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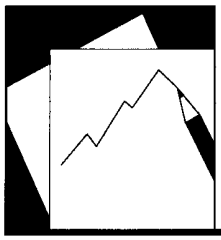

IMF Working Paper

News and Monetary Shocks at a High Frequency: A Simple Approach

Troy Matheson and Emil Stavrev

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News and Monetary Shocks at a High Frequency: A Simple Approach

Prepared by Troy Matheson and Emil Stavrev[1]

Authorized for distribution by Hamid Faruqee

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Abstract

We develop a simple approach to identify economic news and monetary shocks at a high frequency. The approach is used to examine financial market developments in the United States following the Federal Reserve's May 22, 2013 taper talk suggesting that it would begin winding down its quantitative easing program. Our findings show that the sharp rise in 10-year Treasury bond yields immediately after the taper talk was largely due to monetary shocks, with positive economic news becoming increasingly important in subsequent months.

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Author's E-Mail Address: tmatheson@imf.org; estavrev@imf.org

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I. INTRODUCTION

Disentangling the relative impacts of economic news and monetary shocks is crucial to understand financial market developments. In this paper, we develop a simple method to untangle these two shocks. We employ a bivariate structural VAR containing (log) equity prices and 10-year bond yields estimated at the daily frequency and identified with sign restrictions. The sign restrictions used are economically intuitive and easy to employ. The basic intuition is as follows: equity prices and bond yields increase following positive economic news; unexpected monetary tightening reduces equity prices and increases bond yields. Specifically: (i) equity prices and bond yields rise/fall as a result of unexpected positive/negative economic news for future economic activity; (ii) equity prices rise/fall and bond yields fall/rise as a result of unexpected monetary loosening/tightening (because of central bank action or market perceptions); and (iii) central banks tighten/loosen monetary policy in response to expectations of stronger/weaker economic activity, i.e., there is a monetary policy reaction function.

The methodology is used to examine the sharp increase in the U.S. long-term interest rates following Chairman Ben Bernanke's testimony to Congress on May 22, 2013. In response to a question during his testimony, the Chairman said that whenever stimulus efforts began to taper off, it would not happen in an "automatic, mechanistic program" and that "any change would depend on the incoming data." After the details of the Federal Open Market Committee meeting on April 30 and May 1 2013 were released later that day, many market participants were surprised by the number of voices inside the Fed calling for a slowdown in the stimulus effort in the near future.

Our findings show that the sharp rise in 10-year Treasury bond yields that immediately followed May 22 was largely due to monetary policy shocks, with the impact of positive economic news becoming increasingly important in subsequent months. Our results are robust when the model is estimated over different samples and using different model-selection strategies.

II. METHODOLOGY

A. Model

To examine the relative impacts of economic news (*NEWS*) and monetary surprises (*MONEY*) on bond yields (*R*) and equity prices (*S*), we adopt a simple bivariate structural VAR estimated using daily data:

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 S_{i,t-1} + \varepsilon_t^R \quad (1)$$

$$S_t = \delta_0 + \delta_1 R_{t-1} + \delta_2 S_{t-1} + \varepsilon_t^S \quad (2)$$

where the reduced-form shocks to yields and equity prices (ε_t^R and ε_t^S, respectively) are driven by two structural shocks (*NEWS* and *MONEY*):

$$\varepsilon_t^R = \alpha_3 NEWS_t + \alpha_4 MONEY_t \quad (3)$$

$$\varepsilon_t^S = \delta_3 NEWS_t + \delta_4 MONEY_t \quad (4)$$

and $NEWS_t \sim \mathrm{N}(0,1)$ and $MONEY_t \sim \mathrm{N}(0,1)$.

The parameters of the reduced-form model (equations 1 and 2) are estimated using OLS, and the structural parameters (equations 3 and 4) are estimated using contemporaneous sign restrictions. As described in Section I, the sign restrictions assume that positive economic news leads to an expected monetary response causing interest rates to rise to stabilize expectations of activity and inflation, while a monetary shock is assumed to cause long-term yields to rise and equity prices to fall as a monetary response reduces activity and inflation. The sign restrictions can be summarized as follows:

	Yields (R)	*Stocks (S)*
NEWS	+	+
MONEY	+	-

The sign restrictions are implemented as follows. If we let ε contain the reduced-form shocks from equations 1 and 2 and ϵ contain the structural shocks from equations 3 and 4. Then:

$$\varepsilon = \mathrm{S}^{-1}\epsilon \quad (5)$$

If the variance-covariance matrix of the reduced-form shocks is Σ, the lower-triangular Cholesky decomposition of Σ, *P*, yields $\mathrm{S}^{-1} = P$ and $\Sigma = PP'$. Notice that $\mathrm{S}^{-1} = PD$ also satisfies $\Sigma = PP'$, if *D* is orthogonal, i.e., $PP' = I$. In fact, an infinite number of matrices *P* can be examined by repeatedly drawing orthonormal rotation matrices *D* and retaining those whose impulse response functions satisfy the a priori sign restrictions. The procedure consists of the following steps (see, for example, Rubio-Ramirez and others, 2005):

1. Draw a matrix *X* from N(0,1). Derive the QR decomposition of *X* such that $X = QR$ and $QQ' = I$;

2. Let $D = Q'$ and compute the impulse response function using the orthogonalization $\mathrm{S}^{-1} = PD$. If it satisfies the sign restrictions, keep it.

3. Repeat 1 and 2 until we have 10000 valid models.

The baseline model we choose is that which minimizes the squared distance to the median contemporaneous impulse response for both equity prices and bond yields. Let Z_S and Z_R be the contemporaneous impulse responses for equity prices and bond yields, respectively. Then, the baseline model is determined by the following minimization problem:

$$\min_D \left(Z_S - Z_S^{Median}\right)^2 + \left(Z_R - Z_R^{Median}\right)^2 \quad (6)$$

B. Data

We use daily data spanning January 2003 to June 2014. The long-term bond yield (*R*) series is the 10-year Treasury yield at constant maturity and the equity price (*S*) series is the (log) S&P 500 index.

III. RESULTS

The top panels of Figure 1 shows historical shock decompositions converted to the quarterly frequency for equity prices and bond yields over the entire sample (January 2003 to June 2014). The bottom panels show the decompositions at the daily frequency following May 22, 2013. The results are economically intuitive.

In the lead up to financial crisis, equity prices and bond yields were boosted by strong economic activity. At the same time, the Federal Reserve was acting to contain inflation by tightening monetary conditions, putting upward pressure on bond yields and downward pressure on equity prices. With the onset of the financial crisis in late 2007, a string of negative news shocks led the Federal Reserve to cut its policy rate and, by late 2008, the rate hit the zero lower bound (ZLB). However, adverse economic news continued impacting the economy while policy rates remained at ZLB, pushing yields and equity prices down.

The model suggests that during 2009-10, with policy rates at ZLB, markets perceived monetary conditions to be too tight relative to the flow of economic news, with money shocks increasing bond yields and reducing equity prices. However, in late 2011, the situation changed as the Federal Reserve began buying bonds with maturities of 6 to 30 years and selling bonds with maturities less than 3 years (Operation Twist, OT). Following OT, the average maturity of the Fed portfolio extended appreciably, which effectively reduced long-term bond yields and boosted equity prices (Figure 1, top panels: money shocks pushed up stocks and down long-term yields from late 2011 until May 2013).

The daily decompositions after the May 22, 2013 taper talk are shown in the lower panels of Figure 1. These results suggest that bond yields rose because of a combination of positive economic news and tightening money shocks. The impact of money shocks were particularly important between the FOMC statements in June and September, when tightening monetary conditions were acting to offset the positive effects of other economic news on equity prices. Following the Fed's September decision to delay tapering until 2014, the impact of monetary shocks began to unwind, boosting equity prices, and putting downward pressure on yields by the end of the year. By mid-2014, the impact of monetary shocks on yields is negligible.

IV. ROBUSTNESS CHECKS

We examine the robustness of our findings by estimating the model over different sample periods and by using different model-selection assumptions.

The results showing the daily decomposition of bond yields from May 22, 2013 until mid-2014 using different samples are displayed in Figure 2. The top panel shows the results when the model is estimated over the period from the Lehman collapse (September 15, 2008) to

mid-2014. The bottom panel shows the results when the model is estimated since the beginning of 1998 to the day before the Lehman collapse (September 14, 2008).

As a robustness check, in addition to the baseline model (using minimum difference from the median criteria; equation 6), Figure 3 shows historical shock decompositions from models using as a criterion the minimum squared distance to the median contemporaneous impulse response function for either equity prices or bond yields. It also shows the results from the baseline model-selection method, where the model is just identified so that sign restriction imposed on equity prices to a monetary shock is relaxed (freely determined).

Overall, we find that our results are very similar both when different samples and different model-selection schemes are used to estimate the model. Likewise, looking at one-step-ahead forecast error variance decompositions from a variety of models shows very similar contributions to 10-year bond yields (Table 1). Here, we also provide results from a monthly VAR that includes (log) industrial production, (log) CPI excluding food and energy, and 10-year bond yields estimated over the past 10 years and the past 15 years.[2]

Table 1: Percent Variance of Bond Yields Explained

	NEWS	MONEY
Baseline	0.69	0.31
Post Lehman	0.71	0.29
Pre Lehman	0.66	0.34
All Weight on Bond	0.69	0.31
All Weight on Equity	0.69	0.31
Just Identified	0.68	0.32
Monthly (past 10 years)	0.63	0.37
Monthly (past 15 years)	0.62	0.38

The results suggest that during May–December 2013 money shocks have been, overall, a less important contributor to the variation in long-term bond yields than economic news shocks, with around two thirds of the variance of bond yields being driven by economic news shocks.

V. CONCLUSIONS

We developed a simple approach to identify economic news and monetary shocks at a high frequency. The approach was used to examine financial market developments in the United States following the Federal Reserve's communication on May 22, 2013, suggesting it would begin winding down its quantitative easing program.

[2] The monthly VAR is identified with the following contemporaneous sign restrictions: a demand shock increases all variables; a cost-push shock increases prices and yields and reduces activity; a money shock increases yields and reduces the other variables. The contribution from NEWS in Table 1 is the sum of contributions from demand and cost-push shocks.

Our findings show that the sharp rise in 10-year Treasury bond yields that immediately followed the May 22 taper talk was largely due to monetary policy shocks, with the impact of positive economic news becoming increasingly important in subsequent months. We also find that our results are robust when the model is estimated over different samples and using different model-selection strategies.

The results highlight the importance of perceptions about the current and future stance of monetary policy for the dynamics of long-term bond yields, with around one third of the variation in bond yields being attributable to money shocks. The results also indicate the importance of central bank transparency and communications given multiple objectives and instruments, as well as prevailing uncertainties about growth, inflation, and monetary transmission. To avoid undue market turbulence, a challenge for central banks will be to provide clear guidance about their policy intentions without encouraging excessive risk taking and market volatility. To this end, communications should shift focus from explaining potential triggers of interest rate adjustment towards conveying views about policy trade-offs to address cyclical and/or financial stability concerns.

References

Rubio-Ramirez, J. F., D. Waggoner, T. Zha (2005). Markov-Switching Structural Vector Autoregressions: Theory and Application. Federal Reserve Bank of Atlanta 2005-27.

Figure 1. Historical Shocks Decompositions, % Deviation from Deterministic Trend

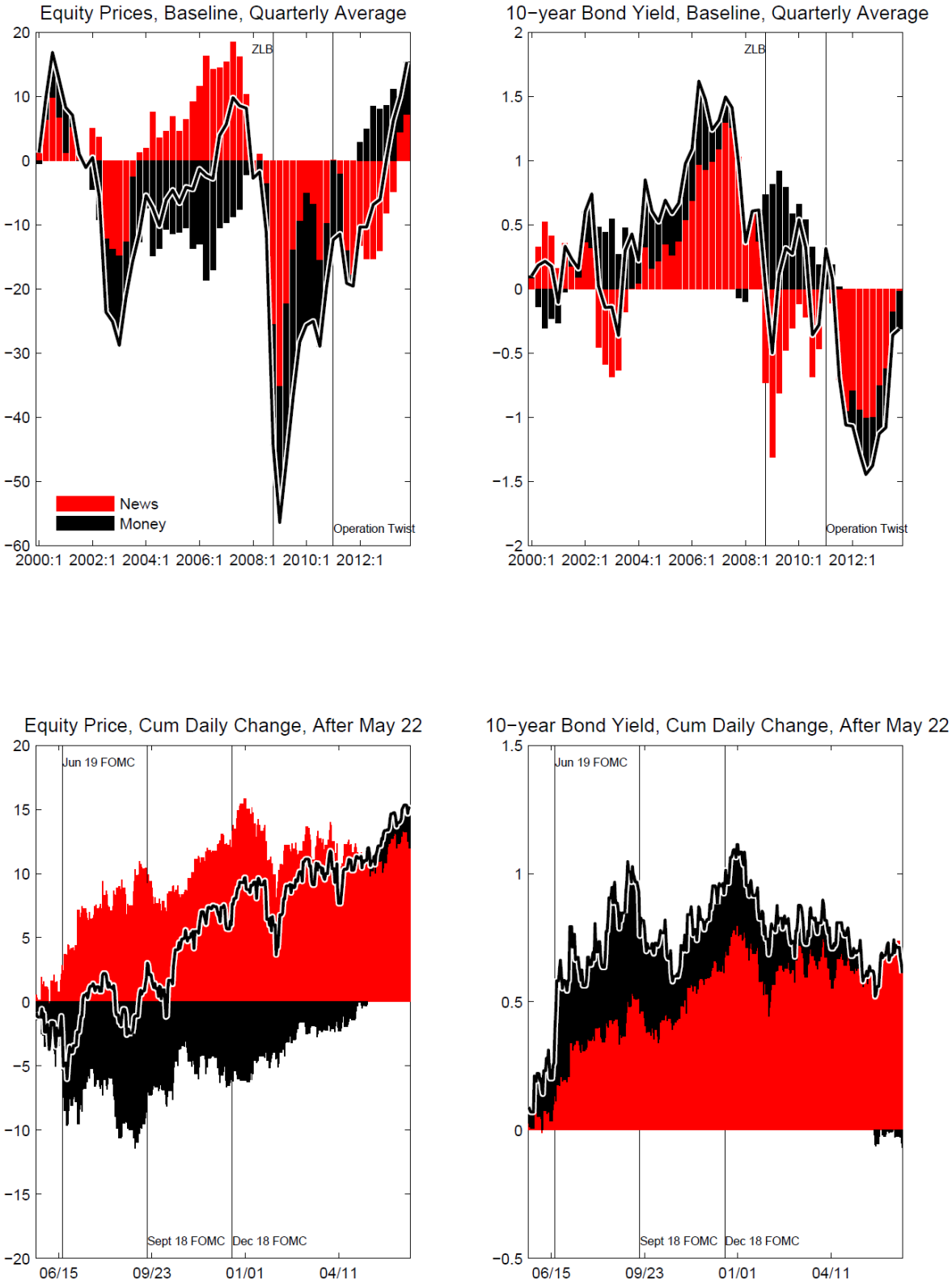

Figure 2. Robustness: 10-year Bond Yields, Different Samples (cumulative change)

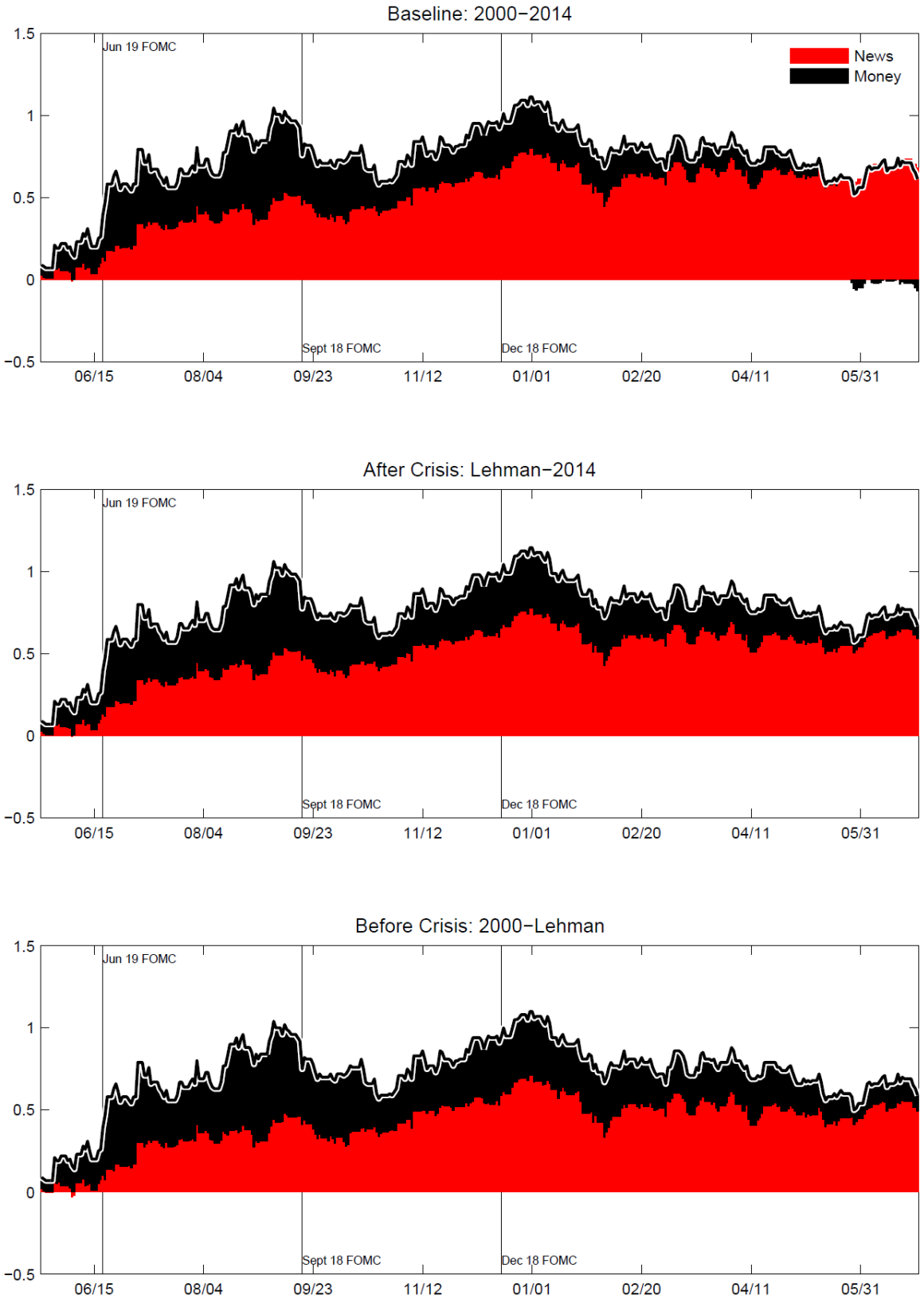

Figure 3. Robustness: 10-year Bond Yields, Different Selection (cumulative change)