The Effect of Monetary Policy on Global Fixed Income Covariances

Paul Wohlfarth and Xiaohong Chen*

November 21, 2019

Abstract

We analyse the effect of monetary policy on dynamic covariances on global fixed income markets, using a novel measure for monetary policy attention based on Google Search data. We filter covariances using a Dynamic Conditional Correlation model as baseline case and a BEKK model as well as a long-memory exponential smoother proposed by RiskMetrics for robustness. We find evidence for direct impact of policy on both asset variances and covariances domestically and internationally, supporting both signalling and portfolio rebalancing channels in the context of international policy transmission.

JEL Classifications: E52, E44, G1, G10, G15, C32

Keywords: Attention, Google, Monetary Policy, International Financial Markets, Macro-Finance, Sovereign Bonds, International Finance, Bond Markets

1 Introduction

The analysis of covariances on international fixed income markets is of great importance to both policy makers and practitioners. For monetary policy, transmission channels will inevitably need to be informed through effects of policy on interest rates. Fixed income markets are hence at the core of policy analysis. It is further widely accepted that fixed income markets are segmented and international. It is therefore crucial to consider policy effects along credit and term structures of bond portfolios both, domestically and internationally. On financial markets, analysing asset correlations is a crucial part of portfolio management. Knowing the impact of policy on asset covariances is hence important to allow for adjustment of portfolio management strategies.

There is a well developed financial literature studying co-movements across asset classes (Shiller and Beltratti (1992)) and countries (Ammer and Mei (1996),

***Aknowledgdements:** We are indebted to Ron Smith, Yunus Aksoy for the help and comments provided. I am further grateful for comments from Dr. Pedro Gomes, Prof. Stephen Wright and from attendees of the July 2017 Birkbeck Jamboree.

dAddona and Kind (2006)). Yet there is relatively little empirical research on the impact of policy factors on asset correlations. Andersen et al. (2007) analyse the effect of several news releases on price discovery across countries and assets using intra-daily data. They find significant cross-country and cross-asset linkages, even after controlling for macroeconomic releases. In this sense policy variables enter by informing policy states but the focus is not on studying the direct impact of policy on covariances. One obstacle to overcome here are the different frequencies commonly observed for financial, policy and economic variables: Financial data can be observed in real time and is typically analysed in daily or weekly frequency, whilst most macroeconomic variables are observed in monthly or quarterly frequency. There is a large literature of mixed-data sampling (MIDAS) methods following Ghysels et al. (2007) that tackles this challenge. However, the MIDAS approach relies on the highest frequencies being observed in covariates, whereas in order to evaluate effects of policy on market variables we would typically find the highest frequencies in dependent variables, which raises the need for a high frequent policy measure.

In Macroeconomics, monetary policy transmission has traditionally been tackled in general equilibrium models, assuming market completeness for tracktability (Christiano et al. (2005), Smets and Wouters (2003)). But such DSGE models fail to produce sufficiently large term spreads on the fixed income market (Rudebusch and Swanson (2008)). Partial-equilibrium models of the fixed income market address this bond-premium puzzle by assuming market segmentation, which is empirically analysed in Krishnamurthy and Vissing-Jorgensen (2007) and Krishnamurthy and Vissing-Jorgensen (2011). Vayanos and Vila (2009) formalise market segmentation in a preferred-habitat theory of the fixed income market, which is extended in Hamilton and Wu (2012), and Altavilla et al. (2015). International policy transmission has predominantly been studied between large and small central banks (Bauer and Neely (2014) and Neely (2015)) or focused on the role of foreign exchange markets (Georgiadis and Gräb (2016)). But research on the existence of global financial cycles (Rey (2015), Miranda-Agrippino and Rey (2015)) suggests that in the presence of large central banks FX markets insufficiently capture international policy transmission.

We approach international policy transmission by linking the finance literature, focussing on the evolution of asset covariances with the macroeconomic literature, focussing on policy transmission. In doing so, we tackle both, latency and frequency problems by employing a novel measure for monetary attention based on Google keyword search data following Bloom (2009) and Baker et al. (2016). We then use the measure in regressions on daily dynamic covariances. This is in the same vein as Gomes and Taamouti (2016) who used more general policy risk factors based on Google data in regressions on weekly European asset covariances. In particular, they show that covariances between assets are linear functions of such risk factors. This result allows us to employ simple linear regression techniques to assess the effect of our policy measures on covariances. We use policy rate futures as alternative policy measures, capturing policy guidance, in line with Gurkaynak et al. (2004) and Kuttner (2001), where futures are used to measure policy rate surprises on identified announcement dates. However, these surprise factors are typically constructed through event studies by accumulating immediate reactions in short (intra-daily) windows around policy announcements over longer (typically monthly) frequencies, hence resulting in a lower frequent measure. To control for policy rate guidance we therefore include futures directly in our models. This accommodates the use of a policy-guidance measure on daily frequency, but suffers from the caveat of a potentially noisier process. We filter covariances using three different filters from daily US and Eurozone fixed income series. Our baseline case is a dynamic conditional correlation (DCC) model introduced in Engle (2002) and Engle and Sheppard (2001). We accommodate some of the concerns raised regarding the DCC filter (Caporin and McAleer (2013)), by applying two alternative covariance measures: pairwise BEKK covariances (Baba et al., 1990) and a long-memory exponential smoother (Zumbach (2007)).

Our main contribution is to provide evidence of effects of monetary policy through both, a forward guidance and a policy attention measure on portfolio arbitrage internationally and across fixed income market segments. Our results add to evidence on the existence of both a portfolio-rebalancing channel as well as a signalling channel of monetary transmission domestically and internationally. We further offer a case study on the use of internet search data to measure policy attention that is otherwise difficult to observe and thereby introduce a new measure of monetary policy that accommodates high-frequency data and captures a broader range of policy signals than official announcements or policy rates.

The remainder of this paper is structured as follows: The next section introduces our estimation strategy, section 3 gives a summary of the data used and section 4 presents our results. Section 5 offers a conclusion and an outlook.

2 Estimation Strategy

We are investigating covariation of the US-American and the European fixed income markets in the context of diverging monetary policy reactions between both currency areas. In doing so, we proceed with our estimations in two steps. In the first step we estimate conditional volatilities and covariances, which will then in the second step be regressed against our policy measures alongside a number of further independent variables.

2.1 Covariance Filtering

Our baseline models will employ covariances obtained with a dynamic conditional correlation filter following Engle (2002). We employ two alternative covariance filters, a long-memory exponential smoother (Zumbach (2007)) and a BEKK model (Baba et al. (1990)). This section gives an outline of the different covariance estimators.

Given the return on bond i, y_t^i on a segmented fixed income market follows a random walk with drift and the VIX volatility index, we have [1]

$$y_t^i = b_0 + b_1 VIX + \upsilon_t, \tag{1}$$

where

$$\upsilon_t^{1/2} = \varepsilon \boldsymbol{H_t}, \quad \varepsilon \sim IID(0, \Sigma\Sigma')$$

[1]Equilibrium returns on a segmented fixed income market can be derived based on a mean-variance optimisation of an arbitrage portfolio in a preferred-habitat model. See Wohlfarth (2017) for more details.

We are particularily interested in the conditional variance-covariance processes, υ_t. Conditional variances are often explained modelling volatility clusters that are commonly observed in high-frequency financial data using a wide class of ARCH/GARCH models (Engle (1982) Bollerslev (1990)). Such univariate volatility models assume diagonality of $\boldsymbol{H_t}$, and hence no cross-correlations between covariances. When estimating a portfolio of asset returns, this assumption is clearly problematic and estimators might be biased. We relax this assumption and proceed with the estimation of three multivariate volatility models.

DCC Covariances The Dynamic Conditional Correlation model (Engle and Sheppard (2001), Engle (2002)) allows for the estimation of the covariances between assets in (1) efficiently through variance-targeting, i.e. the separate estimation of conditional variances and (unconditional) cross-correlations between those variances. Covariances then evolve according to the following decomposition:

$$\mathbf{H_t} = \mathbf{D_t R_t D_t}, \tag{2}$$

where

$$\mathbf{D_t} = \begin{pmatrix} \sigma_{1,t} & 0 & \cdots & 0 \\ 0 & \sigma_{2,t} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_{m,t} \end{pmatrix}, \mathbf{R} = \begin{pmatrix} 1 & \rho_{12,t} & \cdots & \rho_{1m,t} \\ \rho_{21,t} & 1 & \cdots & \rho_{2m,t} \\ \vdots & \vdots & \ddots & \vdots \\ \rho_{m1,t} & \rho_{m2,t} & \cdots & 1 \end{pmatrix}$$

and

$$\begin{aligned} \mathbf{R_t} &= \mathbf{Q_t^* Q_t Q_t^*}, \\ \boldsymbol{Q_t} &= (1-a-b)\boldsymbol{R} + a\boldsymbol{u}_{t-1}\boldsymbol{u}'_{t-1} + b\boldsymbol{Q}_{t-1}, \\ \boldsymbol{Q}_t^* &= (\boldsymbol{Q}_t \odot \boldsymbol{I}_k)^{-\frac{1}{2}}. \end{aligned}$$

$\boldsymbol{D}_t$ is a $m \times m$, diagonal matrix containing the conditional volatilities, $\sigma_{i,t}, i = 1, 2, \cdots, m$, of asset returns estimated in the first stage and $\boldsymbol{R}$ contains the pairwise unconditional correlations for the i^{th} and j^{th} assets

$$\rho_{ij,t-1} = \rho_{ji,t-1} = \frac{Cov(r_{it}, r_{jt}|\Omega_{t-1})}{\sigma_{i,t-1}\sigma_{j,t-1}}. \tag{3}$$

The DCC model above follows a three-step quasi-maximum likelihood estimation: The first step estimates univariate conditional variances and a vector of standardised residuals, $\mathbf{D_{t-1}}$, which we estimated by 1, assuming the error process, υ_t, to follow a t-distribution. The second step estimates correlations between the standardised residuals where univariate GARCH models are estimated in the first stage for k white-noise residual series, resulting from the mean equations used to estimate constant conditional covariances, $\mathbf{R}$, in the second stage. The dynamic conditional correlations, $\mathbf{R_t}$, are then estimated in the third stage, using $\mathbf{R}$ in the intercepts of $\mathbf{Q_t}$. [2]

The DCC model allows for a parsimonious estimation of even relatively large correlation matrices. However, it comes with a series of caveats: as mentioned in

[2] A derivation of the likelihood function and its properties can be found in Engle (2002) and Engle and Sheppard (2001).

Engle and Sheppard (2001) and further in Aielli (2013), Engle and Kelly (2012) and Hafner and Reznikova (2010), the variance-targeting technique applied leads to a number of asymptotic deficiencies, summarised in Caporin and McAleer (2013) and Francq et al. (2011) . This problem of regularisation is most relevant if the number of variables considered relative to the sample size is large. In such a case, where n is greater than T, Bailey et al. (2014) propose a multiple-testing procedure. We consider a small number of variables relative to our sample size ($n < T$). However, one cannot trivially exclude an accuracy loss for daily covariances obtained through a DCC filter. We hence consider BEKK and RiskMetrics covariances as well.

BEKK Covariances To address some of the issues arising from employing DCC covariances, we also opt for a more conservative approach estimating BEKK covariances. It follows from the multivariate extension of GARCH models, where $\boldsymbol{H_t}$ is assumed non-diagonal and is represented by a vectorisation, which in Baba et al. (1990) is given as half-vectorisation, exploiting the symmetry in $\boldsymbol{H_t}$. Hence, in the general case, we have

$$\boldsymbol{H_t} = \boldsymbol{C_0^{*\prime} C_0^*} + \sum_{k=1}^{K} \boldsymbol{C_{1k}^{*\prime} x_t x_t^{\prime} C_1^*} \sum_{k=1}^{K} \sum_{i=1}^{q} \boldsymbol{A_{ik}^{*\prime} \varepsilon_{t-i} \varepsilon_{t-i}^{\prime} A_{ik}^*} + \sum_{k=1}^{K} \sum_{i=1}^{q} \boldsymbol{G_{ik}^{*\prime} H_{t-i} G_{ik}^*}, \tag{4}$$

where C_0^* are triangular $n \times n$ parameter matrices, A_{ik}^* and G_{ik}^* are $n \times n$ parameter matrices and C_{1k}^* are $J \times n$ parameter matrices, $\boldsymbol{x_t}$ and $\boldsymbol{\varepsilon_{t-1}}$ are column vectors of covariates and of an ARCH-type error process, respectively.

The BEKK covariances can be estimated by quasi-maximum likelihood. Assuming normality, the likelihood function of the estimator is

$$L_t = \frac{n}{2} \ln(2\pi) + |\Gamma| - \frac{1}{2} \ln |H_t| - \frac{1}{2} \varepsilon_t^{\prime} H_t^{-1} \varepsilon_t \tag{5}$$

and its corresponding derivative

$$\frac{\partial L_t}{\partial \theta} = \frac{1}{2} \left(\frac{\partial h_t}{\partial \theta} \right)^{\prime} (H_t^{-1} \otimes H_t^{-1}) \mathrm{vec}(\varepsilon_t \varepsilon_t^{\prime}) - \left(\frac{\partial \mathrm{vec}(\Gamma)}{\partial \theta} \right)^{\prime} \mathrm{vec}(\Gamma^{-1\prime}) - \left(\frac{\partial \varepsilon_t}{\partial \theta} \right)^{\prime} H_t^{-1} \varepsilon_t, \tag{6}$$

where

$$\theta = [(\mathrm{vec}\Gamma)^{\prime}, (\mathrm{vec}B)^{\prime}, (\mathrm{vec}\mathit{\Lambda})^{\prime}, (\mathrm{vec}\Xi)^{\prime},],$$

and

$$\Xi^{\prime} = [C_0^{*\prime}, A_{11}^{*\prime}, \cdots, A_{qK}^{*\prime}, G_{11}^{*\prime}, \cdots, G_{pK}^{*\prime}].$$

We can immediately see the difference between (4) - (6) and the DCC representation in (2), in that the BEKK avoids variance-targeting. Whilst this is more in the spirit of a truly multivariate model, it comes with a severe lack of efficiency. The computational demands on BEKK estimations therefore lead to it practically not being applied to more than bi-variate models. We therefore abstain from a simultaneous estimation of all variables and covariances and instead estimate pair-wise covariances. This shuts down potential multivariate feedback channels of a full multivariate specification in H_t and results should hence be regarded as complementary to those obtained with a DCC filter.

RM Exponential Smoother The RiskMetrics methodology outlined in Zumbach (2007) imposes less of a structure than the previous filters. Dynamic covariances are obtained employing a simple moving-average process with an exponential weight factor, ω_i that allows hyperbolical and hence slow decay. We therefore have

$$H_t = \sum_{i=1}^{m} \omega_i H_{i,t} = (1 - \lambda_i)\varepsilon_{t-1}\varepsilon'_{t-1} + \lambda_i H_{i,t-1} \tag{7}$$

where

$$\omega_i = \frac{1}{C}\left(1 - \frac{\ln(\tau_i)}{\ln(\tau_0)}\right),$$

$$\lambda_i = \exp\left(-\frac{1}{\tau_i}\right),$$

and

$$\tau_i = \tau_1 \rho^{i-1},$$

$$\forall i = 1, 2, \cdots, m.$$

In essence, the RiskMetrics filter obtains covariances recursively through a simple MA-process, that is extended to allow for long-memory decay in the MA components. This is appealing as it avoids restrictions that might have to be imposed in alternative covariance estimation methods but runs the risk of producing noisier outcomes. We parameterised the filter following the standard recommendations for the logarhythmic decay factor, $\tau_0 = 1560$, the lower cut-off, $\tau_1 = 4$, the upper cut-off, $\tau_{max} = 512$, and $\rho = \sqrt{2}$ [3].

2.2 Covariance Regressions

Having estimated dynamic covariances, we specify a number of simple ARDL models following Pesaran et al. (2001), regressing these covariances on a number of explanatory variables. For the covariance between the returns of the ith and jth assets, $cov(r^i, r^j)$, we have

$$cov(r^i, r^j)_t = \upsilon + \beta_{ij} cov(r^i, r^j)_{t-1} + \Gamma'_{ij}\boldsymbol{x}_t + \Delta'\boldsymbol{x}_{t-1} + \epsilon, \tag{8}$$

where $\boldsymbol{x}$ is a vector containing the independent variables, i.e. the Google policy attention indices ECBMPSI and FEDMPSI for the ECB and FED respectively, the VIX volatility index that serves as a proxy for risk and front month policy rate futures for the Euro area and the US, EUFF and USFF.

The primary focus of our models is to evaluate monetary transmisssion from Europe to the US and vice versa. To do so, we focus on variances of the assets first, in particular of US bond return dynamics to a change in European policy attention as measured by ECBMPSI and vice versa. Using the MPSI measures does not identify policy. The identifying assumption here is that policy causes hightened attention, which we measure as a change in search behaviour. We therefore employ policy rate futures as alternative policy measures, which capture policy guidance and hence the signalling channel proposed in Bauer and Rudebusch (2013). As obtained coefficients for the MPSI measures do not allow for judgement on the direction of the effect but only on the contribution to variances, we included interaction terms between the

[3] See Zumbach (2007)

MPSI measures and policy rate futures. We draw further conclusions from the covariances between assets: a significant effect of policy on the covariance between two assets implies that policy had an effect on the degree of market segmentation along the two dimensions we consider (domestic and international). Assuming that there were no direct policy interventions across all market segments, this provides evidence for portfolio rebalancing.

3 Data

We consider daily fixed income (yield) returns for US and European bond markets to construct covariances, data on money market futures and the CBOE VIX implied volatility index for financial market series and search engine data obtained through GoogleTrends for the MPSI indices [4] Our sample spans from January 2014 until early June 2016, to exploit divergence in monetary policies between FED and the ECB at the time that accomodate the analysis of policy spill-overs. An overview of the data sources used for this paper is given in tables 1 and 2.

Table 1: Variables and Datasources – Endogenous Variables

Label	Variable	Unit	Source
XOIS	European Overnight Index Swap Rate	%	Reuters Datastream
XCORP_HY	IBOXX EUR Liquid Corp. HY Index	% Yield	Reuters Datastream
XCORP_Y	IBOXX EUR Liquid Corp. Index	% Yield	Reuters Datastream
XBUND	10-year German Government Bonds	% Yield	Reuters Datastream
USOIS	US Overnight Index Swap Rate	%	FRED
US_CORP_HY	BoAML US Corp. Master Effective Yield Index	% Yield	FRED
US_CORP	BoAML High Yield Effective Yield Index	% Yield	FRED
US10Y	10-year US Government Bonds	% Yield	FRED

Notes: Prefix 'X' indicares USD-converted variables.

Table 2: Variables and Datasources – Exogenous Variables

Label	Variable	Unit	Source
XEONIA	1Month EONIA Futures Rate	%	Quandl
USFF1M	1Month Fed Funds Futures	% Yield	FRED
VIX	Chicago Bond Options Exchange Volatility Index	Index Value	FRED
ECBMPSI	ECB Monetary Policy Search Index	Index Value	Google/ own calculations
FEDMPSI	FED Monetary Policy Search Index	Index Value	Google/ own calculations

Notes: Prefix 'X' indicares USD-converted variables.

We analyse Variances as well as covariances separately and group the latter by market segments. Variances (ie. the diagonals of the variance-covariance matrices) appear to be more volatile than covariances between assets, with volatilities for European HY corporates and US corporates being particularly strong. This is reflected in the evolution of covariances, which are particularly volatile for covariances between European and US corporate markets. Most covariances tend to become more

[4]Further explanations on the construction of the Google indices are given in Appendix B.

volatile towards the end of the sampling horizon, which coincides with monetary policies such as the consideration of (investment graded) corporate bonds in ECBs Extended Asset Purchase Program in early 2016 and the first post-crisis increase of the Fed Funds Rate in December 2015. In this respect it is particularly interesting to observe the evolution of DCC covariances on money markets. There are two main volatility clusters at the beginning and towards the end of the sample. Considering the predominantly negative shocks hitting the covariances between US and European Overnight lending rates, indicates divergence in monetary policy between US Fed and ECB, that we aimed to exploit with our sample choice.

We can further see some differences between the filters considered. Overall, the DCC filter tends to produce the least noisy covariances with many being almost at zero. This could indicate some of the accuracy loss associated with variance-targeting in the DCC; in particular for var(US_CORP_HY) and var(XBUND), the DCC seems to be smoothing a lot of the volatility obtained through the other filters. The BEKK and the RiskMetrics filters, both not relying on variance-targetting, show the more nuanced variation in these covariances. The BEKK filter further shows slightly larger differences in the levels of covariances, which might have to do with its pairwise application. Filtered covariances are plotted in figures 1-3 below.

Table 3: Sample Asset Correlations

	USOIS	US10Y	US_Corp	US_Corp_HY	XOIS	XBUND	XCORP	XCORPHY
USOIS	1							
US10Y	-0.65255	1						
US_Corp	0.88627	-0.66476	1					
US_Corp_HY	0.63015	-0.17716	0.80752	1				
XOIS	-0.86416	0.82601	-0.84382	-0.52872	1			
XBUND	-0.63232	0.93869	-0.66788	-0.27126	0.88301	1		
XCORP	-0.2907	0.80265	-0.3264	0.053681	0.64088	0.89697	1	
XCORPHY	0.33819	0.031933	0.5038	0.55868	-0.10898	0.15769	0.4316	1

Most covariances are positive throughout the sample. Nevertheless, we do observe instances of negative covariances that evolve almost symmetrical to the remaining covariances. This is unsurprising and reflects the inverse relationship between some assets. The presence of negative covariances between assets does, however, affect the interpretation of coefficients in covariance regressions: To see this, consider an initially positive correlation between two assets, ρ, and a regression of some variable, x, on the correlation such that $\rho_t = \beta x_t + \varepsilon$. Any significant $\beta > 0$ would indicate x to significantly increase the correlation between the assets and hence strengthen the association between them. Now consider $\rho < 0$. In this case $\beta > 0$ would still indicate x to lead to an increase in ρ but now it would imply a reduction in the association between the variables considered. To cater for this we consider sample correlations reported in table 3 above, where for negative sample correlations, we alter the interpretation of coefficients accordingly.

Figure 1: DCC Variances and Covariances

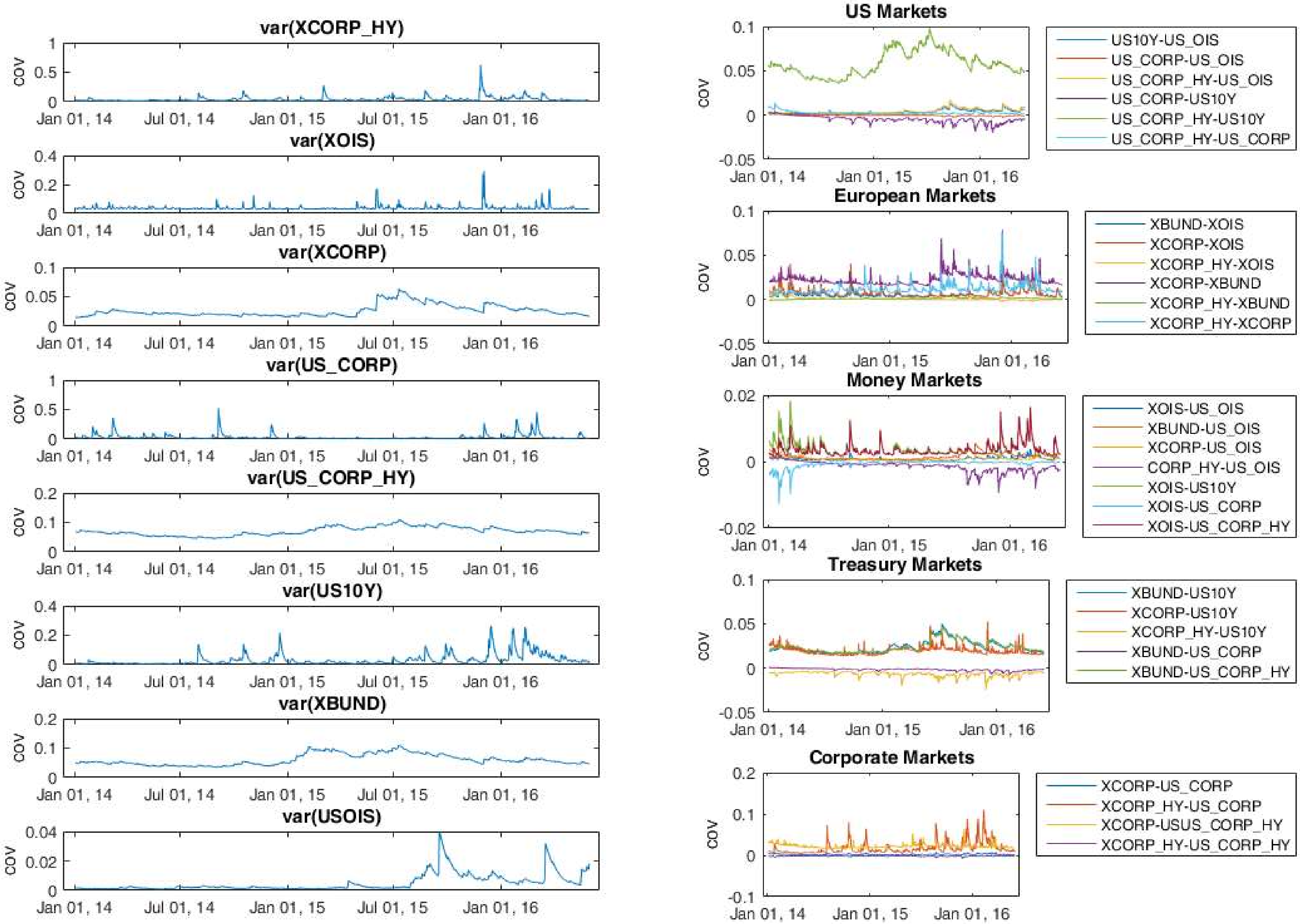


Figure 2: RiskMetrics Variances and Covariances

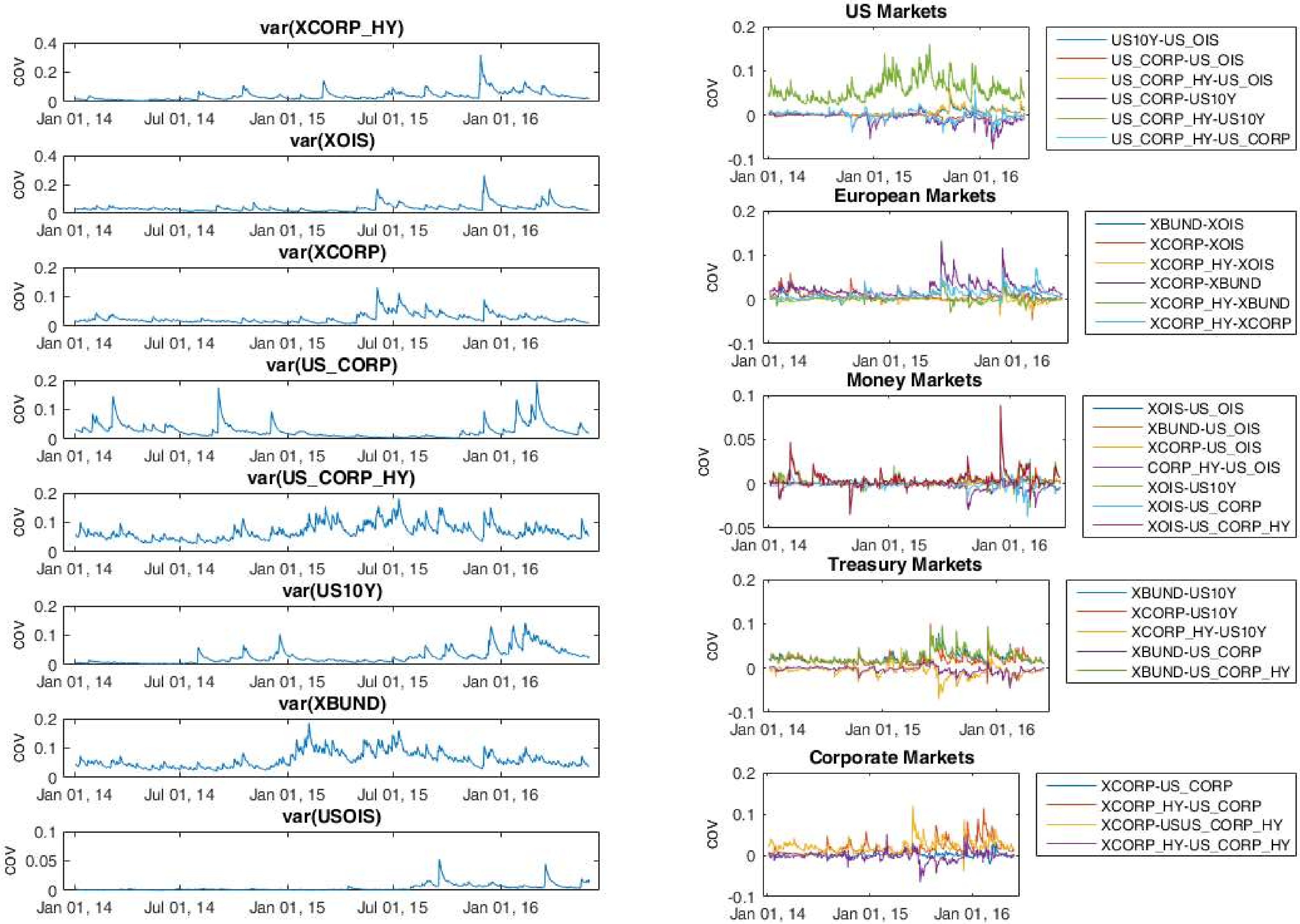
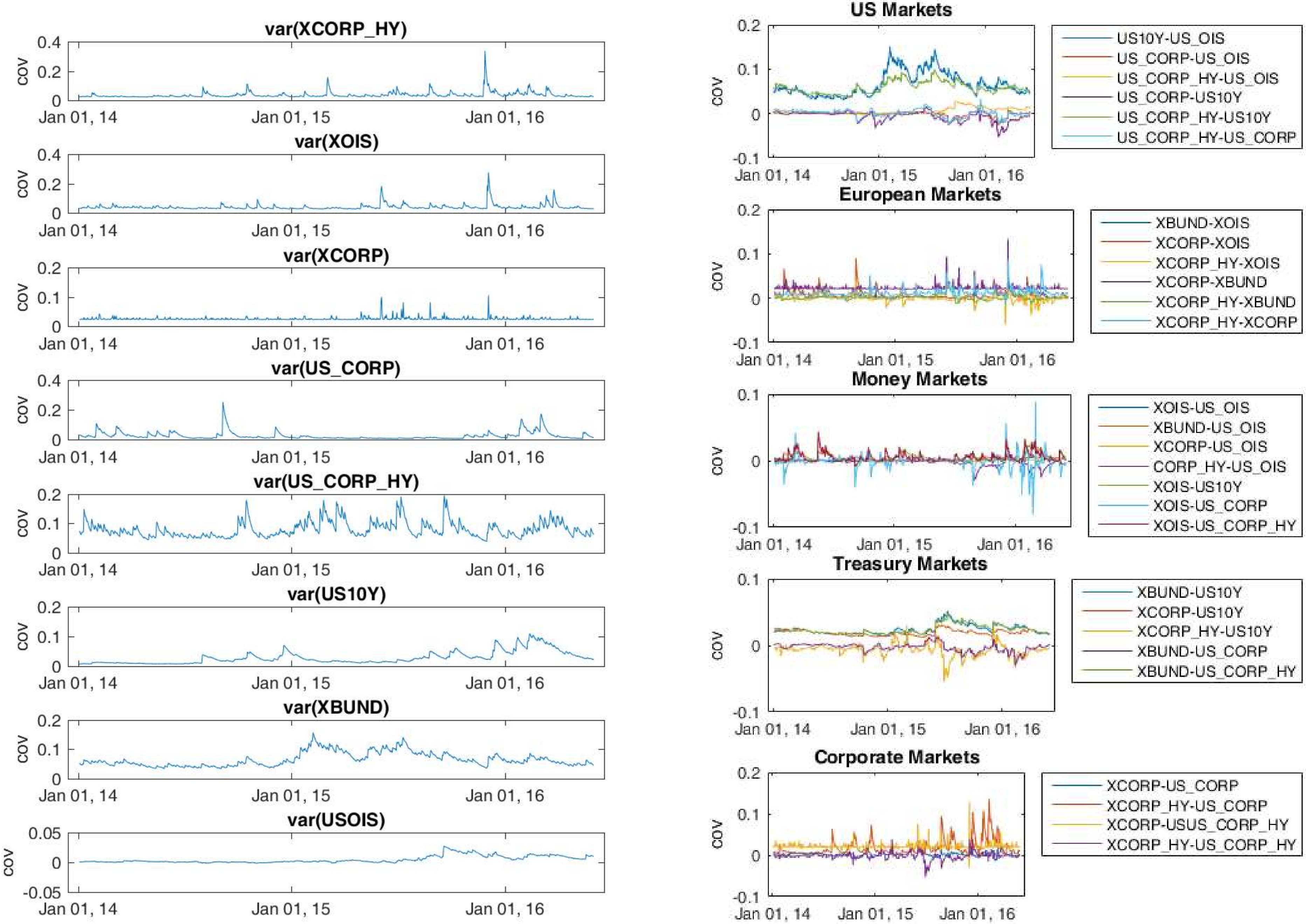


Figure 3: BEKK Variances and Covariances



4 Results

As above, the exposition of our results follows the different market segments considered and distinguishes between variances and covariances. We begin with estimates obtained for variances of the assets. Regarding the covariances, we first consider domestic markets to then investigate covariances between those markets, grouped as (government) treasury, money and corporate markets. We discuss covariances obtained through the DCC filter as baseline case and BEKK and RiskMetrics covariances for robustness. The complete regression output is given in Appendix A.

4.1 Variances

Analysing asset variances allows us to investigate the impact of domestic and foreign policy on asset volatility and hence risk inherent in the assets considered. The obtained results have to be understood as a contribution to some variance and hence do not allow for an interpretation of the direction of effects. We therefore included interaction terms between policy rate futures and our attention measures, that allow for the distinction between policy contractions and expansions, by assuming policy contractions to be accompanied by an increase in policy rate futures. Results are given in tables 5, 11 and 17 of appendix A.

Comparing multivariate with the univariate estimates in Wohlfarth (2017), observed effects are less prominent and are, in the case of US assets, even reversed. The European index, ECBMPSI, suggests significantly negative effects of European policy on US high-yield corporate bonds as well as Treasuries and significantly positive effects on European investment graded coporate bonds, whilst its lag enters significantly negative in both Bunds and European IG corporates, and (weakly) significantly negative in US coporate bond markets. This gives some evidence for effects of European policy attention accross market segments, albeit somewhat less pronounced. The European interaction term enters significantly positive with a lag for European IG corporate bonds and its American counterpart for European overnight rates. European futures are significantly positive for Bunds and European IG corporates, with these effects being reversed in lags. US futures enter significantly negative in US_OIS and positive in XCORP. We can observe the same significant reversal of effects for the lag of USFF as we could for European futures. VIX is positively significant for US IG and European HY corporates. Again, we see effects reversed in lags.

The above suggests policy to mainly affect volatility, and hence risk, in corporate markets. For the ECB, we find positive effects through both policy rate futures and and policy attention suggesting both policy rate guidance and broader policy measures to have led to increases in volatility. The lagged term in XCORP indicates a reversal of the immediate effect. Futures and the VIX display similar patterns in lags. The significant effect of ECBMPSI and its lag on US assets as well as significant effects of US futures on European assets provide evidence for international transmission of policy through these market segments. It is further unsurprising to find the impact of US policy to be picked up by futures rather than the broader policy attention measure. This reflects the shift in the Fed's focus on traditional rate-setting rather than unconventional policies at the time. The interaction terms, particularly those obtained through alternative covariance filters, provide evidence that policy-contractions lead to increases and expansions to decreases in volatility. VIX's positive impact on both US and European coporate indices is intuitive, as it captures the variance risk-premium, which these market segments are more sensitive towards.

4.2 Covariances

Effects on covariances between the assets considered allow to investigate the impact of policy on market segmentation. For most variables, positive coefficients indicate an increasing strength of the co-movement between assets, hence implying less segmented markets and vice versa. The interaction terms again allow judgement on the direction of the policy effects. Given the presence of a positive correlation between assets [5], a positive coefficient suggests that a policy contraction – an anticipated policy rate rise – would lead to a decrease in market segmentation and vice versa.

Table 4 below gives a summary of significant estimates for all 28 covariances considered. It is striking how for European policy measures, the Google attention measure, ECBMPSI, appears to outperform futures, whilst for the US the opposite is the case. This is particularly striking in lagged terms, where ECBMPSI(-1) is significant in almost all models. Considering the joint effects of level and lagged terms shows how most effects are transitory, with ECBMPSI showing persistent effects for most estimates. Offering a more granular point of view, we proceed by discussing individual covariance estimates by market segments.

Table 4: Summary of Covariance Estimates

Variable	significant estimates			jointly significant levels and lags		
	Number of Cases					
	Pos. significant	neg. significant	total	same sign	switch	total
ECBMPSI	8	5	13			
FEDMPSI	0	0	0			
VIX	3	6	9			
EUFF	4	0	4			
USFF	7	3	10			
ECBMPSI*EUFF	0	0	0			
FEDMPSI*USFF	6	0	6			
ECBMPSI(-1)	9	15	24	4	9	13
FEDMPSI(-1)	0	0	0	0	0	0
VIX(-1)	6	4	10	0	10	10
EUFF(-1)	0	6	6	0	5	5
USFF(-1)	3	7	10	0	10	10
ECBMPSI*EUFF(-1)	2	0	2			2
FEDMPSI*USFF(-1)	0	0	0			0

[5] See section 3 for a discussion of the signs of considered covariances.

European Markets ECBMPSI enters significantly positive in the covariances between XOIS and both corporate indices, the covariances between both corporate indices and the covariance between Bunds and IG corporates. In XBUND-XOIS ECBMPSI is (weakly) negatively significant. The effects are partly reversed in lags; for XCORP_HY-XCORP, XCORP-XBUND and XBUND-XOIS the reversal even exceeds the initial effect in size. FEDMPSI is again insignificant for all models in levels and lags. EUFF enters significintly positive in XCORP-XBUND and XCORP-XCORP_HY. USFF is additionally significantly positive in XCORP-XOIS. Again, most effects of futures (all for USFF) are offset in the lagged terms. The ECB interaction term is insignificant in levels and its Fed counterpart significantly positive in XBUND-XOIS and XCORP-XOIS (both with insignificant lags). Lagged ECB interaction terms enter significantly positive in XCORP-XBUND and XCORP-XCORP_HY. VIX enters significantly positive in XCORP_HY-XBUND and XCORP-XCORP_HY. For the former covariance the effect is again partly offset in the lagged term. Results are given in tables 7, 12 and 18 of appendix A.

The above suggest that ECB policies, as measured through both, the guidance and the attention measure, led to an increase in covariances between the majority of assets considered. This provides evidence for ECB's impact on domestic portfolio arbitrage. For US policy we can observe the same effects, albeit for the guidance measure only. This is unsurprising, given the regional focus on rate-setting policies. It is particularly interesting to note that the effects of US Fed Funds Futures are much larger than those of the other measures considered – even larger than the combined effects of ECBMPSI and EUFF. The positive coefficients on VIX are somewhat at odds with portfolio theory and might be driven by it being linked to US options markets. Almost all effects observed appear to be transitory.

US Markets The domestic policy attention measure, FEDMPSI, is insignificant in levels and lags for all models. ECBMPSI is significantly positive for US_CORP-US10Y, significantly negative in USCORP_HY-US10Y and it enters weakly significant with a negative coefficient in US_CORP_HY-US_OIS and US10Y-US_OIS. Its lags are significantly positive in US_CORP-US_OIS and USCORP-US10Y and enter significantly negative in USCORP_HY-US10Y and US_CORP_HY-US_CORP. Both interaction terms are largely insignificant in levels and lags. We can only pick up some weakly significant negative effect of the Fed interaction term in levels for US_CORP-US10Y. European policy rate futures are insignificant in levels and lags, whilst USFF enters significantly negative in US10Y- US_OIS and US_CORP_HY-US_OIS in levels, with a reversal of the effects in lags. VIX is significantly negative in US_CORP-US_OIS and US_CORP-US10Y and positive in the covariance between both coporate bond indices, with all three effects being reversed in the lagged term. Results are reported in tables 6, 13 and 19 of appendix A.

The US domestic policy effect appears to be picked up by the rate guidance measure, reflecting the dominance of policy rate expectations in the US. The reversed signs in the lagged terms also follow a familiar pattern, indicating that the covariance effect through rate expectations is transitory. The significant effects of the European policy attention index indicate some degree of policy spillovers. To further qualify these results, we consider the negative sample correlations between Treasuries and all other US assets, indicating that, apart from US10Y-US_OIS European policy as measured by ECBMPSI has tended to increase the association between US assets. Interestingly, the signs of the lagged term indicates persistence in the effect of ECBMPSI, where both, level and lagged terms are significant. US policy, by contrast seems to have the opposite effect on covariances. Here, this might simply reflect a largely isolated effect of USFF on overnight lending rates. VIX appears to have a largely negative effect on US domestic covariances, which is in line with portfolio-arbitrage theory predicting a negative relation between risk and arbitrage. Again, this effect is only transitory.

Money Markets Having discussed domestic covariances above, we now regard global covariances. Hence for money markets we consider covariances between European OIS rates and US assets, US OIS rates and European assets and covariances between US and European OIS rates. Results are given in tables 8, 14 and 20 of appendix A.

ECBMPSI enters significantly positive in the covariance between European IG corporates and US money markets and is negatively significant for the covariance between US HY and European money markets as well as weakly significant negative for XOIS-US10Y. Effects again tend to be transitory. FEDMPSI and EUFF are insignificant in levels an lags. USFF is significantly negative in XBUND-US_OIS and significantly positive in XCORP-US_OIS, with effects again being reversed in the lagged terms. The US interaction term is significantly positive in XOIS-US_OIS, XOIS-US10Y and XOIS-US_CORP_HY and largely insignificant in lags. VIX has significantly negative but transitory effects on XCORP_HY-US_OIS only.

Sample correlations are negative for all covariances considered apart from XOIS-US10Y and US_OIS-XCORPHY. Taking this into account, ECBMPSI indicates a positive effect of ECB policies on the (inverse) co-movement between European money markets and US high-yield markets, whilst market segmentation increased between European IG coporate bonds and US money markets, which might reflect different policy reactions between FED and ECB over the sample period. US policy rate expectations appeared to have led to an increase in market segmentation US money markets and Bunds and to a strengthening association between European IG corporate bond markets and US money markets. There thus appear to be some arbitrage effects between European corporate bond and US money markets linked to policy rate expectations. The increasing segmentation indicated between Bunds and US money markets likely reflects different dynamics owing to the safe haven properties of Bunds.

Treasury Markets With treasury markets we refer to covariances of assets with a foreign yield curve benchmark (10y government bonds). The results are given in

Tables 9, 15 and 21 of appendix A.

ECBMPSI is significant for all models. It enters positively in covariances with both IG corporate bond indices and negatively in the remaining models. Effects are relatively persistent, with only covariances with European corporate bond indices being partly reversed in lags. Rate expectations are only significant for XCORP-US10Y (bar weakly significant positive coefficients on EUFF in XBUND-US10Y and XBUND-US_CORP_HY), with both European and US futures entering positively and being almost exactly offset in lags. Again, USFF carries a relatively large coefficient. Both interaction terms are largely insignificant in levels and lags; only for XCORP-US10Y the US term picks up some weakly significant positive effect. VIX enters significantly negative in XCORP_HY-US10Y and XBUND-US_CORP, with both effects being transitory.

There are negative sample correlations between both Treasury bond markets and US corporate bond markets. Taking this into account, our results suggest ECB policy, as measured through both futures and policy attention, to significantly reduce market segmentation between investment graded corporate bond markets and Treasury markets, whilst it led to an increase in market segmentation for high-yield markets. This implies that whilst ECB policy led to portfolio shifts between government bond and respective foreign investment graded corporate bonds, this did not affect high-yield markets. It is interesting to note the persistence of these effects for ECBMPSI, particularly on US corporate bonds. Effects on the covariance between both government bond markets are ambiguous: The attention measure indicates a negative effect whilst EUFF suggests a positive effect. US rate guidance appears to lead to a reduction in market segmentation as well, and the positive interaction term indicates these effects to be triggered by monetary contractions.

Corporate Markets We consider covariances between European corporate and HY corporate bond markets and their US counterparts. Results are given in tables 10, 16 and 22 of appendix A.

ECBMPSI enters positively significant in the covariances between the two European corporate indices and US investment grade corporates and negatively significant in the covariance between US and European high-yield markets. Effects are reversed (and over-compensated) in lags. FEDMPSI is again insignificant in lags and levels. Futures are positively significant for both European and American markets in XCORP-US_CORP_HY and USFF is further positively significant in XCORP-US_CORP. Effects of EONIA futures are transitory, whilst USFF is insignificant in lags. Again, it is striking to see the strongest effect in all models through USFF. The ECB interaction term is insignificant for all models in levels and lags (bar one weakly positive significant coefficient in XCORP_HY-US_CORP) and the Fed interaction term is positively significant in XCORP-US_CORP and XCORP-US_CORP_HY. Both interaction terms are largely insignificant in lags. VIX enters positively significant in the first two models and negatively significant in the last, with again significantly reversed signs in lags.

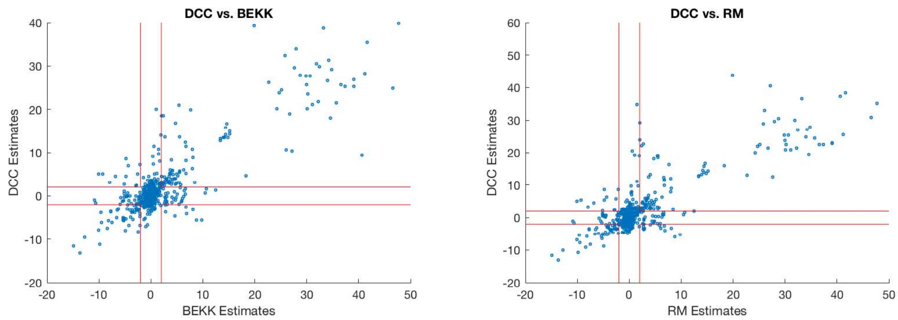
The sample correlations are positive between all corporate bond indices considered, apart from XCORP-US_CORP. But the estimates obtained for ECBMPSI are not robust to applications of different covariance filters. We can hence only conclude that ECBMPSI indicates some degree of impact of European policy on market segmentation. EUFF allows for more specific conclusion, implying European rate guidance to have strengthened the association between each domestic investment graded and foreign HY corporate bond market segment, whilst it has weakened covariances between the remaining segments. This suggests that arbitrage is present between investment graded and foreign high-yield markets internationally rather than between domestic and foreign IG and HY markets, respectively. The Fed interaction term gives some evidence that effects on arbitrage between both IG indices is triggered by monetary expansions, whilst arbitrage between European IG corporates and and US HY corporates likely follows monetary contractions. However, these results are reversed in BEKK and RM covariance filters.

4.3 Robustness to BEKK and RM Filters

As a robustness exercise, we consider alternative models introduced in section 2.1 to filter covariances and draw conclusions from a simple comparison of t-statistics for the estimates.

Figure 4 shows scatter plots of the estimates for the whole sample. The red lines indicate critical values of |2| and hence observations outside these bands are significant for both filters considered. Robust estimates would be found either in the upper right or lower left corner of the plots. Estimates within the significance bands and outside the centre of the plot indicate non-robust estimates that are significant in one and insignificant in another model. Estimates in the upper left or lower right corners indicate non-robust estimates that changed signs and remained significant in both models. We will turn most of our attention on the first and the last case.

Figure 4: Comparison of Estimates – Whole Sample



Overall estimates are positively correlated; most estimates appear to be either in the upper right or lower left corners or in the centre of the plot. They are hence either positively or negatively significant or insignificant in both models. Looking at subsamples, we see a more nuanced picture. Figures 5-7 compare the estimates of BEKK and RM filters with the DCC estimates for the different market segments considered. We can see a strong positive correlation for variances and domestic covariances, whilst for international covariances, particularly for money and corporate markets, the correlation appeared to have weakened considerably.

Figure 5: Comparison of Estimates – Variances

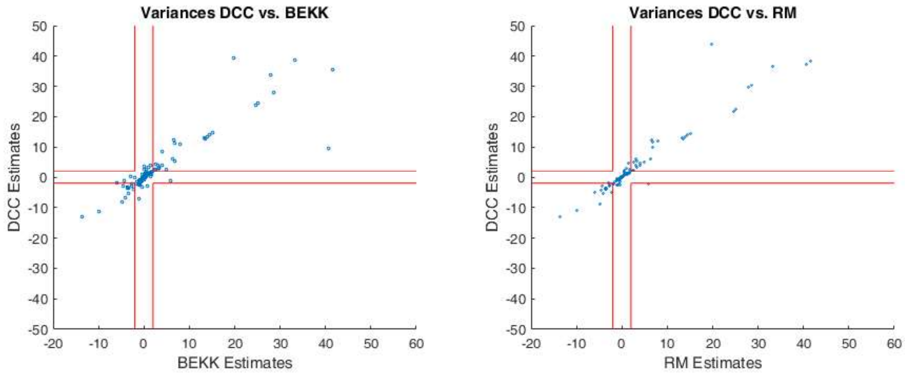
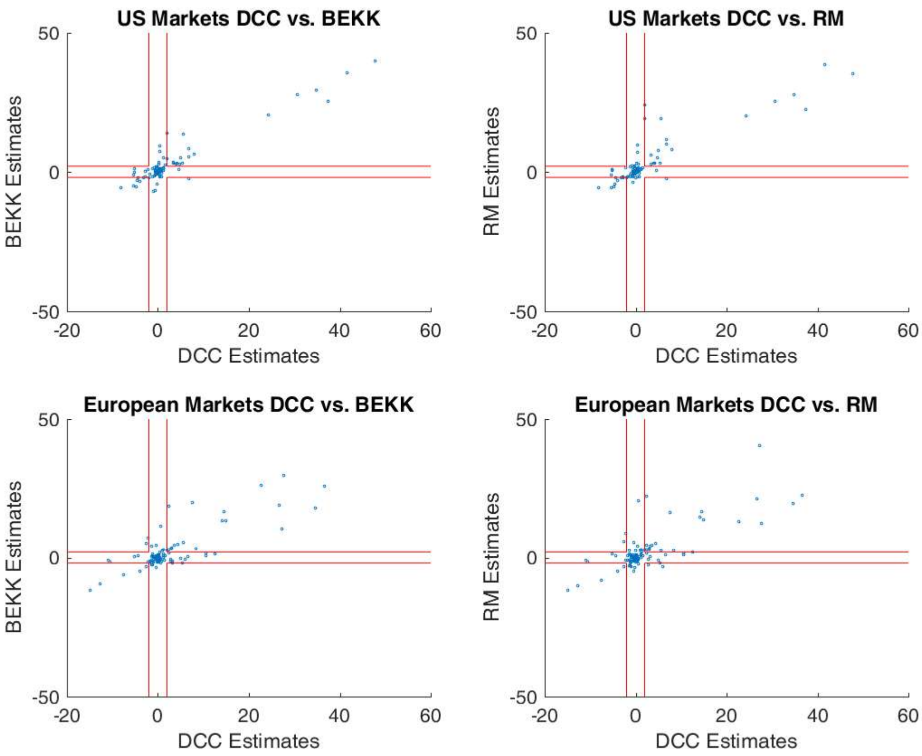
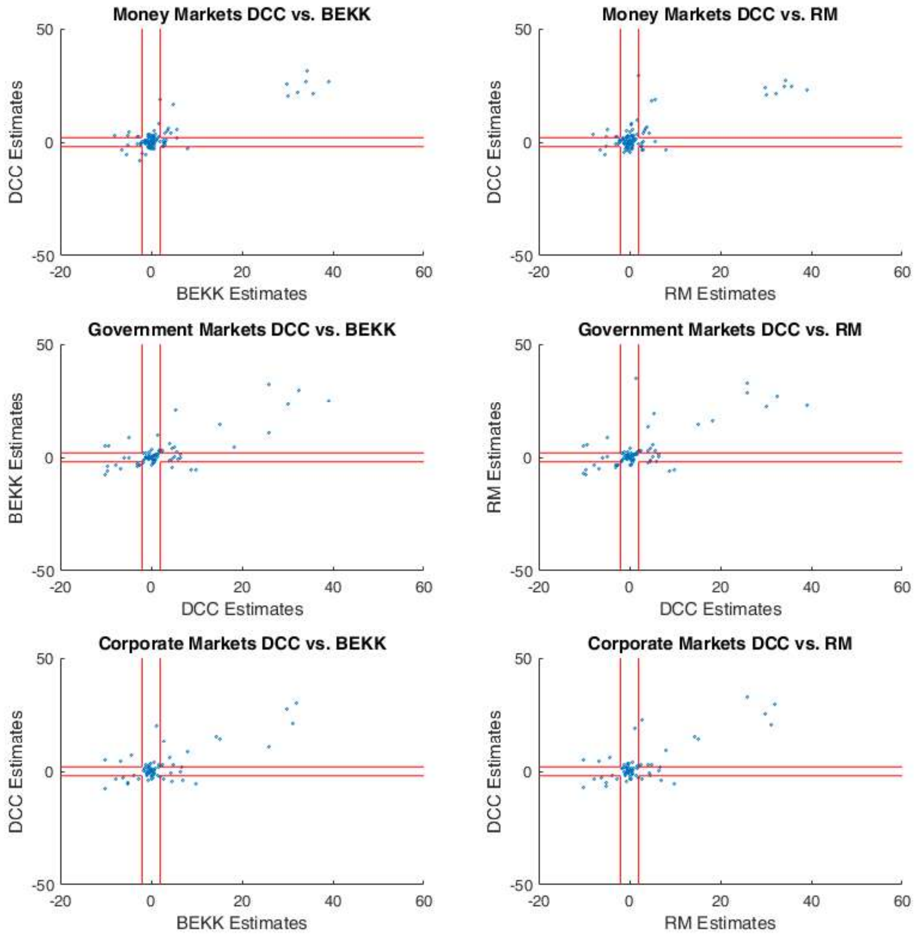


Figure 6: Comparison of Estimates – Domestic Covariances



Specifically, for corporate markets, estimates for ECBMPSI and its lag are neither robust to BEKK nor RM filters; both with respect to significances and estimate signs. For money markets we could only observe a significant change in signs on interaction terms in XOIS-USCORP, and for treasury markets we cannot confirm the sign on ECBMPSI in XCORP_HY-US10Y. Otherwise non-robust estimates reflect significances only.

Figure 7: Comparison of Estimates – Domestic Covariances



5 Conclusions

We study international transmission of monetary policy using policy attention measures based on search data as well as policy rate futures in a case-study of multivariate variance processes of the European and US American fixed income market. In doing so, we filtered dynamic covariances using a DCC filter as well as a BEKK filter and a RiskMetrics long-memory exponential smoother for robustness purposes. Obtained covariances are then regressed on policy measures and a factor controlling for market risk in a series of ARDL models.

We find that ECB policies as measured by our Google attention measure are significant for most asset return covariances, whilst US policy was better captured by rate futures. It is possible that this is a result of Google measures capturing more unconventional elements of policy, which were dominant in Europe over the sample horizon. Both measures suggest policy to affect domestic as well as international return covariances. For the ECB, policy effects seem to be mainly carried through corporate and treasury markets, whilst US measures indicate particularly strong effects on European domestic covariances.

We further find evidence for transmission of monetary policy between ECB and FED. Our results suggest these policy spillovers to be present in both directions across a broad spectrum of fixed income variances and covariances. Effects of ECB policy on US domestic asset covariances appear to be carried through government bonds whilst global covariances are mainly affected through corporate bonds. For the US, policy effects are mainly transmitted through the corporate market segment.

Both, FED and ECB policy had a positive effect on the majority of covariances, indicating a reduction in market segmentation. Where significant, futures tend to have a larger effect than policy attention indicating dominance of the signalling channel of monetary transmission. However, portfolio-rebalancing is likely present more frequently, particularly in cases where policy operates at or close to the zero lower bound. The dominance of particular transmission channels hence likely depends on the policy environment.

Our results are largely robust to application of alternative covariance filters. The majority of non-robust estimates are for covariances on corporate and government bond markets. These are also some of the most volatile covariances, which might be due to problems in the variance-targeting applied in the DCC model, mentioned in the literature on multivariate volatility models.

These results confirm several findings documented in the literature on monetary transmission: Market segmentation does produce different reactions to policy shocks across many of the assets considered, confirming Krishnamurthy and Vissing-Jorgensen (2007) and much of the literature on preferred habitat theories of the fixed income market, following Vayanos and Vila (2009). The presence of both, signalling and portfolio-rebalancing effects is in line with Bauer and Rudebusch (2013) and Bauer and Neely (2014). International transmission effects are present, but appear to be relatively small, which caveats some of the findings in Neely (2015). Furthermore, the vast majority of effects observed are reversed in lags, and are hence transitory. Market risk appears to play a crucial role in policy transmission particularly on corporate markets, which is in line with volatility premiums proposed by portfolio arbitrage theory (Altavilla et al. (2015)) and in international transmission, which supports the theory of global financial cycles (Rey (2015)).

Overall, it seems much of the transmission effects observed are not only very sensitive to model specification as highlighted in Bauer and Neely (2014), but also to policy measures themselves and the frequency of the data obtained. Using policy attention as a measure for policy, accounts for a much wider set of policy interactions and hence a more realistic picture of its effects, whilst employing higher-frequency data allows capturing time-varying volatility that is crucial in the analysis of financial time series. This also opens several routes for further research. In terms of model specification, accounting for hidden breaks employing Markov regime-switching models, as well as employing realized volatility models such as Corsi (2009) and Buccheri and Corsi (2017) appears particularly promising. Furthermore similar policy attention indices could be used to further study central bank communication channels more specifically, and policy in the context of high-frequency analyses in general.

References

Aielli, G. P. Dynamic conditional correlation: on properties and estimation. *Journal of Business & Economic Statistics*, 31(3):282–299, 2013.

Altavilla, C., Carboni, G., and Motto, R. Asset purchase programmes and financial markets: lessons from the euro area. 2015.

Ammer, J. and Mei, J. Measuring international economic linkages with stock market data. *The Journal of Finance*, 51(5):1743–1763, 1996.

Andersen, T. G., Bollerslev, T., Diebold, F. X., and Vega, C. Real-time price discovery in global stock, bond and foreign exchange markets. *Journal of international Economics*, 73 (2):251–277, 2007.

Baba, Y., Engle, R., Kraft, D., and Kroner, K. Multivariate simultaneous generalized arch, department of economics, university of california at san diego. Technical report, Working Paper, 1990.

Bailey, N., Pesaran, M. H., and Smith, L. V. A multiple testing approach to the regularisation of large sample correlation matrices. 2014.

Baker, S. R., Bloom, N., and Davis, S. J. Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4):1593–1636, 2016.

Bauer, M. D. and Neely, C. J. International channels of the fed's unconventional monetary policy. *Journal of International Money and Finance*, 44:24–46, 2014.

Bauer, M. D. and Rudebusch, G. D. The signaling channel for federal reserve bond purchases. *International Journal of Central Banking, forthcoming*, 2013.

Bloom, N. The impact of uncertainty shocks. *econometrica*, 77(3):623–685, 2009.

Bollerslev, T. Modelling the coherence in short-run nominal exchange rates: a multivariate generalized arch model. *The review of economics and statistics*, pages 498–505, 1990.

Buccheri, G. and Corsi, F. Hark the shark: Realized volatility modelling with measurement errors and nonlinear dependencies. 2017.

Caporin, M. and McAleer, M. Ten things you should know about the dynamic conditional correlation representation. *Econometrics*, 1(1):115–126, 2013.

Christiano, L. J., Eichenbaum, M., and Evans, C. L. Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of political Economy*, 113(1):1–45, 2005.

Corsi, F. A simple approximate long-memory model of realized volatility. *Journal of Financial Econometrics*, page nbp001, 2009.

Da, Z., Engelberg, J., and Gao, P. The sum of all fears investor sentiment and asset prices. *Review of Financial Studies*, 28(1):1–32, 2015.

dAddona, S. and Kind, A. H. International stock–bond correlations in a simple affine asset pricing model. *Journal of Banking & Finance*, 30(10):2747–2765, 2006.

Engle, R. Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business & Economic Statistics*, 20(3):339–350, 2002.

Engle, R. and Kelly, B. Dynamic equicorrelation. *Journal of Business & Economic Statistics*, 30(2):212–228, 2012.

Engle, R. F. Autoregressive conditional heteroscedasticity with estimates of the variance of united kingdom inflation. *Econometrica: Journal of the Econometric Society*, pages 987–1007, 1982.

Engle, R. F. and Sheppard, K. Theoretical and empirical properties of dynamic conditional correlation multivariate garch. Technical report, National Bureau of Economic Research, 2001.

Francq, C., Horvath, L., and Zakoïan, J.-M. Merits and drawbacks of variance targeting in garch models. *Journal of Financial Econometrics*, 9(4):619–656, 2011.

Georgiadis, G. and Gräb, J. Global financial market impact of the announcement of the ecb's asset purchase programme. *Journal of Financial Stability*, 26:257–265, 2016.

Ghysels, E., Sinko, A., and Valkanov, R. Midas regressions: Further results and new directions. *Econometric Reviews*, 26(1):53–90, 2007.

Gomes, P. and Taamouti, A. In search of the determinants of european asset market comovements. *International Review of Economics & Finance*, 44:103–117, 2016.

Gurkaynak, R. S., Sack, B. P., and Swanson, E. T. Do actions speak louder than words? the response of asset prices to monetary policy actions and statements. 2004.

Hafner, C. M. and Reznikova, O. Efficient estimation of a semiparametric dynamic copula model. *Computational Statistics & Data Analysis*, 54(11):2609–2627, 2010.

Hamilton, J. D. and Wu, J. C. The effectiveness of alternative monetary policy tools in a zero lower bound environment. *Journal of Money, Credit and Banking*, 44(s1):3–46, 2012.

Krishnamurthy, A. and Vissing-Jorgensen, A. The demand for treasury debt. Technical report, National Bureau of Economic Research, 2007.

Krishnamurthy, A. and Vissing-Jorgensen, A. The effects of quantitative easing on interest rates: channels and implications for policy. Technical report, National Bureau of Economic Research, 2011.

Kuttner, K. N. Monetary policy surprises and interest rates: Evidence from the fed funds futures market. *Journal of monetary economics*, 47(3):523–544, 2001.

Miranda-Agrippino, S. and Rey, H. World asset markets and the global financial cycle. *National Bureau of Economic Research*, 2015.

Neely, C. J. Unconventional monetary policy had large international effects. *Journal of Banking & Finance*, 52:101–111, 2015.

Pesaran, M. H., Shin, Y., and Smith, R. J. Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3):289–326, 2001.

Rey, H. Dilemma not trilemma: The global financial cycle and monetary policy independence. *National Bureau of Economic Research*, May 2015.

Rudebusch, G. D. and Swanson, E. T. Examining the bond premium puzzle with a dsge model. *Journal of Monetary Economics*, 55:S111–S126, 2008.

Shiller, R. J. and Beltratti, A. E. Stock prices and bond yields: Can their comovements be explained in terms of present value models? *Journal of Monetary Economics*, 30(1):25–46, 1992.

Smets, F. and Wouters, R. An estimated dynamic stochastic general equilibrium model of the euro area. *Journal of the European economic association*, 1(5):1123–1175, 2003.

Vayanos, D. and Vila, J.-L. A preferred-habitat model of the term structure of interest rates. Technical report, National Bureau of Economic Research, 2009.

Wohlfarth, P. Measuring the impact of monetary policy attention on global asset volatility using search data. Mimeo, Department of Economics Mathematics and Statistics, Birkbeck, University of London, November 2017.

Zumbach, G. O. The riskmetrics 2006 methodology. 2007.

A Covariance Regressions

This section outlines results of the covariance regressions given in 8. The regressions use the same specification for dependent variables obtained through three different covariance filters. A.1 gives results using a DCC model, A.2 employs a BEKK model and A.3 uses the RiskMetrics exponential smoother.

The output tables are grouped as follows

- Variances, i.e. covariances of assets with themselves: Tables 5, 11 and 17
- Domestic Covariances
  - US: Tables 6, 13 and 19
  - Europe: Tables 7, 12 and 18
- International Covariances
  - Money markets: Tables 8, 14 and 20
  - Government bond markets Tables 9, 15 and 21
  - Corporate markets: Tables 10, 16 and 22

A.1 DCC Estimates

Table 5: Variances

Ind variables	var(US_OIS)	var(DUS10Y)	var(US_CORP_HY)	var(XOIS)	var(XBUND)	var(XCORP)	var(XCORP_HY)
c	0.000468489	0.008447661	0.007103555	-0.032071361	0.005485702	0.044242466	-0.017798717
	(0.16139)	(3.07773)	(3.32301)	(-0.41855)	(3.99261)	(2.60438)	(-0.43157)
	{0.87500}	{0.01169}	{0.00771}	{0.68439}	{0.00255}	{0.02629}	{0.67521}
AR(1)	1.040369113	0.993572114	1.008202785	0.871918285	1.099609736	0.425370459	0.78648002
	(41.63810)	(25.13671)	(24.65123)	(33.18703)	(40.61949)	(19.84667)	(28.69438)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.08583525	-0.008642492	-0.028261322	-0.102724862	-0.116788089	0.138777384	0.042993032
	(-2.85229)	(-0.21806)	(-0.69582)	(-2.73888)	(-4.27837)	(5.89787)	(1.58751)
	{0.01718}	{0.83177}	{0.50239}	{0.02087}	{0.00162}	{0.00015}	{0.14348}
ECBMPSI	2.36E-05	-0.000145277	-0.000136867	-0.001237764	5.71E-06	0.001055114	0.002060865
	(0.49412)	(-4.22828)	(-5.94272)	(-0.50229)	(0.27832)	(2.59076)	(1.40355)
	{0.63189}	{0.00175}	{0.00014}	{0.62634}	{0.78644}	{0.02691}	{0.19074}
FEDMPSI)	6.31E-06	-1.14E-05	8.23E-06	-0.000826294	-7.48E-06	-3.54E-05	0.000714214
	(0.12676)	(-0.35158)	(0.32397)	(-0.83587)	(-0.24476)	(-0.11900)	(1.33474)
	{0.90164}	{0.73245}	{0.75263}	{0.42275}	{0.81159}	{0.90763}	{0.21155}
VIX	1.76E-05	0.000106992	-2.41E-06	0.000213513	-1.94E-05	-0.000512269	0.002805902
	(0.32652)	(-1.90496)	(-0.04555)	(0.10588)	(-0.44105)	(-1.04749)	(3.88507)
	{0.75076}	{0.08592}	{0.96456}	{0.91777}	{0.66856}	{0.31953}	{0.00303}
EUFF	0.000196941	-0.000209386	-0.000218955	-0.001127157	0.000332593	0.00331551	0.001500602
	(1.11496)	(-1.529)	(-2.03460)	(-0.31646)	(3.30299)	(3.28582)	(0.77328)
	{0.29095}	{0.15726}	{0.06927}	{0.75816}	{0.00797}	{0.00821}	{0.45725}
USFF	-0.02996761	-0.000188102	0.000820379	-0.017920047	0.009464944	1.136934038	-0.015902417
	(-4.55983)	(-0.01362)	(-0.07247)	(-0.04006)	(1.13708)	(13.39725)	(-0.08751)
	{0.00104}	{0.98940}	{0.94366}	{0.96883}	{0.28202}	{0.00000}	{0.93200}
ECBMPSIxEUFF	-1.51E-07	1.18E-06	1.09E-06	1.23E-05	-8.22E-08	-9.36E-06	-1.75E-05
	(-0.02398)	(0.50751)	(0.55996)	(0.56136)	(-0.05305)	(-1.79551)	(-1.11892)
	{0.98134}	{0.62280}	{0.58783}	{0.58691}	{0.95873}	{0.10280}	{0.28933}
FedMPSIxUSFF	-5.70E-05	0.000179347	7.11E-05	0.006431949	5.15E-05	0.001142491	-0.002425673
	(-0.27989)	(1.40358)	(0.61544)	(2.26498)	(0.34739)	(1.12266)	(-0.91966)
	{0.78527}	{0.19073}	{0.55201}	{0.04697}	{0.73550}	{0.28781}	{0.37940}
ECBMPSI(-1)	-4.29E-05	-0.000116087	-1.29E-05	0.001526819	-0.000177208	-0.001976129	-0.001238149
	(-1.03005)	(-3.46201)	(-0.55750)	(0.53413)	(-9.85195)	(-4.86978)	(-0.87003)
	{0.32726}	{0.00610}	{0.58945}	{0.60492}	{0.00000}	{0.00065}	{0.40468}
FEDMPSI(-1)	2.09E-05	-1.05E-05	-1.10E-05	0.000499814	-1.42E-05	-6.95E-05	-0.000222464
	(0.42760)	(-0.26915)	(-0.36501)	(0.49163)	(-0.43709)	(-0.19706)	(-0.39572)
	{0.67800}	{0.79328}	{0.72271}	{0.63360}	{0.67134}	{0.84773}	{0.70062}
VIX(-1)	-4.59E-06	-4.87E-05	3.94E-05	-9.64E-05	4.56E-05	0.000531703	-0.002148158
	(-0.07370)	(-0.84424)	(0.76627)	(-0.05034)	(1.03263)	(1.07131)	(-2.81129)
	{0.94270}	{0.41827}	{0.46122}	{0.96085}	{0.32610}	{0.30921}	{0.01843}
EUFF(-1)	-0.000204463	0.000145143	0.00017057	0.001428721	-0.000371995	-0.003521009	-0.001446678
	(-1.17361)	(-1.05527)	(1.56330)	(0.40591)	(-3.69799)	(-3.48062)	(-0.74499)
	{0.26775}	{0.31613}	{0.14905}	{0.69336}	{0.00412}	{0.00592}	{0.47343}
USFF(-1)	0.032611359	-0.003957478	-0.003325993	-0.022405076	-0.012516172	-1.154166816	0.032844411
	(4.84575)	(-0.28628)	(-0.29225)	(-0.05015)	(-1.48496)	(-13.67908)	(0.18014)
	{0.00068}	{0.78050}	{0.77607}	{0.96099}	{0.16838}	{0.00000}	{0.86064}
ECBMPSI x EUFF(-1)	2.55E-07	9.83E-07	1.00E-07	-1.34E-05	1.46E-06	1.63E-05	1.10E-05
	(0.05089)	(-0.43862)	(0.05438)	(-0.50808)	(1.05952)	(3.06764)	(0.69464)
	{0.96042}	{0.67026}	{0.95771}	{0.62242}	{0.31428}	{0.01189}	{0.50310}
FedMPSI x USFF(-1)	-2.98E-05	-5.15E-05	-1.81E-05	-0.002874525	5.82E-05	-0.000255466	0.000985379
	(-0.14939)	(-0.30317)	(-0.12588)	(-0.90672)	(0.39316)	(-0.19890)	(0.39398)
	{0.88422}	{0.76797}	{0.90232}	{0.38588}	{0.70245}	{0.84632}	{0.70186}
Variance	1.90E-06	4.20E-06	2.56E-06	0.000864531	1.75E-06	0.000215674	0.000520988
	(6.70605)	(7.99365)	(6.73946)	(13.94684)	(6.63259)	(14.43589)	(13.37289)
	{0.00005}	{0.00001}	{0.00005}	{0.00000}	{0.00006}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10	10
	(3.68259)	(256707.6582)	(93693.45622)	(14.27696)	(525842.93680)	(11.53369)	(13.82676)
	{0.00423}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.945432876	0.987702928	0.849336144	0.729549957	0.729788014	0.725738142	0.725889641
DW	1.987915747	2.000101102	1.979428625	2.01187849	1.993326176	1.915531708	1.991755

Notes: Dependent variables are obtained through 3-stage DCC filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 6: Covariances –US Markets

Ind variables	Dependent Variables					
	US10Y - US_OIS	US_CORP - US_OIS	US_CORP_HY - US_OIS	US_CORP - US10Y	USCORP_HY - US10Y	US_CORP_HY - US_CORP
c	0.000768141	-0.000365668	0.000766923	-0.004519843	0.007045136	-0.000987557
	(2.68290)	(-5.42857)	(1.55504)	(-4.47326)	(3.44102)	(-3.25481)
	{0.02298}	{0.00029}	{0.15099}	{0.00119}	{0.00632}	{0.00865}
AR(1)	1.083910427	0.938433666	1.10134014	0.931359661	1.003685909	0.938087887
	(46.52817)	(34.84536)	(47.71786)	(30.68554)	(24.29745)	(37.39530)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.114979848	-0.000571507	-0.128466539	-0.034961891	-0.021245422	0.005550305
	(-4.54889)	(-0.02118)	(-5.11669)	(-1.18716)	(-0.51445)	(0.22116)
	{0.00106}	{0.98351}	{0.00045}	{0.26260}	{0.61811}	{0.82942}
ECBMPSI	-1.52E-05	1.39E-06	-1.85E-05	4.81E-05	-0.000125234	-6.00E-06
	(-2.15486)	(0.42380)	(-2.15766)	(3.99753)	(-5.37209)	(-0.85747)
	{0.05660}	{0.68068}	{0.05633}	{0.00253}	{0.00031}	{0.41126}
FEDMPSI)	-7.54E-07	8.80E-07	1.45E-07	9.00E-06	-2.93E-06	-1.95E-06
	(-0.07878)	(0.25446)	(0.01140)	(0.46513)	(-0.12213)	(-0.21483)
	{0.93876}	{0.80430}	{0.99113}	{0.65180}	{0.90521}	{0.83422}
VIX	1.04E-05	-2.24E-05	9.84E-06	-0.000225881	5.02E-05	8.65E-05
	(0.85948)	(-4.79104)	(0.63710)	(-8.17181)	(1.13218)	(6.73920)
	{0.41021}	{0.00073}	{0.53837}	{0.00001}	{0.28398}	{0.00005}
EUFF	3.10E-05	-1.18E-05	3.69E-05	4.92E-05	-0.000182243	-1.21E-05
	(0.55718)	(-0.30820)	(0.59613)	(0.63267)	(-1.74975)	(-0.17869)
	{0.58966}	{0.76426}	{0.56434}	{0.54115}	{0.11073}	{0.86175}
USFF	-0.00659191	-0.000103952	-0.008368264	-0.005167359	0.000368891	0.000886674
	(-4.04780)	(-0.09982)	(-3.98064)	(-0.63050)	(0.03607)	(0.19949)
	{0.00233}	{0.92246}	{0.00260}	{0.54251}	{0.97194}	{0.84588}
ECBMPSIxEUFF	1.28E-07	-1.40E-08	1.54E-07	-3.94E-07	1.01E-06	4.73E-08
	(0.01756)	(-0.00072)	(0.02812)	(-0.21108)	(0.51599)	(0.00879)
	{0.98633}	{0.99944}	{0.97812}	{0.83707}	{0.61708}	{0.99316}
FedMPSIxUSFF	6.32E-06	-9.06E-06	2.54E-06	-0.000126105	0.00011841	2.74E-05
	(0.18352)	(-1.15286)	(0.04931)	(-2.07588)	(1.20167)	(0.86519)
	{0.85806}	{0.27578}	{0.96165}	{0.06464}	{0.25718}	{0.40721}
ECBMPSI(-1)	-7.45E-06	1.37E-05	-5.43E-06	0.000106434	-6.17E-05	2.96E-05
	(-1.06767)	(4.54279)	(-0.62394)	(7.98999)	(-2.73237)	(4.96905)
	{0.31077}	{0.00107}	{0.54663}	{0.00001}	{0.02111}	{0.00056}
FEDMPSI(-1)	5.57E-06	-1.30E-06	6.50E-06	6.72E-06	-9.25E-06	-6.47E-06
	(0.52753)	(-0.36044)	(0.48009)	(0.32701)	(-0.31434)	(-0.65154)
	{0.60933}	{0.72602}	{0.64149}	{0.75040}	{0.75972}	{0.52938}
VIX(-1)	-5.39E-06	1.71E-05	-4.79E-06	0.000165363	-8.29E-06	-7.44E-05
	(-0.40696)	(-3.47790)	(-0.28999)	(5.40399)	(-0.18733)	(-5.16045)
	{0.69261}	{0.00594}	{0.77775}	{0.00030}	{0.85515}	{0.00042}
EUFF(-1)	-3.76E-05	1.57E-05	-4.35E-05	-7.80E-06	0.000131179	2.07E-05
	(-0.67850)	(-0.41120)	(-0.71032)	(-0.09973)	(1.24834)	(0.30417)
	{0.51285}	{0.68960}	{0.49374}	{0.92253}	{0.24034}	{0.76723}
USFF(-1)	0.006965428	-4.96E-05	0.008895031	0.00596206	-0.003456632	-0.001358719
	(4.08317)	(-0.04734)	(4.08728)	(0.71879)	(-0.33625)	(-0.30191)
	{0.00220}	{0.96317}	{0.00219}	{0.48872}	{0.74363}	{0.76891}
ECBMPSI x EUFF(-1)	4.08E-08	-1.17E-07	2.03E-08	-9.72E-07	5.20E-07	-2.29E-07
	(0.00655)	(-0.00911)	(0.00437)	(-0.50512)	(0.27656)	(-0.07214)
	{0.99490}	{0.99291}	{0.99660}	{0.62442}	{0.78775}	{0.94391}
FedMPSI x USFF(-1)	-1.59E-05	1.02E-05	-1.72E-05	4.81E-05	-3.37E-05	-5.21E-06
	(-0.39654)	(1.19793)	(-0.31325)	(0.72875)	(-0.24784)	(-0.13645)
	{0.70004}	{0.25857}	{0.76053}	{0.48287}	{0.80928}	{0.89418}
Variance	1.30E-07	1.95E-08	2.08E-07	1.01E-06	2.42E-06	1.86E-07
	(1.49414)	(0.35655)	(2.06686)	(5.52884)	(6.74279)	(1.96915)
	{0.16601}	{0.72883}	{0.06563}	{0.00025}	{0.00005}	{0.07725}
DoF	10	10	10	10	10	10
	(197524.76900)	(513390.23560)	(194778.07590)	(4.43591)	(77687.73504)	(418283.83540)
	{0.00000}	{0.00000}	{0.00000}	{0.00126}	{0.00000}	{0.00000}
R-sq	0.946026472	0.946029621	0.947421027	0.987603475	0.98769089	0.847235691
DW	1.987052472	1.968462334	1.986431834	1.983659716	1.994926438	2.001740745

Notes: Dependent variables are obtained through 3-stage DCC filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 7: Covariances –European Markets

Ind variables	Dependent Variables					
	XBUND - XOIS	XCORP - XOIS	XCORP_HY - XOIS	XCORP - XBUND	XCORP_HY - XBUND	XCORP - XCORP_HY
c	-0.000657621	-0.003916925	-0.000605798	0.018453569	0.00095572	0.006919935
	(-0.34472)	(-0.96714)	(-1.37281)	(5.55699)	(12.47096)	(2.08180)
	{0.73744}	{0.35628}	{0.19981}	{0.00024}	{0.00000}	{0.06400}
AR(1)	0.914118233	0.669484607	0.976798545	0.641454493	0.9512559	0.593371156
	(27.60738)	(22.73669)	(34.52856)	(27.20085)	(36.56115)	(26.71644)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.065585145	0.084028699	-0.05932907	0.143415782	-0.021200219	0.170978333
	(-1.74930)	(3.09984)	(-2.20175)	(6.03493)	(-0.80297)	(6.60205)
	{0.11081}	{0.01125}	{0.05229}	{0.00013}	{0.44066}	{0.00006}
ECBMPSI	-4.50E-05	0.00013963	5.21E-06	0.000182807	-1.59E-06	0.000365081
	(-2.10734)	(3.18710)	(0.72261)	(4.27960)	(-0.42291)	(8.42247)
	{0.06132}	{0.00970}	{0.48648}	{0.00161}	{0.68131}	{0.00001}
FEDMPSI)	-3.52E-05	-6.62E-05	-2.70E-06	-2.74E-05	5.21E-06	6.71E-05
	(-1.01600)	(-0.96375)	(-0.22338)	(-0.43656)	(1.14358)	(1.20117)
	{0.33358}	{0.35790}	{0.82773}	{0.67171}	{0.27944}	{0.25736}
VIX	1.03E-05	-1.30E-05	6.81E-07	-5.69E-05	3.43E-05	0.000241451
	(0.14160)	(-0.08101)	(0.03063)	(-0.51959)	(5.41654)	(2.43277)
	{0.89021}	{0.93703}	{0.97617}	{0.61465}	{0.00029}	{0.03528}
EUFF	4.81E-05	0.000402318	-1.05E-05	0.000819562	2.69E-05	0.000536658
	(0.33129)	(1.37575)	(-0.17317)	(3.48844)	(0.94125)	(2.35323)
	{0.74726}	{0.19893}	{0.86597}	{0.00584}	{0.36876}	{0.04042}
USFF	0.005506711	0.07165747	0.000355213	0.192607334	0.0014199	0.241647261
	(0.45463)	(4.87978)	(0.06979)	(10.47287)	(1.21483)	(10.63378)
	{0.65909}	{0.00064}	{0.94574}	{0.00000}	{0.25234}	{0.00000}
ECBMPSIxEUFF	5.45E-07	-9.44E-07	-4.23E-08	-1.76E-06	3.56E-09	-3.14E-06
	(0.33322)	(-0.44056)	(-0.01050)	(-0.95817)	(0.00030)	(1.85585)
	{0.74585}	{0.66890}	{0.99183}	{0.36057}	{0.99976}	{0.09315}
FedMPSIxUSFF	0.000286833	0.000575812	-8.28E-06	0.000370711	-1.23E-05	-8.82E-05
	(2.80129)	(2.73308)	(-0.21316)	(1.64452)	(-0.60313)	(-0.39290)
	{0.01875}	{0.02108}	{0.83549}	{0.13110}	{0.55985}	{0.70264}
ECBMPSI(-1)	6.50E-05	-0.000119164	-1.23E-05	-0.000656265	-2.63E-05	-0.000509233
	(2.46242)	(-2.56922)	(-1.42198)	(-14.94477)	(-7.46668)	(-12.78064)
	{0.03354}	{0.02793}	{0.18546}	{0.00000}	{0.00002}	{0.00000}
FEDMPSI(-1)	1.65E-05	3.52E-05	1.78E-06	-1.30E-05	-3.47E-06	-3.33E-05
	(0.45189)	(0.48425)	(0.15496)	(-0.18066)	(-0.73826)	(-0.53195)
	{0.66099}	{0.63864}	{0.87994}	{0.86024}	{0.47732}	{0.60637}
VIX(-1)	5.59E-06	3.93E-05	-8.31E-08	0.000137802	-2.98E-05	-0.000119414
	(0.08146)	(0.26015)	(-0.00361)	(1.24410)	(-4.45664)	(-1.17956)
	{0.93669}	{0.80003}	{0.99719}	{0.24183}	{0.00122}	{0.26548}
EUFF(-1)	-3.95E-05	-0.000361946	1.59E-05	-0.000928577	-3.49E-05	-0.000589474
	(-0.27191)	(-1.23226)	(0.26421)	(-3.95185)	(-1.21461)	(-2.59194)
	{0.79122}	{0.24604}	{0.79699}	{0.00272}	{0.25242}	{0.02686}
USFF(-1)	-0.007107315	-0.074431779	-0.000431685	-0.200066581	-0.001548989	-0.243004125
	(-0.58812)	(-5.13289)	(-0.08428)	(-10.86729)	(-1.31951)	(-10.63177)
	{0.56949}	{0.00044}	{0.93450}	{0.00000}	{0.21641}	{0.00000}
ECBMPSI x EUFF(-1)	-5.75E-07	1.01E-06	1.05E-07	5.46E-06	2.27E-07	4.28E-06
	(-0.36047)	(0.52222)	(0.02310)	(3.01153)	(0.02397)	(2.88869)
	{0.72599}	{0.61289}	{0.98202}	{0.01308}	{0.98135}	{0.01614}
FedMPSI x USFF(-1)	-0.000143783	-0.000330885	4.70E-06	-9.68E-05	1.17E-05	7.63E-05
	(-1.26410)	(-1.45785)	(0.11846)	(-0.37508)	(0.60582)	(0.28856)
	{0.23486}	{0.17556}	{0.90805}	{0.71543}	{0.55813}	{0.77881}
Variance	2.22E-06	9.94E-06	2.15E-07	1.43E-05	4.22E-08	1.22E-05
	(7.66161)	(14.18139)	(2.35340)	(14.83376)	(0.63592)	(14.55750)
	{0.00002}	{0.00000}	{0.04041}	{0.00000}	{0.53911}	{0.00000}
DoF	10	10	10	10	10	10
	(343859.85540)	(9.64485)	(28804.52221)	(7.54119)	(204639.64920)	(8.34004)
	{0.00000}	{0.00000}	{0.00000}	{0.00002}	{0.00000}	{0.00001}
R-sq	0.729550608	0.729543313	0.729543461	0.729774483	0.729774491	0.725731104
DW	2.014175018	2.005264769	1.971828769	1.982703888	2.011438778	1.945360686

Notes: Dependent variables are obtained through 3-stage DCC filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 8: Covariances –Money Markets

Ind variables	Dependent Variables						
	XOIS - US_OIS	XBUND - US_OIS	XCORP - US_OIS	XCORP_HY - US_OIS	XOIS - US10Y	XOIS -US_CORP	XOIS - US_CORP_HY
c	-0.000627671	0.000212342	-1.82E-05	-0.000649857	-0.001309534	0.001167994	-0.000516556
	(-6.47048)	(2.82728)	(-0.30640)	(-2.29252)	(-0.99546)	(3.00644)	(-0.46525)
	{0.00007}	{0.01794}	{0.76559}	{0.04482}	{0.34299}	{0.01320}	{0.65172}
AR(1)	0.952419504	1.129626538	0.809308964	0.900605069	0.941930936	1.022600719	0.924879147
	(32.19506)	(39.07546)	(34.25832)	(34.02278)	(30.06314)	(35.73032)	(29.94782)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.101088805	-0.156247461	0.127489865	0.026019742	-0.082233622	-0.127576846	-0.083216611
	(-3.11016)	(-5.18485)	(5.58794)	(1.00027)	(-2.35439)	(-4.83867)	(-2.32150)
	{0.01106}	{0.00041}	{0.00023}	{0.34077}	{0.04034}	{0.00068}	{0.04266}
ECBMPSI	6.40E-06	-2.55E-06	1.55E-05	6.37E-06	-2.91E-05	1.00E-05	-3.02E-05
	(1.67635)	(-0.60777)	(3.77805)	(0.92012)	(-2.07773)	(1.35977)	(-2.42440)
	{0.12460}	{0.55689}	{0.00361}	{0.37917}	{0.06444}	{0.20377}	{0.03579}
FEDMPSI)	-3.65E-06	2.05E-07	5.17E-07	-8.39E-06	-2.56E-05	7.86E-06	-2.07E-05
	(-0.69245)	(0.04679)	(0.18523)	(-1.11600)	(-1.06158)	(0.61357)	(-0.99390)
	{0.50441}	{0.96360}	{0.85675}	{0.29052}	{0.31339}	{0.55320}	{0.34371}
VIX	3.69E-06	4.01E-06	3.97E-06	-6.71E-05	4.38E-06	-1.42E-05	5.31E-06
	(0.37838)	(0.78733)	(0.67830)	(-5.34317)	(0.08404)	(-0.49323)	(0.12229)
	{0.71306}	{0.44934}	{0.51297}	{0.00033}	{0.93469}	{0.63250}	{0.90509}
EUFF	1.42E-05	2.17E-05	1.96E-05	-5.77E-05	1.95E-05	7.06E-06	4.33E-06
	(0.38299)	(0.55873)	(0.57134)	(-1.05495)	(0.18189)	(0.07820)	(0.04671)
	{0.70974}	{0.58864}	{0.58038}	{0.31627}	{0.85930}	{0.93921}	{0.96366}
USFF	0.000159052	-0.001983356	0.005404083	0.001057288	0.001921297	0.001037697	0.0026175
	(0.08799)	(-2.78499)	(8.13350)	(0.44691)	(0.17550)	(0.08699)	(0.32250)
	{0.93162}	{0.01928}	{0.00001}	{0.66446}	{0.86419}	{0.93240}	{0.75371}
ECBMPSIxEUFF	-3.28E-08	2.22E-08	-1.41E-07	-4.70E-08	3.54E-07	-9.89E-08	3.56E-07
	(-0.00297)	(0.00110)	(-0.00614)	(-0.00575)	(0.21449)	(-0.02462)	(0.16324)
	{0.99769}	{0.99915}	{0.99522}	{0.99553}	{0.83447}	{0.98084}	{0.87358}
FedMPSIxUSFF	3.74E-05	-4.74E-07	8.84E-06	2.96E-05	0.00019568	-3.26E-05	0.000180758
	(2.59411)	(-0.03239)	(1.04810)	(0.93089)	(2.71617)	(-0.66775)	(2.93619)
	{0.02676}	{0.97480}	{0.31926}	{0.37384}	{0.02170}	{0.51940}	{0.01488}
ECBMPSI(-1)	1.39E-05	-4.81E-06	-2.27E-05	1.38E-05	5.83E-05	-2.91E-05	5.63E-05
	(2.98512)	(-1.27414)	(-5.25248)	(1.94806)	(3.26438)	(-2.92573)	(3.64357)
	{0.01369}	{0.23143}	{0.00037}	{0.08000}	{0.00851}	{0.01515}	{0.00451}
FEDMPSI(-1)	4.12E-06	1.33E-06	1.85E-07	9.33E-07	1.32E-05	-5.56E-06	1.13E-05
	(0.77344)	(0.27799)	(0.06063)	(0.10566)	(0.52484)	(-0.46147)	(0.51575)
	{0.45716}	{0.78668}	{0.95285}	{0.91794}	{0.61113}	{0.65434}	{0.61724}
VIX(-1)	-3.75E-07	-1.82E-06	-1.97E-06	5.35E-05	7.41E-06	8.44E-06	3.37E-06
	(-0.03989)	(-0.35617)	(-0.33934)	(4.22630)	(0.14984)	(0.30040)	(0.08220)
	{0.96897}	{0.72912}	{0.74137}	{0.00175}	{0.88387}	{0.77002}	{0.93611}
EUFF(-1)	-9.28E-06	-2.36E-05	-1.93E-05	6.53E-05	-6.24E-06	-1.69E-05	1.99E-06
	(-0.25168)	(-0.60538)	(-0.56182)	(1.20355)	(-0.05870)	(-0.18799)	(0.02136)
	{0.80639}	{0.55841}	{0.58661}	{0.25648}	{0.95435}	{0.85464}	{0.98338}
USFF(-1)	8.26E-05	0.002110448	-0.005317289	-0.001649478	-0.0030102	-0.000869209	-0.003391622
	(0.04582)	(2.86063)	(-7.90068)	(-0.69096)	(-0.27502)	(-0.07278)	(-0.41850)
	{0.96435}	{0.01694}	{0.00001}	{0.50531}	{0.78890}	{0.94342}	{0.68443}
ECBMPSI x EUFF(-1)	-1.22E-07	3.35E-08	1.97E-07	-1.25E-07	-5.15E-07	2.57E-07	-4.95E-07
	(-0.01112)	(0.00188)	(0.00814)	(-0.01511)	(-0.28087)	(0.05831)	(-0.23015)
	{0.99135}	{0.99854}	{0.99366}	{0.98824}	{0.78453}	{0.95465}	{0.82262}
FedMPSI x USFF(-1)	-3.08E-05	-3.06E-06	-1.02E-05	-3.67E-06	-0.000109628	2.36E-05	-9.78E-05
	(-2.10287)	(-0.19546)	(-1.06121)	(-0.11284)	(-1.40700)	(-0.47867)	(-1.44211)
	{0.06178}	{0.84895}	{0.31355}	{0.91239}	{0.18974}	{0.64246}	{0.17985}
Variance	4.86E-08	2.06E-08	2.51E-08	1.54E-07	1.09E-06	1.74E-07	7.95E-07
	(0.69871)	(0.37210)	(0.44208)	(1.70377)	(5.55598)	(1.99742)	(4.78355)
	{0.50066}	{0.71758}	{0.66784}	{0.11925}	{0.00024}	{0.07370}	{0.00074}
DoF	10	10	10	10	10	10	10
	(1031891.57800)	(135230.55400)	(801945.51910)	(881795.69720)	(230614.80020)	(15650.63121)	(316821.87820)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.947413471	0.947425519	0.947423413	0.947385557	0.98765755	0.847235724	0.849335814
DW	2.00435263	1.980608479	1.992795905	1.9833508	2.008928414	1.954893551	2.016968519

Notes: Dependent variables are obtained through 3-stage DCC filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 9: Covariances –Treasury Markets

Ind variables	Dependent Variables				
	XBUND - US10Y	XCORP - US10Y	XCORP_HY - US10Y	XBUND - US_CORP	XBUND - US_CORP_HY
c	0.004313972	0.014621807	-0.001842215	-0.001098783	0.003397608
	(5.13469)	(5.72282)	(-1.61606)	(-5.79471)	(4.54298)
	{0.00044}	{0.00019}	{0.13715}	{0.00017}	{0.00107}
AR(1)	1.120558958	0.649011927	0.895293679	0.933221011	1.109417558
	(39.04295)	(25.84603)	(30.22465)	(32.48929)	(41.19630)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.138273388	0.114143503	-0.038794629	-0.03380182	-0.125515245
	(-4.76280)	(-4.73646)	(-1.24083)	(-1.24382)	(-4.59012)
	{0.00077}	{0.00080}	{0.24299}	{0.24193}	{0.00100}
ECBMPSI	-3.32E-05	0.000180037	-7.03E-05	9.37E-06	-1.95E-05
	(-3.06107)	(4.11775)	(-4.77108)	(2.05895)	(-1.89459)
	{0.01202}	{0.00208}	{0.00076}	{0.06650}	{0.08740}
FEDMPSI)	-7.35E-06	-3.08E-05	-3.62E-05	1.95E-06	-2.41E-06
	(-0.49783)	(-0.72505)	(-1.58722)	(-0.27904)	(-0.15695)
	{0.62937}	{0.48504}	{0.14355}	{0.78590}	{0.87841}
VIX	1.76E-05	-2.97E-05	-0.000210539	-7.84E-05	-2.50E-06
	(0.74694)	(-0.36569)	(-6.60250)	(-7.72907)	(-0.10420)
	{0.47230}	{0.72221}	{0.00006}	{0.00002}	{0.91907}
EUFF	0.000119383	0.000430394	-3.68E-05	4.40E-06	0.000118238
	(1.93522)	(2.51542)	(-0.49160)	(0.08806)	(1.90025)
	{0.08172}	{0.03063}	{0.63361}	{0.93157}	{0.08659}
USFF	0.003717829	0.134431494	-0.005867865	-0.002903621	0.00418179
	(0.41390)	(8.80888)	(-0.37981)	(-1.40621)	(0.64906)
	{0.68769}	{0.00001}	{0.71203}	{0.18997}	{0.53092}
ECBMPSIxEUFF	2.51E-07	-1.71E-06	6.32E-07	-7.60E-08	1.38E-07
	(0.14797)	(-0.64530)	(0.32289)	(-0.01549)	(0.07587)
	{0.88531}	{0.53326}	{0.75343}	{0.98795}	{0.94102}
FedMPSIxUSFF	6.53E-05	0.000342532	0.00010376	-3.78E-05	3.61E-05
	(1.08342)	(2.22798)	(0.98870)	(-1.79085)	(0.49630)
	{0.30405}	{0.05001}	{0.34613}	{0.10358}	{0.63041}
ECBMPSI(-1)	-9.96E-05	-0.000468843	8.21E-05	3.33E-05	-8.28E-05
	(-9.54133)	(-9.60036)	(5.91843)	(6.46898)	(-8.43223)
	{0.00000}	{0.00000}	{0.00015}	{0.00007}	{0.00001}
FEDMPSI(-1)	-7.26E-06	-1.49E-05	2.10E-05	3.72E-06	-7.93E-06
	(-0.44863)	(-0.29674)	(0.94269)	(0.50934)	(-0.49013)
	{0.66327}	{0.77273}	{0.36806}	{0.62156}	{0.63461}
VIX(-1)	4.66E-06	7.79E-05	0.000161001	5.56E-05	2.07E-05
	(0.18956)	(0.95223)	(4.71376)	(5.11463)	(0.86225)
	{0.85345}	{0.36343}	{0.00082}	{0.00045}	{0.40875}
EUFF(-1)	-0.000150549	-0.000504925	5.22E-05	6.30E-06	-0.000142432
	(-2.43615)	(-2.94429)	(0.69237)	(0.12676)	(-2.28637)
	{0.03508}	{0.01468}	{0.50446}	{0.90164}	{0.04529}
USFF(-1)	-0.005939704	-0.142494959	0.006230705	0.003159029	-0.00589847
	(-0.65694)	(-9.31402)	(0.40136)	(1.50310)	(-0.90721)
	{0.52605}	{0.00000}	{0.69660}	{0.16372}	{0.38564}
ECBMPSI x EUFF(-1)	8.20E-06	3.94E-06	-7.52E-07	-3.02E-07	6.82E-07
	(0.47330)	(1.37423)	(-0.40532)	(-0.05224)	(-0.37376)
	{0.64616}	{0.19939}	{0.69378}	{0.95937}	{0.71639}
FedMPSI x USFF(-1)	1.22E-05	-9.50E-05	-7.08E-05	9.17E-06	2.15E-05
	(0.18044)	(-0.52206)	(-0.72620)	(0.41038)	(0.29193)
	{0.86042}	{0.61300}	{0.48437}	{0.69018}	{0.77631}
Variance	6.81E-07	8.16E-06	1.28E-06	1.23E-07	5.66E-07
	(4.08433)	(18.32096)	(5.40640)	(1.43724)	(3.70888)
	{0.00220}	{0.00000}	{0.00030}	{0.18119}	{0.00405}
DoF	10	10	10	10	10
	(107537.80790)	(5.84415)	(3.85919)	(954928.89250)	(92037.79342)
	{0.00000}	{0.00016}	{0.00316}	{0.00000}	{0.00000}
R-sq	0.987632877	0.986664545	0.986611318	0.847235842	0.849419406
DW	1.996789996	1.972946085	1.999190156	1.990483854	1.995315597

Notes: Dependent variables are obtained through 3-stage DCC filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 10: Covariances –Corporate Markets

Ind variables	Dependent Variables			
	XCORP - US_CORP	XCORP_HY - US_CORP	XCORP - US_CORP_HY	XCORP_HY - US_CORP_HY
c	-0.000263348	0.001749919	0.011681195	0.000203754
	(-0.61540)	(0.26797)	(4.11970)	(1.55240)
	{0.55204}	{0.79417}	{0.00208}	{0.15161}
AR(1)	0.818893652	0.877922544	0.629556721	0.893825385
	(29.90728)	(31.87892)	(26.00783)	(31.08987)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.031011319	-0.04437925	0.1139117	-0.012990073
	(-1.14372)	(-1.68264)	(4.65685)	(-0.44746)
	{0.27938}	{0.12336}	{0.00090}	{0.66408}
ECBMPSI	3.08E-05	1.48E-05	0.000266342	-1.97E-05
	(4.44201)	(0.21985)	(6.35862)	(-4.36567)
	{0.00125}	{0.83041}	{0.00008}	{0.00141}
FEDMPSI)	-6.83E-06	7.56E-05	-2.26E-05	-6.08E-06
	(-0.74377)	(0.75764)	(-0.44281)	(-1.07587)
	{0.47413}	{0.46615}	{0.66733}	{0.30726}
VIX	9.38E-05	0.001398944	-4.29E-05	-5.94E-05
	(6.66738)	(8.13176)	(-0.46557)	(-6.25378)
	{0.00006}	{0.00001}	{0.65150}	{0.00009}
EUFF	3.25E-05	0.000400686	0.000507711	-6.27E-06
	(0.69120)	(0.87922)	(2.53535)	(-0.10849)
	{0.50517}	{0.39991}	{0.02960}	{0.91576}
USFF	0.015362299	0.02482042	0.173900899	-0.000593722
	(6.84683)	(0.32938)	(9.76539)	(-0.16415)
	{0.00004}	{0.74866}	{0.00000}	{0.87289}
ECBMPSIxEUFF	-2.90E-07	-3.44E-07	-2.45E-06	1.76E-07
	(-0.09118)	(-0.19183)	(-1.05708)	(0.02214)
	{0.92915}	{0.85171}	{0.31534}	{0.98277}
FedMPSIxUSFF	8.66E-05	-3.20E-05	0.000332286	1.80E-05
	(2.84027)	(-0.08582)	(1.82616)	(0.66502)
	{0.01754}	{0.93330}	{0.09779}	{0.52108}
ECBMPSI(-1)	-5.36E-05	-0.000375511	-0.000467767	7.99E-06
	(-7.74957)	(-5.23155)	(-10.02546)	(1.93397)
	{0.00002}	{0.00038}	{0.00000}	{0.08189}
FEDMPSI(-1)	-1.58E-06	-0.000100264	-9.14E-06	3.77E-06
	(-0.16174)	(-0.85981)	(-0.15438)	(0.65058)
	{0.87473}	{0.41003}	{0.88038}	{0.52998}
VIX(-1)	-5.60E-05	-0.00095752	9.28E-05	4.63E-05
	(-3.78097)	(-5.12364)	(0.99835)	(4.78812)
	{0.00360}	{0.00045}	{0.34165}	{0.00074}
EUFF(-1)	-3.05E-05	-0.000457353	-0.000552466	4.75E-06
	(-0.65011)	(-0.99536)	(-2.75950)	(0.08226)
	{0.53027}	{0.34304}	{0.02015}	{0.93606}
USFF(-1)	-0.015619818	-0.023840023	-0.180005148	0.000732231
	(-6.80690)	(-0.31272)	(-10.09385)	(0.20101)
	{0.00005}	{0.76092}	{0.00000}	{0.84472}
ECBMPSI x EUFF(-1)	4.83E-07	3.66E-06	3.93E-06	-8.64E-08
	(0.16066)	(2.07579)	(1.62605)	(-0.01146)
	{0.87556}	{0.06465}	{0.13500}	{0.99108}
FedMPSI x USFF(-1)	-4.79E-05	0.000179872	-0.000134054	-9.80E-06
	(-1.42809)	(0.42984)	(-0.63069)	(-0.37757)
	{0.18374}	{0.67643}	{0.54239}	{0.71364}
Variance	3.10E-07	3.53E-05	1.05E-05	8.38E-08
	(2.74807)	(14.36299)	(15.17342)	(1.05710)
	{0.02055}	{0.00000}	{0.00000}	{0.31533}
DoF	10	10	10	10
	(73571.14925)	(8.25280)	(7.04979)	(1167204.99800)
	{0.00000}	{0.00001}	{0.00003}	{0.00000}
R-sq	0.84723578	0.846973395	0.849353153	0.849353151
DW	1.992185135	1.985955872	1.963098056	2.005529005

Notes: Dependent variables are obtained through 3-stage DCC filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

A.2 BEKK Estimates

Table 11: BEKK Variances

Ind variables								
	var(US_OIS)	var(US10Y)	var(US_CORP)	var(US_CORP_HY)	var(XOIS)	var(XBUND)	var(XCORP)	var(XCORP_HY)
	0.002691512	0.020047169	0.001797281	0.037326389	-0.004825673	0.047160451	0.025693297	-0.006158931
	(2.61317)	(4.00935)	(0.44942)	(3.09485)	(-0.25572)	(8.33750)	(2.46367)	(-0.40900)
	{0.02590}	{0.00248}	{0.66271}	{0.01135}	{0.80335}	{0.00001}	{0.03347}	{0.69116}
AR(1)	0.977922466	0.967755187	1.029272264	0.908235982	0.9617041	0.264986543	0.86963249	0.769803274
	(35.47620)	(24.50336)	(33.98007)	(23.72682)	(38.71276)	(9.45158)	(39.24702)	(27.81545)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	0.000911666	-0.004275126	-0.073432554	-0.031365046	-0.069966432	-0.060767871	-0.030708159	0.048102699
	(0.03224)	(-0.10745)	(-2.47431)	(-0.80876)	(-2.09527)	(-1.05164)	(-1.32274)	(1.79335)
	{0.97492}	{0.91655}	{0.03286}	{0.43747}	{0.06257}	{0.31771}	{0.21537}	{0.10316}
ECBMPSI	6.31E-06	-0.000320991	-6.69E-05	-0.000562914	-0.000648047	-1.17E-05	0.000774275	0.001073397
	(0.35308)	(-6.79197)	(-1.59540)	(-1.89375)	(-3.42497)	(-0.14154)	(4.35601)	(3.92037)
	{0.73136}	{0.00005}	{0.14171}	{0.08752}	{0.00649}	{0.89025}	{0.00143}	{0.00286}
FEDMPSI)	-2.39E-06	-2.43E-05	-1.15E-05	9.99E-05	-0.000338509	-3.35E-05	-1.72E-05	0.00037352
	(-0.11956)	(-0.34028)	(-0.16703)	(0.36971)	(-1.03365)	(-0.24042)	(-0.08311)	(1.33727)
	{0.90720}	{0.74068}	{0.87068}	{0.71931}	{0.32565}	{0.81486}	{0.93541}	{0.21076}
VIX	3.15E-05	0.000236798	0.000555763	0.001204994	0.000135856	-8.93E-05	-0.000372352	0.00146776
	(1.05777)	(1.87617)	(6.04053)	(3.53579)	(0.18171)	(-0.44586)	(-1.12510)	(3.89819)
	{0.31504}	{0.09009}	{0.00013}	{0.00539}	{0.85944}	{0.66520}	{0.28682}	{0.00297}
EUFF	0.000110329	-0.000455858	1.06E-05	-0.000296519	-0.001396457	0.001466634	0.002343367	0.000789771
	(1.49556)	(-1.52631)	(0.03773)	(-0.34392)	(-1.33976)	(3.32498)	(3.40130)	(0.78287)
	{0.16564}	{0.15792}	{0.97065}	{0.73803}	{0.20997}	{0.00768}	{0.00676}	{0.45185}
USFF	-0.012112298	-0.000782331	0.00278135	-0.058546586	-0.010426808	0.040136878	0.752342623	-0.009019223
	(-2.92306)	(-0.02542)	(0.06745)	(-0.78463)	(-0.06907)	(1.07259)	(12.81086)	(-0.09596)
	{0.01522}	{0.98022}	{0.94756}	{0.45086}	{0.94629}	{0.30866}	{0.00000}	{0.92545}
ECBMPSIxEUFF	-4.82E-08	2.60E-06	5.11E-07	3.74E-06	6.62E-06	-1.01E-07	-6.82E-06	-9.13E-06
	(-0.01135)	(1.69133)	(0.32700)	(0.98807)	(2.58521)	(-0.05040)	(-2.17192)	(-2.25492)
	{0.99117}	{0.12165}	{0.75041}	{0.34642}	{0.02717}	{0.96080}	{0.05499}	{0.04778}
FedMPSIxUSFF	2.11E-05	0.000396088	0.000295815	0.000150962	0.002390772	0.000245788	0.000723542	-0.001267002
	(0.29354)	(1.45684)	(1.41471)	(0.12151)	(2.58042)	(0.36131)	(1.00779)	(-0.93083)
	{0.77511}	{0.17583}	{0.18753}	{0.90569}	{0.02740}	{0.72539}	{0.33732}	{0.37387}
ECBMPSI(-1)	-0.000120901	-0.000254759	-0.000188396	-0.000304566	0.000424627	-0.000844281	-0.001393376	-0.00065162
	(-6.97635)	(-5.40850)	(-4.07109)	(-1.03081)	(1.62285)	(-11.18001)	(-7.98817)	(-2.61799)
	{0.00004}	{0.00030}	{0.00225}	{0.32692}	{0.13569}	{0.00000}	{0.00001}	{0.02569}
FEDMPSI(-1)	2.46E-06	-2.28E-05	-2.31E-05	-2.84E-05	0.000298265	-6.92E-05	-5.03E-05	-0.000118473
	(0.10856)	(-0.26440)	(-0.30797)	(-0.10424)	(0.92576)	(-0.46847)	(-0.20948)	(-0.40414)
	{0.91570}	{0.79684}	{0.76443}	{0.91904}	{0.37637}	{0.64949}	{0.83828}	{0.69462}
VIX(-1)	-1.24E-05	-0.00010929	-0.000333253	-0.001062684	-0.000107048	0.000223352	0.000380604	-0.001125178
	(-0.43684)	(-0.84700)	(-3.30895)	(-2.84871)	(-0.14683)	(1.10198)	(1.12291)	(-2.82600)
	{0.67151}	{0.41681}	{0.00789}	{0.01729}	{0.88618}	{0.29629}	{0.28771}	{0.01797}
EUFF(-1)	-0.000133367	0.000306018	-4.93E-05	5.54E-05	0.001442871	-0.001674635	-0.002481261	-0.000762751
	(-1.80733)	(1.02760)	(-0.17438)	(0.06363)	(1.40224)	(-3.78481)	(-3.59510)	(-0.74930)
	{0.10084}	{0.32835}	{0.86504}	{0.95052}	{0.19112}	{0.00357}	{0.00489}	{0.47093}
USFF(-1)	0.0118173	-0.008685932	-0.002361781	0.057518812	0.003761624	-0.055371338	-0.765134704	0.017806104
	(2.76406)	(-0.28136)	(-0.05660)	(0.78924)	(0.02482)	(-1.46680)	(-13.18506)	(0.18888)
	{0.01999}	{0.78417}	{0.95598}	{0.44828}	{0.98068}	{0.17316}	{0.00000}	{0.85396}
ECBMPSI x EUFF(-1)	9.48E-07	2.15E-06	1.85E-06	2.96E-06	-4.35E-06	6.96E-06	1.15E-05	5.78E-06
	(0.23825)	(1.47646)	(0.98002)	(0.77277)	(-1.29756)	(3.43008)	(3.85075)	(1.35225)
	{0.81650}	{0.17060}	{0.35019}	{0.45754}	{0.22357}	{0.00644}	{0.00321}	{0.20608}
FedMPSI x USFF(-1)	1.38E-05	-0.00011721	-0.000114817	-0.000295782	-0.00157139	0.00028995	-7.19E-05	0.000521431
	(0.16515)	(-0.31826)	(-0.49188)	(-0.23454)	(-1.55465)	(0.42908)	(-0.08237)	(0.40744)
	{0.87212}	{0.75683}	{0.63342}	{0.81930}	{0.15108}	{0.67696}	{0.93598}	{0.69227}
Variance	8.07E-07	2.08E-05	9.42E-06	0.000146757	0.000106206	3.54E-05	9.74E-05	0.000142029
	(5.25810)	(10.78528)	(14.87546)	(11.40254)	(13.36425)	(12.35883)	(14.10915)	(13.12692)
	{0.00037}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10	10	10
	(875920.71850)	(5.54710)	(6.49353)	(8.74254)	(14.13219)	(11.71834)	(11.66134)	(13.63243)
	{0.00000}	{0.00025}	{0.00007}	{0.00001}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.976451109	0.972724364	0.973018663	0.912192976	0.897556295	0.895370445	0.885938135	0.870126249
DW	2.005425923	2.000469896	1.985494164	1.994577502	2.023835458	2.003781717	1.97397469	1.990637006

Notes: Dependent variables are obtained through 3-stage BEKK filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 12: BEKK Covariances – European Markets

Ind variables	Dependent Variables					
	XBUND - XOIS	XCORP - XOIS	XCORP_HY - XOIS	XCORP - XBUND	XCORP_HY - XBUND	XCORP - XCORP_HY
	-0.011516177	-0.01196904	-0.006385203	0.033002325	0.002371111	0.014597066
	(-3.73859)	(-1.61676)	(-0.87230)	(5.51647)	(1.36535)	(2.58238)
	{0.00386}	{0.13700}	{0.40350}	{0.00026}	{0.20207}	{0.02730}
AR(1)	0.946023795	0.907616384	0.788968434	0.269565549	0.917919392	0.721446712
	(29.60183)	(26.21580)	(17.98327)	(10.30468)	(25.66968)	(19.01189)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.052456544	-0.060358017	-0.072335308	-0.029245238	0.017470515	0.014535951
	(-1.50228)	(-1.28576)	(-1.74402)	(-0.58389)	(0.48055)	(0.32948)
	{0.16393}	{0.22750}	{0.11176}	{0.57223}	{0.64118}	{0.74859}
ECBMPSI	0.000294468	-0.000120673	-8.65E-05	0.000423196	0.000134979	0.00021527
	(7.20885)	(-1.84186)	(-1.24398)	(4.99760)	(4.59502)	(3.10373)
	{0.00003}	{0.09531}	{0.24188}	{0.00054}	{0.00099}	{0.01118}
FEDMPSI	3.52E-06	2.79E-05	-5.35E-05	-5.46E-05	-2.80E-06	7.30E-05
	(0.06283)	(0.24265)	(-0.38236)	(-0.40711)	(-0.09516)	(0.75934)
	{0.95114}	{0.81318}	{0.71020}	{0.69251}	{0.92606}	{0.46517}
VIX	7.67E-05	0.000161864	-3.39E-05	-0.000199283	-8.25E-05	0.000255213
	(0.79549)	(0.66412)	(-0.17746)	(-0.78116)	(-1.85123)	(1.59292)
	{0.44480}	{0.52163}	{0.86269}	{0.45280}	{0.09385}	{0.14226}
EUFF	0.000397683	-0.000514203	-0.0001431	0.001991294	0.000283386	0.001037525
	(2.04645)	(-1.12976)	(-0.33111)	(4.54266)	(2.61889)	(2.94567)
	{0.06791}	{0.28495}	{0.74740}	{0.00107}	{0.02565}	{0.01464}
USFF	-0.005575301	-0.026609991	-0.010812215	0.026933246	0.023731738	0.068945031
	(-0.21593)	(-0.38612)	(-0.22815)	(0.70523)	(2.93491)	(1.62453)
	{0.83339}	{0.70749}	{0.82413}	{0.49677}	{0.01491}	{0.13533}
ECBMPSIxEUFF	-2.21E-06	1.70E-06	1.53E-06	-3.68E-06	-1.10E-06	-1.98E-06
	(-0.95349)	(0.81279)	(0.85829)	(-1.68647)	(-0.60571)	(-1.24179)
	{0.36282}	{0.43526}	{0.41083}	{0.12260}	{0.55821}	{0.24265}
FedMPSIxUSFF	-9.88E-05	-0.000446058	-1.25E-05	0.000411379	6.72E-06	-0.000262391
	(-0.55889)	(-1.24045)	(-0.03046)	(0.72967)	(0.05155)	(-0.69619)
	{0.58853}	{0.24312}	{0.97630}	{0.48233}	{0.95990}	{0.50217}
ECBMPSI(-1)	0.000120882	0.000391189	0.000305197	-0.000874601	-0.000145992	-0.000590928
	(2.89884)	(5.08464)	(4.24492)	(-11.59150)	(-6.05641)	(-9.59280)
	{0.01587}	{0.00047}	{0.00170}	{0.00000}	{0.00012}	{0.00000}
FEDMPSI(-1)	-1.27E-05	7.39E-06	0.000129184	-1.97E-05	5.46E-06	-8.57E-05
	(-0.21822)	(0.06065)	(0.94229)	(-0.13079)	(0.15202)	(-0.77380)
	{0.83165}	{0.95283}	{0.36825}	{0.89853}	{0.88219}	{0.45695}
VIX(-1)	-3.95E-05	-0.000141534	-6.19E-05	0.000277421	3.12E-05	-0.000203381
	(-0.39761)	(-0.59155)	(-0.31009)	(1.16774)	(0.64194)	(-1.19162)
	{0.69927}	{0.56728}	{0.76286}	{0.27000}	{0.53535}	{0.26092}
EUFF(-1)	-0.000305389	0.00060471	0.000187329	-0.002112416	-0.000299167	-0.001139663
	(-1.57379)	(1.30972)	(0.42936)	(-4.80160)	(-2.75256)	(-3.26005)
	{0.14661}	{0.21958}	{0.67677}	{0.00072}	{0.02039}	{0.00857}
USFF(-1)	0.005225197	0.031399887	0.020805823	-0.037668514	-0.022580238	-0.067979935
	(0.19947)	(0.45417)	(0.43443)	(-0.98335)	(-2.74455)	(-1.59137)
	{0.84589}	{0.65940}	{0.67320}	{0.34863}	{0.02067}	{0.14261}
ECBMPSI x EUFF(-1)	-1.04E-06	-3.44E-06	-2.81E-06	7.38E-06	1.35E-06	5.22E-06
	(-0.51051)	(-1.81371)	(-1.62687)	(3.50984)	(0.70505)	(3.10463)
	{0.62077}	{0.09980}	{0.13482}	{0.00563}	{0.49687}	{0.01116}
FedMPSI x USFF(-1)	0.00012148	0.000169814	-0.000644675	-3.01E-05	-8.65E-05	0.000291362
	(0.61981)	(0.42059)	(-1.49744)	(-0.04775)	(-0.59887)	(0.68572)
	{0.54925}	{0.68295}	{0.16516}	{0.96285}	{0.56258}	{0.50848}
Variance	7.21E-06	2.49E-05	3.55E-05	3.79E-05	2.90E-06	2.91E-05
	(19.95120)	(13.42788)	(18.53728)	(13.44867)	(11.36295)	(16.63105)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10
	(8.33166)	(12.72133)	(12.47562)	(12.28413)	(11.57835)	(11.39472)
	{0.00001}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.897504953	0.896868108	0.895904909	0.894761162	0.894762894	0.885361066
DW	1.995295531	2.002905044	1.98920745	2.008806361	2.003366729	2.007478435

Notes: Dependent variables are obtained through 3-stage BEKK filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 13: BEKK Covariances – US Markets

Ind variables	Dependent Variables					
	US10Y - US_OIS	US_CORP - US_OIS	US_CORP_HY - US_OIS	US_CORP - US10Y	USCORP_HY - US10Y	US_CORP_HY - US_CORP
	0.015886268	-0.002014771	0.002247976	-0.004640489	0.00952666	-0.00484698
	(3.45042)	(-1.23168)	(2.29934)	(-2.07855)	(3.29786)	(-2.19541)
	{0.00622}	{0.24625}	{0.04430}	{0.06435}	{0.00804}	{0.05285}
AR(1)	0.982553693	0.948549159	0.995535003	0.90838442	0.966637646	0.835009205
	(24.92600)	(29.23612)	(39.76321)	(27.62362)	(20.15033)	(25.31832)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.005664597	-0.027308297	-0.007600152	0.03734672	0.007030558	0.107498848
	(-0.14308)	(-0.88525)	(-0.29607)	(1.13761)	(0.14928)	(3.30497)
	{0.88907}	{0.39681}	{0.77324}	{0.28181}	{0.88430}	{0.00795}
ECBMPSI	-0.000272209	0.000165491	1.26E-05	8.46E-05	-0.000191389	6.65E-05
	(-6.70520)	(7.35315)	(0.82043)	(2.69065)	(-5.00857)	(1.55681)
	{0.00005}	{0.00002}	{0.43109}	{0.02267}	{0.00053}	{0.15057}
FEDMPSI	-2.07E-05	3.31E-05	-1.26E-06	5.85E-05	7.40E-06	5.27E-05
	(-0.34783)	(1.09629)	(-0.06267)	(1.26132)	(0.16953)	(1.15965)
	{0.73518}	{0.29865}	{0.95127}	{0.23582}	{0.86876}	{0.27313}
VIX	0.000203103	-0.000237451	4.66E-06	-0.000341083	0.000306526	-0.000185846
	(1.88731)	(-5.23760)	(0.15448)	(-5.70901)	(5.15801)	(-2.52605)
	{0.08845}	{0.00038}	{0.88031}	{0.00020}	{0.00043}	{0.03007}
EUFF	-0.000391332	0.000233523	9.11E-05	0.000184545	-0.000127177	0.000294573
	(-1.53739)	(-1.90504)	(1.18069)	(1.27204)	(-0.82086)	(1.91370)
	{0.15521}	{0.08591}	{0.26505}	{0.23214}	{0.43086}	{0.08469}
USFF	-0.000175243	0.005251524	-0.012424119	0.016828805	-0.006453955	0.01463178
	(-0.00671)	(0.40164)	(-3.31067)	(0.69832)	(-0.50662)	(0.82651)
	{0.99478}	{0.69640}	{0.00787}	{0.50089}	{0.62340}	{0.42779}
ECBMPSIxEUFF	2.21E-06	-1.29E-06	-9.47E-08	-7.21E-07	1.39E-06	-5.21E-07
	(1.45587)	(-0.59764)	(-0.02276)	(-0.41119)	(0.61642)	(-0.19805)
	{0.17609}	{0.56337}	{0.98229}	{0.68961}	{0.55139}	{0.84697}
FedMPSIxUSFF	0.000337049	-0.000187028	1.25E-05	-0.000292386	0.000100798	-0.000259528
	(1.49185)	(-1.92588)	(0.16658)	(-2.04617)	(0.54774)	(-1.78676)
	{0.16660}	{0.08300}	{0.87102}	{0.06794}	{0.59589}	{0.10427}
ECBMPSI(-1)	-0.000215973	2.22E-05	-9.98E-05	0.000221204	-7.09E-05	0.00021725
	(-5.10829)	(0.89211)	(-6.66142)	(6.36473)	(-1.82220)	(5.06087)
	{0.00046}	{0.39330}	{0.00006}	{0.00008}	{0.09842}	{0.00049}
FEDMPSI(-1)	-1.92E-05	-1.79E-05	3.84E-06	-3.74E-06	-1.86E-06	-5.16E-06
	(-0.26404)	(-0.49182)	(0.17602)	(-0.07485)	(-0.03823)	(-0.10141)
	{0.79711}	{0.63346}	{0.86379}	{0.94181}	{0.97025}	{0.92123}
VIX(-1)	-9.33E-05	0.000142552	7.19E-06	0.000192112	-0.000272383	7.13E-05
	(-0.84970)	(2.95672)	(0.25237)	(3.10911)	(-4.22156)	(1.02508)
	{0.41537}	{0.01437}	{0.80587}	{0.01108}	{0.00177}	{0.32948}
EUFF(-1)	0.000268874	-0.000205751	-0.000109756	-0.000132497	6.11E-05	-0.000245045
	(1.05803)	(-1.67547)	(-1.42354)	(-0.90778)	(0.39133)	(-1.58055)
	{0.31493}	{0.12478}	{0.18502}	{0.38535}	{0.70376}	{0.14506}
USFF(-1)	-0.007615657	-0.004879736	0.011920813	-0.014273449	0.004641127	-0.011361229
	(-0.29113)	(-0.36937)	(3.09870)	(-0.58774)	(0.36574)	(-0.63493)
	{0.77690}	{0.71955}	{0.01128}	{0.56974}	{0.72218}	{0.53973}
ECBMPSI x EUFF(-1)	1.83E-06	-3.06E-07	7.66E-07	-1.98E-06	6.28E-07	-1.88E-06
	(1.13066)	(-0.14512)	(0.21414)	(-1.02667)	(0.27795)	(-0.69708)
	{0.28458}	{0.88750}	{0.83474}	{0.32877}	{0.78671}	{0.50164}
FedMPSI x USFF(-1)	-0.000101204	0.000123741	1.83E-05	6.63E-05	-7.07E-05	6.61E-05
	(-0.32528)	(-1.04866)	(0.21853)	(0.41313)	(-0.30387)	(0.37311)
	{0.75167}	{0.31902}	{0.83141}	{0.68823}	{0.76746}	{0.71685}
Variance	1.51E-05	2.09E-06	6.70E-07	5.23E-06	5.10E-06	5.29E-06
	(10.75213)	(9.13802)	(4.57245)	(13.51817)	(8.13262)	(13.93847)
	{0.00000}	{0.00000}	{0.00102}	{0.00000}	{0.00001}	{0.00000}
DoF	10	10	10	10	10	10
	(141311.01520)	(12.61676)	(291088.84750)	(9.82178)	(5.48255)	(9.35707)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00027}	{0.00000}
R-sq	0.978828008	0.978744045	0.978774187	0.972453658	0.972397992	0.972801853
DW	2.000312059	1.961193807	2.004178353	1.996098827	1.996775964	2.011117025

Notes: Dependent variables are obtained through 3-stage BEKK filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 14: BEKK Covariances – Money Markets

Ind variables	Dependent Variables						
	XOIS - US_OIS	XBUND - US_OIS	XCORP - US_OIS	XCORP_HY - US_OIS	XOIS - US10Y	XOIS -US_CORP	XOIS - US_CORP_HY
	-0.002764308	0.000185797	-0.001060272	-0.000934894	0.000454058	-0.000930201	-0.000120536
	(-3.28817)	(0.54821)	(-2.39508)	(-0.66541)	(0.31759)	(-0.10787)	(-0.04093)
	{0.00818}	{0.59557}	{0.03763}	{0.52084}	{0.75733}	{0.91623}	{0.96816}
AR(1)	0.920686606	0.875435351	0.846694529	0.942861674	0.980986313	0.604032614	0.924322469
	(21.74211)	(26.81710)	(31.37604)	(26.61731)	(20.21512)	(21.49241)	(25.70333)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.040251857	0.089946446	0.051669652	0.015238504	-0.011458864	0.146954915	-0.044237255
	(-0.96243)	(2.68785)	(1.83661)	(0.45328)	(-0.23582)	(4.51644)	(-1.07203)
	{0.35853}	{0.02278}	{0.09613}	{0.66002}	{0.81833}	{0.00111}	{0.30889}
ECBMPSI	3.01E-05	2.63E-05	4.73E-05	7.12E-05	-9.34E-05	0.000157547	-0.00031833
	(2.49223)	(3.56898)	(6.08584)	(3.31610)	(-4.77401)	(1.59323)	(-8.19301)
	{0.03187}	{0.00510}	{0.00012}	{0.00780}	{0.00075}	{0.14219}	{0.00001}
FEDMPSI	5.71E-06	5.60E-06	-8.76E-07	1.89E-05	4.04E-06	-0.000171618	4.66E-05
	(0.34729)	(0.64227)	(-0.09345)	(0.91056)	(0.13299)	(-1.02369)	(0.77621)
	{0.73557}	{0.53515}	{0.92739}	{0.38395}	{0.89684}	{0.33011}	{0.45559}
VIX	1.57E-05	-2.01E-05	-5.03E-05	-0.000193748	0.000133289	-0.000438076	8.53E-05
	(0.60856)	(-1.62305)	(-3.12903)	(-5.53884)	(3.01150)	(-2.02488)	(0.79149)
	{0.55638}	{0.13564}	{0.01071}	{0.00025}	{0.01308}	{0.07040}	{0.44703}
EUFF	0.000223289	0.000103555	8.58E-05	-5.75E-05	-5.76E-05	0.001203593	0.000505526
	(3.10488)	(2.23700)	(1.85883)	(-0.54740)	(-0.48308)	(2.46256)	(2.33803)
	{0.01116}	{0.04925}	{0.09269}	{0.59611}	{0.63944}	{0.03353}	{0.04148}
USFF	0.003072209	0.005623331	-0.006387519	0.00311226	0.008411919	0.107440746	0.028117177
	(0.58988)	(2.38085)	(-3.12092)	(-0.45986)	(1.32166)	(2.42222)	(1.79223)
	{0.56836}	{0.03856}	{0.01086}	{0.65545}	{0.21572}	{0.03593}	{0.10335}
ECBMPSIxEUFF	-2.43E-07	-2.05E-07	-3.92E-07	-6.52E-07	7.82E-07	-8.25E-07	2.74E-06
	(-0.08025)	(-0.03772)	(-0.08295)	(-0.21398)	(0.36376)	(-0.46596)	(1.87014)
	{0.93762}	{0.97066}	{0.93553}	{0.83486}	{0.72361}	{0.65123}	{0.09099}
FedMPSIxUSFF	-9.63E-05	-2.78E-05	3.73E-05	2.00E-05	-2.88E-05	0.001160992	-0.000293967
	(-1.77145)	(-0.79377)	(1.14690)	(0.24962)	(-0.24763)	(2.18241)	(-1.56680)
	{0.10690}	{0.44576}	{0.27812}	{0.80793}	{0.80943}	{0.05402}	{0.14823}
ECBMPSI(-1)	5.35E-05	-4.00E-05	-9.49E-06	3.45E-06	1.56E-05	0.000230142	0.000218458
	(3.98840)	(-5.41973)	(-1.08294)	(0.15950)	(0.69460)	(2.21924)	(5.17335)
	{0.00257}	{0.00029}	{0.30425}	{0.87645}	{0.50313}	{0.05076}	{0.00042}
FEDMPSI(-1)	-8.19E-07	-5.66E-06	-3.06E-06	3.52E-06	8.03E-06	0.000195885	-3.09E-05
	(-0.04413)	(-0.51667)	(-0.25741)	(0.12686)	(0.28379)	(1.07688)	(-0.52737)
	{0.96567}	{0.61662}	{0.80208}	{0.90157}	{0.78236}	{0.30683}	{0.60944}
VIX(-1)	3.56E-06	3.22E-05	4.97E-05	0.000139973	-0.000111592	0.000199274	-6.14E-05
	(0.13218)	(2.46992)	(3.15836)	(3.83443)	(-2.17829)	(0.89384)	(-0.55529)
	{0.89746}	{0.03311}	{0.01019}	{0.00329}	{0.05440}	{0.39241}	{0.59090}
EUFF(-1)	-0.000203953	-0.000106532	-7.64E-05	7.12E-05	4.96E-05	-0.001165355	-0.000511439
	(-2.85422)	(-2.32942)	(-1.66563)	(0.67868)	(0.41542)	(-2.37354)	(-2.37210)
	{0.01713}	{0.04209}	{0.12676}	{0.51274}	{0.68661}	{0.03904}	{0.03914}
USFF(-1)	-0.000420002	-0.005084438	0.006585324	-0.003239765	-0.006847794	-0.106790857	-0.024349675
	(-0.07957)	(-2.09995)	(3.07186)	(-0.46514)	(-1.07167)	(-2.44764)	(-1.54150)
	{0.93815}	{0.06208}	{0.01180}	{0.65180}	{0.30905}	{0.03440}	{0.15422}
ECBMPSI x EUFF(-1)	-4.43E-07	3.17E-07	7.77E-08	-8.27E-08	-1.33E-07	-2.45E-06	-1.70E-06
	(-0.14013)	(0.06170)	(0.01758)	(-0.02807)	(-0.06270)	(-1.25213)	(-1.17165)
	{0.89134}	{0.95202}	{0.98632}	{0.97816}	{0.95124}	{0.23902}	{0.26850}
FedMPSI x USFF(-1)	6.83E-07	2.01E-05	-1.45E-05	-3.70E-05	-1.20E-05	-0.001390005	0.000174165
	(0.01148)	(0.48846)	(-0.35764)	(-0.36936)	-(0.11127)	(-2.67783)	(0.88186)
	{0.99107}	{0.63575}	{0.72804}	{0.71956}	{0.91361}	{0.02318}	{0.39856}
Variance	6.58E-07	1.77E-07	2.47E-07	1.46E-06	1.49E-06	4.54E-05	8.97E-06
	(5.04532)	(1.96970)	(2.65895)	(7.99161)	(5.76769)	(18.58274)	(16.73192)
	{0.00050}	{0.07718}	{0.02394}	{0.00001}	{0.00018}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10	10
	(6.10587)	(112753.43060)	(10.82185)	(8.79537)	(105865.02940)	(10.25965)	(264243.52900)
	{0.00011}	{0.00000}	{0.00000}	{0.00001}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.978769724	0.978769088	0.978768422	0.978721926	0.972376486	0.968661546	0.912068527
DW	1.995548935	1.997409633	2.007431566	1.973126531	1.995138167	2.01767618	1.995921016

Notes: Dependent variables are obtained through 3-stage BEKK filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 15: BEKK Covariances – Treasury Markets

Ind variables	Dependent Variables				
	XBUND - US10Y	XCORP - US10Y	XCORP_HY - US10Y	XBUND - US_CORP	XBUND - US_CORP_HY
	0.00534923	0.002023929	-0.007063823	-0.000532045	0.004298916
	(4.64527)	(2.52728)	(-2.19129)	(-0.39499)	(3.96653)
	{0.00091}	{0.03001}	{0.05322}	{0.70114}	{0.00266}
AR(1)	0.979923641	1.004161807	0.843321057	0.916550907	0.978175425
	(25.25275)	(32.44179)	(23.52458)	(29.86192)	(28.24207)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.004558631	-0.030266902	0.073999012	0.012294968	-0.000814682
	(-0.11791)	(-0.99633)	(2.06193)	(0.40664)	(-0.02347)
	{0.90848}	{0.34259}	{0.06617}	{0.69284}	{0.98174}
ECBMPSI	-6.38E-05	-1.77E-05	0.000354421	6.55E-05	-1.33E-05
	(-3.76021)	(-1.43703)	(8.64317)	(3.21811)	(-0.84423)
	{0.00372}	{0.18125}	{0.00001}	{0.00920}	{0.41828}
FEDMPSI	-1.56E-05	-9.08E-06	0.00012986	4.28E-06	-3.48E-06
	(-0.76360)	(-0.67776)	(1.91890)	(0.17069)	(-0.17016)
	{0.46274}	{0.51330}	{0.08396}	{0.86787}	{0.86828}
VIX	3.21E-05	-5.68E-06	-0.000506029	-0.000118843	-1.43E-05
	(1.02251)	(-0.23751)	(-5.05801)	(-3.45900)	(-0.44009)
	{0.33064}	{0.81705}	{0.00049}	{0.00613}	{0.66923}
EUFF	0.000232072	0.000167898	0.00049668	0.00033029	0.000207224
	(2.90338)	(2.79664)	(2.40693)	(3.62928)	(2.74896)
	{0.01574}	{0.01890}	{0.03688}	{0.00462}	{0.02051}
USFF	0.003782914	-0.022698382	0.031421184	-0.005660027	0.005591396
	(0.41041)	(-5.58385)	(1.36264)	(-0.77067)	(0.73970)
	{0.69016}	{0.00023}	{0.20289}	{0.45873}	{0.47649}
ECBMPSIxEUFF	5.07E-07	9.98E-08	-3.00E-06	-4.67E-07	9.39E-08
	(0.33995)	(0.04511)	(-2.60483)	(-0.25722)	(0.05341)
	{0.74093}	{0.96491}	{0.02627}	{0.80222}	{0.95846}
FedMPSIxUSFF	9.61E-05	0.000126593	-0.000322786	-0.000123882	3.91E-05
	(1.15661)	(2.60826)	(-1.27401)	(-1.44006)	(0.43141)
	{0.27432}	{0.02612}	{0.23147}	{0.18041}	{0.67532}
ECBMPSI(-1)	-9.84E-05	-4.50E-05	-4.40E-05	2.52E-05	-0.000122341
	(-6.04802)	(-3.82370)	(-1.04323)	(1.23591)	(-7.44820)
	{0.00012}	{0.00335}	{0.32141}	{0.24473}	{0.00002}
FEDMPSI(-1)	-7.83E-06	2.00E-07	-5.05E-05	2.24E-05	-8.04E-06
	(-0.33091)	(0.01137)	(-0.66929)	(0.74053)	(-0.35159)
	{0.74754}	{0.99115}	{0.51846}	{0.47601}	{0.73244}
VIX(-1)	-3.20E-06	1.34E-05	0.000396387	1.23E-05	4.50E-05
	(-0.09796)	(0.56519)	(3.97659)	(0.32744)	(1.36415)
	{0.92390}	{0.58440}	{0.00262}	{0.75008}	{0.20243}
EUFF(-1)	-0.000268775	-0.000179378	-0.000440314	-0.000319103	-0.000238008
	(-3.35595)	(-2.99980)	(-2.12237)	(-3.48142)	(-3.15381)
	{0.00729}	{0.01335}	{0.05978}	{0.00591}	{0.01027}
USFF(-1)	-0.006848809	0.021592493	-0.025821706	0.009062635	-0.007674086
	(-0.73601)	(5.10121)	(-1.10447)	(1.19827)	(-1.00376)
	{0.47863}	{0.00046}	{0.29526}	{0.25844}	{0.33916}
ECBMPSI x EUFF(-1)	7.55E-07	3.79E-07	4.07E-07	-1.97E-07	9.63E-07
	(0.39771)	(0.16005)	(0.32859)	(-0.11443)	(0.43688)
	{0.69920}	{0.87603}	{0.74925}	{0.91116}	{0.67148}
FedMPSI x USFF(-1)	2.97E-05	-5.91E-05	2.33E-05	-8.44E-05	3.24E-05
	(0.30688)	(-0.96958)	(0.07386)	(-0.83846)	(0.31970)
	{0.76523}	{0.35512}	{0.94258}	{0.42136}	{0.75577}
Variance	1.33E-06	6.76E-07	1.28E-05	2.00E-06	1.11E-06
	(5.80684)	(4.63928)	(20.96656)	(9.68178)	(5.12567)
	{0.00017}	{0.00092}	{0.00000}	{0.00000}	{0.00045}
DoF	10	10	10	10	10
	(4.22064)	(5.77344)	(10.42657)	(7.30237)	(4.13671)
	{0.00177}	{0.00018}	{0.00000}	{0.00003}	{0.00202}
R-sq	0.972376289	0.972372291	0.971365907	0.96863409	0.912137452
DW	2.023112661	2.00801618	1.999491617	2.006587511	2.016404814

Notes: Dependent variables are obtained through 3-stage BEKK filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 16: BEKK Covariances – Corporate Markets

Ind variables	Dependent Variable			
	XCORP - US_CORP	XCORP_HY - US_CORP	XCORP - US_CORP_HY	XCORP_HY - US_CORP_HY
	0.002264068	0.0024009	0.03525905	-0.007117743
	(1.05026)	(0.33181)	(5.85832)	(-1.78634)
	{0.31832}	{0.74688}	{0.00016}	{0.10435}
AR(1)	0.812131003	0.872487717	0.279444736	0.793400024
	(27.64732)	(30.45152)	(10.66421)	(21.12385)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	0.077177546	0.004575616	-0.128841986	0.069487576
	(2.65247)	(0.17197)	(-4.56040)	(1.83550)
	{0.02421}	{0.86689}	{0.00104}	{0.09631}
ECBMPSI	-2.38E-05	-0.000124981	-1.15E-05	0.000321463
	(-0.72460)	(-1.68653)	(-0.13831)	(6.91566)
	{0.48531}	{0.12259}	{0.89274}	{0.00004}
FEDMPSI	6.66E-05	4.66E-05	-3.42E-05	0.000153351
	(1.64588)	(0.34308)	(-0.31998)	(1.90187)
	{0.13081}	{0.73864}	{0.75557}	{0.08636}
VIX	9.81E-05	0.001527993	-0.000193166	-0.000395438
	(1.61934)	(8.88200)	(-0.93406)	(-3.01568)
	{0.13644}	{0.00000}	{0.37228}	{0.01299}
EUFF	0.000569017	0.000686307	0.001259394	0.000847766
	(3.97766)	(1.54406)	(2.93016)	(3.64667)
	{0.00261}	{0.15361}	{0.01504}	{0.00449}
USFF	-0.048851037	-0.093869419	-0.172555524	0.036420949
	(-3.99137)	(-3.15535)	(-5.48277)	(1.31417)
	{0.00255}	{0.01024}	{0.00027}	{0.21813}
ECBMPSIxEUFF	1.37E-07	1.05E-06	-1.87E-07	-2.64E-06
	(0.06530)	(0.56179)	(-0.09770)	(-2.40488)
	{0.94922}	{0.58663}	{0.92410}	{0.03701}
FedMPSIxUSFF	-0.000483261	-6.04E-05	0.000684288	-0.000412833
	(-3.64161)	(-0.12378)	(1.67544)	(-1.19655)
	{0.00452}	{0.90394}	{0.12479}	{0.25908}
ECBMPSI(-1)	-0.000110689	-0.000443541	-0.000663335	-0.000109459
	(-3.62990)	(-5.66110)	(-7.77097)	(-2.11026)
	{0.00461}	{0.00021}	{0.00002}	{0.06102}
FEDMPSI(-1)	-1.15E-05	-0.000159235	-2.82E-05	-7.64E-05
	(-0.23598)	(-1.22199)	(-0.19754)	(-0.82106)
	{0.81821}	{0.24973}	{0.84736}	{0.43075}
VIX(-1)	-0.000104023	-0.000969209	0.000296068	0.000338548
	(-1.71546)	(-5.09580)	(1.46199)	(2.71159)
	{0.11702}	{0.00047}	{0.17445}	{0.02187}
EUFF(-1)	-0.00059124	-0.000759616	-0.00139731	-0.000802083
	(-4.15600)	(-1.69918)	(-3.25594)	(-3.42790)
	{0.00196}	{0.12013}	{0.00863}	{0.00646}
USFF(-1)	0.055613727	0.089634888	0.163189352	-0.029175335
	(4.51564)	(3.00771)	(5.14694)	(-1.04059)
	{0.00112}	{0.01317}	{0.00043}	{0.32257}
ECBMPSI x EUFF(-1)	8.53E-07	4.18E-06	5.50E-06	1.09E-06
	(0.49774)	(2.49577)	(2.77661)	(0.90639)
	{0.62943}	{0.03168}	{0.01956}	{0.38605}
FedMPSI x USFF(-1)	0.000198828	0.000485022	-0.000153561	0.00011919
	(1.31292)	(1.01838)	(-0.28034)	(0.28968)
	{0.21854}	{0.33250}	{0.78493}	{0.77798}
Variance	4.75E-06	3.96E-05	4.31E-05	1.72E-05
	(13.52029)	(15.75502)	(14.29304)	(20.01489)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10
	(7.53078)	(8.82808)	(11.70225)	(10.81851)
	{0.00002}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.968544763	0.960367978	0.911089505	0.910673315
DW	2.012141453	1.976888168	2.011873152	2.013541827

Notes: Dependent variables are obtained through 3-stage BEKK filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2; t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

A.3 RiskMetrics Estimates

Table 17: RM Variances

Ind variables	Dependent Variables							
	var(US_OIS)	var(US10Y)	var(US_CORP)	var(US_CORP_HY)	var(XOIS)	var(XBUND)	var(XCORP)	var(XCORP_HY)
c	-0.000362683	0.052934431	0.005276603	0.055837955	-0.015812484	0.024265175	0.019264348	-0.0082256
	(-0.08705)	(5.93270)	(0.67039)	(5.47489)	(-0.84862)	(4.67943)	(2.11492)	(-0.60803)
	{0.93235}	{0.00014}	{0.51779}	{0.00027}	{0.41595}	{0.00087}	{0.06054}	{0.55673}
AR(1)	0.953501158	0.884570114	0.92707222	0.885262352	0.976916133	0.995187346	0.979252806	0.876567839
	(38.40626)	(22.47852)	(29.67942)	(21.79590)	(36.60758)	(37.37835)	(43.82025)	(30.51461)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.059513385	0.011182208	-0.028459164	-0.023791921	-0.093765244	-0.081656444	-0.056244308	0.031548099
	(-1.87544)	(0.28454)	(-0.94892)	(-0.58050)	(-2.81810)	(-2.83238)	(-2.37440)	(1.08826)
	{0.09020}	{0.78180}	{0.36503}	{0.57443}	{0.01822}	{0.01778}	{0.03898}	{0.30201}
ECBMPSI	6.10E-05	-0.000644194	-0.000163064	-0.000897569	-0.000379085	1.26E-05	0.00070723	0.000983243
	(0.72167)	(-5.23150)	(-2.22294)	(-4.92988)	(-2.67918)	(0.17186)	(4.87808)	(4.63737)
	{0.48703}	{0.00038}	{0.05044}	{0.00060}	{0.02313}	{0.86698}	{0.00064}	{0.00093}
FEDMPSI)	1.26E-05	-5.27E-05	-1.79E-05	5.43E-05	-0.000262627	-2.51E-05	-1.33E-05	0.000335081
	(0.17229)	(-0.36631)	(-0.12721)	(0.32180)	(-0.86791)	(-0.19777)	(-0.07137)	(-1.33117)
	{0.86665}	{0.72176}	{0.90130}	{0.75423}	{0.40579}	{0.84719}	{0.94451}	{0.21268}
VIX	2.72E-05	0.000450973	0.00113599	-1.88E-05	5.19E-05	-5.91E-05	-0.000331416	0.001304384
	(0.33654)	(1.80975)	(6.24304)	(-0.05444)	(0.08417)	(-0.31474)	(-1.11981)	(3.87879)
	{0.74342}	{0.10044}	{0.00010}	{0.95766}	{0.93458}	{0.75943}	{0.28897}	{0.00306}
EUFF	0.000308105	-0.000897345	-1.43E-05	-0.001431124	-0.000313827	0.00139636	0.002122317	0.00069425
	(1.21487)	(-1.54822)	(-0.02563)	(-2.09480)	(-0.28491)	(3.41767)	(3.43158)	(0.76491)
	{0.25232}	{0.15261}	{0.98006}	{0.06262}	{0.78152}	{0.00657}	{0.00642}	{0.46200}
USFF	-0.044857284	-0.009979475	0.008115177	-0.001621585	-0.005827883	0.040741583	0.675632619	0.005540676
	(-4.46444)	(-0.15437)	(0.09988)	(-0.02061)	(-0.04024)	(1.18556)	(12.77860)	(0.06017)
	{0.00121}	{0.88039}	{0.92241}	{0.98396}	{0.96869}	{0.26320}	{0.00000}	{0.95321}
ECBMPSIxEUFF	-4.27E-07	5.19E-06	1.24E-06	7.10E-06	3.81E-06	-2.75E-07	-6.22E-06	-8.38E-06
	(-0.06483)	(2.37750)	(0.75188)	(2.41064)	(1.63656)	(-0.14526)	(-2.19512)	(-2.49716)
	{0.94959}	{0.03878}	{0.46945}	{0.03664}	{0.13276}	{0.88739}	{0.05288}	{0.03160}
FedMPSIxUSFF	-0.000105658	0.000794354	0.000587147	0.000456605	0.002009197	0.000206767	0.000621057	-0.001137487
	(-0.34572)	(1.39682)	(1.35108)	(0.57061)	(2.34151)	(0.33580)	(0.95652)	(-0.92221)
	{0.73671}	{0.19269}	{0.20644}	{0.58086}	{0.04123}	{0.74396}	{0.36136}	{0.37813}
ECBMPSI(-1)	-3.77E-05	-0.000524049	-0.000398969	-0.000104752	0.000459287	-0.000731282	-0.001247668	-0.000523618
	(-0.47161)	(-4.03450)	(-4.90991)	(-0.53798)	(2.28649)	(-10.79629)	(-8.76027)	(-2.70671)
	{0.64733}	{0.00238}	{0.00061}	{0.60236}	{0.04528}	{0.00000}	{0.00001}	{0.02206}
FEDMPSI(-1)	3.36E-05	-5.49E-05	-4.53E-05	-7.43E-05	0.000148062	-5.08E-05	-4.38E-05	-9.26E-05
	(0.47412)	(-0.32755)	(-0.29240)	(-0.37718)	(0.48330)	(-0.37742)	(-0.20408)	(-0.35368)
	{0.64559}	{0.75001}	{0.77596}	{0.71392}	{0.63929}	{0.71375}	{0.84239}	{0.73092}
VIX(-1)	-3.86E-06	-0.000205389	-0.000706303	0.000279167	-2.03E-05	0.00018909	0.000341678	-0.000963524
	(-0.04149)	(-0.81012)	(-3.52654)	(0.83376)	(-0.03435)	(1.00075)	(1.12596)	(-2.69262)
	{0.96772}	{0.43672}	{0.00548}	{0.42388}	{0.97328}	{0.34055}	{0.28648}	{0.02260}
EUFF(-1)	-0.000312445	0.000513163	-7.80E-05	0.001042326	0.000458417	-0.001573085	-0.002243789	-0.000678761
	(-1.24413)	(0.88589)	(-0.13902)	(1.50486)	(0.42032)	(-3.84622)	(-3.62616)	(-0.73968)
	{0.24182}	{0.39648}	{0.89220}	{0.16327}	{0.68314}	{0.00323}	{0.00464}	{0.47650}
USFF(-1)	0.050193594	-0.013359648	-0.002706972	-0.017476487	-0.002113428	-0.052709914	-0.684065691	0.006457033
	(4.87816)	(-0.20585)	(-0.03290)	(-0.22096)	(-0.01460)	(-1.51895)	(-13.05156)	(0.06995)
	{0.00064}	{0.84104}	{0.97440}	{0.82957}	{0.98864}	{0.15974}	{0.00000}	{0.94561}
ECBMPSI x EUFF(-1)	1.75E-07	4.39E-06	3.84E-06	7.94E-07	-4.06E-06	6.01E-06	1.02E-05	4.67E-06
	(0.02821)	(1.97816)	(2.63920)	(0.26677)	(-1.57169)	(3.10007)	(3.88522)	(1.30096)
	{0.97805}	{0.07610}	{0.02477}	{0.79507}	{0.14710}	{0.01125}	{0.00303}	{0.22245}
FedMPSI x USFF(-1)	-6.12E-05	-0.000188111	-0.000223268	-9.27E-05	-0.000868015	0.000220692	-6.58E-05	0.000426784
	(-0.20577)	(-0.25413)	(-0.46146)	(-0.09699)	(-0.94667)	(0.36117)	(-0.08456)	(0.36966)
	{0.84110}	{0.80454}	{0.65434}	{0.92465}	{0.36612}	{0.72548}	{0.93428}	{0.71935}
Variance	4.42E-06	7.97E-05	3.80E-05	0.000107959	8.32E-05	3.00E-05	7.79E-05	0.000113609
	(9.89425)	(11.98077)	(14.40994)	(11.48483)	(13.30896)	(12.36824)	(14.06522)	(12.99541)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10	10	10
	(8.11252)	(6.82994)	(9.65249)	(6.64896)	(13.60907)	(11.55123)	(11.59219)	(13.63946)
	{0.00001}	{0.00005}	{0.00000}	{0.00006}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.868571059	0.893569157	0.893808961	0.883141074	0.878075128	0.877476463	0.879514948	0.880729028
DW	1.987741565	2.002604964	1.984797849	1.97990484	2.008860798	1.994298508	1.985400254	1.993747003

Notes: Dependent variables are obtained through 3-stage RM filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 18: RM Covariances – European Markets

Ind variables	Dependent Variables					
	XBUND - XOIS	XCORP - XOIS	XCORP_HY - XOIS	XCORP - XBUND	XCORP_HY - XBUND	XCORP - XCORP_HY
c	-0.019731187	-0.023968883	-0.004227832	0.015012289	0.007089207	0.014647666
	(-4.76123)	(-3.32941)	(-1.04375)	(2.73780)	(1.90965)	(2.86280)
	{0.00077}	{0.00763}	{0.32117}	{0.02091}	{0.08525}	{0.01688}
AR(1)	0.829868678	0.835669091	0.828871462	0.999850527	0.832010596	0.828015653
	(12.49065)	(13.01135)	(19.46130)	(40.47501)	(22.46250)	(21.32728)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	0.040361144	0.011415003	-0.038580429	-0.087290343	0.036398402	0.033759615
	(0.64053)	(0.19216)	(-0.92945)	(-3.20366)	(0.94010)	(0.83525)
	{0.53623}	{0.85146}	{0.37455}	{0.00943}	{0.36932}	{0.42308}
ECBMPSI	0.000477506	0.000271146	1.73E-05	0.000387279	0.000260382	0.000153723
	(8.69589)	(4.11496)	(0.34491)	(5.22379)	(5.45004)	(2.51864)
	{0.00001}	{0.00209}	{0.73731}	{0.00039}	{0.00028}	{0.03046}
FEDMPSI	1.25E-05	9.08E-05	-2.13E-05	-4.59E-05	-7.64E-06	6.93E-05
	(0.15051)	(0.77847)	(-0.26769)	(-0.37428)	(-0.12291)	(0.82278)
	{0.88335}	{0.45432}	{0.79438}	{0.71601}	{0.90461}	{0.42981}
VIX	-4.85E-05	5.33E-05	-1.74E-05	-0.000175681	-0.000177946	0.000227815
	(-0.33507)	(0.26500)	(-0.17165)	(-0.74869)	(-1.85255)	(1.59394)
	{0.74450}	{0.79639}	{0.86714}	{0.47129}	{0.09365}	{0.14203}
EUFF	0.001063358	0.000995971	0.000258071	0.001851104	0.000599166	0.000921743
	(4.12011)	(2.33406)	(1.09131)	(4.61280)	(2.63493)	(2.94884)
	{0.00208}	{0.04176}	{0.30073}	{0.00096}	{0.02495}	{0.01456}
USFF	-0.004791539	-0.038127947	-0.00860569	0.028326564	0.051079909	0.06172389
	(-0.15250)	(-1.06145)	(-0.31048)	(0.81700)	(3.00574)	(1.68927)
	{0.88183}	{0.31345}	{0.76257}	{0.43296}	{0.01321}	{0.12205}
ECBMPSIxEUFF	-3.64E-06	-1.59E-06	2.47E-07	-3.37E-06	-2.13E-06	-1.47E-06
	(-1.37287)	(-1.31729)	(0.08636)	(-1.61265)	(-1.62428)	(-0.91870)
	{0.19979}	{0.21713}	{0.93289}	{0.13790}	{0.13538}	{0.37988}
FedMPSIxUSFF	-0.000189111	-0.000979532	-8.09E-05	0.000368721	2.55E-05	-0.000239174
	(-0.70215)	(-2.63685)	(-0.35252)	(0.72752)	(0.09352)	(-0.72225)
	{0.49860}	{0.02487}	{0.73176}	{0.48359}	{0.92734}	{0.48669}
ECBMPSI(-1)	0.00025024	0.000445576	0.000136281	-0.000783173	-0.000339799	-0.000558013
	(4.56418)	(5.79015)	(2.59187)	(-11.64256)	(-8.24709)	(-10.12462)
	{0.00104}	{0.00018}	{0.02686}	{0.00000}	{0.00001}	{0.00000}
FEDMPSI(-1)	-4.50E-05	-5.42E-05	6.58E-05	-8.69E-06	1.03E-05	-7.15E-05
	(-0.52212)	(-0.44049)	(0.81745)	(-0.06331)	(0.13752)	(-0.73193)
	{0.61296}	{0.66895}	{0.43272}	{0.95077}	{0.89335}	{0.48101}
VIX(-1)	9.66E-05	-5.97E-06	-3.72E-05	0.000258615	6.81E-05	-0.000184304
	(0.64134)	(-0.02832)	(-0.34515)	(1.18682)	(0.64881)	(-1.20627)
	{0.53572}	{0.97796}	{0.73713}	{0.26273}	{0.53108}	{0.25548}
EUFF(-1)	-0.000903234	-0.000810528	-0.000222691	-0.001955799	-0.000649088	-0.001040321
	(-3.50907)	(-1.89272)	(-0.93492)	(-4.85718)	(-2.84454)	(-3.34936)
	{0.00564}	{0.08767}	{0.37185}	{0.00066}	{0.01741}	{0.00737}
USFF(-1)	0.003233276	0.044496962	0.012259794	-0.036484986	-0.049152564	-0.058255295
	(-0.10135)	(1.25245)	(0.43777)	(-1.04805)	(-2.84462)	(-1.58022)
	{0.92128}	{0.23890}	{0.67085}	{0.31929}	{0.01741}	{0.14514}
ECBMPSI x EUFF(-1)	-2.08E-06	-3.75E-06	-1.32E-06	6.60E-06	3.09E-06	4.90E-06
	(-0.86343)	(-2.28351)	(-0.45957)	(3.19825)	(2.45678)	(2.95791)
	{0.40813}	{0.04551}	{0.65565}	{0.00952}	{0.03386}	{0.01434}
FedMPSI x USFF(-1)	0.000299049	0.000528089	-0.000342443	-6.39E-05	-0.000176287	0.000241251
	(1.07728)	(1.27505)	(-1.39651)	(-0.11215)	(-0.58709)	(0.63973)
	{0.30666}	{0.23112}	{0.19278}	{0.91292}	{0.57016}	{0.53673}
Variance	1.27E-05	2.67E-05	1.06E-05	3.19E-05	1.32E-05	2.32E-05
	(16.30013)	(14.51976)	(22.05718)	(13.56895)	(20.46047)	(16.70142)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10
	(11.90911)	(13.79707)	(12.61364)	(12.14656)	(11.73702)	(11.18624)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
R-sq	0.877952069	0.877389625	0.877300317	0.877273139	0.877144372	0.879197647
DW	1.999452564	2.00865946	1.989777469	2.001577378	2.00550298	2.010645219

Notes: Dependent variables are obtained through 3-stage RM filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 19: RM Covariances – US Markets

Ind variables	Dependent Variables						
	US10Y -DUS_OIS	US_CORP - US_OIS	US_CORP_HY - US_OIS	XOIS - US_OIS	US_CORP - US10Y	USCORP_HY - US10Y	US_CORP_HY - US_CORP
c	0.004453781	-0.001853096	0.004928963	-0.003188267	-0.009011358	0.052987233	-0.009887652
	(1.92973)	(-1.07440)	(1.58865)	(-3.52576)	(-2.12243)	(5.96988)	(-2.25595)
	{0.08247}	{0.30788}	{0.14322}	{0.00549}	{0.05978}	{0.00014}	{0.04770}
AR(1)	0.883803455	0.880140216	0.891873609	0.853425687	0.816844911	0.867902394	0.745103874
	(30.79424)	(27.84710)	(35.08846)	(21.38199)	(25.29271)	(19.93704)	(22.34280)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	0.023261224	-0.008369054	0.017714774	-0.03374931	0.056994596	0.006096583	0.103517225
	(0.74771)	(-0.27515)	(0.62381)	(-0.85624)	(1.77254)	(0.14077)	(3.12203)
	{0.47185}	{0.78880}	{0.54672}	{0.41191}	{0.10671}	{0.89085}	{0.01084}
ECBMPSI	5.34E-05	0.000167717	9.63E-05	4.12E-05	0.00014177	-0.000764166	0.000114626
	(1.11736)	(6.94721)	(1.56757)	(3.32852)	(2.93676)	(-5.82548)	(2.26895)
	{0.28996}	{0.00004}	{0.14805}	{0.00764}	{0.01487}	{0.00017}	{0.04665}
FEDMPSI)	-2.10E-06	3.34E-05	1.54E-06	5.12E-06	0.000109038	-1.76E-05	9.76E-05
	(-0.04681)	(1.03646)	(0.02464)	(0.28953)	(1.19787)	(-0.12168)	(1.06220)
	{0.96358}	{0.32440}	{0.98082}	{0.77809}	{0.25859}	{0.90556}	{0.31312}
VIX	6.92E-05	-0.000249726	1.43E-05	1.16E-05	-0.000666782	0.00021362	-0.000373418
	(1.02229)	(-5.24610)	(0.14645)	(0.39727)	(-5.71393)	(0.79003)	(-2.53401)
	{0.33074}	{0.00038}	{0.88648}	{0.69952}	{0.00019}	{0.44784}	{0.02967}
EUFF	0.00025943	0.000244815	0.00030513	0.00022277	0.000374164	-0.000994059	0.000609509
	(1.66312)	(1.89964)	(1.39477)	(2.90298)	(1.34382)	(-1.68943)	(2.02314)
	{0.12727}	{0.08667}	{0.19329}	{0.01575}	{0.20870}	{0.12202}	{0.07061}
USFF	-0.026125275	0.006754359	-0.036601543	0.003485347	0.033814742	0.001302094	0.031712845
	(-2.76328)	(0.50142)	(-3.04972)	(0.63516)	(0.69469)	(0.02018)	(0.86936)
	{0.02002}	{0.62693}	{0.01226}	{0.53959}	{0.50307}	{0.98430}	{0.40504}
ECBMPSIxEUFF	-4.19E-07	-1.30E-06	-7.45E-07	-3.34E-07	-1.22E-06	6.07E-06	-8.98E-07
	(-0.11994)	(-0.59270)	(-0.19215)	(-0.13391)	(-0.63754)	(-2.60917)	(-0.49192)
	{0.90691}	{0.56654}	{0.85147}	{0.89613}	{0.53809}	{0.02608}	{0.63340}
FedMPSIxUSFF	2.64E-05	-0.00019645	2.12E-06	-0.000104648	-0.00055273	0.00067977	-0.000498087
	(-0.16185)	(-1.90658)	(-0.00890)	(-1.79056)	(-1.97174)	(1.10450)	(-1.67648)
	{0.87465}	{0.08569}	{0.99307}	{0.10363}	{0.07692}	{0.29524}	{0.12458}
ECBMPSI(-1)	-0.000219827	1.55E-05	-0.000243086	5.63E-05	0.000413282	-0.000296262	0.000427874
	(-4.73006)	(0.58436)	(-3.80318)	(4.08571)	(7.97150)	(-2.11585)	(7.68852)
	{0.00080}	{0.57193}	{0.00347}	{0.00219}	{0.00001}	{0.06044}	{0.00002}
FEDMPSI(-1)	8.52E-06	-1.99E-05	1.67E-05	-1.42E-06	-1.17E-05	-5.63E-05	-1.79E-05
	(0.16606)	(-0.50947)	(0.24376)	(-0.07158)	(-0.11995)	(-0.32555)	(-0.17396)
	{0.87142}	{0.62148}	{0.81234}	{0.94435}	{0.90690}	{0.75147}	{0.86537}
VIX(-1)	-2.33E-05	0.000147557	3.10E-05	1.09E-05	0.000384831	-2.95E-05	0.000133761
	(-0.35817)	(2.90867)	(0.33838)	(0.36620)	(3.16343)	(-0.10988)	(0.95163)
	{0.72766}	{0.01560}	{0.74208}	{0.72184}	{0.01010}	{0.91468}	{0.36372}
EUFF(-1)	-0.000300119	-0.000217045	-0.000349435	-0.000200367	-0.000271791	0.000624459	-0.000505249
	(-1.92752)	(-1.67990)	(-1.59919)	(-2.62353)	(-0.97026)	(1.05154)	(-1.66220)
	{0.08277}	{0.12390}	{0.14086}	{0.02544}	{0.35480}	{0.31776}	{0.12745}
USFF(-1)	0.027207009	-0.006942412	0.03749055	-0.000491469	-0.031416798	-0.023086813	-0.02641782
	(2.77351)	(-0.51044)	(3.02704)	(-0.08817)	(-0.64098)	(-0.35524)	(-0.71789)
	{0.01967}	{0.62082}	{0.01274}	{0.93148}	{0.53595}	{0.72979}	{0.48926}
ECBMPSI x EUFF(-1)	1.73E-06	-2.58E-07	1.86E-06	-4.57E-07	-3.71E-06	2.42E-06	-3.72E-06
	(0.52876)	(-0.12064)	(0.49602)	(-0.18185)	(-1.85242)	(1.00683)	(-1.99368)
	{0.60851}	{0.90636}	{0.63060}	{0.85934}	{0.09367}	{0.33776}	{0.07416}
FedMPSI x USFF(-1)	8.55E-06	0.00012819	2.04E-05	9.81E-07	0.000143278	-0.000151855	0.000147308
	(0.04365)	(1.02435)	(0.07569)	(0.01541)	(0.45377)	(-0.18375)	(0.40652)
	{0.96604}	{0.32981}	{0.94115}	{0.98801}	{0.65968}	{0.85788}	{0.69293}
Variance	4.27E-06	2.33E-06	6.98E-06	7.51E-07	1.98E-05	8.06E-05	2.16E-05
	(11.08003)	(9.60769)	(23.93671)	(5.61883)	(18.93904)	(11.67223)	(18.98847)
	{0.00000}	{0.00000}	{0.00000}	{0.00022}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10	10
	(8.69805)	(12.49187)	(9.70447)	(7.12321)	(10.16098)	(6.82575)	(11.22382)
	{0.00001}	{0.00000}	{0.00000}	{0.00003}	{0.00000}	{0.00005}	{0.00000}
R-sq	0.879872614	0.879543793	0.882116323	0.881935176	0.893045472	0.881437156	0.893022664
DW	2.003580714	1.962404859	2.002064226	1.996555602	1.99939122	1.997017199	2.012380837

Notes: Dependent variables are obtained through 3-stage RM filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 20: RM Covariances – Money Markets

Ind variables	Dependent Variables						
	XOIS - US_OIS	XBUND - US_OIS	XCORP - US_OIS	XCORP_HY - US_OIS	XOIS - US10Y	XOIS -US_CORP	XOIS - US_CORP_HY
c	-0.003188267	-0.000479323	-0.00243097	-0.000835502	-0.011300723	0.000389056	-0.009234434
	(-3.52576)	(-0.37989)	(-2.11842)	(-0.49328)	(-2.95019)	(0.11177)	(-2.27826)
	{0.00549}	{0.71197}	{0.06018}	{0.63246}	{0.01453}	{0.91321}	{0.04592}
AR(1)	0.853425687	0.764364082	0.730571463	0.863992079	0.826791122	0.645338204	0.883702205
	(21.38199)	(22.87794)	(27.07116)	(24.69881)	(20.81027)	(24.34488)	(23.70400)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	-0.03374931	0.081747714	0.009857919	0.06002758	0.028278456	0.163834321	-0.021082643
	(-0.85624)	(2.12857)	(0.33047)	(1.85892)	(0.68755)	(5.39259)	(-0.48396)
	{0.41191}	{0.05916}	{0.74787}	{0.09268}	{0.50737}	{0.00030}	{0.63884}
ECBMPSI	4.12E-05	9.59E-05	0.00011565	7.55E-05	4.47E-05	5.97E-05	-2.91E-05
	(3.32852)	(4.91573)	(6.72788)	(2.87062)	(0.95758)	(1.47447)	(-0.59621)
	{0.00764}	{0.00061}	{0.00005}	{0.01665}	{0.36085}	{0.17113}	{0.56429}
FEDMPSI	5.12E-06	1.73E-05	-2.51E-06	2.23E-05	8.15E-05	-7.00E-05	0.000108606
	(0.28953)	(0.73092)	(-0.11896)	(0.88980)	(0.96135)	(-1.06578)	(1.26143)
	{0.77809}	{0.48160}	{0.90767}	{0.39448}	{0.35905}	{0.31158}	{0.23579}
VIX	1.16E-05	-5.57E-05	-0.000113996	-0.000238682	6.12E-05	-0.000172125	-5.10E-05
	(0.39727)	(-1.66556)	(-3.07491)	(-5.67907)	(0.45374)	(-1.97688)	(-0.31078)
	{0.69952}	{0.12677}	{0.01174}	{0.00020}	{0.65971}	{0.07627}	{0.76235}
EUFF	0.00022277	0.000292049	0.000197981	-8.00E-05	0.001190312	0.000484766	0.001365634
	(2.90298)	(3.13000)	(2.30285)	(-0.64711)	(4.25063)	(2.39785)	(4.61926)
	{0.01575}	{0.01069}	{0.04404}	{0.53213}	{0.00169}	{0.03745}	{0.00095}
USFF	0.003485347	0.015705985	-0.015669799	0.004005625	0.025487008	0.043716408	0.033567688
	(0.63516)	(2.30408)	(-3.25093)	(0.49091)	(0.59504)	(2.50479)	(0.77508)
	{0.53959}	{0.04395}	{0.00871}	{0.63408}	{0.56504}	{0.03119}	{0.45623}
ECBMPSIxEUFF	-3.34E-07	-7.49E-07	-9.55E-07	-7.07E-07	-1.62E-07	-2.92E-07	3.85E-07
	(-0.13391)	(-0.35857)	(-0.45296)	(-0.25207)	(-0.13372)	(-0.23155)	(0.24862)
	{0.89613}	{0.72737}	{0.66024}	{0.80609}	{0.89628}	{0.82156}	{0.80869}
FedMPSIxUSFF	-0.000104648	-8.82E-05	9.03E-05	2.87E-05	-0.00089063	0.000456567	-0.000871008
	(-1.79056)	(-0.89393)	(1.20519)	(0.29995)	(-3.41874)	(2.16647)	(-3.21379)
	{0.10363}	{0.39236}	{0.25588}	{0.77036}	{0.00656}	{0.05550}	{0.00927}
ECBMPSI(-1)	5.63E-05	-9.07E-05	-3.11E-05	-1.41E-05	0.000273448	9.11E-05	0.000335893
	(4.08571)	(-4.53231)	(-1.64715)	(-0.53311)	(5.20496)	(2.29097)	(5.90408)
	{0.00219}	{0.00109}	{0.13055}	{0.60560}	{0.00040}	{0.04494}	{0.00015}
FEDMPSI(-1)	-1.42E-06	-1.48E-05	-9.08E-06	3.39E-06	-4.90E-05	7.83E-05	-6.47E-05
	(-0.07158)	(-0.48456)	(-0.33519)	(0.09892)	(-0.58499)	(1.11097)	(-0.75640)
	{0.94435}	{0.63843}	{0.74441}	{0.92315}	{0.57152}	{0.29258}	{0.46686}
VIX(-1)	1.09E-05	9.15E-05	0.000112358	0.000177967	-1.52E-05	6.84E-05	9.80E-05
	(0.36620)	(2.56087)	(3.09405)	(4.07588)	(-0.11073)	(0.76056)	(0.59185)
	{0.72184}	{0.02833}	{0.01137}	{0.00223}	{0.91402}	{0.46448}	{0.56709}
EUFF(-1)	-0.000200367	-0.000293507	-0.000176296	9.40E-05	-0.00111287	-0.000474307	-0.001305553
	(-2.62353)	(-3.18545)	(-2.05422)	(0.76216)	(-3.95286)	(-2.33009)	(-4.39096)
	{0.02544}	{0.00973}	{0.06703}	{0.46356}	{0.00272}	{0.04204}	{0.00135}
USFF(-1)	-0.000491469	-0.013148029	0.015986363	-0.004627455	-0.015296777	-0.044076992	-0.024068937
	(-0.08817)	(-1.88499)	(3.20034)	(-0.55100)	(-0.35479)	(-2.57453)	(-0.55121)
	{0.93148}	{0.08879}	{0.00949}	{0.59373}	{0.73012}	{0.02767}	{0.59359}
ECBMPSI x EUFF(-1)	-4.57E-07	7.21E-07	2.55E-07	4.35E-08	-2.16E-06	-9.68E-07	-2.63E-06
	(-0.18185)	(0.32758)	(0.13025)	(0.01658)	(-1.41636)	(-0.72267)	(-1.42281)
	{0.85934}	{0.74998}	{0.89895}	{0.98710}	{0.18706}	{0.48644}	{0.18523}
FedMPSI x USFF(-1)	9.81E-07	4.75E-05	-2.30E-05	-4.10E-05	0.000483572	-0.000572706	0.000437193
	(-0.01541)	(0.40566)	(-0.24446)	(-0.33832)	(1.85996)	(-2.85955)	(1.51190)
	{0.98801}	{0.69354}	{0.81181}	{0.74211}	{0.09252}	{0.01697}	{0.16150}
Variance	7.51E-07	1.40E-06	1.37E-06	2.16E-06	1.59E-05	7.41E-06	1.83E-05
	(5.61883)	(7.47093)	(7.97053)	(9.74009)	(18.44698)	(29.26518)	(18.20298)
	{0.00022}	{0.00002}	{0.00001}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10	10	10
	(7.12321)	(5.94760)	(9.94549)	(9.50293)	(12.29994)	(8.24933)	(13.03442)
	{0.00003}	{0.00014}	{0.00000}	{0.00000}	{0.00000}	{0.00001}	{0.00000}
R-sq	0.881935176	0.88137407	0.880874595	0.882187881	0.880868518	0.892939248	0.882788451
DW	1.996555602	1.994799916	1.99867723	1.983756222	2.024688437	2.02303203	2.022500978

Notes: Dependent variables are obtained through 3-stage RM filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 21: RM Covariances – Treasury Markets

Ind variables	Dependent Variables				
	XBUND - US10Y	XCORP - US10Y	XCORP_HY - US10Y	XBUND - US_CORP	XBUND - US_CORP_HY
c	0.024834873	0.015616964	-0.00919612	-0.000403534	0.023881409
	(5.58861)	(3.08644)	(-2.00132)	(-0.16241)	(4.68300)
	{0.00023}	{0.01151}	{0.07323}	{0.87422}	{0.00086}
AR(1)	0.868261365	0.880497263	0.803408252	0.822852625	0.866212184
	(22.83452)	(28.92753)	(22.35960)	(26.92166)	(25.51443)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	0.01059031	-0.041210718	0.093271378	0.036075642	0.007433039
	(0.28405)	(-1.33695)	(2.58548)	(1.16813)	(0.21458)
	{0.78217}	{0.21086}	{0.02716}	{0.26985}	{0.83440}
ECBMPSI	-0.000283419	-0.000151083	0.000486907	0.000103595	-5.52E-05
	(-4.58795)	(-2.14170)	(8.57690)	(3.04104)	(-0.77080)
	{0.00100}	{0.05787}	{0.00001}	{0.01244}	{0.45865}
FEDMPSI)	-6.67E-05	-6.53E-05	0.000180665	4.95E-06	-1.34E-05
	(-0.73755)	(-0.70364)	(1.85228)	(0.10548)	(-0.12017)
	{0.47774}	{0.49771}	{0.09369}	{0.91808}	{0.90673}
VIX	0.000148958	-3.37E-05	-0.000728559	-0.000227114	-6.38E-05
	(1.06422)	(-0.20595)	(-5.03413)	(-3.47800)	(-0.36071)
	{0.31225}	{0.84096}	{0.00051}	{0.00594}	{0.72582}
EUFF	0.001043431	0.001158216	0.000722883	0.000626437	0.00114115
	(3.02062)	(3.13435)	(2.42706)	(3.76743)	(2.98247)
	{0.01288}	{0.01061}	{0.03563}	{0.00368}	{0.01375}
USFF	0.017353781	-0.159613086	0.046031659	-0.011516828	0.030718366
	(0.42406)	(-5.85816)	(1.44718)	(-0.82048)	(0.74162)
	{0.68050}	{0.00016}	{0.17846}	{0.43107}	{0.47537}
ECBMPSIxEUFF	2.23E-06	9.03E-07	-4.13E-06	-7.24E-07	3.43E-07
	(1.26920)	(0.53304)	(-3.36593)	(-0.45464)	(0.17161)
	{0.23311}	{0.60565}	{0.00717}	{0.65908}	{0.86717}
FedMPSIxUSFF	0.000426004	0.000892291	-0.000445751	-0.00022006	0.000198475
	(1.15888)	(2.65026)	(-1.20902)	(-1.40069)	(0.40309)
	{0.27343}	{0.02430}	{0.25447}	{0.19157}	{0.69536}
ECBMPSI(-1)	-0.000436201	-0.000356541	-0.00010036	4.02E-05	-0.000646451
	(-7.79230)	(-5.39357)	(-1.75025)	(1.12998)	(-9.20619)
	{0.00001}	{0.00030}	{0.11064}	{0.28486}	{0.00000}
FEDMPSI(-1)	-3.18E-05	-5.04E-06	-7.85E-05	4.06E-05	-3.93E-05
	(-0.30437)	(-0.04129)	(-0.72303)	(0.71116)	(-0.31740)
	{0.76709}	{0.96788}	{0.48623}	{0.49324}	{0.75746}
VIX(-1)	-6.70E-06	9.19E-05	0.000573941	2.95E-05	0.0002543
	(-0.04619)	(0.55753)	(3.99455)	(0.40774)	(1.40152)
	{0.96407}	{0.58943}	{0.00254}	{0.69205}	{0.19132}
EUFF(-1)	-0.001215311	-0.001252913	-0.000647025	-0.000609314	-0.001315672
	(-3.50032)	(-3.39610)	(-2.16304)	(-3.64309)	(-3.42405)
	{0.00572}	{0.00682}	{0.05582}	{0.00451}	{0.00650}
USFF(-1)	-0.030682398	0.151655555	-0.038937317	0.016527326	-0.041537974
	(-0.74231)	(5.43150)	(-1.20576)	(1.14143)	(-0.99330)
	{0.47497}	{0.00029}	{0.25567}	{0.28029}	{0.34399}
ECBMPSI x EUFF(-1)	3.32E-06	2.98E-06	8.88E-07	-3.14E-07	5.06E-06
	(1.96698)	(1.72773)	(0.69599)	(-0.19854)	(2.66253)
	{0.07753}	{0.11473}	{0.50229}	{0.84660}	{0.02380}
FedMPSI x USFF(-1)	0.000127693	-0.000375099	5.26E-05	-0.000151118	0.000167576
	(0.29683)	(-0.88416)	(0.11579)	(-0.81975)	(0.30354)
	{0.77267}	{0.39737}	{0.91011}	{0.43146}	{0.76770}
Variance	2.63E-05	3.30E-05	2.65E-05	7.25E-06	3.28E-05
	(13.29229)	(15.98635)	(18.99253)	(34.80415)	(12.55588)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10	10
	(9.43897)	(10.82912)	(10.45334)	(8.13857)	(10.77618)
	{0.00000}	{0.00000}	{0.00000}	{0.00001}	{0.00000}
R-sq	0.87956103	0.877250808	0.875979313	0.892889557	0.881786522
DW	2.024378038	2.005165061	2.003177461	2.006300119	2.017373115

Notes: Dependent variables are obtained through 3-stage RM filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

Table 22: RM Covariances – Corporate Markets

Ind variables	Dependent Variables			
	XCORP - US_CORP	XCORP_HY - US_CORP	XCORP - US_CORP_HY	XCORP_HY - US_CORP_HY
c	0.003519231	0.002404425	0.01807489	-0.008188955
	(1.12958)	(0.43423)	(2.98499)	(-1.59069)
	{0.28502}	{0.67334}	{0.01369}	{0.14276}
AR(1)	0.737260656	0.851299154	0.897455515	0.784968647
	(25.31991)	(29.86816)	(33.00865)	(20.76156)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}
AR(2)	0.08270923	0.030918262	-0.04750425	0.086041627
	(2.72305)	(1.18729)	(-1.64640)	(2.24790)
	{0.02145}	{0.26255}	{0.13070}	{0.04835}
ECBMPSI	-4.08E-05	-0.000122504	9.57E-06	0.000382922
	(-1.00488)	(-2.23631)	(0.11034)	(6.27843)
	{0.33865}	{0.04931}	{0.91433}	{0.00009}
FEDMPSI)	9.71E-05	4.20E-05	-3.06E-05	0.000193962
	(1.62945)	(0.40707)	(-0.28229)	(1.83873)
	{0.13427}	{0.69254}	{0.78348}	{0.09580}
VIX	0.000144062	0.001174157	-0.00016384	-0.00051801
	(1.63109)	(8.99368)	(-0.78850)	(-3.03061)
	{0.13392}	{0.00000}	{0.44869}	{0.01266}
EUFF	0.000843113	0.000500677	0.001355394	0.00110585
	(-4.04653)	(-1.47172)	(-3.12916)	(-3.62912)
	{0.00234}	{0.17185}	{0.01071}	{0.00462}
USFF	-0.073377995	-0.071914363	-0.166200738	0.048609963
	(-4.03366)	(-3.17729)	(-5.28222)	(1.38308)
	{0.00239}	{0.00986}	{0.00036}	{0.19674}
ECBMPSIxEUFF	2.51E-07	9.77E-07	-3.57E-07	-3.16E-06
	(0.14414)	(0.51237)	(-0.18521)	(-2.46618)
	{0.88825}	{0.61952}	{0.85677}	{0.03332}
FedMPSIxUSFF	-0.00071061	-3.99E-05	0.000633909	-0.000508631
	(-3.64767)	(-0.11061)	(1.53951)	(-1.11263)
	{0.00448}	{0.91412}	{0.15470}	{0.29190}
ECBMPSI(-1)	-0.000159681	-0.000353334	-0.000610899	-0.00018365
	(-3.65786)	(-6.36782)	(-6.87536)	(-2.72179)
	{0.00440}	{0.00008}	{0.00004}	{0.02149}
FEDMPSI(-1)	-1.82E-05	-0.000116171	-1.15E-05	-0.000104864
	(-0.25221)	(-1.16322)	(-0.07893)	(-0.86491)
	{0.80598}	{0.27175}	{0.93864}	{0.40736}
VIX(-1)	-0.000160062	-0.000729003	0.000276269	0.00043903
	(-1.78503)	(-5.08054)	(1.34446)	(2.70128)
	{0.10457}	{0.00048}	{0.20850}	{0.02226}
EUFF(-1)	-0.000877233	-0.000565832	-0.001480778	-0.001052985
	(-4.22928)	(-1.65267)	(-3.42559)	(-3.43369)
	{0.00175}	{0.12940}	{0.00649}	{0.00640}
USFF(-1)	0.083674845	0.072308929	0.160928303	-0.038790803
	(4.57387)	(3.17975)	(5.05918)	(-1.08971)
	{0.00102}	{0.00982}	{0.00049}	{0.30140}
ECBMPSI x EUFF(-1)	1.24E-06	3.27E-06	5.03E-06	1.73E-06
	(0.69134)	(1.75953)	(2.46535)	(1.25442)
	{0.50509}	{0.10899}	{0.03337}	{0.23822}
FedMPSI x USFF(-1)	0.000295602	0.000377324	-0.000227648	0.000177431
	(1.32070)	(1.06041)	(-0.41437)	(0.32952)
	{0.21603}	{0.31390}	{0.68735}	{0.74856}
Variance	1.04E-05	2.30E-05	4.38E-05	2.95E-05
	(22.65801)	(15.74014)	(14.34950)	(19.12747)
	{0.00000}	{0.00000}	{0.00000}	{0.00000}
DoF	10	10	10	10
	(9.39408)	(7.94162)	(11.80036)	(10.93348)
	{0.00000}	{0.00001}	{0.00000}	{0.00000}
R-sq	0.89272307	0.89425672	0.87985129	0.878994032
DW	2.016119859	1.975812075	2.005686271	2.016421711

Notes: Dependent variables are obtained through 3-stage RM filter as outlined in section 2.1; model specification follows conditional auto-regressive dynamic lag representation with error-correction terms as presented in section 2.2;t-statistics are reported in (), p-values in ; R-sq: adjusted R-squared; DW: Durbin-Watson statistic.

B Index Construction

The Monetary Policy Search Index (MPSI) uses an index based on a number of search queries related to one particular central bank investigated. The index is constructed following the approach of Da et al. (2015) in that the search topics "European Central Bank" and "Federal Reserve System" are entered into the Google Trends user interface, which returns a list of related top searches, which will then enter each index, weighted by the impact value assigned by Google. Search terms that are ambiguous or unrelated will be excluded. It is crucial to stress at this stage that weights are not constructed through data-mining approaches such as using uninformed correlation measures, but instead are based on Google's measure of *related searches*, which gives correlations based on search terms the same users also entered and hence avoids spurious relationships.

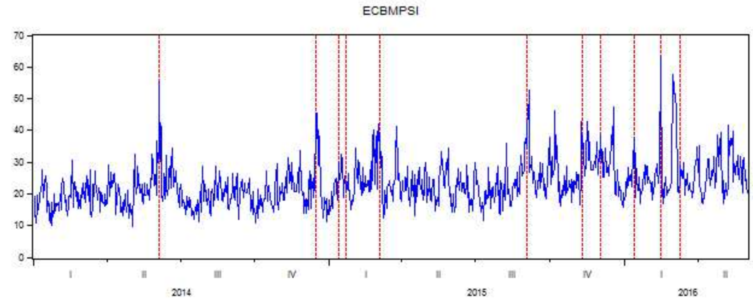
Table 23: MPSI Indices – Search Words

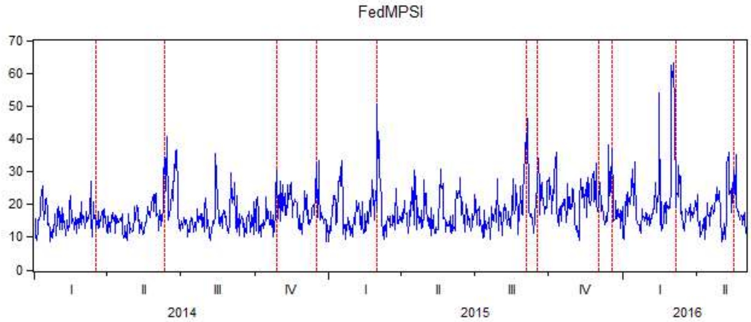
Index	Search Words	weight
MPSI	European Central Bank	100
	ECB	55
	ECB rate	40
	EZB	25
	BCE	15
	Banco Central Europeo	5
	Banca Centrale Europea	5
	Europaeische Zentralbank	5
	Banque Centrale Europeenne	5
MPSI*		
	Federal Reserve	100
	Fed	65
	Federal Reserve System	60
	Fed interest	5
	Fed rate	5
	Federal Reserve Bank	5
	The Fed	5

The search words are selected by querying the search topics "European Central Bank" and "Federal Reserve System" with the Google Trends UI, where the search is limited to News Search only. Google reports a number of statistics with each search term queried. We use "related queries" from which we select the most popular search queries. The given metric for those related queries is then used as a weight in our indices. These metrics are described in the Google Trends UI as "Scoring is on a relative scale where a value of 100 is the most commonly searched query, 50 is a query searched half as often, and a value of 0 is a query searched for less than 1% as often as the most popular query."
We follow the same approach in the construction of our control indices.

The search indices for ECB and Fed related searches are plotted in figure 2. The vertical lines represent identified events, which are given in table 22 below. We can observe that the indices that the indices are clearly heteroskedastic and can identify several volatility spikes and clusters that coincide with policy events. The most significant events seem to be relating to the launch and extension of asset purchases for the ECB and interest rate hikes for the Fed, which is in line with the patterns we observed for the fixed income series. Identifying certain relevant events using our indices is not a comprehensive exercise, which would compromise one of the reasons for using such measures, but provides evidence that the MPSI can replicate policy events and do not just follow noise.

Figure 8: Google Search Indices and Identified Events





Notes: Vertical lines represent individual identified events. Vertical axis gives a search volume index value based on normalised index values obtained through Google Trends for individual search words (see appendix A.3 for details). Data source: Google Trends (www.google.com/trends)

Table 24: Identified ECB Events

Date	Event
05/06/2014	GC Meeting: Deposit rate from 0% to -0.1%; Refi rate from 0.25% to 0.15%; 4yr TLTRO, QE hint
16/12/2014	Bundesbank's Weidmann raises concern over QE
14/01/2015	ECJ Advocate General Approves of OMT
05/03/2015	GC meeting: Announcement to start purchases, as markets raise doubts on ECB's ability to conduct purchases; ELA extension (Greece)
09/03/2015	Benoit Coere confirms EUR3.2bn in purchases (as targeted)
03/09/2015	GC meeting: Hint towards further asset purchases
11/11/2015	Rumors ECB might engage in municipal bond purchases
03/14/2015	12/2015 GCM minutes released
21/01/2016	GC meeting: Draghi hints further asset purchases
15/02/2016	Dovish Draghi Speech at EP
10/03/2016	GC meeting: Deposit rate cut to -0.4; QE extension to EUR80bn/m, incl. corporate bonds

Table 25: Identified Fed Events

Date	Event
14/06/2014	Stanley Fisher appointed FOMC vice chair
29/10/2014	QE ended
17/12/2015	FOMC "paitent to raise rates"
02/03/2015	Appointment of Patrick Harker to succeed Charles Plosser at Phil. Fed
04/09/2015	Disappointing jobs report
17/09/2015	Dovish FOMC meeting
02/12/2015	Yellen hints rate hike
18/12/2015	First rate hike
07/03/2016	Comments from Fed's Brainard and Fisher
18/05/2016	FOMC minutes