeta_t^1}\right] = \mathbb{E}_t^2\left[\frac{\zeta_T^1}{\zeta_t^1}\right] = \frac{\mathbb{E}_t^2\left[\frac{\xi_T^0}{\xi_t^0}\frac{\Pi_t}{\Pi_T}\right]}{\bar{P}_{t,T}^1} = \frac{\bar{P}_{t,T}^2}{\bar{P}_{t,T}^1}.$$

Strict concavity of $h(\cdot)$ and $0 < f_t < 1$ implies that

$$f_t h(1) + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right) < h\left(f_t\cdot 1 + (1-f_t)\cdot\frac{\lambda_T}{\lambda_t}\right).$$

Hence,

$$\begin{aligned}
P_{t,T} = \bar{P}_{t,T}^1\,\hat{\mathbb{E}}_t^1\left[\left(f_t + (1-f_t)h\left(\frac{\lambda_T}{\lambda_t}\right)\right)^{\gamma}\right] &< \bar{P}_{t,T}^1\,\hat{\mathbb{E}}_t^1\left[h\left(f_t\cdot 1 + (1-f_t)\cdot\frac{\lambda_T}{\lambda_t}\right)^{\gamma}\right] \\
= \bar{P}_{t,T}^1\left(f_t + (1-f_t)\hat{\mathbb{E}}_t^1\left[\frac{\lambda_T}{\lambda_t}\right]\right) = \bar{P}_{t,T}^1\left(f_t + (1-f_t)\frac{\bar{P}_{t,T}^2}{\bar{P}_{t,T}^1}\right) &= f_t\bar{P}_{t,T}^1 + (1-f_t)\bar{P}_{t,T}^2 = \bar{P}_{t,T}^0.
\end{aligned}$$

This concludes the proof of the case $\gamma > 1$.

It remains to prove the statements about the break-even inflation rate. Suppose $\gamma = 1$. We know from Theorem 1 that $B_{t,T} = \bar{B}_{t,T}^0$ and we have just shown that $P_{t,T} = \bar{P}_{t,T}^0$ if $\gamma = 1$. Hence, $\frac{P_{t,T}}{B_{t,T}} = \frac{\bar{P}_{t,T}^0}{\bar{B}_{t,T}^0}$ and, thus, the break-even inflation rate does not depend on disagreement. If $\gamma \neq 1$, then the break-even inflation rate can be higher or lower with disagreement as the Edgeworth box example plotted in the left graph of Figure IA.1 shows.[52] □

*Proof of Theorem 3.* Equation (A.6) is satisfied if Assumption 2 holds. Hence, Theorem 3 follows from Theorem 4. □

[52]See the Internet Appendix for more details.

# Internet Appendix for

# "Disagreement about Inflation and the Yield Curve"

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This Internet Appendix serves as a companion to our paper "Disagreement about Inflation and the Yield Curve." It provides additional theoretical and empirical results not reported in the main text due to space constraints. We present the results in the order they appear in the main paper.

## 1. Theoretical Results

In this section, we provide closed-form solutions for the disagreement measure, the expected cross-sectional consumption growth variance, the real short rate, the real price of a real bond, the expected real value of one dollar, the nominal short rate, and the nominal price of a nominal bond in the GBM and Poisson examples. If risk aversion $\gamma$ is not an integer, then the closed form solutions for the real and nominal bond price in both examples involve infinite sums. We approximate the infinite sums with a finite sum and choose the number of summands sufficiently large to obtain basis point accuracy for real and nominal yields. The

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subjective discount factor in both examples is set to zero and aggregate consumption and the preference shock are normalized to one.

## 1.1. Geometric Brownian Motion Example

Consider a continuous-time economy in which the price level $\Pi_t$ follows a geometric Brownian motion and two investors disagree on the expected inflation rate. The dynamics of the price level are

$$d\Pi_t = x^i \Pi_t \, dt + \sigma_\Pi \Pi_t \, dz_t^i,$$

where $x^i$ denotes the expected inflation rate and $z_t^i$ denotes the perceived nominal shock of investor $i$. The dynamics of the likelihood ratio $\lambda_t$ are

$$d\lambda_t = \Delta \lambda_t \, dz_t^1, \qquad \Delta = \frac{x^2 - x^1}{\sigma_\Pi}.$$

The disagreement measure for the period $t$ to $T$ is

$$\mathcal{D}_{t,T} = \frac{1}{2}\Delta^2.$$

The expected cross-sectional consumption growth variance from time t to $T$ is

$$\mathbb{E}^1\left[\sigma_{CS}^2(t,T)\right] = \frac{1}{4\gamma^2}\left(\Delta^2(T-t) + \frac{1}{4}\Delta^4(T-t)^2\right).$$

The real short rate at time $t$ is

$$r_t = \frac{\gamma - 1}{2\gamma}\Delta^2 f_t(1 - f_t).$$

The real price of a real discount bond at time $t$ that matures at $T$ is

$$B_{t,T} = f_t^\gamma \Phi\left(\gamma, \frac{1}{\gamma}, \frac{1 - f_t}{f_t}, -\frac{1}{2}\Delta^2(T-t), \Delta^2(T-t)\right),$$

where $\Phi(\cdot,\cdot,\cdot,\cdot,\cdot)$ is given in Proposition IA.1.

The expected real value of a time $T$ dollar at $t$ is

$$\mathbb{E}_t^i\left[\frac{1}{\Pi_T}\right] = \frac{1}{\Pi_t} e^{-\left(x^i - \sigma_\Pi^2\right)(T-t)}.$$

The nominal short rate at time $t$ is

$$r_{P,t} = r_t + f_t x^1 + (1 - f_t) x^2 - \sigma_\Pi^2.$$

The nominal price of a nominal discount bond at time $t$ that matures at $T$ is

$$P_{t,T} = e^{-\left(x^1 - \sigma_\Pi^2\right)(T-t)} f_t^\gamma \Phi\left(\gamma, \frac{1}{\gamma}, \frac{1-f_t}{f_t}, \left(x^1 - x^2\right)(T-t) - \frac{1}{2}\Delta^2 (T-t), \Delta^2 (T-t)\right),$$

where $\Phi(\cdot,\cdot,\cdot,\cdot,\cdot)$ is given in Proposition IA.1.

**Proposition IA.1** (GBM Example)**.** *Suppose $x$ is normally distributed with mean $M$ and variance $V$. Let $A$, $B$, and $C$ denote positive real numbers. Then*

$$\Phi(A,B,C,M,V) \equiv \mathbb{E}\left[\left(1 + Ce^{Bx}\right)^A\right] = \begin{cases} \sum_{n=0}^{A} \binom{A}{n} C^n e^{nBM + \frac{1}{2}n^2 B^2 V} & \textit{if} \quad A = 1,2,\ldots, \\ \Phi_1(\cdot) + \Phi_2(\cdot) & \textit{otherwise}, \end{cases}$$

*where*

$$\Phi_1(A,B,C,M,V) = \frac{1}{2} e^{-\frac{1}{2}\frac{(MB + \log C)^2}{B^2 V}} \sum_{n=0}^{\infty} \binom{A}{n} \textit{erfcx}\left(\frac{MB + \log C + nB^2 V}{B\sqrt{2V}}\right),$$

$$\Phi_2(A,B,C,M,V) = \frac{1}{2} e^{-\frac{1}{2}\frac{(MB + \log C)^2}{B^2 V}} \sum_{n=0}^{\infty} \binom{A}{n} \textit{erfcx}\left(\frac{(n-A)B^2 V - (MB + \log C)}{B\sqrt{2V}}\right),$$

*and where $\binom{A}{k}$ denotes the generalized binomial coefficient and erfcx$(\cdot)$ the scaled complementary error function.*

## 1.2. Poisson Example

Consider a continuous-time economy in which the dynamics of the price level are

$$d\Pi_t = x\Pi_{t-}\, dt + \theta \Pi_{t-} dN_{t-}^i,$$

where $x$ denotes a constant and $\theta$ denotes the constant jump size with $\theta \neq 0$ and $\theta > -1$. The two investors agree on the jump times of the Poisson process, but disagree on the jump intensity $l^i$. Hence, they disagree on the expected inflation rate $x + \theta l^i$. The dynamics of the likelihood ratio $\lambda_t$ are

$$d\lambda_t = \Delta \lambda_{t-} \left(dN_{t-}^1 - l^1 dt\right), \qquad \Delta = \frac{l^2 - l^1}{l^1}.$$

The disagreement measure for the period $t$ to $T$ is

$$\mathcal{D}_{t,T} = -l^1(\log(1+\Delta) - \Delta).$$

The expected cross sectional consumption growth variance from time $t$ to $T$ is

$$\mathbb{E}^1\left[\sigma^2_{CS}(t,T)\right] = \frac{1}{4\gamma^2}\left(\left(l^1(T-t)\right)^2(\log(1+\Delta)-\Delta))^2 + l^1(T-t)\left(\log(1+\Delta)\right)^2\right).$$

The real short rate at time $t$ is

$$r_t = (1-f_t)\Delta l^1 - \left(\left(f_t + (1-f_t)(1+\Delta)^{\frac{1}{\gamma}}\right)^\gamma - 1\right) l^1.$$

The real price of a real discount bond at time $t$ that matures at $T$ is

$$B_{t,T} = f_t^\gamma \Phi\left(\gamma, \frac{1}{\gamma}\log(1+\Delta), \frac{1-f_t}{f_t}e^{-\frac{l^2-l^1}{\gamma}(T-t)}, l^1(T-t)\right),$$

where $\Phi(\cdot,\cdot,\cdot,\cdot)$ is given in Proposition IA.2.

The expected real value of a time $T$ dollar at $t$ is

$$\mathbb{E}_t^i\left[\frac{1}{\Pi_T}\right] = \frac{1}{\Pi_t}e^{-\left(x+\frac{\theta}{1+\theta}l^i\right)(T-t)}.$$

The nominal short rate at time $t$ is

$$r_{P,t} = r_t + x + \left(f_t + (1-f_t)(1+\Delta)^{\frac{1}{\gamma}}\right)^\gamma \frac{\theta}{1+\theta}l^1.$$

The nominal price of a nominal discount bond at time $t$ that matures at $T$ is

$$P_{t,T} = e^{-\left(x+\frac{\theta l^1}{1+\theta}\right)(T-t)} f_t^\gamma \Phi\left(\gamma, \frac{1}{\gamma}\log(1+\Delta), \frac{1-f_t}{f_t}e^{-\frac{l^2-l^1}{\gamma}(T-t)}, \frac{l^1(T-t)}{1+\theta}\right),$$

where $\Phi(\cdot,\cdot,\cdot,\cdot)$ is given in Proposition IA.2.

**Proposition IA.2** (Poisson Example)**.** *Suppose $x$ is Poisson distributed with parameter $L$*

*and define the functions*

$$\Psi_1(x,y,z) = e^{z(e^y-1)} - \Psi_2(x,y,z) - \Psi_3(x,y,z),$$
$$\Psi_2(x,y,z) = \begin{cases} 0 & \textit{if} \quad x \le 0, \\ \sum_{\xi=0}^{\lfloor -x \rfloor} \frac{z^\xi}{\xi!} e^{y\xi - z} & \textit{otherwise}, \end{cases}$$
$$\Psi_3(x,y,z) = \begin{cases} \frac{z^x}{x!} e^{xy-z} & \textit{if} \quad x = 0,1,2,\ldots, \\ 0 & \textit{otherwise}, \end{cases}$$

*where* $x!$ *denotes the factorial of* $x$ *and* $\lfloor x \rfloor$ *denotes the floor of* $x$*, that is, the largest integer not greater than* $x$*. Let* $A$*,* $B$*, and* $C$ *denote real numbers with* $A$ *and* $C$ *positive. Then*

$$\Phi(A,B,C,L) = \mathbb{E}\left[\left(1 + Ce^{Bx}\right)^A\right] = \begin{cases} \Phi_1^+(\cdot) + \Phi_2^+(\cdot) + \Phi_3(\cdot) & \textit{if} \quad B > 0, \\ (1+C)^A & \textit{if} \quad B = 0, \\ \Phi_1^-(\cdot) + \Phi_2^-(\cdot) + \Phi_3(\cdot), & \textit{if} \quad B < 0, \end{cases} \tag{IA.1}$$

*where*

$$\Phi_1^+(A,B,C,L) = \sum_{n=0}^{\infty} \binom{A}{n} C^n \cdot \Psi_2\left(-\frac{\log(C)}{B}, nB, L\right),$$
$$\Phi_2^+(A,B,C,L) = \sum_{n=0}^{\infty} \binom{A}{n} C^{A-n} \cdot \Psi_1\left(-\frac{\log(C)}{B}, (A-n)B, L\right),$$
$$\Phi_3(A,B,C,L) = 2^A \Psi_3\left(-\frac{\log(C)}{B}, 0, L\right),$$
$$\Phi_1^-(A,B,C,L) = \sum_{n=0}^{\infty} \binom{A}{n} C^n \cdot \Psi_1\left(-\frac{\log(C)}{B}, nB, L\right),$$
$$\Phi_2^-(A,B,C,L) = \sum_{n=0}^{\infty} \binom{A}{n} C^{A-n} \cdot \Psi_2\left(-\frac{\log(C)}{B}, (A-n)B, L\right).$$

*If* $A$ *is a positive integer, then equation (IA.1) simplifies to*

$$\Phi(A,B,C,L) = \sum_{n=0}^{A} \binom{A}{n} C^n e^{L\left(e^{nB}-1\right)}.$$

## 1.3. Second-Order Stochastic Dominance

*Proof of Remark 2 in the main paper: Second Order Stochastic Dominance.*
We split the proof into three parts:

1. It follows from the definition of equality in distribution, mean independence, and Jensen's inequality that

$$\begin{aligned}\mathbb{E}^y\left[g\left(\tilde{y}\right)\right] &= \mathbb{E}^y\left[g\left(\tilde{x}\tilde{\varepsilon}\right)\right] = \mathbb{E}^x\left[\mathbb{E}^\varepsilon\left[g\left(\tilde{x}\tilde{\varepsilon}\right) \mid \tilde{x}\right]\right] \leq \mathbb{E}^x\left[g\left(\mathbb{E}^\varepsilon\left[\tilde{x}\tilde{\varepsilon} \mid \tilde{x}\right]\right)\right] = \mathbb{E}^x\left[g\left(\tilde{x}\mathbb{E}^x\left[\tilde{\varepsilon} \mid \tilde{x}\right]\right)\right] \\ &= \mathbb{E}^x\left[g\left(\tilde{x}\right)\right].\end{aligned}$$

2. It follows from the definition of equality in distribution, mean independence, and Jensen's inequality that

$$\begin{aligned}\mathbb{V}^y\left[\tilde{y}\right] &= \mathbb{V}^y\left[\tilde{x}\,\tilde{\varepsilon}\right] = \mathbb{E}^y\left[\tilde{x}^2\tilde{\varepsilon}^2\right] - \left(\mathbb{E}^y\left[\tilde{x}\,\tilde{\varepsilon}\right]\right)^2 = \mathbb{E}^x\left[\mathbb{E}^\varepsilon\left[\tilde{x}^2\tilde{\varepsilon}^2 \mid \tilde{x}\right]\right] - \left(\mathbb{E}^x\left[\mathbb{E}^\varepsilon\left[\tilde{x}\,\tilde{\varepsilon} \mid \tilde{x}\right]\right]\right)^2 \\ &= \mathbb{E}^x\left[\tilde{x}^2\mathbb{E}^\varepsilon\left[\tilde{\varepsilon}^2 \mid \tilde{x}\right]\right] - \left(\mathbb{E}^x\left[\tilde{x}\,\mathbb{E}^\varepsilon\left[\tilde{\varepsilon} \mid \tilde{x}\right]\right]\right)^2 \geq \mathbb{E}^x\left[\tilde{x}^2\left(\mathbb{E}^\varepsilon\left[\tilde{\varepsilon} \mid \tilde{x}\right]\right)^2\right] - \left(\mathbb{E}^x\left[\tilde{x}\right]\right)^2 \\ &= \mathbb{E}^x\left[\tilde{x}^2\right] - \left(\mathbb{E}^x\left[\tilde{x}\right]\right)^2 = \mathbb{V}^x\left[\tilde{x}\right].\end{aligned}$$

3. Since $g(x) = \log(x)^2$ is convex for $0 < x < 1$ and concave for $x > 1$, we cannot apply the first result to show the third result. However, if $\tilde{x}$ and $\tilde{\varepsilon}$ are independent, then

$$\begin{aligned}\mathbb{E}^y\left[\left(\log\left(\tilde{y}\right)\right)^2\right] &= \mathbb{E}^y\left[\left(\log\left(\tilde{x}\,\tilde{\varepsilon}\right)\right)^2\right] = \mathbb{E}^y\left[\left(\log\left(\tilde{x}\right) + \log\left(\tilde{\varepsilon}\right)\right)^2\right] \\ &= \mathbb{E}^x\left[\left(\log\left(\tilde{x}\right)\right)^2\right] + 2\mathbb{E}^y\left[\log\left(\tilde{x}\right)\log\left(\tilde{\varepsilon}\right)\right] + \mathbb{E}^\varepsilon\left[\left(\log\left(\tilde{\varepsilon}\right)\right)^2\right] \\ &= \mathbb{E}^x\left[\left(\log\left(\tilde{x}\right)\right)^2\right] + 2\mathbb{E}^x\left[\log\left(\tilde{x}\right)\right]\mathbb{E}^\varepsilon\left[\log\left(\tilde{\varepsilon}\right)\right] + \mathbb{E}^\varepsilon\left[\left(\log\left(\tilde{\varepsilon}\right)\right)^2\right].\end{aligned}$$

The first and third terms are non-negative and, thus, it remains to be shown that the second term is nonnegative. We know that $\tilde{x}$ and $\tilde{\varepsilon}$ have unit mean and, thus, the average of the log of both variables is nonpositive because by Jensen's inequality

$$\mathbb{E}^x\left[\log\left(\tilde{x}\right)\right] \leq \log\left(\mathbb{E}^x\left[\tilde{x}\right]\right) = 0.$$

Hence,

$$\mathbb{E}^x\left[\log\left(\tilde{x}\right)\right]\mathbb{E}^\varepsilon\left[\log\left(\tilde{\varepsilon}\right)\right] \geq 0,$$

which concludes the proof of the third statement. □

## 1.4. Counterexample for Effects on Break Even Inflation Rate

Figure IA.1 shows the difference between the break-even inflation rate in an economy with and without inflation disagreement as a function of risk aversion. The price level today is normalized to one. In the high inflation state, it is 1.25. In the low inflation state, it is 0.9. The second investor thinks that both inflation states are equally likely. Suppose the first investor thinks that the probability of a high inflation state is less likely than the second investor thinks. The red area shows that the break-even inflation rate is lower with disagreement if $\gamma > 1$ and higher if $\gamma < 1$. Suppose the first investor thinks that the probability of a high inflation state is more likely than the second investor thinks. The blue area shows that the break-even inflation rate is higher with disagreement if $\gamma > 1$ and lower if $\gamma < 1$.

## 1.5. Inflation Risk Premium

In this subsection, we study whether disagreement drives a wedge between real and nominal yields. Let $\text{BEIR}_{t,T}$ denote the break-even inflation rate defined as the difference between the nominal and real yield of a $T-$year bond, that is, $\text{BEIR}_{t,T} = y^P_{t,T} - y^B_{t,T}$. In contrast to the break-even inflation rate, which is a statement about prices, the inflation risk premium is sensitive to the belief chosen to determine inflation expectations. Specifically, let $\hat{\mathbb{P}}$ denote the belief of an econometrician. Then the nominal yield can be decomposed into:

$$y^P_{t,T} = y^B_{t,T} + \widehat{\text{EINFL}}_{t,T} + \widehat{\text{IRP}}_{t,T} = y^B_{t,T} + \text{EINFL}^i_{t,T} + \text{IRP}^i_{t,T}, \qquad \forall\, i = 0, 1, 2. \tag{IA.2}$$

Investors and econometricians agree on prices, so they agree on the break-even inflation rate $\text{BEIR}_{t,T} = y^P_{t,T} - y^B_{t,T}$. However, they may have different beliefs about inflation. If they disagree about expected inflation, then by equation (IA.2) they have to disagree on the inflation risk premium. For example, consider the case when the first investor predicts lower inflation than the second investor, that is, $\text{EINFL}^1_{t,T} < \text{EINFL}^2_{t,T}$. Subtracting the expected inflation rate from the agreed upon break-even inflation rate leads to a higher perceived compensation for inflation risk for the first investor, that is, $\text{IRP}^1_{t,T} > \text{IRP}^2_{t,T}$.

Figure IA.2 shows the inflation risk premium in an economy with disagreement perceived by an econometrician for different beliefs $\hat{\mathbb{P}}$. In all three examples, the first investor thinks expected inflation is 1% and the second investor thinks expected inflation is 3%, that is, $\text{EINFL}^1_{t,T} = 1\% < \text{EINFL}^2_{t,T} = 3\%$. Both investors consume the same fraction of consumption today, so the consumption-share weighted average belief about expected inflation is 2%. When the belief of the econometrician coincides with the consumption-share weighted average belief, then the inflation risk premium is slightly negative in the Edgeworth box example because the break-even inflation rate is smaller with than without disagreement. In the other two examples, the risk premium is positive. The plot of the inflation risk premium perceived by an econometrician in an economy without disagreement is very similar. In this case, the inflation risk premium is zero when we impose rational expectations, that is, if we impose that the belief of the econometrician coincides with the belief of the representative investor ($\mathbb{P}^0 = \hat{\mathbb{P}}$). If the econometrician underestimates expected inflation ($\widehat{\text{EINFL}}_{t,T} < \text{EINFL}^0_{t,T}$), then she perceives a positive inflation risk premium.

We characterize the inflation risk premium perceived by both investors in the following proposition.

**Proposition IA.3.** *The difference in investors' perceived inflation risk premiums is independent of preferences and consumption allocations. Specifically,*

$$IRP^2_{t,T} - IRP^1_{t,T} = EINFL^1_{t,T} - EINFL^2_{t,T} = \Delta EINFL_{t,T}.$$

*Moreover, we have the following limits*

$$\lim_{f_t \to 1} IRP^1_{t,T} = IRP^{H,1}_{t,T}, \qquad \lim_{f_t \to 0} IRP^1_{t,T} = IRP^{H,2}_{t,T} - \Delta EINFL_{t,T},$$
$$\lim_{f_t \to 0} IRP^2_{t,T} = IRP^{H,2}_{t,T}, \qquad \lim_{f_t \to 1} IRP^2_{t,T} = IRP^{H,1}_{t,T} + \Delta EINFL_{t,T},$$

*where $IRP^{H,i}_{t,T}$ is the inflation risk premium in an economy populated by investor $i$ only.*

*Proof of Proposition IA.3.* Straightforward. □

While the difference in inflation risk premiums is independent of preferences and consumption shares, the investor who actually perceives the largest (absolute) inflation risk premium is not. Consider the case when investor one has a consumption share that is close to one. Then, bond prices reflect the view of investor one. Therefore, the speculative component, as captured by $\Delta\text{EINFL}_{t,T}$, is negligible from that investor's point of view. The entire speculative component is captured by the second investor. As the consumption shares become similar across investors, bond prices reflect both views and the perceived inflation risk premiums for both investors reflect the disagreement in the economy.

The perceived inflation risk premiums are not bounded between the risk premiums in the homogeneous investor economies; that is, $min\left\{\text{IRP}^1_{t,T}, \text{IRP}^2_{t,T}\right\} \leq min\left\{\text{IRP}^{H,1}_{t,T}, \text{IRP}^{H,2}_{t,T}\right\}$ or $max\left\{\text{IRP}^1_{t,T}, \text{IRP}^2_{t,T}\right\} \geq max\left\{\text{IRP}^{H,1}_{t,T}, \text{IRP}^{H,2}_{t,T}\right\}$ can occur. The next example shows that investors can disagree about the distribution of inflation, but agree on the inflation risk premium. Consider a two date economy with two investors and three states, where the time discount factor is zero and aggregate consumption and habit are normalized to one. We choose probabilities perceived by the investors in such a way that they agree on expected inflation, $\text{EINFL}^1_{t,T} = \text{EINFL}^2_{t,T}$, but disagree about the distribution of inflation. In this case, the nominal yield in a homogeneous investor economy with beliefs given by investor one would be equal to that of a homogeneous investor economy with beliefs given by investor two and the inflation risk premium would be zero under both beliefs. However, once both investors are present in the same economy and $\gamma \neq 1$, then the inflation risk premium is non-zero due to changes in the investment opportunity set caused by speculative trade. Figure IA.3 shows the real and nominal yields, the break-even inflation, and the inflation risk premium as a function of disagreement. Both real and nominal yields are increasing in disagreement. In addition, both investors agree on the inflation risk premium. Yet, the inflation risk premium differs from that of a homogeneous investor economy. Here, disagreement about the distribution of inflation creates a positive inflation risk premium that increases in disagreement.

# 2. Additional Empirical Results Including Robustness Checks

## 2.1. Disagreement about the Variance and Skewness of Inflation

In the paper, we illustrate that disagreement about expected inflation increases the nominal and real yields. Our theory in Section 1 is more general because real and nominal yields also increase when there is disagreement about other moments of inflation, not just the mean. To empirically test this prediction, we use the SPF to compute disagreement about the mean (DisInfMean), which serves as a robustness check for the results in the main paper, disagreement about the variance (DisInfVar), and disagreement about the skewness (DisInfSkew) of the one year inflation rate based on the probability forecasts for the GDP deflator. We consider the GDP deflator instead of the CPI because probability forecasts based on the CPI are only available since the first quarter of 2007 whereas probability forecasts based on the GDP deflator are available since the third quarter of 1981. The two measures of inflation are very similar, that is, the correlation between the cross-sectional average inflation rate based on CPI and the GDP deflator is 96.21%. The survey respondents provide probability forecasters for the current and next calendar year which implies that the forecast horizon shrinks within both years. To keep the forecast horizon constant, we interpolate between the two probability forecasts. The time series for the second probability forecast starts in the third quarter of 1981. Specifically, the survey asks professional forecasters each quarter to assign probabilities to a set of fixed bins for GDP deflator growth until the end of this year and the end of next year. To determine a probability distribution for one year inflation rates, we interpolate between both forecasts. Specifically, for forecaster $j$ we approximate the fixed horizon forecast in the following way:

$$x^j = w_{quarter} x^j_{current} + (1 - w_{quarter}) x^j_{next},$$

where $x^j_{current}$ is the forecast for the current year, $x^j_{next}$ is the forecast for the next year, and $w_{quarter} \in \{1, 2/3, 1/3, 0\}$ are the weights. For each forecaster, we construct the implied mean, variance, and skewness based on the histograms. Specifically, we assume that for a specific bin all the probability mass is concentrated at the mid-point. Let there be $N$ bins with $x_n$ the mid-point of bin $n$. For forecaster $j = 1, \ldots, J$ the mean, variance, and skewness are

$$\begin{aligned} m_j &= \sum_{n=1}^{N} p^j_n x_j, \\ v_j &= \sum_{n=1}^{N} p^j_n x^2_j - m^2_j, \\ sk_j &= \frac{\sum_{n=1}^{N} p^j_n x^3_j - 3 m_j v_j - m^3_j}{v_j^{\frac{2}{3}}}, \end{aligned}$$

where $p^j_n$ is the probability mass assigned to bin $n$ by forecaster $j$ and $m_j$, $v_j$, and $sk_j$ are the mean, variance, and skewness of the inflation distribution for forecaster $j$, respectively. Given a cross section of $J$ forecasters at time $t$, we calculate disagreement about the mean, variance, and skewness of inflation as the cross-sectional standard deviation of the individual mean, variance, and skewness forecasts. Table IA.1 provides summary statistics for all three disagreement measures. Disagreement about expected inflation derived from the probability forecasts for the GDP deflator is slightly lower and less volatile than disagreement about expected inflation based on the CPI.[1] The three disagreement measures are positively correlated.

Table IA.2 shows regression results of real and nominal yields on inflation disagreement. Panels 1, 2, and 3 of Table IA.2 show in univariate regressions that the coefficient of inflation disagreement about the mean, variance, and skewness is positive as well as economically and

[1] There is less variation in the probability forecasts than in the mean forecasts for inflation. The cross-sectional mean, median, and standard deviation of one year inflation forecasts based on the GDP deflator are 0.6570%, 0.5943%, and 0.3126%, respectively, which is nevertheless very similar to the ones based on the CPI.

statistically significant. Disagreement about skewness shows the weakest relation and has the lowest explanatory power. This is not surprising given there is more noise in estimating skewness.[2] From Panel 4 in Table IA.2, we see that disagreement about skewness is no longer significant when including all three disagreement measures as independent variables. Importantly, the economic and statistical significance of DisInfMean and DisInfVar is very similar. This remains the case, even when we control for expected inflation and the volatility of inflation, as shown in Panel 5, although the economic magnitudes are slightly lower.

## 2.2. Emprical Robustness Checks

We conduct several robustness checks of our empirical results. The tables with these checks are attached to the end of this Internet Appendix.

1. Estimation results and summary statistics.
   (a) Table IA.3 and IA.4 reports summary statistics of the most important variables.
   (b) Table IA.5 reports estimation results of different models for expected consumption growth.
2. Inflation disagreement and Fama-Bliss nominal yields.
   (a) Table IA.6 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). ExpInf and SigInf are estimators from a time series model with an ARMA(1,1) mean equation and a GARCH(1,1) variance equation for the mean and volatility of inflation over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield are already reported in Table 2 of the draft.
   (b) Table IA.7 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth (ExpC). ExpC is an estimator from a time series model with an ARMA(1,1) mean equation for the mean of consumption growth over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield are already reported in Table 2 of the draft.

[2] A significant fraction of forecasters cluster their probability estimates in a few bins. The average number of bins is 4.004 with a standard deviation of 1.842. The median number of buckets is 4.

(c) Table IA.8 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected industrial production growth (ExpIP). ExpIP is an estimator from a time series model with an ARMA(1,1) mean equation for the mean of industrial production growth over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield and MSC inflation disagreement are already reported in Table 2 of the draft.

(d) Table IA.9 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected GDP growth (ExpGDP). ExpGDP is an estimator from a time series model with an ARMA(1,1) mean equation for the mean of GDP growth over the corresponding yield maturity horizon.

(e) Table IA.10 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{II}$). $\text{ExpC}_{II}$ denotes the projection from a regression of one quarter ahead consumption growth ($\text{gc}_{t+1}$) on a constant (Const) and current quarterly consumption growth ($\text{gc}_t$).

(f) Table IA.11 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{III}$). $\text{ExpC}_{III}$ denotes the projection from a regression of one quarter ahead consumption growth ($\text{gc}_{t+1}$) on a constant (Const), current quarterly consumption growth ($\text{gc}_t$), and inflation disagreement ($\text{DisInf}_t$).

(g) Table IA.12 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{IV}$). $\text{ExpC}_{IV}$ denotes the projection from a regression of one quarter ahead consumption growth ($\text{gc}_{t+1}$) on a constant (Const), current quarterly consumption growth ($\text{gc}_t$), inflation disagreement ($\text{DisInf}_t$), and current quarterly inflation rate ($\text{Inf}_t$).

(h) Table IA.13 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_V$). $\text{ExpC}_V$ denotes the projection from a regression of one quarter ahead consumption growth ($\text{gc}_{t+1}$) on a constant (Const), current quarterly consumption growth

($\text{gc}_t$), inflation disagreement ($\text{DisInf}_t$), and the instrumented real interest rate ($\text{rYld}_t$).

3. Inflation disagreement and real yields based on Chernov and Mueller (2012) and TIPS data.

   (a) Table IA.14 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). ExpInf and SigInf are estimators from a time series model with an ARMA(1,1) mean equation and a GARCH(1,1) variance equation for the mean and volatility of inflation over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield are already reported in Table 2 of the draft.

   (b) Table IA.15 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth (ExpC). ExpC is an estimator from a time series model with an ARMA(1,1) mean equation for the mean of consumption growth over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield are already reported in Table 2 of the draft.

   (c) Table IA.16 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected GDP growth (ExpGDP). ExpGDP is an estimator from a time series model with an ARMA(1,1) mean equation for the mean of GDP growth over the corresponding yield maturity horizon.

   (d) Table IA.17 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{II}$). $\text{ExpC}_{II}$ denotes the projection from a regression of one quarter ahead consumption growth ($\text{gc}_{t+1}$) on a constant (Const) and current quarterly consumption growth ($\text{gc}_t$).

   (e) Table IA.18 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{III}$). $\text{ExpC}_{III}$ denotes the projection from a regression of one quarter ahead consumption growth ($gc_{t+1}$) on a constant (Const), current quarterly consumption growth ($gc_t$), and inflation disagreement ($DisInf_t$).

(f) Table IA.19 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($ExpC_{IV}$). $ExpC_{IV}$ denotes the projection from a regression of one quarter ahead consumption growth ($gc_{t+1}$) on a constant (Const), current quarterly consumption growth ($gc_t$), inflation disagreement ($DisInf_t$), and current quarterly inflation rate ($Inf_t$).

(g) Table IA.20 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($ExpC_V$). $ExpC_V$ denotes the projection from a regression of one quarter ahead consumption growth ($gc_{t+1}$) on a constant (Const), current quarterly consumption growth ($gc_t$), inflation disagreement ($DisInf_t$), and the instrumented real interest rate ($rYld_t$).

4. Inflation disagreement and Fama-Bliss nominal yield volatility.

(a) Table IA.21 reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). ExpInf and SigInf are estimators from a time series model with an ARMA(1,1) mean equation and a GARCH(1,1) variance equation for the mean and volatility of inflation over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield are already reported in Table 2 of the draft.

(b) Table IA.22 reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of consumption growth (SigC). SigC is the annualized predictor of the volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. The results for the two- and five-year nominal yield volatility for SPF are already reported in Table 2 of the draft.

(c) Table IA.23 reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected industrial production growth (ExpIP). ExpIP is an estimator from a time series model with an ARMA(1,1) mean equation for the mean of industrial production growth over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield and MSC inflation disagreement are already reported in Table 2 of the draft.

(d) Table IA.24 reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of consumption growth (SigGDP). SigGDP is the annualized predictor of the volatility of GDP growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. The results for the two- and five-year nominal yield volatility for SPF are already reported in Table 2 of the draft.

(e) Table IA.25 reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), expected consumption growth (ExpC), and the volatility of consumption growth (SigC). ExpC and SigC is the annualized predictor of the mean and volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation.

(f) Table IA.26 reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation, and the CME Volatility Index VXO.

5. Inflation disagreement and real yield volatilities based on Chernov and Mueller (2012) and TIPS data.

   (a) Table IA.27 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). ExpInf and SigInf are estimators from a time series model with an ARMA(1,1) mean equation and a GARCH(1,1) variance equation for the mean and volatility of inflation over the corresponding yield maturity horizon. The results for the two- and five-year real yield volatility are already reported in Table 2 of the draft.

   (b) Table IA.28 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of consumption growth (SigC). SigC is an estimator from a time series model with an ARMA(1,1) mean equation and GARCH(1,1) variance equation for the volatility of consumption growth over the corresponding yield maturity horizon. The results for the two- and five-year nominal yield are already reported in Table 2 of the draft.

(c) Table IA.29 reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of GDP growth (SigGDP). SigGDP is an estimator from a time series model with an ARMA(1,1) mean equation and GARCH(1,1) variance equation for the volatility of GDP growth over the corresponding yield maturity horizon.

(d) Table IA.30 reports results from OLS regressions of the one-, to five-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), expected consumption growth (ExpC), and the volatility of consumption growth (SigC). ExpC and SigC is the annualized predictor of the mean and volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation.

(e) Table IA.31 reports results from OLS regressions of the one-, to five-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the CME Volatility Index VXO.

6. We consider zero-coupon bond yields ranging from 1 year to 15 years extracted from U.S. Treasury security prices by the method of Gürkaynak, Sack, and Wright (2007).

   (a) In Table IA.32, we report regression results for disagreement based on the SPF.

   (b) In Table IA.33, we report regression results for disagreement based on the MSC.

7. We consider two alternative proxies for real yields:

   (a) In Table IA.34, we subtract an ARMA(1,1) predictor of expected inflation from nominal yields.

   (b) In Table IA.35, we subtract from each nominal yield expected inflation, which is predicted by regressing future inflation over the horizon of each bond on current inflation and yields with maturities ranging from one to five years.

8. We consider three alternative proxies for inflation disagreement:

(a) In Table IA.36, we report regression results when inflation disagreement is measured as the cross-sectional variance of inflation forecasts based on MSC and SPF.

(b) In Table IA.37, we report regression results when inflation disagreement is measured as the cross-sectional interquartile range of inflation forecasts based on MSC and SPF.

(c) We compute inflation disagreement for professionals and households as the cross-sectional standard deviation divided by inflation volatility. Tables IA.38, IA.39, and IA.40 show the nominal yield, real yield, and nominal and real yield volatility results, respectively.

(d) In Table IA.41, we report regression results when inflation disagreement is measured as the first PC of the cross-sectional standard deviation of inflation forecasts based on SPF and MSC.

9. We control for two different measures of disagreement about real quantities:

    (a) We control for disagreement about GDP growth. Table IA.42 shows regression results for nominal yields and their volatilities and Table IA.43 shows results for real yields and their volatilites.

    (b) Table IA.44 shows regression results for real and nominal yields when controlling for earnings disagreement.

10. We control for five different measures of economic uncertainty:

    (a) Table IA.45 shows regression results when we control for the volatility of real consumption growth estimated by a GARCH(1,1) model.

    (b) Table IA.46 shows regression results when we control for the volatility of real GDP growth estimated by a GARCH(1,1) model.

    (c) Table IA.47 shows regression results when we control for the volatility of industrial production estimated by a GARCH(1,1) model.

    (d) Table IA.48 shows regression results when we control for the Jurado, Ludvigson, and Ng (2015) Uncertainty Measure.

    (e) Table IA.49 shows regression results when we control for the Baker, Bloom, and Davis (2015) Uncertainty Measure.

11. We control for the output gap and the NBER business cycle indicator.

(a) Table IA.50 shows regression results when we control for the output gap computed as in Cooper and Priestley (2009).

(b) Table IA.51 shows regression results when we control for the Chicago Fed National Activity Index (CFNAI) developed in Stock and Watson (1999).

# 3. Additional Details on Section 4 - Model-Based Quantitative Evidence

In this section, we report details on the model in Section 4 of the main paper. We have included the model description from the paper, and hence this section can be read independently.

The exogenous real aggregate output process $C_t$ follows a geometric Brownian motion with dynamics given by

$$dC_t = \mu_C C_t \, dt + \sigma_C C_t \, dz_{C,t}, \qquad C_0 > 0,$$

where $z_C$ represents a real shock. The dynamics of the price level $\Pi_t$ and the unobservable expected inflation rate $x_t$ are

$$d\Pi_t = x_t \Pi_t \, dt + \sigma_\Pi \Pi_t \, dz_{\Pi,t}, \qquad dx_t = \kappa \left(\bar{x} - x_t\right) \, dt + \sigma_x \, dz_{x,t}, \qquad \Pi_0 = 1,$$

where $z_{\Pi,t}$ represents a nominal shock. The three Brownian motions $z_{C,t}$, $z_{\Pi,t}$, and $z_{x,t}$ are uncorrelated.

To obtain zero disagreement in the steady-state and a tractable stochastic disagreement process, we assume that investors agree on the long run mean $\bar{x}$ and the speed of mean reversion $\kappa$, but differ in their beliefs about the volatility of expected inflation, $\sigma_x$.[3] The dynamics of the price level and the best estimator for expected inflation as perceived by investor $i$ are given by (Liptser and Shiryaev (1974a,b)):

$$d\Pi_t = x_t^i \Pi_t \, dt + \sigma_\Pi \Pi_t \, dz_{\Pi,t}^i, \quad dx_t^i = \kappa \left(\bar{x} - x_t^i\right) \, dt + \hat{\sigma}_x^i \, dz_{\Pi,t}^i, \quad x_0^i \sim N\left(\mu_{\bar{x},0}^i, \sigma_{x_0^i}^2\right).$$

The volatility $\hat{\sigma}_x^i$ is a function of $\kappa$ and $\sigma_x^i$. Investors observe the price level for a sufficiently

[3] The disagreement process is deterministic if there is only disagreement about the long run mean and it is not Markov if there is disagreement about the speed of mean reversion.

long time so that the perceived volatility, $\hat{\sigma}_x^i$, has reached its steady state level.[4]

Investors' nominal innovation processes are linked through the disagreement process $\Delta_t$, which summarizes current disagreement about expected inflation. Specifically,

$$dz_{\Pi,t}^2 \;=\; dz_{\Pi,t}^1 - \Delta_t dt, \qquad \Delta_t = \frac{x_t^2 - x_t^1}{\sigma_\Pi}.$$

The disagreement process $\Delta_t$ follows an Ornstein-Uhlenbeck process

$$d\Delta_t = -\beta \Delta_t dt + \sigma_\Delta dz_{\Pi,t}^1, \qquad \beta = \frac{\kappa \sigma_\Pi + \hat{\sigma}_x^2}{\sigma_\Pi}, \qquad \sigma_\Delta = \frac{\hat{\sigma}_x^2 - \hat{\sigma}_x^1}{\sigma_\Pi},$$

and the dynamics of the likelihood ratio $\lambda_t$ are

$$d\lambda_t = \Delta_t \lambda_t dz_{\Pi,t}^1.$$

We determine the disagreement measure over the horizon $T - t$ in the next Proposition.

**Proposition IA.4.** *The disagreement measure is*

$$\mathcal{D}_{t,T} \equiv \mathcal{D}\left(\Delta_t^2, T-t\right) = \frac{\sigma_\Delta^2}{4\beta} + \frac{1}{4\beta\left(T-t\right)}\left(\Delta_t^2 - \frac{\sigma_\Delta^2}{2\beta}\right)\left(1 - e^{-2\beta(T-t)}\right).$$

*Proof of Proposition IA.4.* The disagreement measure is

$$\mathcal{D}_{t,T} = \frac{1}{2\left(T-t\right)}\mathbb{E}^1\left[\int_t^T \Delta_s^2 ds\right] = \frac{1}{2\left(T-t\right)}\int_t^T \mathbb{E}^1\left[\Delta_s^2\right] ds$$

To evaluate the above we need to know $E^1\left[\Delta_s^2\right]$. To this end, note that by Ito's lemma

$$d\Delta_t^2 = 2\beta\left(\frac{\sigma_\Delta^2}{2\beta} - \Delta_t^2\right)dt - 2\beta\Delta_t dz_{\Pi,t}^1.$$

Using the dynamics of $\Delta_t^2$, we have $\mathbb{E}^1\left[\Delta_s^2\right] = \frac{\sigma_\Delta^2}{2\beta} + e^{-2\beta}\left(\Delta_t^2 - \frac{\sigma_\Delta^2}{2\beta}\right)$. Inserting this back into the expression for the disagreement measure and integrating yields the result. □

Disagreement is strictly increasing in $\Delta_t^2$ and converges to $\frac{1}{2}\Delta_t^2$ and $\frac{\sigma_\Delta^2}{4\beta}$ as $T$ goes to $t$ and

[4]The steady state level is $\hat{\sigma}_x^i = \sigma_\Pi\left(\sqrt{\kappa^2 + \left(\frac{\sigma_x^i}{\sigma_\Pi}\right)^2} - \kappa\right)$. Note that the perceived volatility of expected inflation $\hat{\sigma}_x^i$ is lower than $\sigma_x^i$, due to updating.

infinity, respectively. Hence, the instantaneous disagreement measure is given by $\frac{1}{2}\Delta_t^2$ and the long-run disagreement measure equals $\frac{\sigma_\Delta^2}{4\beta}$. In the empirical analysis in the main paper, we measure disagreement as the standard deviation of expected inflation across investors, which in the model is $\frac{1}{2}\sigma_\Pi \frac{1}{\kappa}\left(1-e^{-\kappa}\right) \mid \Delta_t \mid$. Therefore, the empirical disagreement measure is strictly increasing in $\mathcal{D}\left(\Delta(t)^2, T-t\right)$ for any maturity $T-t$.

Each investor solves the consumption-savings problem given by

$$\mathbb{E}^i\left[\int_{t=0}^{T'} e^{-\rho t} u\left(\frac{C_t^i}{H_t}\right) dt\right] \qquad \text{s.t.} \qquad \mathbb{E}^i\left[\int_{t=0}^{T'} \xi_t^i C_t^i \, dt\right] \leq w_0^i, \tag{IA.3}$$

where $w_0^i$ denotes initial wealth of investor $i$.

We conclude the description of the model by specifying an external habit process which helps match asset pricing moments.[5] Specifically,

$$\log(H_t) = \log(H_0) e^{-\delta t} + \delta \int_0^t e^{-\delta(t-a)} \log(C_a)\, da, \qquad \delta > 0,$$

where $\delta$ describes the dependence of $H_t$ on the history of aggregate output. Relative log output $\omega_t = \log(C_t/H_t)$, a state variable in the model, follows a mean reverting process

$$d\omega_t = \delta(\bar{\omega} - \omega_t)\, dt + \sigma_C \, dz_{C,t}, \qquad \bar{\omega} = (\mu_C - \sigma_C^2/2)/\delta.$$

Equilibrium consumption allocations and state price densities are given in Proposition IA.5.

**Proposition IA.5** (Consumption Allocations and State Price Densities)**.** *Optimal consumption allocations are $C_t^1 = f(\lambda_t) C_t$ and $C_t^2 = (1 - f(\lambda_t)) C_t$ with*

$$f(\lambda_t) = \frac{1}{1 + (y\lambda_t)^{\frac{1}{\gamma}}},$$

*where $y = \frac{y^2}{y^1}$ and $y^i$ is the constant Lagrange multiplier from the static budget constraint given in equation (IA.3). The state price densities are*

$$\xi_t^1 = (y^1)^{-1} e^{-\rho t} C_t^{-\gamma} H_t^{\gamma-1} f(\lambda_t)^{-\gamma}, \qquad \xi_t^2 = (y^2)^{-1} e^{-\rho t} C_t^{-\gamma} H_t^{\gamma-1} (1 - f(\lambda_t))^{-\gamma}.$$

[5] See Abel (1990), Abel (1999), Chan and Kogan (2002), and Ehling and Heyerdahl-Larsen (2016).

## 3.1. Real Yields

We provide closed-form solutions of real bond prices in the next proposition.[6]

**Proposition IA.6.** *The real bond price, when $\gamma$ is an integer is*

$$B_{t,T} = \sum_{k=0}^{\gamma} w_t^k B_{t,T}^k. \tag{IA.4}$$

*The stochastic weights $w_t^k$ sum up to one and are given by*

$$w_t^k = \binom{\gamma}{k} \frac{\lambda_t^{\frac{k}{\gamma}}}{\left(1+\lambda_t^{\frac{1}{\gamma}}\right)^{\gamma}} = \binom{\gamma}{k} f(\lambda_t)^{\gamma-k}(1-f(\lambda_t)^k. \tag{IA.5}$$

*$B_{t,T}^k$ is an exponential quadratic function of the state vector $Y_{1,t} = (\Delta_t, \omega_t)$:*

$$B_{t,T}^k = exp\left(\mathcal{A}_B^k(T-t) + \mathcal{B}_B^k(T-t)'Y_{1,t} + Y_{1,t}'\mathcal{C}_B^k(T-t)Y_{1,t}\right),$$

*where the coefficients $\mathcal{A}_B^k(\cdot), \mathcal{B}_B^k(\cdot), \mathcal{C}_B^k(\cdot)$ are solutions to ordinary differential equations summarized in Section 3.3 of the Internet Appendix.*

*Proof of Proposition IA.6.* Assume $\gamma$ is integer. The real bond price is $B_{t,T} = \mathbb{E}_t^1\left[\frac{\xi_T^1}{\xi_t^1}\right]$. From Proposition IA.5, we have that the SDF is

$$\begin{aligned}\xi_t^1 &= (y^1)^{-1}e^{-\rho t}C_t^{-\gamma}H_t^{\gamma-1}f(\lambda_t)^{-\gamma} = (y^1)^{-1}e^{-\rho t}C_t^{-\gamma}H_t^{\gamma-1}\left(1+(y\lambda_t)^{\frac{1}{\gamma}}\right)^{\gamma} \\ &= \sum_{k=0}^{\gamma}\binom{\gamma}{k}(y^1)^{-1}e^{-\rho t}C_t^{-\gamma}H_t^{\gamma-1}(y\lambda_t)^{\frac{k}{\gamma}}.\end{aligned}$$

Inserting the above into the expression for the bond price we have

$$\sum_{k=0}^{\gamma} w_t^k \mathbb{E}_t^1\left[\left(\frac{C_T}{C_t}\right)^{-\gamma}\left(\frac{H_T}{H_t}\right)^{\gamma-1}\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{k}{\gamma}}\right], \quad \text{where} \quad w_t^k = \binom{\gamma}{k}\frac{\lambda_t^{\frac{k}{\gamma}}}{\left(1+\lambda_t^{\frac{1}{\gamma}}\right)^{\gamma}}.$$

Define $\frac{\xi_T^k}{\xi_t^k} = \left(\frac{C_T}{C_t}\right)^{-\gamma}\left(\frac{H_T}{H_t}\right)^{\gamma-1}\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{k}{\gamma}}$. We can think of this as a stochastic discount factor

[6] Our solution method relies on a binomial expansion similar to the approach in Yan (2008), Dumas, Kurshev, and Uppal (2009), and Bhamra and Uppal (2014). Alternatively, the model can be solved by the generalized transform analysis proposed in Chen and Joslin (2012).

in an artificial economy. Applying Ito's lemma we have

$$\frac{d\xi_t^k}{\xi_t^k} = -r_t^k dt - \theta_t^k dz, \quad \text{where} \quad dz = \left(dz_{C,t}, dz_{\Pi,t}^1\right)$$

and

$$\theta_t^k = \left(\gamma\sigma_C, \frac{k}{\gamma}\Delta_t\right), \quad \text{and} \quad r_t^k = \rho + \gamma\mu_C - \frac{1}{2}\gamma(\gamma+1)\sigma_C^2 - \delta(\gamma-1)\omega_t + \frac{1}{2}\frac{k}{\gamma}\left(1 - \frac{k}{\gamma}\right)\Delta_t^2.$$

Define the state vector $Y_{1,t} = (\Delta_t, \omega)$. We have that $Y_{1,t}$ follows a multidimensional Ornstein-Uhlenbeck process. Moreover, the real short rate in the artificial economies are quadratic in the state vector and the market prices of risk are linear in the state vector. Hence, the artificial state price densities are in the class of quadratic Gaussian term structure (QGTS) models and the solution to $\mathbb{E}_t^1\left[\left(\frac{C_T}{C_t}\right)^{-\gamma}\left(\frac{H_T}{H_t}\right)^{\gamma-1}\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{k}{\gamma}}\right] = \mathbb{E}^1\left[\frac{\xi_T^k}{\xi_t^k}\right]$ is an exponential quadratic function of the state vector with time dependent coefficients that are solutions to ordinary differential equations.[7]

□

The bond price in equation (IA.4) is a weighted average of artificial bond prices that belong to the class of quadratic Gaussian term structure models. To gain intuition, we inspect the real short rate $r_t$ which is the limit of the bond yield as maturity T approaches $t$:

$$r_t = \underbrace{\rho + \gamma\mu_C - \frac{1}{2}\gamma(\gamma+1)\sigma_C^2}_{CRRA} - \underbrace{\delta(\gamma-1)\omega_t}_{Habit} + \underbrace{\left(1 - \frac{1}{\gamma}\right) f(\lambda_t)(1 - f(\lambda_t))\frac{1}{2}\Delta_t^2}_{Disagreement}. \quad \text{(IA.6)}$$

We see from equation (IA.6) that the real short rate is the real short rate in a CRRA preferences representative investor economy plus two additional terms. The additional terms account for habit preferences and inflation disagreement. The impact from inflation disagreement on the real yield curve depends on the consumption share $f(\lambda_t)$, risk aversion $\gamma$, and the instantaneous disagreement measure $\frac{1}{2}\Delta_t^2$. The real short rate does not depend on disagreement if $\gamma = 1$ and is increasing in disagreement when $\gamma > 1$ (the opposite is true when $\gamma < 1$).

[7] We derive solutions to bond prices that belong to the class of QGTS models in Section 3.3 in this Internet Appendix.

## 3.2. Nominal Yields

We provide closed-form solutions of the nominal price of a nominal bond in the next proposition.

**Proposition IA.7.** *The nominal bond price, when $\gamma$ is an integer, is*

$$P_{t,T} = \sum_{k=0}^{\gamma} w_t^k P_{t,T}^k,$$

*where $w_t^k$ is given in equation (IA.5). $P_{t,T}^k$ is an exponential quadratic function of the state vector $Y_t = (x_t^1, \Delta_t, \omega_t)$:*

$$P_{t,T}^k = \exp\left(\mathcal{A}_P^k(T-t) + \mathcal{B}_P^k(T-t)'Y_t + Y_t'\mathcal{C}_P^k(T-t)Y_t\right),$$

*where the coefficients $\mathcal{A}_P^k(\cdot), \mathcal{B}_P^k(\cdot), \mathcal{C}_P^k(\cdot)$ are solutions to ordinary differential equations summarized in Section 3.3 of the Internet Appendix.*

*Proof of Proposition IA.7.* The proof follows similar steps as in the proof of Proposition IA.6. In particular, the bond price can be written as

$$\sum_{k=0}^{\gamma} w_t^k \mathbb{E}_t^1\left[\left(\frac{C_T}{C_t}\right)^{-\gamma}\left(\frac{H_T}{H_t}\right)^{\gamma-1}\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{k}{\gamma}}\frac{\Pi_t}{\Pi_T}\right],$$

and we can define a set of artificial nominal stochastic discount factors

$$\frac{\xi_{\Pi,T}^k}{\xi_{\Pi,t}^k} = \left(\frac{C_T}{C_t}\right)^{-\gamma}\left(\frac{H_T}{H_t}\right)^{\gamma-1}\left(\frac{\lambda_T}{\lambda_t}\right)^{\frac{k}{\gamma}}\frac{\Pi_t}{\Pi_T}.$$

Applying Ito's lemma, we have

$$\frac{d\xi_{\Pi,t}^k}{\xi_{\Pi,t}^k} = -r_{\Pi,t}^k dt - \theta_{\Pi,t}^k dz, \quad \text{where} \quad \theta_{\Pi,t}^k = \theta_t^k + \sigma_\Pi, \quad r_{\Pi,t}^k = r_{\Pi,t}^k + x_t^1 + \frac{k}{\gamma}\Delta_t - \sigma_\Pi^2.$$

Define the state vector $Y_t = (x_t^1, \Delta_t, \omega)$. We have that $Y_t$ follows a multidimensional Ornstein-Uhlenbeck process. Moreover, the real short rate in the artificial economies are quadratic in the state vector and the market prices of risk are linear in the state vector. Hence, the artificial state price densities are in the class of QGTS models and, thus, we can solve for the bond price in closed form up to the solution of ordinary differential equations. □

Similarly to the real bond price, the nominal bond price can be expressed as a weighed average of artificial bond prices that belong to the class of quadratic Gaussian term structure models. Taking the limit of the nominal bond yield as the maturity T approaches $t$, we obtain the nominal short rate

$$r_{P,t} = r_t + f_t x_t^1 + (1 - f_t) x_t^2 - \sigma_\Pi^2. \tag{IA.7}$$

We see from equation (IA.7) that the nominal short rate is the sum of the real short rate, the market view about expected inflation, and a Jensen's inequality term. The intuition for this is straightforward; when an investor has a larger consumption share, her view is more important in determining the price of the nominal bond. Hence, the market view replaces expected inflation in a standard economy with homogeneous beliefs.

The main channel through which inflation disagreement affects nominally interest rates becomes transparent through equation (IA.7) of the nominal short rate. There is no inflation risk premium without disagreement and from the perspective of an outsider whose view coincides with the market view there is also no inflation risk premium with disagreement. Therefore, an increase in inflation disagreement raises the real short rate and, consequently, also the nominal short rate.[8]

## 3.3. Quadratic Gaussian Term Structure Models

In this section, we summarize results from the quadratic Gaussian term structure literature which we use to solve for closed-form real and nominal bond prices. Here we use the same notation as Ahn, Dittmar, and Gallant (2002).[9] Let $Y(t)$ denote a $N-$dimensional vector of state variables and $Z_M(t)$ a $M-$dimensional vector of independent Brownian motions.

**Assumption 1.** *The dynamics of the stochastic discount factor SDF(t) are*[10]

$$\frac{dSDF(t)}{SDF(t)} = -r(t)\, dt + 1_M'\ diag \left[\eta_{0m} + \eta_{Ym}' Y(t)\right]_M\ dZ_M(t),$$

*with*

$$\eta_0 = (\eta_{01}, \ldots, \eta_{0M})' \in \mathcal{R}^M, \quad \eta_Y = (\eta_{Y1}, \ldots, \eta_{YM})' \in \mathcal{R}^{M \times N}.$$

[8]Both investors' inflation views differ from the market view and, thus, they perceive positive inflation risk premiums on their investments.

[9]In contrast to Ahn, Dittmar, and Gallant (2002): (i) we assume that the vector of Brownian motions driving the discount factor is identical to the vector of Brownian motions driving the state variables and, thus, $\Upsilon$ is the identify matrix, and (ii) we allow the vector of Brownian motions to have a dimension that is different from the number of state variables.

[10]An apostrophe denotes the transpose of a vector or matrix, $1_M'$ denotes a vector of ones, and diag $[Y_m']_M$ denotes a $M$-dimensional matrix with diagonal elements $(Y_1, \ldots, Y_m)$.

Hence, the market price of risk is an affine function of the state vector $Y(t)$.

**Assumption 2.** *The short rate is a quadratic function of the state variables:*

$$r(t) = \alpha + \beta' Y(t) + Y(t)' \Psi Y(t),$$

*where $\alpha$ is a constant, $\beta$ is an $N$-dimensional vector of constants, and $\Psi$ is an $N \times N$ dimensional positive semidefinite matrix of constants.*[11]

If the matrix $\Psi$ is non singular, then $r(t) \geq \alpha - \frac{1}{2}\beta'\Psi^{-1}\beta \; \forall t$.

**Assumption 3.** *The state vector $Y(t)$ follows a multidimensional OU-process:*

$$dY(t) = (\mu + \xi Y(t)) \; dt + \Sigma dZ_M(t),$$

*where $\mu$ is an $N$-dimensional vector of constants, $\xi$ is an $N$-dimensional square matrix of constants, and $\Sigma$ is a $N \times M$-dimensional matrix of constants. We assume that $\xi$ is diagonalizable and has negative real components of eigenvalues. Specifically, $\xi = U\Lambda U^{-1}$ in which $U$ is the matrix of $N$ eigenvectors and $\Lambda$ is the diagonal matrix of eigenvalues.*

Let $V(t,\tau)$ denote the price of a zero-coupon bond and $y(t,\tau)$ the corresponding yield. Specifically,

$$V(t,\tau) = \mathrm{E}_t\left[\frac{\mathrm{SDF}(t+\tau)}{\mathrm{SDF}(t)}\right], \quad \text{and} \quad y(t,\tau) = -\frac{1}{\tau}\ln\left(V(t,\tau)\right).$$

The bond price and corresponding yield are given in the next proposition.

**Proposition IA.8** (Quadratic Gaussian Term Structure Model)**.** *Let $\delta_0 = -\Sigma\Upsilon\eta_0 = -\Sigma\eta_0$ and $\delta_Y = -\Sigma\Upsilon\eta_Y = -\Sigma\eta_Y$. The bond price is an exponential quadratic function of the state vector*

$$V(t,\tau) = exp\left\{A(\tau) + B(\tau)'Y(t) + Y(t)'C(\tau)Y(t)\right\},$$

*where $A(\tau)$, $B(\tau)$, and $C(\tau)$ satisfy the ordinary differential equations,*

$$\frac{dA(\tau)}{d\tau} = trace\left[\Sigma\Sigma' C(\tau)\right] + \frac{1}{2}B(\tau)'\Sigma\Sigma' B(\tau) + B(\tau)'(\mu - \delta_0) - \alpha, \quad with \quad A(0) = 0,$$
$$\frac{dB(\tau)}{d\tau} = 2C(\tau)\Sigma\Sigma' B(\tau) + (\xi - \delta_Y)'B(\tau) + 2C(\tau)(\mu - \delta_0) - \beta, \quad with \quad B(0) = 0,$$
$$\frac{dC(\tau)}{d\tau} = 2C(\tau)\Sigma\Sigma' C(\tau) + (C(\tau)(\xi - \delta_Y) + (\xi - \delta_Y)'C(\tau)) - \Psi, \quad with \quad C(0) = 0_{N\times N}.$$

[11] We do not impose an additional parameter restriction that guarantees non-negativity of the short rate.

*Moreover, the yield is a quadratic function of the state vector $Y(t)$:*

$$y(t, \tau) = A_y(\tau) + B_y(\tau)'Y(t) + Y(t)'C_y(\tau)Y(t),$$

*with $A_y(\tau) = -A(\tau)/\tau$, $B_y(\tau) = -B(\tau)/\tau$, and $C_y(\tau) = -C(\tau)/\tau$.*

*Proof.* See Ahn, Dittmar, and Gallant (2002). □

If the short rate is an affine function of the state vector $Y(t)$, then the bond price is an exponential affine function of the state vector $Y(t)$ because $\Psi = 0_{N\times N}$ implies $C(\tau) = 0_{N\times N}$ for all $\tau$. The bond price in this case belongs to the class of essential affine term structure models (see Duffee (2002)) and is given in the next proposition.

**Proposition IA.9** (Essential Affine Term Structure Model)**.** *Let $\Psi = 0_{N\times N}$, $\delta_0 = -\Sigma\Upsilon\eta_0 = -\Sigma\eta_0$, and $\delta_Y = -\Sigma\Upsilon\eta_Y = -\Sigma\eta_Y$ and assume that $(\xi - \delta_Y)$ is invertible. The bond price is an exponential affine function of the state vector*

$$V(t, \tau) = exp\left\{A(\tau) + B(\tau)'Y(t)\right\},$$

*where $A(\tau)$ and $B(\tau)$ satisfy the ordinary differential equations,*

$$\frac{dA(\tau)}{d\tau} = \frac{1}{2}B(\tau)'\Sigma\Sigma'B(\tau) + B(\tau)'(\mu - \delta_0) - \alpha, \quad with \quad A(0) = 0,$$
$$\frac{dB(\tau)}{d\tau} = (\xi - \delta_Y)'B(\tau) - \beta, \quad with \quad B(0) = 0.$$

*Moreover, the yield is an affine function of the state vector $Y(t)$:*

$$y(t, \tau) = A_y(\tau) + B_y(\tau)'Y(t) \quad with \quad A_y(\tau) = -A(\tau)/\tau, \quad B_y(\tau) = -B(\tau)/\tau.$$

# References


Abel, A. B., 1990. Asset prices under habit information and catching up with the Joneses. American Economic Review 80, 38–42.

Abel, A. B., 1999. Risk premia and term premium in general equilibrium. Journal of Monetary Economics 43, 3–33.

Ahn, D.-H., Dittmar, R. F., Gallant, A. R., 2002. Quadratic term structure models: Theory and evidence. Review of Financial Studies 15, 243–288.

Baker, S. R., Bloom, N., Davis, S. J., 2015. Measuring economic policy uncertainty, stanford University.

Bhamra, H., Uppal, R., 2014. Asset prices with heterogeneity in preferences and beliefs. Review of Financial Studies 27, 519–580.

Chan, Y. L., Kogan, L., 2002. Catching up with the Joneses: Heterogeneous preferences and the dynamics of asset prices. Journal of Political Economy 110, 1255–1285.

Chen, H., Joslin, S., 2012. Generalized transform analysis of affine processes and applications in finance. Review of Financial Studies 25, 2225–2256.

Cooper, I., Priestley, R., 2009. Time-varying risk premiums and the output gap. Review of Financial Studies 22, 2601–2633.

Duffee, G. R., 2002. Term premia and interest rate forecast in affine models. Journal of Finance 57, 405–443.

Dumas, B., Kurshev, A., Uppal, R., 2009. Equilibrium portfolio strategies in the presence of sentiment risk and excess volatility. The Journal of Finance 64, 579–629.

Ehling, P., Heyerdahl-Larsen, C., 2016. Correlations. Management Science forthcoming.

Gürkaynak, R. S., Sack, B., Wright, J. H., 2007. The U.S. treasury yield curve: 1961 to the present. Journal of Monetary Economics 54, 2291–2304.

Gürkaynak, R. S., Sack, B., Wright, J. H., 2010. The tips yield curve and inflation compensation. American Economic Journal: Macroeconomics 2, 70–92.

Jurado, K., Ludvigson, S. C., Ng, S., 2015. Measuring uncertainty. American Economic Review 105, 1177–1216.

Liptser, R., Shiryaev, A. N., 1974a. Statistics of Random Processes I General Theory. Springer, second ed.

Liptser, R., Shiryaev, A. N., 1974b. Statistics of Random Processes II Applications. Springer, second ed.

Stock, J. H., Watson, M. W., 1999. Forecasting inflation. Journal of Monetary Economics 44, 293–335.

Yan, H., 2008. Natural selection in financial markets: Does it work? Management Science 54, 1935–1950.

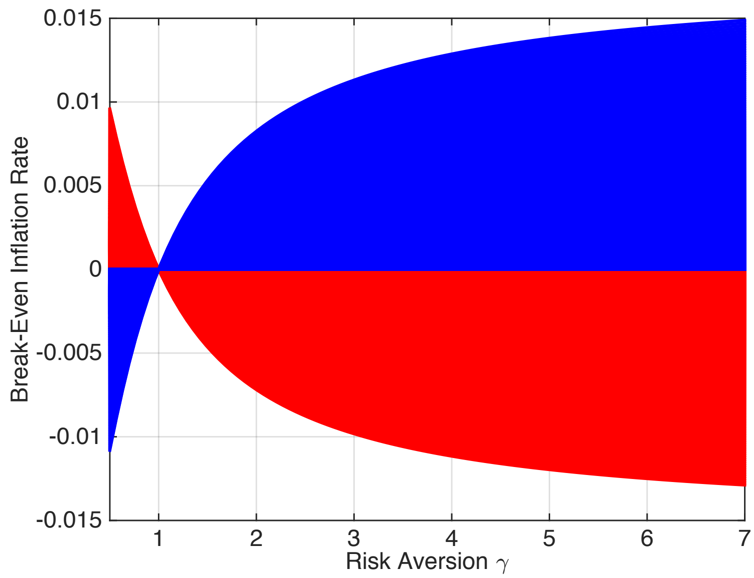


Figure IA.1: Break-Even Inflation Rate in Edgeworth Box

This plot shows the difference between the break-even inflation rate in an economy with and without inflation disagreement as a function of risk aversion. The price level today is normalized to one and it is 1.25 in the high and 0.9 in the low inflation state tomorrow. The second investor thinks that both inflation states are equally likely.

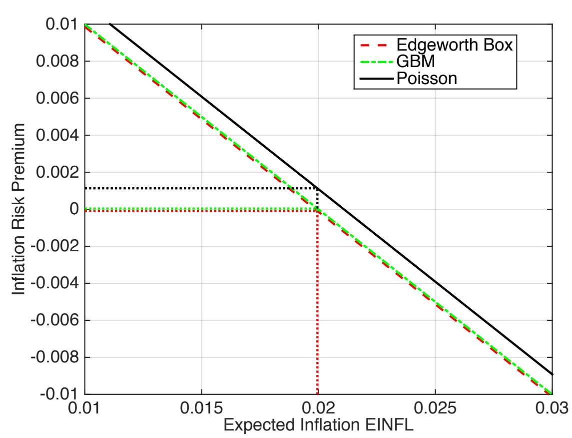


Figure IA.2: Inflation Risk Premium

This plot shows the inflation risk premium when there is a disagreement as a function of perceived expected inflation of an econometrician. The inflation risk premium is sensitive to the belief of the econometrician.

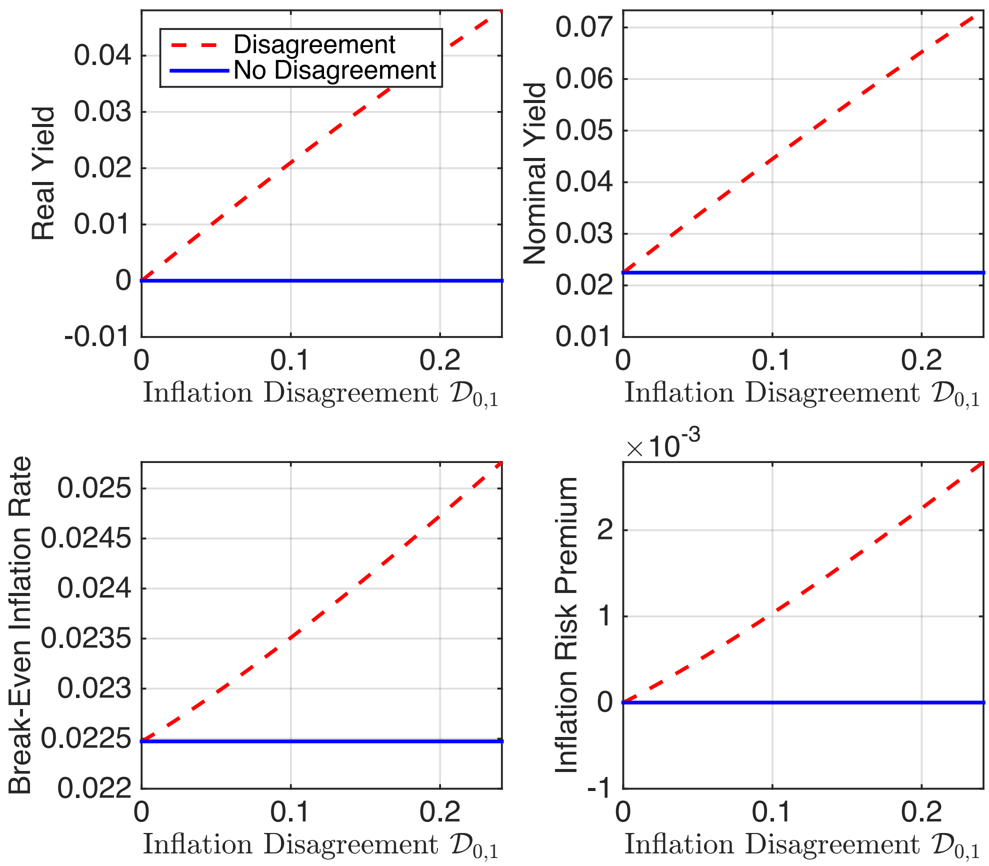


Figure IA.3: Inflation Risk Premium

The figure shows the real yield (top-left), nominal yield (top-right), break-even inflation (bottom-left), and inflation risk premium (bottom-right) as an increasing function of inflation disagreement $\mathcal{D}_{0,1}$ when $\gamma = 2$. There are three states with inflation given by $(0.9, 1, 1.125)$ in state one, two, and three, respectively. The probability as perceived by investor one over the three states are given by $(0.2, 0.4, 0.4)$. For the second investor, we vary the probability of the first state from 0.2 to 0.05 and then solve for the probability of the two other states such that $\mathbb{E}^1\left[\frac{1}{\Pi_1}\right] = \mathbb{E}^2\left[\frac{1}{\Pi_1}\right]$. There is a positive break even inflation rate and inflation risk premium even though investors agree on the expected real value of one dollar.

Table IA.1: **Summary Statistics - Disagreement about the Mean, Variance, and Skewness of Inflation.** The table reports summary statistics for disagreement about the mean (DisInfMean), disagreement about the variance (DisInfVar), and disagreement about the skewness (DisInfSkew) of inflation in percent. The three disagreement measures are calculated as the cross-sectional standard deviation of the individual mean, variance, and skewness of one-year inflation rates based on the probability forecasts for the GDP deflator provided by the Survey of Professional Forecasters. Samples: $Q3$-1981 to $Q2$-2014.

| | Mean | Median | STD | Correlation | | |
|---|---|---|---|---|---|---|
| | | | | DisInfMean | DisInfVar | DisInfSkew |
| DisInfMean | 0.5546 | 0.5174 | 0.1711 | 100 | 51.63 | 18.59 |
| DisInfVar | 0.0082 | 0.0071 | 0.0041 | | 100 | 49.15 |
| DisInfSkew | 0.0034 | 0.0007 | 0.0075 | | | 100 |

Table IA.2: **Real and Nominal Yield Levels and Disagreement about the Mean, Variance, and Skewness of Inflation.** The table reports results from OLS regressions of real and nominal yields on disagreement about the mean (DisInfMean), disagreement about the variance (DisInfVar), and disagreement about the skewness (DisInfSkew) of inflation. The three disagreement measures are calculated as the cross-sectional standard deviation of the individual mean, variance, and skewness of one year inflation rates based on the probability forecasts for the GDP deflator provided by the Survey of Professional Forecasters. The first three panels show univariate regression results of real and nominal yields onto each disagreement measure. In Panel 4, all three disagreements are included. Panel 5 also controls for expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are predicted by a GARCH$(1, 1)$ model with an ARMA$(1, 1)$ mean equation over multiple horizons (T). Samples: $Q$3-1981 to $Q$2-2014.

| | Real Yields | | | | | Nominal Yields | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 1y | 2y | 3y | 4y | 5y |
| DisInfMean | 0.44 | 0.44 | 0.45 | 0.46 | 0.46 | 0.47 | 0.47 | 0.48 | 0.49 | 0.50 |
| t-stat | 2.88 | 2.86 | 2.83 | 2.83 | 2.85 | 3.19 | 3.23 | 3.31 | 3.41 | 3.50 |
| adj. $R^2$ | 0.18 | 0.19 | 0.20 | 0.20 | 0.21 | 0.21 | 0.22 | 0.23 | 0.23 | 0.24 |
| DisInfVar | 0.45 | 0.45 | 0.46 | 0.45 | 0.45 | 0.53 | 0.53 | 0.53 | 0.53 | 0.53 |
| t-stat | 3.06 | 3.04 | 2.96 | 2.93 | 2.91 | 4.29 | 4.19 | 4.16 | 4.17 | 4.18 |
| adj. $R^2$ | 0.19 | 0.20 | 0.20 | 0.20 | 0.20 | 0.28 | 0.27 | 0.27 | 0.27 | 0.28 |
| DisInfSkew | 0.18 | 0.19 | 0.20 | 0.21 | 0.21 | 0.24 | 0.24 | 0.24 | 0.24 | 0.24 |
| t-stat | 2.31 | 2.33 | 2.31 | 2.31 | 2.32 | 3.07 | 3.08 | 3.05 | 3.03 | 3.06 |
| adj. $R^2$ | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| DisInfMean | 0.28 | 0.29 | 0.30 | 0.31 | 0.31 | 0.26 | 0.27 | 0.29 | 0.30 | 0.30 |
| t-stat | 2.44 | 2.43 | 2.45 | 2.49 | 2.53 | 2.20 | 2.31 | 2.45 | 2.55 | 2.66 |
| DisInfVar | 0.32 | 0.31 | 0.30 | 0.29 | 0.29 | 0.40 | 0.39 | 0.38 | 0.37 | 0.38 |
| t-stat | 2.56 | 2.56 | 2.46 | 2.39 | 2.33 | 3.70 | 3.52 | 3.45 | 3.44 | 3.39 |
| DisInfSkew | -0.03 | -0.02 | -0.00 | 0.01 | 0.01 | -0.01 | -0.00 | -0.00 | -0.00 | -0.00 |
| t-stat | -0.29 | -0.21 | -0.01 | 0.06 | 0.13 | -0.09 | -0.03 | -0.00 | -0.00 | -0.02 |
| adj. $R^2$ | 0.24 | 0.25 | 0.26 | 0.26 | 0.26 | 0.32 | 0.32 | 0.32 | 0.33 | 0.34 |
| DisInfMean | 0.22 | 0.22 | 0.24 | 0.25 | 0.26 | 0.19 | 0.20 | 0.22 | 0.23 | 0.24 |
| t-stat | 2.27 | 2.28 | 2.34 | 2.40 | 2.46 | 2.19 | 2.33 | 2.49 | 2.58 | 2.71 |
| DisInfVar | 0.24 | 0.24 | 0.23 | 0.23 | 0.23 | 0.32 | 0.31 | 0.31 | 0.30 | 0.31 |
| t-stat | 2.18 | 2.21 | 2.17 | 2.14 | 2.11 | 3.37 | 3.27 | 3.24 | 3.26 | 3.23 |
| DisInfSkew | -0.03 | -0.02 | -0.01 | -0.00 | 0.00 | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 |
| t-stat | -0.27 | -0.24 | -0.08 | -0.03 | 0.02 | -0.37 | -0.31 | -0.28 | -0.28 | -0.28 |
| ExpInf | 0.28 | 0.28 | 0.28 | 0.26 | 0.25 | 0.39 | 0.37 | 0.36 | 0.35 | 0.33 |
| t-stat | 2.04 | 2.08 | 2.00 | 1.93 | 1.84 | 2.70 | 2.59 | 2.46 | 2.37 | 2.33 |
| SigInf | 0.12 | 0.09 | 0.07 | 0.06 | 0.04 | 0.02 | 0.00 | -0.00 | -0.01 | -0.01 |
| t-stat | 1.13 | 0.94 | 0.80 | 0.65 | 0.46 | 0.17 | 0.00 | -0.05 | -0.13 | -0.16 |
| adj. $R^2$ | 0.29 | 0.29 | 0.30 | 0.30 | 0.30 | 0.44 | 0.43 | 0.43 | 0.43 | 0.43 |

Table IA.3: **Descriptive Statistics of Real and Nominal Yields and their Volatilities.** The table reports mean, median, standard deviation (Std), and number of observations (N) of percentage real and nominal yields and real and nominal yield volatilities. Quarterly real yields are from Chernov and Mueller (2012) merged with TIPS yields from Gürkaynak, Sack, and Wright (2010). Nominal yields at monthly and quarterly frequency are from Fama-Bliss. Yield volatilities are computed by estimating a GARCH(1, 1) model with an AR(1) mean equation. Real yield sample: $Q3$-1981 to $Q2$-2014. Nominal yield sample: January 1978 to June 2014.

| Maturity | 2y | 3y | 5y | 7y | 10y | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quarterly Real Yields | | | | | Quarterly Nominal Yields | | | | | Monthly Nominal Yields | | | | |
| Mean | 1.927 | 2.027 | 2.255 | 2.415 | 2.586 | 4.851 | 5.160 | 5.421 | 5.647 | 5.809 | 5.412 | 5.672 | 5.884 | 6.080 | 6.220 |
| Median | 2.370 | 2.395 | 2.430 | 2.533 | 2.628 | 5.012 | 5.080 | 5.332 | 5.615 | 5.585 | 5.370 | 5.560 | 5.788 | 5.922 | 5.972 |
| STD | 1.976 | 1.836 | 1.594 | 1.433 | 1.247 | 3.390 | 3.424 | 3.380 | 3.311 | 3.219 | 3.690 | 3.631 | 3.528 | 3.432 | 3.328 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| | Quarterly Real Yield Volatilities | | | | | Quarterly Nominal Yield Volatilities | | | | | Monthly Nominal Yield Volatilities | | | | |
| Mean | 0.733 | 0.620 | 0.511 | 0.452 | 0.389 | 0.319 | 0.352 | 0.357 | 0.368 | 0.357 | 0.374 | 0.388 | 0.386 | 0.388 | 0.371 |
| Median | 0.639 | 0.555 | 0.468 | 0.423 | 0.368 | 0.258 | 0.313 | 0.335 | 0.339 | 0.329 | 0.278 | 0.322 | 0.340 | 0.342 | 0.326 |
| STD | 0.298 | 0.212 | 0.134 | 0.096 | 0.070 | 0.256 | 0.196 | 0.154 | 0.152 | 0.140 | 0.352 | 0.263 | 0.216 | 0.188 | 0.167 |

Table IA.4: **Descriptive Statistics of the Mean, Volatility, and Disagreement of Inflation, CEX and Trading Data.** The table reports mean, median, standard deviation (Std), and number of observations (N) of monthly and quarterly expected inflation, monthly and quarterly inflation volatility, MSC and SPF based measures of inflation disagreements (DisInf), CEX cross-sectional consumption growth volatility (Cons Vol) and income growth volatility (Income Vol), volatility of treasury volume (Vol Volume), open interest ratio in interest rate futures (Open Interest Ratio), and the notionals of inflation swaps (Inf Swaps). The reported statistics of one year forecasts of expected inflation (ExpInf) and inflation volatility (SigInf) are estimated using a GARCH(1, 1) model with an ARMA(1, 1) mean equation.

| Forecast Horizon | 1y | 2y | 3y | 4y | 5y | 7y | 10y | 1y | 2y | 3y | 4y | 5y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quarterly Expected Inflation | | | | | | | Monthly Expected Inflation | | | | |
| Mean | 3.106 | 3.192 | 3.259 | 3.313 | 3.355 | 3.417 | 3.475 | 3.628 | 3.603 | 3.584 | 3.568 | 3.555 |
| Median | 3.100 | 3.186 | 3.254 | 3.308 | 3.351 | 3.414 | 3.473 | 3.197 | 3.239 | 3.272 | 3.299 | 3.320 |
| STD | 1.133 | 0.948 | 0.803 | 0.688 | 0.597 | 0.464 | 0.339 | 2.047 | 1.730 | 1.479 | 1.277 | 1.115 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| | Quarterly Inflation Volatility | | | | | | | Monthly Inflation Volatility | | | | |
| Mean | 1.746 | 1.483 | 1.359 | 1.286 | 1.237 | 1.175 | 1.124 | 0.973 | 0.722 | 0.608 | 0.538 | 0.489 |
| Median | 1.446 | 1.271 | 1.191 | 1.145 | 1.115 | 1.079 | 1.050 | 0.874 | 0.661 | 0.565 | 0.505 | 0.463 |
| STD | 0.942 | 0.668 | 0.533 | 0.450 | 0.392 | 0.316 | 0.249 | 0.363 | 0.217 | 0.153 | 0.115 | 0.091 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| | Quarterly | | | Monthly | | | | | | | | |
| | DisInf SPF | DisInf MSC | | DisInf MSC | CEX Cons Vol | CEX Income Vol | Vol Volume | Open Interest Ratio | Inf Swaps | | | |
| Mean | 0.660 | 5.192 | | 5.537 | 0.367 | 0.898 | 0.036 | 0.688 | 0.000 | | | |
| Median | 0.564 | 4.900 | | 5.200 | 0.366 | 0.902 | 0.023 | 0.712 | 0.020 | | | |
| STD | 0.339 | 1.584 | | 1.947 | 0.022 | 0.178 | 0.023 | 0.103 | 0.496 | | | |
| N | 132 | 132 | | 438 | 345 | 330 | 152 | 333 | 70 | | | |

Table IA.5: **Expected Consumption Growth.** The table reports estimation results of different models for expected consumption growth. Panel A shows estimation results from OLS regressions of one quarter ahead consumption growth ($\text{gc}_{t+1}$) on a constant (Const), current quarterly consumption growth ($\text{gc}_t$), inflation disagreement ($\text{DisInf}_t$), current quarterly inflation rate ($\text{Inf}_t$), and the instrumented real interest rate ($\text{rYld}_t$). Each column corresponds to a different regression model and $\text{ExpC}_i$, with $i \in \{II, III, IV, V, VI\}$, is its annualized predictor. The t-statistics (t-stat) are Newey-West corrected with 12 lags. $\text{rYld}_t$ is the date t-1 projector from a regression of the real interest rate at time t on the real interest rate at time $t-1$ with estimation results shown in Panel B. Data are available at the quarterly frequency from $Q3$-1981 to $Q2$-2014.

| Panel A: | | Survey of Professional Forecasters | | | Surveys of Consumers | | |
|---|---|---|---|---|---|---|---|
| | $\text{ExpC}_{II}$ | $\text{ExpC}_{III}$ | $\text{ExpC}_{IV}$ | $\text{ExpC}_{V}$ | $\text{ExpC}_{III}$ | $\text{ExpC}_{IV}$ | $\text{ExpC}_{V}$ |
| Const. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| t-stat | 2.87 | 2.56 | 2.57 | 2.63 | 0.82 | 0.91 | 1.34 |
| $\text{gc}_t$ | 0.38 | 0.38 | 0.39 | 0.36 | 0.38 | 0.39 | 0.36 |
| t-stat | 2.89 | 2.90 | 2.72 | 2.63 | 2.92 | 2.74 | 2.57 |
| $\text{DIS}_t$ | - | 0.00 | 0.01 | -0.12 | 0.03 | 0.03 | -0.01 |
| t-stat | - | 0.00 | 0.07 | -0.93 | 0.79 | 1.04 | -0.19 |
| $\text{Infl}_t$ | - | - | -0.09 | - | - | -0.11 | - |
| t-stat | - | - | -1.25 | - | - | -1.54 | - |
| $\text{rYld}_t$ | - | - | - | 0.05 | - | - | 0.04 |
| t-stat | - | - | - | 1.85 | - | - | 1.62 |
| $R^2$ | 0.15 | 0.15 | 0.16 | 0.18 | 0.16 | 0.17 | 0.18 |
| N | 131 | 131 | 131 | 130 | 131 | 131 | 130 |

| Panel B: | Instrumented Real Yield $\text{rYld}_t$ | | | |
|---|---|---|---|---|
| | $y^{\tau}_{r,t-1}$ | t-stat | $R^2$ | Nobs |
| $y^{\tau}_{r,t}$ | 0.95 | 52.60 | 0.86 | 131 |

Table IA.6: **Inflation Disagreement and Nominal Yields I.** The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. The survey of professional forecasters (SPF) is available at the quarterly frequency from Q3-1981 to Q2-2014 and the Michigan survey of consumers (MSC) is available at the monthly frequency from January 1978 to June 2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.354 | 0.356 | 0.363 | 0.364 | 0.377 | 0.470 | 0.513 | 0.548 | 0.571 | 0.594 |
| t-stat | 3.63 | 3.60 | 3.65 | 3.74 | 3.88 | 4.11 | 4.39 | 4.61 | 4.80 | 5.05 |
| ExpInf | 0.459 | 0.449 | 0.437 | 0.435 | 0.424 | 0.356 | 0.298 | 0.249 | 0.219 | 0.196 |
| t-stat | 4.36 | 4.37 | 4.26 | 4.26 | 4.19 | 3.49 | 2.73 | 2.16 | 1.81 | 1.62 |
| adj. $R^2$ | 0.41 | 0.40 | 0.39 | 0.39 | 0.39 | 0.58 | 0.56 | 0.55 | 0.54 | 0.55 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| DisInf | 0.364 | 0.374 | 0.381 | 0.384 | 0.397 | 0.488 | 0.542 | 0.582 | 0.613 | 0.636 |
| t-stat | 3.51 | 3.50 | 3.51 | 3.58 | 3.63 | 4.16 | 4.55 | 4.86 | 5.17 | 5.42 |
| ExpInf | 0.448 | 0.430 | 0.416 | 0.411 | 0.399 | 0.334 | 0.264 | 0.207 | 0.169 | 0.144 |
| t-stat | 3.21 | 3.07 | 2.94 | 2.89 | 2.83 | 3.15 | 2.41 | 1.84 | 1.46 | 1.24 |
| SigInf | -0.024 | -0.041 | -0.044 | -0.049 | -0.050 | -0.061 | -0.091 | -0.107 | -0.126 | -0.126 |
| t-stat | -0.24 | -0.40 | -0.42 | -0.46 | -0.47 | -0.86 | -1.31 | -1.55 | -1.88 | -1.97 |
| adj. $R^2$ | 0.40 | 0.39 | 0.39 | 0.39 | 0.39 | 0.58 | 0.57 | 0.56 | 0.56 | 0.56 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.7: **Inflation Disagreement and Nominal Yields II**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth (ExpC). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpC is the annualized predictor of the mean of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.33 | 0.34 | 0.35 | 0.35 | 0.37 | 0.50 | 0.53 | 0.56 | 0.58 | 0.59 |
| t-stat | 3.41 | 3.54 | 3.62 | 3.74 | 3.95 | 4.72 | 5.35 | 5.76 | 6.14 | 6.43 |
| ExpC | 0.36 | 0.37 | 0.37 | 0.37 | 0.38 | 0.41 | 0.42 | 0.42 | 0.41 | 0.42 |
| t-stat | 2.35 | 2.38 | 2.34 | 2.27 | 2.30 | 5.07 | 5.35 | 5.33 | 5.21 | 5.43 |
| ExpInf | 0.50 | 0.49 | 0.47 | 0.47 | 0.46 | 0.44 | 0.41 | 0.39 | 0.37 | 0.36 |
| t-stat | 3.40 | 3.29 | 3.17 | 3.12 | 3.07 | 4.77 | 4.61 | 4.34 | 4.21 | 3.96 |
| SigInf | 0.18 | 0.17 | 0.17 | 0.17 | 0.17 | 0.18 | 0.16 | 0.15 | 0.13 | 0.13 |
| t-stat | 0.98 | 0.92 | 0.90 | 0.85 | 0.87 | 2.10 | 1.86 | 1.71 | 1.48 | 1.45 |
| adj. $R^2$ | 0.49 | 0.49 | 0.49 | 0.48 | 0.49 | 0.69 | 0.71 | 0.72 | 0.73 | 0.74 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.8: **Inflation Disagreement and Nominal Yields III**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected industrial production growth (ExpIP). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpIP is the annualized predictor of the mean of industrial production growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the monthly frequency from January 1978 to June 2014.

| Maturity | 1y | 2y | 3y | 4y | 5y |
|---|---|---|---|---|---|
| DisInf | 0.50 | 0.55 | 0.59 | 0.62 | 0.65 |
| t-stat | 4.34 | 4.75 | 5.03 | 5.33 | 5.57 |
| ExpIP | 0.09 | 0.10 | 0.09 | 0.09 | 0.09 |
| t-stat | 1.18 | 1.24 | 1.10 | 1.10 | 1.12 |
| ExpInf | 0.34 | 0.27 | 0.21 | 0.17 | 0.15 |
| t-stat | 3.29 | 2.53 | 1.94 | 1.56 | 1.34 |
| SigInf | -0.01 | -0.04 | -0.06 | -0.07 | -0.07 |
| t-stat | -0.13 | -0.49 | -0.77 | -1.07 | -1.09 |
| adj. $R^2$ | 0.58 | 0.57 | 0.56 | 0.56 | 0.57 |
| N | 438 | 438 | 438 | 438 | 438 |

Table IA.9: **Inflation Disagreement and Nominal Yields IV**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected GDP growth (ExpGDP). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpGDP is the annualized predictor of the mean of GDP growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.38 | 0.39 | 0.40 | 0.40 | 0.42 | 0.48 | 0.52 | 0.54 | 0.57 | 0.58 |
| t-stat | 3.94 | 4.00 | 4.02 | 4.13 | 4.25 | 3.55 | 3.94 | 4.21 | 4.48 | 4.66 |
| ExpGDP | 0.19 | 0.22 | 0.23 | 0.23 | 0.25 | 0.23 | 0.25 | 0.25 | 0.24 | 0.25 |
| t-stat | 1.83 | 2.03 | 2.04 | 2.05 | 2.18 | 2.99 | 3.17 | 3.12 | 3.07 | 3.22 |
| ExpInf | 0.46 | 0.44 | 0.43 | 0.42 | 0.41 | 0.43 | 0.40 | 0.37 | 0.36 | 0.35 |
| t-stat | 3.22 | 3.09 | 2.97 | 2.92 | 2.87 | 4.20 | 3.99 | 3.72 | 3.58 | 3.36 |
| SigInf | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.11 | 0.09 | 0.08 | 0.06 | 0.06 |
| t-stat | 0.55 | 0.52 | 0.51 | 0.49 | 0.53 | 1.26 | 1.08 | 0.94 | 0.73 | 0.74 |
| adj. $R^2$ | 0.42 | 0.42 | 0.42 | 0.42 | 0.43 | 0.59 | 0.61 | 0.62 | 0.63 | 0.64 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.10: **Inflation Disagreement and Nominal Yields V**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{II}$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $\text{ExpC}_{II}$ is the annualized estimator from a regression of future quarterly consumption growth on a constant and current quarterly consumption growth. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.32 | 0.33 | 0.34 | 0.34 | 0.35 | 0.52 | 0.55 | 0.58 | 0.60 | 0.61 |
| t-stat | 3.20 | 3.26 | 3.32 | 3.41 | 3.57 | 3.86 | 4.30 | 4.63 | 4.95 | 5.16 |
| $\text{ExpC}_{II}$ | 0.21 | 0.23 | 0.23 | 0.23 | 0.24 | 0.25 | 0.26 | 0.26 | 0.26 | 0.27 |
| t-stat | 1.95 | 2.01 | 1.98 | 1.94 | 1.99 | 3.37 | 3.47 | 3.46 | 3.47 | 3.52 |
| ExpInf | 0.49 | 0.48 | 0.47 | 0.46 | 0.45 | 0.38 | 0.36 | 0.34 | 0.32 | 0.31 |
| t-stat | 3.28 | 3.18 | 3.05 | 2.99 | 2.93 | 3.51 | 3.41 | 3.26 | 3.19 | 3.09 |
| SigInf | 0.08 | 0.07 | 0.07 | 0.06 | 0.07 | 0.10 | 0.09 | 0.08 | 0.06 | 0.06 |
| t-stat | 0.54 | 0.48 | 0.45 | 0.40 | 0.40 | 1.10 | 0.97 | 0.88 | 0.74 | 0.75 |
| adj. $R^2$ | 0.43 | 0.43 | 0.43 | 0.42 | 0.43 | 0.58 | 0.60 | 0.61 | 0.62 | 0.64 |
| N | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |

Table IA.11: **Inflation Disagreement and Nominal Yields VI**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($ExpC_{III}$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $ExpC_{III}$ is the annualized estimator from a regression of future quarterly consumption growth on a constant, current quarterly consumption growth, and current inflation disagreement. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.32 | 0.33 | 0.34 | 0.34 | 0.35 | 0.47 | 0.50 | 0.52 | 0.55 | 0.56 |
| t-stat | 3.20 | 3.26 | 3.32 | 3.41 | 3.57 | 3.52 | 3.97 | 4.32 | 4.66 | 4.91 |
| $ExpC_{III}$ | 0.21 | 0.23 | 0.23 | 0.23 | 0.24 | 0.25 | 0.26 | 0.26 | 0.26 | 0.27 |
| t-stat | 1.95 | 2.01 | 1.98 | 1.94 | 1.99 | 3.37 | 3.47 | 3.46 | 3.47 | 3.52 |
| ExpInf | 0.49 | 0.48 | 0.47 | 0.46 | 0.45 | 0.38 | 0.36 | 0.34 | 0.32 | 0.31 |
| t-stat | 3.28 | 3.18 | 3.05 | 2.99 | 2.93 | 3.51 | 3.41 | 3.26 | 3.19 | 3.09 |
| SigInf | 0.08 | 0.07 | 0.07 | 0.06 | 0.07 | 0.10 | 0.09 | 0.08 | 0.06 | 0.06 |
| t-stat | 0.54 | 0.48 | 0.45 | 0.40 | 0.40 | 1.10 | 0.97 | 0.88 | 0.74 | 0.75 |
| adj. $R^2$ | 0.43 | 0.43 | 0.43 | 0.42 | 0.43 | 0.58 | 0.60 | 0.61 | 0.62 | 0.64 |
| N | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |

Table IA.12: **Inflation Disagreement and Nominal Yields VII**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{IV}$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $\text{ExpC}_{IV}$ is the annualized estimator from a regression of future quarterly consumption growth on a constant, current quarterly consumption growth, current inflation disagreement, and current quarterly inflation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.30 | 0.30 | 0.31 | 0.32 | 0.33 | 0.43 | 0.46 | 0.49 | 0.51 | 0.52 |
| t-stat | 2.88 | 2.95 | 3.01 | 3.11 | 3.27 | 3.34 | 3.82 | 4.20 | 4.56 | 4.84 |
| $\text{ExpC}_{IV}$ | 0.27 | 0.28 | 0.29 | 0.28 | 0.29 | 0.29 | 0.30 | 0.30 | 0.30 | 0.31 |
| t-stat | 2.28 | 2.32 | 2.28 | 2.24 | 2.28 | 3.70 | 3.75 | 3.72 | 3.72 | 3.76 |
| ExpInf | 0.57 | 0.56 | 0.55 | 0.54 | 0.53 | 0.47 | 0.45 | 0.42 | 0.41 | 0.40 |
| t-stat | 3.53 | 3.44 | 3.29 | 3.23 | 3.17 | 4.30 | 4.26 | 4.11 | 4.04 | 3.93 |
| SigInf | 0.11 | 0.10 | 0.10 | 0.09 | 0.09 | 0.12 | 0.10 | 0.09 | 0.08 | 0.08 |
| t-stat | 0.68 | 0.62 | 0.58 | 0.53 | 0.53 | 1.22 | 1.08 | 0.99 | 0.86 | 0.86 |
| adj. $R^2$ | 0.45 | 0.45 | 0.45 | 0.44 | 0.45 | 0.59 | 0.61 | 0.63 | 0.64 | 0.65 |
| N | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |

Table IA.13: **Inflation Disagreement and Nominal Yields VIII**. The table reports results from OLS regressions of the one-, to five-year nominal yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_V$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $\text{ExpC}_V$ is the annualized estimator from a regression of future quarterly consumption growth on a constant, current quarterly consumption growth, current inflation disagreement, and the instrumented two year real yield. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.31 | 0.32 | 0.33 | 0.33 | 0.34 | 0.44 | 0.47 | 0.50 | 0.52 | 0.54 |
| t-stat | 4.07 | 4.18 | 4.24 | 4.34 | 4.56 | 4.36 | 5.09 | 5.63 | 6.17 | 6.49 |
| $\text{ExpC}_V$ | 0.48 | 0.49 | 0.49 | 0.48 | 0.48 | 0.43 | 0.43 | 0.43 | 0.42 | 0.42 |
| t-stat | 4.31 | 4.24 | 4.11 | 4.02 | 3.97 | 5.55 | 5.60 | 5.56 | 5.54 | 5.56 |
| ExpInf | 0.43 | 0.42 | 0.41 | 0.40 | 0.39 | 0.35 | 0.32 | 0.30 | 0.29 | 0.28 |
| t-stat | 3.42 | 3.34 | 3.21 | 3.15 | 3.08 | 3.49 | 3.40 | 3.25 | 3.19 | 3.08 |
| SigInf | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.14 | 0.12 | 0.11 | 0.09 | 0.09 |
| t-stat | 1.16 | 1.05 | 0.99 | 0.91 | 0.89 | 1.61 | 1.44 | 1.33 | 1.15 | 1.15 |
| adj. $R^2$ | 0.56 | 0.56 | 0.56 | 0.55 | 0.55 | 0.65 | 0.67 | 0.68 | 0.69 | 0.70 |
| N | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 |

Table IA.14: **Inflation Disagreement and Real Yields I.** The table reports results from OLS regressions of real yields on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.407 | 0.397 | 0.388 | 0.382 | 0.376 | 0.560 | 0.575 | 0.583 | 0.589 | 0.595 |
| t-stat | 3.48 | 3.33 | 3.23 | 3.18 | 3.12 | 3.04 | 3.18 | 3.29 | 3.39 | 3.50 |
| adj. $R^2$ | 0.16 | 0.15 | 0.14 | 0.14 | 0.13 | 0.31 | 0.33 | 0.33 | 0.34 | 0.35 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| DisInf | 0.290 | 0.285 | 0.281 | 0.280 | 0.280 | 0.452 | 0.472 | 0.487 | 0.501 | 0.515 |
| t-stat | 2.27 | 2.20 | 2.12 | 2.12 | 2.12 | 2.55 | 2.75 | 3.00 | 3.17 | 3.34 |
| ExpInf | 0.350 | 0.359 | 0.358 | 0.352 | 0.344 | 0.251 | 0.246 | 0.236 | 0.221 | 0.206 |
| t-stat | 2.19 | 2.17 | 2.03 | 1.95 | 1.88 | 1.98 | 1.98 | 1.87 | 1.77 | 1.64 |
| SigInf | 0.099 | 0.080 | 0.068 | 0.057 | 0.042 | 0.106 | 0.077 | 0.056 | 0.038 | 0.018 |
| t-stat | 0.71 | 0.57 | 0.48 | 0.39 | 0.29 | 1.04 | 0.80 | 0.62 | 0.43 | 0.20 |
| adj. $R^2$ | 0.24 | 0.24 | 0.24 | 0.23 | 0.22 | 0.34 | 0.36 | 0.36 | 0.37 | 0.37 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.15: **Inflation Disagreement and Real Yields II.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth (ExpC). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpC is the annualized predictor of the mean of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.25 | 0.24 | 0.24 | 0.24 | 0.24 | 0.46 | 0.48 | 0.49 | 0.51 | 0.52 |
| t-stat | 2.21 | 2.18 | 2.18 | 2.22 | 2.27 | 3.25 | 3.60 | 4.23 | 4.59 | 4.92 |
| ExpC | 0.41 | 0.42 | 0.45 | 0.46 | 0.46 | 0.44 | 0.45 | 0.48 | 0.49 | 0.49 |
| t-stat | 2.46 | 2.49 | 2.67 | 2.66 | 2.64 | 3.56 | 3.64 | 3.97 | 4.01 | 4.01 |
| ExpInf | 0.41 | 0.42 | 0.43 | 0.42 | 0.42 | 0.29 | 0.29 | 0.29 | 0.28 | 0.26 |
| t-stat | 2.43 | 2.42 | 2.29 | 2.22 | 2.15 | 2.21 | 2.26 | 2.21 | 2.13 | 2.03 |
| SigInf | 0.34 | 0.33 | 0.33 | 0.32 | 0.31 | 0.34 | 0.32 | 0.32 | 0.30 | 0.28 |
| t-stat | 1.42 | 1.36 | 1.37 | 1.33 | 1.26 | 2.04 | 1.97 | 2.01 | 1.93 | 1.80 |
| adj. $R^2$ | 0.36 | 0.37 | 0.39 | 0.38 | 0.38 | 0.49 | 0.51 | 0.54 | 0.55 | 0.55 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.16: **Inflation Disagreement and Real Yields III**. The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected GDP growth (ExpGDP). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpGDP is the annualized predictor of the mean of GDP growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.31 | 0.30 | 0.30 | 0.30 | 0.31 | 0.46 | 0.48 | 0.49 | 0.50 | 0.52 |
| t-stat | 2.75 | 2.70 | 2.67 | 2.70 | 2.73 | 2.70 | 2.94 | 3.29 | 3.51 | 3.72 |
| ExpGDP | 0.25 | 0.27 | 0.31 | 0.32 | 0.32 | 0.24 | 0.25 | 0.29 | 0.30 | 0.30 |
| t-stat | 2.01 | 2.10 | 2.49 | 2.57 | 2.61 | 2.05 | 2.18 | 2.63 | 2.73 | 2.80 |
| ExpInf | 0.36 | 0.37 | 0.38 | 0.37 | 0.36 | 0.27 | 0.27 | 0.26 | 0.25 | 0.23 |
| t-stat | 2.22 | 2.21 | 2.08 | 2.01 | 1.95 | 2.03 | 2.06 | 1.99 | 1.90 | 1.80 |
| SigInf | 0.23 | 0.22 | 0.23 | 0.23 | 0.22 | 0.24 | 0.22 | 0.22 | 0.21 | 0.19 |
| t-stat | 1.19 | 1.12 | 1.14 | 1.10 | 1.03 | 1.59 | 1.49 | 1.55 | 1.47 | 1.34 |
| adj. $R^2$ | 0.28 | 0.29 | 0.30 | 0.30 | 0.29 | 0.38 | 0.40 | 0.42 | 0.43 | 0.43 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.17: **Inflation Disagreement and Real Yields IV.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{II}$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $\text{ExpC}_{II}$ is the annualized estimator from a regression of future quarterly consumption growth on a constant and current quarterly consumption growth. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.24 | 0.23 | 0.22 | 0.22 | 0.22 | 0.43 | 0.45 | 0.46 | 0.47 | 0.49 |
| t-stat | 1.86 | 1.81 | 1.76 | 1.78 | 1.80 | 2.65 | 2.92 | 3.35 | 3.62 | 3.87 |
| $\text{ExpC}_{II}$ | 0.26 | 0.27 | 0.31 | 0.31 | 0.32 | 0.28 | 0.29 | 0.32 | 0.32 | 0.32 |
| t-stat | 1.96 | 2.01 | 2.23 | 2.26 | 2.26 | 2.77 | 2.84 | 3.17 | 3.21 | 3.23 |
| ExpInf | 0.41 | 0.42 | 0.43 | 0.43 | 0.42 | 0.30 | 0.30 | 0.30 | 0.29 | 0.28 |
| t-stat | 2.35 | 2.33 | 2.21 | 2.14 | 2.07 | 2.24 | 2.28 | 2.23 | 2.15 | 2.04 |
| SigInf | 0.24 | 0.23 | 0.23 | 0.22 | 0.21 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 |
| t-stat | 1.16 | 1.08 | 1.08 | 1.03 | 0.96 | 1.71 | 1.59 | 1.59 | 1.49 | 1.33 |
| adj. $R^2$ | 0.29 | 0.30 | 0.31 | 0.30 | 0.30 | 0.40 | 0.42 | 0.44 | 0.45 | 0.45 |
| N | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |

Table IA.18: **Inflation Disagreement and Real Yields V.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($ExpC_{III}$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $ExpC_{III}$ is the annualized estimator from a regression of future quarterly consumption growth on a constant, current quarterly consumption growth, and current inflation disagreement. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.24 | 0.23 | 0.22 | 0.22 | 0.22 | 0.37 | 0.39 | 0.40 | 0.41 | 0.42 |
| t-stat | 1.86 | 1.81 | 1.76 | 1.78 | 1.80 | 2.26 | 2.51 | 2.93 | 3.21 | 3.47 |
| $ExpC_{III}$ | 0.26 | 0.27 | 0.31 | 0.31 | 0.32 | 0.28 | 0.29 | 0.32 | 0.32 | 0.33 |
| t-stat | 1.96 | 2.01 | 2.23 | 2.26 | 2.26 | 2.77 | 2.84 | 3.17 | 3.21 | 3.23 |
| ExpInf | 0.41 | 0.42 | 0.43 | 0.43 | 0.42 | 0.30 | 0.30 | 0.30 | 0.29 | 0.28 |
| t-stat | 2.35 | 2.33 | 2.21 | 2.14 | 2.07 | 2.24 | 2.28 | 2.23 | 2.15 | 2.04 |
| SigInf | 0.24 | 0.23 | 0.23 | 0.22 | 0.21 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 |
| t-stat | 1.16 | 1.08 | 1.08 | 1.03 | 0.96 | 1.71 | 1.59 | 1.59 | 1.49 | 1.33 |
| adj. $R^2$ | 0.29 | 0.30 | 0.31 | 0.30 | 0.30 | 0.40 | 0.42 | 0.44 | 0.45 | 0.45 |
| N | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |

Table IA.19: **Inflation Disagreement and Real Yields VI.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($\text{ExpC}_{IV}$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $\text{ExpC}_{IV}$ is the annualized estimator from a regression of future quarterly consumption growth on a constant, current quarterly consumption growth, current inflation disagreement, and current quarterly inflation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.21 | 0.21 | 0.19 | 0.19 | 0.19 | 0.34 | 0.36 | 0.36 | 0.37 | 0.38 |
| t-stat | 1.64 | 1.59 | 1.52 | 1.53 | 1.55 | 2.05 | 2.29 | 2.70 | 2.98 | 3.25 |
| $\text{ExpC}_{IV}$ | 0.29 | 0.31 | 0.34 | 0.35 | 0.36 | 0.30 | 0.31 | 0.34 | 0.35 | 0.35 |
| t-stat | 2.10 | 2.17 | 2.38 | 2.41 | 2.43 | 2.84 | 2.93 | 3.28 | 3.33 | 3.34 |
| ExpInf | 0.48 | 0.50 | 0.52 | 0.52 | 0.52 | 0.39 | 0.39 | 0.40 | 0.39 | 0.38 |
| t-stat | 2.52 | 2.50 | 2.39 | 2.32 | 2.26 | 2.66 | 2.71 | 2.69 | 2.61 | 2.50 |
| SigInf | 0.25 | 0.24 | 0.25 | 0.24 | 0.23 | 0.24 | 0.21 | 0.21 | 0.19 | 0.18 |
| t-stat | 1.20 | 1.13 | 1.13 | 1.09 | 1.02 | 1.71 | 1.59 | 1.60 | 1.50 | 1.34 |
| adj. $R^2$ | 0.30 | 0.31 | 0.32 | 0.32 | 0.31 | 0.40 | 0.43 | 0.45 | 0.46 | 0.46 |
| N | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 | 131 |

Table IA.20: **Inflation Disagreement and Real Yields VII.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and expected consumption growth ($ExpC_V$). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. $ExpC_V$ is the annualized estimator from a regression of future quarterly consumption growth on a constant, current quarterly consumption growth, current inflation disagreement, and the instrumented two year real yield. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.22 | 0.21 | 0.21 | 0.21 | 0.21 | 0.34 | 0.36 | 0.37 | 0.39 | 0.40 |
| t-stat | 2.39 | 2.35 | 2.32 | 2.35 | 2.39 | 2.64 | 3.02 | 3.74 | 4.19 | 4.59 |
| $ExpC_V$ | 0.54 | 0.55 | 0.57 | 0.57 | 0.56 | 0.48 | 0.49 | 0.50 | 0.50 | 0.49 |
| t-stat | 4.24 | 4.14 | 3.98 | 3.88 | 3.80 | 4.62 | 4.55 | 4.54 | 4.46 | 4.38 |
| ExpInf | 0.35 | 0.36 | 0.37 | 0.36 | 0.36 | 0.27 | 0.27 | 0.27 | 0.26 | 0.24 |
| t-stat | 2.51 | 2.53 | 2.39 | 2.31 | 2.23 | 2.25 | 2.32 | 2.26 | 2.18 | 2.07 |
| SigInf | 0.32 | 0.30 | 0.30 | 0.29 | 0.28 | 0.28 | 0.26 | 0.25 | 0.23 | 0.21 |
| t-stat | 1.78 | 1.69 | 1.63 | 1.55 | 1.45 | 2.17 | 2.05 | 2.00 | 1.87 | 1.68 |
| adj. $R^2$ | 0.46 | 0.47 | 0.48 | 0.48 | 0.47 | 0.51 | 0.53 | 0.55 | 0.56 | 0.55 |
| N | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 | 130 |

Table IA.21: **Inflation Disagreement and Nominal Yield Volatilities I.** The table reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.597 | 0.606 | 0.567 | 0.656 | 0.644 | 0.474 | 0.464 | 0.442 | 0.501 | 0.511 |
| t-stat | 5.24 | 5.20 | 5.94 | 6.92 | 8.13 | 4.40 | 4.03 | 4.01 | 3.67 | 3.65 |
| ExpInf | 0.287 | 0.265 | 0.260 | 0.204 | 0.205 | 0.287 | 0.261 | 0.283 | 0.170 | 0.126 |
| t-stat | 2.90 | 2.74 | 2.44 | 2.25 | 2.31 | 1.60 | 1.44 | 1.50 | 0.96 | 0.68 |
| SigInf | 0.129 | 0.116 | 0.113 | 0.088 | 0.063 | 0.174 | 0.174 | 0.150 | 0.153 | 0.114 |
| t-stat | 1.37 | 1.21 | 1.15 | 1.09 | 0.81 | 2.45 | 2.26 | 2.08 | 1.99 | 1.45 |
| adj. $R^2$ | 0.55 | 0.54 | 0.48 | 0.56 | 0.53 | 0.52 | 0.47 | 0.46 | 0.42 | 0.38 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.22: **Inflation Disagreement and Nominal Yield Volatilities II.** The table reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of consumption growth (SigC). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. SigC is the annualized predictor of the volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.47 | 0.49 | 0.45 | 0.56 | 0.53 | 0.41 | 0.39 | 0.35 | 0.39 | 0.38 |
| t-stat | 4.20 | 4.16 | 4.49 | 5.32 | 6.02 | 2.92 | 2.70 | 2.69 | 2.38 | 2.32 |
| SigC | 0.37 | 0.33 | 0.35 | 0.29 | 0.32 | 0.27 | 0.26 | 0.29 | 0.25 | 0.28 |
| t-stat | 2.82 | 2.40 | 2.28 | 2.10 | 2.23 | 2.15 | 1.88 | 1.95 | 1.69 | 1.83 |
| ExpInf | 0.25 | 0.23 | 0.22 | 0.17 | 0.17 | 0.25 | 0.23 | 0.22 | 0.16 | 0.15 |
| t-stat | 3.80 | 3.60 | 3.18 | 2.78 | 2.95 | 3.04 | 2.95 | 2.72 | 1.84 | 1.70 |
| SigInf | 0.01 | 0.00 | -0.01 | -0.02 | -0.06 | 0.12 | 0.11 | 0.07 | 0.11 | 0.06 |
| t-stat | 0.14 | 0.06 | -0.20 | -0.28 | -0.92 | 1.22 | 0.96 | 0.63 | 0.85 | 0.47 |
| adj. $R^2$ | 0.65 | 0.61 | 0.56 | 0.61 | 0.60 | 0.57 | 0.51 | 0.48 | 0.44 | 0.44 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.23: **Inflation Disagreement and Nominal Yield Volatilities III.** The table reports results from OLS regressions of the one-, to five-year nominal yield volatility on MSC disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of industrial production growth (SigIP). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. SigIP is the annualized predictor of the volatility of industrial production growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the monthly frequency from January 1978 to June 2014.

| Maturity | 1y | 2y | 3y | 4y | 5y |
|---|---|---|---|---|---|
| DisInf | 0.45 | 0.44 | 0.41 | 0.48 | 0.49 |
| t-stat | 4.45 | 4.10 | 4.03 | 3.73 | 3.70 |
| SigIP | 0.16 | 0.18 | 0.18 | 0.18 | 0.15 |
| t-stat | 1.73 | 1.73 | 1.74 | 1.45 | 1.30 |
| ExpInf | 0.28 | 0.25 | 0.27 | 0.15 | 0.11 |
| t-stat | 1.60 | 1.43 | 1.49 | 0.90 | 0.62 |
| SigInf | 0.09 | 0.08 | 0.06 | 0.06 | 0.03 |
| t-stat | 1.43 | 1.16 | 0.86 | 0.84 | 0.45 |
| adj. $R^2$ | 0.54 | 0.49 | 0.48 | 0.44 | 0.39 |
| N | 438 | 438 | 438 | 438 | 438 |

Table IA.24: **Inflation Disagreement and Nominal Yield Volatilities IV.** The table reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the volatility of GDP growth (SigGDP). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. SigGDP is the annualized predictor of the volatility of GDP growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.33 | 0.36 | 0.36 | 0.45 | 0.45 | 0.33 | 0.34 | 0.36 | 0.32 | 0.33 |
| t-stat | 3.95 | 3.95 | 3.73 | 4.56 | 3.93 | 3.23 | 2.96 | 2.67 | 2.30 | 2.23 |
| SigGDP | 0.45 | 0.41 | 0.36 | 0.34 | 0.33 | 0.51 | 0.49 | 0.44 | 0.50 | 0.48 |
| t-stat | 3.22 | 2.51 | 2.01 | 2.03 | 1.76 | 3.45 | 3.17 | 2.83 | 3.10 | 2.93 |
| ExpInf | 0.27 | 0.26 | 0.25 | 0.20 | 0.19 | 0.23 | 0.22 | 0.21 | 0.19 | 0.17 |
| t-stat | 3.71 | 3.30 | 2.87 | 2.65 | 2.67 | 4.28 | 4.17 | 3.65 | 3.31 | 2.93 |
| SigInf | -0.02 | -0.00 | 0.01 | -0.02 | -0.04 | 0.00 | 0.02 | 0.03 | 0.00 | -0.02 |
| t-stat | -0.36 | -0.05 | 0.09 | -0.28 | -0.57 | 0.10 | 0.36 | 0.40 | 0.04 | -0.28 |
| adj. $R^2$ | 0.63 | 0.62 | 0.56 | 0.62 | 0.57 | 0.65 | 0.63 | 0.58 | 0.59 | 0.55 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.25: **Inflation Disagreement and Nominal Yield Volatilities V.** The table reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), expected consumption growth (ExpC), and the volatility of consumption growth (SigC). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpC and SigC are annualized predictors of the mean and volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.44 | 0.47 | 0.42 | 0.53 | 0.50 | 0.40 | 0.38 | 0.34 | 0.38 | 0.36 |
| t-stat | 4.10 | 3.98 | 4.28 | 5.09 | 5.61 | 3.40 | 3.02 | 3.00 | 2.66 | 2.58 |
| ExpC | 0.21 | 0.20 | 0.23 | 0.23 | 0.26 | 0.24 | 0.22 | 0.25 | 0.27 | 0.29 |
| t-stat | 2.42 | 2.29 | 2.44 | 3.19 | 3.53 | 2.79 | 2.51 | 2.49 | 3.10 | 3.32 |
| SigC | 0.39 | 0.35 | 0.37 | 0.32 | 0.35 | 0.30 | 0.29 | 0.32 | 0.29 | 0.32 |
| t-stat | 2.95 | 2.43 | 2.49 | 2.29 | 2.51 | 1.53 | 1.66 | 1.65 | 1.49 | 1.26 |
| ExpInf | 0.28 | 0.26 | 0.26 | 0.21 | 0.21 | 0.28 | 0.26 | 0.26 | 0.20 | 0.20 |
| t-stat | 3.94 | 3.61 | 3.34 | 3.08 | 3.32 | 3.31 | 3.05 | 2.91 | 2.10 | 2.04 |
| SigInf | 0.12 | 0.11 | 0.11 | 0.11 | 0.09 | 0.22 | 0.21 | 0.17 | 0.22 | 0.19 |
| t-stat | 1.18 | 1.01 | 1.04 | 1.11 | 0.90 | 1.79 | 1.42 | 1.23 | 1.42 | 1.20 |
| adj. $R^2$ | 0.68 | 0.64 | 0.60 | 0.65 | 0.64 | 0.61 | 0.54 | 0.52 | 0.50 | 0.51 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.26: **Inflation Disagreement and Nominal Yield Volatilities VI.** The table reports results from OLS regressions of the one-, to five-year nominal yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), the volatility of consumption growth (SigC), and the CME Volatility Index VXO. The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. The VXO volatility index is based on trading of S&P 100 (OEX) options. Data are available at the quarterly frequency from Q2-1986 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.11 | 0.15 | 0.15 | 0.27 | 0.30 | 0.39 | 0.36 | 0.31 | 0.28 | 0.27 |
| t-stat | 0.65 | 0.94 | 1.04 | 2.19 | 2.45 | 3.72 | 3.12 | 2.20 | 1.88 | 1.74 |
| VXO | 0.33 | 0.34 | 0.30 | 0.32 | 0.31 | 0.34 | 0.35 | 0.31 | 0.33 | 0.31 |
| t-stat | 2.15 | 2.21 | 1.87 | 2.17 | 2.09 | 3.24 | 3.36 | 2.59 | 2.75 | 2.53 |
| ExpInf | 0.42 | 0.41 | 0.37 | 0.31 | 0.29 | 0.31 | 0.33 | 0.30 | 0.27 | 0.26 |
| t-stat | 3.00 | 2.69 | 2.39 | 2.27 | 2.33 | 2.96 | 2.96 | 2.72 | 2.58 | 2.57 |
| SigInf | 0.16 | 0.16 | 0.15 | 0.10 | 0.03 | 0.14 | 0.17 | 0.17 | 0.18 | 0.13 |
| t-stat | 0.77 | 0.82 | 0.88 | 0.74 | 0.23 | 1.23 | 1.55 | 1.75 | 1.90 | 1.31 |
| adj. $R^2$ | 0.21 | 0.24 | 0.19 | 0.23 | 0.22 | 0.35 | 0.33 | 0.26 | 0.24 | 0.20 |
| N | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 |

Table IA.27: **Inflation Disagreement and Real Yield Volatilities I.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.523 | 0.560 | 0.624 | 0.700 | 0.749 | 0.332 | 0.387 | 0.420 | 0.447 | 0.471 |
| t-stat | 8.13 | 8.76 | 8.61 | 9.32 | 9.52 | 1.97 | 2.16 | 2.15 | 2.04 | 1.97 |
| ExpInf | 0.018 | 0.065 | 0.081 | 0.055 | 0.025 | 0.074 | 0.110 | 0.137 | 0.129 | 0.108 |
| t-stat | 0.20 | 0.75 | 0.94 | 0.60 | 0.25 | 0.61 | 0.96 | 1.20 | 1.02 | 0.80 |
| SigInf | 0.238 | 0.228 | 0.183 | 0.114 | 0.016 | 0.391 | 0.380 | 0.351 | 0.305 | 0.219 |
| t-stat | 2.17 | 2.08 | 1.84 | 1.40 | 0.22 | 2.87 | 2.87 | 2.66 | 2.19 | 1.51 |
| adj. $R^2$ | 0.40 | 0.44 | 0.50 | 0.56 | 0.57 | 0.28 | 0.32 | 0.34 | 0.33 | 0.31 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.28: **Inflation Disagreement and Real Yield Volatilities II.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and consumption growth volatility (SigC). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. SigC is the annualized predictor of the volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.45 | 0.47 | 0.54 | 0.63 | 0.69 | 0.17 | 0.22 | 0.26 | 0.31 | 0.36 |
| t-stat | 6.24 | 7.14 | 8.02 | 9.75 | 10.17 | 1.45 | 1.84 | 2.05 | 2.02 | 1.97 |
| SigC | 0.23 | 0.27 | 0.25 | 0.21 | 0.17 | 0.27 | 0.29 | 0.28 | 0.24 | 0.19 |
| t-stat | 1.56 | 1.72 | 1.70 | 1.55 | 1.36 | 1.54 | 1.64 | 1.60 | 1.42 | 1.16 |
| ExpInf | 0.00 | 0.04 | 0.06 | 0.03 | 0.01 | 0.09 | 0.12 | 0.15 | 0.14 | 0.11 |
| t-stat | -0.04 | 0.53 | 0.76 | 0.40 | 0.07 | 0.82 | 1.24 | 1.46 | 1.18 | 0.88 |
| SigInf | 0.16 | 0.14 | 0.10 | 0.04 | -0.04 | 0.30 | 0.28 | 0.26 | 0.22 | 0.15 |
| t-stat | 1.63 | 1.47 | 1.13 | 0.50 | -0.62 | 2.14 | 2.05 | 1.86 | 1.54 | 1.06 |
| adj. $R^2$ | 0.43 | 0.49 | 0.54 | 0.58 | 0.58 | 0.31 | 0.36 | 0.38 | 0.36 | 0.32 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.29: **Inflation Disagreement and Real Yield Volatilities III.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and GDP growth volatility (SigGDP). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. SigGDP is the annualized predictor of the volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.15 | 0.18 | 0.25 | 0.29 | 0.36 | 0.04 | 0.10 | 0.12 | 0.11 | 0.14 |
| t-stat | 1.05 | 1.36 | 2.03 | 2.52 | 3.22 | 0.42 | 0.96 | 1.19 | 1.02 | 1.08 |
| SigGDP | 0.62 | 0.64 | 0.63 | 0.63 | 0.61 | 0.70 | 0.72 | 0.74 | 0.77 | 0.80 |
| t-stat | 3.69 | 3.97 | 4.13 | 4.13 | 3.74 | 5.34 | 6.28 | 6.68 | 6.30 | 5.53 |
| ExpInf | 0.00 | 0.04 | 0.05 | 0.03 | 0.01 | 0.02 | 0.05 | 0.06 | 0.06 | 0.04 |
| t-stat | 0.05 | 0.78 | 1.19 | 0.68 | 0.14 | 0.31 | 0.68 | 1.08 | 0.98 | 0.51 |
| SigInf | 0.04 | 0.02 | -0.02 | -0.07 | -0.17 | 0.05 | 0.03 | -0.01 | -0.06 | -0.16 |
| t-stat | 0.61 | 0.30 | -0.38 | -1.13 | -1.97 | 0.66 | 0.41 | -0.12 | -0.71 | -1.41 |
| adj. $R^2$ | 0.57 | 0.62 | 0.67 | 0.69 | 0.72 | 0.56 | 0.61 | 0.65 | 0.66 | 0.67 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.30: **Inflation Disagreement and Real Yield Volatilities IV.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), expected consumption growth (ExpC), and consumption growth volatility (SigC). The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. ExpC and SigC are annualized predictors of the mean and volatility of consumption growth over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. Data are available at the quarterly frequency from Q3-1981 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.47 | 0.49 | 0.55 | 0.63 | 0.68 | 0.18 | 0.22 | 0.26 | 0.31 | 0.36 |
| t-stat | 6.81 | 7.71 | 8.43 | 9.86 | 9.90 | 1.48 | 1.85 | 2.07 | 2.08 | 2.07 |
| ExpC | -0.21 | -0.14 | -0.07 | -0.01 | 0.08 | -0.16 | -0.08 | -0.01 | 0.06 | 0.14 |
| t-stat | -1.28 | -0.96 | -0.59 | -0.06 | 0.86 | -0.77 | -0.45 | -0.07 | 0.36 | 0.94 |
| SigC | 0.21 | 0.25 | 0.24 | 0.21 | 0.17 | 0.26 | 0.29 | 0.28 | 0.24 | 0.20 |
| t-stat | 1.40 | 1.62 | 1.66 | 1.55 | 1.39 | 1.53 | 1.66 | 1.65 | 1.49 | 1.26 |
| ExpInf | -0.03 | 0.02 | 0.05 | 0.03 | 0.02 | 0.07 | 0.11 | 0.15 | 0.14 | 0.13 |
| t-stat | -0.5 | 0.31 | 0.67 | 0.38 | 0.18 | 0.74 | 1.21 | 1.42 | 1.15 | 0.92 |
| SigInf | 0.04 | 0.06 | 0.06 | 0.04 | -0 | 0.22 | 0.24 | 0.25 | 0.25 | 0.22 |
| t-stat | 0.35 | 0.52 | 0.54 | 0.35 | -0 | 1.1 | 1.22 | 1.3 | 1.26 | 1.17 |
| adj. $R^2$ | 0.46 | 0.5 | 0.54 | 0.58 | 0.59 | 0.33 | 0.36 | 0.37 | 0.36 | 0.33 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.31: **Inflation Disagreement and Real Yield Volatilities V.** The table reports results from OLS regressions of the two, three, five, seven, and ten-year real yield volatility on disagreement about inflation (DisInf), expected inflation (ExpInf), the volatility of inflation (SigInf), and the CME Volatility Index VXO. The t-statistics (t-stat) are Newey-West corrected with 12 lags and regression coefficients are standardized. ExpInf and SigInf are annualized predictors of the mean and volatility of inflation over the corresponding yield maturity horizon using a GARCH(1,1) model with an ARMA(1,1) mean equation. The VXO volatility index is based on trading of S&P 100 (OEX) options. Data are available at the quarterly frequency from Q2-1986 to Q2-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.35 | 0.33 | 0.32 | 0.31 | 0.33 | 0.07 | 0.09 | 0.09 | 0.05 | 0.02 |
| t-stat | 2.26 | 2.26 | 2.45 | 2.77 | 3.02 | 0.74 | 1.05 | 1.00 | 0.52 | 0.15 |
| VXO | 0.10 | 0.09 | 0.07 | 0.02 | -0.10 | 0.08 | 0.08 | 0.06 | 0.00 | -0.11 |
| t-stat | 0.79 | 0.67 | 0.45 | 0.10 | -0.57 | 0.67 | 0.62 | 0.40 | 0.03 | -0.63 |
| ExpInf | -0.07 | -0.04 | -0.04 | -0.10 | -0.18 | -0.02 | -0.00 | -0.01 | -0.05 | -0.11 |
| t-stat | -0.75 | -0.43 | -0.46 | -0.89 | -1.26 | -0.13 | -0.00 | -0.05 | -0.36 | -0.76 |
| SigInf | 0.19 | 0.22 | 0.21 | 0.17 | 0.07 | 0.36 | 0.37 | 0.35 | 0.31 | 0.22 |
| t-stat | 1.63 | 1.64 | 1.56 | 1.36 | 0.60 | 2.23 | 2.14 | 2.06 | 1.81 | 1.32 |
| adj. $R^2$ | 0.24 | 0.23 | 0.21 | 0.17 | 0.14 | 0.14 | 0.15 | 0.13 | 0.09 | 0.05 |
| N | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 113 |

Table IA.32: **SPF Inflation Disagreement and Gürkaynak, Sack, and Wright (2010) Nominal Yields.** The table reports results from OLS regressions of nominal yields and their volatilities on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). Monthly nominal discount bond yields are from Gürkaynak, Sack, and Wright (2010). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). Sample: $Q3$-1981 to $Q2$-2014.

| | Nominal Yields | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1y | 2y | 3y | 4y | 5y | 6y | 7y | 8y | 9y | 10y | 11y | 12y | 13y | 14y | 15y |
| DisInf | 0.35 | 0.36 | 0.36 | 0.37 | 0.38 | 0.38 | 0.39 | 0.39 | 0.40 | 0.40 | 0.40 | 0.40 | 0.41 | 0.41 | 0.41 |
| t-stat | 3.20 | 3.20 | 3.25 | 3.32 | 3.39 | 3.47 | 3.53 | 3.60 | 3.65 | 3.69 | 3.73 | 3.76 | 3.78 | 3.80 | 3.81 |
| ExpInf | 0.46 | 0.45 | 0.44 | 0.43 | 0.42 | 0.41 | 0.41 | 0.41 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.39 | 0.39 |
| t-stat | 3.52 | 3.40 | 3.30 | 3.22 | 3.16 | 3.11 | 3.08 | 3.06 | 3.05 | 3.04 | 3.03 | 3.03 | 3.03 | 3.02 | 3.02 |
| SigInf | 0.01 | 0.00 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 |
| t-stat | 0.14 | 0.03 | -0.05 | -0.10 | -0.12 | -0.12 | -0.12 | -0.11 | -0.10 | -0.09 | -0.09 | -0.09 | -0.10 | -0.11 | -0.13 |
| adj. $R^2$ | 0.40 | 0.39 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yield Volatilities | | | | | | | | | | | | | | |
| DisInf | 0.60 | 0.59 | 0.59 | 0.60 | 0.62 | 0.64 | 0.65 | 0.69 | 0.69 | 0.69 | 0.69 | 0.68 | 0.68 | 0.67 | 0.66 |
| t-stat | 5.01 | 5.26 | 5.59 | 6.11 | 6.79 | 7.44 | 7.75 | 10.66 | 11.19 | 11.60 | 12.21 | 12.32 | 12.31 | 12.17 | 11.87 |
| ExpInf | 0.28 | 0.27 | 0.24 | 0.20 | 0.16 | 0.12 | 0.07 | 0.06 | 0.03 | 0.01 | 0.00 | -0.01 | -0.02 | -0.02 | -0.03 |
| t-stat | 3.10 | 2.88 | 2.53 | 2.19 | 1.84 | 1.41 | 0.91 | 0.76 | 0.37 | 0.09 | -0.06 | -0.17 | -0.23 | -0.28 | -0.31 |
| SigInf | 0.14 | 0.13 | 0.12 | 0.09 | 0.07 | 0.05 | 0.03 | -0.01 | -0.02 | -0.03 | -0.04 | -0.04 | -0.05 | -0.05 | -0.05 |
| t-stat | 1.58 | 1.49 | 1.33 | 1.12 | 0.89 | 0.63 | 0.40 | -0.08 | -0.23 | -0.35 | -0.49 | -0.57 | -0.62 | -0.63 | -0.58 |
| adj. $R^2$ | 0.55 | 0.53 | 0.50 | 0.48 | 0.47 | 0.46 | 0.44 | 0.49 | 0.47 | 0.46 | 0.45 | 0.44 | 0.43 | 0.41 | 0.40 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.33: **MSC Inflation Disagreement and Gürkaynak, Sack, and Wright (2010) Nominal Yields.** The table reports results from OLS regressions of nominal yields and their volatilities on disagreement about inflation (DisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). Monthly nominal discount bond yields are from Gürkaynak, Sack, and Wright (2010). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are predicted by a GARCH(1,1) model with an ARMA(1,1) mean equation over multiple horizons (T). Sample: January 1978 to June 2014.

| | Nominal Yields | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1y | 2y | 3y | 4y | 5y | 6y | 7y | 8y | 9y | 10y | 11y | 12y | 13y | 14y | 15y |
| DisInf | 0.49 | 0.54 | 0.58 | 0.61 | 0.64 | 0.66 | 0.68 | 0.69 | 0.70 | 0.71 | 0.71 | 0.72 | 0.72 | 0.73 | 0.73 |
| t-stat | 4.15 | 4.53 | 4.88 | 5.20 | 5.47 | 5.71 | 5.91 | 6.09 | 6.23 | 6.35 | 6.45 | 6.53 | 6.60 | 6.65 | 6.68 |
| ExpInf | 0.33 | 0.26 | 0.21 | 0.17 | 0.14 | 0.12 | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | 0.06 | 0.05 | 0.05 | 0.04 |
| t-stat | 3.13 | 2.36 | 1.85 | 1.49 | 1.23 | 1.04 | 0.89 | 0.77 | 0.68 | 0.60 | 0.54 | 0.49 | 0.44 | 0.40 | 0.37 |
| SigInf | -0.06 | -0.09 | -0.11 | -0.12 | -0.13 | -0.13 | -0.14 | -0.14 | -0.14 | -0.14 | -0.14 | -0.14 | -0.14 | -0.15 | -0.15 |
| t-stat | -0.90 | -1.30 | -1.60 | -1.84 | -2.04 | -2.19 | -2.31 | -2.40 | -2.47 | -2.53 | -2.59 | -2.64 | -2.70 | -2.76 | -2.82 |
| adj. $R^2$ | 0.58 | 0.56 | 0.56 | 0.56 | 0.57 | 0.57 | 0.57 | 0.58 | 0.58 | 0.58 | 0.58 | 0.59 | 0.59 | 0.59 | 0.59 |
| N | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 |
| | Nominal Yield Volatilities | | | | | | | | | | | | | | |
| DisInf | 0.47 | 0.45 | 0.45 | 0.46 | 0.48 | 0.49 | 0.51 | 0.54 | 0.55 | 0.55 | 0.56 | 0.57 | 0.57 | 0.57 | 0.56 |
| t-stat | 4.37 | 4.18 | 3.92 | 3.73 | 3.61 | 3.56 | 3.59 | 3.52 | 3.58 | 3.65 | 3.71 | 3.77 | 3.84 | 3.90 | 3.95 |
| ExpInf | 0.29 | 0.28 | 0.24 | 0.19 | 0.14 | 0.08 | 0.03 | -0.03 | -0.06 | -0.08 | -0.10 | -0.11 | -0.11 | -0.11 | -0.10 |
| t-stat | 1.68 | 1.51 | 1.28 | 1.01 | 0.72 | 0.43 | 0.18 | -0.14 | -0.31 | -0.44 | -0.55 | -0.60 | -0.63 | -0.62 | -0.58 |
| SigInf | 0.18 | 0.17 | 0.15 | 0.14 | 0.13 | 0.14 | 0.15 | 0.15 | 0.16 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.18 |
| t-stat | 2.47 | 2.24 | 2.02 | 1.81 | 1.66 | 1.62 | 1.69 | 1.47 | 1.53 | 1.57 | 1.53 | 1.53 | 1.52 | 1.53 | 1.57 |
| adj. $R^2$ | 0.52 | 0.47 | 0.43 | 0.38 | 0.35 | 0.32 | 0.30 | 0.30 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 |
| N | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 | 438 |

Table IA.34: **Real Yields = Nominal Yields - Expected Inflation from ARMA(1,1).** The table reports results from OLS regressions of real yields on disagreement about inflation (DisInf). Real yields are computed from nominal yields by subtracting expected inflation predicted by an ARMA(1,1). ExpInf is predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Samples: $Q3$-1981 to $Q2$-2014 and January 1978 to June 2014.

| | SPF | | | | | MSC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.45 | 0.46 | 0.46 | 0.47 | 0.48 | 0.45 | 0.50 | 0.53 | 0.56 | 0.59 |
| t-stat | 3.59 | 3.59 | 3.66 | 3.74 | 3.89 | 2.82 | 3.25 | 3.50 | 3.79 | 4.12 |
| adj. $R^2$ | 0.20 | 0.20 | 0.21 | 0.21 | 0.22 | 0.20 | 0.25 | 0.28 | 0.32 | 0.35 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| DisInf | 0.41 | 0.42 | 0.41 | 0.41 | 0.42 | 0.66 | 0.70 | 0.72 | 0.74 | 0.76 |
| t-stat | 3.51 | 3.50 | 3.51 | 3.58 | 3.63 | 4.16 | 4.55 | 4.86 | 5.17 | 5.42 |
| ExpInf | 0.19 | 0.22 | 0.26 | 0.29 | 0.31 | -0.30 | -0.27 | -0.26 | -0.25 | -0.23 |
| t-stat | 1.21 | 1.40 | 1.69 | 1.90 | 2.08 | -2.08 | -1.94 | -1.88 | -1.77 | -1.64 |
| SigInf | -0.03 | -0.05 | -0.05 | -0.05 | -0.05 | -0.08 | -0.12 | -0.13 | -0.15 | -0.15 |
| t-stat | -0.24 | -0.40 | -0.42 | -0.46 | -0.47 | -0.86 | -1.31 | -1.55 | -1.88 | -1.97 |
| adj. $R^2$ | 0.23 | 0.25 | 0.28 | 0.30 | 0.32 | 0.24 | 0.29 | 0.32 | 0.35 | 0.38 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.35: **Real Yields = Nominal Yields - Expected Inflation from VAR.** The table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) in the top panel and disagreement about inflation (DisInf), expected inflation (ExpInf) and the volatility of inflation (SigInf). Real yields are computed from nominal yields by subtracting expected inflation (ExpInf). ExpInf is predicted by regressing realized inflation over the bond maturity horizon on lagged monthly inflation and yields with maturity 1-5 years. The volatility of inflation is calculated by regressing the squared residuals from the first regression onto lagged squared residuals and yields with maturity 1-5 years. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Samples: $Q3$-1981 to $Q2$-2014 and January 1978 to June 2014.

| | SPF | | | | | MSC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.38 | 0.40 | 0.45 | 0.49 | 0.52 | 0.51 | 0.55 | 0.57 | 0.58 | 0.59 |
| t-stat | 2.79 | 2.98 | 3.74 | 4.58 | 5.68 | 3.49 | 3.93 | 4.13 | 4.22 | 4.23 |
| adj. $R^2$ | 0.14 | 0.15 | 0.19 | 0.23 | 0.27 | 0.26 | 0.30 | 0.32 | 0.33 | 0.35 |
| N | 128 | 124 | 120 | 116 | 112 | 426 | 414 | 402 | 390 | 378 |
| DisInf | 0.21 | 0.22 | 0.25 | 0.33 | 0.39 | 0.46 | 0.46 | 0.46 | 0.47 | 0.51 |
| t-stat | 1.37 | 1.52 | 1.86 | 2.75 | 3.90 | 3.59 | 3.65 | 3.54 | 3.51 | 3.85 |
| ExpInf | 0.37 | 0.37 | 0.36 | 0.32 | 0.27 | 0.13 | 0.17 | 0.19 | 0.16 | 0.09 |
| t-stat | 2.78 | 2.76 | 2.82 | 2.91 | 2.77 | 1.13 | 1.48 | 1.66 | 1.41 | 0.83 |
| SigInf | 0.03 | 0.09 | 0.12 | 0.04 | 0.01 | -0.10 | -0.09 | -0.07 | -0.01 | 0.06 |
| t-stat | 0.32 | 1.01 | 1.40 | 0.58 | 0.18 | -1.05 | -1.19 | -0.95 | -0.07 | 0.60 |
| adj. $R^2$ | 0.24 | 0.28 | 0.31 | 0.31 | 0.32 | 0.27 | 0.31 | 0.34 | 0.34 | 0.35 |
| N | 128 | 124 | 120 | 116 | 112 | 426 | 414 | 402 | 390 | 378 |

Table IA.36: **Cross-Sectional Variance as a Measure of Inflation Disagreement.** The table reports results from OLS regressions of real and nominal yields and their volatilities on disagreement about inflation (DisInf) and expected inflation (ExpInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Disagreement about inflation is the cross-sectional variance of one year ahead inflation forecasts (DisInf). ExpInf is predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). Samples: $Q3$-1981 to $Q2$-2014 and January 1978 to June 2014.

| | VARIANCE SPF | | | | | VARIANCE MSC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| | | | | | Real Yields | | | | | |
| DisInf | 0.40 | 0.39 | 0.38 | 0.38 | 0.37 | 0.57 | 0.58 | 0.59 | 0.59 | 0.60 |
| t-stat | 4.70 | 4.63 | 4.58 | 4.51 | 4.44 | 3.50 | 3.64 | 3.75 | 3.84 | 3.93 |
| adj. $R^2$ | 0.15 | 0.15 | 0.14 | 0.14 | 0.13 | 0.31 | 0.33 | 0.34 | 0.35 | 0.35 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | | | | | Real Yield Volatilities | | | | | |
| DisInf | 0.52 | 0.58 | 0.66 | 0.71 | 0.73 | 0.42 | 0.49 | 0.54 | 0.57 | 0.57 |
| t-stat | 7.30 | 9.48 | 13.14 | 14.92 | 13.83 | 2.15 | 2.36 | 2.33 | 2.21 | 2.15 |
| adj. $R^2$ | 0.27 | 0.33 | 0.43 | 0.50 | 0.52 | 0.17 | 0.24 | 0.29 | 0.31 | 0.33 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| | | | | | Nominal Yields | | | | | |
| DisInf | 0.36 | 0.36 | 0.36 | 0.36 | 0.37 | 0.46 | 0.50 | 0.53 | 0.55 | 0.57 |
| t-stat | 5.95 | 5.79 | 5.86 | 5.89 | 5.63 | 3.89 | 4.12 | 4.23 | 4.37 | 4.59 |
| ExpInf | 0.46 | 0.45 | 0.44 | 0.44 | 0.43 | 0.34 | 0.28 | 0.23 | 0.20 | 0.18 |
| t-stat | 3.86 | 3.86 | 3.77 | 3.76 | 3.69 | 3.40 | 2.65 | 2.08 | 1.74 | 1.54 |
| adj. $R^2$ | 0.41 | 0.40 | 0.39 | 0.39 | 0.39 | 0.56 | 0.54 | 0.52 | 0.51 | 0.51 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| | | | | | Nominal Yield Volatilities | | | | | |
| DisInf | 0.65 | 0.66 | 0.60 | 0.68 | 0.64 | 0.59 | 0.58 | 0.56 | 0.62 | 0.60 |
| t-stat | 13.88 | 14.02 | 13.10 | 14.73 | 12.73 | 4.57 | 4.35 | 4.54 | 4.16 | 4.06 |
| ExpInf | 0.23 | 0.21 | 0.21 | 0.17 | 0.18 | 0.16 | 0.12 | 0.15 | 0.03 | 0.01 |
| t-stat | 2.38 | 2.39 | 2.16 | 1.87 | 2.08 | 0.95 | 0.75 | 0.89 | 0.20 | 0.07 |
| adj. $R^2$ | 0.54 | 0.54 | 0.46 | 0.54 | 0.50 | 0.50 | 0.46 | 0.46 | 0.41 | 0.37 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.37: **Interquartile Range as a Measure of Inflation Disagreement.** The table reports results from OLS regressions of real and nominal yields and their volatilities on disagreement about inflation (DisInf) and expected inflation (ExpInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Disagreement about inflation is the interquartile range (IQR) of one year ahead inflation forecasts (DisInf) computed from the 75th percentile minus the 25th percentile of inflation forecasts. ExpInf is predicted by a GARCH(1,1) model with an ARMA(1,1) mean equation over multiple horizons (T). Samples: $Q$3-1981 to $Q$2-2014 and January 1978 to June 2014.

| | IQR — SPF | | | | | IQR — MSC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| | | | | | Real Yields | | | | | |
| DisInf | 0.30 | 0.30 | 0.32 | 0.33 | 0.33 | 0.40 | 0.41 | 0.43 | 0.44 | 0.45 |
| t-stat | 1.63 | 1.60 | 1.69 | 1.72 | 1.76 | 2.53 | 2.66 | 2.90 | 3.05 | 3.17 |
| adj. $R^2$ | 0.08 | 0.08 | 0.10 | 0.10 | 0.10 | 0.15 | 0.16 | 0.18 | 0.19 | 0.19 |
| N | 132 | 132 | 132 | 132 | 132 | 129 | 129 | 129 | 129 | 129 |
| | | | | | Real Yield Volatilities | | | | | |
| DisInf | 0.51 | 0.53 | 0.55 | 0.58 | 0.59 | 0.65 | 0.71 | 0.76 | 0.81 | 0.82 |
| t-stat | 4.18 | 3.71 | 3.29 | 3.10 | 2.84 | 9.40 | 10.31 | 9.46 | 8.74 | 7.22 |
| adj. $R^2$ | 0.25 | 0.27 | 0.30 | 0.33 | 0.35 | 0.42 | 0.50 | 0.57 | 0.65 | 0.67 |
| N | 132 | 132 | 132 | 132 | 132 | 129 | 129 | 129 | 129 | 129 |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| | | | | | Nominal Yields | | | | | |
| DisInf | 0.24 | 0.26 | 0.28 | 0.28 | 0.31 | 0.46 | 0.50 | 0.53 | 0.55 | 0.57 |
| t-stat | 1.54 | 1.60 | 1.68 | 1.75 | 1.85 | 3.89 | 4.12 | 4.23 | 4.37 | 4.59 |
| ExpInf | 0.51 | 0.50 | 0.49 | 0.48 | 0.47 | 0.34 | 0.28 | 0.23 | 0.20 | 0.18 |
| t-stat | 4.04 | 4.11 | 4.06 | 4.05 | 4.09 | 3.40 | 2.65 | 2.08 | 1.74 | 1.54 |
| adj. $R^2$ | 0.35 | 0.34 | 0.34 | 0.34 | 0.35 | 0.56 | 0.54 | 0.52 | 0.51 | 0.51 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| | | | | | Nominal Yield Volatilities | | | | | |
| DisInf | 0.50 | 0.52 | 0.53 | 0.58 | 0.58 | 0.59 | 0.58 | 0.56 | 0.62 | 0.60 |
| t-stat | 2.68 | 2.90 | 3.47 | 3.64 | 3.89 | 4.57 | 4.35 | 4.54 | 4.16 | 4.06 |
| ExpInf | 0.31 | 0.29 | 0.28 | 0.24 | 0.25 | 0.16 | 0.12 | 0.15 | 0.03 | 0.01 |
| t-stat | 2.30 | 2.32 | 2.27 | 2.01 | 2.20 | 0.95 | 0.75 | 0.89 | 0.20 | 0.07 |
| adj. $R^2$ | 0.38 | 0.39 | 0.39 | 0.43 | 0.43 | 0.50 | 0.46 | 0.46 | 0.41 | 0.37 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.38: **Normalized Inflation Disagreement and Nominal Yields.** The table reports results from OLS regressions of nominal yields on disagreement about inflation scaled by the volatility of inflation (NormDisInf), and expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). Samples: $Q3$-1981 to $Q2$-2014 and January 1978 to June 2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| NormDisInf | 0.309 | 0.326 | 0.337 | 0.346 | 0.366 | 0.309 | 0.355 | 0.383 | 0.409 | 0.421 |
| t-stat | 2.759 | 2.839 | 2.915 | 3.047 | 3.164 | 3.296 | 3.763 | 4.089 | 4.390 | 4.530 |
| ExpInf | 0.430 | 0.414 | 0.399 | 0.394 | 0.379 | 0.511 | 0.457 | 0.417 | 0.389 | 0.375 |
| t-stat | 2.876 | 2.820 | 2.716 | 2.680 | 2.592 | 4.853 | 4.251 | 3.748 | 3.429 | 3.271 |
| adj. $R^2$ | 0.370 | 0.369 | 0.364 | 0.367 | 0.371 | 0.527 | 0.511 | 0.493 | 0.491 | 0.489 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |
| NormDisInf | 0.320 | 0.336 | 0.347 | 0.355 | 0.375 | 0.421 | 0.457 | 0.482 | 0.502 | 0.516 |
| t-stat | 2.973 | 3.036 | 3.120 | 3.252 | 3.389 | 3.737 | 4.079 | 4.354 | 4.588 | 4.784 |
| ExpInf | 0.488 | 0.469 | 0.456 | 0.450 | 0.438 | 0.477 | 0.430 | 0.393 | 0.368 | 0.355 |
| t-stat | 3.425 | 3.298 | 3.176 | 3.112 | 3.091 | 4.701 | 4.074 | 3.574 | 3.257 | 3.114 |
| SigInf | 0.170 | 0.157 | 0.156 | 0.152 | 0.156 | 0.192 | 0.183 | 0.182 | 0.174 | 0.181 |
| t-stat | 1.534 | 1.450 | 1.455 | 1.431 | 1.527 | 1.935 | 1.802 | 1.760 | 1.687 | 1.802 |
| adj. $R^2$ | 0.390 | 0.386 | 0.380 | 0.381 | 0.387 | 0.554 | 0.535 | 0.518 | 0.513 | 0.514 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.39: **Normalized Inflation Disagreement and Real Yields.** The table reports results from OLS regressions of real yields on disagreement about inflation scaled by the volatility of inflation (NormDisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are predicted by a GARCH$(1,1)$ model with an ARMA$(1,1)$ mean equation over multiple horizons (T). Sample: $Q3$-1981 to $Q2$-2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| NormDisInf | 0.369 | 0.376 | 0.378 | 0.383 | 0.389 | 0.384 | 0.416 | 0.436 | 0.454 | 0.473 |
| t-stat | 2.655 | 2.771 | 2.814 | 2.917 | 3.056 | 2.139 | 2.371 | 2.565 | 2.701 | 2.852 |
| adj. $R^2$ | 0.130 | 0.135 | 0.136 | 0.140 | 0.144 | 0.141 | 0.166 | 0.184 | 0.200 | 0.218 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| NormDisInf | 0.278 | 0.279 | 0.280 | 0.285 | 0.292 | 0.433 | 0.453 | 0.464 | 0.478 | 0.492 |
| t-stat | 2.039 | 2.034 | 2.017 | 2.083 | 2.167 | 2.084 | 2.257 | 2.438 | 2.570 | 2.699 |
| ExpInf | 0.373 | 0.380 | 0.379 | 0.371 | 0.362 | 0.362 | 0.364 | 0.360 | 0.350 | 0.340 |
| t-stat | 2.407 | 2.384 | 2.241 | 2.160 | 2.081 | 2.636 | 2.664 | 2.563 | 2.486 | 2.392 |
| SigInf | 0.254 | 0.233 | 0.217 | 0.205 | 0.189 | 0.402 | 0.384 | 0.368 | 0.356 | 0.341 |
| t-stat | 2.077 | 1.926 | 1.816 | 1.722 | 1.585 | 2.599 | 2.523 | 2.429 | 2.386 | 2.315 |
| adj. $R^2$ | 0.245 | 0.247 | 0.244 | 0.240 | 0.236 | 0.316 | 0.332 | 0.337 | 0.341 | 0.347 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.40: **Normalized Inflation Disagreement and Real and Nominal Yield Volatilities.** The table reports results from OLS regressions of real and nominal yield volatilities on disagreement about inflation scaled by the volatility of inflation (NormDisInf), expected inflation (ExpInf), and the volatility of inflation (SigInf). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf and SigInf are predicted by a GARCH$(1,1)$ model with an ARMA$(1,1)$ mean equation over multiple horizons (T). Samples: $Q$3-1981 to $Q$2-2014 and January 1978 to June 2014.

| | Survey of Professional Forecasters | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yield Volatilities | | | | | | | | | |
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| NormDisInf | 0.384 | 0.412 | 0.469 | 0.521 | 0.564 | 0.093 | 0.139 | 0.169 | 0.164 | 0.161 |
| t-stat | 4.326 | 3.980 | 3.861 | 4.177 | 4.474 | 0.556 | 0.883 | 1.089 | 1.000 | 0.924 |
| ExpInf | 0.104 | 0.158 | 0.180 | 0.163 | 0.140 | 0.215 | 0.267 | 0.301 | 0.303 | 0.295 |
| t-stat | 0.850 | 1.256 | 1.295 | 1.091 | 0.894 | 1.308 | 1.528 | 1.476 | 1.332 | 1.215 |
| SigInf | 0.522 | 0.530 | 0.518 | 0.476 | 0.399 | 0.534 | 0.556 | 0.549 | 0.500 | 0.418 |
| t-stat | 4.052 | 3.878 | 3.445 | 2.961 | 2.362 | 3.032 | 2.973 | 2.655 | 2.217 | 1.752 |
| adj. $R^2$ | 0.329 | 0.363 | 0.401 | 0.414 | 0.405 | 0.206 | 0.228 | 0.230 | 0.196 | 0.146 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yield Volatilities | | | | | | | | | |
| Maturity | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| NormDisInf | 0.458 | 0.471 | 0.476 | 0.538 | 0.537 | 0.312 | 0.278 | 0.275 | 0.292 | 0.290 |
| t-stat | 3.842 | 4.001 | 4.655 | 5.090 | 5.737 | 3.842 | 3.326 | 3.133 | 2.838 | 2.695 |
| ExpInf | 0.379 | 0.366 | 0.351 | 0.309 | 0.306 | 0.470 | 0.456 | 0.470 | 0.384 | 0.342 |
| t-stat | 2.728 | 2.661 | 2.579 | 2.460 | 2.520 | 2.550 | 2.470 | 2.428 | 2.169 | 1.863 |
| SigInf | 0.443 | 0.441 | 0.419 | 0.422 | 0.391 | 0.379 | 0.367 | 0.338 | 0.349 | 0.311 |
| t-stat | 2.732 | 2.705 | 2.937 | 2.964 | 2.912 | 3.538 | 3.268 | 3.382 | 2.971 | 2.613 |
| adj. $R^2$ | 0.467 | 0.465 | 0.445 | 0.481 | 0.463 | 0.453 | 0.406 | 0.408 | 0.331 | 0.281 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.41: **First Principal Component.** The table reports results from OLS regressions of real and nominal yields and their volatilities on the first principal component of the SPF and MSC based disagreement about inflation (DisInf). ExpInf is predicted by a GARCH$(1,1)$ model with an ARMA$(1,1)$ mean equation over multiple horizons (T). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Sample: $Q3$-1981 to $Q2$-2014.

| | Real Yields | | | | | Nominal Yields | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2y | 3y | 5y | 7y | 10y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.39 | 0.40 | 0.41 | 0.41 | 0.42 | 0.48 | 0.50 | 0.52 | 0.53 | 0.54 |
| t-stat | 3.25 | 3.42 | 3.67 | 3.83 | 3.98 | 5.61 | 6.05 | 6.42 | 6.82 | 6.95 |
| ExpInf | 0.22 | 0.22 | 0.21 | 0.20 | 0.19 | 0.30 | 0.27 | 0.24 | 0.23 | 0.21 |
| t-stat | 1.67 | 1.64 | 1.51 | 1.40 | 1.30 | 2.84 | 2.56 | 2.33 | 2.23 | 2.08 |
| SigInf | 0.02 | 0.00 | -0.02 | -0.03 | -0.05 | -0.11 | -0.13 | -0.14 | -0.15 | -0.16 |
| t-stat | 0.23 | -0.01 | -0.18 | -0.33 | -0.50 | -1.58 | -1.99 | -2.13 | -2.28 | -2.32 |
| adj. $R^2$ | 0.34 | 0.35 | 0.35 | 0.35 | 0.35 | 0.54 | 0.55 | 0.56 | 0.57 | 0.57 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Real Yield Volatilities | | | | | Nominal Yield Volatilities | | | | |
| | 2y | 3y | 5y | 7y | 10y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.46 | 0.50 | 0.56 | 0.60 | 0.63 | 0.61 | 0.61 | 0.59 | 0.63 | 0.62 |
| t-stat | 5.71 | 5.50 | 4.94 | 4.68 | 4.53 | 5.63 | 5.24 | 5.64 | 5.55 | 5.99 |
| ExpInf | -0.05 | -0.02 | -0.02 | -0.05 | -0.08 | 0.15 | 0.14 | 0.14 | 0.09 | 0.08 |
| t-stat | -0.56 | -0.23 | -0.22 | -0.56 | -0.84 | 2.37 | 2.40 | 2.10 | 1.50 | 1.48 |
| SigInf | 0.25 | 0.23 | 0.19 | 0.12 | 0.03 | 0.08 | 0.08 | 0.07 | 0.05 | 0.02 |
| t-stat | 2.53 | 2.54 | 2.35 | 1.68 | 0.33 | 1.60 | 1.53 | 1.36 | 0.90 | 0.42 |
| adj. $R^2$ | 0.42 | 0.48 | 0.54 | 0.56 | 0.55 | 0.68 | 0.66 | 0.61 | 0.65 | 0.62 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.42: **Disagreement about GDP Growth and Nominal Yields.** The table reports results from OLS regressions of nominal yields and nominal yield volatilities on disagreement about inflation (DisInf), disagreement about GDP growth (DisGDP), expected inflation (ExpInf), expected GDP growth (muGDPgr), and the volatility of GDP growth (SigGDPgr). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Sample: $Q3$-1981 to $Q2$-2014.

| Nominal Yields | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.308 | 0.299 | 0.298 | 0.295 | 0.301 | 0.572 | 0.590 | 0.603 | 0.617 | 0.621 |
| t-stat | 2.16 | 2.09 | 2.08 | 2.08 | 2.16 | 3.75 | 4.06 | 4.32 | 4.58 | 4.79 |
| DisGDP | 0.300 | 0.317 | 0.326 | 0.332 | 0.341 | 0.223 | 0.228 | 0.231 | 0.230 | 0.240 |
| t-stat | 3.26 | 3.28 | 3.26 | 3.20 | 3.21 | 3.37 | 3.57 | 3.63 | 3.63 | 3.69 |
| adj. R2 | 0.27 | 0.28 | 0.29 | 0.29 | 0.30 | 0.48 | 0.50 | 0.53 | 0.54 | 0.56 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| DisInf | 0.327 | 0.321 | 0.319 | 0.317 | 0.323 | 0.537 | 0.562 | 0.582 | 0.599 | 0.607 |
| t-stat | 3.92 | 3.76 | 3.63 | 3.56 | 3.61 | 4.03 | 4.46 | 4.79 | 5.13 | 5.35 |
| ExpInf | 0.345 | 0.331 | 0.318 | 0.315 | 0.303 | 0.218 | 0.195 | 0.176 | 0.167 | 0.153 |
| t-stat | 2.89 | 2.84 | 2.75 | 2.73 | 2.68 | 2.87 | 2.86 | 2.74 | 2.76 | 2.64 |
| DisGDP | 0.200 | 0.220 | 0.233 | 0.240 | 0.251 | 0.186 | 0.194 | 0.200 | 0.200 | 0.212 |
| t-stat | 2.67 | 2.57 | 2.51 | 2.42 | 2.45 | 2.51 | 2.57 | 2.59 | 2.56 | 2.62 |
| muGDPgr | 0.296 | 0.299 | 0.293 | 0.292 | 0.289 | 0.321 | 0.329 | 0.326 | 0.329 | 0.326 |
| t-stat | 2.58 | 2.60 | 2.55 | 2.55 | 2.53 | 3.38 | 3.62 | 3.70 | 3.90 | 3.98 |
| adj. R2 | 0.51 | 0.51 | 0.50 | 0.50 | 0.51 | 0.65 | 0.67 | 0.68 | 0.70 | 0.71 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| Nominal Yield Volatilities | | | | | | | | | | |
| DisInf | 0.584 | 0.583 | 0.528 | 0.585 | 0.549 | 0.562 | 0.522 | 0.494 | 0.456 | 0.451 |
| t-stat | 4.30 | 4.20 | 4.27 | 5.03 | 5.14 | 3.06 | 2.89 | 2.76 | 2.61 | 2.62 |
| DisGDP | 0.238 | 0.237 | 0.260 | 0.280 | 0.310 | 0.310 | 0.325 | 0.331 | 0.397 | 0.411 |
| t-stat | 2.21 | 1.95 | 2.04 | 2.08 | 2.23 | 2.19 | 2.15 | 2.45 | 2.43 | 2.63 |
| adj. R2 | 0.54 | 0.53 | 0.48 | 0.59 | 0.57 | 0.55 | 0.51 | 0.48 | 0.51 | 0.52 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| DisInf | 0.316 | 0.349 | 0.321 | 0.376 | 0.356 | 0.353 | 0.319 | 0.318 | 0.259 | 0.271 |
| t-stat | 3.19 | 3.08 | 2.82 | 3.51 | 3.40 | 2.95 | 2.66 | 2.43 | 2.13 | 2.18 |
| ExpInf | 0.266 | 0.239 | 0.223 | 0.175 | 0.177 | 0.203 | 0.194 | 0.173 | 0.156 | 0.151 |
| t-stat | 4.53 | 4.12 | 3.19 | 3.05 | 3.14 | 4.65 | 4.16 | 3.69 | 3.39 | 3.34 |
| DisGDP | 0.212 | 0.213 | 0.236 | 0.268 | 0.295 | 0.237 | 0.255 | 0.270 | 0.331 | 0.350 |
| t-stat | 2.53 | 2.11 | 2.13 | 2.32 | 2.39 | 3.42 | 2.99 | 3.20 | 3.30 | 3.44 |
| SigGDPgr | 0.329 | 0.286 | 0.251 | 0.263 | 0.239 | 0.373 | 0.363 | 0.312 | 0.379 | 0.339 |
| t-stat | 2.32 | 2.11 | 1.81 | 2.20 | 1.86 | 2.61 | 2.53 | 2.40 | 2.92 | 2.70 |
| adj. R2 | 0.62 | 0.60 | 0.53 | 0.63 | 0.61 | 0.66 | 0.61 | 0.55 | 0.61 | 0.60 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.43: **Disagreement about GDP Growth and Real Yields.** The table reports results from OLS regressions of real yields and real yield volatilities on disagreement about inflation (DisInf), disagreement about GDP growth (DisGDP), expected GDP growth (expGDP), and the volatility of GDP growth (SigGDP). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Sample: $Q3$-1981 to $Q2$-2014.

| Real Yields | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
| Maturity | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.287 | 0.268 | 0.245 | 0.234 | 0.221 | 0.486 | 0.500 | 0.503 | 0.508 | 0.513 |
| t-stat | 2.42 | 2.21 | 1.96 | 1.86 | 1.75 | 2.79 | 2.97 | 3.14 | 3.27 | 3.40 |
| DisGDP | 0.229 | 0.246 | 0.273 | 0.284 | 0.295 | 0.177 | 0.179 | 0.192 | 0.195 | 0.197 |
| t-stat | 2.32 | 2.38 | 2.39 | 2.38 | 2.38 | 2.15 | 2.29 | 2.58 | 2.64 | 2.68 |
| adj. R2 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 0.33 | 0.35 | 0.36 | 0.37 | 0.38 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| DisInf | 0.358 | 0.341 | 0.320 | 0.308 | 0.296 | 0.521 | 0.536 | 0.540 | 0.546 | 0.551 |
| t-stat | 4.24 | 3.91 | 3.48 | 3.27 | 3.06 | 3.26 | 3.50 | 3.76 | 3.93 | 4.10 |
| DisGDP | 0.203 | 0.220 | 0.246 | 0.256 | 0.268 | 0.173 | 0.175 | 0.189 | 0.191 | 0.194 |
| t-stat | 2.12 | 2.17 | 2.17 | 2.15 | 2.14 | 1.81 | 1.90 | 2.07 | 2.10 | 2.12 |
| expGDP | 0.341 | 0.348 | 0.357 | 0.356 | 0.356 | 0.331 | 0.343 | 0.355 | 0.356 | 0.358 |
| t-stat | 3.23 | 3.30 | 3.34 | 3.30 | 3.29 | 3.09 | 3.30 | 3.50 | 3.57 | 3.68 |
| adj. R2 | 0.30 | 0.30 | 0.31 | 0.31 | 0.31 | 0.43 | 0.46 | 0.48 | 0.49 | 0.50 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| Real Yield Volatilities | | | | | | | | | | |
| DisInf | 0.612 | 0.641 | 0.689 | 0.733 | 0.736 | 0.334 | 0.392 | 0.423 | 0.431 | 0.428 |
| t-stat | 6.60 | 6.89 | 6.63 | 6.72 | 6.55 | 1.92 | 2.14 | 2.15 | 2.03 | 1.94 |
| DisGDP | -0.014 | 0.013 | 0.020 | 0.025 | 0.045 | 0.168 | 0.186 | 0.206 | 0.231 | 0.253 |
| t-stat | -0.15 | 0.12 | 0.16 | 0.17 | 0.28 | 1.19 | 1.24 | 1.21 | 1.18 | 1.22 |
| adj. R2 | 0.36 | 0.41 | 0.48 | 0.55 | 0.57 | 0.17 | 0.24 | 0.28 | 0.31 | 0.33 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| DisInf | 0.140 | 0.208 | 0.316 | 0.398 | 0.471 | 0.052 | 0.127 | 0.173 | 0.186 | 0.209 |
| t-stat | 1.04 | 1.75 | 2.93 | 3.96 | 4.64 | 0.64 | 1.53 | 1.82 | 1.71 | 1.62 |
| DisGDP | 0.054 | 0.075 | 0.074 | 0.073 | 0.083 | 0.089 | 0.112 | 0.136 | 0.162 | 0.191 |
| t-stat | 1.01 | 1.17 | 0.85 | 0.67 | 0.63 | 2.48 | 2.94 | 2.30 | 1.89 | 1.71 |
| SigGDP | 0.662 | 0.608 | 0.524 | 0.470 | 0.373 | 0.722 | 0.679 | 0.639 | 0.628 | 0.563 |
| t-stat | 4.40 | 4.95 | 5.20 | 4.08 | 2.32 | 7.89 | 9.63 | 7.54 | 4.77 | 2.99 |
| adj. R2 | 0.60 | 0.62 | 0.63 | 0.67 | 0.65 | 0.59 | 0.61 | 0.61 | 0.63 | 0.58 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.44: **Earnings Disagreement.** The table reports results from OLS regressions of real and nominal yields on disagreement about inflation (DisInf) and market capitalization weighted disagreement about corporate earnings growth (DisEar). The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. Sample: $Q$1-1983 to $Q$4-2013.

| | Real Yields | | | | | Nominal Yields | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisEar | -0.136 | -0.130 | -0.091 | -0.075 | -0.065 | -0.072 | -0.054 | -0.040 | -0.020 | 0.003 |
| t-stat | -0.68 | -0.65 | -0.46 | -0.39 | -0.34 | -0.50 | -0.37 | -0.27 | -0.14 | 0.02 |
| adj. R2 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| N | 124 | 124 | 124 | 124 | 124 | 371 | 371 | 371 | 371 | 371 |
| DisInf | 0.459 | 0.439 | 0.395 | 0.378 | 0.364 | 0.551 | 0.579 | 0.600 | 0.618 | 0.632 |
| t-stat | 4.08 | 3.66 | 3.05 | 2.82 | 2.64 | 4.28 | 4.63 | 4.94 | 5.21 | 5.39 |
| DisEar | -0.386 | -0.369 | -0.306 | -0.281 | -0.264 | -0.136 | -0.122 | -0.110 | -0.092 | -0.071 |
| t-stat | -2.47 | -2.38 | -2.10 | -1.95 | -1.85 | -1.17 | -1.07 | -1.00 | -0.86 | -0.68 |
| adj. R2 | 0.15 | 0.14 | 0.10 | 0.09 | 0.08 | 0.30 | 0.33 | 0.35 | 0.37 | 0.39 |
| N | 124 | 124 | 124 | 124 | 124 | 371 | 371 | 371 | 371 | 371 |

Table IA.45: **Real Consumption.** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and real consumption growth volatility (SigC). The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and real consumption growth volatility. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). SigC is also predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation. Sample: $Q$3-1981 to $Q$2-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.28 | 0.26 | 0.24 | 0.22 | 0.20 | 0.50 | 0.51 | 0.50 | 0.50 | 0.50 |
| t-stat | 2.19 | 2.00 | 1.76 | 1.65 | 1.54 | 2.78 | 2.93 | 3.05 | 3.13 | 3.19 |
| SigC | 0.26 | 0.29 | 0.33 | 0.35 | 0.37 | 0.10 | 0.11 | 0.14 | 0.15 | 0.17 |
| t-stat | 1.53 | 1.60 | 1.68 | 1.75 | 1.83 | 0.80 | 0.84 | 0.98 | 1.06 | 1.11 |
| $R^2$ | 0.21 | 0.21 | 0.22 | 0.23 | 0.23 | 0.31 | 0.33 | 0.34 | 0.35 | 0.36 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.23 | 0.21 | 0.21 | 0.20 | 0.21 | 0.45 | 0.47 | 0.48 | 0.49 | 0.50 |
| t-stat | 2.08 | 1.97 | 1.91 | 1.87 | 1.95 | 2.81 | 3.02 | 3.17 | 3.33 | 3.43 |
| ExpInf | 0.48 | 0.47 | 0.46 | 0.46 | 0.45 | 0.40 | 0.38 | 0.36 | 0.35 | 0.33 |
| t-stat | 5.77 | 5.96 | 5.95 | 6.06 | 6.04 | 5.18 | 5.28 | 5.13 | 5.12 | 4.94 |
| SigC | 0.26 | 0.29 | 0.32 | 0.34 | 0.35 | 0.04 | 0.06 | 0.08 | 0.09 | 0.11 |
| t-stat | 2.14 | 2.40 | 2.60 | 2.80 | 2.90 | 0.37 | 0.51 | 0.66 | 0.77 | 0.87 |
| $R^2$ | 0.46 | 0.46 | 0.47 | 0.48 | 0.48 | 0.55 | 0.57 | 0.58 | 0.59 | 0.60 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.46: **Real GDP.** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and real GDP growth volatility (SigGDP). The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and real GDP growth volatility. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). SigGDP is also predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation. Sample: $Q$3-1981 to $Q$2-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.41 | 0.40 | 0.39 | 0.38 | 0.37 | 0.55 | 0.57 | 0.58 | 0.59 | 0.60 |
| t-stat | 3.67 | 3.58 | 3.41 | 3.28 | 3.10 | 2.79 | 2.96 | 3.08 | 3.19 | 3.30 |
| SigGDP | 0.00 | -0.01 | 0.00 | 0.01 | 0.01 | 0.03 | 0.01 | 0.00 | 0.00 | -0.01 |
| t-stat | 0.02 | -0.03 | -0.01 | 0.04 | 0.07 | 0.23 | 0.08 | 0.01 | -0.01 | -0.04 |
| $R^2$ | 0.15 | 0.14 | 0.14 | 0.13 | 0.13 | 0.30 | 0.32 | 0.33 | 0.34 | 0.34 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.27 | 0.26 | 0.26 | 0.25 | 0.25 | 0.49 | 0.53 | 0.55 | 0.56 | 0.57 |
| t-stat | 2.41 | 2.32 | 2.23 | 2.09 | 2.11 | 2.83 | 3.14 | 3.35 | 3.59 | 3.74 |
| ExpInf | 0.52 | 0.51 | 0.50 | 0.51 | 0.50 | 0.39 | 0.36 | 0.34 | 0.33 | 0.32 |
| t-stat | 4.57 | 4.69 | 4.67 | 4.78 | 4.76 | 4.00 | 4.07 | 4.01 | 4.10 | 4.05 |
| SigGDP | 0.00 | 0.02 | 0.04 | 0.05 | 0.07 | -0.03 | -0.03 | -0.02 | -0.02 | -0.01 |
| t-stat | -0.01 | 0.11 | 0.22 | 0.32 | 0.40 | -0.20 | -0.20 | -0.16 | -0.14 | -0.05 |
| $R^2$ | 0.44 | 0.43 | 0.42 | 0.42 | 0.42 | 0.55 | 0.57 | 0.57 | 0.59 | 0.59 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

Table IA.47: **Industrial Production.** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and the volatility of industrial production (SigIP). The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and the volatility of IP. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH(1,1) model with an ARMA(1,1) mean equation over multiple horizons (T). Sample: $Q3$-1981 to $Q2$-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.40 | 0.39 | 0.39 | 0.38 | 0.38 | 0.55 | 0.57 | 0.58 | 0.59 | 0.60 |
| t-stat | 3.14 | 3.09 | 3.06 | 3.06 | 3.05 | 2.98 | 3.14 | 3.27 | 3.38 | 3.49 |
| SigIP | 0.03 | 0.02 | 0.00 | -0.01 | -0.02 | 0.06 | 0.04 | 0.02 | 0.01 | -0.01 |
| t-stat | 0.49 | 0.24 | 0.00 | -0.09 | -0.21 | 0.99 | 0.65 | 0.30 | 0.12 | -0.11 |
| adj. $R^2$ | 0.15 | 0.15 | 0.14 | 0.13 | 0.13 | 0.31 | 0.32 | 0.33 | 0.34 | 0.34 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.29 | 0.30 | 0.31 | 0.31 | 0.33 | 0.48 | 0.53 | 0.57 | 0.59 | 0.61 |
| t-stat | 2.50 | 2.54 | 2.60 | 2.67 | 2.77 | 4.15 | 4.51 | 4.77 | 5.04 | 5.27 |
| ExpInf | 0.51 | 0.50 | 0.49 | 0.48 | 0.47 | 0.35 | 0.29 | 0.24 | 0.21 | 0.19 |
| t-stat | 4.39 | 4.23 | 4.05 | 4.00 | 3.90 | 3.45 | 2.73 | 2.17 | 1.82 | 1.62 |
| SigIP | 0.13 | 0.12 | 0.11 | 0.11 | 0.10 | -0.03 | -0.05 | -0.05 | -0.06 | -0.06 |
| t-stat | 1.40 | 1.24 | 1.18 | 1.14 | 1.06 | -0.58 | -0.83 | -0.87 | -1.00 | -0.97 |
| adj. $R^2$ | 0.41 | 0.40 | 0.39 | 0.39 | 0.39 | 0.58 | 0.56 | 0.55 | 0.55 | 0.55 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.48: **Jurado, Ludvigson, and Ng (2015) Uncertainty Measure.** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and the Jurado, Ludvigson, and Ng (2015) uncertainty measure (U-JLN). The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and the Jurado, Ludvigson, and Ng (2015) uncertainty measure. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH(1, 1) model with an ARMA(1, 1) mean equation over multiple horizons (T). Sample: $Q$3-1981 to $Q$2-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.33 | 0.34 | 0.34 | 0.34 | 0.34 | 0.51 | 0.53 | 0.55 | 0.56 | 0.57 |
| t-stat | 2.12 | 2.11 | 2.09 | 2.10 | 2.13 | 2.89 | 3.05 | 3.21 | 3.34 | 3.45 |
| U-JLN | 0.13 | 0.11 | 0.09 | 0.07 | 0.05 | 0.16 | 0.14 | 0.11 | 0.09 | 0.07 |
| t-stat | 0.70 | 0.55 | 0.40 | 0.33 | 0.25 | 1.18 | 0.96 | 0.76 | 0.66 | 0.53 |
| adj. $R^2$ | 0.16 | 0.15 | 0.14 | 0.14 | 0.13 | 0.33 | 0.34 | 0.34 | 0.34 | 0.35 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.32 | 0.34 | 0.35 | 0.35 | 0.37 | 0.45 | 0.51 | 0.54 | 0.57 | 0.59 |
| t-stat | 2.41 | 2.49 | 2.53 | 2.59 | 2.69 | 3.94 | 4.29 | 4.57 | 4.83 | 5.03 |
| ExpInf | 0.47 | 0.45 | 0.44 | 0.44 | 0.42 | 0.35 | 0.29 | 0.25 | 0.22 | 0.20 |
| t-stat | 3.87 | 3.71 | 3.58 | 3.53 | 3.43 | 3.22 | 2.55 | 2.01 | 1.71 | 1.52 |
| U-JLN | 0.06 | 0.03 | 0.03 | 0.02 | 0.01 | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 |
| t-stat | 0.36 | 0.20 | 0.15 | 0.10 | 0.03 | 0.37 | 0.14 | 0.09 | 0.00 | 0.02 |
| adj. $R^2$ | 0.40 | 0.39 | 0.39 | 0.38 | 0.39 | 0.58 | 0.56 | 0.55 | 0.54 | 0.55 |
| N | 132 | 132 | 132 | 132 | 132 | 438 | 438 | 438 | 438 | 438 |

Table IA.49: **Baker, Bloom, and Davis (2015) Uncertainty Measure.** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and the Baker, Bloom, and Davis (2015) uncertainty measure (U-BBD). The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and the Baker, Bloom, and Davis (2015) uncertainty measure. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH(1,1) model with an ARMA(1,1) mean equation over multiple horizons (T). Sample: $Q$3-1981 to $Q$2-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.14 | 0.12 | 0.10 | 0.09 | 0.08 | 0.44 | 0.47 | 0.49 | 0.50 | 0.51 |
| t-stat | 1.18 | 1.04 | 0.87 | 0.78 | 0.65 | 2.65 | 2.90 | 3.16 | 3.30 | 3.41 |
| U-BBD | -0.47 | -0.49 | -0.51 | -0.50 | -0.49 | -0.49 | -0.51 | -0.54 | -0.54 | -0.53 |
| t-stat | -3.32 | -3.10 | -2.68 | -2.45 | -2.22 | -5.36 | -5.22 | -4.46 | -4.05 | -3.72 |
| adj. $R^2$ | 0.18 | 0.20 | 0.22 | 0.22 | 0.20 | 0.36 | 0.41 | 0.45 | 0.46 | 0.46 |
| N | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | -0.10 | -0.13 | -0.14 | -0.15 | -0.14 | 0.47 | 0.51 | 0.54 | 0.56 | 0.58 |
| t-stat | -0.69 | -0.87 | -0.98 | -1.06 | -1.06 | 4.48 | 5.06 | 5.44 | 5.74 | 5.98 |
| ExpInf | 0.44 | 0.43 | 0.42 | 0.41 | 0.41 | 0.26 | 0.25 | 0.23 | 0.23 | 0.23 |
| t-stat | 2.58 | 2.54 | 2.45 | 2.46 | 2.40 | 2.62 | 2.66 | 2.57 | 2.69 | 2.60 |
| U-BBD | 0.16 | 0.21 | 0.24 | 0.27 | 0.29 | -0.44 | -0.44 | -0.43 | -0.41 | -0.40 |
| t-stat | 1.36 | 1.98 | 2.51 | 3.04 | 3.55 | -6.65 | -6.67 | -6.30 | -5.88 | -5.51 |
| adj. $R^2$ | 0.21 | 0.22 | 0.23 | 0.24 | 0.24 | 0.52 | 0.54 | 0.55 | 0.56 | 0.56 |
| N | 118 | 118 | 118 | 118 | 118 | 354 | 354 | 354 | 354 | 354 |

Table IA.50: **Output Gap.** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and the output gap (OG). The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and OG. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH$(1,1)$ model with an ARMA$(1,1)$ mean equation over multiple horizons (T). Sample: $Q$3-1981 to $Q$2-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.45 | 0.43 | 0.42 | 0.41 | 0.39 | 0.83 | 0.84 | 0.84 | 0.84 | 0.83 |
| t-stat | 4.25 | 3.93 | 3.61 | 3.45 | 3.29 | 5.91 | 5.64 | 5.11 | 4.89 | 4.73 |
| ExpInf | 0.16 | 0.14 | 0.12 | 0.10 | 0.08 | 0.50 | 0.49 | 0.48 | 0.46 | 0.43 |
| t-stat | 0.96 | 0.83 | 0.73 | 0.59 | 0.45 | 3.79 | 3.52 | 3.12 | 2.88 | 2.68 |
| adj. $R^2$ | 0.18 | 0.16 | 0.15 | 0.14 | 0.13 | 0.48 | 0.49 | 0.49 | 0.49 | 0.48 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.29 | 0.28 | 0.28 | 0.27 | 0.28 | 0.66 | 0.67 | 0.69 | 0.69 | 0.69 |
| t-stat | 3.50 | 3.29 | 3.23 | 3.19 | 3.27 | 3.88 | 3.77 | 3.74 | 3.69 | 3.69 |
| ExpInf | 0.51 | 0.51 | 0.50 | 0.50 | 0.49 | 0.16 | 0.13 | 0.10 | 0.09 | 0.09 |
| t-stat | 5.66 | 5.92 | 5.88 | 6.00 | 5.91 | 1.25 | 0.98 | 0.71 | 0.66 | 0.66 |
| OG | 0.04 | 0.00 | -0.03 | -0.06 | -0.08 | 0.21 | 0.17 | 0.15 | 0.12 | 0.09 |
| t-stat | 0.30 | -0.03 | -0.24 | -0.45 | -0.64 | 1.48 | 1.16 | 0.99 | 0.81 | 0.63 |
| adj. $R^2$ | 0.44 | 0.43 | 0.42 | 0.42 | 0.42 | 0.61 | 0.59 | 0.57 | 0.56 | 0.56 |
| N | 132 | 132 | 132 | 132 | 132 | 146 | 146 | 146 | 146 | 146 |

Table IA.51: **Chicago Fed National Activity Index (CFNAI).** The top table reports results from OLS regressions of real yields on disagreement about inflation (DisInf) and the CFNAI. The bottom table reports results from OLS regressions of nominal yields on disagreement about inflation, expected inflation (ExpInfl), and the CFNAI. The t-statistics (t-stat) are Newey-West corrected with 12 lags. Regression coefficients are standardized. ExpInf is predicted by a GARCH(1,1) model with an ARMA(1,1) mean equation over multiple horizons (T). The CFNAI is the index of economic activity developed in Stock and Watson (1999). Sample: $Q$3-1981 to $Q$2-2014.

| | Survey of Professionals | | | | | Surveys of Consumers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Real Yields | | | | | | | | | |
| | 2y | 3y | 5y | 7y | 10y | 2y | 3y | 5y | 7y | 10y |
| DisInf | 0.42 | 0.41 | 0.41 | 0.41 | 0.40 | 0.56 | 0.58 | 0.60 | 0.60 | 0.61 |
| t-stat | 3.46 | 3.41 | 3.38 | 3.38 | 3.37 | 3.04 | 3.20 | 3.35 | 3.46 | 3.59 |
| CFNAI | 0.05 | 0.08 | 0.11 | 0.12 | 0.13 | 0.04 | 0.07 | 0.10 | 0.12 | 0.13 |
| t-stat | 0.63 | 0.98 | 1.37 | 1.57 | 1.74 | 0.54 | 1.01 | 1.57 | 1.91 | 2.24 |
| adj. $R^2$ | 0.16 | 0.15 | 0.15 | 0.15 | 0.15 | 0.30 | 0.32 | 0.34 | 0.35 | 0.36 |
| N | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
| | Nominal Yields | | | | | | | | | |
| | 1y | 2y | 3y | 4y | 5y | 1y | 2y | 3y | 4y | 5y |
| DisInf | 0.29 | 0.30 | 0.31 | 0.31 | 0.33 | 0.38 | 0.42 | 0.46 | 0.48 | 0.50 |
| t-stat | 2.84 | 2.92 | 2.98 | 3.08 | 3.22 | 3.24 | 3.76 | 4.16 | 4.53 | 4.83 |
| ExpInf | 0.51 | 0.50 | 0.48 | 0.48 | 0.47 | 0.36 | 0.34 | 0.32 | 0.31 | 0.30 |
| t-stat | 4.89 | 4.78 | 4.64 | 4.63 | 4.46 | 3.06 | 3.05 | 2.98 | 3.07 | 2.94 |
| CFNAI | 0.07 | 0.10 | 0.10 | 0.11 | 0.13 | 0.16 | 0.18 | 0.19 | 0.20 | 0.19 |
| t-stat | 0.98 | 1.35 | 1.42 | 1.54 | 1.64 | 2.50 | 3.03 | 3.16 | 3.38 | 3.39 |
| adj. $R^2$ | 0.44 | 0.44 | 0.43 | 0.43 | 0.43 | 0.38 | 0.41 | 0.42 | 0.45 | 0.46 |
| N | 132 | 132 | 132 | 132 | 132 | 354 | 354 | 354 | 354 | 354 |