

Macroeconomic News and Stock–Bond Comovement*

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Abstract

Covariances between aggregate stock returns and changes in bond yields change sign over time. Existing theories emphasize either time-varying properties of expected inflation or time-varying properties of real yields. Using revisions in survey forecasts as proxies for macroeconomic news, neither approach succeeds empirically. Inflation-centric models require much more news about expected future inflation than we observe from surveys. Real-centric models posit signs of covariances among macroeconomic news, changes in yields, and stock returns that do not match those in the data. In a nutshell, macroeconomic news appears to drive a substantial part of stock–bond comovement, but not in ways consistent with our theories.

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1. Introduction

The comovement between aggregate stock returns and nominal bond yields varies widely over time, occasionally switching sign. Figure 1 illustrates patterns first identified by Li (2002) and Fleming, Kirby, and Ostdiek (2003). The figure displays rolling two-month sample correlations between daily aggregate stock returns and contemporaneous changes in Treasury yields. Sample correlations are close to zero in the early 1960s. Stock returns and bond yields move in opposite directions from the late 1960s through the late 1990s. After an abrupt sign change around 1997, yields and stock returns move together throughout much of the 21st century. This time-variation in daily comovement also holds for monthly, quarterly, and annual horizons.

An active literature beginning with Hasseltoft (2009) attempts to explain the dynamics of this comovement, especially the sign change associated with the sharp break. In this research I make two contributions to this literature. Both are negative, in the sense they deepen the puzzle.

Most of the published literature in this area emphasizes how time-varying dynamics of inflation and output affect the conditional comovement between stock returns and bond yields. Expected inflation was countercyclical during the 1960s through the early 1990s and procyclical after this period. In Burkhardt and Hasseltoft (2012), David and Veronesi (2013), Song (2017), and Campbell, Pflueger, and Viceira (2020), this change in regime drives the large swings in correlations observed in Figure 1, including the change in sign.

However, Duffee (2018) concludes that during the past 50 years, standard deviations of quarterly innovations in survey expectations of inflation are small relative to standard deviations of quarterly innovations in bond yields. Although this evidence says nothing about stock returns, it prompts a question. If there is not much news about expected inflation, how can changes in its properties be the primary driver of changes in the comovement of aggregate stock returns and bond yields?

INSERT FIGURE 1 AROUND HERE

My first contribution addresses directly the apparent conflict in the literature by unpacking some of the published inflation-centric models. I show that the parameterized model-implied properties of expected inflation news differ substantially from those of survey-inferred

news. The models generate either much more news about expected inflation than surveys indicate, news that is highly correlated with real rates rather than roughly uncorrelated as in surveys, or both. Put differently, the models “succeed” because they are not tied down to the actual behavior of expected inflation.

My second contribution explores empirically the roles played by macroeconomic shocks in driving time-varying stock–bond comovement. I study stock returns and contemporaneous changes in yields at the six-week horizon—the time between successive Federal Reserve Board (Greenbook) macroeconomic forecasts. I project Greenbook-to-Greenbook stock returns and changes in bond yields on contemporaneous revisions in Greenbook macroeconomic forecasts, as summarized by a few principal components. The forecast revisions capture various types of macroeconomic news arriving during the six weeks. The projected (i.e., fitted) values proxy for the macro-news components of stock returns and changes in yields.

Projections estimated over 1978 (the year when sufficient Greenbook data are available) through 1996 reflect macroeconomic influences during a time when aggregate stock prices and bond yields move inversely. Projections estimated over 1997 through 2016 (the most recent available data) reflect these influences during a time when stock prices and bond yields move together. Armed with these macro-news projections, I examine how much of the change in covariances between these periods is attributable to changes in macroeconomic influences.

This empirical exercise connects to theories that link time-varying comovement to macroeconomic influences other than inflation. These theories focus on real rate behavior. Campbell, Shiller, and Viceira (2009), Campbell, Sunderam, and Viceira (2017), and Liu (2020) all observe that the conditional comovement between stock returns and long-term inflation-indexed yields is roughly similar to the conditional comovement between stock returns and long-term nominal yields. Prompted by this research, as well as early versions of the current paper, a recent flurry of research explores a variety of macroeconomic channels. They share a common mathematical structure. Models have typically one shock that moves stocks and real yields in the same direction, another shock that moves them in opposite directions, and a time-varying state variable that determines the conditional volatilities of the two shocks. In the earlier (later) sample, the negative-covariance (positive-covariance) shock dominates.

The modestly good news from this exercise is that sample covariances between macro-projected stock returns and macro-projected changes in yields have qualitatively ‘correct’

properties. Like their raw counterparts, they are negative for the 1978–1996 sample and positive for the 1997–2016 sample. The magnitude of their change across the two samples is around a third to a half of the change in sample covariances of their non-projected counterparts.

The bad news is that the results do not line up with existing theories of time-varying stock–bond comovement in Kozak (2022), Ermolov (2022), Chernov, Lochstoer, and Song (2021), Jones and Pyun (2022), or Laarits (2022). Starkly put, none of their mechanisms that generate negative comovement, nor any of their mechanisms that generate positive comovement, are consistent with the joint properties of macroeconomic news, stock returns, and changes in yields. In sum, macroeconomic forces drive both negative and positive comovement between stock returns and changes in yields, but in ways that existing theories do not explain.

The evidence in this paper hints at a possible direction for future theoretical research. Existing theories are built on economies with single risky sectors, such as ones with aggregate endowment or a single stochastic tree. There is no scope for news that moves different risky sectors in different directions. Yet empirically, macroeconomic news that drives residential investment up, away from other components of economic growth, is generally accompanied by declining yields. During 1978 through 1996, such news (especially if we ignore October 1987) raises stock prices, while during 1997 through 2016, it lowers stock prices. Perhaps changing sectoral dynamics, especially those associated with housing, can help explain stock–bond comovement dynamics.

This paper is most closely related to Duffee (2018) in its analysis of expected inflation. It is also related to Duffee (2022), which studies the Euler equation for bonds. The Euler equation is an integral part of many of the theories of stock–bond comovement, but Duffee (2022) does not examine comovement, nor does it consider sector-level macroeconomic news.

The next section discusses the conflict between models that emphasize inflation dynamics and the evidence of Duffee (2018). It also presents some basic empirical evidence. Section 3 outlines the theories for stock–bond comovement based on real rate behavior. It then introduces an empirical framework to evaluate the theories, and presents the results. Section 4 concludes.

2. Inflation-Centric Models of Comovement

A literature emphasizing the large role of expected inflation in explaining stock–bond comovement appears to conflict with the evidence in Duffee (2018) of the small role played by expected inflation in explaining changes in bond yields. This section unpacks the dissonance between this literature and the empirical evidence.

2.1 The Literature

The relevant research starts with the observation that inflation was countercyclical throughout much of the second half of the 20th century, and more recently has been procyclical. Asset pricing implications of countercyclical inflation are explored by Piazzesi and Schneider (2007). They document that news about expected future consumption growth and news about expected future inflation are negatively correlated throughout much of the postwar period. Piazzesi and Schneider combine these dynamics with recursive preferences to produce an asset-pricing model that explains why the nominal yield curve slopes up on average: investor fear stagflation. Bansal and Shaliastovich (2013) use similar ingredients to build a term structure model that exhibits countercyclical expected inflation.

In long-run risk models that build on Bansal and Yaron (2004), the aggregate stock market reacts positively to news of higher expected future consumption growth.¹ This relation, coupled with the evidence discussed in the prior paragraph and the Fisher equation linking expected inflation to nominal yields, produces a negative covariance between aggregate stock returns and nominal long-term yields.

Burkhardt and Hasseltoft (2012) modify this framework to explain why the stock–bond relation sometimes changes sign. They conclude that the correlation between consumption growth and inflation changes over time. From 1930 through 1970, the correlation between annual consumption growth and annual inflation ranges from positive to modestly negative. Subsequently the correlation turns sharply negative, in the neighborhood of -0.6 during 1970 through 2000. The correlation then switches sign again, to about 0.6 from 2000 through 2010. Burkhardt and Hasseltoft use this and related evidence to motivate a long-run risk model with exogeneous regimes shifts in inflation–output dynamics. They interpret the sign change in the stock-bond covariance in the 1990s as a consequence of a shift from a countercyclical

¹Model parameterizations almost always exhibit a sufficiently high elasticity of intertemporal substitution to ensure this positive relation.

inflation regime to a procyclical inflation regime.

Other researchers follow the spirit of Burkhardt and Hasseltoft to explain Figure 1. Campbell, Sunderam, and Viceira (2017) use a continuous state variable to capture time-varying covariances with expected inflation rather than one that jumps from regime to regime. Song (2017) endogenizes regime shifts in inflation with regime shifts in monetary policy. David and Veronesi (2013) have unobserved regimes that differ in their exogenous conditional covariance between inflation expectations and equity cash flows, creating a filtering problem for agents. Campbell, Pflueger, and Viceira (2020) combine habit formation preferences with an exogenous regime shift in the dynamics of output and inflation.

These interpretations are appealing because they combine off-the-shelf asset pricing models with a well-documented change in stock–inflation dynamics. My version of that evidence appears next.

2.2 Baseline Evidence

This section documents substantial changes over time in stock–bond comovement. Although the results are standard, they are worth presenting because Section 3.3 builds on these baseline results. Federal Reserve Board staff produce Greenbook (since 2010, Tealbook) economic forecasts prior to every meeting of the Federal Open Market Committee (FOMC). The timing of these forecasts dictates how I measure stock returns and changes in bond yields.

Daily aggregate value-weighted stock returns from the Center for Research in Security Prices are cumulated to construct the stock market return between forecast dates. These dates are about six weeks apart. Excess returns are calculated assuming that the three-month Treasury bill yield as of the date of beginning forecast is the riskfree rate for each day between the two forecasts. The daily three-month Treasury bill yield is from the Federal Reserve’s H-15 release. Changes in one-year and ten-year Treasury zero-coupon bond yields between forecast dates use the interpolation method of Gurkaynak, Sack, and Wright (2007).

I use Greenbook data to calculate contemporaneous changes in forecasts of inflation. For each Greenbook, I use forecasts of quarterly inflation at various horizons to construct a measure of one-year-ahead inflation. The change as of a given Greenbook forecast is the difference between the current year-ahead forecast and the previous year-ahead forecast. I construct these measures for the GDP deflator, the CPI, and Core CPI. The Appendix contains additional details about the data and their construction. I subtract these changes

in one-year inflation forecasts from the changes in the one-year nominal yield to produce changes in ex-ante real one-year yields.

Table I presents the baseline evidence for time-varying comovement. Beginning with Table I, and throughout the remainder of this research, I use covariances rather than correlations or some other measure of comovement. Covariances are both analytically tractable and (at least for the objective of this paper) contain important information not captured by correlations. The first observation is mid-July 1978, a starting date determined by data availability in Section 3.3. Greenbook forecasts of CPI and Core CPI inflation are available beginning in 1979 and 1986 respectively. The sample through 1996 has between 87 (Core CPI) and 154 (GDP deflator) observations. The sample beginning in 1997 has 160 observations.

INSERT TABLE I ABOUT HERE

Not surprisingly, the table documents a sharp change over time in covariances between stock returns and changes in nominal yields. Through 1996 the sample covariances for both one-year and ten-year yields are less than $-1.1\%^2$, and statistically overwhelmingly different from zero. From 1997 through 2016 the covariances are around $0.4\%^2$ and modestly statistically different from zero. The hypothesis of equal covariances over time is easily rejected.

Consistent with the inflation-centric literature, the table also documents statistically significant changes in covariances between stock returns and changes in expected inflation for both the GDP deflator and the CPI. The evidence for Core CPI is inconclusive, perhaps because the limited sample size. However, the changes over time in the inflation covariances are much smaller—less than one-third—than the corresponding changes in yield covariances.

Given the relatively weak economic significance of changing inflation covariances, it is not surprising that covariances between stock returns and changes in ex-ante one-year real yields change substantially over time. For each inflation measure underlying a real yield, we can easily reject the hypothesis of a constant covariance over time. Inflation-based theories have difficulty explaining time-varying comovement of stock returns and real yields. However, data limitations prevent us from estimating properties of real yields as precisely as we estimate those of nominal yields. In particular, here I use ex-ante real yields rather than real yields, and only for a one-year maturity.

2.3 Confronting Duffee (2018)

The relatively small changes in sample covariances between stock returns and changes in annual expected inflation are consistent with the argument of Duffee (2018) that over short horizons (say, six weeks or one quarter), not much news is revealed about expected future inflation. The glaring failure of inflation-centric models is they require much more volatility of inflation news than we see in the data.

I first summarize the methodology of Duffee (2018). Denote the log change in the price level from $t - 1$ to t as π_t . Denote the log return to holding an n -period nominal bond from t to $t + 1$ in excess of the short-term real rate and inflation as

$$xr_{y,t+1}^{(n)} \equiv \left(ny_t^{(n)} - (n - 1)y_{t+1}^{(n-1)} \right) - r_t^{(1)} - \pi_{t+1}.$$

A standard accounting identity first applied by Campbell and Ammer (1993) expresses the bond's yield as the sum of future inflation, real rates, and excess returns,

$$y_t^{(n)} = \frac{1}{n} \sum_{i=1}^m \pi_{t+i} + \frac{1}{n} \sum_{i=1}^n r_{t+i-1}^{(1)} + \frac{1}{n} \sum_{i=1}^n xr_{y,t+i}^{(n-i+1)}. \quad (1)$$

Conditioning (1) on information at time t produces

$$E_t \left(y_t^{(n)} \right) = \frac{1}{n} \sum_{i=1}^n E_t \left(\pi_{t+i} \right) + \frac{1}{n} \sum_{i=1}^n E_t \left(r_{t+i-1}^{(1)} \right) + \frac{1}{n} \sum_{i=1}^n E_t \left(xr_{y,t+i}^{(n-i+1)} \right). \quad (2)$$

Equation (2) says that the period- t nominal yield is the sum of average expected future short-term real rates, average expected inflation, and average expected excess returns over the life of the bond.

Mechanically, innovations in yields must equal innovations in expected future inflation, real rates, and expected excess returns. The notation is

$$\begin{aligned} \tilde{y}_t^{(n)} &\equiv y_t^{(n)} - E_{t-1} y_t^{(n)} \\ &= \eta_{\pi,t}^{(n)} + \eta_{r,t}^{(n)} + \eta_{xr,t}^{(n)}. \end{aligned}$$

The news components are

$$\begin{aligned}\eta_{\pi,t}^{(n)} &\equiv E_t \left(\frac{1}{n} \sum_{i=1}^n \pi_{t+i} \right) - E_{t-1} \left(\frac{1}{n} \sum_{i=1}^n \pi_{t+i} \right), \\ \eta_{r,t}^{(n)} &\equiv E_t \left(\frac{1}{n} \sum_{i=1}^n r_{t+i-1} \right) - E_{t-1} \left(\frac{1}{n} \sum_{i=1}^n r_{t+i-1} \right), \\ \eta_{xr,t}^{(n)} &\equiv E_t \left(\frac{1}{n} \sum_{i=1}^n xr_{y,t+i}^{(n-i+1)} \right) - E_{t-1} \left(\frac{1}{n} \sum_{i=1}^n xr_{y,t+i}^{(n-i+1)} \right).\end{aligned}$$

Use this accounting framework to decompose the conditional covariance between aggregate stock returns and innovations in the n -maturity nominal bond yield. The conditional covariance is

$$\text{Cov}_{t-1} \left(xr_{m,t}, \tilde{y}_t^{(n)} \right) = \text{Cov}_{t-1} \left(xr_{m,t}, \eta_{\pi,t}^{(n)} \right) + \text{Cov}_{t-1} \left(xr_{m,t}, \eta_{r,t}^{(n)} \right) + \text{Cov}_{t-1} \left(xr_{m,t}, \eta_{xr,t}^{(n)} \right).$$

Changes in the overall covariance over time must be driven by changes in one or more of the three component covariances. The literature discussed in Section 2.1 focuses on the time-variation in first term on the right, the conditional covariance between stock returns and news about expected inflation.

The evidence in Duffee (2018) suggests that this approach may be incapable of capturing observed dynamics between stock returns and bond yields. That paper examines the unconditional variance decomposition of yield innovations, given by

$$\begin{aligned}\text{Var}_{t-1} \left(\tilde{y}_t^{(n)} \right) &= \text{Var}_{t-1} \left(\eta_{\pi,t}^{(n)} \right) + \text{Var}_{t-1} \left(\eta_{r,t}^{(n)} \right) + \text{Var}_{t-1} \left(\eta_{xr,t}^{(n)} \right) \\ &\quad + 2\text{Cov}_{t-1} \left(\eta_{\pi,t}^{(n)}, \eta_{r,t}^{(n)} \right) + 2\text{Cov}_{t-1} \left(\eta_{\pi,t}^{(n)}, \eta_{xr,t}^{(n)} \right) + 2\text{Cov}_{t-1} \left(\eta_{r,t}^{(n)}, \eta_{xr,t}^{(n)} \right).\end{aligned}\quad (3)$$

This earlier work concludes that the variance of news about expected inflation contributes little to the overall variance of yield innovations. The ratio of the first variance on the right to the total variance ranges from 0.1 to 0.2 across various sample periods and bond maturities.

In addition, Duffee (2018) calculates model-implied decompositions (3) for estimated models in Piazzesi and Schneider (2007) and Bansal and Shaliastovich (2013). Model-implied volatilities of yield shocks are well below observed volatilities, while simultaneously model-

implied volatilities of news about expected future inflation are well above observed volatilities. In a nutshell, in the data, yield shocks are primarily driven by news other than revisions in inflation expectations, while these models heavily rely on an inflation channel.

2.4 Properties of Inflation-Centric Models

I perform a similar exercise for a few models that attempt to explain time-varying comovement of stock returns and nominal yields. Table II reports standard deviations of quarterly news about expected inflation and quarterly innovations in five-year Treasury bond yields. The first set of estimates use the data and code of Duffee (2018), which relies on a minimal set of assumptions. The implied ratios of the variance of news about expected inflation to the variance of yield innovations range from 0.03 to 0.13, with tight asymptotic standard errors.

INSERT TABLE II ABOUT HERE

The next set of standard deviations in the table are for the three regimes in the estimated model of Song (2017).² The table reports that Song’s model generates standard deviations of quarterly nominal yield innovations similar to those reported by Duffee. However, it does so almost entirely through news about expected inflation. The inflation variance ratios are close to one for all regimes.

Like Song’s model with recursive preferences, the habit formation model of Campbell, Pflueger, and Viceira (2020) roughly matches the volatility of quarterly nominal yield innovations. The habit formation preferences generate more news about expected excess bond returns than the recursive preferences employed by Song. Thus the ratios of inflation-news variance to yield-shock variance in Campbell, Pflueger, and Viceira (2020) are a little larger than 0.8, improving slightly on the performance of Song (2017).³ Nonetheless, the standard deviation of inflation news for 1979–2001 is 2.5 times the standard deviation calculated using the approach of Duffee (2018). The corresponding ratio for 2001–2011 is 4.5. In sum, the models of Song (2017) and Campbell, Pflueger, and Viceira (2020) match the observed volatility of yield innovations using stochastic processes for expected inflation that are unrealistically volatile.

²Thanks to Dongho for sharing the standard deviations underlying his Table E-7.

³I produce these numbers by modifying the Matlab code available on the *JPE* website.

Inflation variance ratios for the model of David and Veronesi (2013) are much smaller. The model generates standard deviations of news about expected inflation that are not much larger than those based on Duffee (2018). Volatilities of yield innovations are a little low relative to the data, thus the model’s variance ratios are around 1/3. Their inflation-centric model generates more news about expected future real rates and expected future excess returns than either Song (2017) or Campbell, Pflueger, and Viceira (2020). At first glance, this is surprising because David and Veronesi use power utility preferences rather than preferences that are commonly used to generate substantial variation in real rates and risk premia. How is this possible?

In David and Veronesi (2013), nominal bonds are essentially leveraged bets on future inflation. They follow Basak and Yan (2010) by assuming investors have a form of money illusion. When investors’ expectations of next period’s inflation increase by, say, one percent, they revise downward their expectation of next period’s *real* stochastic discount factor (SDF) by 80 basis points, and their expectation of next period’s *nominal* SDF by 180 basis points. Thus the short-term real rate rises by 80 basis points and the short-term nominal rate rises by 180 basis points. In the model, changes in one-year real yields, expected annual inflation, and one-year real yields are almost perfectly correlated, with standard deviations proportional to 0.8, 1, and 1.8.

The model’s requirement that real yields and expected inflation move in lockstep has no empirical support. Their changes are not even positively correlated. Using Bank of England data, Barr and Campbell (1997) estimate that monthly innovations in one-year real rates and one-year inflation expectations are negatively correlated. Using the same data underlying Table I, changes in ex-ante one-year real rates and changes in one-year-ahead expected inflation are negatively correlated for both the sample period through 1996 and the 1997–2016 sample. (These correlations are not reported in any table.) Hence the key mechanism in David and Veronesi (2013) is just as implausible as are the mechanisms in Song (2017) and Campbell, Pflueger, and Viceira (2020).⁴

⁴David and Veronesi (2013) estimate a version of their model without money illusion. Alex graciously shared the parameter estimates. With these estimates, the inflation variance ratio for a five-year nominal bond exceeds 1.0.

3. Real-Centric Models

A recent literature explores whether the behavior of real rates can explain observed variation in stock–(nominal) bond comovement. A variety of standard and not-so-standard mechanisms produce nonzero covariances between stock returns and changes in real yields. As noted in the introduction, models in this literature have one or more aggregate shocks that always produce positive comovement, one or more aggregate shocks that always produce negative comovement, and a device to vary their relative importance over time. A regime-shifting model that switches from one type of shock to another works qualitatively, but the literature prefers the greater flexibility of stochastic volatility models.

3.1 Economic Mechanisms of Comovement

The following mechanisms generate a positive covariance between stock returns and changes in real yields.

P-1. Positively serially correlated shocks to consumption growth rates

Much of the theory on comovement uses settings in which a representative agent has Epstein-Zin preferences over aggregate consumption. My shorthand for this setting is RA/EZ. Campbell, Shiller, and Viceira (2009) note that with RA/EZ, the sign and magnitude of comovement between stock returns and real yields depends on the serial correlation properties of aggregate consumption. A long literature beginning with Kandel and Stambaugh (1990, 1991), Cecchetti, Lam, and Mark (1990, 1993), and Bansal and Yaron (2004) focuses on models with transitory shocks to the growth rate of consumption. Owing to these shocks, consumption contains a unit root.

Chernov, Lochstoer, and Song (2021) and Jones and Pyun (2022) borrow the dynamics of Bansal and Yaron (2004), combined with a sufficiently high elasticity of intertemporal substitution (EIS), to generate positive comovement between stock returns and real yields. Good news about expected future consumption raises real rates as the representative agent attempts to shift consumption to the present. The increase in real rates is not sufficient to prevent stock prices from rising in anticipation of higher future cash flows.

P-2. Flight to quality

Pricing requires a stochastic discount factor (SDF). Settings in which the SDF is conditionally heteroskedastic exhibit flight to quality. A positive innovation to the conditional variance of the SDF raises both risk premia and the desire for precautionary savings. When stocks are sufficiently risky, this innovation simultaneously lowers aggregate stock prices and real rates. In the comovement literature, this mechanism is implemented via the conditional volatility of aggregate consumption by Jones and Pyun (2022) and exogenously imposed on the SDF (i.e., disconnected from consumption) by Kozak (2022) and Laarits (2022).

P-3. Countercyclical flight to quality

Changes in risk premia and changes in real rates have opposite effects on stock prices. This dampens the flight-to-quality effect on stock returns. Jones and Pyun (2022) and Ermolov (2022) magnify the reaction of stock prices by introducing flight-to-quality innovations that are negatively correlated with the level of economic activity. In other words, good news about the economy is typically accompanied by a decrease in the SDF's conditional volatility. These work together to raise stock prices, while real rates increase owing to a decrease in the precautionary saving motive.

The following mechanisms generate a negative covariance between stock returns and changes in real yields.

N-1. Transitory shocks to consumption

In the RA/EZ setting, transitory shocks to the level of consumption, rather than its growth rate, can generate negative comovement between stock returns and real yields. Chernov, Lochstoer, and Song (2021) and Jones and Pyun (2022) have such shocks in addition to growth-rate shocks. A positive transitory innovation raises current consumption and lowers expected future consumption growth, as agents anticipate a future decline in consumption. Stock prices increase and real rates decrease.

N-2. Positively serially correlated shocks to consumption growth rates (low EIS)

The first positive-covariance mechanism relies on a sufficiently high EIS, so that positive shocks to the growth rate of consumption raise stock prices. Laarits (2022) effectively

assumes the EIS is sufficiently small, an assumption at odds with typical parameterizations in finance. This generates negative comovement between stock returns and real yields.

N-3. Procyclical conditional volatility of the SDF

This is economically equivalent to procyclical flight to quality, but that terminology can be confusing. Innovations to the conditional volatility of the SDF positively covary with aggregate consumption. Thus news about expected future cash flows positively covaries with the desire for precautionary savings. With a sufficiently large positive covariance, the cash flow news outweighs the risk premium news. Then a more volatile SDF corresponds to lower real yields and higher stock prices. Jones and Pyun (2022) and Ermolov (2022) both include this mechanism. Kozak (2022) contains the mechanism in a production economy with a risky tree and a safe tree.

N-4. Slow-moving habit

In the RA/EZ setting, martingale innovations to aggregate consumption have no effect on real yields. Ermolov (2022) examines a setting with only martingale innovations to aggregate consumption. However, the representative agent has slow-moving habit preferences as in the literature starting with Campbell and Cochrane (1999). A positive martingale innovation to aggregate consumption raises stock prices and lowers real yields, as the representative agent attempts to save for her anticipated decline in surplus consumption.

N-5. Stochastic time rate of preference

A stochastic time rate of preference naturally generates negative comovement between stock returns and bond yields. An increase in patience lowers real yields, and thus discount rates for expected future cash flows. Albuquerque et al. (2016) study this mechanism, although not for the purpose of understanding variations over time in stock–bond comovement.

3.2 Macroeconomic News and Comovement Mechanisms

Properties of macroeconomic news help determine which of these mechanisms are more plausible than others. For example, Chernov, Lochstoer, and Song (2021) and Jones and

Pyun (2022) motivate their models by documenting variation over time in the autocorrelation properties of U.S. aggregate consumption. I take a different approach that focuses on the covariances between stock returns and bond yields induced by macroeconomic news.

Consider, for example, regressing excess stock market returns and changes in bond yields on contemporaneous news about current economic growth. The regressions are

$$xr_{m,t} = \beta_{m,0} + \beta_{m,1}F_t + \epsilon_{m,t}, \quad (4)$$

$$\Delta y_t^{(n)} = \beta_{y,n,0} + \beta_{y,n,1}F_t + \epsilon_{y,n,t}, \quad (5)$$

$$\Delta r_t^{(n)} = \beta_{r,n,0} + \beta_{r,n,1}F_t + \epsilon_{r,n,t}, \quad (6)$$

where F_t denotes the growth news and $r_t^{(n)}$ is the maturity- n ex-ante real rate.

The positive-covariance mechanisms [P-1] and [P-3] imply that news about current economic growth covaries positively with both stock returns and yields. In the context of regressions (4), (5), and (6), the coefficients on news are all positive. Mechanism [P-2] (pure flight to quality) is unconnected with macroeconomic news, although we can tell stories about changes in investment associated with changes in discount rates.

Four of the five negative-covariance mechanisms also rely on properties of macroeconomic shocks, although not all in the same way. Mechanisms [N-1], [N-3], and [N-4] imply that news about the level of contemporaneous macroeconomic activity covaries positively with stock returns and negatively with yields. For these mechanisms, the regression coefficient in (4) is positive and those in (5) and (6) are negative. Mechanism [N-2] implies that this macroeconomic news covaries negatively with stock returns and positively with yields. Finally, mechanism [N-5] is silent about the connection with contemporaneous economic activity. As with flight to quality, we can tell stories about changes in investment owing to changes in discount rates.

The regression framework allows for testing some, but not all, models of time-varying stock–bond comovement. Testable models have positive-covariance and negative-covariance mechanisms that are both driven by covariances with news about current economic growth. The most relevant examples are Chernov, Lochstoer, and Song (2021) and Jones and Pyun (2022). These models explain the sign change in comovement with a sign change of the coefficients in (5) and (6). Prior to the late 1990s, good news about current growth should

raise stock prices and yields. In more recent data, good news about current growth should raise stock prices and lower yields.

Define a dummy variable that equals one during the 1997 through 2016 period and zero otherwise. Estimate the split-sample regressions

$$xr_{m,t} = \beta_{m,0} + \beta_{m,0}^* D_t + \beta_{m,1} F_t + \beta_{m,1}^* D_t F_t + \epsilon_{m,t}, \quad (7)$$

$$\Delta y_t^{(n)} = \beta_{y,n,0} + \beta_{y,n,0}^* D_t + \beta_{y,n,1} F_t + \beta_{y,n,1}^* D_t F_t + \epsilon_{y,n,t}, \quad (8)$$

$$\Delta r_t^{(n)} = \beta_{r,n,0} + \beta_{r,n,0}^* D_t + \beta_{r,n,1} F_t + \beta_{r,n,1}^* D_t F_t + \epsilon_{r,n,t}. \quad (9)$$

Define the fitted values for (7) as

$$\widehat{xr}_{m,t} \equiv \widehat{\beta}_{m,0} + \widehat{\beta}_{m,0}^* D_t + \widehat{\beta}_{m,1} F_t + \widehat{\beta}_{m,1}^* D_t F_t,$$

and define corresponding fitted values for (8) and (9). Then regress the product of macro-news components of stock returns and changes in yields on the time dummy. For nominal yields, the regression is

$$\widehat{xr}_{m,t} \widehat{\Delta y_t^{(n)}} = \alpha_0 + \alpha_1 D_t + \omega_t \quad (10)$$

The regression estimates the covariance during the pre-1997 period with α_0 and estimates the covariance during the later period with $\alpha_0 + \alpha_1$.⁵

Evaluating a given model requires testing whether the regression coefficient on the dummy in (10) is zero and testing whether the signs of the coefficients in (7), (8), and (9) are consistent with the model. I use Generalized Methods of Moments (GMM), stacking the OLS moment conditions for the regressions and estimating the coefficients jointly.

This procedure does not apply to models with one or more mechanisms disconnected from macroeconomic news. For example, the model of Laarits (2022) uses exogenous changes in the conditional volatility of risk premia (flight to quality) to help explain changes in stock–bond comovement. These changes in volatility are unaccompanied by changes in the sensitivity of stock prices and bond yields to macroeconomic news. In the context of (7),

⁵This is strictly accurate only when either the fitted excess stock returns or the fitted changes in bond yields have mean zero. Although asymptotically the latter holds, it does not in finite samples. In practice I demean excess stock returns for both sample periods so that the sample mean product on the left of (10) equals the sample covariance.

(8), and (9), the change over time in stock–bond comovement is picked up in the covariance of the residuals, not in the fitted values.

That said, the specific mechanism [N-2] in Laarits (2022) can be tested using other measures of macroeconomic news. Reinterpreting the macro news factor F_t as news about expected future economic growth, the mechanism implies that the regression coefficients in (4), (5), and (6) are all positive. This example illustrates that we can add other measures of macroeconomic news to these regressions to both refine tests of the covariance mechanisms and investigate more broadly the macroeconomic determinants of stock–bond comovement. I next discuss measuring macroeconomic news.

3.3 Measuring Economic News

I measure news of current and expected future economic growth by Greenbook-to-Greenbook revisions in forecasts of six macroeconomic variables. Some notation is unavoidable. Time is measured by Greenbook dates, which are indexed by t . The unit of time is approximately six weeks. Greenbook forecast t is made in calendar quarter q_t , an index ranging from 1 (1978Q2) to 155 (2016Q4).

Construction of GDP growth forecast revisions illustrate the procedure. Greenbook forecast t is made in calendar quarter q_t . Denote the level of real GDP in calendar quarter i by GDP_i . Greenbook GDP forecasts at t have the form

$$\text{forecast}_t^{(j)} \equiv E_t^G 100 \left(\left(\frac{GDP_{q_t+j}}{GDP_{q_t+j-1}} \right)^4 - 1 \right), \quad (11)$$

where E^G indicates these are Greenbook predictions of annualized one-quarter growth rates. The nowcast corresponds to $j = 0$. Five of the six variables used here have this form. They are real one-quarter growth in gross domestic product (GDP), personal consumption expenditures (PCE), business fixed investment (BFI), and residential investment (RRES). The sixth variable is the unemployment rate, which is forecast in levels rather than growth rates. All these variables are included in Greenbook beginning in June 1978.

Revisions from meeting $t - 1$ to meeting t in forecasts of j -ahead values are

$$\text{revision}_t^{(j)} \equiv \begin{cases} \text{forecast}_t^{(j)} - \text{forecast}_{t-1}^{(j)}, & q_t = q_{t-1}; \\ \text{forecast}_t^{(j)} - \text{forecast}_{t-1}^{(j+1)}, & q_t = q_{t-1} + 1. \end{cases}$$

For example, if forecast t and forecast $t - 1$ are made in the same calendar quarter, the nowcast revision is the difference between the nowcast at t and the nowcast at $t - 1$. If t is in the next calendar quarter, the nowcast revision is the difference between the nowcast at t and the one-quarter-ahead forecast at $t - 1$. I use forecasts revisions for horizons $j = 0$ through $j = 4$. For about half of the observations, $j = 4$ forecast revisions require a five-quarter-ahead forecast as of $t - 1$. This forecast is missing for a few of the Greenbooks.

For the purposes of evaluating the mechanisms discussed in Section 3.1, we want to distinguish between news about current economic growth and news about expected future economic growth. (They can be correlated.) News about current activity affects nowcasts. Through the time-averaging of macroeconomic data, this news also affects forecasts of one-quarter-ahead growth. News about expected future growth can affect the nowcast if “future” is within a couple of months. Otherwise it affects primarily forecasts of future growth. Since one-quarter-ahead forecast innovations mix these two types of news, I drop this horizon from my empirical analysis. I infer news about current economic growth from nowcast revisions and news about expected future growth from revisions in forecasts from two to four quarters ahead.

A few principal components summarize common variation in these innovations. Since volatilities of the forecast innovations differ across variables and across forecast horizon, I first scale all innovations to unit variances. Figure 2 displays loadings of the first two components of scaled nowcast innovations, where the sign of the unemployment nowcast is changed to align with the other variables. Figure 3 displays loadings for the first two components of news about expected future growth. Table III reports some statistics about these components.

INSERT FIGURE 2 AROUND HERE

Figure 2 shows that the first component of nowcasts is news about overall economic growth. The loadings on the different nowcasts have the same sign and similar magnitudes. Table III reports that this component explains nearly half of the overall variance. The second component is sectoral, and distinguishes between booms (or recessions) led by housing, rather than by overall employment and consumption. This component explains a little less than a fifth of the overall nowcast variance.

Figure 3 suggests similar interpretations for the first two principal components of “fu-

ture” news. The first component, accounting for 42% of the overall variance, is news about expected future economic growth over the next year. Loadings have the same sign across variables and forecast horizons, although those for residential investment are noticeably smaller than those for other variables. The second component is sectoral, distinguishing between news about expected future residential investment and news about other measures of growth. It accounts for 17% of the overall variance.

INSERT FIGURE 3 AROUND HERE

Table III also reports correlation matrices of the first two principal components of both current and future news. The correlation between the first principal components of current and future news changes from negative in the sample through 1996 to positive in the post-1996 sample. This sign change is consistent with the evidence of Chernov, Lochstoer, and Song (2021) and Jones and Pyun (2022) that autocorrelations of consumption growth are much lower through the late 1990s than in subsequent years. It is also consistent with the analysis of Greenbook’s GDP growth rate forecasts in Duffee (2022).

INSERT TABLE III ABOUT HERE

By construction, principal components of a dataset are orthogonal over the full sample, but not necessarily over subsamples. The table reports that future-news component correlations are small ($\pm 11\%$) in the two subsamples. The current-news component correlation in the post-1996 sample is modestly larger (19%).

I estimate the regressions described in Section 3.2 using the vector of the first two principal components of nowcast and future news,

$$F_t = \left(PC1_{nowcast,t} \quad PC2_{nowcast,t} \quad PC1_{future,t} \quad PC2_{future,t} \right)'$$

Interpret the coefficients on F_t in these regressions as row vectors.

3.4 Regression Results

I estimate versions of (4), (5), and (6), along with the split-sample covariance regression (10). Tables IV and V contain parameter estimates of (4) and (5) for stock returns and nominal bond yields, splitting the sample into 1978 through 1996 (Table IV) and 1997 through 2016

(Table V). Estimates of (6) for one-year ex ante real yields differ little from those for the one-year nominal yield, thus parameter estimates for these regressions are in the Online Appendix. Table VI contains parameter estimates of split-sample covariances (10) for the nominal bond yields and, for completeness, one of the ex ante real yields.

These tables shine a light on three main empirical results that hold across the entire sample. First, good news about current economic growth (the first PC of nowcast innovations) corresponds to increases in bond yields, while good news about expected future economic growth (the first PC of news of future growth) does not. Duffee (2022) contains similar evidence using different measures of growth. The hypothesis that yields do not covary with this nowcast news is rejected at the 1% level in both periods. In the early period, news of expected future economic growth is statistically negatively related to changes in yields (p values around 1% to 5%), while in the early period the relation is closer to zero.

INSERT TABLE IV ABOUT HERE

Many real-centric mechanisms are incompatible with this evidence. Mechanisms [P-1] and [N-1] imply that setting longer-horizon news to zero, nowcast news should not affect yields. They also imply that setting nowcast news to zero, longer-horizon news should be positively related to yields. Duffee (2022) makes the same points in an examination of the first-order condition of a representative agent. Mechanisms [N-3] and [N-4] both imply that good news about current economic growth lower bond yields; the former because the demand for precautionary savings rises with this news, and the latter because agents want to save for an anticipated decline in surplus consumption. By contrast, mechanism [P-3] implies that good news about the future should raise yields, since good times correspond to lower demand for precautionary savings.

Second, good news about expected future economic growth corresponds to higher stock prices. This result is overwhelmingly statistically significant in both periods. Although not surprising, this pattern nonetheless runs counter to mechanism [N-2], which posits such a high desire to smooth consumption over time that stock prices fall in response to news of higher expected future cash flows.

Third, good news about residential investment growth relative to other components of economic growth corresponds to declining yields. This result is new to the literature. In the 1978 through 1996 period, the connection between residential investment and bond yields is

picked up by the second nowcast PC. In the 1997 through 2016 period, it is picked up by the second future-news PC. All these coefficients are statistically different from zero at least at the 5% level.

INSERT TABLE V ABOUT HERE

In 1997 through 2016, this good (relative) news of residential investment growth corresponds to a decline in stock prices, and therefore contributes to a positive covariance between stock prices and changes in yields. Since none of the mechanisms described in 3.1 are based on sector-level news, they cannot explain the macroeconomic underpinnings of this covariance.

Recall from Table III that the first PCs of nowcast and future news are negatively (positively) correlated with each other in the early (later) period. These signs, combined with the first and second main results above, induce positive (negative) covariances between stock returns and changes in yields during the early (later) period. Table 6 reports covariances between fitted values of stock returns and changes in yields. Ignore the “No Crash” columns for now. For the one-year nominal yield, the test of equality across the two periods is rejected at the 5% when using more macroeconomic information than just the first nowcast PC. Rejections are at the 10% level for the ten-year nominal yield.⁶ This macro-induced sign-switching is unexplained by the remaining two mechanisms, [P-2] and [N-5], because they are silent about the macroeconomy.

In sum, none of the mechanisms described in Section 3.1 are consistent with the evidence in Tables IV, V, and VI. Macroeconomic news appears to drive changes over time in stock–bond covariances, but not in any way consistent with existing theories. Another troubling observation is that during 1978 through 1996, stock returns are only weakly related to macroeconomic news as summarized by the four PCs. The stock-return R^2 s in Table IV are 9% (first PCs) and 14% (all PCs). By contrast, the corresponding R^2 s in Table V, for 1997 through 2016, are 38% and 42%.

This weak explanatory power accounts for the mismatch between the sample covariances in Table I and their counterparts in Table VI. The covariances for 1978 through 1996 in Table I are economically and statistically strongly negative. Since the volatility of fitted

⁶Evidence for a sign change in the covariance with the one-year ex ante real yield (GDP deflator) is considerably weaker.

stock returns is low, they cannot covary substantially with changes in bond yields. Therefore the corresponding fitted covariances reported in the “Full Sample” column of Table VI are substantially closer to zero, and in most cases the hypothesis that the covariance equals zero cannot be rejected.

INSERT TABLE VI ABOUT HERE

These results lead to two natural questions. First, what accounts for the residual components of stock returns and changes in yields? If they are not responding to macroeconomic news, as summarized in the PCs, to what are they responding? Second, why do covariances between these residual components switch sign over time, just as the covariances between macro-projected covariances switch sign?

Answers to these questions are suggested by the mechanisms in Section 3.1. Mechanism [P-2], stochastic flight to quality, drives stock prices and bond yields in the same direction without necessarily appearing in macroeconomic news. Similarly, mechanism [N-5], stochastic time rate of preference, drives stock prices and bond yields in opposite directions. We could simply hypothesize that, for whatever reason, innovations to the time rate of preference played an extremely large role in the stock market during 1978 through 1996.

Perhaps the largest “flight to quality” event is in the earlier sample; the October 1987 stock market crash. Indeed, October 1987 noticeably contributes to the weak results in the early period. The stock market declined 33% between the Greenbooks of mid-September 1987 and late October 1987. It may have been triggered by a flight to quality, but inadequate market mechanisms largely account for its severity; see Greenwald and Stein (1988) for an overview. The Online Appendix contains a version of Table IV that excludes the October 1987 observation from the 1978 through 1996 sample. The R^2 of regressions of stock returns on the macroeconomic news rise to 11% (first PCs) and 16% (all PCs). Excluding October 1987 increases both the economic and statistical strength of the positive relation between the second nowcast PC and stock returns.

The columns in Table VI labeled “No Crash” use fitted stock returns from these regressions that exclude October 1987. The point estimates of the covariances are well below those reported in the “Full Sample” column. Covariance estimates based on all four PCs are statistically different from zero at the five (nominal yields) and ten (real yield) level. Tests of equality over time of the fitted covariances, in the final column of Table VI, reject at the

5% level the hypotheses that the covariances are stable.

As mentioned above, residential investment news contributes to a positive covariance between stock prices and changes in yields during 1997 through 2016. When the 1987 stock market crash is stripped from the data, such news contributes to a negative covariance during 1978 through 1996. This evidence suggests time variation in the stock–bond covariance may be driven by changing sector dynamics. An extremely large literature explores the role of housing in asset pricing and the business cycle. See, for example, Davis and Van Nieuwerburgh (2015) for a survey. A macroeconomic literature beginning with Davis and Heathcote (2005) builds multisector models to understand the joint dynamics of consumption, business investment, and housing investment. Extending these models to study asset prices may prove fruitful.

4. Concluding Comments

Sign changes in the comovement between aggregate stock returns and bond yields were first recognized twenty years ago. Standard asset-pricing theories connect these sign changes to variations in macroeconomic dynamics. These theories place either inflation dynamics, or, more recently, real-rate dynamics, on the center stage.

The empirical analysis here concludes that the sign changes are connected to macroeconomic news. However, neither the theories that emphasize inflation nor those that emphasize real rates are consistent with the evidence. Inflation-based theories require much more news about inflation than we observe. The real-rate theories do not match the signs of important connections among macroeconomic news, stock returns, and changes in yields.

Some of this evidence suggests that news about residential investment may play a particularly important role in stock–bond comovement. Exploration of this idea awaits further research.

Data Availability

The data used in this study are available both on the author’s website and on request from the author.

Appendix: Calculation of the Ex-Ante One-Year Real Yield

The one-year ex-ante real yield is the nominal one-year yield less a measure of expected inflation. I use Greenbook forecasts of inflation. Inflation is measured with either the GDP deflator, the CPI, or Core CPI. For the purposes of constructing a real yield, the correct measure of expected inflation is from the date of the Greenbook forecast to the same date in the next year. However, Greenbook forecasts of expected inflation are forecasts of the percentage change in average price level in quarter $j - 1$ to the average price level in quarter j . Assume that Greenbook forecasts are for price levels from one quarter's midpoint to the next quarter's midpoint. Also assume that expected inflation over each midpoint-to-midpoint is constant. In other words, for Greenbook forecast i , expected inflation for any arbitrary day in the future is a step function in time, where steps occur at quarter midpoints.

To illustrate the data construction, consider measuring inflation with the GDP deflator. Using notation similar to Equation (11) in the main text, denote the log of forecasted inflation at Greenbook forecast i for horizon j as

$$\pi_i^{(j)} \equiv 100 \log E_i^G \left(\left(\frac{DEFLATOR_{q_i+j}}{DEFLATOR_{q_j+j-1}} \right)^4 \right).$$

For Greenbook forecast i , define the fraction of the quarter remaining as f_i . For example, a Greenbook forecast made in the first week of a quarter has a fraction f_i close to one, while a Greenbook forecast made in the last week of a quarter has a fraction f_i close to zero. Then expected one-year inflation at i is measured by

$$EXP_INFL_i = \begin{cases} \frac{1}{4}((f_i - 0.5)\pi_i^{(0)} + \sum_{j=1}^3 \pi_i^{(j)} + (1.5 - f_i)\pi_i^{(4)}), & f_i > 0.5; \\ \frac{1}{4}((f_i + 0.5)\pi_i^{(1)} + \sum_{j=2}^4 \pi_i^{(j)} + (0.5 - f_i)\pi_i^{(5)}), & f_i \leq 0.5. \end{cases}$$

There are a few observations for which $f_i < 0.5$ and the five-quarter-ahead forecast is missing. In these cases the five-quarter-ahead expectation is proxied by the four-quarter-ahead expectation.

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Table I. Sample covariances of yields and expected inflation with stock market returns

The table reports covariances between six-week excess returns to the aggregate stock market and contemporaneous changes in bond yields and forecasts of one-year-ahead inflation. The six-week periods are aligned with dates of Greenbook forecasts. The inflation forecasts are from Greenbook. Stock returns are measured in percent. Yields and inflation forecasts are measured in percent/year. The sample period ranges from the first date in the table to the end of 2016, and is split at the end of 1996. Standard errors are in parentheses. Asterisks represent statistical significance versus zero at two-sided ten, five, and one percent levels. The final column reports the significance level of a test that the covariance is constant across the two periods. Test statistics are adjusted for generalized heteroskedasticity. The sample beginning in 1997 has 160 observations for all variables.

Variable	First obs	Total obs	Covariance through 1996	Covariance 1997 – 2016	<i>p</i> value of equality test
Nominal 1 Yr Yield	7/12/1978	314	-1.268*** (0.388)	0.469** (0.192)	0.000
Nominal 10 Yr Yield	7/12/1978	314	-1.113*** (0.310)	0.351* (0.180)	0.000
Expected 1-Yr Infl (GDP Deflator)	7/12/1978	314	-0.107 (0.109)	0.281** (0.120)	0.017
Expected 1 Yr Infl (CPI)	11/14/1979	300	-0.136 (0.124)	0.425** (0.173)	0.008
Expected 1 Yr Infl (Core CPI)	3/26/1986	247	-0.080 (0.166)	0.160 (0.110)	0.229
Ex Ante Real 1 Yr Yield (GDP Deflator)	7/12/1978	314	-1.162*** (0.400)	0.188 (0.156)	0.002
Ex Ante Real 1 Yr Yield (CPI)	11/14/1979	300	-1.046*** (0.382)	0.043 (0.184)	0.010
Ex Ante Real 1 Yr Yield (Core CPI)	3/26/1986	247	-0.257 (0.208)	0.309** (0.154)	0.029

Table II. Standard deviations of news about expected inflation and yield innovations

Standard deviations of quarterly shocks to both expected average inflation over the next five years and the five-year Treasury yield are reported for various models. The units are basis points of annualized rates. The column labeled “Variance Ratio” reports the squared ratio of the two standard deviations. In parentheses are asymptotic standard errors for variance ratios calculated as in Duffee (2018). They are computed with GMM. In David and Veronesi (2013) the regime is unobserved, hence agents have conditional probabilities that the current regime is regime i . The regime-specific values reported in the table are conditional on agents assigning at least a 0.5 probability that the current regime is the listed regime.

Source	Period and/or regime	Inflation news	Yield innovations	Variance ratio
Duffee (2018)	1968Q4–2013Q4	22	61	0.13 (0.037)
	1979Q3–2001Q1	24	74	0.10 (0.034)
	2001Q2–2011Q4	8	45	0.03 (0.005)
Song (2017)	1963–2014			
	Countercyclic/Active Fed	79	71	1.22
	Countercyclic/Passive Fed	104	99	1.12
	Procylic/Active Fed	44	54	0.65
Campbell, Pflueger, and Viceira (2020)	1979Q3–2001Q1	59	66	0.81
	2001Q2–2011Q4	37	40	0.85
David and Veronesi (2013)	1958–2010			
	Unconditional	28	47	0.35
	Regime 1	18	29	0.38
	Regime 2	39	66	0.35
	Regime 3	26	43	0.36
	Regime 4	58	104	0.31
	Regime 5	14	22	0.40
Regime 6	27	48	0.32	

Table III. Principal components of Greenbook forecast innovations

News about current economic growth is measured by Greenbook-to-Greenbook innovations in nowcasts of output growth (GDP), consumption growth (PCE), business fixed investment (BFI) growth, residential investment growth (RRES), and the unemployment rate. News about expected future economic growth is measured by Greenbook-to-Greenbook innovations in forecasts from two to four quarters ahead of growth in GDP, PCE, BFI, and RRES. All variables are standardized to a unit variance. The table reports information about the first two principal components of innovations in news about the present (nowcasts) and news about the future. “Explained” is the fraction of total variance explained by the given principal component. Construction of the principal components uses the entire sample from 1978 through 2016. Subsample standard deviations and correlations are reported.

Panel A. Summary statistics						
Type of news	First obs	Number of obs	First component explained		Second component explained	
			std dev		std dev	
Present	7/12/1978	314	0.47	1.53	0.18	0.96
Future	8/9/1978	304	0.42	2.25	0.17	1.42

Panel B. Standard deviations (diagonals) and correlations								
	1978 through 1996 (144 Obs)				1997 through 2016 (160 Obs)			
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
	present	present	future	future	present	present	future	future
1st Present	1.87				1.16			
2nd Present	-0.08	1.09			0.19	0.82		
1st Future	-0.22	0.13	2.16		0.34	0.15	2.32	
2nd Future	-0.45	-0.07	0.11	1.54	-0.34	-0.08	-0.11	1.29

Table IV. Regressions of stock market returns and yield changes on macroeconomic news, 1978–1996

The table reports results of regressing Greenbook-to-Greenbook excess stock market returns and changes in bond yields on the first two principal components (PCs) of innovations in Greenbook nowcasts of economic growth and the first two PCs of innovations in Greenbook forecasts of expected future economic growth. Table 3 describes the PCs in more detail. The sample period is July 1978 through 1996. Stock returns are measured in percent. Yields are measured in percent/year. Standard errors are in parentheses. Asterisks represent statistical significance versus zero at two-sided ten, five, and one percent levels. Test statistics are adjusted for generalized heteroskedasticity. Regressions using only nowcast PCs have 154 observations. Regressions also using PCs of longer horizon forecasts have 144 observations.

Dependent variable	News from nowcasts		News from longer horizon forecasts		R^2
	1st PC	2nd PC	1st PC	2nd PC	
Stock Return	−0.139 (0.240)				0.002
	−0.041 (0.240)		0.748*** (0.257)		0.086
	−0.300 (0.210)	0.587 (0.358)	0.719*** (0.251)	−0.762 (0.477)	0.141
Δ Nominal 1 Year Yield	0.218*** (0.057)				0.224
	0.215*** (0.055)		−0.083** (0.035)		0.302
	0.188*** (0.060)	−0.148*** (0.058)	−0.074** (0.036)	−0.058 (0.049)	0.341
Δ Nominal 10 Year Yield	0.124*** (0.024)				0.189
	0.119*** (0.024)		−0.055*** (0.017)		0.272
	0.105*** (0.029)	−0.087** (0.037)	−0.050*** (0.018)	−0.030 (0.040)	0.306

Table V. Regressions of stock market returns and yield changes on macroeconomic news, 1997–2016

The table reports results of regressing Greenbook-to-Greenbook excess stock market returns and changes in bond yields on the first two principal components (PCs) of innovations in Greenbook nowcasts of economic growth and the first two PCs of innovations in Greenbook forecasts of expected future economic growth. Table 3 describes the PCs in more detail. The sample period is July 1978 through 1996. Stock returns are measured in percent. Yields are measured in percent/year. Standard errors are in parentheses. Asterisks represent statistical significance versus zero at two-sided ten, five, and one percent levels. Test statistics are adjusted for generalized heteroskedasticity. Each regression has 160 observations.

Dependent variable	News from nowcasts		News from longer horizon forecasts		R^2
	1st PC	2nd PC	1st PC	2nd PC	
Stock Return	1.573*** (0.496)				0.100
	0.609* (0.356)		1.395*** (0.223)		0.379
	0.397 (0.391)	-0.723* (0.391)	1.424*** (0.224)	-0.773** (0.307)	0.415
Δ Nominal 1 Year Yield	0.104*** (0.022)				0.203
	0.100*** (0.023)		0.006 (0.012)		0.205
	0.087*** (0.022)	-0.028 (0.021)	-0.007 (0.011)	-0.042** (0.021)	0.250
Δ Nominal 10 Year Yield	0.082*** (0.028)				0.088
	0.097*** (0.026)		-0.023* (0.012)		0.112
	0.069*** (0.021)	-0.002 (0.029)	-0.022* (0.012)	-0.076*** (0.018)	0.195

Table VI. Sample covariances between macro-news projections of stock market returns and changes in yields

Excess stock market returns and changes in bond yields are regressed on the first two principal components (PCs) of Greenbook-to-Greenbook nowcast revisions of economic growth and the first two PCs of revisions in longer-run forecasts. Regressions use either just first PCs or all four PCs. This table reports sample covariances between the fitted excess stock returns (%) and fitted changes in bond yields (%/year). Regressions and covariances are estimated separately for 1978 through 1996 and 1997 through 2016. The “No Crash” column drops the 10/28/1987 Greenbook observation. The ex ante real yield is the one-year nominal yield less expected GDP deflator inflation. Standard errors are in parentheses. Asterisks represent statistical significance versus zero at two-sided ten, five, and one percent levels. The final two columns report p -values of tests of equality of the covariances across the early and late samples. Test statistics are adjusted for generalized heteroskedasticity.

Bond	Regressors (PCs)	1978–1996		1997–2016	Test of equality	
		full sample	no crash		full sample	no crash
1 Yr Nominal	Nowcast 1st	−0.103 (0.191)	−0.191 (0.179)	0.219** (0.109)	0.143	0.050
	Both 1st	−0.468 (0.303)	−0.553* (0.295)	0.256* (0.142)	0.030	0.013
	All	−0.501 (0.343)	−0.651** (0.317)	0.317** (0.159)	0.030	0.006
10 Yr Nominal	Nowcast 1st	−0.058 (0.107)	−0.108 (0.098)	0.173** (0.081)	0.085	0.028
	Both 1st	−0.293** (0.149)	−0.339** (0.143)	0.022 (0.115)	0.095	0.049
	All	−0.317* (0.176)	−0.401** (0.158)	0.109 (0.135)	0.055	0.014
1 Yr Ex Ante Real	Nowcast 1st	−0.101 (0.183)	−0.188 (0.174)	0.168** (0.075)	0.174	0.060
	Both 1st	−0.291 (0.268)	−0.384 (0.256)	0.087 (0.128)	0.203	0.100
	All	−0.357 (0.316)	−0.511* (0.285)	0.123 (0.129)	0.160	0.043

Correlations Between Stock Returns and Changes in Treasury Yields

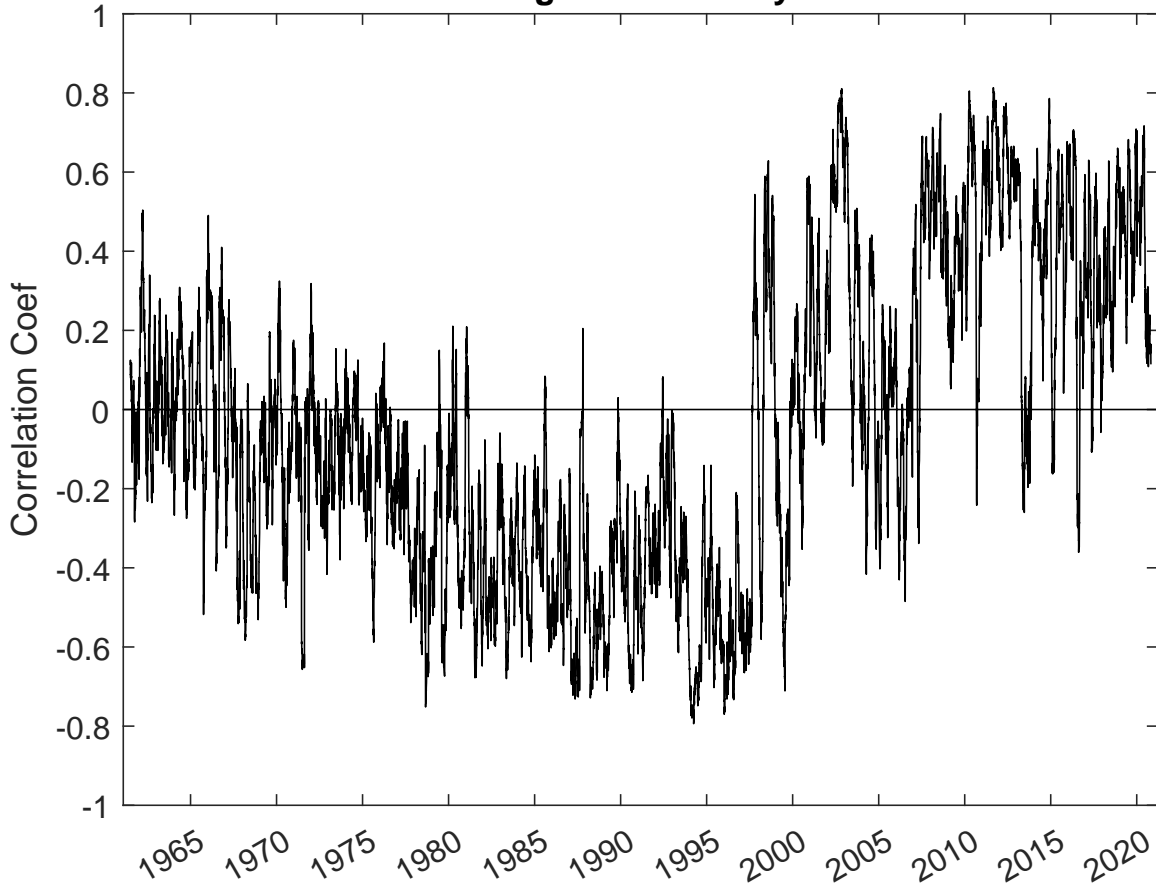


Figure 1. The figure displays rolling sample correlations between the daily value-weighted return to the U.S. stock market and daily changes in the yield on a ten-year zero-coupon nominal Treasury bond. The samples are overlapping periods of 44 trading days.

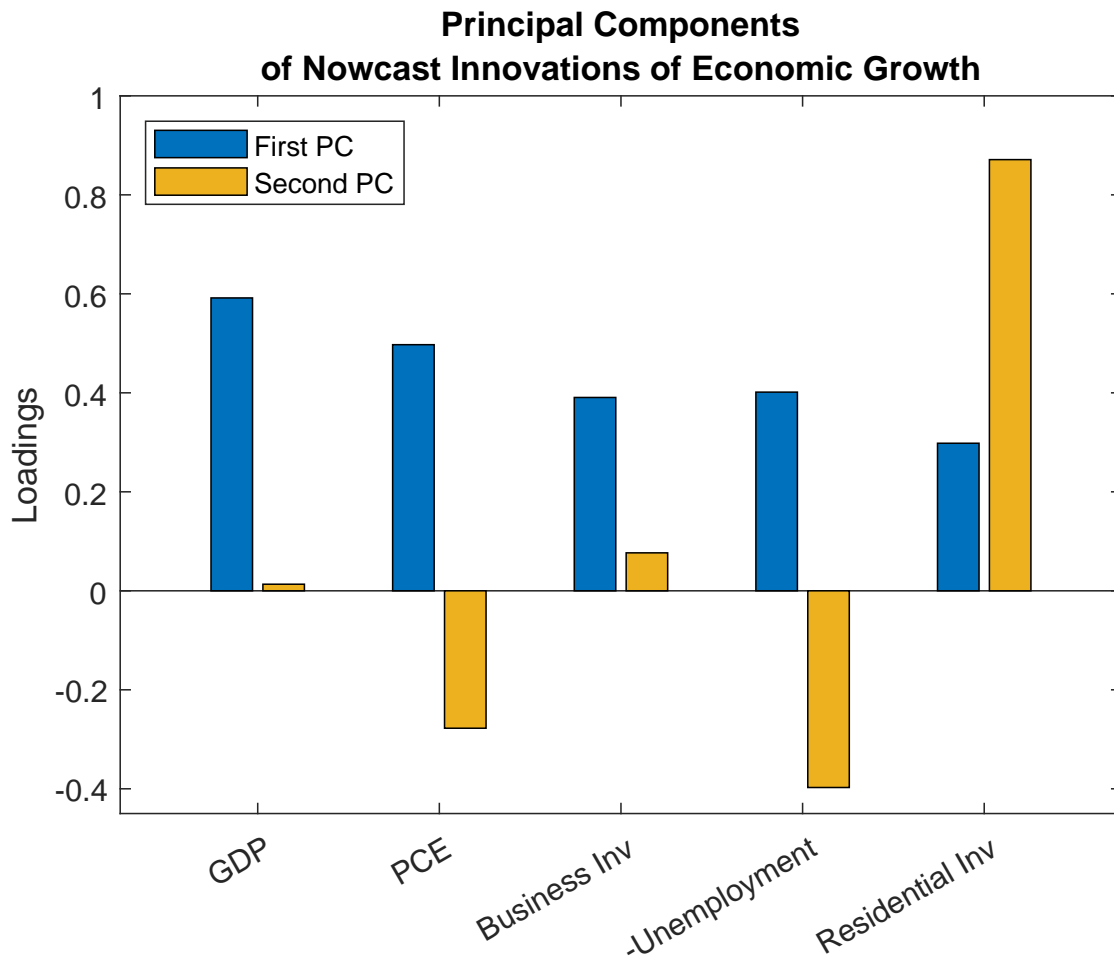


Figure 2. Innovations are Greenbook-to-Greenbook revisions in nowcasts of real growth in gross domestic product, personal consumption expenditures, business fixed investment, and residential investment, as well as the unemployment rate. The data range from July 1978 through December 2016. The figure displays loadings of the first two principal components of the correlation matrix of nowcast innovations.

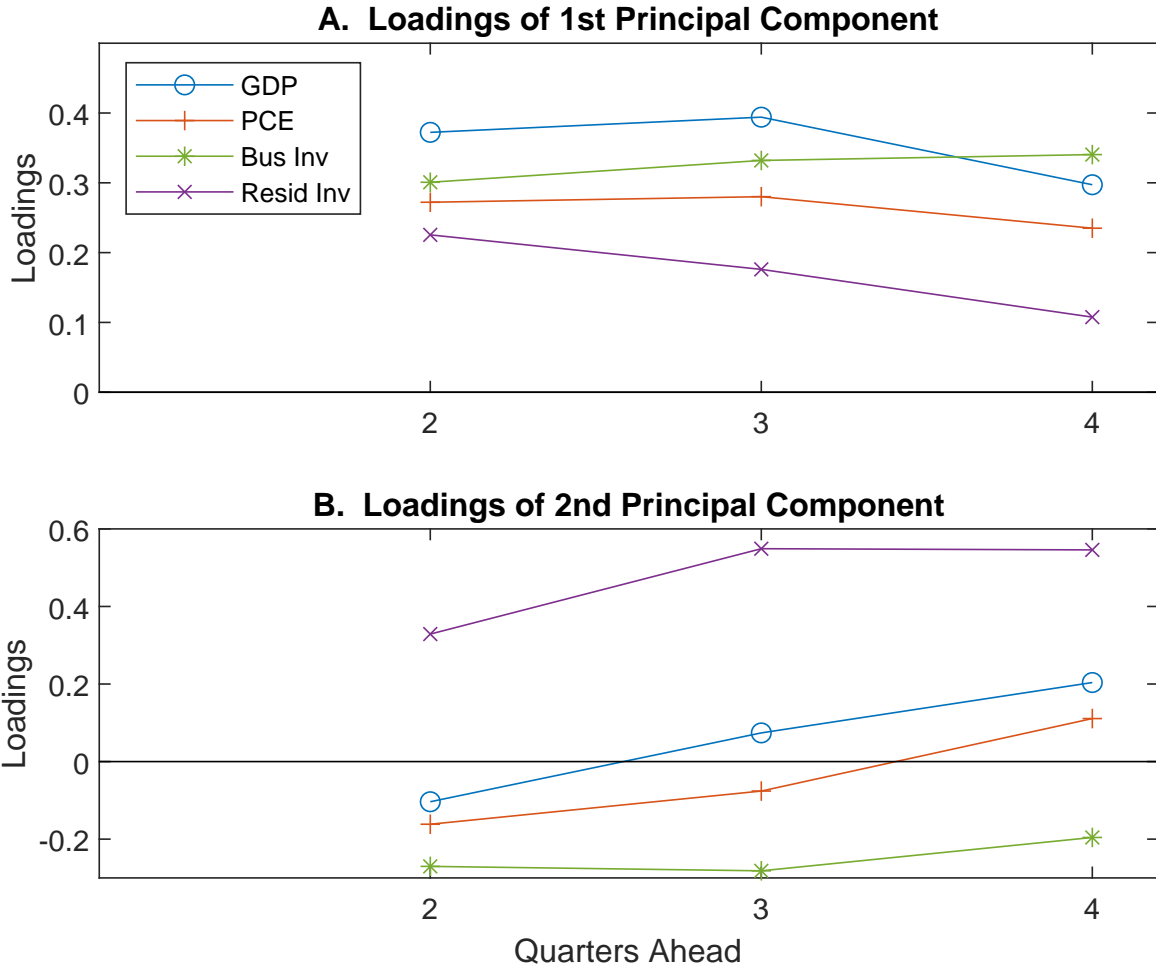


Figure 3. Principal Components of Innovations in Forecasts of Future Economic Growth. Innovations are Greenbook-to-Greenbook revisions in forecasts of real growth in gross domestic product, personal consumption expenditures, business fixed investment, and residential investment. Each of these four variables has forecast innovations for two, three, and four quarters ahead. The data range from August 1978 through December 2016. Panels A and B display loadings of the first and second principal components, respectively, of the correlation matrix of the innovations.