Monetary Policy and Corporate Bond Returns*

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Abstract

We investigate the impact of monetary policy shocks, measured as the surprise change in the Fed Funds rate (FFR), on the excess returns of U.S. corporate bonds. We obtain a significant negative response of excess bond returns to shocks in FFR, and this effect is especially strong in the period before the 2007-09 financial crisis and for bonds with longer maturity and lower rating. By using a VAR-based decomposition for excess bond returns, our results show that the largest part of the contemporaneous negative response of corporate bond returns to monetary policy tightening can be attributed to higher expected excess bond returns (higher bond risk premia). Therefore, the discount rate channel represents an important mechanism through which monetary policy affect corporate bonds. Our results also show that the importance of this effect has declined after the financial crisis.

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1 Introduction

While the impact of monetary policy actions on the stock and Treasury bond markets has been widely studied, previous research in the area of corporate bonds is considerably less dense.[1] Given the significance of debt financing for firms and the size of the market for corporate debt, it is important to understand how monetary policy in general affects the pricing of corporate bonds.[2] Especially more so, since the Federal Reserve (Fed) is aiming at normalising monetary conditions and exit a prolonged period of ultra-loose monetary policy.

In this paper, we conduct an empirical analysis of the effects of unanticipated monetary policy actions on the contemporaneous returns of corporate bonds. The main contribution of this paper lies on identifying the channels through which monetary policy shocks affect corporate bond returns. In order to get an insight into the observed reaction, we utilise a return decomposition framework that relates current realized unexpected excess bond returns to revisions in expectations (”news”) about the future excess bond return (discount rate news or bond premium news), inflation rate (inflation news), and the real interest rate (real interest rate news). The decomposition of returns to news about macro-fundamentals and expected risk premia was pioneered in bond market studies by Campbell and Ammer (1993) by using Treasury bond returns. The methodology is flexible enough to allow for the incorporation of monetary policy shifts in the analysis. This enables us to decompose the response of corporate bond returns to shocks in the Federal funds rate (FFR) into the effects on each of the three news components. Specifically, according to this present-value model, an increase in FFR has a negative effect on current corporate bond returns, because it leads to an increase in future bond risk premia, inflation rates, real interest rates, or a combination of these three effects.

Although monetary policy proxies have been included in studies of corporate bond return predictability and empirical investigation of the determinants of the corporate-government bond yield differential, we are the first to examine the contemporaneous response of corporate bond

[1]Stock market studies typically find that the contemporaneous response of returns to a monetary tightening shock is negative (Thorbecke, 1997; Bernanke and Kuttner, 2005; Kontonikas and Kostakis, 2013; Maio, 2014). Analyses of Treasuries show that bond yields respond significantly to shifts in the policy rate, especially at the short-end of the yield curve (Kuttner, 2001; Cochrane and Piazzesi, 2002); Gurkaynak *et al.*, 2005). The literature on corporate bonds is overall less voluminous, and even thinner with regards to the impact of monetary policy actions. Previous studies tend to focus on two issues—the predictability of corporate bond returns (Fama and French, 1989; Jensen *et al.*, 1996; Baker *et al.*, 2003; Greenwood and Hanson, 2013) and the factors that determine the credit spread (Collin-Dufresne *et al.*, 2001; Elton *et al.*, 2001; Driessen, 2005; Avramov *et al.*, 2007; Gertler and Karadi, 2015). With the exception of a small number of studies that we discuss later in this section, the role of monetary policy actions in general, and policy rate shocks in particular, has been under-explored in the case of corporate bonds.

[2]The U.S. market for corporate debt is the largest in the world. The value of outstanding U.S. corporate debt at the end of 2014 was about 7.8 trillion dollars according to data from the Securities Industry and Financial Markets Association.

returns to monetary policy shocks and its decomposition into the components of excess bond returns. Our analysis focuses on monetary policy shocks, which are identified by using data on FFR futures contracts (see Kuttner, 2001), since anticipated policy actions should be already priced in the bond market.[3] We use monthly return data on both long-term and intermediate corporate bond indices, each of them associated with four different credit ratings (AAA, AA, A, and BAA).

By conducting simple regressions over the period 1989.02–2013.12, we obtain a negative and significant response of excess returns on corporate bonds to shocks in FFR prior to the financial crisis. This conclusion remains valid across both medium and longer maturities as well as across different credit ratings. The effect of monetary policy on bond returns is weaker and less significant in the full sample, indicating potential implications of the financial crisis. Similar results are obtained when we examine monetary policy effects on unexpected excess bond returns, obtained from a first-order VAR.

With respect to the bond return variance decomposition, our results demonstrate that the key determinant of the variability in current unexpected excess returns on long-term and intermediate term corporate bonds is the variance of the revisions in expectations about future bond risk premia. The other two components of excess bond returns play only a limited role. These results holds across all four credit ratings considered, and are also robust to the 2007–2009 financial crisis. More importantly, we provide evidence that discount rate news constitute the major determinant of variation in current excess bond returns, that is, the largest part of the contemporaneous negative response of corporate bond returns to monetary policy tightening can be attributed to higher expected excess bond returns (higher bond risk premia). The effects of monetary policy shocks on the expectations of future inflation and real interest rates are relatively small when it comes to explaining the negative effect of interest rate rises on current bond returns. This is especially notable for the pre-crisis period that excludes the recent financial turmoil (2007–2009), which was associated with a significant rise in volatility in bond markets. Therefore, the discount rate channel represents an important mechanism through which monetary policy affect corporate bonds.

Methodologically, this paper is closely linked to the stock market study of Bernanke and Kuttner (2005), who use a similar monetary policy proxy and also decompose the total stock

[3]For example, in anticipation of the increase in the FFR in December 2015, the Economist (December 12, 2015) points out: "If the Federal Reserve does increase interest rates on December 16th, very few investors will be taken by surprise. It will be the most discussed, most anticipated rate rise in history". The use of FFR shocks as a proxy for U.S. monetary policy shifts is well-established in the related literature (e.g., Bernanke and Mihov, 1998; Romer and Romer, 2004; Bernanke and Kuttner, 2005).

return reaction into the components of realized stock returns. Nevertheless, our paper extends their analysis to corporate bonds and provides additional evidence supporting their insight about an increase in risk premia in response to tight money shocks. Thus, the relation between monetary shocks and future risk premia is not confined to the stock market and also holds in the corporate bond market.[4] This work is also related to a recent study by Gertler and Karadi (2015) who use FFR futures contracts to calculate monetary policy shocks and find that the increase in private credit costs, in response to unexpected tightening, primarily reflects higher risk premia.[5] The focus on this paper, however, is different since we model the impact of monetary policy shocks on corporate bond index portfolio returns.

This paper provides additional evidence supporting the significant role that news about expected returns or discount rates play in explaining asset price fluctuations. The primacy of discount rate news is typical in previous return decomposition studies that examine stocks at the market level (Campbell, 1991; Campbell and Ammer, 1993; Bernanke and Kuttner, 2005), but not in studies that analyse Treasury bonds.[6] The latter tend to identify inflation news as the key driver of excess bond returns (Campbell and Ammer, 1993; Engsted and Tanggaard, 2007; Kontonikas *et al.*, 2015). Hence, the type of issuer, government vs. corporation, matters. In other words, credit risk seems to play an important role on the reaction of investors to fundamental news. In this particular dimension (i.e., the relative exposure of contemporaneous unexpected excess returns to discount rate and inflation (cash-flows) news), corporate bonds seem to behave more like stocks, rather than Treasuries. Thus, our results also contribute towards a better understanding of the similarities and differences that corporate bonds exhibit in comparison to other major asset classes. Apart from informing financial managers about the exposure of corporate bonds to monetary policy and interest rate risk, this line of research also has important implications for monetary policy makers. Financial markets are relevant in several channels of the transmission mechanism of monetary policy (Boivin *et al.*, 2010) and the market for corporate debt, in particular, plays a crucial role in the credit channel (Bernanke

[4]The study of Jensen *et al.* (1996) is one of the few papers that examine the relationship between monetary policy and expected corporate bond returns using a predictability framework. They characterise monetary policy using a dummy variable, based on previous changes in the Fed's discount rate, which captures monetary regimes (expansive vs. restrictive cycles) rather than policy shocks. After controlling for the effect of the business conditions variables of Fama and French (1989), they find no evidence for a direct monetary effect on expected returns and only weak evidence for an indirect effect.

[5]The "excess bond premium" that Gertler and Karadi (2015) consider is based upon previous work by Gilchrist and Zakrajsek (2012). Firm-level data is used to calculate the credit spread and then decompose it in two components: a component that captures systematic movements in firm-specific default risk, and a residual component, the excess bond premium, that reflects exposure to corporate credit risk in excess of the compensation for expected defaults.

[6]Moreover, if we move from the market level to individual stocks (or portfolios of stocks) level, cash-flows news become the main component of unexpected excess stock returns (Vuolteenaho, 2002; Maio, 2014).

and Gertler, 1995).

We now briefly discuss how the risk premium effects of monetary policy actions may be interpreted and rationalised. Bernanke and Kuttner (2005) argue that tight money can have a positive effect on expected returns by increasing the riskiness of firms and/or by depressing the risk appetite of investors (increasing risk aversion). In other words, the "quantity" and/or "price" component of the risk premium, respectively, may be affected. Specifically, firm riskiness can increase, in response to an unexpected increase in the FFR, through a rise in the interest burden and the weakening of balance sheets.[7] The resulting increase in the credit spread should lead to higher future expected bond returns (Fama and French, 1989). The mechanism relating monetary policy to the risk appetite of investors is, however, more controversial. Borio and Zhu (2012) argue that monetary policy can influence the financial intermediaries perception of, or attitude towards, risk.[8] There are also some empirical studies that provide empirical support for this conjecture using financial intermediaries' balance sheet data (Gambacorta, 2009; Adrian and Shin, 2010; Jimenez *et al.*, 2014) but the issue is not fully settled.

The paper proceeds as follows. Section 2 describe the data and variables employed in the empirical analysis. In Section 3, we measure the contemporaneous effect of monetary policy shocks in corporate bond returns. Section 4 shows the results for a VAR-based decomposition of the total bond return response to shocks in FFR into the effects on the three components of excess bond returns. Section 5 provides a sensitivity analysis, while Section 6 concludes.

2 Data and variables

2.1 Corporate bond returns and state variables

U.S. corporate bond indices constructed by Barclays are used to calculate corporate bond returns. The Barclays indices, formerly maintained by Lehman Brothers, are often used in academic studies to represent the US corporate bond market and standard benchmarks for managing bond portfolios in the asset management industry (Sangvinatsos, 2005; Abhyankar and Gonzalez, 2009; Lin *et al.*, 2015). They capture the total holding period return, by reflecting capital gains

[7]According to the credit channel theory of monetary policy transmission, the effects of monetary policy shifts on private borrowing costs are amplified through endogenous changes in the external finance premium. The external premium reflects the cost differential between funds raised externally (by issuing equity or debt) and funds generated internally, and is inversely related to the creditworthiness of the borrower. In line with this theory's prediction, apart from Gertler and Karadi (2015), a number of other studies demonstrate empirically that the bond credit spread increases when monetary policy tightens (e.g. Avramov *et al.*, 2007; Chun *et al.*, 2014; Cenesizoglu and Essid, 2012).

[8]See Brunnermeier and Sannikov (2011), Diamond and Rajan (2012) and Drechsler *et al.* (2014) for examples of models with the risk-taking channel of monetary policy.

and coupon payments, and incorporate USD-denominated, fixed-rate, taxable bonds that are publicly issued by US and non-US industrial, utility, and financial firms (minimum issue size is USD 250 million). The indices are value-weighted and rebalanced at the end of each month. All component bonds are marked by Barclays market-makers at the middle and end of each month.[9] Bonds with fixed-to-floating coupon rate are only included during their fixed-rate term, while inflation-linked bonds, bonds with equity type features (e.g., warrants and convertibles), and bonds with less than one year to maturity are excluded. Finally, in addition to bullet bonds, the indices include bonds with embedded put and call options and sinking fund provisions. The inclusion of bonds with embedded options in the Barclays indices is a non-trivial matter when it comes to analysing the impact of monetary policy actions on corporate bond returns. Due to changes in the value of the option, the price of such bonds is less sensitive to interest rate changes, as opposed to comparable option-free bonds. The incorporation of callable and putable bonds in the analysis should generally attenuate the reaction of corporate bond returns to the interest rate shocks that the Fed initiates. Hence, it is likely that the monetary policy elasticities that we capture in the next section would have been stronger in the absence of bonds with embedded options.[10]

The eight Barclays indices that we use represent portfolios of investment-grade corporate bonds with different maturity and credit rating characteristics. Specifically, we consider indices of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. Bond ratings are assigned using the middle rating of Moodys, SP and Fitch, or the lowest rating if only two ratings are available. Bonds included in the intermediate maturity indices have maturity of one to less than ten years, while long-term indices are based on bonds with maturity of ten years and more. Monthly data on the Barclays indices (end of month observations) is collected over the period 1985.01–2013.12 from Datastream. The bond data sample commences during the early years of the Great Moderation period, while its latter part contains the recent global financial crisis and its aftermath.[11] The empirical analysis in Section

[9]The use of model/matrix-based pricing is limited to a minority of the bonds that enter the Barclays indices. Specifically, up to 3,000 actively traded benchmark corporate bonds are priced by Barclays Capital traders on a daily basis, while the remaining less liquid bonds are priced using an Option Adjusted Spread model or issuer curve that is generated using these actively quoted benchmark bonds. For more details on the construction of the Barclays indices see Goltz and Campani (2011) and the information that accompanied the rebranding of the Lehman indices in November 2008, available at https://index.barcap.com/download?rebrandingDoc.

[10]Callable bonds constitute the majority of bonds with embedded options. Their share in the market for corporate bonds has fluctuated significantly over time. It was very high until the late 1980s, decreasing to a historical low by the mid-1990s, and then increasing again over the past decade. As Gilchrist and Zakrajsek (2012) argue, limiting the sample to non-callable corporate bonds would significantly limit the available time-span. Nozawa (2014) makes the same argument to support the inclusion of callable bonds in the sample and finds that his main results are not driven by callability

[11]By the early to mid-1980s, Volcker's disinflation was largely accomplished with inflation declining sharply

3 is conducted over both the full sample period and a shorter sample that ends in July 2007, that is, prior to the onset of the recent financial crisis. This will allow us to isolate the potential effects of the crisis and the resulting ultra-loose monetary stance on the variance decomposition of bond returns and the relationship between monetary actions and bond returns.[12]

To compute monthly excess corporate bond returns (x_n), we take the first difference in the log of the Barclays index and subtract the continuously compounded 1-month Treasury bill rate (y_1) that we obtain from the Centre for Research in Security Prices.[13] The descriptive statistics in Table 1 indicate that both the mean and standard deviation of excess returns on long-term corporate bonds are higher than those of intermediate maturity bonds. As the rating declines, average returns tend to increase; removing the crisis period, however, eliminates this effect. These patterns are also consistent with the graphical evidence in Figure 1, which plots the (normalised) level of the Barclays indices for BAA and AAA long-term and intermediate maturity bonds and shows that prior to the crisis lower quality bonds did not outperform higher quality bonds. Moreover, while in the case of intermediate maturity bonds lower rating is associated with higher volatility of bond returns, for long-term bonds the opposite is true.[14] For all indices under investigation, the standard deviation of excess returns is lower in the pre-crisis period, as opposed to the full sample, highlighting the volatile nature of returns during the recent bad times. The full sample maximum and minimum values of excess bond returns, shown in Table 1–Panel A, in almost all cases materialise at the peak of the financial crisis, between September and December of 2008.

Table 2 reports the correlation coefficients between excess corporate bond returns across different maturities and ratings. Three stylised facts can be identified. First, correlations are stronger between bond returns of similar maturity. For example, while the full sample correlation between long-term AAA and AA excess bond returns is 0.94, it declines to 0.82 for when the latter are replaced with intermediate maturity AA returns. Second, the magnitude of the correlation coefficients increases when the bonds that we consider are more alike in terms of credit quality. For instance, the full sample correlation coefficient between intermediate matu-

from 10% (per annum) at 1980 to 3% at 1983. This development allowed interest rates to decline and ushered the Great Moderation era that was characterised by lower macroeconomic volatility.

[12]The start of the financial crisis is dated to August 2007 when doubts about financial stability emerged and the first major central bank interventions in response to increasing interbank market pressures took place (Brunnermeier, 2009; Kontonikas *et al.*, 2013). Following that, on September 2007 the Fed proceeded to the first major FFR cut (0.5%) since 2003, initiating a long cycle of monetary expansion.

[13]n denotes the average maturity of the bond index.

[14]The lack of increasing tendency, as credit quality deteriorates, in the volatility of excess returns on investment grade long-term corporate bonds can also be observed in the descriptive statistics of previous bond market studies that use alternative datasets and/or sample periods (Chang and Huang, 1990; Johnson *et al.*, 2003; Lin *et al.*, 2015). It should be noted that the Sharpe ratios of intermediate maturity bonds remain fairly flat as the rating declines, but those of long-term bonds increase, especially in the longer sample (see Table A.1 in Appendix B).

rity AAA and AA excess bond returns is 0.95, dropping to to 0.74 when we use, instead of the latter, intermediate maturity BAA returns. Third, correlations are overall stronger during the pre-crisis period.

In addition to corporate bond returns and a proxy for monetary policy shocks, the empirical analysis conducted in the following sections requires data on several other variables. The 1-month real interest rate (r_r) is calculated as the difference between the 1-month Treasury bill rate and the monthly inflation rate (π). The latter is measured as the first difference in the log of the seasonally adjusted CPI All items index. The default spread (def) is equal to the Moodys seasoned Baa corporate bond yield minus the 10-year Treasury bond yield. The term spread ($term$) represents the difference between the 10-year Treasury bond yield and the 1-month Treasury bill rate. The CPI, Treasury bond yield and Moody's BAA yield data are obtained from the Federal Reserve Bank of St Louis database (FREDII). The state variables are demeaned prior to the VAR estimations of Section 4 below.[15]

2.2 Monetary policy shocks

Monetary policy conducted during the period that we investigate is characterised by targeting of the Fed Funds rate (FFR), the interest rate on overnight loans of reserves between banks, and also by increasing transparency (Bernanke and Blinder, 1992; Bernanke and Mihov, 1998; Romer and Romer, 2004). We proxy monetary policy shocks by isolating the unexpected component of changes in the FFR. To do so, we use data on FFR futures and the methodology employed by Kuttner (2001). This market-based proxy of policy shocks has been widely used in the literature that examines the impact of monetary policy on stocks and bonds (Bernanke and Kuttner, 2005; Bredin *et al.*, 2010; Cenesizoglu and Essid, 2012; Kontonikas *et al.*, 2015). The month $t+1$ monetary policy shock (MP) is calculated as follows:

$$MP_{t+1} = \frac{1}{D}\sum_{d=1}^{D} i_{t+1,d} - f^1_{t,D}, \tag{1}$$

where $i_{t+1,d}$ denotes the target FFR on day d of month $t+1$ and $f^1_{t,D}$ is the rate corresponding to the one-month futures contract on the last (D^{th}) day of month t. The implied futures rate is 100 minus the contract price.[16] The futures data, sourced from Bloomberg, commences on 1989

[15] All the variables that we use are stationary according to the results from Augmented Dickey-Fuller and Phillips Perron unit root tests (see Table A.2 in Appendix B).

[16] The 30-day Federal Funds Futures contracts that we use are traded on the Chicago Board of Trade. The futures settlement price is based upon the monthly average effective FFR which follows very closely the target rate (Bernanke and Kuttner, 2005; Fama, 2013). It should be noted that measuring surprise changes in terms of the average FFR may understate the magnitude of policy surprises. The time-aggregation issue is analysed in

with the first observation on MP corresponding to 1989.02. The FFR data is obtained from the FREDII database.

Figure 1 plots our measure of monetary policy shocks. Some of the largest unexpected changes in the FFR occurred during, or near, periods of economic slowdown. These pronounced shocks were typically of monetary expansionary nature, that is, associated with negative values of the MP indicator. Nevertheless, the recent major recession and financial crisis period witnessed a large positive realisation of MP in November 2008. This reflects the fact that Fed kept the target rate constant at 1% throughout November 2008, while market participants expected further decline, following two rate decreases in October 2008. The final cut, which brought the FFR down to the zero lower bound, took place in December 2008. Ever since, and until the end of the sample, there were no rate changes and the volatility of FFR shocks dies out. This is not surprising considering the effort that the Fed had put in assuring the public and financial markets about its intention to keep the policy rate at near zero in the future.[17] The Fed's aggressive interest rate response to the financial crisis was supplemented with liquidity provision facilities and large scale purchases of mainly Treasury bonds and agency mortgage backed securities. The bond market effects of the Fed's unconventional policies are analysed in previous studies (Gagnon *et al.*, 2011; Christensen and Rudebusch, 2012; Wright, 2012; Krishnamurthy and Vissing-Jorgensen, 2011) and are beyond the scope of this paper that focuses on conventional FFR-based policy shocks.

The monetary policy indicator is included as an exogenous variable in the VAR model of Section 4 below. The exogeneity assumption would not be valid if the Fed responds contemporaneously to developments in the market for corporate bonds (reverse feedback) and/or if the Fed and corporate bonds jointly and contemporaneously respond to economic news (simultaneity). With respect to reverse feedback, while modifications of the Taylor rule have been recently proposed, whereby the Fed responds to measures of financial stress including credit spreads (Taylor, 2008; Curdia and Woodford, 2010), these rules refer to a systematic response involving actual and expected FFR changes, as opposed to unexpected changes (Cenesizoglu and Essid, 2012). The use of shocks is crucial not only to ameliorate endogeneity concerns, but also because anticipated policy actions should be already priced in the bond market. In order to

Evans and Kuttner (1998). Cenesizoglu and Essid (2012) find that adjusting for the the risk premium in Federal Funds contracts, by using the procedure of Piazzesi and Swanson (2008), makes no difference when analysing the impact of FFR shocks on corporate bond yield spreads.

[17]Initially, the language was qualitative with post-meeting statements of the Federal Open Market Committee (FOMC) including phrases such as the FFR will remain near zero for "an extended period" (FOMC statement of March 18, 2009). It then evolved to date-based guidance, specifying future dates such as "at least through mid-2015" (September 13, 2012). Finally, a threshold-based approach was adopted linking the first rate increase to developments in inflation and unemployment.

examine whether FFR shocks react to economic news we follow Bernanke and Kuttner (2005) and regress them on variables that capture surprises in nonfarm payrolls, industrial production growth, retail sales growth, core and headline CPI inflation. Surprises are calculated as the difference between the actual value that was released for a given key macroeconomic variable and the median forecast from Reuters Economic Polls. Table 3 reports the results.[18] We do not find a significant contemporaneous monetary policy response to macroeconomic surprises. Hence, the exogeneity assumption should not be significantly restrictive in our case.

3 Monetary policy effects on corporate bond returns: a simple regression approach

In this section, we estimate the contemporaneous reaction of monthly excess corporate bond returns to shocks in the Fed funds rate (FFR). We start with the following baseline regression model:

$$x_{n,t+1} = \alpha + \beta MP_{t+1} + u_{t+1}, \tag{2}$$

where x_n denotes excess returns on the Barclays corporate bond index with average maturity of n, MP represents unexpected changes in the FFR, and u denotes the component of excess returns that is not explained by monetary policy shocks.

The model is estimated by ordinary least squares, for each of the eight Barclays indices that we consider, that is, long-term and intermediate maturity with AAA, AA, A, and BAA ratings. t-statistics are calculated using Newey and West (1987) standard errors. The results in Table 4 show that the slope coefficient, β, exhibits a negative sign, albeit not always significantly different from zero when we use the full sample. In the pre-crisis sample, the effect of unexpected FFR changes is significantly negative across all ratings and maturities indicating that excess corporate returns respond negatively to a tightening shocks. The responsiveness of long-term corporate bond returns to monetary policy shocks is stronger in comparison to that of intermediate maturity bonds, as indicated by the magnitudes of the slopes. Moreover, there is a tendency for the reaction of returns to monetary policy shocks to increase in magnitude, albeit not always monotonically, as we move from higher grade towards lower grade bonds. Hence, lower rating bonds are more responsive to monetary shocks. The weaker significance levels that we identify in the full sample results can be attributed to the incorporation of the financial crisis

[18]Due to data availability on the macroeconomic surprises, the sample period for these regressions commences in 1991.10.

in the estimation window. As discussed in Section 2.1, the volatility of bond returns increased significantly during that period of financial turmoil, leading to some extreme observations that deteriorate the fit of the empirical model and the statistical significance of the regression slopes. In fact, the R^2 estimates are significantly larger in the restricted sample.[19]

We proceed by adding several business conditions controls to the regression above in order to assess the robustness of the baseline findings. These controls include two important indicators of business conditions proposed by Fama and French (1989), the default spread (def) and the term spread ($term$). We also include the inflation rate (π) and the real interest rate (r_r). Thus, the following augmented regression model is estimated:

$$x_{n,t+1} = \alpha + \beta MP_{t+1} + \gamma_1 def_{t+1} + \gamma_2 term_{t+1} + \gamma_3 \pi_{t+1} + \gamma_4 r_{r,t+1} + v_{t+1}, \tag{3}$$

The results in Table 5 indicate that, with the occasional exception of inflation and the default spread, business conditions proxies tend not to be statistically significant in explaining contemporaneous excess bond returns. Furthermore, the main findings from the baseline estimations remain robust. In the full sample, the impact of FFR shocks on excess bond returns is negative and statistically significant only in the case of intermediate maturity bonds, which is consistent with the evidence from the single regressions discussed previously. When the financial crisis and its aftermath are excluded from the sample period, we find that the monetary policy effect is always highly significant (1% level), similarly to the univariate regressions. As the rating declines and maturity increases, the sensitivity of bond returns to FFR surprises tends to increase. Overall, the empirical findings in this section are indicative of a negative contemporaneous reaction of excess corporate bond returns to monetary tightening shocks.

4 Monetary policy effects on corporate bond returns: a VAR-based approach

In this section, we use an empirical framework that decomposes corporate bond excess returns to their fundamental components in an effort to explain the negative reaction of bond premia to monetary policy shocks, documented in the last section.

[19] When we account for a few crisis-related outliers, using dummy variables or the method proposed by Yohai (1987), the full sample and pre-crisis results become largely consistent. Results are available upon request.

4.1 Components of realized excess bond returns

Modifying the zero-coupon bond framework of Campbell and Ammer (1993) for the case of coupon paying bonds, we can decompose current period unexpected excess bond returns into news about future excess bond returns, inflation, and the real interest rate:

$$\tilde{x}_{n,t+1} = (E_{t+1}-E_t)\left[-\sum_{j=1}^{n-1}\rho^j x_{n-j,t+1+j} - \sum_{j=1}^{n-1}\rho^j \pi_{t+1+j} - \sum_{j=1}^{n-1}\rho^j r_{r,t+1+j}\right] = -\tilde{x}_{x,t+1}-\tilde{x}_{\pi,t+1}-\tilde{x}_{r,t+1}, \tag{4}$$

where $\tilde{x}_{n,t+1} \equiv (E_{t+1} - E_t)x_{n,t+1}$ represents the unexpected one-period log return on a n-period bond (or equivalently a bond index with an average maturity of n periods) in excess of the continuously compounded one-period nominal risk-free rate, $\tilde{x}_{x,t+1}$ denotes revisions in expectations regarding future excess bond returns (discount rate news), $\tilde{x}_{\pi,t+1}$ represents revisions in expectations about future inflation (inflation news) and $\tilde{x}_{r,t+1}$ denotes revisions in expectations regarding future real interest rates (real interest rate news).[20] The intermediate maturity Barclays corporate bond index has an average maturity of 5 years, while that of the long-term index is 24 years. Hence, for intermediate maturity bonds we set n=60 months, while for long-term bonds n=288. ρ is the linearization constant, a number marginally smaller than one, which is linked to the average yield to maturity of each bond index.[21]

Equation (4) is a dynamic accounting identity that arises from the definition of bond returns and imposes internal consistency on expectations. It is not a behavioural model containing economic theory and asset pricing assumptions and implications. The decomposition implies that negative unexpected excess bond returns must be associated with increases in expected future excess returns during the life of the bond, rises in expected future inflation rates, increases in expected future real interest rates, or a combination of these three effects. Inflation news have implications for real bond cash flows. If the bond's cash-flows (coupons and principal) are fixed in nominal terms, as it is typically the case with corporate bonds (Kang and Pflueger, 2015), then an upward revision in inflation expectations (positive inflation news) will reflect lower real cash flows.[22]

[20]In Appendix A, we provide more details on the derivation. For a decomposition of consol bonds, see Engsted and Tanggaard (2001) and Abhyankar and Gonzalez (2009). Using a log-linearized pricing identity Nozawa (2014) decomposes credit spreads for corporate bonds into changing expected returns and changing expectation of credit losses and finds that they are both significant in explaining the variance of credit spreads.

[21]We set $\rho = \frac{1}{1+\overline{Y_n}}$, where $\overline{Y_n}$ is the average yield to maturity of a given bond index. The average value of ρ used in the estimations is 0.9944, ranging from 0.9935 in the case of long-term BAA bonds to 0.9952 for intermediate maturity AAA bonds.

[22]Note that, as we explain in Section 2, the Barclays corporate indices do not contain inflation-linked bonds.

From Equation (4), it follows that the total variance of unexpected excess bond returns can be decomposed into the sum of the three variances plus the respective covariance terms:

$$
\begin{aligned}
Var\left[\tilde{x}_{n,t+1}\right] = {} & Var\left[\tilde{x}_{x,t+1}\right] + Var\left[\tilde{x}_{\pi,t+1}\right] + Var\left[\tilde{x}_{r,t+1}\right] + 2Cov\left[\tilde{x}_{x,t+1}, \tilde{x}_{\pi,t+1}\right] \\
& +2Cov\left[\tilde{x}_{x,t+1}, \tilde{x}_{r,t+1}\right] + 2Cov\left[\tilde{x}_{r,t+1}, \tilde{x}_{\pi,t+1}\right].
\end{aligned} \tag{5}
$$

In order to evaluate the relative importance of news about future excess bond returns, inflation, and the real interest rate, we normalise each of the variance and covariance terms in Equation (5) by the total variability of excess returns. The delta method is used to calculate the standard errors for the weights of the terms of the variance decomposition since these represent nonlinear functions of the estimated VAR parameters (see Campbell and Ammer, 1993; Barr and Pesaran, 1997; Bernanke and Kuttner, 2005).

The implementation of the decomposition requires empirical proxies for the unobserved components of excess bond returns. Following Campbell and Ammer (1993), we link these multi-period expectations to the stationary dynamics of a vector autoregressive model (VAR). Specifically, a first-order VAR is employed, which contains excess bond returns and other variables that help to forecast changes in bond premia:

$$
\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \mathbf{w}_{t+1}, \tag{6}
$$

where $\mathbf{z}_t$ is a vector of endogenous state variables, $\mathbf{A}$ denotes a matrix of VAR parameters, and $\mathbf{w}_{t+1}$ is a vector of forecasting residuals. In the benchmark VAR the state vector is given by $\mathbf{z}_{t+1} = [x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where all the variables are defined as in Section 3.

The forecast errors and the estimated parameters from the VAR model can be used to compute unexpected excess bond returns and the three news components identified in Equation (5) as follows:

$$
\tilde{x}_{n,t+1} \equiv x_{n,t+1} - E_t[x_{n,t+1}] = \mathbf{s}_1'\mathbf{w}_{t+1}, \tag{7}
$$

$$
\tilde{x}_{x,t+1} \equiv (E_{t+1} - E_t)\sum_{j=1}^{n-1} \rho^j x_{n-j,t+1+j} = \mathbf{s}_1'(\mathbf{I} - \rho\mathbf{A})^{-1}(\rho\mathbf{A} - \rho^n\mathbf{A}^n)\mathbf{w}_{t+1}, \tag{8}
$$

$$
\tilde{x}_{r,t+1} \equiv (E_{t+1} - E_t)\sum_{j=1}^{n-1} \rho^j r_{r,t+1+j} = \mathbf{s}_2'(\mathbf{I} - \rho\mathbf{A})^{-1}(\rho\mathbf{A} - \rho^n\mathbf{A}^n)\mathbf{w}_{t+1}, \tag{9}
$$

$$\tilde{x}_{\pi,t+1} \equiv (E_{t+1} - E_t) \sum_{j=1}^{n-1} \rho^j \pi_{t+1+j} = -\tilde{x}_{n,t+1} - \tilde{x}_{x,t+1} - \tilde{x}_{r,t+1}, \tag{10}$$

where $\mathbf{s}'_i$ is a unit selection vector with i representing the i^{th} equation in the VAR model and accordingly the i^{th} element of the vector is set to 1, and $\mathbf{I}$ is the identity matrix.

Equation (7) shows that unexpected excess bond returns represent the residuals from the VAR forecasting model for excess returns. Discount rate news and real interest rate news are computed directly from the VAR estimates using Equation (8) and (9), respectively. We employ Equation (10) to compute inflation news using the dynamic accounting identity and the estimates of the other two components. This procedure is in line with previous studies that typically obtain inflation news as the residual component of unexpected excess bond returns (Campbell and Ammer, 1993; Engsted and Tanggaard, 2001; Abhyankar and Gonzalez, 2009; Bredin *et al.*, 2010). In the robustness checks section, we show that our results are not sensitive to an alternative identification scheme where real interest rate news become the residual component of the bond premium decomposition. We should also note that some modelling noise may be present since the Barclays indices are rebalanced to maintain their specified maturity, while the return decomposition in Equation (4) implies that maturity shrinks as time passes and j increases (Engsted *et al.*, 2012). Chen and Zhao (2009) argue that such modelling noise is not likely to be empirically important. In the robustness analysis, we also implement a decomposition for long-term bonds using the formulas for consol bonds, where the problem of shrinking maturity does not arise, and show that our results do not change in a significant way.

The VAR model that is used to extract news is assumed to contain all relevant information that investors may have when forming expectations about the future. If investors have additional information that is not present in the state vector, the relative importance of the residual component may be overstated.[23] The presence of inflation in the state vector, along with the default spread, term spread, and the real interest rate, is consistent with previous work by Chen and Zhao (2009) and the corporate bond returns predictability literature. Specifically, the default spread and the term spread are used, among other studies, by Keim and Stambaugh (1986), Fama and French (1989), and Greenwood and Hanson (2013), while Baker *et al.* (2003) add inflation and the real interest rate in the list of potential predictors.[24] In the robustness analysis, we show that our baseline findings are robust to the incorporation of additional macro-

[23]Campbell and Ammer (1993) point out that the sign of the possible bias is uncertain since it will depend on the covariances between state variables and any omitted variables.

[24]The default spread, term spread, and inflation are also used in the corporate bond return predictability study of Lin *et al.* (2015), whereas Abhyankar and Gonzalez, 2009 employ the real interest rate and the default spread to forecast excess bond returns.

financial predictor variables in the VAR state vector.

Table 6 presents estimates of the excess returns forecasting equation in the benchmark VAR for the eight Barclays indices. The results can be summarised as follows. First, the 1-month ahead forecasting power of the VAR is quite reasonable. The adjusted R^2 values lie within the range of 4.5–9.5% in the full sample estimation, which is in line with previous evidence from bond predictability studies. In the pre-crisis sample, the corresponding range is between 5.5% and 8.1%. Moreover, the explanatory ratios tend to be slightly higher in the case of intermediate maturity bonds. Second, with the exception of the default spread that is only occasionally significant in the full sample estimation, the other predictors are performing quite well. In agreement with Chen and Zhao (2009) and Baker *et al.* (2003), we find that future excess bond returns are positively related to inflation, the real interest rate, and the term spread. Third, long-term bonds exhibit stronger sensitivities to these predictors (as indicated by the respective slopes), in comparison to intermediate maturity bonds, whereas there is no clear pattern when we move from higher to lower credit rating.[25]

The variance decomposition results are shown in Table 7. The key finding is that across bonds with different maturities and credit ratings, discount rate news typically constitute the major component of shocks in current excess bond returns. For example, the full sample variance decomposition attributes 88% of the variance of long-term AAA excess return innovations to the variance of discount rate news. Inflation news follow as the second component, albeit with quite smaller magnitude, whereas real interest rate news only play a smaller role in the full sample estimates of intermediate bonds. Finally, although the covariance terms between inflation news and discount rate news appears relatively sizeable, they are always statistically insignificant, similar to almost all other covariance terms. In sum, our results for corporate bonds strongly support the importance of discount rate news, as a driver of the total variability of returns, in agreement with studies that conduct variance decomposition for stocks at the market level (Campbell, 1991; Campbell and Ammer, 1993; Bernanke and Kuttner, 2005; Maio, 2014; Maio and Philip, 2015). On the other hand, previous studies on Treasuries find that inflation news is the main component of unexpected excess bond returns (Campbell and Ammer, 1993; Engsted and Tanggaard, 2007; Kontonikas *et al.*, 2015). These results provide additional evidence on the

[25] The estimated VARs are dynamically stable since no root lies outside the unit circle. The results from the forecasting equations of the other variables are available upon request. In short, they indicate that the real interest rate is typically predicted by inflation and its own lag, with the adjusted R^2 ranging between 26% and 38% across the various models. Inflation is simply an autoregressive process with an estimated AR(1) coefficient that varies between 0.42 and 0.50. The adjusted R^2 for the inflation equation takes values between 13% and 23%. The default spread is a highly persistent process with AR(1) coefficient of 0.90 or above. The term spread is very persistent too, but also related to the lagged default spread. The adjusted R^2 values for the default spread and term spread models vary between 76% and 92%.

different behavior of Treasury and corporate bond returns.

4.2 Explaining the impact of monetary policy shocks on bond returns

In order to explain the source of the corporate bond markets reaction to monetary policy shocks, we estimate the effect of these shocks to unexpected excess bond returns and also their three components. To do so, we follow Bernanke and Kuttner (2005) and include unexpected FFR changes as an exogenous variable in the VAR model:

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \phi MP_{t+1} + \omega_{t+1}, \tag{11}$$

where ϕ is a vector that includes the state variables response parameters to contemporaneous monetary policy shocks. The original VAR error vector ($\mathbf{w}_{t+1}$) is essentially decomposed in a component related to the monetary policy actions, ϕMP_{t+1}, and a component related to other information, ω_{t+1}. Following Bernanke and Kuttner, 2005, we proceed by estimating the original VAR model to obtain estimates of $\mathbf{A}$ and then regress the VAR residuals vector on monetary policy shocks in order to estimate ϕ. The monetary policy impact on the contemporaneous unexpected excess bond returns and news about expected returns, the real interest rate, and inflation can be calculated using Equations (12)-(15), respectively:

$$\tilde{x}^{MP}_{n,t+1} = \frac{\partial \tilde{x}_{n,t+1}}{\partial MP_{t+1}} = \mathbf{s}'_1\phi, \tag{12}$$

$$\tilde{x}^{MP}_{x,t+1} = \frac{\partial \tilde{x}_{x,t+1}}{\partial MP_{t+1}} = \mathbf{s}'_1(\mathbf{I} - \rho\mathbf{A})^{-1}(\rho\mathbf{A} - \rho^n\mathbf{A}^n)\phi, \tag{13}$$

$$\tilde{x}^{MP}_{r,t+1} = \frac{\partial \tilde{x}_{r,t+1}}{\partial MP_{t+1}} = \mathbf{s}'_2(\mathbf{I} - \rho\mathbf{A})^{-1}(\rho\mathbf{A} - \rho^n\mathbf{A}^n)\phi, \tag{14}$$

$$\tilde{x}^{MP}_{\pi,t+1} = \frac{\partial \tilde{x}_{\pi,t+1}}{\partial MP_{t+1}} = -\tilde{x}^{MP}_{n,t+1} - \tilde{x}^{MP}_{x,t+1} - \tilde{x}^{MP}_{r,t+1}. \tag{15}$$

Thus, the response of excess bond returns and their components to monetary policy shocks depends both on ϕ and the dynamics of the VAR through the VAR coefficient matrix, $\mathbf{A}$. As in Bernanke and Kuttner (2005), the delta method is used to compute standard errors for these responses to monetary shocks.

Table 8 presents the results. In the full sample, the total response of unexpected excess bond returns to unexpected FFR changes is negative and almost always statistically significant. The sole exception is for long-term AAA bonds, in which case the negative slope is not significant at the 10% level. This implies that unexpected excess bond returns respond negatively to a monetary tightening shock. Excluding the recent financial crisis and its aftermath, the effect of policy shocks becomes strongly significant (1% level) across all ratings and maturities. Mirroring the results from the single equation estimates in Section 3, in the pre-crisis sample the monetary policy effect on long-term corporate bond returns is always significant and stronger (as indicated by the magnitudes of the respective slopes), in comparison to intermediate maturity bonds. Furthermore, the total response of unexpected excess bond returns to policy shocks tends to increase in magnitude, but not always monotonically, as the credit rating deteriorates.

Moving on to the reaction of the components of excess returns, we start the discussion with the pre-crisis findings, which are more clear-cut. The results show that the effect of monetary policy shocks is basically explained though the discount rate news channel. In all cases, tightening shocks negatively affect contemporaneous unexpected excess corporate bond returns through an increase in expected bond returns. The share of discount rate news in the total response tends to be stronger for bonds with higher credit rating. In the intermediate maturity group, for example, discount rate news contribute towards 84% (2.00/2.38) of the response of excess returns on AAA bonds to a policy shock, when the corresponding figure for BAA bonds is 67% (2.00/2.99). The policy impact on the remaining components of bond returns is not statistically insignificant in any of the cases. The dominant role of discount rate news in explaining the response of excess returns to monetary shocks is in agreement with the evidence of Bernanke and Kuttner (2005) for the stock market.

Next, with regards to the full sample results, we note that the incorporation of the financial crisis in the estimation window leads to less precise estimates of discount rate news reaction to policy shocks. Finally, the response of discount rate news typically exceeds in magnitude that of real interest rate news, but the former is significant only in a few cases, whereas the effect on real interest rate news is always significant (although, the estimates are more precisely estimate in the case of intermediate bonds). Finally, the response coefficient of inflation news is statistically insignificant in most cases.[26]

Overall, the VAR-based results strongly favour discount rate news in being the key driver of the response of excess bond returns to monetary policy shocks in the pre-crisis period, with monetary tightening negatively affecting contemporaneous returns through higher expected returns. However, the results also indicate that recently this channel may have become more subdued.

[26] In the case of long-term AAA bonds it is negative and significant (at the 1% level), but outweighed by positive policy impact on remaining news components.

5 Robustness checks

We examine the robustness of our key VAR-based empirical findings in a number of ways and find that the results reported in Section 4 are overall not sensitive to these changes. First, we use alternative state vector specifications for the underlying VAR model. Second, we consider higher-order VARs. Third, we use the consol formulas to conduct the variance decomposition for returns on long-term corporate bonds. Finally, we use an alternative identification scheme for the news components. The results are contained in Appendix B.

5.1 Alternative state vector specifications

The state variables in the VAR are chosen on the basis of their predictive power over excess bond returns. The benchmark VAR state vector includes excess bond returns, the 1-month real interest rate, the default spread, the term spread, and the monthly inflation rate. Here, we augment the state vector by additional macro-financial indicators that may help to forecast bond returns. Specifically, the following variables are considered in turn: the log dividend to price ratio on the SP500 stock market index, the Chicago Fed Adjusted National Financial Conditions Index (ANFCI), and the Chicago Fed National Activity Index (CFNAI). The CFNAI is a proxy of overall economic activity, calculated as the weighted average of 85 monthly indicators of national economic activity. The ANFCI isolates the component of financial conditions (in money markets, debt, and equity markets, and the traditional and shadow banking systems) that is uncorrelated with economic conditions.[27] Generally, the main findings of the VAR-based return variance decomposition are robust to the inclusion of additional macro-financial state variables. The key driving force of the variance of unexpected excess bond returns is bond premium news across the board. Also, we again find the positive effect of monetary policy easing on excess bond returns that mainly comes from a corresponding negative effect on the future bond risk premium. As reported and discussed in Section 4, the policy transmission channel appears to be less clear once the financial crisis and its aftermath are included in the sample period.

5.2 Higher-order VAR models

The main empirical analysis is based on the first-order VAR model. Nevertheless, one may argue that this could be too restrictive and not adequate to capture the dynamic structure of the data. Therefore, we also consider higher-order VARs as in other related studies (Campbell and Ammer,

[27] The calculation of the market-wide log dividend to price ratio is based on data provided by Robert J. Shiller at: http://www.econ.yale.edu/ shiller/data.htm. The ANFCI and CFNAI indices are obtained from the FREDII database.

1993; Maio, 2014). The empirical estimations are repeated using VAR(2), VAR(3), and VAR(6) models. The state vector remains the same as in the benchmark VAR(1) model. The results are similar across different lags structure, hence, we only report the estimates obtained using VAR(3) in order to preserve space. Overall, the main findings regarding the role of risk premium news in explaining excess bond returns and their response to monetary policy changes are not affected by the alternative VAR order.

5.3 The case of consol bonds

Most of related studies generally apply this methodology of return variance decomposition for long-term coupon bonds assuming infinite maturity, i.e. the empirical analysis is based on consol (perpetual) bonds (Engsted and Tanggaard, 2007; Bredin *et al.*, 2010). One obvious advantage of this approach is that the problem of shrinking bond maturity over time is not relevant when calculating future excess bond returns directly from the estimated VAR. In this subsection, we apply the methodology and formulas as provided in Bredin *et al.* (2010) on the long-term corporate bonds using the same data as before. In line with our benchmark analysis, we extract inflation news as a residual component using the dynamic identity relationship. The results are nearly identical to those for long-term bonds discussed in the previous section. Hence, our approach to assume long-term bonds as n-period bonds does not lead to different findings. This also implies that our results are not driven by the fact that we do not account for shrinking bond maturity over time.

5.4 Alternative identification scheme of excess returns components

We examine whether a different identification has any implications to our main findings. The inflation news component is now estimated directly from the forecast VAR while the real interest rate news is calculated as the residual term. As previously, the risk premium news is the most important component of the unexpected excess return, explaining most of the respective variance. On the other hand, the empirical results regarding the monetary policy impact on excess bond returns are also robust to the alternative identification of excess returns components.

6 Conclusion

There is a vast amount of literature on the monetary policy implications for asset prices. Generally, stock and government bond markets have been the focus of the attention while there is significantly less empirical work carried out with respect to corporate bonds. The aim of this paper is to examine whether conventional U.S. monetary policy has any implications for corporate both returns and their components. Moreover, we shed some light on the impact of the recent financial crisis on the empirical relationship between corporate bond market movements and monetary policy actions. To start, we simply regress monthly excess bond returns on a monetary policy indicator to provide an estimation of the respective contemporaneous correlation. Next, we adapt the log-linear return decomposition framework of Campbell and Ammer (1993) together with a first-order VAR model to decompose the monetary policy effects on unexpected excess bond returns in terms of their three components: inflation news, real interest rate news, and risk premium news.

By conducting simple regressions over the period 1989.02–2013.12, we obtain a negative and significant response of excess returns on corporate bonds to shocks in FFR prior to the financial crisis. This conclusion remains valid across both medium and longer maturities as well as across different credit ratings. The effect of monetary policy on bond returns is weaker and less significant in the full sample, indicating potential implications of the financial crisis. Similar results are obtained when we examine monetary policy effects on unexpected excess bond returns, obtained from a first-order VAR.

With respect to the bond return variance decomposition, our results demonstrate that the key determinant of the variability in current unexpected excess returns on long-term and intermediate term corporate bonds is the variance of the revisions in expectations about future bond risk premia. The other two components of excess bond returns play only a limited role. These results holds across all four credit ratings considered, and are also robust to the 2007–2009 financial crisis.

More importantly, we provide evidence that discount rate news constitute the major determinant of variation in current excess bond returns, that is, the largest part of the contemporaneous negative response of corporate bond returns to monetary policy tightening can be attributed to higher expected excess bond returns (higher bond risk premia). The effects of monetary policy shocks on the expectations of future inflation and real interest rates are relatively small when it comes to explaining the negative effect of interest rate rises on current bond returns. This is especially notable for the pre-crisis period that excludes the recent financial turmoil (2007–2009), which was associated with a significant rise in volatility in bond markets. Therefore, the discount rate channel represents an important mechanism through which monetary policy affect corporate bonds.

A Bond return decomposition and VAR identification

This appendix provides a summary of the key steps for the decomposition of unexpected excess bond returns in terms of news components and the VAR-based empirical identification. In line with Campbell *et al.* (1997), the starting point is the definition of bond returns. The gross nominal holding-period return $(1 + R_{n,t+1})$ on an n-period coupon bond, or equivalently a bond index with n-period average maturity, from t to $t+1$ is

$$1 + R_{n,t+1} = \frac{P_{n-1,t+1} + C}{P_{n,t}}, \tag{A1}$$

where $P_{n,t}$ denotes the bond price at period t and C is the respective coupon. By taking logs on both sides of Equation (A1), we obtain the log nominal holding-period return:

$$r_{n,t+1} = p_{n-1,t+1} - p_{n,t} + \ln\left(1 + e^{c-p_{n-1,t+1}}\right), \tag{A2}$$

where $p = \ln(P)$ and $c = \ln(C)$ denote the log price and log coupon, respectively. The non-linear term, $\ln(1 + e^{c-p_{n-1,t+1}})$, can be approximated around the mean of the log coupon-price ratio, $\overline{c-p}$, by using a first-order Taylor expansion. Consequently, we have:

$$r_{n,t+1} \approx k + \rho p_{n-1,t+1} + (1-\rho)c - p_{n,t}, \tag{A3}$$

where $k = -\ln(\rho) - (1-\rho)\ln\left(\frac{1}{\rho} - 1\right)$ and $\rho = \frac{1}{1+e^{\overline{c-p}}} \approx \frac{1}{1+\overline{Y_n}}$. $\overline{Y_n}$ is the average yield to maturity of the bond. This definition of ρ gives a good approximation for returns on bonds selling close to par (see Campbell *et al.*, 1997).

By re-arranging Equation (A3), solving forward, and taking expectations at time t, we can express the log price in terms of expected future returns and coupon payments:

$$p_{n,t} = E_t \sum_{j=0}^{n-1} \rho^j \left[k + (1-\rho)c - r_{n-j,t+1+j})\right]. \tag{A4}$$

By using (A4) and (A3), we obtain an expression for current unexpected bond returns, in which this variable is negatively related to revisions in expectations of future bond returns:

$$r_{n,t+1} - E_t[r_{n,t+1}] = -(E_{t+1} - E_t)\left[\sum_{j=1}^{n-1} \rho^j x_{n-j,t+1+j}\right]. \tag{A5}$$

On the other hand, excess bond returns are defined as follows:

$$x_{n,t+1} = r_{n,t+1} - y_{1,t+1} = r_{n,t+1} - \pi_{t+1} - r_{r,t+1}, \tag{A6}$$

where $y_{1,t+1}$ is the log nominal short-term risk-free rate, π_{t+1} is the inflation rate (defined as the log difference of the consumer price index between periods t and $t+1$), and $r_{r,t+1}$ is the log real interest rate.

We can then re-write Equation (A6) in terms of excess returns and obtain the following equation, which decomposes unexpected excess bond returns ($\tilde{x}_{n,t+1}$) into discount rate news ($\tilde{x}_{x,t+1}$), inflation news ($\tilde{x}_{\pi,t+1}$), and real interest rate news ($\tilde{x}_{r,t+1}$):

$$\begin{aligned}\tilde{x}_{n,t+1} = x_{n,t+1} - E_t[x_{n,t+1}] = (E_{t+1} - E_t)\left[-\sum_{j=1}^{n-1}\rho^j x_{n-j,t+1+j} - \sum_{j=1}^{n-1}\rho^j \pi_{t+1+j} - \sum_{j=1}^{n-1}\rho^j r_{r,t+1+j}\right] \\ = -\tilde{x}_{x,t+1} - \tilde{x}_{\pi,t+1} - \tilde{x}_{r,t+1},\end{aligned} \tag{A7}$$

where $\tilde{x}_{x,t+1} = (E_{t+1} - E_t)\sum_{j=1}^{n-1}\rho^j x_{n-j,t+1+j}$, $\tilde{x}_{\pi,t+1} = (E_{t+1} - E_t)\sum_{j=1}^{n-1}\rho^j \pi_{t+1+j}$, and $\tilde{x}_{r,t+1} = (E_{t+1} - E_t)\sum_{j=1}^{n-1}\rho^j r_{r,t+1+j}$.

In order to obtain empirical proxies for unexpected excess bond returns and their (news-related) components, we employ the VAR approach widely used in the literature (e.g., Campbell, 1991). Consider a first-order VAR model:

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \mathbf{w}_{t+1}, \tag{A8}$$

where the VAR state vector is given by $\mathbf{z}_{t+1} = [x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$. x_n denotes excess bond returns; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. $\mathbf{A}$ denotes a matrix of VAR parameters and $\mathbf{w}_{t+1}$ is a vector of forecasting residuals.

The unexpected one-period excess bond return at time $t+1$ ($\tilde{x}_{n,t+1}$) is directly obtainable from the first equation of the VAR system:

$$\tilde{x}_{n,t+1} = x_{n,t+1} - E_t[x_{n,t+1}] = \mathbf{s}_1'(\mathbf{A}\mathbf{z}_t + \mathbf{w}_{t+1} - \mathbf{A}\mathbf{z}_t) = \mathbf{s}_1'\mathbf{w}_{t+1}, \tag{A9}$$

where $\mathbf{s}_i'$ is a unit selection vector with i representing the i^{th} equation in the VAR model, and accordingly the i^{th} element of the vector is set to 1. Hence, $\mathbf{s}_1' = [1,0,0,0,0]$ selects the residuals of the first equation in the VAR (excess bond return equation) as a proxy for the unexpected excess bond return.

Projections from the error vector are used to empirically approximate revisions in expectations about future excess returns:

$$(E_{t+1} - E_t)\mathbf{z}_{t+1} = \mathbf{A}^j \mathbf{w}_{t+1}. \tag{A10}$$

It can then be shown that discount rate news can be expressed in terms of the VAR estimates:

$$\tilde{x}_{x,t+1} = (E_{t+1} - E_t) \sum_{j=1}^{n-1} \rho^j x_{n-j,t+1+j} = \mathbf{s}_1' \sum_{j=1}^{n-1} \rho^j \mathbf{A}^j (\mathbf{z}_{t+1} - \mathbf{A}\mathbf{z}_t) = \mathbf{s}_1' \sum_{j=1}^{n-1} (\rho \mathbf{A})^j \mathbf{w}_{t+1}. \tag{A11}$$

By using the geometric series properties, we obtain the following expression for discount rate news:

$$\tilde{x}_{x,t+1} = \mathbf{s}_1' (\mathbf{I} - \rho \mathbf{A})^{-1} (\rho \mathbf{A} - \rho^n \mathbf{A}^n) \mathbf{w}_{t+1}, \tag{A12}$$

where $\mathbf{I}$ is the identity matrix.

In a similar fashion, real interest rate news can be calculated as follows:

$$\tilde{x}_{r,t+1} = \mathbf{s}_2' \sum_{j=1}^{n-1} (\rho \mathbf{A})^j \mathbf{w}_{t+1} = \mathbf{s}_2' (\mathbf{I} - \rho \mathbf{A})^{-1} (\rho \mathbf{A} - \rho^n \mathbf{A}^n) \mathbf{w}_{t+1}. \tag{A13}$$

Finally, we obtain inflation news as the residual component from the dynamic identity in Equation (A7):

$$\tilde{x}_{\pi,t+1} = -\tilde{x}_{n,t+1} - \tilde{x}_{x,t+1} - \tilde{x}_{r,t+1}. \tag{A14}$$

B Additional results

This appendix describes the tables presented below, which contain the results discussed in Section 5 in the main paper. Tables A.3-A.5 report the results of the variance decomposition using the alternative state vectors, and Tables A.6-A.8 show the corresponding VAR-based monetary policy effects. Table A.9 summarises the results for the variance decomposition associated with a higher-order VAR. The estimated monetary policy impact on the unexpected excess bond return and its respective components are reported in Table A.10. The variance decomposition and VAR-based responses associated with a dynamic decomposition for consol bonds are presented in Tables A.11 and A.12, respectively. Table A.13 reports the variance decomposition results for an alternative identification of excess bond returns, whereas the monetary policy effects are summarised in Table A.14.

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Table 1: Descriptive statistics for monetary policy shocks and VAR state variables

This table presents descriptive statistics for the monetary policy shocks proxy (unexpected change in the FFR; MP) and the state variables used in the VAR analysis of Section 4. The state variables are the excess returns on Barclays corporate bond indices; the 1-month real interest rate (r_r); the default spread (def); the term spread ($term$); and the monthly inflation rate (π). The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The only exception is MP for which, due to data availability, the sample starts on 1989.02.

	Mean	Stdev.	Min.	Max.		Mean	Stdev.	Min.	Max.
				Panel A: Full sample					
AAA^L	0.49	3.29	−19.26	16.78	r_r	0.08	0.29	−1.08	1.82
AA^L	0.57	2.92	−9.90	16.44	def	2.24	0.74	1.24	5.92
A^L	0.54	2.90	−12.76	15.65	$term$	1.85	1.26	−1.34	4.63
BAA^L	0.58	2.71	−16.47	11.02	π	0.23	0.26	−1.79	1.37
AAA^I	0.38	1.34	−7.92	5.06	MP	−0.03	0.09	−0.63	0.33
AA^I	0.39	1.35	−6.80	5.56					
A^I	0.40	1.50	−11.62	5.46					
BAA^I	0.43	1.51	−10.93	6.16					
				Panel B: Pre-crisis					
AAA^L	0.57	2.75	−9.89	13.73	r_r	0.14	0.25	−1.08	1.15
AA^L	0.57	2.67	−9.90	12.28	def	2.00	0.49	1.24	3.71
A^L	0.55	2.60	−9.79	11.53	$term$	1.71	1.32	−1.34	4.63
BAA^L	0.55	2.41	−8.18	10.98	π	0.25	0.22	−0.55	1.37
AAA^I	0.39	1.28	−4.63	4.98	MP	−0.04	0.10	−0.63	0.31
AA^I	0.40	1.32	−3.77	5.31					
A^I	0.39	1.32	−3.61	4.96					
BAA^I	0.40	1.35	−3.49	6.16					

Table 2: Correlation matrix of excess corporate bond returns

This table presents the correlation coefficients for excess returns on Barclays corporate bond indices. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
Panel A: Full sample								
AAA^L	1.00							
AA^L	0.94	1.00						
A^L	0.90	0.97	1.00					
BAA^L	0.79	0.90	0.96	1.00				
AAA^I	0.87	0.85	0.84	0.75	1.00			
AA^I	0.82	0.88	0.89	0.83	0.95	1.00		
A^I	0.80	0.85	0.89	0.86	0.91	0.96	1.00	
BAA^I	0.63	0.76	0.85	0.91	0.74	0.85	0.88	1.00
Panel B: Pre-crisis								
AAA^L	1.00							
AA^L	0.99	1.00						
A^L	0.98	0.99	1.00					
BAA^L	0.93	0.95	0.97	1.00				
AAA^I	0.91	0.91	0.90	0.85	1.00			
AA^I	0.92	0.92	0.91	0.87	0.98	1.00		
A^I	0.92	0.93	0.93	0.90	0.97	0.98	1.00	
BAA^I	0.88	0.89	0.91	0.93	0.91	0.92	0.95	1.00

Table 3: Monetary policy shocks and economic news

This table presents the estimated response of monetary policy shocks (unexpected change in the FFR, MP) to economic news. The latter are calculated on the basis of Reuters Economic Polls as the difference between 'actual' (the actual value that was reported by the primary source) minus 'median forecast' (the forecast figure from the polls prior to the announcement) after the actual value is released. The following macroeconomic variables are considered: CPI inflation, core CPI inflation, change in nonfarm payrolls, growth rate of industrial production, and growth rate of retail sales (excluding automobiles). The full sample period is 1991.10–2013.12 and the pre-crisis period is 1991.10–2007.07. $\overline{R}^2$ is the adjusted R^2. Newey-West standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Panel A: Full sample	Panel B: Pre-crisis
CPI inflation	-0.05	-0.06
	(0.04)	(0.04)
Core CPI inflation	0.04	0.09
	(0.05)	(0.06)
Nonfarm payrolls	0.00	-0.01
	(0.00)	(0.01)
Industrial production	-0.02^{*}	-0.01
	(0.01)	(0.02)
Retail sales excl. autos	0.01	0.02
	(0.01)	(0.02)
$\overline{R}^2$	0.002	0.000

Table 4: Responses of excess bond returns to monetary policy shocks

This table presents the estimated response of excess bond returns to monetary policy shocks (unexpected change in the FFR, MP), as described in Section 3. Bond returns are calculated using the Barclays corporate bond indices, which represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. $\overline{R}^2$ is the adjusted R^2. Newey-West standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$Intercept$	0.32*	0.42**	0.37**	0.42**	0.27***	0.27***	0.28***	0.31***
	(0.18)	(0.18)	(0.18)	(0.17)	(0.08)	(0.09)	(0.10)	(0.10)
MP	−1.61	−1.69	−2.38	−2.01	−1.94	−2.24*	−2.18*	−2.17*
	(3.10)	(2.93)	(2.85)	(2.57)	(1.21)	(1.17)	(1.25)	(1.20)
$\overline{R}^2$	0.000	0.000	0.003	0.002	0.016	0.023	0.016	0.015
				Panel B: Pre-crisis				
$Intercept$	0.23	0.22	0.18	0.19	0.20**	0.20**	0.19**	0.17*
	(0.17)	(0.17)	(0.17)	(0.16)	(0.09)	(0.10)	(0.09)	(0.10)
MP	−4.90***	−5.00***	−5.77***	−5.26***	−3.00***	−3.27***	−3.51***	−3.56***
	(1.23)	(1.25)	(1.23)	(1.17)	(0.72)	(0.82)	(0.70)	(0.69)
$\overline{R}^2$	0.044	0.044	0.058	0.052	0.059	0.070	0.082	0.075

Table 5: Responses of excess bond returns to monetary policy shocks: controlling for business conditions

This table presents the estimated response of excess bond returns to monetary policy shocks (unexpected change in the FFR, MP) controlling for business conditions, as described in Section 3. Bond returns are calculated using the Barclays corporate bond indices, which represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The business conditions controls include the 1-month real interest rate (r_r); the default spread (def); the term spread ($term$); and the monthly inflation rate (π). The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. $\overline{R}^2$ is the adjusted R^2. Newey-West standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$Intercept$	1.85	0.55	1.38	1.57	−0.03	−0.18	0.22	0.60
	(1.59)	(1.20)	(1.38)	(1.48)	(0.55)	(0.55)	(0.75)	(1.03)
MP	−2.86	−3.00	−3.64	−3.22	−2.40**	−2.69***	−2.76**	−2.78**
	(2.36)	(2.25)	(2.45)	(2.44)	(0.97)	(1.01)	(1.07)	(1.28)
def	−0.14	0.28	0.02	−0.05	0.24	0.28*	0.18	0.08
	(0.45)	(0.33)	(0.41)	(0.46)	(0.16)	(0.17)	(0.25)	(0.33)
$term$	−0.24	−0.15	−0.21	−0.18	−0.11	−0.09	−0.09	−0.10
	(0.16)	(0.15)	(0.16)	(0.16)	(0.07)	(0.07)	(0.08)	(0.10)
π	−3.57*	−2.43*	−2.98**	−2.98**	−0.45	−0.29	−0.88	−1.13
	(1.98)	(1.46)	(1.38)	(1.25)	(0.69)	(0.61)	(0.72)	(0.95)
r_r	−0.49	0.08	−1.04	−1.75	0.37	0.33	−0.20	−1.11
	(1.56)	(1.28)	(1.40)	(1.42)	(0.57)	(0.53)	(0.67)	(0.95)
$\overline{R}^2$	0.057	0.062	0.032	0.014	0.063	0.062	0.038	0.021
				Panel B: Pre-crisis				
$Intercept$	−0.02	−0.32	0.25	0.56	−0.79	−0.99	−0.66	−0.05
	(1.04)	(1.04)	(1.02)	(0.98)	(0.48)	(0.47)	(0.49)	(0.56)
MP	−5.28***	−5.35***	−6.21***	−5.77***	−3.02***	−3.27***	−3.59***	−3.78***
	(1.32)	(1.36)	(1.32)	(1.21)	(0.77)	(0.89)	(0.75)	(0.69)
def	0.51*	0.61**	0.40	0.30	0.54***	0.61***	0.50***	0.31
	(0.29)	(0.29)	(0.29)	(0.32)	(0.15)	(0.15)	(0.15)	(0.19)
$term$	−0.21	−0.19	−0.20	−0.17	−0.10	−0.09	−0.10	−0.10
	(0.14)	(0.14)	(0.14)	(0.13)	(0.08)	(0.08)	(0.08)	(0.08)
π	−1.67	−1.50	−2.11*	−2.52**	0.19	0.29	−0.15	−0.91
	(1.33)	(1.28)	(1.27)	(1.19)	(0.63)	(0.60)	(0.66)	(0.80)
r_r	−0.22	−0.02	−0.44	−0.83	0.54	0.65	0.35	−0.30
	(1.34)	(1.33)	(1.34)	(1.29)	(0.62)	(0.61)	(0.65)	(0.78)
$\overline{R}^2$	0.072	0.075	0.085	0.079	0.105	0.124	0.123	0.094

Table 6: Excess bond returns forecasting regression in the benchmark VAR

This table presents the estimated coefficients for the excess bond returns equation in the benchmark VAR(1) model presented in Section 4. The VAR state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. $\overline{R}^2$ is the adjusted R^2. Newey-West standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	$x_{n+1,t}$	$r_{r,t}$	def_t	$term_t$	π_t	$\overline{R}^2$
Panel A: Full sample						
AAA^L	0.04	3.30**	0.10	0.54***	2.27	0.045
	(0.09)	(1.60)	(0.53)	(0.16)	(1.49)	
AA^L	0.02	3.69***	0.60	0.53***	2.54*	0.063
	(0.08)	(1.39)	(0.40)	(0.15)	(1.36)	
A^L	0.09	3.27**	0.47	0.51***	2.09	0.067
	(0.09)	(1.31)	(0.39)	(0.14)	(1.30)	
BAA^L	0.10	2.85**	0.56	0.48***	1.97*	0.069
	(0.09)	(1.11)	(0.36)	(0.12)	(1.16)	
AAA^I	0.12**	1.65***	0.14	0.24***	1.24**	0.070
	(0.05)	(0.52)	(0.16)	(0.06)	(0.52)	
AA^I	0.14***	1.78***	0.25*	0.24***	1.31**	0.088
	(0.05)	(0.52)	(0.14)	(0.06)	(0.54)	
A^I	0.17***	1.69***	0.28*	0.25***	1.19**	0.086
	(0.06)	(0.55)	(0.17)	(0.07)	(0.59)	
BAA^I	0.18**	1.49**	0.30	0.27***	0.98	0.095
	(0.09)	(0.58)	(0.21)	(0.07)	(0.62)	
Panel B: Pre-crisis						
AAA^L	0.06	3.76**	0.21	0.49***	3.47**	0.055
	(0.07)	(1.73)	(0.34)	(0.18)	(1.68)	
AA^L	0.05	3.67**	0.31	0.48***	3.38**	0.055
	(0.06)	(1.62)	(0.35)	(0.16)	(1.57)	
A^L	0.06	3.49**	0.24	0.47***	3.01**	0.056
	(0.06)	(1.52)	(0.35)	(0.16)	(1.49)	
BAA^L	0.05	3.24**	0.35	0.45***	2.59*	0.059
	(0.06)	(1.34)	(0.36)	(0.13)	(1.32)	
AAA^I	0.13**	1.92***	0.11	0.24***	1.71***	0.079
	(0.06)	(0.66)	(0.17)	(0.07)	(0.64)	
AA^I	0.14**	1.98***	0.17	0.24***	1.71**	0.081
	(0.06)	(0.68)	(0.17)	(0.07)	(0.66)	
A^I	0.13**	1.94***	0.17	0.25***	1.59**	0.079
	(0.02)	(0.69)	(0.17)	(0.07)	(0.67)	
BAA^I	0.10*	1.94**	0.19	0.27***	1.38*	0.078
	(0.06)	(0.75)	(0.19)	(0.07)	(0.72)	

Table 7: Variance decomposition for unexpected excess bond returns

This table presents the decomposition of the variance of unexpected excess bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from the benchmark VAR(1) model presented in Section 4. The VAR state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$Var[\tilde{x}_\pi]$	0.32*	0.29*	0.19***	0.23***	0.35*	0.49*	0.42**	0.48**
	(0.17)	(0.15)	(0.06)	(0.07)	(0.19)	(0.27)	(0.18)	(0.21)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.14	-0.02	-0.05	0.02	-0.17	-0.09	0.01	0.17
	(0.14)	(0.15)	(0.11)	(0.13)	(0.20)	(0.22)	(0.19)	(0.20)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.48	-0.70	-0.38	-0.43	-0.65	-0.95	-0.67	-0.83
	(0.40)	(0.58)	(0.40)	(0.42)	(0.54)	(0.80)	(0.66)	(0.74)
$Var[\tilde{x}_r]$	0.07	0.09	0.09	0.09	0.25**	0.25**	0.19**	0.18**
	(0.05)	(0.06)	(0.06)	(0.07)	(0.10)	(0.10)	(0.08)	(0.07)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.36**	0.22	0.20	0.06	0.42*	0.26	0.09	-0.16
	(0.18)	(0.21)	(0.16)	(0.20)	(0.25)	(0.29)	(0.26)	(0.30)
$Var[\tilde{x}_x]$	0.88***	1.13**	0.95**	1.03**	0.80**	1.04*	0.95*	1.16*
	(0.27)	(0.51)	(0.40)	(0.42)	(0.40)	(0.59)	(0.54)	(0.60)
				Panel B: Pre-crisis				
$Var[\tilde{x}_\pi]$	0.19*	0.20*	0.20**	0.29**	0.25*	0.27*	0.27**	0.37***
	(0.11)	(0.11)	(0.10)	(0.12)	(0.13)	(0.14)	(0.13)	(0.13)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.05	-0.04	-0.05	-0.03	-0.11	-0.04	-0.03	0.01
	(0.07)	(0.07)	(0.07)	(0.10)	(0.13)	(0.15)	(0.14)	(0.17)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.64	-0.62	-0.55	-0.59	-0.71	-0.68	-0.61	-0.61
	(0.55)	(0.57)	(0.52)	(0.61)	(0.50)	(0.56)	(0.54)	(0.59)
$Var[\tilde{x}_r]$	0.04	0.04	0.04	0.05	0.16	0.15	0.15	0.14
	(0.03)	(0.03)	(0.03)	(0.04)	(0.11)	(0.10)	(0.10)	(0.09)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.25	0.23	0.23	0.19	0.39*	0.32	0.28	0.17
	(0.15)	(0.15)	(0.15)	(0.16)	(0.21)	(0.21)	(0.21)	(0.22)
$Var[\tilde{x}_x]$	1.20**	1.18**	1.12**	1.10*	1.01**	0.98*	0.95*	0.92
	(0.52)	(0.53)	(0.50)	(0.57)	(0.47)	(0.52)	(0.52)	(0.56)

Table 8: VAR-based responses of unexpected excess bond returns to monetary policy shocks

This table reports presents the estimated response of unexpected excess bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from the benchmark VAR(1) presented in Section 4. The VAR state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
Panel A: Full sample								
$\tilde{x}_n^{MP}$	-0.54	-1.15^{*}	-1.81^{***}	-1.62^{***}	-1.58^{***}	-1.94^{***}	-2.03^{***}	-1.92^{***}
	(0.88)	(0.67)	(0.64)	(0.55)	(0.24)	(0.24)	(0.26)	(0.29)
$\tilde{x}_r^{MP}$	0.67^{*}	0.67^{*}	0.68^{**}	0.68^{**}	0.58^{***}	0.56^{***}	0.54^{***}	0.55^{***}
	(0.35)	(0.35)	(0.34)	(0.33)	(0.22)	(0.20)	(0.20)	(0.18)
$\tilde{x}_\pi^{MP}$	-2.16^{***}	-0.72	-0.03	0.42	0.11	0.62	0.63	1.33^{***}
	(0.68)	(0.76)	(0.63)	(0.71)	(0.32)	(0.39)	(0.44)	(0.44)
$\tilde{x}_x^{MP}$	2.04^{***}	1.19	1.16	0.52	0.89^{**}	0.76^{*}	0.86^{*}	0.05
	(0.65)	(0.90)	(0.77)	(0.87)	(0.36)	(0.41)	(0.48)	(0.49)
Panel B: Pre-crisis								
$\tilde{x}_n^{MP}$	-3.61^{***}	-3.77^{***}	-4.61^{***}	-4.24^{***}	-2.38^{***}	-2.63^{***}	-2.91^{***}	-2.99^{***}
	(0.52)	(0.48)	(0.45)	(0.39)	(0.19)	(0.20)	(0.20)	(0.22)
$\tilde{x}_r^{MP}$	0.55	0.55	0.55	0.54	0.53	0.51	0.52	0.46
	(0.44)	(0.43)	(0.45)	(0.44)	(0.33)	(0.33)	(0.34)	(0.33)
$\tilde{x}_\pi^{MP}$	-1.53	-1.23	-0.38	-0.38	-0.15	0.12	0.37	0.53
	(1.05)	(1.08)	(1.03)	(1.16)	(0.47)	(0.56)	(0.60)	(0.73)
$\tilde{x}_x^{MP}$	4.60^{***}	4.45^{***}	4.43^{***}	4.08^{***}	2.00^{***}	2.01^{***}	2.02^{***}	2.00^{**}
	(1.07)	(1.14)	(1.11)	(1.26)	(0.54)	(0.63)	(0.67)	(0.80)

Figure 1: Barclays corporate bond indices

This figure plots the monthly time-series for the following Barclays corporate bond indices: long-term (L) maturity with BAA and AAA ratings; intermediate (I) maturity with BAA and AAA ratings. Shaded areas denote US recessions as classified by NBER business cycle dates. The series have been normalised so that they are equal to 100 at the start of the sample period. The sample period is 1985.01–2013.12.

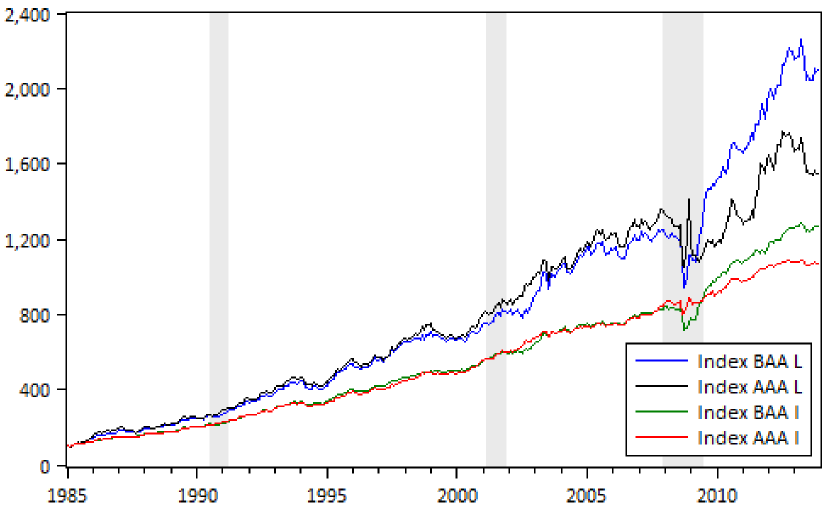

Figure 2: Monetary policy shocks

This figure plots the monthly time-series for monetary policy shocks (MP), proxied by the unexpected change in the FFR. See Section 2 for more details. Shaded areas denote US recessions as classified by NBER business cycle dates. The sample period is 1989.02–2013.12.

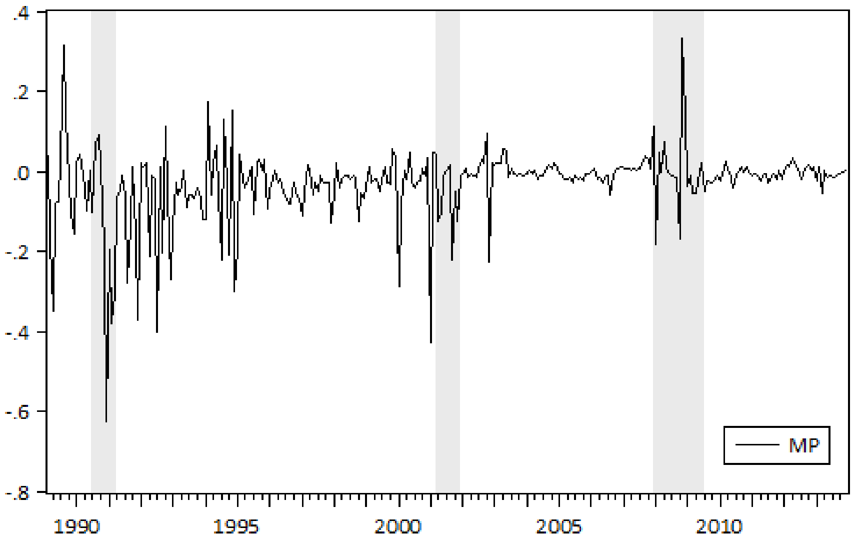

Table A.1: Mean, standard deviation, and Sharpe ratio of corporate bond returns

This table presents the mean, standard deviation, and Sharpe ratio for the returns on Barclays corporate bond indices. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The risk free rate used in the calculation of the Sharpe ratio is the continuously compounded 1-month Treasury bill rate (y_1). The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07.

	Mean	Stdev.	Sharpe
Panel A: Full sample			
AAA^L	0.81	3.31	0.15
AA^L	0.88	2.94	0.19
A^L	0.85	2.91	0.19
BAA^L	0.89	2.72	0.21
AAA^I	0.69	1.38	0.27
AA^I	0.70	1.38	0.28
A^I	0.71	1.51	0.26
BAA^I	0.74	1.52	0.28
y_1	0.31	0.21	
Panel B: Pre-crisis			
AAA^L	0.96	2.77	0.21
AA^L	0.95	2.69	0.21
A^L	0.93	2.62	0.21
4 BAA^L	0.93	2.42	0.23
AAA^I	0.78	1.31	0.30
AA^I	0.78	1.35	0.30
A^I	0.78	1.34	0.29
BAA^I	0.78	1.37	0.29
y_1	0.39	0.16	

Table A.2: Unit root tests

This table presents the estimates for the augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests, corresponding to the cases of constant and constant and trend. The sample period is 1985.01–2013.12 for all variables apart from MP, where the sample is 1989.02–2013.12. In parentheses, we report the lag-length of the ADF test, based on Akaike information criterion, and the Newey-West bandwidth for the PP test. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	ADF constant	ADF constant and trend	PP constant	PP constant and trend
AAA^L	-9.00 (3)***	-9.19 (3)***	-17.53 (3)***	-17.65 (4)***
AA^L	-14.26 (1)***	-14.36 (1)***	-17.53 (3)***	-17.57 (4)***
A^L	-14.41 (1)***	-14.51 (1)***	-16.69 (1)***	-16.65 (2)***
BAA^L	-13.90 (1)***	-13.94 (1)***	-16.49 (3)***	-16.49 (3)***
AAA^I	-14.17 (1)***	-14.40 (1)***	-16.05 (3)***	-16.16 (5)***
AA^I	-13.18 (1)***	-13.34 (1)***	-15.52 (3)***	-15.58 (4)***
A^I	-13.43 (1)***	-13.51 (1)***	-15.31 (0)***	-15.34 (0)***
BAA^I	-9.76 (2)***	-9.78 (2)***	-15.25 (5)***	-15.23 (4)***
r_r	-2.89 (14)**	-3.71 (14)**	-10.43 (6)***	-11.80 (1)***
def	-3.38 (1)**	-3.62 (1)**	-3.11 (5)**	-3.51 (6)**
$term$	-3.96 (12)***	-3.95 (12)**	-4.51 (8)***	-4.49 (8)***
π	-3.82 (14)***	-6.10 (11)***	-11.40 (8)***	-11.50 (11)***
MP	-2.58 (11)*	-3.78 (12)**	-14.60 (5)***	-15.58 (7)***

Table A.3: Variance decomposition for unexpected excess bond returns: alternative state vector 1 (adding dp)

This table presents the decomposition of the variance of unexpected excess bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}, dp_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; π denotes the monthly inflation rate; and dp is the log dividend-to-price ratio for the S& P500 stock market index. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
Panel A: Full sample								
$Var[\tilde{x}_\pi]$	0.30**	0.28**	0.19***	0.24***	0.38**	0.51**	0.42**	0.52**
	(0.13)	(0.12)	(0.07)	(0.09)	(0.16)	(0.24)	(0.17)	(0.26)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.12	-0.05	-0.02	0.06	-0.29	-0.21	-0.01	0.26
	(0.11)	(0.12)	(0.10)	(0.14)	(0.23)	(0.26)	(0.21)	(0.25)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.45	-0.67	-0.41	-0.56	-0.72	-0.95	-0.66	-1.05
	(0.33)	(0.53)	(0.41)	(0.46)	(0.50)	(0.73)	(0.65)	(0.86)
$Var[\tilde{x}_r]$	0.06	0.08	0.08	0.09	0.28**	0.28**	0.21**	0.20**
	(0.04)	(0.05)	(0.05)	(0.06)	(0.14)	(0.13)	(0.10)	(0.10)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.35**	0.26	0.19	0.04	0.50*	0.32	0.06	-0.31
	(0.16)	(0.18)	(0.17)	(0.23)	(0.26)	(0.30)	(0.30)	(0.40)
$Var[\tilde{x}_x]$	0.87***	1.10**	0.98**	1.13**	0.85**	1.05*	0.97*	1.37*
	(0.25)	(0.47)	(0.42)	(0.47)	(0.38)	(0.55)	(0.56)	(0.71)
Panel B: Pre-crisis								
$Var[\tilde{x}_\pi]$	0.19*	0.20*	0.20**	0.27**	0.30*	0.34*	0.29*	0.36**
	(0.11)	(0.12)	(0.10)	(0.12)	(0.16)	(0.20)	(0.16)	(0.15)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.04	-0.04	-0.02	0.00	-0.19	-0.16	-0.09	0.04
	(0.06)	(0.06)	(0.06)	(0.08)	(0.18)	(0.19)	(0.16)	(0.15)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.61	-0.63	-0.52	-0.59	-0.89	-0.95	-0.73	-0.59
	(0.56)	(0.57)	(0.54)	(0.62)	(0.58)	(0.67)	(0.62)	(0.62)
$Var[\tilde{x}_r]$	0.03	0.03	0.03	0.04	0.14	0.13	0.13	0.12
	(0.02)	(0.02)	(0.02)	(0.03)	(0.10)	(0.09)	(0.09)	(0.08)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.23*	0.23*	0.21	0.17	0.44	0.41	0.32	0.13
	(0.13)	(0.14)	(0.13)	(0.14)	(0.27)	(0.27)	(0.23)	(0.21)
$Var[\tilde{x}_x]$	1.19**	1.20**	1.11**	1.10*	1.21**	1.24**	1.08*	0.94
	(0.52)	(0.52)	(0.51)	(0.57)	(0.49)	(0.56)	(0.55)	(0.59)

Table A.4: Variance decomposition for unexpected excess bond returns: alternative state vector 2 (adding $ANFCI$)

This table presents the decomposition of the variance of unexpected excess bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}, ANFCI_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; π denotes the monthly inflation rate; and $ANFCI$ is the Chicago Fed Adjusted National Financial Conditions Index. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
Panel A: Full sample								
$Var[\tilde{x}_\pi]$	0.32*	0.30*	0.19***	0.23***	0.34**	0.47*	0.38**	0.45**
	(0.17)	(0.16)	(0.06)	(0.07)	(0.17)	(0.25)	(0.15)	(0.19)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.14	-0.03	-0.05	0.01	-0.18	-0.12	-0.02	0.15
	(0.13)	(0.14)	(0.11)	(0.12)	(0.18)	(0.20)	(0.16)	(0.18)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.46	-0.74	-0.40	-0.45	-0.64	-0.94	-0.63	-0.80
	(0.38)	(0.58)	(0.38)	(0.41)	(0.49)	(0.74)	(0.57)	(0.71)
$Var[\tilde{x}_r]$	0.07	0.08	0.08	0.09	0.24**	0.24**	0.19**	0.18**
	(0.05)	(0.06)	(0.06)	(0.06)	(0.10)	(0.10)	(0.08)	(0.07)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.35**	0.22	0.20	0.07	0.42*	0.28	0.11	-0.14
	(0.17)	(0.20)	(0.16)	(0.20)	(0.24)	(0.28)	(0.25)	(0.29)
$Var[\tilde{x}_x]$	0.86***	1.16**	0.97**	1.05***	0.82**	1.07**	0.96**	1.17**
	(0.27)	(0.49)	(0.37)	(0.40)	(0.36)	(0.54)	(0.47)	(0.56)
Panel B: Pre-crisis								
$Var[\tilde{x}_\pi]$	0.20*	0.21*	0.20**	0.29**	0.25**	0.28**	0.27**	0.37***
	(0.11)	(0.11)	(0.10)	(0.12)	(0.13)	(0.14)	(0.12)	(0.13)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.05	-0.04	-0.05	-0.03	-0.11	-0.05	-0.03	0.01
	(0.07)	(0.07)	(0.07)	(0.09)	(0.14)	(0.16)	(0.14)	(0.17)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.64	-0.64	-0.56	-0.61	-0.70	-0.68	-0.61	-0.62
	(0.54)	(0.55)	(0.51)	(0.60)	(0.48)	(0.53)	(0.52)	(0.55)
$Var[\tilde{x}_r]$	0.04	0.04	0.04	0.05	0.17	0.16	0.15	0.14
	(0.03)	(0.03)	(0.03)	(0.04)	(0.11)	(0.10)	(0.10)	(0.09)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.26	0.24	0.24	0.20	0.40*	0.33	0.28	0.18
	(0.16)	(0.15)	(0.15)	(0.16)	(0.22)	(0.23)	(0.22)	(0.23)
$Var[\tilde{x}_x]$	1.21**	1.19**	1.12**	1.11**	1.00**	0.97*	0.93*	0.92*
	(0.50)	(0.51)	(0.48)	(0.54)	(0.45)	(0.49)	(0.49)	(0.52)

Table A.5: Variance decomposition for unexpected excess bond returns: alternative state vector 3 (adding $CFNAI$)

This table presents the decomposition of the variance of unexpected excess bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}, CFNAI_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; π denotes the monthly inflation rate; and $CFNAI$ is the Chicago Fed National Activity Index. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$Var[\tilde{x}_\pi]$	0.35*	0.29**	0.19***	0.23***	0.36**	0.49*	0.42**	0.47**
	(0.20)	(0.14)	(0.06)	(0.07)	(0.18)	(0.29)	(0.19)	(0.22)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.15	-0.03	-0.05	0.01	-0.18	-0.10	0.01	0.16
	(0.14)	(0.15)	(0.11)	(0.13)	(0.21)	(0.23)	(0.20)	(0.20)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.53	-0.70	-0.38	-0.42	-0.65	-0.95	-0.66	-0.80
	(0.46)	(0.58)	(0.40)	(0.41)	(0.54)	(0.83)	(0.69)	(0.76)
$Var[\tilde{x}_r]$	0.07	0.09	0.08	0.09	0.25**	0.25**	0.19**	0.18**
	(0.05)	(0.06)	(0.06)	(0.06)	(0.11)	(0.10)	(0.08)	(0.07)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.37**	0.23	0.20	0.07	0.42	0.26	0.09	-0.14
	(0.18)	(0.21)	(0.17)	(0.21)	(0.26)	(0.31)	(0.28)	(0.30)
$Var[\tilde{x}_x]$	0.90***	1.13**	0.95**	1.02**	0.80**	1.05*	0.95*	1.14*
	(0.31)	(0.50)	(0.39)	(0.41)	(0.39)	(0.60)	(0.56)	(0.61)
				Panel B: Pre-crisis				
$Var[\tilde{x}_\pi]$	0.20*	0.21*	0.21**	0.30**	0.26**	0.28**	0.28**	0.38***
	(0.12)	(0.13)	(0.11)	(0.13)	(0.13)	(0.14)	(0.13)	(0.13)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.05	-0.04	-0.05	-0.04	-0.12	-0.05	-0.04	0.00
	(0.07)	(0.07)	(0.07)	(0.10)	(0.14)	(0.16)	(0.15)	(0.17)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.64	-0.62	-0.56	-0.60	-0.73	-0.70	-0.64	-0.62
	(0.59)	(0.59)	(0.54)	(0.63)	(0.50)	(0.55)	(0.53)	(0.57)
$Var[\tilde{x}_r]$	0.04	0.04	0.04	0.05	0.16	0.15	0.15	0.14
	(0.03)	(0.03)	(0.03)	(0.04)	(0.10)	(0.10)	(0.10)	(0.09)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.25*	0.23	0.23	0.19	0.40*	0.33	0.29	0.18
	(0.15)	(0.14)	(0.15)	(0.15)	(0.21)	(0.22)	(0.21)	(0.22)
$Var[\tilde{x}_x]$	1.20**	1.18**	1.12**	1.10*	1.02**	0.99**	0.96*	0.93*
	(0.53)	(0.54)	(0.50)	(0.56)	(0.46)	(0.50)	(0.50)	(0.53)

Table A.6: VAR-based response of unexpected excess bond returns to monetary policy shocks: alternative state vector 1 (adding dp)

This table reports presents the estimated response of unexpected excess bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}, dp_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; π denotes the monthly inflation rate; and dp is the log dividend-to-price ratio for the S& P500 stock market index. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
Panel A: Full sample								
$\tilde{x}_n^{MP}$	-0.59	-1.16^{*}	-1.80^{***}	-1.59^{***}	-1.60^{***}	-1.95^{***}	-2.02^{***}	-1.90^{***}
	(0.86)	(0.66)	(0.63)	(0.54)	(0.24)	(0.24)	(0.26)	(0.28)
$\tilde{x}_r^{MP}$	0.72	0.72	0.72^{*}	0.71^{*}	0.54^{*}	0.52^{*}	0.49^{*}	0.50^{**}
	(0.45)	(0.43)	(0.43)	(0.41)	(0.28)	(0.27)	(0.27)	(0.25)
$\tilde{x}_\pi^{MP}$	-2.23^{**}	-0.57	-0.19	0.19	0.29	0.85^{*}	0.70	1.19^{**}
	(0.94)	(0.89)	(0.78)	(0.85)	(0.34)	(0.43)	(0.52)	(0.53)
$\tilde{x}_x^{MP}$	2.11^{***}	1.01	1.27	0.69	0.77^{**}	0.58	0.84	0.21
	(0.71)	(0.96)	(0.89)	(1.05)	(0.36)	(0.45)	(0.56)	(0.61)
Panel B: Pre-crisis								
$\tilde{x}_n^{MP}$	-3.68^{***}	-3.84^{***}	-4.64^{***}	-4.23^{***}	-2.43^{***}	-2.68^{***}	-2.95^{***}	-2.98^{***}
	(0.49)	(0.46)	(0.43)	(0.37)	(0.18)	(0.19)	(0.19)	(0.21)
$\tilde{x}_r^{MP}$	0.65	0.64	0.66	0.64	0.52	0.50	0.52	0.46
	(0.44)	(0.44)	(0.46)	(0.45)	(0.33)	(0.33)	(0.34)	(0.34)
$\tilde{x}_\pi^{MP}$	-1.67	-1.16	-0.66	-0.66	-0.02	0.29	0.48	0.50
	(1.15)	(1.13)	(1.19)	(1.29)	(0.44)	(0.51)	(0.55)	(0.72)
$\tilde{x}_x^{MP}$	4.70^{***}	4.36^{***}	4.64^{***}	4.25^{***}	1.93^{***}	1.89^{***}	1.95^{***}	2.03^{***}
	(1.15)	(1.16)	(1.24)	(1.37)	(0.49)	(0.56)	(0.62)	(0.80)

Table A.7: VAR-based response of unexpected excess bond returns to monetary policy shocks: alternative state vector 2 (adding $ANFCI$)

This table reports presents the estimated response of unexpected excess bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}, ANFCI_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; π denotes the monthly inflation rate; and $ANFCI$ is the Chicago Fed Adjusted National Financial Conditions Index. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$\tilde{x}_n^{MP}$	-0.81	−1.46*	−2.11***	−1.87***	−1.75***	−2.12***	−2.24***	−2.08***
	(1.02)	(0.74)	(0.69)	(0.59)	(0.27)	(0.25)	(0.26)	(0.31)
$\tilde{x}_r^{MP}$	0.70*	0.71*	0.71**	0.70**	0.60***	0.58***	0.55***	0.56***
	(0.36)	(0.37)	(0.35)	(0.34)	(0.22)	(0.20)	(0.20)	(0.19)
$\tilde{x}_\pi^{MP}$	−2.22***	-0.68	-0.01	0.44	0.08	0.58	0.60	1.34***
	(0.72)	(0.80)	(0.65)	(0.72)	(0.31)	(0.35)	(0.39)	(0.42)
$\tilde{x}_x^{MP}$	2.33***	1.43	1.42*	0.72	1.08***	0.96**	1.10**	0.18
	(0.73)	(0.95)	(0.80)	(0.91)	(0.36)	(0.37)	(0.43)	(0.48)
				Panel B: Pre-crisis				
$\tilde{x}_n^{MP}$	−3.68***	−3.85***	−4.68***	−4.31***	−2.40***	−2.66***	−2.93***	−3.02***
	(0.52)	(0.48)	(0.45)	(0.39)	(0.19)	(0.20)	(0.20)	(0.22)
$\tilde{x}_r^{MP}$	0.58	0.58	0.59	0.58	0.57	0.56	0.57	0.52
	(0.44)	(0.44)	(0.45)	(0.44)	(0.36)	(0.36)	(0.37)	(0.36)
$\tilde{x}_\pi^{MP}$	-1.58	-1.32	-0.43	-0.45	-0.17	0.08	0.35	0.45
	(1.00)	(1.02)	(0.98)	(1.09)	(0.46)	(0.54)	(0.56)	(0.65)
$\tilde{x}_x^{MP}$	4.68***	4.59***	4.52***	4.18***	2.00***	2.02***	2.01***	2.06***
	(1.00)	(1.05)	(1.03)	(1.17)	(0.50)	(0.58)	(0.62)	(0.71)

Table A.8: VAR-based response of unexpected excess bond returns to monetary policy shocks: alternative state vector 3 (adding $CFNAI$)

This table reports presents the estimated response of unexpected excess bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}, CFNAI_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; π denotes the monthly inflation rate; and $CFNAI$ is the Chicago Fed National Activity Index. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$\tilde{x}_n^{MP}$	-0.79	-1.13^{*}	-1.87^{***}	-1.68^{***}	-1.47^{***}	-1.78^{***}	-1.96^{***}	-1.86^{***}
	(0.72)	(0.64)	(0.61)	(0.55)	(0.25)	(0.25)	(0.27)	(0.29)
$\tilde{x}_r^{MP}$	0.58^{*}	0.58^{*}	0.58^{*}	0.58^{**}	0.53^{**}	0.51^{***}	0.49^{**}	0.47^{***}
	(0.31)	(0.31)	(0.29)	(0.29)	(0.21)	(0.19)	(0.19)	(0.16)
$\tilde{x}_\pi^{MP}$	-1.73^{***}	-0.74	0.01	0.33	0.12	0.54	0.56	1.17^{***}
	(0.53)	(0.61)	(0.55)	(0.63)	(0.35)	(0.40)	(0.46)	(0.39)
$\tilde{x}_x^{MP}$	1.95^{***}	1.29^{*}	1.28^{*}	0.77	0.83^{**}	0.74^{*}	0.92^{*}	0.21
	(0.69)	(0.72)	(0.66)	(0.71)	(0.40)	(0.44)	(0.52)	(0.42)
				Panel B: Pre-crisis				
$\tilde{x}_n^{MP}$	-2.94^{***}	-3.07^{***}	-3.92^{***}	-3.58^{***}	-1.97^{***}	-2.20^{***}	-2.45^{***}	-2.53^{***}
	(0.62)	(0.58)	(0.55)	(0.49)	(0.26)	(0.26)	(0.27)	(0.29)
$\tilde{x}_r^{MP}$	0.53	0.53	0.54	0.52	0.51	0.49	0.50	0.44
	(0.40)	(0.40)	(0.42)	(0.40)	(0.31)	(0.31)	(0.31)	(0.31)
$\tilde{x}_\pi^{MP}$	-1.51	-1.21	-0.37	-0.37	-0.14	0.12	0.37	0.52
	(1.08)	(1.10)	(1.05)	(1.16)	(0.45)	(0.54)	(0.57)	(0.68)
$\tilde{x}_x^{MP}$	3.91^{***}	3.75^{***}	3.74^{***}	3.42^{***}	1.60^{***}	1.59^{***}	1.58^{**}	1.57^{**}
	(1.08)	(1.13)	(1.09)	(1.23)	(0.51)	(0.59)	(0.62)	(0.72)

Table A.9: Variance decomposition for unexpected excess bond returns: higher order VAR

This table presents the decomposition of the variance of unexpected excess bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from a VAR(3) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
	Panel A: Full sample							
$Var[\tilde{x}_\pi]$	0.29	0.13*	0.08	0.14**	0.12**	0.18**	0.16***	0.39*
	(0.20)	(0.07)	(0.05)	(0.07)	(0.06)	(0.09)	(0.06)	(0.20)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.16	0.01	-0.04	0.02	-0.03	0.08	0.13	0.28
	(0.19)	(0.11)	(0.08)	(0.10)	(0.15)	(0.18)	(0.15)	(0.22)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.53	-0.51	-0.22	-0.31	-0.39	-0.46	-0.26	-0.86
	(0.39)	(0.34)	(0.24)	(0.36)	(0.29)	(0.45)	(0.38)	(0.77)
$Var[\tilde{x}_r]$	0.09	0.11	0.10	0.11	0.28**	0.26**	0.20**	0.20**
	(0.07)	(0.08)	(0.08)	(0.08)	(0.12)	(0.12)	(0.09)	(0.10)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.28	0.08	0.07	-0.09	0.12	-0.08	-0.20	-0.46
	(0.22)	(0.24)	(0.19)	(0.26)	(0.34)	(0.39)	(0.34)	(0.45)
$Var[\tilde{x}_x]$	1.04***	1.19***	1.01***	1.13***	0.90**	1.02*	0.96**	1.45**
	(0.27)	(0.40)	(0.30)	(0.39)	(0.38)	(0.52)	(0.47)	(0.72)
	Panel B: Pre-crisis							
$Var[\tilde{x}_\pi]$	0.10	0.10	0.11	0.22	0.19	0.18	0.17	0.32**
	(0.07)	(0.07)	(0.07)	(0.14)	(0.17)	(0.15)	(0.11)	(0.14)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.05	-0.04	-0.05	-0.07	-0.03	0.02	0.03	0.02
	(0.08)	(0.06)	(0.08)	(0.13)	(0.15)	(0.16)	(0.15)	(0.21)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.50*	-0.44	-0.39	-0.42	-0.63	-0.53	-0.43	-0.46
	(0.29)	(0.32)	(0.33)	(0.54)	(0.55)	(0.54)	(0.47)	(0.58)
$Var[\tilde{x}_r]$	0.05	0.05	0.06	0.06	0.24	0.22*	0.21	0.20
	(0.04)	(0.04)	(0.04)	(0.05)	(0.15)	(0.13)	(0.13)	(0.13)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.17	0.14	0.13	0.06	0.18	0.11	0.06	-0.13
	(0.17)	(0.17)	(0.17)	(0.17)	(0.32)	(0.32)	(0.30)	(0.32)
$Var[\tilde{x}_x]$	1.23***	1.18***	1.14***	1.15**	1.05**	1.00*	0.96*	1.04*
	(0.33)	(0.36)	(0.36)	(0.48)	(0.53)	(0.54)	(0.51)	(0.56)

Table A.10: VAR-based response of unexpected excess bond returns to monetary policy shocks: higher order VAR

This table reports presents the estimated response of unexpected excess bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from a VAR(3) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$\tilde{x}_n^{MP}$	-1.27	−1.72***	−2.25***	−1.73***	−1.78***	−2.09***	−2.29***	−1.84***
	(0.88)	(0.65)	(0.60)	(0.52)	(0.27)	(0.24)	(0.28)	(0.29)
$\tilde{x}_r^{MP}$	0.75	0.81*	0.74*	0.68*	0.54*	0.56*	0.43	0.46**
	(0.50)	(0.49)	(0.44)	(0.40)	(0.32)	(0.29)	(0.29)	(0.22)
$\tilde{x}_\pi^{MP}$	−1.90**	-0.51	-0.20	0.18	-0.23	0.27	0.30	0.99**
	(0.78)	(0.60)	(0.44)	(0.56)	(0.29)	(0.38)	(0.42)	(0.40)
$\tilde{x}_x^{MP}$	2.41***	1.42	1.70**	0.87	1.48***	1.26**	1.57**	0.39
	(0.86)	(0.97)	(0.71)	(0.88)	(0.48)	(0.54)	(0.61)	(0.55)
				Panel B: Pre-crisis				
$\tilde{x}_n^{MP}$	-3.65***	-3.78***	-4.52***	-4.03***	-2.35***	-2.63***	-2.90***	-2.84***
	(0.53)	(0.50)	(0.46)	(0.42)	(0.21)	(0.21)	(0.21)	(0.25)
$\tilde{x}_r^{MP}$	0.36	0.31	0.18	0.05	0.51	0.36	0.30	-0.08
	(0.45)	(0.47)	(0.48)	(0.42)	(0.35)	(0.37)	(0.38)	(0.35)
$\tilde{x}_\pi^{MP}$	-1.44**	-1.10*	-0.49	-0.29	-0.14	0.08	0.39	0.69
	(0.58)	(0.64)	(0.65)	(0.85)	(0.36)	(0.43)	(0.43)	(0.51)
$\tilde{x}_x^{MP}$	4.74***	4.57***	4.84***	4.28***	1.98***	2.19***	2.20***	2.23***
	(0.75)	(0.80)	(0.81)	(0.96)	(0.51)	(0.56)	(0.58)	(0.63)

Table A.11: Variance decomposition for unexpected excess bond returns: consol bonds

This table presents the decomposition of the variance of unexpected excess long-term bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with infinite average maturity; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The relevant formulas for consol bonds are used. The Barclays indices represent portfolios of corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L
Panel A: Full sample				
$Var[\tilde{x}_\pi]$	0.32*	0.29*	0.19***	0.23***
	(0.17)	(0.15)	(0.06)	(0.07)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.14	-0.02	-0.05	0.02
	(0.14)	(0.15)	(0.11)	(0.13)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.48	-0.70	-0.38	-0.43
	(0.40)	(0.58)	(0.40)	(0.42)
$Var[\tilde{x}_r]$	0.07	0.09	0.09	0.09
	(0.05)	(0.06)	(0.06)	(0.07)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.36**	0.22	0.20	0.06
	(0.18)	(0.21)	(0.16)	(0.20)
$Var[\tilde{x}_x]$	0.88***	1.13**	0.95**	1.03**
	(0.27)	(0.51)	(0.40)	(0.42)
Panel B: Pre-crisis				
$Var[\tilde{x}_\pi]$	0.19*	0.20*	0.20**	0.29**
	(0.11)	(0.11)	(0.10)	(0.12)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.05	-0.04	-0.05	-0.03
	(0.07)	(0.07)	(0.07)	(0.10)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	-0.64	-0.62	-0.55	-0.59
	(0.55)	(0.57)	(0.52)	(0.61)
$Var[\tilde{x}_r]$	0.04	0.04	0.04	0.05
	(0.03)	(0.03)	(0.03)	(0.04)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	0.25	0.23	0.23	0.19
	(0.15)	(0.15)	(0.15)	(0.16)
$Var[\tilde{x}_x]$	1.20**	1.18**	1.12**	1.10*
	(0.52)	(0.53)	(0.50)	(0.57)

Table A.12: VAR-based response of unexpected excess bond returns to monetary policy shocks: consol bonds

This table reports presents the estimated response of unexpected excess long-term bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with infinite average maturity; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. The relevant formulas for consol bonds are used. The Barclays indices represent portfolios of corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L
Panel A: Full sample				
$\tilde{x}_n^{MP}$	-0.54	-1.15^{*}	-1.81^{***}	-1.62^{***}
	(0.88)	(0.67)	(0.64)	(0.55)
$\tilde{x}_r^{MP}$	0.67^{*}	0.68^{*}	0.68^{**}	0.68^{**}
	(0.35)	(0.35)	(0.34)	(0.33)
$\tilde{x}_\pi^{MP}$	-2.16^{***}	-0.72	-0.03	0.41
	(0.69)	(0.76)	(0.63)	(0.71)
$\tilde{x}_x^{MP}$	2.04^{***}	1.19	1.16	0.52
	(0.66)	(0.90)	(0.77)	(0.87)
Panel B: Pre-crisis				
$\tilde{x}_n^{MP}$	-3.61^{***}	-3.77^{***}	-4.61^{***}	-4.24^{***}
	(0.52)	(0.48)	(0.45)	(0.39)
$\tilde{x}_r^{MP}$	0.55	0.55	0.55	0.54
	(0.44)	(0.43)	(0.45)	(0.44)
$\tilde{x}_\pi^{MP}$	-1.53	-1.23	-0.38	-0.38
	(1.05)	(1.08)	(1.03)	(1.16)
$\tilde{x}_x^{MP}$	4.60^{***}	4.46^{***}	4.43^{***}	4.08^{***}
	(1.07)	(1.14)	(1.11)	(1.26)

Table A.13: Variance decomposition for unexpected excess bond returns: alternative identification (real interest rate news as residual)

This table presents the decomposition of the variance of unexpected excess bond returns into the variance of inflation news ($\tilde{x}_\pi$), the variance of real interest rate news ($\tilde{x}_r$), the variance of discount rate news ($\tilde{x}_x$), and the covariances between these three news components. News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. Real interest rate news are backed out as the residual component of the decomposition. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1985.01–2013.12 and the pre-crisis period is 1985.01–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
Panel A: Full sample								
$Var[\tilde{x}_\pi]$	0.03	0.03	0.03	0.03	0.12	0.12	0.09	0.08
	(0.03)	(0.04)	(0.04)	(0.04)	(0.17)	(0.16)	(0.11)	(0.10)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.07	0.08	0.02	0.05	0.06	0.15	0.11	0.12
	(0.12)	(0.12)	(0.07)	(0.08)	(0.17)	(0.20)	(0.15)	(0.18)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	0.13	-0.04	-0.03	-0.12	0.00	-0.21	-0.26	-0.37
	(0.14)	(0.23)	(0.17)	(0.21)	(0.42)	(0.53)	(0.44)	(0.41)
$Var[\tilde{x}_r]$	0.28*	0.24**	0.18***	0.26***	0.25***	0.38***	0.43***	0.63***
	(0.16)	(0.12)	(0.03)	(0.07)	(0.06)	(0.14)	(0.14)	(0.22)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	-0.25	-0.44	-0.15	-0.25	-0.24	-0.48	-0.31	-0.62
	(0.38)	(0.50)	(0.36)	(0.37)	(0.31)	(0.54)	(0.48)	(0.73)
$Var[\tilde{x}_x]$	0.88***	1.13**	0.95**	1.03**	0.80**	1.04*	0.95*	1.16*
	(0.27)	(0.51)	(0.40)	(0.42)	(0.40)	(0.59)	(0.54)	(0.60)
Panel B: Pre-crisis								
$Var[\tilde{x}_\pi]$	0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.04
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)	(0.04)	(0.03)
$2Cov[\tilde{x}_r, \tilde{x}_\pi]$	-0.01	0.00	-0.01	0.00	0.00	0.04	0.05	0.05
	(0.04)	(0.04)	(0.04)	(0.06)	(0.10)	(0.11)	(0.10)	(0.12)
$2Cov[\tilde{x}_x, \tilde{x}_\pi]$	0.16	0.15	0.14	0.12	0.26	0.22	0.19	0.13
	(0.12)	(0.12)	(0.12)	(0.12)	(0.17)	(0.16)	(0.15)	(0.16)
$Var[\tilde{x}_r]$	0.18*	0.20*	0.19**	0.29**	0.26**	0.30*	0.30**	0.43***
	(0.10)	(0.11)	(0.09)	(0.11)	(0.13)	(0.16)	(0.14)	(0.16)
$2Cov[\tilde{x}_x, \tilde{x}_r]$	-0.54	-0.53	-0.46	-0.53	-0.58	-0.58	-0.53	-0.57
	(0.56)	(0.58)	(0.53)	(0.62)	(0.50)	(0.55)	(0.54)	(0.60)
$Var[\tilde{x}_x]$	1.20**	1.18**	1.12**	1.10*	1.01**	0.98*	0.95*	0.92
	(0.52)	(0.53)	(0.50)	(0.57)	(0.47)	(0.52)	(0.52)	(0.56)

Table A.14: VAR-based response of unexpected excess bond returns to monetary policy shocks: alternative identification (real interest rate news as residual)

This table reports presents the estimated response of unexpected excess bond returns ($\tilde{x}_n^{MP}$) and the three news components (real interest rate news, $\tilde{x}_r^{MP}$; inflation news, $\tilde{x}_\pi^{MP}$; and discount rate news, $\tilde{x}_x^{MP}$) to monetary policy shocks (unexpected change in the FFR, MP). News components are extracted from a VAR(1) model where the state vector is given by $[x_{n,t+1}, r_{r,t+1}, def_{t+1}, term_{t+1}, \pi_{t+1}]'$, where x_n denotes excess returns on the Barclays corporate bond index with average maturity n; r_r is the 1-month real interest rate; def denotes the default spread; $term$ is the term spread; and π denotes the monthly inflation rate. Real interest rate news are backed out as the residual component of the decomposition. The Barclays indices represent portfolios of long-term (L) and intermediate (I) maturity corporate bonds with AAA, AA, A, and BAA ratings. The full sample period is 1989.02–2013.12 and the pre-crisis period is 1989.02–2007.07. The standard errors reported in parentheses are computed using the delta method. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	AAA^L	AA^L	A^L	BAA^L	AAA^I	AA^I	A^I	BAA^I
				Panel A: Full sample				
$\tilde{x}_n^{MP}$	-0.54	−1.15*	−1.81***	−1.62***	−1.58***	−1.94***	−2.03***	−1.92***
	(0.88)	(0.67)	(0.64)	(0.55)	(0.24)	(0.24)	(0.26)	(0.29)
$\tilde{x}_r^{MP}$	−1.61**	-0.18	0.54	0.98	0.69**	1.25***	1.32***	1.92***
	(0.69)	(0.75)	(0.66)	(0.76)	(0.27)	(0.35)	(0.42)	(0.50)
$\tilde{x}_\pi^{MP}$	0.12	0.14	0.11	0.12	0.00	-0.06	-0.15	-0.04
	(0.24)	(0.25)	(0.23)	(0.23)	(0.20)	(0.19)	(0.20)	(0.15)
$\tilde{x}_x^{MP}$	2.04***	1.19	1.16	0.52	0.89**	0.76*	0.86*	0.05
	(0.65)	(0.90)	(0.77)	(0.87)	(0.36)	(0.41)	(0.48)	(0.49)
				Panel B: Pre-crisis				
$\tilde{x}_n^{MP}$	−3.61***	−3.77***	−4.61***	−4.24***	−2.38***	−2.63***	−2.91***	−2.99***
	(0.52)	(0.48)	(0.45)	(0.39)	(0.19)	(0.20)	(0.20)	(0.22)
$\tilde{x}_r^{MP}$	-1.23	-0.93	-0.08	-0.08	0.12	0.38	0.65	0.78
	(1.14)	(1.17)	(1.12)	(1.26)	(0.53)	(0.62)	(0.66)	(0.81)
$\tilde{x}_\pi^{MP}$	0.24	0.25	0.25	0.24	0.26	0.24	0.25	0.21
	(0.31)	(0.31)	(0.32)	(0.31)	(0.25)	(0.25)	(0.26)	(0.26)
$\tilde{x}_x^{MP}$	4.60***	4.45***	4.43***	4.08***	2.00***	2.01***	2.02***	2.00**
	(1.07)	(1.14)	(1.11)	(1.26)	(0.54)	(0.63)	(0.67)	(0.80)