Uncertainty Matters: Evidence from Close Elections

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Abstract

This paper uses a data rich environment to produce direct econometric estimates of macroeconomic and financial uncertainty for 11 advanced nations. These indices exhibit significant independent variation from popular proxies and provide a refinement of the influential work of Jurado et al. (2015) that results in improved real-time performance. We use this new data in combination with narrative evidence to jointly identify macro uncertainty and financial shocks. Macro uncertainty shocks are identified with close elections and financial shocks with financial stress during financial crises. We find that macro uncertainty shocks matter for the majority of countries and that the real effects of macro uncertainty shocks are generally larger conditioning on close elections. We find that macro uncertainty shocks are more important, on average over our sample, in explaining business cycle fluctuations in real variables than financial shocks. These results are robust to controlling for news shocks and global uncertainty as well as a variety of shocks considered to be important drivers of the business cycle.

Keywords: economic uncertainty, business cycles, elections.

JEL classification numbers: D80, E32, D72

1 Introduction

The global financial crisis (GFC) has renewed interest in two drivers of the business cycle: financial shocks and uncertainty shocks. For example, Stock and Watson (2012) find that shocks to credit spreads and uncertainty accounted for two thirds of the movements in USA GDP growth from 2008-2012. However, the GFC was associated with large increases in uncertainty *and* a significant deterioration of financial conditions. Thus in samples where this episode dominates, it can be difficult to separate the effect of one shock from the other. Indeed, while there is a broad consensus that independent financial shocks can produce a recession, there is significant debate as to whether uncertainty shocks that act independently of a financial channel, have significant business cycle effects (Caldara et al. (2016),Ludvigson et al. (2018) and Born et al. (2018)).

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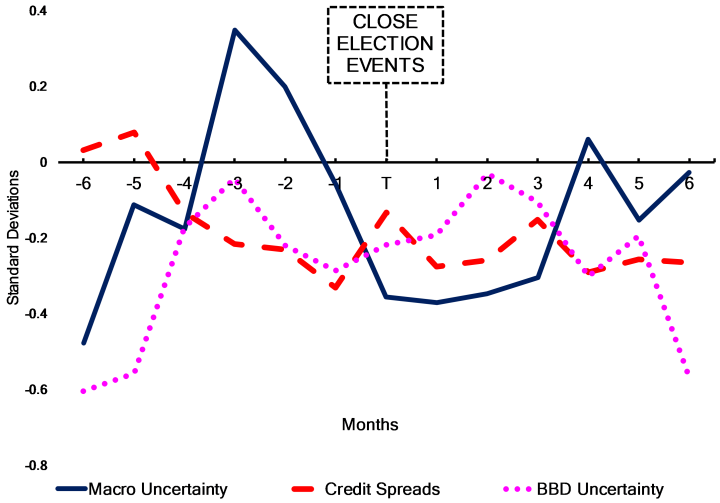
Figure 1: Uncertainty rises with elections, credit spreads do not



Macro uncertainty is calculated as per section 2. BBD uncertainty is based on Baker et al. (2016) and taken from policyuncertainty.com. Close elections dates are as in table 3 and credit spreads data are defined in table 8 in the appendix.

This paper addresses this question by looking for events that are associated with a rise uncertainty about the real economy but that are not driven by large financial shocks. We identify 28 closely contested general elections across the G10 as such periods. During these events there is a rise in measures of uncertainty that relate to the real economy but they are not typically associated with financial stress as indicated by credit spreads - see figure 1. This study makes two contributions to this debate: improved measurement, and a novel identification procedure using narrative information to jointly identify both macro uncertainty and financial shocks.

On measurement, this debate has focused almost exclusively on USA data [1] where the global financial crisis originated and where its effects were particularly pronounced. Here we extend this to 11 advanced nations increasing the potential coverage of non-financial events that cause uncertainty. We contribute to the measurement of uncertainty in the cross country context by producing separate measures of of macro and financial uncertainty following an adjusted version of the approach of Jurado et al. (2015), hereafter JLN. This adjusted approach makes this uncertainty measure more useful for policy in that it has significantly improved real time performance and can be used as an input to forecasting. To identify macro uncertainty shocks, we impose a small number of relatively uncontroversial sign restrictions and then sharpen this identification by imposing additional narrative sign restrictions (as developed by Antolín-Díaz and Rubio-Ramírez (2018)) requiring that macro uncertainty shocks take place during close elections. The latter are periods when macro uncertainty is less likely to act through a financial channel compared to events where large economic shocks take place. Similarly, financial shocks are identified with sign restrictions that only impose that credit spreads and financial uncertainty are positive with identification sharpened by imposing that financial shocks are positive during periods of peak financial

[1] Popescu and Smets (2010) is an early exception studying this question using German data and in a companion paper Redl (2017) studies the case of the UK in detail.

stress as determined by the financial distress index of Romer and Romer (2017). Thus we jointly identify orthogonal macro uncertainty and financial shocks in our system and allow them to compete in explaining real variables.

We find that macro uncertainty shocks matter for the majority of countries studied where the transmission is consistent with firms pausing investment and reducing hours worked, precipitating a decline in GDP. We find limited evidence that the decline in GDP is driven by declines in household spending. Identifying macro uncertainty shocks with close elections increases the share of GDP fluctuations they explain to one of the most important sources at the 1-2 year horizon, and roughly doubles their role in explaining variation in hours from around 10% to over 20%. Interestingly, financial shocks are found to be less important, on average, than macro uncertainty shocks in driving real variables, despite being identified with periods of peak financial stress. A key challenge to empirical studies of uncertainty shocks is to control for the fact that uncertainty is likely to rise at times when negative first moment shocks hit or when mean expectations deteriorate (Haddow et al. (2013)). We address this concern by identifying a news shock using 1-year ahead professional forecasts for GDP growth and imposing that these forecasts don't deteriorate on impact when the uncertainty shock hits. Cross-country studies have providing evidence that the real effects of domestic uncertainty shocks may be driven by increases in global uncertainty (Berger et al. (2016), Mumtaz and Theodoridis (2017), and Ozturk and Sheng (2017)). We add a measure of global uncertainty to the model and identify a global uncertainty shock. In general, we find our results are robust to including a global uncertainty shock in our model, however, consistent with these studies we find that rises in global uncertainty following a domestic uncertainty shock are important for some countries.

A wide range of approaches to measuring uncertainty have been pursued in the literature. Closely related to the JLN approach is the use of realised and implied stock market volatilties as initiated by Bloom (2009) and used by Caggiano et al. (2014), Basu and Bundick (2017) for the USA and Carriere-Swallow and Cespedes (2013), Cesa-Bianchi et al. (2014) and Berger et al. (2016) in a cross-country context. These proxies are focused exclusively on financial measures and don't control for a deterioration in mean expectations as volatilties rise. The JLN approach improves on this by using a broad information set of macro and financial variables, separately measures macro and financial variables and uses a forecasting model to remove mean expectations.

The influential work of Baker et al. (2016) employed a news count of articles discussing policy uncertainty which has been extended to cover monetary policy (Husted et al. (2017)), geopolitical risk (Caldara and Iacoviello (2018)) as well as a wide range of countries[2]. Text based measures are valuable for capturing uncertainty not reflected in data however, they can be very volatile and potentially provide a misleading signal when their correlations with the data change (see Forbes (2016) for the case of the

[2]These include Dendy et al. (2013) and Haddow et al. (2013) for the UK, Popescu and Smets (2010) for Germany, Zalla (2017) for Ireland, Kok et al. (2015) for the Netherlands, Arbatli et al. (2017) for Japan, Armelius et al. (2017) for Sweden, Larsen (2017) for Norway, and Redl (2015) for South Africa.

UK during the Brexit vote). The JLN approach aggregates the uncertainty in a large number of series and is thus less susceptible to unusual changes in just one series. This is also an advantage over other econometric estimates of uncertainty that use estimated volatility in a small number of macro variables such as Fernandez-Villaverde et al. (2011), Fernandez-Villaverde et al. (2015), and Croce et al. (2017).

A number of studies have shown a reduced role for uncertainty shocks once financial shocks are appropriately controlled for. Popescu and Smets (2010) show that the real effects of financial stress are much larger and persistent than those of uncertainty with lower inflation, GDP, and higher unemployment. Caldara et al. (2016) find that both financial and uncertainty shocks matter for real fluctuations but that uncertainty shocks matter significantly more when they coincide with a tightening of credit spreads.

This paper is closely related to Ludvigson et al. (2018). They identify financial and macro uncertainty shocks and their impact on industrial production using two sets of shock-based constraints. Firstly, narrative event constraints, requiring financial uncertainty shocks are at least 4 standard deviations in October 1987 (Black Monday) and at some period during the 2007-2009 financial crisis, while macro uncertainty shock are no larger than 2 standard deviations. Secondly, correlation constraints which impose that the identified uncertainty shocks are negatively correlated with an external variable, aggregate stock market returns, but that correlation is larger (in absolute value) for financial uncertainty. They find that macro uncertainty is a fully endogenous response to real shocks that cause business cycles but that financial uncertainty shocks have negative effects on real variables. Here we pursue a related but alternative strategy, while Ludvigson et al. (2018) employ narrative restrictions on events where financial uncertainty should play a larger role than macro uncertainty (financial crises), we use events where macro uncertainty should play a larger role than financial uncertainty (close elections). Ludvigson et al. (2018) employ correlation with an external variable (stock returns) whereas we employ sign restrictions on the response of variables to the shocks. While the former is a novel and an appealing approach is it more challenging to use for a larger model (we have up to 10 variables rather than the 3 used in Ludvigson et al. (2018)) where finding the appropriate external variables is not straightforward. Moreover, in a larger model it is important to allow macro uncertainty shocks to compete with real and financial shocks to explain GDP movements.

Our identification relies on the positive link between macro uncertainty and close elections. Kelly et al. (2016) present a model where firm profitability depends on government policies and agents learn about the impact of those policies from political news. Elections create uncertainty by resetting agents beliefs about government policy. They show that this model predicts a positive relationship between option prices and elections, and in their empirical work find evidence of a 5% premium on options that cover political events (national elections and global summits) relative to those that do not. Azzimonti (2017) develops a model where the quality of government policies influence the probability of a recession. Partisan conflict lowers the quality of those policies promoting tail risk that reduces investment

spending. Agents rely on signals to learn the degree of partisan conflict where elections generate a spike in uncertainty about partisanship through resetting agents priors.

A number of papers provide empirical support to this link. Li and Born (2006) find that realised USA stock market volatility rises prior to the election date if there is no clear leader in election polls. Bialkowski et al. (2008) find that realised stock market volatility is 23% higher within a two month window around elections using data on 27 OECD countries. They find evidence that a small margin of victory is a significant determinant of that rise in volatility. Goodell and Vahamaa (2013) find similar evidence of increased implied volatility around elections using the VIX. These results suggest that rises in financial uncertainty may play an important role in the transmission of macro uncertainty shocks around elections - we find some evidence for this link but do not find that it is always and everywhere the case. Gao and Qi (2013) provide evidence that municipal bond rates rise around gubernatorial elections in the USA while Jens (2017) documents falls in corporate investment around these elections. Julio and Yook (2012) and Canes-Wrone and Park (2014) document uncertainty induced declines in investment around general elections across a variety of developed and developing countries. Julio and Yook (2016) use election timing as a source of fluctuations in political uncertainty, documenting a significant drop in FDI flows to receipt countries from the USA around domestic elections. They find this effect is more pronounced for closer elections. Larsen (2017) develops topic-specific measures of uncertainty using text mining tools on a corpus of articles from the major Norwegian business daily. He shows that uncertainty relating to elections is one of the most important types of uncertainty driving investment.

The remainder of this paper is structured as follows: section 2 outlines the econometric framework used to measure macro and financial uncertainty; section 3 describes the data set used in estimation; section 4 describes the estimates of uncertainty we find; section 5 describes the macroeconomic impact of uncertainty shocks; and section 6 concludes.

2 Measuring Uncertainty: Econometric Framework

We measure uncertainty following JLN, the reader is directed to their paper for full details of that approach. Uncertainty is defined as the conditional variance of the unforecastable component common to a large set of macro or financial variables. The approach proceeds as follows: (1) collect a large set of macro and financial data; (2) summarise the data using principal component factors; (3) use the factors in a VAR model to make forecasts of each series in the dataset; (4) estimate the latent, time varying, conditional variance of the unforecastable component of each series by feeding the forecast errors from the VAR model to a stochastic volatility model; (5) estimate uncertainty as the average of the estimated stochastic volatilities of the series of interest[3] (e.g. macro variables for macro uncertainty, financial

[3]To estimate the expected forecast error variance for each series requires using a forecasting function based on the set-up assumed in the stochastic volatility model. In the case of JLN this corresponds to an AR(1) and so is not simply an average of the stochastic volatility estimates. However, in the stochastic volatility model used here we assume a random

variables for financial uncertainty). This methodology ensures that measured uncertainty captures when the economy has become less predictable (rather than just more volatile) and also reduces dependencies on a one (or a small number of) observable series.

Following Ludvigson et al. (2018), let $y_{jt} \in Y_t = (y_{1t}, y_{2t}, ..., y_{Nt})$ be one of the N variables for a given country dataset. A forecast, $E[y_{jt+1}|I_t]$, is taken from a factor augmented forecasting model:

$$y_{jt+1} = \phi_j^y(L)y_{jt} + \gamma_j^F(L)\hat{\mathbf{F}}_t + \gamma_j^G(L)\hat{\mathbf{G}}_t + \gamma_j^W(L)\mathbf{W}_t + v_{jt+1}^y \tag{1}$$

Where $\phi_j^k(L)$ for $k = \{y, F, G, W\}$ are finite order lag polynomials. The factors, $\hat{\mathbf{F}}_t$, are drawn from the information set of agents, I_t, comprised of the full data set of macro and financial variables for that country described in the appendix. $\hat{\mathbf{G}}_t$ is drawn in the same way except that the squares of the original data are used to capture potential non-linearities, and $\mathbf{W}_t$ is the square of the first component of $\hat{\mathbf{F}}_t$, capturing non-linearity in this factor. The prediction error for y_{jt+1}, $\hat{\mathbf{F}}_t$,$\hat{\mathbf{G}}_t$ and $\mathbf{W}_t$ are permitted to have time-varying volatility[4]. The forecasting model can be cast as FAVAR in first order companion form with $\mathbf{Z}_t = (\hat{\mathbf{F}}_t', \hat{\mathbf{G}}_t', \mathbf{W}_t')$, $Y_{jt} = (y_{jt}, y_{jt-1}, ..., y_{jt-q+1})'$, and $\mathcal{Z}_t = (\mathbf{Z}_t', ..., \mathbf{Z}_{t-q+1})'$:

$$\begin{pmatrix} \mathcal{Z}_t \\ Y_{jt} \end{pmatrix} = \begin{bmatrix} \Phi^Z & \mathbf{0} \\ \Lambda_j' & \Phi_j^Y \end{bmatrix} \begin{pmatrix} \mathcal{Z}_{t-1} \\ Y_{jt-1}^C \end{pmatrix} + \begin{pmatrix} \mathcal{V}_t^Z \\ \mathcal{V}_{jt}^Y \end{pmatrix} \tag{2}$$

Where Φ^Z an autoregressive term for $\mathcal{Z}_t$. The mean squared forecast error varies over time due to the fact that shocks to y_{jt+1} and $\mathbf{Z}_t$ have time varying variance. The forecast error variance of y_{jt+1}, denoted by $\Omega_{jt} = E_t\left(\mathcal{V}_{jt+1}^Y \left(\mathcal{V}_{jt+1}^Y\right)'\right)$[5], is the conditional volatility of the purely unforecastable component of the future value of the series, conditional on all information known at time t. The definition of uncertainty for y_{jt} is denoted $\mathcal{U}_{jt}$:

$$\mathcal{U}_{jt} = \sqrt{1_j'\Omega_{jt}1_j} = \sqrt{E\left[\left(y_{jt+1} - E\left[y_{jt+1}|I_t\right]\right)^2 |I_t\right]} \tag{3}$$

This procedure results in an uncertainty measure for each series in Y_t. To arrive at an aggregate measure of uncertainty in that category we use simple averages of those indices (as in JLN): $\mathcal{U}_t = \frac{1}{N}\sum_{j=1}^N \mathcal{U}_{jt}$. To form the macro uncertainty index we use only macro variables in the average, similarly for the financial uncertainty index.

Clearly, a key input to this uncertainty measure is the expected forecast error variance. The predictions errors, $\mathcal{V}_{jt+1}^Y$, are taken to be noisy measures of the true underlying stochastic volatility process Ω_{jt} and are fed to a stochastic volatility model to infer the latter. A stochastic volatility model allows

walk process for the volatilities which means the expectation at any future horizon is just the estimate of volatility today and taking simple averages is a correct description.

[4]JLN allow for stochastic volatility in both the estimates of the factors used to augment the VAR and the variables included in the VAR. This results in four sources of time variation in the forecast errors due to the stochastic volatility of the VAR shocks, the factors, the covariance between these two, and an autoregressive term due to persistence in the volatility of the VAR shocks. Without stochastic volatility the forecast error would not vary with t but only with h. See JLN, p.1188.

[5]JLN consider horizons greater than 1 period. However when standardised these estimates are very similar and so here we proceed with outlining the simpler case of a one period ahead based measure.

for shocks to the second moment of a variable to be independent of the first moment ensuring that these estimates capture a mean preserving increase in volatility rather than a rise in volatility that accompanies a deterioration in the mean (as is often seen in survey forecasts used widely in uncertainty proxies). JLN use the STOCHVOL package in R which implements the highly efficient stochastic volatility smoother model of Kastner and Frühwirth-Schnatter (2014). This method uses the entire data series to estimate the latent stochastic volatility at date t. This means that future forecast errors are used to infer the level of uncertainty today. This has a number of drawbacks. Firstly, the uncertainty estimates are arguably inappropriate for forecasting as they would entail look ahead bias. Secondly, and as demonstrated below, the two-sided nature of the filter leads to large real time revisions making these estimates unappealing for policy use. Finally, it is unappealing from a theoretical perspective that an agents estimate of uncertainty today is informed by information outside the agents information set. To address these concerns we employ a one-sided stochastic volatility filter that only employs current and past values of forecast errors to infer the latent state of volatility. We use a minor alteration of the Jacquier et al. (1994) algorithm, with the details outlined in the appendix.

3 Data

For each country, the forecasts above are formed on the basis of two monthly data sets, one capturing macroeconomic series and one capturing financial variables. The data sources are described in full in the appendix. The data generally covers early 1990s to 2018[6]. The original JLN work employed a monthly model and we do the same here to capture higher frequency changes in forecast errors which may be not captured in a quarterly model[7]. The macro series range in number from 50 (USA) to 15 (Switzerland), and broadly cover the labour market (unemployment, employment, wages, vacancies), retail sales, industrial production, orders, inflation, trade (exports, imports and their prices), vehicle sales as well as business consumer confidence and a composite leading indicator. The financial series are fewer in number and range from 27 (the UK) to 8 (Spain), and broadly cover exchange rates, money supply, credit extension, foreign reserves, interest rates (interbank rates, government bond yields) and share price indices. The original JLN measure of financial data captures only asset returns whereas here it is defined more broadly to include credit extension - which is important in models featuring financial frictions.

For each country, the macro and financial data sets are combined to form the information set in the forecasting model from which the forecasting factors are drawn. The forecasting model uses a large set of potential predictors in the factors, $\mathbf{F}_t$, and $\mathbf{W}_t$ (which is comprised of squares of the first principal

[6]Data to be made public and regularly updated on the authors webpage (currently this only has the two-sided estimates).

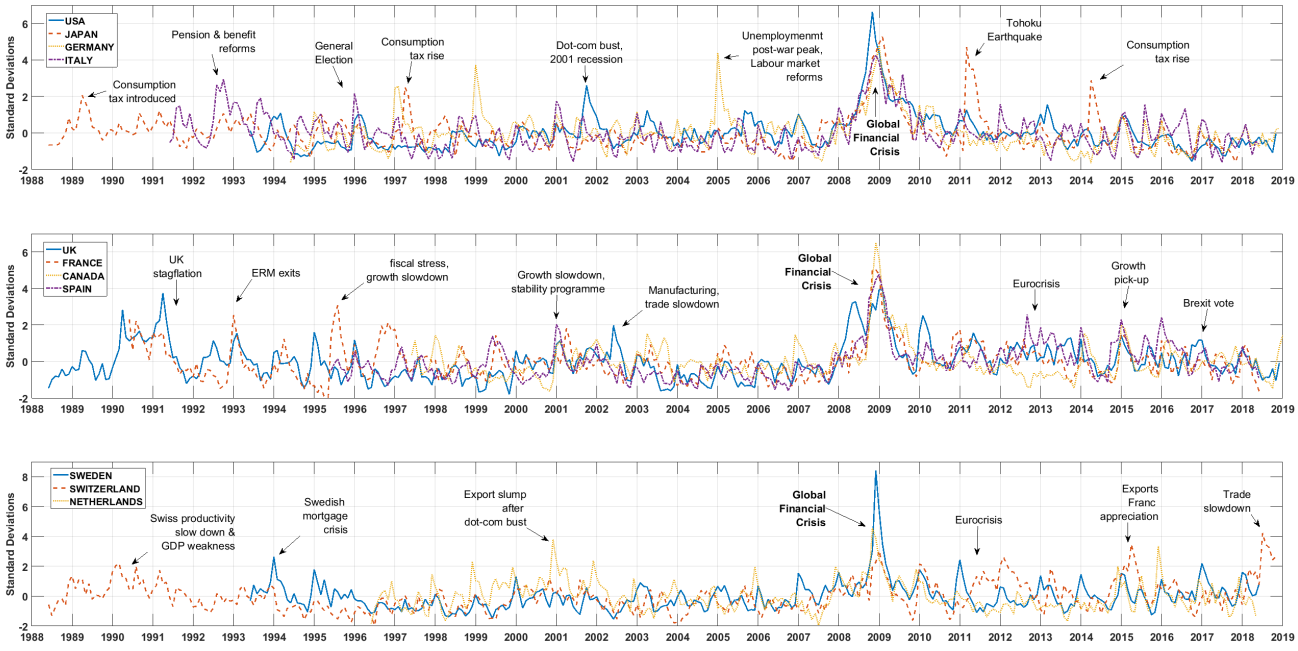
[7]Experiments with a quarterly dataset for the USA, covering similar series to those used for the other countries here, showed that a quarterly model does well in capturing macro uncertainty but less well in capturing financial uncertainty when compared to the original JLN indices. However, the JLN financial data focuses exclusively on asset returns where we take this measure to be broader, see above. In future research we intend to extend the country sample using quarterly data.

component in $\mathbf{F}_t$), and $\mathbf{G}_t$ a further set of factors drawn from the squares of the original data set. From the potential factors, $\mathbf{F}_t$ and $\mathbf{G}_t$, a subset, $\hat{\mathbf{F}}_t$ and $\hat{\mathbf{G}}_t$, are chosen based on the information criterion in Bai and Ng (2002).The set of predictors, $\left\{\hat{\mathbf{F}}_t, \hat{\mathbf{G}}_t, \mathbf{W}_t\right\}$, are selected for inclusion in the forecasting model based on their incremental predictive power using a t-test (with the threshold set at $t = 2.575$, corresponding to a 99% confidence interval) for each y_{jt} [8].

4 Estimates of Uncertainty

Figure (2) compares the estimates for macro uncertainty across countries. The GFC is largest uncertainty event for most countries but there remains significant idiosyncratic variation. For example, in March 2011 a 4 standard deviation rise in uncertainty took place in Japan as the 9.0 magnitude Tohoku earthquake hit the east coast. Italy experienced a significant rise in macro uncertainty during 1992 as the Amato government cut pension and benefit entitlements (Miniaci and Weber (1999)). The UK experienced high uncertainty around 2002 linked to poor performance in the manufacturing sector (Redl (2017)). Recently, the slowdown in global trade has had a significant impact on Swiss export performance leading to a large uptick in uncertainty at the end of 2018.

Figure 2: Macro Uncertainty



Similar patterns are present in the financial uncertainty measures. Switzerland experiences very high financial uncertainty around the announcement of the Swiss Franc-Euro exchange rate floor in September 2011 and the ending of the floor in January 2015. The Netherlands experience a significant increase in financial uncertainty in 2001 as share prices collapses following the dot-com bust in the US.

[8] The equations each contain four lags of their own series.

Germany experienced high financial uncertainty as interest rates rose and credit growth declined sharply in the early 1990s.

The macro uncertainty measures exhibit significant independent variation from the news based indices of Baker et al. (2016) labeled as BBD in figure (6). The indices computed in this paper show less short term volatility and greater persistence for uncertainty spikes, and register larger increases in uncertainty around the GFC. The JLN based indices also do not accord with the recent increases in EPU seen in the UK, Germany, France and Canada. This may be due to coverage of political events that have not resulted in greater inability to forecast the path of real macro variables.

Figure 3: Financial Uncertainty

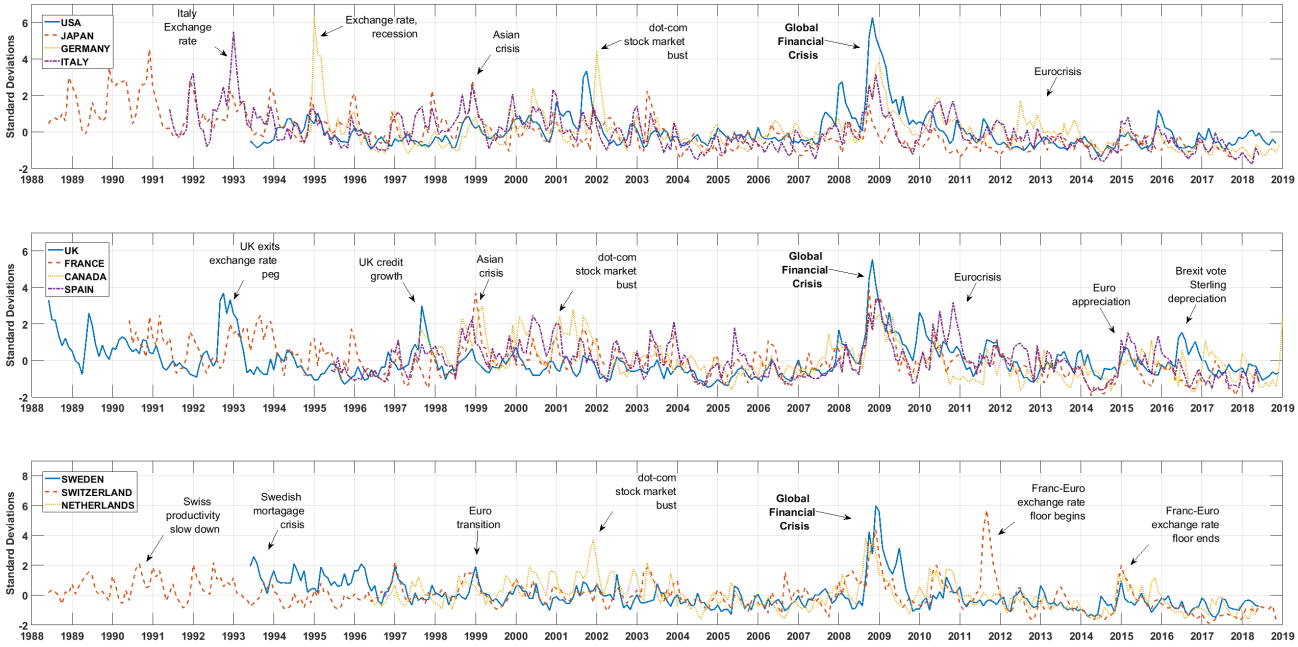


Table 1: Correlations across Macro and Financial Uncertainty measures

	USA	JAPAN	GERMANY	ITALY	UK	FRANCE	CANADA	SPAIN	SWEDEN	SWITZERLAND	NETHERLANDS
USA		57	53	57	55	50	66	55	58	27	44
JAPAN	20		49	48	50	46	60	48	48	32	28
GERMANY	52	34		54	38	38	53	36	46	14	39
ITALY	47	56	57		49	46	58	61	54	30	42
UK	60	24	26	47		46	45	64	54	36	26
FRANCE	57	54	65	72	37		59	56	45	32	38
CANADA	60	45	38	56	40	53		48	64	17	37
SPAIN	45	27	60	80	44	68	43		57	45	38
SWEDEN	56	37	55	52	41	62	51	47		33	43
SWITZERLAND	45	33	45	55	41	54	43	54	42		21
NETHERLANDS	53	38	56	66	36	59	45	59	44	48	

Note: Below main diagonal are financial uncertainty correlations (%), above main diagonal are macro uncertainty correlations.

Table (1) presents the cross-correlations in macro and financial uncertainty across countries. There are higher levels of correlation for financial compared to macro uncertainty, as one might expect given open capital accounts. The G7 have stronger links on both measures however Japan's financial uncertainty is more weakly correlated with uncertainty in the rest of the countries. The Netherlands and Switzerland are an outliers in terms of the independence of their experience of macro uncertainty rel-

ative to the other nations, although financial uncertainty is more closely aligned with other European nations.

Figure 4: Pseudo-real time performance: smoother v. filter approach to stochastic volatility for macro uncertainty for the UK

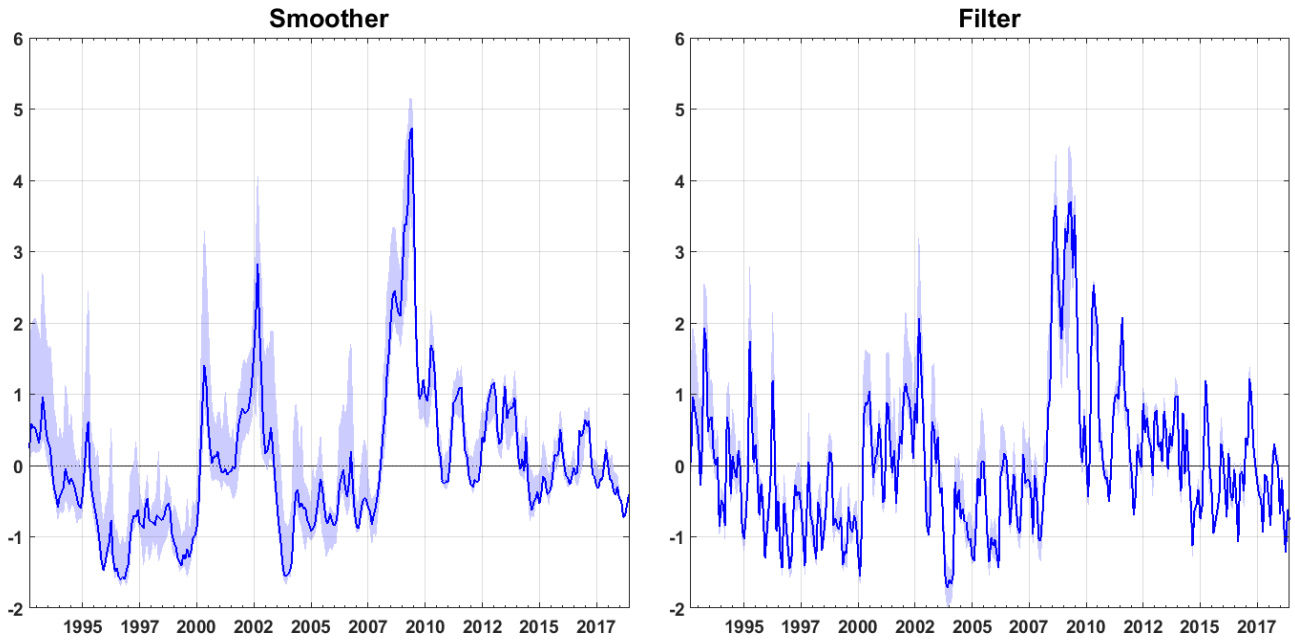
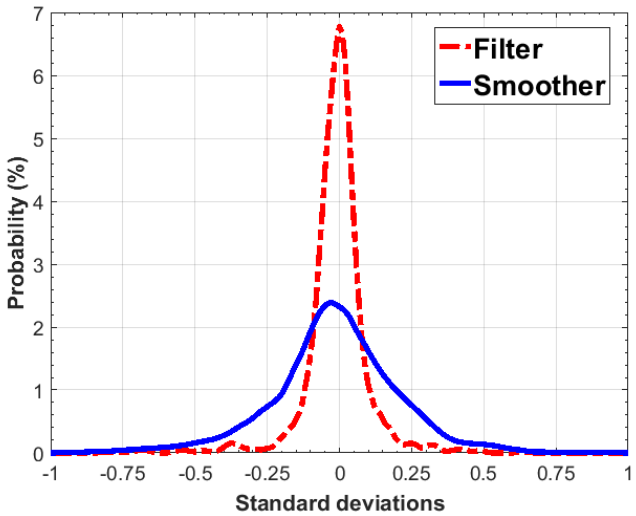


Figure 5: Distribution of pseudo-real time revisions based on different stochastic volatility models



Probability density function from a non-parametric Epanechnikov kernel density estimate of the pseudo real time revisions in the 8 quarters after the initial estimate.

We have pursued a one-sided filter approach to extracting the stochastic volatility in place of the two-sided stochastic volatility smoother approach used in JLN. This leads to greater real time stability. We perform a pseudo real time test of the two approaches. We calculate the index up to 2005 and then re-estimate the model as we roll forward one quarter at a time using the latest data and collect the revisions that take place at each date for the next 8 quarters. The results for the UK macro uncertainty

index are shown in figure (4). The smoother based estimate is, unsurprisingly, less volatile than the filtered estimate however the revisions are significantly larger: the probability that the initial estimate is revised by more than 0.25 standard deviations in the subsequent 8 quarters is 21.2% for the smoothed estimate but only 4.1% for the filtered estimate (see figure 5). This revisions noise, which is completely unrelated to data revisions since the data is held constant in this exercise, would entail significant news to a policy makers forecasting model were that model to incorporate uncertainty. The real time stability of the filtered estimates makes this measure more appropriate for policy use.

5 Macroeconomic Impact of Uncertainty Shocks

We identify the following structural VAR model following Antolín-Díaz and Rubio-Ramírez (2018). The model can be written as:

$$A_0 y_t = \sum_{j=1}^{p} A_j y_{t-j} + c + \epsilon_t \tag{4}$$

Where y_t is a nx1vector of endogenous variables, p is the lag length, $A_j$is an nxn matrix of parameters and c is a vector of nx1 parameters, ϵ_t is a nx1vector of exogenous structural shocks which is Guassian condional on past information with mean zero and covariance matrix given by the nxn identity matrix: $E(\epsilon_t \epsilon_t') = I_n$. The matrix A_0captures the impact of shocks to ϵ_t on y_t, to recover this we must first estimate the reduced form model:

$$y_t = \sum_{j=1}^{p} B_j y_{t-j} + b + u_t \tag{5}$$

Where $B_j = A_0^{-1} A_j$, $u_t = A_0^{-1}\epsilon_t$, $b = A_0^{-1}c$ and $E(u_t u_t') = \Sigma_u$. In order to identify the structural model we need to impose restricitons on the matrix A_0. A common approach is to assume a recursive relationship between ϵ_t and y_t by using $A_0 = chol(\Sigma_u)$, where $chol()$ refers to the Cholesky decomposition and $A_0' A_0 = \Sigma_u$. We instead employ sign restricitons where we define $A_0 = Q\tilde{A}_0$ where $\tilde{A}_0 = chol(\Sigma_u)$ and Q is a nxn orthogonal matrix i.e. $Q'Q = QQ' = I_n$. The sign restrictions are imposed sampling Q from a standard normal random matrix but only retaining draws which entail a A_0 that corresponds to our assumed traditional sign restricitons. To identify the structural shocks we follow Antolín-Díaz and Rubio-Ramírez (2018). There approach to implementing zero and sign restriction follows Rubio-Ramírez et al. (2010) complemented with the recent insights in Arias et al. (2018). Let $\boldsymbol{B} = [B_1, B_2, ..., B_p, b]$. We will impose sign restrictions on the IRFs. Let $\boldsymbol{L}' = [L_0, L_1, ..., L_\infty]$ represent the stacked IRFs at each horizon[9]. The algorithm proceeds as follows:

[9]The impulse resposne functions (IRFs) at horizon h are defined as $L_h = A_0^{-1}(J'F^hJ)'$, where $J' = [I_n, 0, ..., 0]$ and

$$F = \begin{bmatrix} A_1 A_0^{-1} & I_n & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ A_{p-1} A_0^{-1} & 0 & \cdots & I_n \\ A_p A_0^{-1} & 0 & \cdots & 0 \end{bmatrix}$$

1. Draw $(\boldsymbol{B}, \boldsymbol{\Sigma_u})$ from the posterior distribution of the reduced form parameters

2. Draw an orthogonal matrix Q from a QR decomposition of a nxn matrix whose columns are independent random draws from a $N(0, I_k)$[10].

3. Let L_0 be the Cholesky decomposition of Σ_u, then $L_0 Q$ will be a draw from the posterior distribution of A_0^{-1} before the sign restricitons are imposed.

4. Compute $\boldsymbol{L}$ with $L_0 Q$ replacing L_0. Retain the draw if $\boldsymbol{L}$ accords with the sign restrictions for all variables at all horizons.

5. Repeat steps 2- 4 M times.

This reduced form VAR is estimated with Bayesian methods using a normal inverse Wishart Prior[11]. We estimate the above model for each country. The variables included in the matrix y_t are a measure of short term interest rates typically the policy rate, Consumer Price Index, hours or if unavailable employment, investment, consumption, GDP, credit spreads and a measure of uncertainty - see section 8 in the appendix for data description. The monthly uncertainty indices are averaged to get quarterly figures. All variables are de-trended using a cubic trend except for credit spreads, bank rate and the uncertainty measures. The model includes 2 lags following the Schwartz and Hannan-Quinn information criteria.

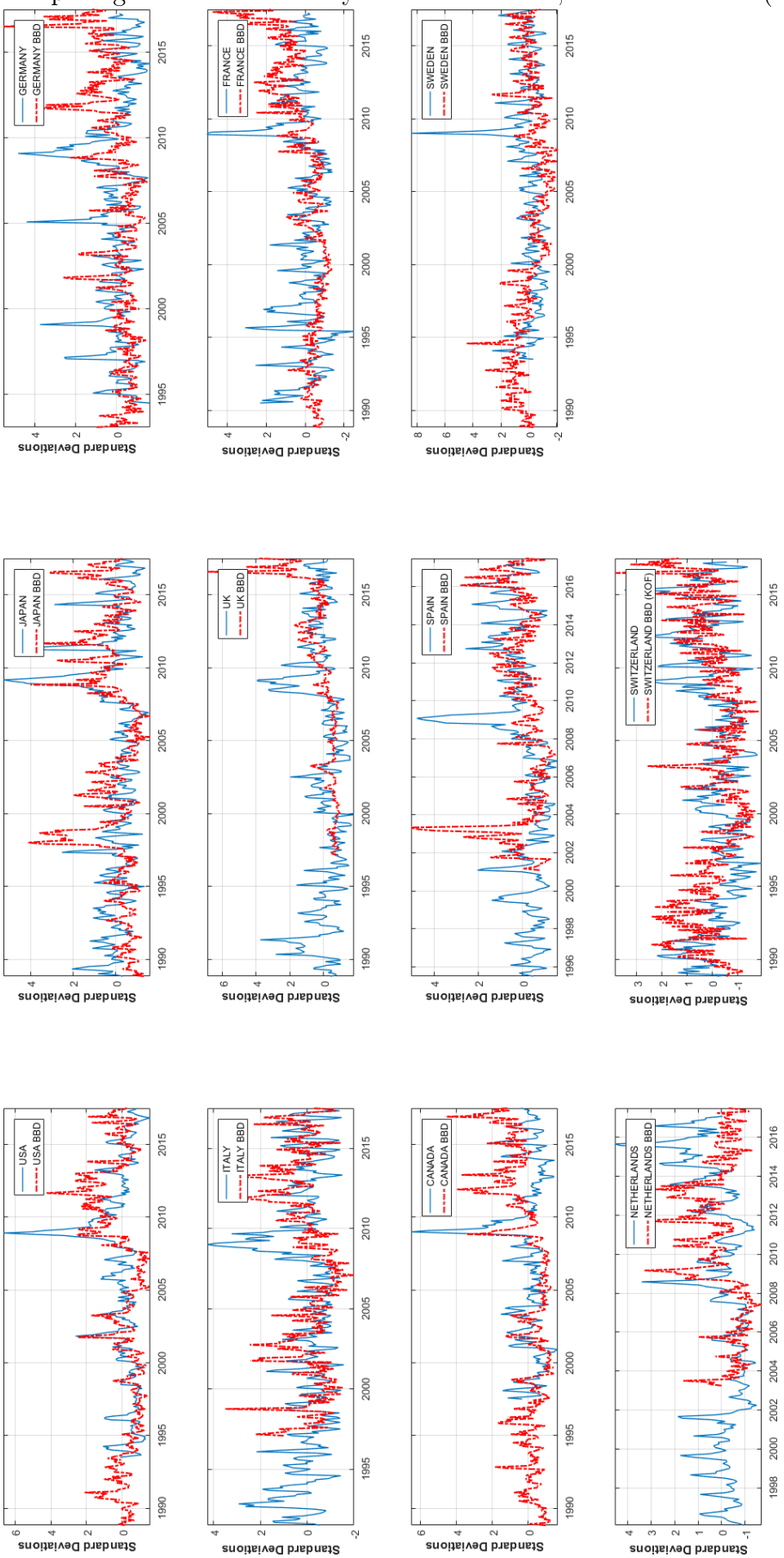
We identify 2 shocks to the system using traditional sign restrictions on the response of variables to the shock - see table 2. In addition we also require that the identified series of shocks is positive on particular dates. For macro uncertainty, the identified shocks must be positive in the months preceeding the close election event where as for the financial shock, identified shocks must be positive on the dates of the largest change in the Romer and Romer (2017) financial distress index, see tables 3 and 4. This final step of the algorithm simply computes the time series of the structural shocks identified above and keeps the draw if the shock has the correct sign on the requierd date[12].

[10] In the case of zero and sign restrictions the Q matrix is drawn recursively so that each column of Q is consistent with the zero restricitons as outlined by Arias et al. (2018)

[11] The Normal inverse Wishart prior assumes a normal prior for the VAR coefficients and a inverse Wishart prior for the covariance matrix, see Blake and Mumtaz (2012).

[12] Antolín-Díaz and Rubio-Ramírez (2018) provide two types of narrative restrictions, those on the shocks and using the historical decomposition. Here, I use only restrictions on the shocks themselves.If restrictions are placed on the historical decomposition then additional steps to re-weight the likelihood function are required (using weights inversely proportional to the probability of satisfying the narrative restrictions) as this procedure truncates the likelihood function, see Antolín-Díaz and Rubio-Ramírez (2018).

Figure 6: Comparing Macro Uncertainty Indices to Baker, Bloom & Davis (2016) EPU



All indices are standardised. BBD style news index for Switzerland is provided by KOF Swiss Economic Institute, available at https://www.kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-uncertainty-indicator.html.

5.1 Results

The majority of empirical studies of macro uncertainty employ recursive identification schemes (for example, Baker et al. (2016); Leduc and Liu (2012)). However, recursive ordering imposes a rigid structure on the response of the VAR system requiring that the timing of each variable to a shock is known. This challenge is especially relevant when attempting to separate fast-moving financial and uncertainty shocks that, on average, may move together.

We identify macro uncertainty shocks using small number of traditional sign restrictions and then sharpen this identification by imposing additional narrative sign restrictions requiring that macro uncertainty shocks take place during close elections (see table 2 and table 3). As a baseline, we pursue a partial identification approach, identifying only the macro uncertainty shock. The traditional sign restrictions impose only that investment falls following a macro uncertainty shock in line with a large number of empirical and theoretical results (see for example, Bloom (2009); Basu and Bundick (2017); Baker et al. (2016); Fernandez-Villaverde et al. (2015))[13]. We apply minimal use of traditional sign restrictions in order to put more weight on the narrative restrictions in identifying the shocks.

Table 2: Sign restrictions on response of variables to shocks

Variable / Shock	*Macro Uncertainty*	*Financial*
Short term interest rate		
CPI		
Hours or Employment		
Investment	-	
Consumption		
GDP		
Credit Spreads		+
Macro Uncertainty	+	
Financial Uncertainty		+

No entry represents an unrestricted response.

In addition to the above standard sign restrictions we impose narrative sign restrictions on the macro uncertainty shocks which require a positive shock takes place around close general elections, following the framework of Antolín-Díaz and Rubio-Ramírez (2018). Table (3) outlines which general elections we have selected as close and presents some ex-post evidence that these were close elections. This includes the results of the election in terms of popular vote which would represent a broad measure of the voter disagreement in the country. However, what matters for the ability of politicians to affect the business

[13]The response of inflation is less clear, theoretical models focusing on a precautionary demand channel indicate that inflation should fall (Leduc and Liu (2012); Basu and Bundick (2017)) but others find evidence that uncertainty can create an upward pricing bias in firms price setting decision (Fernandez-Villaverde et al. (2015)) similarly there is empirical evidence that this can go either way (for inflationary see Popescu and Smets (2010); Redl (2015, 2017); for dis-inflationary see Leduc and Liu (2012); Basu and Bundick (2017)). Hence we remain agnostic on the response of inflation.

environment is the split in the legislature, this is provided in the percentage of seats. On average, these metrics are both very close for the selected elections. A new ruling party may bring more potential changes in economic policies thus more uncertainty. This takes place in about half the elections here (15/28). Further narrative evidence around these events is outlined in appendix II.

A key source of ex-ante macro uncertainty around close elections is the difference in the policy plans of the leading parties. To measure this we construct an economic policy analogue to the RILE measure of left-right sentiment in party manifestos used widely in political science (Budge et al. (2001)). This measure uses the Manifesto Project Database (Volkens et al. (2017)) which uses human coders to assign codes to each sentence (or part sentence) in each manifesto which express a positive or negative sentiment in a variety of categories: external relations, freedom and democracy, the political system, the economy, etc. The database then expresses these coded sentences as a proportion of all coded sentences in the manifesto. For example, in the USA presidential election of 2008 (with Barrack Obama as candidate), in the Democratic party manifesto 2.91% of all coded sentences expressed support for market regulation (a subsection of the economy section of the codes) whereas for the Republican party this was 1.19%. The original right-left position or RILE measure adds code score relating to left leaning sentences and subtracts the right leaning ones. This is done for a selection of codes across all topics in the database. For our purposes I focus on the economy topic to measure left-right position in terms of market policies. I add all the codes that express support for free market policies and subtract all the codes expressing support for greater intervention in the free market, within the economy modules[14]. I label this EconRILE. Thus a positive value suggests the party promotes policies that are pro-free market and a negative value indicates greater focus on market intervention. I present the gap between the two leading parties EconRILE measures as an indicator of the difference in their planned policies, as the more pro-free market party less the more interventionist or socialist party. The greater this gap (in absolute value) the larger the disagreement in policy and the more plausible it is that a close election should cause greater macroeconomic uncertainty. If there was little disagreement this value would be close to zero, however it is typical for their to be significant differences between parties based on this gap.

The results are summarised in figure (7) using the pooled mean group estimator of Pesaran et al. (1999), which is simply an average of the impulse response functions for each country. Two key results are present: (1) macro uncertainty shocks have significant effects on the cyclical component of GDP even without a rise in credit spreads or financial uncertainty, and (2) conditioning on electoral uncertainty implies larger real effects of uncertainty shocks. The average peak response is around -1% for GDP (quarterly annualised) where the effects tend to be expressed via a larger drop in investment and employment or hours as emphasised by Baker et al. (2016). There is also a rise in financial uncertainty and a moderate rise in credit spreads, although neither is significant at the aggregate level. If the sample is split between those countries with a larger response due to close elections to the macro uncertainty

[14]More details are provided in Appendix II

shock credit spreads rise by around 25 bps more than in the countries with a weaker response[15]. In order to better control for the role of financial shocks we identify a financial shock alongside the macro uncertainty shock.

Following the above above approach to identifying macro uncertainty shocks we impose minimal sign restrictions on the financial shock - only that financial uncertainty and credit spreads are positive after the shocks hits. Additional narrative sign restrictions are used based on the financial distress index of Romer and Romer (2017). The latter produce a real time financial distress index based on the authors reading of semi-annual OECD Economic Outlook publications. We use the dates of peak distress as episodes where financial shocks are of primary importance in the business cycle. It is unclear which dates are most relevant for this exercise, where the index reaches its peak level may indicate that financial shocks hit some time ago, whereas peak changes in the index may do a better job of indicating when those shocks hit but may also ignore times when the level has been slowly building. To balance a weight on both the level and the change we use the interaction of the change and the level (product of the change and the level of the index) to choose the dates to impose narrative restrictions.

[15]Countries where the response is larger are USA, Italy, UK, France and the Netherlands. A more muted response is found in Japan, Germany, Canada, Spain, Sweden and Switzerland.

Table 3: Close Election Events

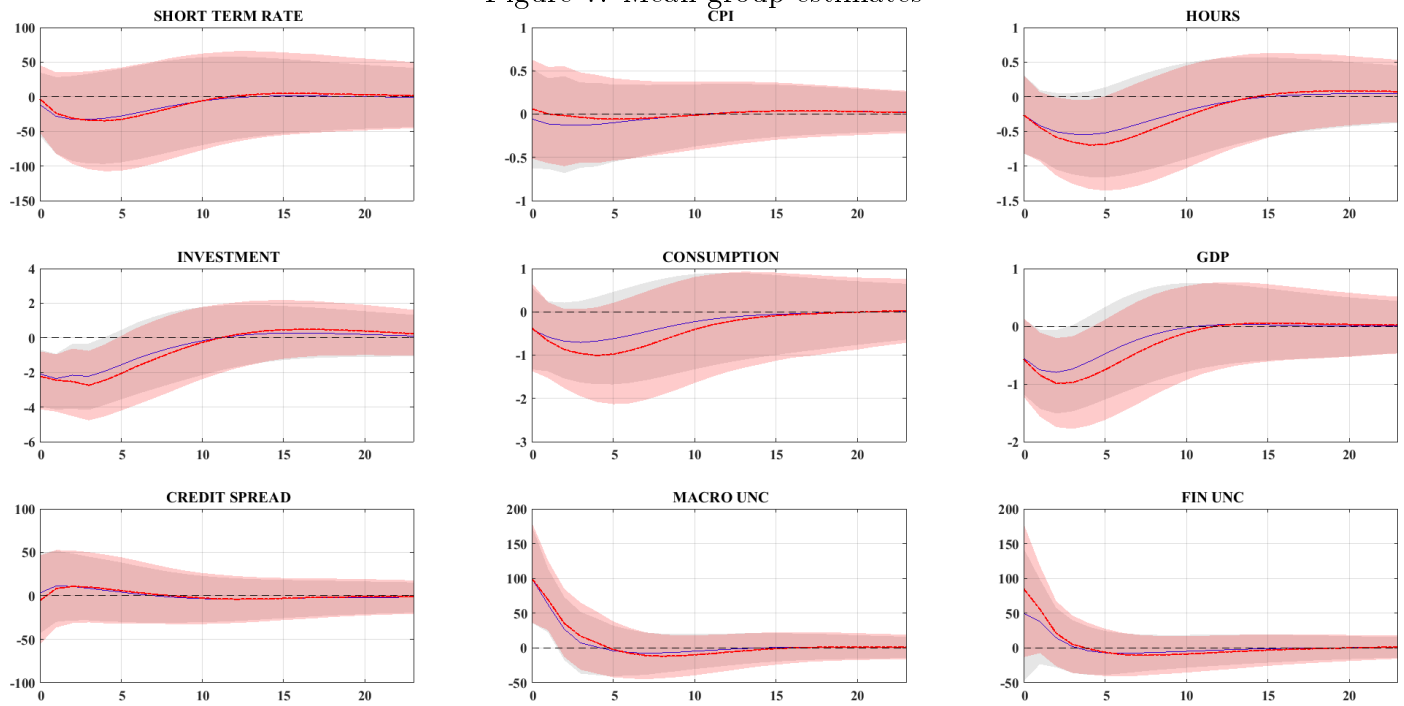
Country	Elections date	Narrative sign restriction date	Winner (runner-up)	% Popular vote	% Seats$^{\triangledown}$	New Ruling Party	EconRILE Gap$^{\diamond}$ (average gap)
USA	7/11/2000	Q3	Bush (Gore)	47.9 (48.4)	50.4 (49.4)	Yes	4.8 (6.3)
	2/112004	Q3	Bush (Kerry)	50.7 (48.3)	53.2 (46.7)	No	9.5 (6.3)
	8/11/2016	Q3	Trump (Clinton)	46.1 (48.2)	56.5 (42.2)	Yes	-
Japan	25/6/2000	Q2	Mori (Hatoyama)	28.3 (25.2)	48.5 (26.5)	No	3.1 (5.5)
	9/11/2003	Q4	Koizumi (Kan)	35 (37.4)	49.4 (36.9)	No	12.1 (5.5)
Germany	22/9/2002	Q3	Schröder (Stoiber)	38.5 (38.5)	41.6 (41.1)	No	3.9 (4.1)
	18/9/2005	Q3	Merkel (Schröder)	35.2 (34.2)	36.8 (36.2)	Yes	6.4 (4.1)
Italy†	21/4/1996	Q1	Prodi (Berlusconi)	42.6 (40.3)	52.0 (38.3)	Yes	-
	9/4/2006	Q1	Prodi (Berlusconi)	49.4 (50.0)	53.5 (46.2)	Yes	15.1 (9.0)
	24/2/2013	Q1	Bersani (Berlusconi)	30.6 (30.0)	49.5 (25.6)	Yes	19.2 (10.8)
UK	9/4/1992	Q1	Major (Kinnock)	41.9 (34.4)	51.6 (41.6)	No	13.9 (9.8)
	6/5/2010	Q1	Cameron (Brown)	36.1 (29.0)	47.1 (39.7)	Yes	0.4 (9.8)
	7/5/2015	Q1	Cameron (Miliband)	36.8 (30.4)	50.8 (35.7)	No	6.4 (9.8)
France*	7/5/1995	Q2	Chirac (Jospin)	52.6 (47.4)	Pres. election	Yes	-
	6/5/2007	Q2	Sarkozy (Royal)	53.1 (46.9)	Pres. election	Yes	7.6 (-)
	6/5/2012	Q2	Hollande (Sarkozy)	51.6 (48.4)	Pres. election	Yes	12.1 (-)
Canada	28/6/2004	Q2	Martin (Harper)	36.7 (29.6)	54.5 (32.1)	No	-4.4 (0.41)
	23/1/2006	Q1	Harper (Martin)	36.3 (30.2)	40.3 (33.4)	Yes	3.8 (0.41)
Spain‡	3/3/1996	Q1	Aznar (González)	38.8 (37.6)	48.0 (39.8)	Yes	1.9 (5.5)
	9/3/2008	Q1	Zapatero (Rajoy)	43.9 (39.9)	46.1 (45.7)	No	5.2 (5.5)
	20/12/2015	Q4	Rajoy (Sánchez)	28.7 (22.0)	44.3 (24.6)	No	6.0 (5.5)
Sweden	17/9/2006	Q3	Reinfeldt (Persson)$^{\vee}$	26.3 (35.0)	27.8 (37.2)	No	9.6 (16.2)
	19/9/2010	Q3	Sahlin (Reinfeldt)	30.7 (30.1)	32.1 (30.7)	No	3.1 (16.2)
Switzerland*	19/10/2003	Q4	Maurer (C.Brunner)	26.7 (23.3)	26.0 (25.1)	Yes	16.1 (14.3)
	23/10/2011	Q4	T.Brunner (Levrat)	26.6 (18.7)	24.0 (23.2)	No	24.8 (14.3)
Netherlands	15/5/2002	Q4	Balkenende (Fortuyn)	27.9 (17.0)	28.7 (17.3)	Yes	1.1 (4.6)
	9/6/2010	Q2	Rutte (Cohen)	20.5 (19.6)	20.7 (20.0)	Yes	11.3 (4.6)
	12/9/2012	Q3	Rutte (Samsom)	26.6 (24.8)	27.3 (25.3)	No	14.8 (4.6)

$\triangledown$ All elections require approximately 50% of seats to form a government.*Second round run-off.† Italy popular votes data taken as an average of popular vote from the chamber of Deputies and the Italian Senate .‡ Spain data used for both congress of deputies (350 seats) and the Senate (266 seats however only 208 seats were up for election).⋆ Switzerland data used for both National Council (200 seats) and council of States (46 seats). $\vee$ Reinfeldt received fewer votes but lead government by forming a coalition with smaller parties.$\diamond$Author calculations using Manifesto Project Database, gap defined as more free market party less more socialist party. The average gap is the EconRILE gap between leading parties in postwar data (where available).

The index is semi-annual so we impose that the identified financial shock must be positive on both quarters corresponding to those dates - see table 4. These dates tend to emphasize the financial crisis, the exceptions being Japan's experience of the Asian crisis in 1998H1, the Netherlands exposure to the Euro crisis in 2012H1 and Sweden's housing crash in 1992H2.

Adding a financial shock that is orthogonal to the macro uncertainty shocks reduces the latter's role in explaining movements in GDP and hours on average across the 11 countries - see figure 9. There remains

Figure 7: Mean group estimates



Responses in blue (with 68% credible set in Grey) are results with baseline sign restrictions given in table (2) for the macro shock only. Responses in red show the effect of adding narrative information. All IRFs are mean group estimates across all countries.

evidence that the impact is more severe when these shocks act through the transmission mechanism in action around close elections. This is more clearly evident when considering the individual country results - figure 8. For the USA, Japan, the UK, France and the Netherlands we see larger declines in GDP and the narrative information in some cases is sufficient to provide significant evidence of a decline in GDP from the minimal sign restrictions which would not occur otherwise (USA, UK, France, Canada and the Netherlands). Adding the financial shock to the system has reduced rise the role of credit spreads as part of the transmission mechanism of the macro uncertainty shock.

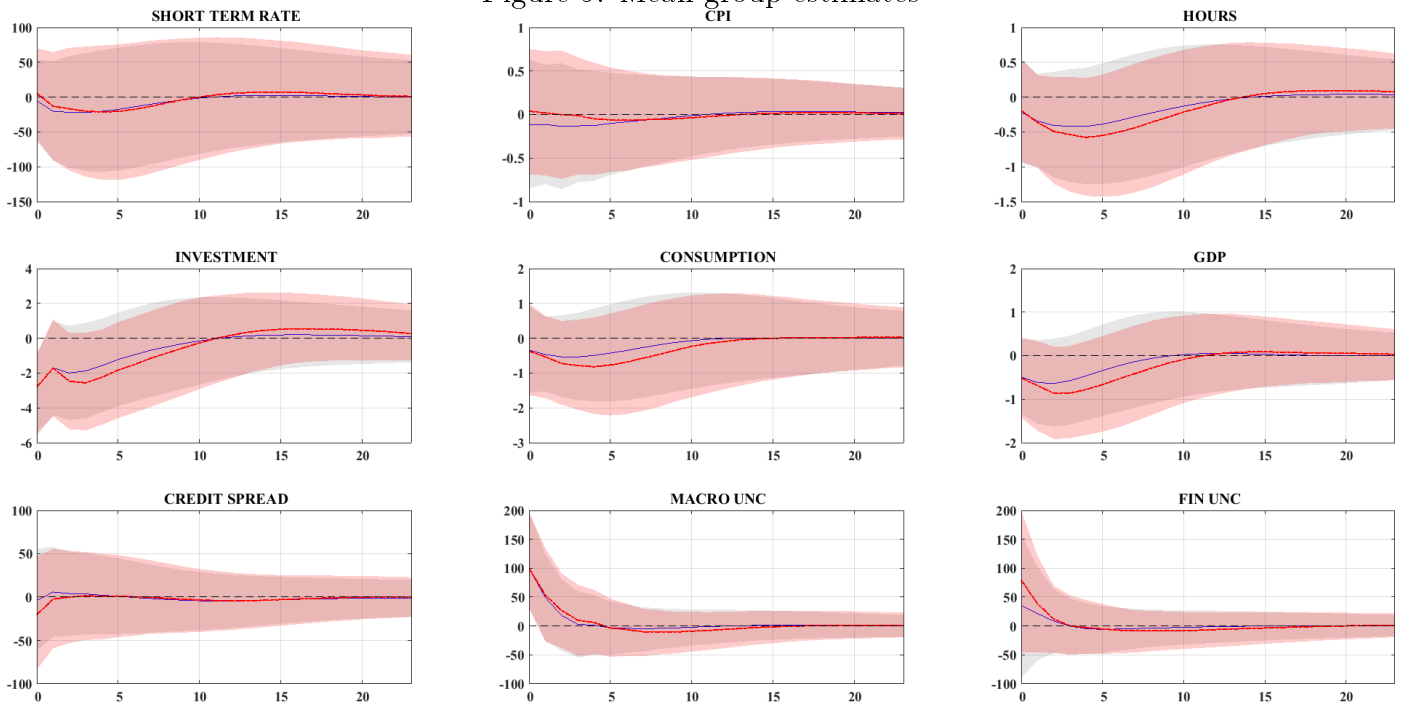
Table 4: Romer and Romer (2017) Financial Distress Index Peak Dates

Country	*(1) Max Change*	*(2) Max Level*	*(3) Interaction: Change (1) * Level (2)*
USA	2008H2	2007H2	2008H2
Japan	1998H2	1991H2	1998H1
Germany	2008H2	1974H2	2008H2
Italy	2012H2	2008H1	2008H2
UK	2008H2	2007H2	2007H2
France	2008H2	2008H2	2008H2
Canada	2008H2	2007H2	2007H2
Spain	2012H2	2008H1	2008H1
Sweden	1993H1	1992H2	1992H2
Switzerland	2008H1	2007H2	2008H1
Netherlands	2009H1	2012H1	2012H1

Where H refers to a semi-annual period e.g. 2008H2 is 2008Q1 and 2008Q2.The dates above are the peak readings of the Romer & Romer financial conditions semi-annual indices for the (1) level of the index, (2) change in the level and the (3) interaction of change and level. The narrative restrictions to identify a financial shock use the interaction (3) dates for both quarters of the period above.

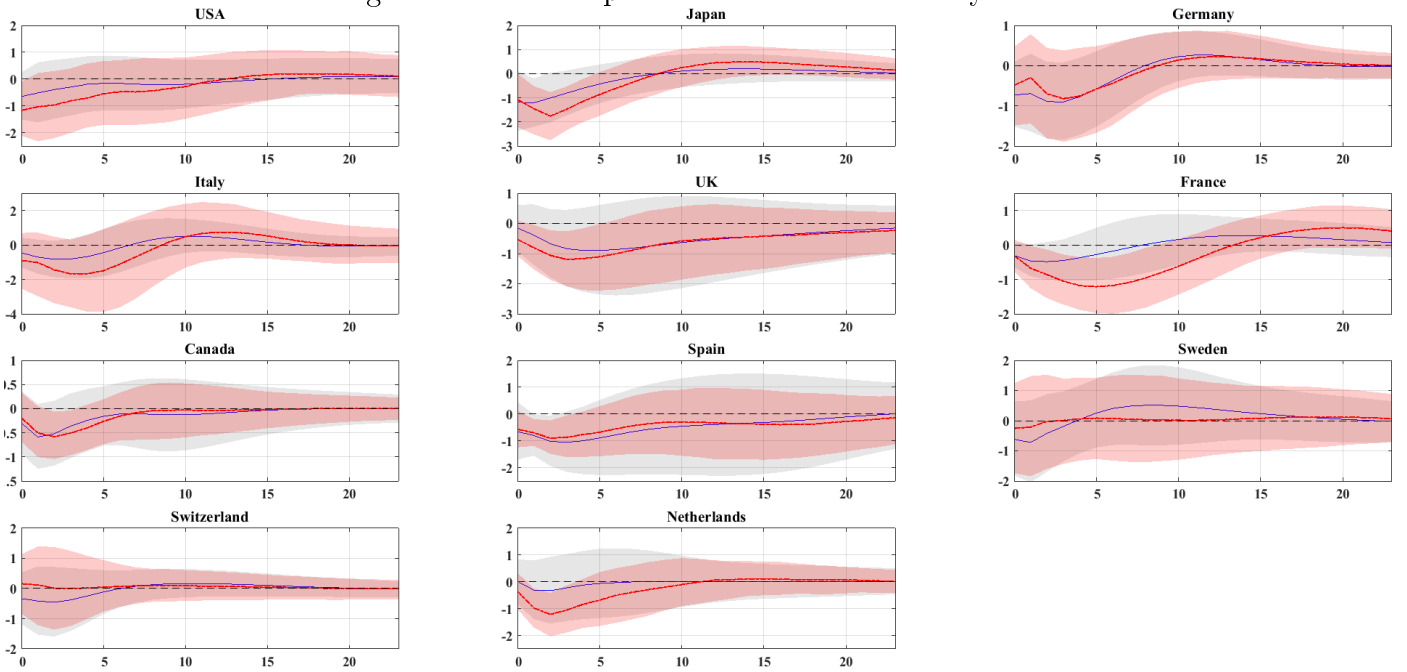
However there remains some evidence that higher financial uncertainty may be an important part of the transmission mechanism of macro uncertainty shocks. While the rise in financial uncertainty is not significant at the aggregate level, we can look into the country level results to see if those with a larger response under close elections tend to be those with higher financial uncertainty (the full IRFs for each country are provided in the appendix). Of the countries showing stronger real effects of macro uncertainty shocks under close elections, the USA, UK and the Netherlands show significantly elevated financial uncertainty. However, this is also true of countries where the real effects are weaker: Sweden, Spain & Switzerland. On average financial uncertainty rises as much in countries with a larger response as those where the response is weaker. In general the transmission mechanism is broadly the same conditioning on close elections, however the declines in hours and investment tend to be deeper. In Japan and the UK a significant response of consumption is behind a larger drop in GDP, potentially because this type of uncertainty is more salient to consumers.

Figure 9: Mean group estimates



Responses in blue (with 68% credible set in Grey) are results with baseline sign restrictions given in table (2). Responses in red show the effect of adding narrative information. All IRFs are mean group estimates across all countries.

Figure 8: GDP Response to Macro Uncertainty Shock



Responses in blue (with 68% credible set in Grey) are results with baseline sign restrictions given in table (2). Responses in red show the effect of adding narrative information.

5.2 Variance Decomposition

Table 5: Sign restrictions on response of variables to shocks

Variable / Shock	*Macro Uncertainty*	*Financial*	*Labour Supply*	*Monetary Policy*	*Cost Push*	*Preference*	*Generic Supply*	*Generic Demand*
Short term interest rate				+				
CPI			-	-	+	+	-	+
Hours or Employment			+					
Investment	-							
Consumption				-	-	+		
GDP				-			+	+
Credit Spreads		+						
Macro Uncertainty	+							
Financial Uncertainty		+						

No entry represents an unrestricted response.

In order to asses the role of uncertainty shocks in driving the business cycle we augment the 2 shock VAR system described above to include 6 additional shocks and compute variance decompositions using the mean group IRFs for all countries. The additional shocks are identified using the sign restrictions in table 5. The macro uncertainty and financial shocks are identified as before.

The variance decompositions are computed with and without the narrative sign restrictions in order to asses how this information alters the role of macro uncertainty and financial shocks in the model - see figure 10. Using only traditional sign restrictions, we see that preference and supply shocks are the dominant explanations for movements in de-trended GDP while labour supply shocks are most important for explaining the variation in hours. Macro uncertainty shocks play a moderate role in GDP fluctuations in the medium term but financial shocks play a relatively small role overall. The addition of narrative information raises the importance of both macro uncertainty and financial shocks - right panel of figure 10. At the horizon of 2-3 years, macro uncertainty shocks are now on par with supply shocks in explaining GDP variations and their role is around twice as important for hours: rising from around 10% to 20% and the most important shock aside from labour supply shocks. Financial shocks are more important for both GDP and hours variation when narrative information is included but are less relevant than macro uncertainty shocks[16].

[16]The full variance decompositions for each shock are available in the appendix and show that financial shocks are important for explaining movements in financial uncertainty and credit spreads. Moving from the 2 shock model to this 8 shock model does not notably change the IRFs for the macro uncertainty shock whereas the IRFs are notably smaller in peak magnitude for th financial shock.

Figure 10: Variance Decomposition for GDP and Hours

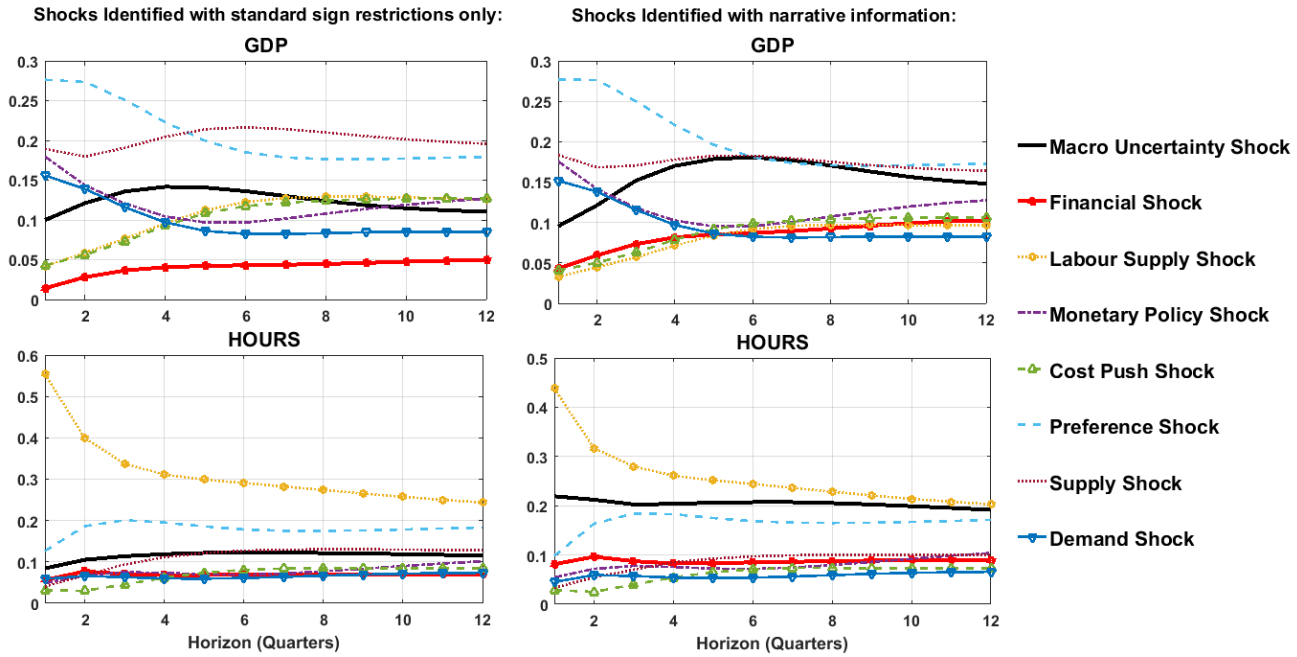


Figure shows the forecast error variance decomposition for model identified with standard sign restriction in table 5 without narrative information (LHS) and with narrative information (RHS) relating to macro uncertainty and financial shocks.

5.3 Robustness

Table 6: Sign restrictions on response of variables to shocks

Variable / Shock	*Macro Uncertainty*	*Financial*	*News Shock*	*Global Uncertainty*
Short term interest rate				
CPI				
Hours or Employment				
Investment	-		*0, + (Q4-Q6)**	-
Consumption				
GDP			*0, + (Q4-Q6)**	
Credit Spreads		+		
Macro Uncertainty	+			
Financial Uncertainty		+		
CE GDP growth forecasts	0		+	
Global Uncertainty				+

No entry represents an unrestricted response. * Zero response on impact but a positive response for 2 quarerts a year after the shock hits.

We check the robustness of the above results by adding two additional shocks to the 2 shock system presented in table 2[17]: news shocks and global uncertainty shocks. A significant challenge to using

[17] Computational constraints make it difficult to include a larger set of shocks as in table 5 alongside the news and global

uncertainty indices in policy is that positive uncertainty shocks (second moment) are typically correlated with negative confidence shocks (first moment), as highlighted by Haddow et al. (2013). The news shock will capture changes in confidence that may be incorrectly attributed to uncertainty shocks. Moreover, a number of studies have highlighted that uncertainty shocks are closely related to news shocks (Berger et al. (2017), Cascaldi-Garcia and Galvao (2018)) and thus there is a risk of conflating the two without separately identifying news in the model. News shocks are identified as shocks that increase Consensus Economics 1-year ahead GDP growth forecasts on impact, have no contemporaneous effect on GDP and investment but see a rise in those variables for two quarters a year after the shock hits. These assumptions are in line with the theoretical and empirical results in Barsky and Sims (2011). To control for a deterioration in mean expectations driving the results of the domestic uncertainty shock we impose that the identified domestic macro uncertainty shock does not cause a drop in growth expectations.

It may be that the effects of domestic macro uncertainty shocks are not due to domestic developments but rather through correlation with global uncertainty shocks as highlighted by Cesa-Bianchi et al. (2014), Mumtaz and Theodoridis (2015) and Berger et al. (2016). We employ a measure of global uncertainty developed in Redl (2017) to test this hypothesis[18]. That measure of global uncertainty applies the JLN methodology to a wide set of global macro and financial variables. The index uses global macro and financial data covering stock market returns, sovereign bonds yields, exchange rates, commodity prices, trade volumes, retail sales, consumer and business confidence from emerging and advanced economies. We allow the global uncertainty shock to compete with the domestic macro uncertainty shock by identifying it in a similar way, assuming that it also drags on investment.

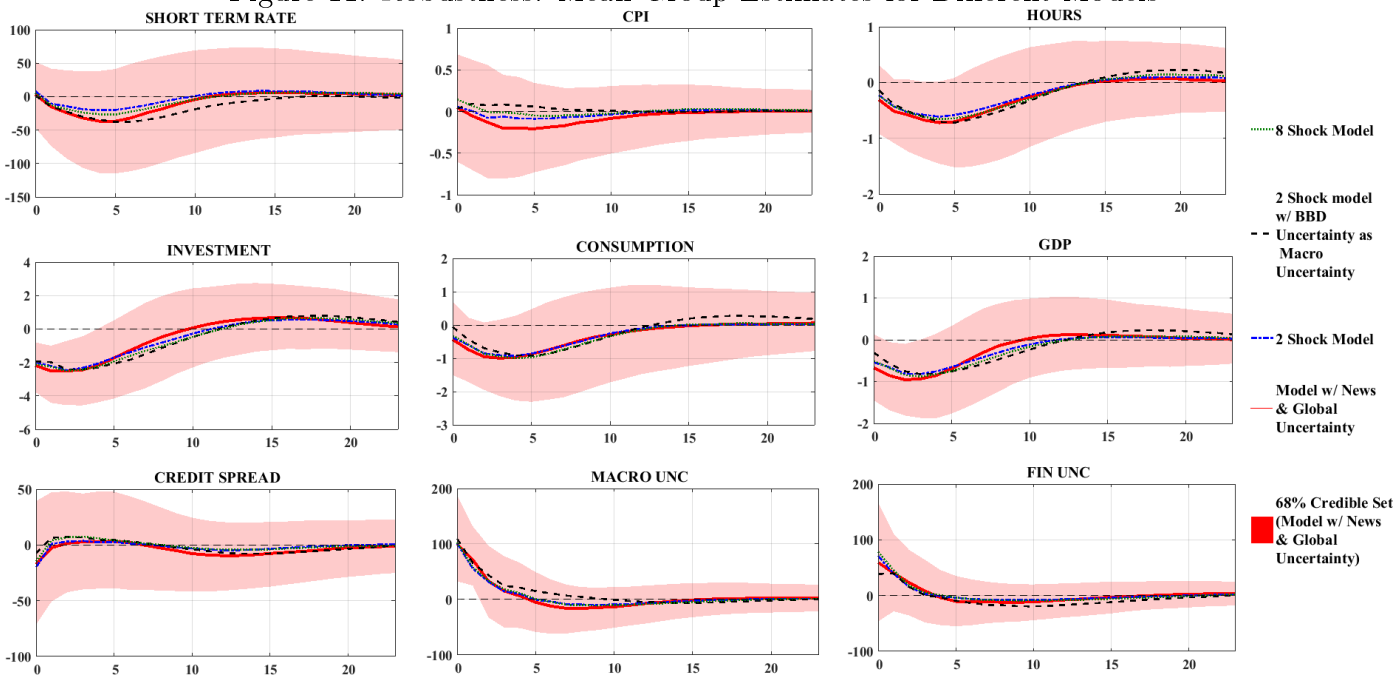
Including news and global uncertainty shocks in the model does not significantly alter the main results, see figure 11, in fact the results are slightly stronger than in the case where only uncertainty and financial shocks are identified as the impact on GDP is now significant. However, similar to the finding above for financial uncertainty, there is some evidence that an increase in global uncertainty is part of the transmission mechanism for the real effects of domestic macro uncertainty shocks. This is the case for the UK, Spain and notably for Italy but is not particularly pronounced for the other countries (response of global uncertainty to a domestic macro shock is provided in the appendix).

As additional robustness checks we replace the JLN based measures of macro uncertainty with the news based measure produced by Baker et al. (2016), labeled BBD in figure 11 and 12. The transmission mechanism is broadly in line with the 2 shock model presented above, with significant declines in inputs to production (investment and hours) resulting in lower GDP and little evidence of uncertainty working through lower spending from households. A similar group of countries experience elevated financial uncertainty alongside the macro uncertainty shock, most notably the UK. The impulse responses from the larger 8 shock model are also inline with the previous results from the smaller model where only the macro uncertainty and financial shocks were identified.

uncertainty shocks since as this must be calculated for 11 countries with 2 sets of narrative sign restrictions as well as the dynamic sign restrictions used for the news shock as this requires a very large number of draws.

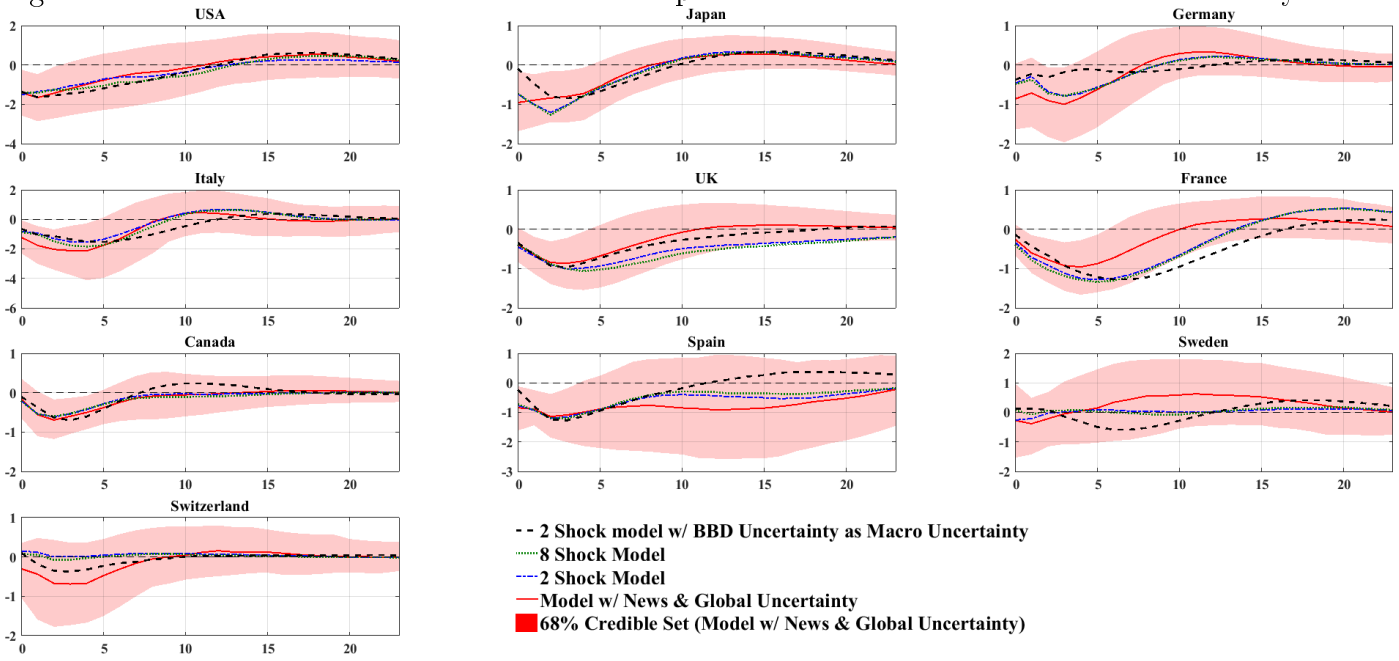
[18]That paper used global variables excluding the UK as it focused exclusively on the UK. In constructing this global index we use all global data including the UK.

Figure 11: Robustness: Mean Group Estimates for Different Models



Responses in blue (with 68% credible set in Grey) . Responses in red show the effect of adding narrative information. All IRFs are mean group estimates across all countries.

Figure 12: Robustness: Narrative estimates of impact on GDP of Domestic Macro Uncertainty Shock



Responses

6 Conclusion

This paper uses a data rich environment to produce new econometric measures of macroeconomic and financial uncertainty for 11 advanced nations. These new macro uncertainty measures show significant independent variation from other popular proxies such as those of Baker et al. (2016), with improved readiness for policy use through improved real-time performance and a construction appropriate as an input for forecasting. Moreover, these new measures of financial uncertainty go beyond narrow measures of share price or interest rate implied volatility to also capture credit extension and the external environment.

We apply these measures to study the impact of macro uncertainty shocks controlling for financial shocks identified using narrative information on financial crises. We find that real macro uncertainty shocks matter for the majority of countries. We further isolate the macro uncertainty channel by employing narrative information from closely contested elections. We find that this induces a larger real effect of macro uncertainty shocks. We find that the transmission mechanism of these shocks does not rely on a rise in credit spreads, however there is evidence that increases in financial and global uncertainty can be an important part of the transmission mechanism for some countries. These results are robust to controlling for news shocks as well as a variety of shocks considered to be important drivers of the business cycle.

We find that identifying macro uncertainty shocks with close elections raises their important as a source of fluctuations in GDP especially at the horizon of 1-2 years where they explain around 20% of the forecast error variance of GDP. Interestingly, we find that these shocks are more important for real variables than financial shocks, which explain only around 10% of the variation in GDP. Similarly identifying macro uncertainty shocks with close elections raises approximately doubles their importance in explaining labour market fluctuations (hours) from around 10% to slightly more than 20%.

The JLN approach could be used to estimate macro economic uncertainty in developing countries where news search is not viable and the narrative approach used to isolate macro uncertainty shocks using elections. This is planned future work.

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7 Online Appendix I - Data Sources for Measuring Uncertainty

Country	Macro Series	Financial Series
UK	33	27
USA	50	16
Germany	37	13
France	17	12
Spain	23	8
Italy	21	11
Canada	37	15
Japan	40	13
Sweden	19	12
Netherlands	19	12
Switzerland	15	10

Transformations:

1. Levels
    2. First difference.
    3. Second difference.
    4. Natural log
    5. Log first difference
    6. Log second difference.

7.1 USA

Figure 13:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
THE CONFERENCE BOARD LEADING ECONOMIC INDICATORS INDEX	The Conference Board	5
GOODS & SERVICES BALANCE ON A BALANCE OF PAYMENTS BASIS	U.S. Census Bureau	2
EXPORTS F.A.S.	U.S. Census Bureau	5
IMPORTS F.A.S.	U.S. Census Bureau	5
VISIBLE TRADE BALANCE F.A.S.-F.A.S.	U.S. Census Bureau	2
FEDERAL GOVERNMENT BUDGET BALANCE	Bureau of the Fiscal Service, United States	2
CONSUMER CONFIDENCE INDEX	The Conference Board	2
NEW PASSENGER CARS - TOTAL REGISTRATIONS	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
SALES OF NEW ONE FAMILY HOUSES (AR)	U.S. Census Bureau	5
EXISTING HOME SALES: SINGLE-FAMILY & CONDO (AR)	NAR - National Association of Realtors, United States	5
NATIONAL ASSOCIATION OF HOME BUILDERS HOUSING MARKET I	NAHB - National Association of Home Builders, United States	2
RETAIL SALES & FOOD SERVICES, TOTAL	U.S. Census Bureau	5
RETAIL SALES & FOOD SVS, TOTAL EXCL MV & PARTS DEALERS	U.S. Census Bureau	5
PERSONAL INCOME (MONTHLY SERIES) (AR)	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
PERSONAL SAVING AS % OF DISPOSABLE PERSONAL INCOME	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	1
DISPOSABLE PERSONAL INCOME (AR)	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
PERSONAL CONSUMPTION EXPENDITURES (AR)	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
POPULATION (ESTIMATES USED IN NATIONAL ACCOUNTS)	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
ALL EMPS - NONFARM INDUSTRIES TOTAL (PAYROLL SURVEY)	Bureau of Labor Statistics, U.S. Department of Labor	5
TOTAL CIVILIAN EMPLOYMENT	Bureau of Labor Statistics, U.S. Department of Labor	5
UNEMPLOYED (16 YRS & OVER)	Bureau of Labor Statistics, U.S. Department of Labor	5
UNEMPLOYMENT RATE	Bureau of Labor Statistics, U.S. Department of Labor	1
AHE: PROD EMPS - TOTAL PRIVATE	Bureau of Labor Statistics, U.S. Department of Labor	5
AHE: PROD EMPS - MANUFACTURING	Bureau of Labor Statistics, U.S. Department of Labor	5
AWH: PROD EMPS - TOTAL PRIVATE	Bureau of Labor Statistics, U.S. Department of Labor	5
CAPACITY UTILIZATION RATE - ALL INDUSTRY	Federal Reserve, United States	5
ISM PURCHASING MANAGERS INDEX (MFG SURVEY)	ISM - Institute for Supply Management	2
CHICAGO PURCHASING MANAGER BUSINESS BAROMETER (SA)	MNI Indicators	2
PHILADELPHIA FED MBOS: GENL BUS ACTIV - INDEX	Federal Reserve Bank of Philadelphia	2
INDUSTRIAL PRODUCTION - TOTAL INDEX	Federal Reserve, United States	5
INDUSTRIAL PRODUCTION - MANUFACTURING (NAICS)	Federal Reserve, United States	5
NEW PRIVATE HOUSING UNITS STARTED (AR)	U.S. Census Bureau	5
NEW PRIVATE HOUSING UNITS AUTHORIZED BY BLDG.PERMIT (AR)	U.S. Census Bureau	5
CONSTRUCTION EXPENDITURES - TOTAL (AR)	U.S. Census Bureau	5
NEW ORDERS - ALL MANUFACTURING INDUSTRIES	U.S. Census Bureau	5
NEW ORDERS - MANUFACTURING, EXCLUDING TRANSPORTATION	U.S. Census Bureau	5
NEW ORDERS - MANUFACTURING, DURABLES	U.S. Census Bureau	5
NEW ORDERS-MANUFACTURING, DURABLES, EXCL. TRANSPORTATION	U.S. Census Bureau	5
BUSINESS INVENTORIES (MFG & TRADE)	U.S. Census Bureau	5
BUSINESS SALES (MFG & TRADE)	U.S. Census Bureau	5
WHOLESALE TRADE INVENTORIES - TOTAL	U.S. Census Bureau	5
SALES BY MERCHANT WHOLESALERS - TOTAL	U.S. Census Bureau	5
CPI - ALL URBAN: ALL ITEMS	Bureau of Labor Statistics, U.S. Department of Labor	5
CPI - ALL ITEMS LESS FOOD & ENERGY (CORE)	Bureau of Labor Statistics, U.S. Department of Labor	5
CHAIN-TYPE PRICE INDEX FOR PERSONAL CONSMPTN.EXPENDITURE	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
CHAIN-TYPE PRICE INDEX FOR PCE LESS FOOD & ENERGY	BEA - Bureau of Economic Analysis, U.S. Department of Commerce	5
CPI- ALL URBAN SAMPLE: ALL ITEMS - ANNUAL INFLATION RATE	Bureau of Labor Statistics, U.S. Department of Labor	2
EXP - ALL COMMODITIES (END USE)	Bureau of Labor Statistics, U.S. Department of Labor	5
IMP - ALL COMMODITIES (END USE)	Bureau of Labor Statistics, U.S. Department of Labor	5
TERMS OF TRADE REBASED TO 1975=100	Datastream	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
FOREIGN RESERVE ASSETS	Federal Reserve, United States	5
MONETARY BASE	Federal Reserve, United States	5
MONEY SUPPLY M1	Federal Reserve, United States	5
MONEY SUPPLY M2 (BCI 106)	The Conference Board	5
FEDERAL FUNDS TARGET RATE (EP)	Reuters	2
FEDERAL FUNDS RATE (MONTHLY AVERAGE)	Federal Reserve, United States	2
TREASURY BILL RATE - 3 MONTH (EP)	Federal Reserve, United States	2
INTERBANK RATE - 3 MONTH (LONDON) (MONTH AVG)	Reuters	2
PRIME RATE CHARGED BY BANKS (MONTH AVG)	Federal Reserve, United States	2
TREASURY YIELD ADJUSTED TO CONSTANT MATURITY - 20 YEAR	Federal Reserve, United States	1
DOW JONES INDUSTRIALS SHARE PRICE INDEX (EP)	S&P Dow Jones Indices	5
TOTAL TREASURY SECURITIES OUTSTANDING (PUBLIC DEBT)	U.S. Department of the Treasury	5
FOREIGN NET LONG TERM FLOWS IN SECURITIES	U.S. Department of the Treasury	2
CONSUMER CREDIT OUTSTANDING	Federal Reserve, United States	5
COMMERCIAL BANK ASSETS - LOANS & LEASES IN BANK CREDIT	Federal Reserve, United States	5
COMMERCIAL BANK ASSETS - COMMERCIAL & INDUSTRIAL LOANS	Federal Reserve, United States	5

7.2 UK

Figure 14:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
Industrial Production	ONS	5
Manufacturing Production	ONS	5
Real Retail Sales ex Fuel	ONS	5
Real Retail Sales ex Food	ONS	5
BOP Total Exports (Goods)	ONS	5
Exports Volume (Goods)	ONS	5
BOP Total Imports (Goods)	ONS	5
Imports Volume (Goods)	ONS	5
UK CBI SURVEY - BELOW CAPACITY UTILIZATION	Thomson Reuters	2
CBI Industrial Trends: Current Total Order Book	Confederation of British Industry	2
CBI - vol of stocks bal	Confederation of British Industry	2
New Cars Registrations	The Society of Motor Manufacturers & Traders	5
LFS Unemployment Rate	ONS	1
LFS Number of Employees (Total)	ONS	5
Claimant Count Rate	ONS	1
UK LFS: TOTAL ACTUAL WEEKLY HOURS WORKED, ALL	ONS	5
UK WEEKLY EARN: PRIVATE SECTOR	Main Economic Indicators,copyright OECD	5
PPI	ONS	5
CPI all items	ONS	5
RPI all items	ONS	5
RPI ex Mortgages Interest Payments (RPIX)	ONS	5
Nationwide House Price MoM	Housing and Construction	5
RICS House Price Balance	RICS - The Royal Institution of Chartered Surveyors, Unit	2
UK PSNCR Public Sector Net Cash Requirement	ONS	2
New Cars Registrations	The Society of Motor Manufacturers & Traders	5
GfK Consumer Confidence	European Commission	1
European Commission Consumer Confidence	European Commission	1
CBI Distributive Trades: Retail Volume of Sales vs Year Ago	Confederation of British Industry	1
CBI Industrial Trends: Current Total Order Book	Confederation of British Industry	1
CBI Industrial Trend: Expected Selling Prices	Confederation of British Industry	1
Gfk/EC consumer conf, current financial situation of HH	European Commission	1
Gfk/EC consumer conf, current financial situation of HH over next 12m	European Commission	1
CBI MT expectations	Confederation of British Industry	1

FINANCIAL DATA		
Name	**Source**	**Transformation**
3m LIBOR	Bloomberg	2
10yr nom implied fwd	Bank of England	2
10yr real implied fwd	Bank of England	2
5yr nom implied fwd	Bank of England	2
5yr real implied fwd	Bank of England	2
FTSE all share	Bloomberg	5
SHORT STERLING IMPLIED VOL 12 MO	Probability Density Function	2
OIL (WTI) 12mo implied vol	Probability Density Function	2
Sterling exchange rate index	Financial Statistics	5
FTSE 250 INDEX	Bloomberg	5
UK CHANGE IN LENDING TO UK PRIVATE SECTOR- LOANS & ADVANCES	BBA - British Bankers' Association	1
UK MONEY SUPPLY M4	Bank of England	5
UK UK MONEY SUPPLY M3	Bank of England	5
UK MONEY SUPPLY M1	Bank of England	5
UK MONEY SUPPLY M2: RETAIL DEPOSITS AND CASH IN M4	Bank of England	5
GBP TO USD - EXCHANGE RATE	Bank of England	5
GBP TO EUR - EXCHANGE RATE	Bank of England	5
SMALL LoBM	Fama French	1
ME1 BM2	Fama French	1
ME1 BM3	Fama French	1
ME1 BM4	Fama French	1
SMALL HiBM	Fama French	1
UK BANK OF ENGLAND BASE RATE	Long-run dataset	1
bank rate libor spread	Bank of England	1
bank rate 5yr spread	Bank of England	1
bank rate 10 yr spread	Bank of England	1
Oil Brent	Thomson Reuters	5

7.3 Germany

Figure 15:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
BUSINESS EXPECTATIONS	Ifo - Institute for Economic Research, University of Munich	5
COMPOSITE LEADING INDICATOR	OECD	5
BOP CAPITAL & FINANCIAL ACCOUNT BALANCE	Deutsche Bundesbank	1
CURRENT ACCOUNT BALANCE	Deutsche Bundesbank	1
BOP: EXPORTS FOB	Deutsche Bundesbank	5
BOP: IMPORTS CIF	Deutsche Bundesbank	5
BOP: VISIBLE TRADE BALANCE	Deutsche Bundesbank	5
EM EFFECTIVE EXCH.RATE - REAL CPI	ECB - European Central Bank	5
CONSUMER CONFIDENCE INDICATOR	DG ECFIN - Directorate General for Economic and Financial Affairs	2
NEW PASSENGER CAR REGISTRATIONS	KBA - Federal Motor Transport Authority, Germany	5
RETAIL SALES EXCL CARS	Federal Statistical Office, Germany	5
RETAIL SALES EXCLUDING CARS INDEX	Federal Statistical Office, Germany	5
EMPLOYED PERSONS	Bundesagentur fur Arbeit, Germany	5
UNEMPLOYMENT LEVEL	Deutsche Bundesbank	5
UNEMPLOYMENT REGISTERED	Deutsche Bundesbank	5
UNEMPLOYMENT: % CIVILIAN LABOUR	Bundesagentur fur Arbeit, Germany	1
UNEMPLOYMENT: % CIVILIAN LABOUR	Deutsche Bundesbank	1
EG UNEMPLOYMENT RATE, REGISTERED	Deutsche Bundesbank	1
WG UNEMPLOYMENT RATE, REGISTERED	Deutsche Bundesbank	1
VACANCIES	Deutsche Bundesbank	5
WAGE & SALARY,OVERALL ECONOMY-ON A MTHLY BASIS	Deutsche Bundesbank	5
WAGE & SALARY: ON HRLY. BASIS - PRDG. SECTOR	Deutsche Bundesbank/Thomson Reuters	5
PRODUCTIVITY: OUTPUT PER MAN-HOUR WORKED	Deutsche Bundesbank	5
WAGES & SALARIES: PER UNIT OF OUTPUT	Federal Statistical Office, Germany	5
TRADE & IND: BUS CLIMATE	Ifo - Institute for Economic Research, University of Munich	5
INDL PROD: INDUSTRY INCL CNSTR	Federal Statistical Office, Germany	5
INDL PROD: MANUFACTURING	Federal Statistical Office, Germany	5
NEW ORDERS RECD: CNSTR - RESL CNSTR	Deutsche Bundesbank	5
MANUFACTURING ORDERS	Deutsche Bundesbank	5
MANUFACTURING ORDERS	Deutsche Bundesbank	5
INSOLVENCIES - BUSINESS ENTERPRISES	Federal Statistical Office, Germany	5
CPI	Deutsche Bundesbank	5
EXPORT PRICE INDEX	Deutsche Bundesbank	5
IMPORT PRICE INDEX	Deutsche Bundesbank	5
TERMS OF TRADE	Deutsche Bundesbank	5
PPI: INDL. PRODUCTS, TOTAL, SOLD ON THE DOMESTIC MARKET	Federal Statistical Office, Germany	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
GERMAN MARKS TO US$	Bank of England	5
US $ TO 1 EURO	Bank of England	5
EM BOE EURO TRADE WEIGHTED INDEX	Bank of England	5
MONEY SUPPLY M0	Thomson Reuters	5
MONEY SUPPLY-GERMAN CONTRIBUTION TO EURO M1	Deutsche Bundesbank/Thomson Reuters	5
MONEY SUPPLY- M2	Deutsche Bundesbank/Thomson Reuters	5
MNY.SUPL-M3	Deutsche Bundesbank/Thomson Reuters	5
DISCOUNT RATE / SHORT TERM EURO REPO RATE	ECB - European Central Bank	1
FIBOR - 3 MONTH	EBF - European Banking Federation/ACI - The Financial Markets Association	1
BANK PRIME LENDING RATE / ECB MARGINAL LENDING FACILITY	Deutsche Bundesbank	1
LONG TERM GOVERNMENT BOND YIELD - 9-10 YEARS	Datastream	1
DAX SHARE PRICE INDEX, EP	Reuters	5
LENDING TO ENTERPRISES & INDIVIDUALS	Deutsche Bundesbank	5

7.4 France

Figure 16:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
COMPOSITE LEADING INDICATOR - TREND RESTORED	Main Economic Indicators,copyright OECD	5
EXPORTS FOB	Direction generale des douanes et droits indirects, France	5
IMPORTS FOB	Direction generale des douanes et droits indirects, France	5
VISIBLE TRADE BALANCE FOB-FOB	Direction generale des douanes et droits indirects, France	1
EM BOE EURO TRADE WEIGHTED INDEX	Bank of England	5
SURVEY - HOUSEHOLD CONFIDENCE INDICATOR	INSEE - National Institute for Statistics and Economic Studies, France	5
HOUSEHOLD CONSUMPTION - ENGINEERED PRODUCTS	INSEE - National Institute for Statistics and Economic Studies, France	5
NEW CAR REGISTRATIONS	Ministere de l'Ecologie du Developpement et de l'Amenagement durables, France	5
NEW CAR REGISTRATIONS	CCFA - Comite des Constructeurs Francais d'Automobiles	5
POPULATION: METROPOLITAN	INSEE - National Institute for Statistics and Economic Studies, France	5
SURVEY: MANUFACTURING OUTPUT LEVEL - GENERAL OUTLOOK	INSEE - National Institute for Statistics and Economic Studies, France	1
SURVEY: MANUFACTURING - SYNTHETIC BUSINESS INDICATOR	INSEE - National Institute for Statistics and Economic Studies, France	5
INDUSTRIAL PRODUCTION	INSEE - National Institute for Statistics and Economic Studies, France	5
INDUSTRIAL PRODUCTION - MANUFACTURING	INSEE - National Institute for Statistics and Economic Studies, France	5
INDUSTRY BANKRUPTCIES	INSEE - National Institute for Statistics and Economic Studies, France	5
CPI	INSEE - National Institute for Statistics and Economic Studies, France	5
CPI - ALL ITEMS LESS ENERGY	INSEE - National Institute for Statistics and Economic Studies, France	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
OFFICIAL RESERVES	MINEFI - Ministere de l'Economie, des Finances et de l'Industrie, France	5
FRENCH FRANCS TO US $	Bank of England	5
US $ TO 1 EURO	Bank of England	5
MONEY SUPPLY - M1	Banque de France	5
MONEY SUPPLY - M2	Banque de France	5
MONEY SUPPLY - M3	Banque de France	5
AVERAGE COST OF FUNDS FOR BANKS / EURO REPO RATE	ECB - European Central Bank	1
PIBOR / EURIBOR - 3-MONTH	Main Economic Indicators,copyright OECD	1
CAPITAL MARKET YIELDS-13-WEEK TREASURY BILLS,MO.WGHTD.AVG.	Banque de France	1
GOVERNMENT GUARANTEED BOND YIELD	Banque de France	1
SHARE PRICE INDEX - SBF 250	Main Economic Indicators,copyright OECD	5
MFI LOANS TO RESIDENT PRIVATE SECTOR	Banque de France	5

7.5 Italy

Figure 17:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
COMPOSITE LEADING INDICATOR - TREND RESTORED	Main Economic Indicators,copyright OECD	5
EXPORTS OF GOODS FOB	Istat - National Institute of Statistics, Italy	5
IMPORTS OF GOODS CIF	Istat - National Institute of Statistics, Italy	5
VISIBLE TRADE BALANCE	ITVISGDSA Italy Istat - National Institute of Statistics, Italy	2
STATE BUDGET: BALANCE (CMLV)	Bank of Italy	2
HOUSEHOLD CONFIDENCE INDEX	Istat - National Institute of Statistics, Italy	2
NEW PASSENGER CAR REGISTRATIONS	ANFIA - Italian Association of the Automotive Industry	5
RETAIL SALES	Istat - National Institute of Statistics, Italy	5
CONTRACTUAL HOURLY WAGE: ALL WORKERS	Istat - National Institute of Statistics, Italy	5
BUSINESS CONFIDENCE INDICATOR	Istat - National Institute of Statistics, Italy	5
BUS.SVY.: ECONOMY IN NEXT 3MOS- FAVOURABLES PLUS STABLES	Istat - National Institute of Statistics, Italy	5
INDUSTRIAL PRODUCTION	Istat - National Institute of Statistics, Italy	5
INDUSTRIAL PRODUCTION: MANUFACTURING	Istat - National Institute of Statistics, Italy	5
NEW ORDERS	Istat - National Institute of Statistics, Italy	5
CPI INCLUDING TOBACCO - NIC (LINKED & REBASED)	Istat - National Institute of Statistics, Italy	5
INFLATION RATE	Istat - National Institute of Statistics, Italy	1
EXPORT UNVALUE INDEX	Istat - National Institute of Statistics, Italy	5
IMPORT UNVALUE INDEX	Istat - National Institute of Statistics, Italy	5
TERMS OF TRADE	Istat - National Institute of Statistics, Italy	5
PPI	Istat - National Institute of Statistics, Italy	5
NEW ORDERS	Istat - National Institute of Statistics, Italy	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
ITALIAN LIRE TO US $	Bank of England	5
US $ TO 1 EURO (ITALIAN LIRE DERIVED HISTORY PRIOR 1999)	Bank of England	5
EM BOE EURO TRADE WEIGHTED INDEX	Bank of England	5
EM EFFECTIVE EXCH.RATE: BROAD GROUP(38 PARTNERS) - REAL CPI	ECB - European Central Bank	5
MONEY SUPPLY: M1 - ITALIAN CONTRIBUTION TO THE EURO AREA	Bank of Italy	5
MONEY SUPPLY: M2 - ITALIAN CONTRIBUTION TO THE EURO AREA	Bank of Italy	5
MONEY SUPPLY: M3 - ITALIAN CONTRIBUTION TO THE EURO AREA	Bank of Italy	5
DISCOUNT RATE / SHORT TERM EURO REPO RATE	ECB - European Central Bank	1
INTERBANK DEPOSRATE-AVERAGE ON 3-MONTHS DEPOSITS	Bank of Italy	1
GOVERNMENT BOND GROSS YIELD (RENDISTATO)	Bank of Italy	1
MILAN COMGENERAL SHARE PRICE INDEX	Borsa Italiana	5

7.6 Japan

Figure 18:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
LEADING DIFFUSION INDEX	Cabinet Office, Japan	2
COINCIDENT DIFFUSION INDEX	Cabinet Office, Japan	2
GOLD AND FOREIGN EXCHANGE RESERVES	Ministry of Finance, Japan	5
JAPANESE YEN EFFECTIVE EXCHANGE RATE INDEX	Bank of England	5
MOTOR VEHICLE NEW REGISTRATIONS: PASSENGER CARS EXCL.BELOW 66	Japan Automobile Dealers Association	5
RETAIL SALES	METI - Ministry of Economy, Trade and Industry, Japan	5
MONTHLY WORKERS SAVINGS & INSURANCE RATE	Ministry of Internal Affairs and Communications, Japan	2
LABOUR FORCE PARTICIPATION RATE	Ministry of Internal Affairs and Communications, Japan	1
EMPLOYED PERSONS	Ministry of Internal Affairs and Communications, Japan	5
EMPD PERS. - NON AGL. INDS.	Ministry of Internal Affairs and Communications, Japan	5
UNEMPLOYMENT LEVEL	Ministry of Internal Affairs and Communications, Japan	5
UNEMPD SEEKING EMPL	Ministry of Internal Affairs and Communications, Japan	5
UNEMPLOYMENT RATE	Ministry of Internal Affairs and Communications, Japan	1
UNEMPLOYMENT RATE	Ministry of Internal Affairs and Communications, Japan	1
UNFILLED VACANCIES: NEW JOB OFFERS	Ministry of Health, Labour and Welfare, Japan	5
RATIO OF EFFECTIVE JOB OFFERS PER ONE APPLICANT	The Japan Institute for Labour Policy and Training	5
AVERAGE MONTHLY CASH EARN. - MANUFACTURING	Ministry of Health, Labour and Welfare, Japan	5
WAGE INDEX: CASH EARNINGS - MANUFACTURING	Ministry of Health, Labour and Welfare, Japan	5
WAGE INDEX: CASH EARNINGS - ALL INDUSTRIES	Ministry of Health, Labour and Welfare, Japan	5
WAGE INDEX: CONTRACT CASH EARN-MFG.	Ministry of Health, Labour and Welfare, Japan	5
OPERATING RATIO - MANUFACTURING	METI - Ministry of Economy, Trade and Industry, Japan	5
INDUSTRIAL PRODUCTION - MINING & MANUFACTURING	METI - Ministry of Economy, Trade and Industry, Japan	5
INDUSTRIAL PRODUCTION - MANUFACTURING	METI - Ministry of Economy, Trade and Industry, Japan	5
MACHINERY ORDERS	Cabinet Office, Japan	5
NEW HOUSING CONSTRUCTION STARTED	Ministry of Land, Infrastructure, Transport and Tourism, Japan	5
CPI: NATIONAL MEASURE	Thomson Reuters/Statistics Bureau, Ministry of Internal Affairs & Communication, Japan	5
CPI: TOKYO-ALL ITEMS LESS FOOD(LESS ALCOHOL BEV)& ENERGY	Ministry of Internal Affairs and Communications, Japan	5
CPI: NATIONAL MEASURE - ANNUAL INFLATION RATE	Thomson Reuters/Statistics Bureau, Ministry of Internal Affairs & Communication, Japan	1
CPI (%YOY)	National Sources	1
EXPORT PRICE INDEX - ALL COMMODITIES	Bank of Japan	5
IMPORT PRICE INDEX - ALL COMMODITIES	Bank of Japan	5
TERMS OF TRADE INDEX	Bank of Japan	5
PRODUCER PRICE INDEX	Bank of Japan	5
TERTIARY INDUSTRY ACTIVITY INDEX	METI - Ministry of Economy, Trade and Industry, Japan	5
TERTIARY INDUSTRY ACTIVITY INDEX	METI - Ministry of Economy, Trade and Industry, Japan	5
ALL INDS. ACTIVITY INDEX	METI - Ministry of Economy, Trade and Industry, Japan	5
ALL INDS. ACTIVITY INDEX	METI - Ministry of Economy, Trade and Industry, Japan	5
WORKERS HOUSEHOLD LIVING EXPENDITURE	Ministry of Internal Affairs and Communications, Japan	5
EXPORTS	Ministry of Finance, Japan	5
IMPORTS	Ministry of Finance, Japan	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
JAPANESE YEN TO US $	Bank of England	5
MONEY SUPPLY: M0 - CASH CIRCL	Bank of Japan	5
MONEY SUPPLY: M1	Bank of Japan	5
MONEY SUPPLY: M2	Bank of Japan	5
MONEY SUPPLY: M2	Bank of Japan	5
MONEY SUPPLY: M4 BROAD LIQUIDITY	Bank of Japan	5
MONEY SUPPLY: L	Bank of Japan	5
BANK OF JAPAN MAIN POLICY RATE	Bank of Japan	1
BASIC DISCOUNT & LOAN RATE	Bank of Japan	1
PRIME RATE - LONG TERM	Bank of Japan	1
INTEREST-BEARING GOVERNMENT BONDS - 10-YEAR	Thomson Reuters	1
TOKYO STOCK EXCHANGE - TOPIX	Reuters	5
BUSINESS FAILURES	Tokyo Shoko Research, Ltd.	5

7.7 Spain

Figure 19:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
COMPOSITE LEADING INDICATOR - TREND RESTORED	Main Economic Indicators,copyright OECD	5
BOP: CURRENT ACCOUNT BALANCE	Banco de Espana	1
BOP: CAPITAL & FINANCIAL ACCOUNT BALANCE	Banco de Espana	1
EXPORTS	Banco de Espana	5
IMPORTS	Banco de Espana	5
VISIBLE TRADE BALANCE	Banco de Espana	1
EM BOE EURO TRADE WEIGHTED INDEX	Bank of England	5
REGISTRATIONS: PASSENGER CAR	Ministry of the Economy and Finance, Spain	5
RETAIL SALEXCLUDING SERVICE STATION	INE - National Statistics Institute, Spain	5
RETAIL SALEXCLUDING SERVICE STATION - DEFLATED	INE - National Statistics Institute, Spain	5
UNEMPLOYMENT: REGISTERED	Ministry of the Economy and Finance, Spain	5
UNEMPLOYMENT RATE: REGISTERED	Ministry of the Economy and Finance, Spain	1
JOB VACANCI$METHODOLOGY	INEM - Instituto de Empleo, Servicio Publico de Empleo Estatal, Spain	5
ECONOMIC SENTIMENT INDICATOR	Ministry of Industry, Tourism and Trade, Spain	1
INDUSTRIAL PRODUCTION	INE - National Statistics Institute, Spain	5
INDUSTRIAL PRODUCTION - MANUFACTURING INDUSTRY	INE - National Statistics Institute, Spain	5
HOUSCONSTRUCTION COMMENCED	Ministry of Housing, Spain	5
CPI	INE - National Statistics Institute, Spain	5
CPI - HARMONISED EUROPEAN UNION BASIS	INE - National Statistics Institute, Spain	5
EXPORT UNIT VALUE INDEX	Ministry of the Economy and Finance, Spain	5
IMPORT UNIT VALUE INDEX	Ministry of the Economy and Finance, Spain	5
TERMS OF TRADE	Ministry of the Economy and Finance, Spain	5
PPI	INE - National Statistics Institute, Spain	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
OFFICIAL RESERVE ASSETS	Banco de Espana	5
SPANISH PESETAS TO US $	Bank of England	5
US $ TO 1 EURO	Bank of England	5
EM EFFECTIVE EXCH.RATE - REAL CPI	ECB - European Central Bank	5
DISCOUNT RATE/SHORT TERM EURO REPO RATE	ECB - European Central Bank	1
CENTRAL GOVERNMENT BOND - 10-YEAR YIELD	Banco de Espana	1
MADRID S.E - GENERAL INDEX	Ministry of the Economy and Finance, Spain	5
LOANS TO RESIDENTS BY MFI	Banco de Espana	5

7.8 Sweden

Figure 20:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
COMPOSITE LEADING INDICATOR - TREND RESTORED	Main Economic Indicators,copyright OECD	5
EXPORTS TRND	SCB - Statistics Sweden	5
IMPORTS TRND	SCB - Statistics Sweden	5
VISIBLE TRADE BALANCE TRND	SCB - Statistics Sweden	2
CENTRAL GOVERNMENT BUDGET - BALANCE	The Swedish National Financial Management Authority	2
CONSUMER SURVEY: CONSUMER CONFIDENCE INDICATOR	NIER - National Institute of Economic Research, Sweden	2
NEW MOTOR VEHICHLE REGISTRATION - PASSENGER CARS	SCB - Statistics Sweden	5
RETAIL SALES EXCL.MOTOR VEHICLES & REPAIR SHOPS	SCB - Statistics Sweden	5
RETAIL SALES EXCL. MOTOR VEHICLES & REPAIR SHOPS	SCB - Statistics Sweden	5
POPULATION	SCB - Statistics Sweden	5
JOB VACANCIES	Swedish Public Employment Service	2
NEW ORDERS - MINING, QUAR & MANUFACTURING	SCB - Statistics Sweden	5
CPI	SCB - Statistics Sweden	5
CPI: SPECIAL INDEXES,UNDERLYING INFLATION CPIF	SCB - Statistics Sweden	5
OFFICIAL RATE OF INFLATION	SCB - Statistics Sweden	2
EXPORT PRICE INDEX	SCB - Statistics Sweden	5
IMPORT PRICE INDEX	SCB - Statistics Sweden	5
TERMS OF TRADE	SCB - Statistics Sweden	5
PPI	SCB - Statistics Sweden	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
BANK OF SWEDEN: ASSETS - GOLD & FOREIGN EXCHANGE RESERVE	Sveriges Riksbank	5
SWEDISH KRONOR TO US $	Sveriges Riksbank	5
SWEDISH KRONA TRADE WEIGHTED INDEX	Bank of England	5
SWEDISH KRONA TRADE WEIGHTED INDEX	Sveriges Riksbank	5
MONEY SUPPLY - M0	SCB - Statistics Sweden/Sveriges Riksbank	5
MONEY SUPPLY - M3	SCB - Statistics Sweden/Sveriges Riksbank	5
REPO RATE	Sveriges Riksbank	2
DISCOUNT RATE - OFFICIAL	Sveriges Riksbank	2
TREASURY BILL RATE - 3 MONTH	Sveriges Riksbank	2
INTERBANK MONEY RATE: 3 MONTHS	Sveriges Riksbank	2
GOVERNMENT BOND YIELD - 10 YEAR MATURITIES	Sveriges Riksbank	2
BANKRUPTCIES - ENTERPRISES	SCB - Statistics Sweden	5

7.9 Netherlands

Figure 21:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
COMPOSITE LEADING INDICATOR - TREND RESTORED	Main Economic Indicators,copyright OECD	5
EXPORTS - FOB	CBS - Statistics Netherlands	5
IMPORTS - CIF	CBS - Statistics Netherlands	5
VISIBLE TRADE BALANCE	CBS - Statistics Netherlands	5
CBS CONSUMER CONFIDENCE SURVEY: INDEX	CBS - Statistics Netherlands	2
PERSONAL SAVINGS	CBS - Statistics Netherlands	2
HOURLY WAGE RATES	CBS - Statistics Netherlands	5
HOURLY WAGE RATES - MANUFACTURING	CBS - Statistics Netherlands	5
CBS MFG. SVY.: PRODUCER CONFIDENCE INDEX	CBS - Statistics Netherlands	2
INDUSTRIAL PRODUCTION EXCLUDING CONSTRUCTION	CBS - Statistics Netherlands	5
INDUSTRIAL PRODUCTION - MANUFACTURING	CBS - Statistics Netherlands	5
CPI	CBS - Statistics Netherlands	5
CPI - ALL ITEMS	CBS - Statistics Netherlands	5
CPI CORE-ALL ITEMS EXCL.ENERGY,FOOD, ALCOHOL AND TOBACCO	CBS - Statistics Netherlands	5
EXPORT UNIT VALUE INDEX	CBS - Statistics Netherlands	5
IMPORT UNIT VALUE INDEX	CBS - Statistics Netherlands	5
TERMS OF TRADE	CBS - Statistics Netherlands	5
RETAIL SALES VALUE INDEX (%YOY)	Thomson Reuters	2
NEW PASSENGER CAR REGISTRATIONS	ACEA - European Automobile Manufacturers' Association	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
NETHERLANDS GULDEN TO US$	Bank of England	5
US $ TO 1 EURO(NETHERLANDS GUILDER DERIVED HISTORY PRIOR 1999	Bank of England	5
EM BOE EURO TRADE WEIGHTED INDEX	Bank of England	5
EM EFFECTIVE EXCH.RATE: BROAD GROUP - REAL CPI	ECB - European Central Bank	5
CURRENCY IN CIRCULATION	DNB - De Nederlandsche Bank	5
MONEY SUPPLY - M1	DNB - De Nederlandsche Bank	5
MONEY SUPPLY - M2	DNB - De Nederlandsche Bank	5
MONEY SUPPLY - M3	DNB - De Nederlandsche Bank	5
CREDIT ADVANCES / SHORT TERM EURO REPO RATE	ECB - European Central Bank	1
INTERBANK THREE MONTH: OFFERED RATE	DNB - De Nederlandsche Bank	1
YIELD LATEST 10-YEAR CENTRAL GOVERNMENT BONDS	DNB - De Nederlandsche Bank	1
AMSTERDAM SE ALL SHARE STOCK PRICE INDEX	CBS - Statistics Netherlands	5

7.10 Canada

Figure 22:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
GDP - ALL INDUSTRIES	CANSIM - Statistics Canada	5
GDP - INDUSTRIAL PRODUCTION	CANSIM - Statistics Canada	5
GDP - MANUFACTURING	CANSIM - Statistics Canada	5
EXPORTS (BOP)	CANSIM - Statistics Canada	5
IMPORTS (BOP)	CANSIM - Statistics Canada	5
VISIBLE TRADE BALANCE	CANSIM - Statistics Canada	2
OFFICIAL INTERNATIONAL RESERVES:TOTAL	Department of Finance Canada	5
FEDERAL GOVERNMENT BUDGETARY SURPLUS OR DEFICIT	Department of Finance Canada	2
RETAIL SALES: TOTAL	CANSIM - Statistics Canada	5
RETAIL SALES: TOTAL EXCL. MOTOR VEHICLE & PARTS DEALERS	CANSIM - Statistics Canada	5
EMPLOYMENT - CANADA	CANSIM - Statistics Canada	5
FULL-TIME EMPLOYMENT	CANSIM - Statistics Canada	5
EMPLOYMENT- INDUSTRIAL AGGREGATE INCL. UNCLASSIFIED	CANSIM - Statistics Canada	5
UNEMPLOYMENT	CANSIM - Statistics Canada	5
UNEMPLOYMENT RATE	CANSIM - Statistics Canada	1
AVG.HOURLY EARN- INDUSTRIAL AGGREGATE EXCL. UNCLASSIFIED	CANSIM - Statistics Canada	5
AVG.WEEKLY EARN- INDUSTRIAL AGG. EXCL. UNCLASSIFIED	CANSIM - Statistics Canada	5
AVERAGE HOURLY EARNINGS - MANUFACTURING	CANSIM - Statistics Canada	5
HOUSING STARTS	CMHC - Canada Mortgage and Housing Corporation	5
BUILDING PERMITS: TOTAL	CANSIM - Statistics Canada	5
NEW HOUSING PRICE INDEX	CANSIM - Statistics Canada	5
NEW ORDERS: ALL MANUFACTURING INDUSTRIES	CANSIM - Statistics Canada	5
NEW ORDERS:DURABLE GOODS INDUSTRIES	CANSIM - Statistics Canada	5
MANUFACTURING SHIPMENTS	CANSIM - Statistics Canada	5
INVENTORY OWNED:ALL MANUFACTURING INDUSTRIES	CANSIM - Statistics Canada	5
INVENTORY OWNED/SHIPMENTS RATIO:ALL MFG.INDS.	CANSIM - Statistics Canada	1
UNFILLED ORDERS:ALL MANUFACTURING INDUSTRIES	CANSIM - Statistics Canada	5
WHOLESALE TRADE SALES: TOTAL	CANSIM - Statistics Canada	5
WHOLESALE TRADE INVTRY: TOTAL	CANSIM - Statistics Canada	5
CPI	CANSIM - Statistics Canada	5
CPI (%YOY)	CANSIM - Statistics Canada	1
CPI LESS 8 TILE COMPONENTS & EFFECT OF INDIRECT TAXES	CANSIM - Statistics Canada	5
EXPORT UNIT VALUE PRICE INDEX	CANSIM - Statistics Canada	5
IMPORT UNIT VALUE PRICE INDEX	CANSIM - Statistics Canada	5
TERMS OF TRADE	Thomson Reuters	5
RAW MATERIALS PRICE INDEX:TOTAL	CANSIM - Statistics Canada	5
INDUSTRIAL PRODUCT PRICE INDEX (IPPI)	CANSIM - Statistics Canada	5
FINANCIAL DATA		
Name	**Source**	**Transformation**
MONETARY BASE	CANSIM - Statistics Canada	5
MONEY SUPPLY M1 PLUS GROSS.	Bank of Canada	5
MONEY SUPPLY M2	CANSIM - Statistics Canada	5
MONEY SUPPLY M3	CANSIM - Statistics Canada	5
TARGET RATE	CANSIM - Statistics Canada	1
OVERNIGHT MONEY MARKET FINANCING RATE	CANSIM - Statistics Canada	1
INTEREST RATE: 3 MONTH TREASURY BILLS	CANSIM - Statistics Canada	1
CHARTERED BANKS PRIME RATE	Bank of Canada	1
GOVERNMENT BOND YIELD - OVER 10 YEARS	CANSIM - Statistics Canada	1
TORONTO STOCK EXCHANGE COMPOSITE SHARE PRICE INDEX	Reuters	5
SECURITIES BOUGHT BY NON-RESIDENTS:TOTAL	CANSIM - Statistics Canada	2
CONSUMER CREDIT:TOTAL	CANSIM - Statistics Canada	5
CHARTERED BANKS: CN$ BUSINESS LOANS	CANSIM - Statistics Canada	5
TOTAL BUSINESS CREDIT	CANSIM - Statistics Canada	5
CHARTERED BANKS: CN$ BUSINESS LOANS (SHORT-TERM)	CANSIM - Statistics Canada	5

7.11 Switzerland

Figure 23:

MACROECONOMIC DATA		
Name	**Source**	**Transformation**
COMPOSITE LEADING INDICATOR - TREND RESTORED	Main Economic Indicators,copyright OECD	5
EXPORTS FOB	FCA - Federal Customs Administration, Switzerland	5
IMPORTS CIF	FCA - Federal Customs Administration, Switzerland	5
VISIBLE TRADE BALANCE	FCA - Federal Customs Administration, Switzerland	2
CAR REGISTRATIONS - NEW	FSO - Federal Statistical Office, Switzerland	5
UNEMPLOYMENT - REGISTERED	KOF - Swiss Economic Institute	5
UNEMPLOYMENT RATE	SECO - State Secretariat for Economic Affairs, Switzerland	2
JOB VACANCIES - UNFILLED	SECO - State Secretariat for Economic Affairs, Switzerland	5
KOF INDUSTRY SURVEY: BUSINESS CLIMATE	KOF - Swiss Economic Institute	2
CPI	KOF - Swiss Economic Institute	5
ANNUAL INFLATION RATE	FSO - Federal Statistical Office, Switzerland	1
IMPORT PRICE INDEX	KOF - Swiss Economic Institute	5
TERMS OF TRADE	KOF - Swiss Economic Institute	5
PPI	KOF - Swiss Economic Institute	5
INDUSTRIAL PRODUCTION (%YOY)	IMF - International Financial Statistics	1
FINANCIAL DATA		
Name	**Source**	**Transformation**
SWISS FRANCS TO USD	SNB - Swiss National Bank	5
SWISS FRANC REAL EFFECTIVE EXCHANGE RATE	SNB - Swiss National Bank	5
MONEY SUPPLY: M1	SNB - Swiss National Bank	5
MONEY SUPPLY: M2	SNB - Swiss National Bank	5
MONEY SUPPLY: M3	SNB - Swiss National Bank	5
MONEY SUPPLY: CENTRAL BANK MONEY	SNB - Swiss National Bank	5
THREE MONTH INTERBANK RATE: BID RATE	SNB - Swiss National Bank	1
CONFEDERATION BOND YIELD - 10 YEARS	SNB - Swiss National Bank	1
SPI SHARE PRICE INDEX	SNB - Swiss National Bank	5
BANK LOANS GRANTED	SNB - Swiss National Bank	5

8 Online Appendix II - Data Sources for VAR models

		Short-Term Rate	CPI	Employment	Investment	Consumption	GDP	Credit
USA	*Variable*	Effective Federal Funds Rate	Consumer Price Index for All Urban Consumers: All Items	Nonfarm Business Sector: Hours of All Persons	Gross Private Domestic Investment	Personal Consumption Expenditures	Real Gross Domestic Product	Moody's Seasoned Baa Corporate Bond Yield Relative to Yield on 10-Year
	Source	*Board of Governors of the Federal Reserve System (US)*	*U.S. Bureau of Labor Statistics*	*U.S. Bureau of Labor Statistics*	*U.S. Bureau of Economic Analysis*	*U.S. Bureau of Economic Analysis*	*U.S. Bureau of Economic Analysis*	*Federal Reserve Bank of St. Louis*
Japan	*Variable*	BANK OF JAPAN MAIN POLICY RATE	Consumer Price Index, National Measure, Index, 2015 =100	Employment, Overall, Total, SA	Ministry of Internal Affairs & Communication, Japan	Final Consumption Expenditure, Private, Total, Constant Prices, AR, SA, Japanese Yen, 2011 Chained Prices	Gross Domestic Product, Total, Constant Prices, AR, SA, Japanese Yen, 2011 Chained Prices	Prime Rate - Long Term less Bank rate
	Source	*BANK OF JAPAN*	*Thomson Reuters/Statistics Bureau, Ministry of Internal Affairs & Communication, Japan*	*Ministry of Internal Affairs & Communication, Japan*	*Cabinet Office, Japan*	*Cabinet Office, Japan*	*Cabinet Office, Japan*	*BANK OF JAPAN*
Germany	*Variable*	Discount Rate / Short Term Euro Repo Rate	Consumer Prices, All Items, Total, Index, 2015 =100	Employment, Overall, Number in Work, Living in Germany, SA	Gross Capital Formation, Fixed, Total, Current Prices, Calendar Adjusted, SA	Final Consumption Expenditure, Private, Total, Constant Prices, Calendar Adjusted, SA	Gross Domestic Product, Constant Prices, Calendar Adjusted, SA	Corporate Bond Rate less 3m FIBOR
	Source	*ECB*	*Federal Statistical Office*	*Bundesagentur fur Arbeit*	*Deutsche Bundesbank*	*Federal Statistical Office*	*Federal Statistical Office*	*EBF - European Banking Federation/ACI - The Financial Markets Association and Deutsche Bundesbank*
Italy	*Variable*	DISCOUNT RATE / SHORT TERM EURO REPO RATE	CPI INCLUDING TOBACCO - NIC (LINKED & REBASED)	Employment (Thousands)	GFCF - 2010 Chained prices	FINAL DOMESTIC CONSUMPTION: HOUSEHOLDS & NPISH	GDP - 2010 Chained prices	Lending Rates, New Loans, Non-Fin Corporation, ex Bank Overdrafts, Euro 1 M less discount rate
	Source	*ECB*	*Istat - National Institute of Statistics, Italy*	*Istat - National Institute of Statistics, Italy*	*Istat - National Institute of Statistics, Italy*	*Istat - National Institute of Statistics, Italy*	*Istat - National Institute of Statistics, Italy*	*Bank of Italy*
UK	*Variable*	Bank Rate	CPI All Items - SA	Hours worked	Real Business Investment -CVM SA	Household Final Consumption Expenditure - CVM SA	Gross Domestic Product: chained volume measures: Seasonally adjusted £m	Aggregate measure of credit spreads from households, Corporate sector
	Source	*Bank of England*	*Office for National Statistics, Authors calculations*	*Office for National Statistics*	*Office for National Statistics*	*Office for National Statistics*	*Office for National Statistics*	*Bank of England*

		Short-Term Rate	CPI	Employment	Investment	Consumption	GDP	Credit
France	*Variable*	Policy Rate	All Items, Total, Total, Consumer Price Index All Items, Index, 2015 = 100	Employment, Thousands Persons, SA	Gross Fixed Capital Formation, SA, Index, 2015 = 100	Private Final Consumption Expenditure, Private Final Consumption Expenditure, SA, Index, 2015 = 100	Private Final Consumption Expenditure, Private Final Consumption Expenditure, SA, Index, 2015 = 100	Capital Market Yields - Bond Yield, Private Sector less Policy Rate
	Source	*Fathom Consulting*	*OECD*	*INSEE - National Institute for Statistics and Economic Studies, France*	*OECD*	*OECD*	*OECD*	*Banque de France*
Canada	*Variable*	Canada, Policy Rates, Target Rate	Canada, Consumer Prices, All Items, SA, Index, 2002 = 100	Canada, Employment, Overall, Total, SA	Gross Capital Formation, Fixed, Total, Constant Prices, AR, SA, Canadian Dollar, 2012 Chained Prices	Final Consumption Expenditure, Private, Household, Constant Prices, AR, SA, Canadian Dollar, 2012 Chained Prices	Gross Domestic Product, at Market Prices, Constant Prices, AR, SA, Canadian Dollar, 2012 Chained Prices	Canada Prime less Bank Rate
	Source	*CANSIM - Statistics Canada*	*CANSIM - Statistics Canada*	*CANSIM - Statistics Canada*	*CANSIM - Statistics Canada*	*CANSIM - Statistics Canada*	*CANSIM - Statistics Canada*	*CIBC World Markets & CANSIM - Statistics Canada*
Spain	*Variable*	Policy Rate	Consumer Prices, by Commodity, All Items, Total, Index, 2016 = 100	Employment, Overall, Total	Gross Capital Formation, Fixed, Total, Constant Prices, Calendar Adjusted, SA, Index, 2010 = 100	Final Consumption Expenditure, Households, Total National, Constant Prices, Calendar Adjusted, SA, Index	Gross Domestic Product, Total, Constant Prices, Calendar Adjusted, SA, Index, 2010 = 100	Government Bonds, Central Government Bond - Long Term Less bank rate
	Source	*Fathom Consulting*	*INE - National Statistics Institute, Spain*	*INE - National Statistics Institute, Spain*	*INE - National Statistics Institute, Spain*	*INE - National Statistics Institute, Spain*	*INE - National Statistics Institute, Spain*	*Banco de Espana*
Sweden	*Variable*	Policy Rate	Consumer Prices, by Commodity, All Items, Total, Index, 1980 = 100	Hours Worked, Overall, Total, Calendar Adjusted, SA	Approach, Gross Capital Formation, Fixed, Overall, Total, Constant Prices, SA, SEK, 2017 Prices	Expenditure Approach, Final Consumption Expenditure, Households, Total, Constant Prices, SA	Expenditure Approach, Gross Domestic Product, Total at Market Prices, Constant Prices, Calendar	Personal Lending Rates, Banks, Outstanding Loan Rate, Non-Fin Corporations and Households, All
	Source	*Sveriges Riksbank*	SCB - Statistics Sweden	SCB - Statistics Sweden	SCB - Statistics Sweden	SCB - Statistics Sweden	SCB - Statistics Sweden	*SCB - Statistics Sweden/Sveriges Riksbank*
Switzerland	*Variable*	SWISS TARGET 3 MTH. LIBOR(AVG.,SNB)	Consumer Price Index, SA, Index, 2015M12 = 100	Employment, Overall, Employees	Gross Capital Formation, Fixed, Total, Constant Prices, Calendar Adjusted, SA, CHF, 2010 Chained Prices	Final Consumption Expenditure, Households and Non-Profit Institutions Serving Households, Total, Constant Prices, Calendar	Gross Domestic Product, Total, Constant Prices, Calendar Adjusted, SA, CHF, 2010 Chained Prices	SWISS CONFEDERATION BOND 10 YEAR less Bank Rate
	Source	*SNB - Swiss National Bank*	*KOF - Swiss Economic Institute*	*FSO - Federal Statistical Office, Switzerland*	*SECO - State Secretariat for Economic Affairs, Switzerland*	*SECO - State Secretariat for Economic Affairs, Switzerland*	*SECO - State Secretariat for Economic Affairs, Switzerland*	*KOF - Swiss Economic Institute*
Netherlands	*Variable*	Policy Rate	Consumer Prices, All Items, Index, 2015 = 100	Employment, SA	Gross Capital Formation, Fixed, Total, Constant Prices, Calendar Adjusted, SA, Euro, 2015 Chained Prices	Final Consumption Expenditure, Private, Total, Constant Prices, Calendar Adjusted, SA, Euro, 2015 Chained Prices	Gross Domestic Product, Total, Constant Prices, Calendar Adjusted, SA, Euro, 2015 Chained Prices	Interbank Rates, Euribor 3 Month, End of Period less Bank rate
	Source	*ECB*	*CBS - Statistics Netherlands*	*Quarterly National Accounts,copyright OECD*	*CBS - Statistics Netherlands*	*CBS - Statistics Netherlands*	*CBS - Statistics Netherlands*	*DNB - De Nederlandsche Bank*

9 Online Appendix III - Narrative Account of Close Elections

EconRILE Measure of Economic Policy Disagreement

The EconRILE measure is based on the popular RILE measure and simply adds and subtracts different code scores from the Manifesto Project Database data. The formula for the EconRILE using that database is:

$$(per401 + per402 + per407) \; - \; (per403 + per406 + per409 + per412 + per413 + per415 + per416)$$

These codes are fully explained in the database code book[19]. The first terms in brackets are the proportion of sentences expressing a positive view on: (1) Free markets, (2) Supply side interventions, (3) Anti-protectionism. These are taken to be pro-free market views. These are set against positive views for: (1) Market regulation, (2) Protectionism, (3) Keynesian demand management, (4) Direct control of the economy, (5) Nationalisation of industry, (6) Marxist policies, (7) Lower growth to promote equality or welfare (sustainability). To illustrate the index we plot the resultant index for the two leading parties in the USA. and the UK The index clearly recognises Republicans (Conservatives) as having more free market polices than the Democrats (labour). For the UK this gap was largest during the decade of Margaret Thatchers rule in the UK, which is widely acknowledged as a shift toward greater free market economic polices in the UK. For the USA the index shows an upward trend in free market polices across both parties but a significant gap between the extend of this endorsement of free markets.

Narrative around election events

In some cases, typically only available after 2000, polling data indicates high levels of ex-ante uncertainty for the elections outlined in table 3.

USA

For the USA, fivethirtyeight.com document that an average of national polls were around an absolute polling error in each of the election events selected[20]. Polling data for 2004 showed 2 large reversals with Bush leading until July, Kerry until august then Bush from September onwards with the gap narrowing to within 1% in the last few polls prior to the election event[21]. While Clinton lead Trump for the 6 months prior to the election in November 2016, the polls narrowed substantially in September and again in the 2 weeks prior to the event[22].

Germany

The 2005 German election saw Angela Merkel come to power with the CDU defeating the Schroders SPD which had lead the Bundestag since 1994. 5 months prior to the event CDU held a large lead in polls but this consistently narrowed to within 10% by the election in December 2005.

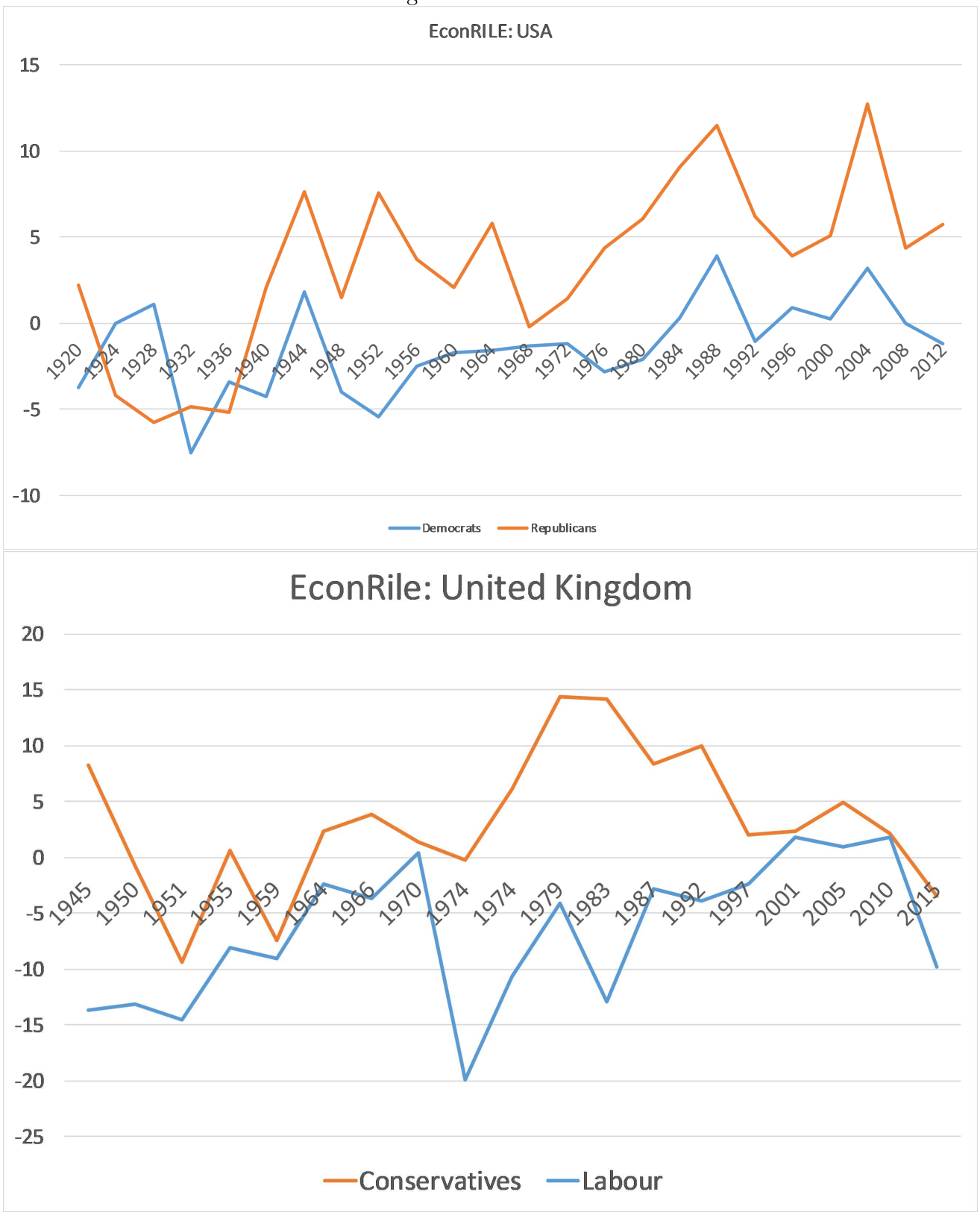
[19] See https://manifestoproject.wzb.eu/datasets

[20] https://fivethirtyeight.com/features/trump-is-just-a-normal-polling-error-behind-clinton/. The Bush-Gore election was the closest in US history with a winning margin of only 537 votes in the deciding state of Florida requiring a recount and triggering litigation in both federal and state courts. This uncertainty resolved in December 12 2000 when the Florida high court ruled in favour of Bush.

[21] https://uselectionatlas.org/USPRESIDENT/GENERAL/CAMPAIGN/2004/polls.php

[22] https://uselectionatlas.org/POLLS/PRESIDENT/2016/polls.php

Figure 24: EconRILE Index



Italy

Callegaro and Gasperoni (2005) show that polls tightened around 4 months prior to the 2006 election in Italy but then indicated a Prodi victory, however politicians on the right regularly challenged the accuracy of the poll data casting doubt creating a sense of greater competition. The 2013 race saw a tight contest in the polls over the year prior to the Bersani victory in February 2013, with some widening in favour of Bersani in the last two months prior to the event[23].

UK

See Redl (2017) for a full description of the events surrounding the UK elections. The 1992 election saw Margaret Thatcher lose a leadership battle for the conservative party to John Major, polls and exit polls predicted a hung parliament however the conservatives won a four term. The 2010 election resulted in a hung parliament with polls seeing a surge in support for a 3rd party, the Liberal Democrats who eventually became members of the coalition government with the conservatives under David Cameron. The 2015 election saw a large number of polls and professional forecasters expected a hang parliament and the need to form a coalition government[24]. The conservative party won a surprise, but slim, majority.

France

The 2007 French election saw a run-off between Sarkozy and Royal with Sarkozy leading in the but by less than 10% in April and May[25]. The same is true of the Hollande-Sarkozy 2nd round in 2012[26].

Canada

The Canadian election of 2004 saw Liberals re-elected under new Prime Minister Paul Martin to a minority government. They defeated the new Conservative Party, led by Stephen Harper, ex-leader of the Canadian Alliance, who merged that party with the Progressive Conservatives. Bloc Québécois experiences a revival due to a Liberal sponsorship scandal. Polls prior to the event were tight with 1-4% lead for eventual winners the Liberal party[27]. January 2006 saw an unusual winter general election, caused by a motion of no confidence passed by the House of Commons on November 28, 2005, with Canada's three opposition parties contending that the Liberal government of Prime Minister Paul Martin was corrupt. Polls reflected this uncertain environment with small liberal lead until December of around 5% then reversing in favour of Harper's conservatives through January [28].

Spain

The Spanish election of 1996 saw Jose Maria Aznar's People's party (PP) displace the incumbent Socialist Workers Party (PSOE) in an extremely close election result with polls tightening to near parity in the last week prior to the event. The election of 2008 saw close polling within PSOE leading PP but remaining within 10pp and high volatility and closing of the gap in the weeks prior to the event . Rajoy (PP) defeated Sanchez (PSOE) in December 2014 but with very few seats and an unprecedented number of seats going to a third party, Podemos. Polls show the rise of Pablo Iglesias' Podemos party which rose from obscurity in 2014 to leading the polls (albeit briefly) by November 2014. They also show the

[23]https://en.wikipedia.org/wiki/Opinion_polling_for_the_Italian_general_election,_2013

[24]For a summary of the pre-election poll results see https://en.wikipedia.org/wiki/Opinion_polling_for_the_2015_United_King
see http://electionforecast.co.uk/2015/index.html for an example of the election forecast predicting a hang parliament.

[25]https://en.wikipedia.org/wiki/French_presidential_election,_2007

[26]https://www.sondages-en-france.fr/sondages/Elections/Pr%C3%A9sidentielles%202012

[27]https://en.wikipedia.org/wiki/Opinion_polling_in_the_Canadian_federal_election,_2004

[28]https://en.wikipedia.org/wiki/Opinion_polling_in_the_Canadian_federal_election,_2006

late surge of Albert Riveria's Citizen's Party (C's) with a rise from around 2% in early 2014 to parity with PSOE near 20% in the polls by November 2015[29].

Sweden

Sweden's election in September 2006 saw the Goran Persson's Social Democrats lose power to a majority coalition led by the Moderates Fredrik Reinfeldt. This was achieved by Fredrik Reinfeldt by forming a governing coalition, the Alliance, with three other parties (Centre, Liberal Peoples and Christian Democrats). The Alliance contested the election against the Red-Green Bloc (Social Democrats, Left Party and Green Party). The Alliance remained very close to the Red Green Bloc in the year leading up to the election, within 5%. This ended the dominance of the Social Democrats in the Swedish parliament (Riksdag), a position which they have held since the 1930s. The same coalitions contested the September 2010 election with the Alliance losing its majority but retaining power. However, polls had the Red-Green coalition leading until the month prior to the election, this reversal coincided with violence at a Social Democrats election rally and tensions relating to the immigrant Muslim population.

Switzerland

Swiss elections are unusual in that all four major parties form a coalition therefore changes of government are difficult. Nonetheless the rise in anti-EU and anti-immigration parties is a noteworthy shift with the Swiss Peoples Party SVP becoming the largest party in 2003.

The Netherlands

The Dutch election of 2010 saw significant uncertainty in polls with a close competition between the top 3 parties until Mark Rutte's conservative liberal Peoples Party for Freedom and Democracy (VVD) rallied in the last week to take the largest share of votes [30]. However, it took 3 months toss form a working government with Rutte joining with Balkenede's Christian Democratic Appeal (CDA). Rutte again won the largest share votes but closely followed by Samsom's Labour Party (PvdA) as the latter had a very strong performance in opinion polls in the month prior to the election[31]. After 2 months a new government was formed between the CDA and the PvdA.

10 Online Appendix IV - Full Impulse Response Functions

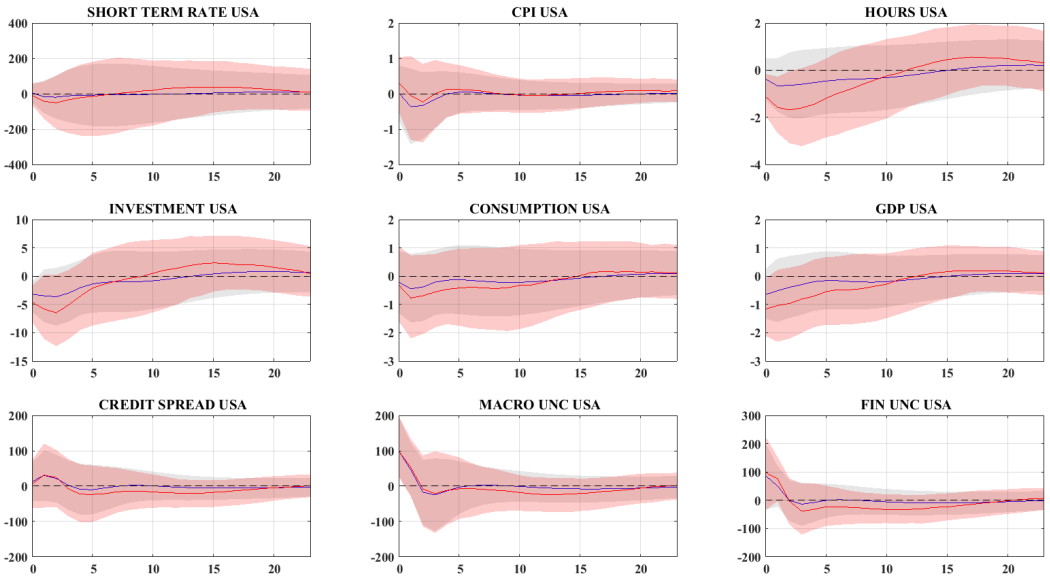
10.1 Two shock identification

Results below show the response of the individual countries to a macro uncertainty shock when the VAR includes a financial shock identified with narrative restrictions as outlined in the paper.

[29]Polling data for these elections can be found at:
https://en.wikipedia.org/wiki/Spanish_general_election,_1996#Opinion_polls
https://en.wikipedia.org/wiki/Spanish_general_election,_2008#Opinion_polls
https://en.wikipedia.org/wiki/Spanish_general_election,_2015#Opinion_polls
[30]https://en.wikipedia.org/wiki/Dutch_general_election,_2010
[31]https://en.wikipedia.org/wiki/Dutch_general_election,_2012

10.1.1 USA

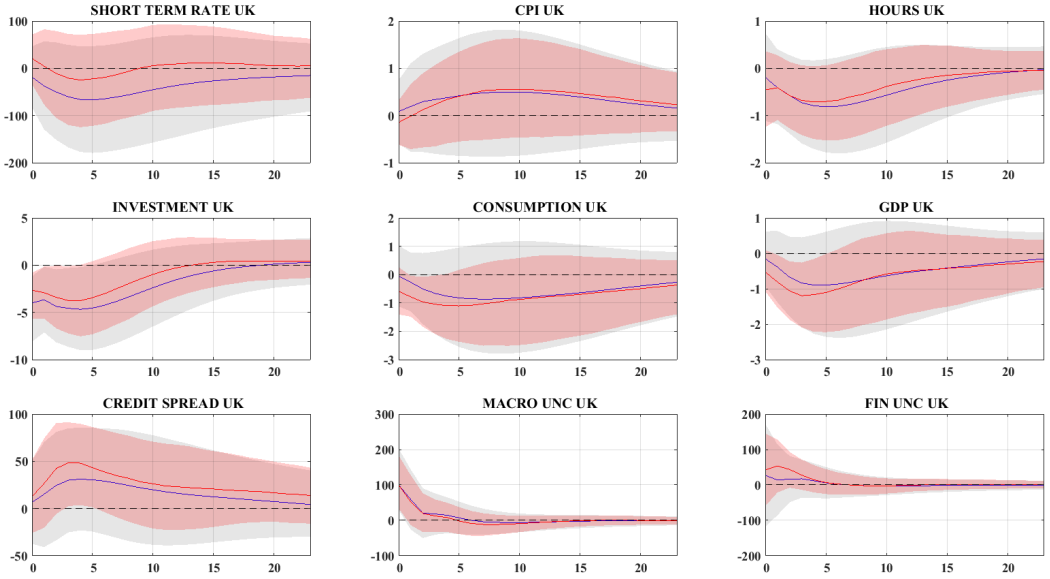
Figure 25:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.2 UK

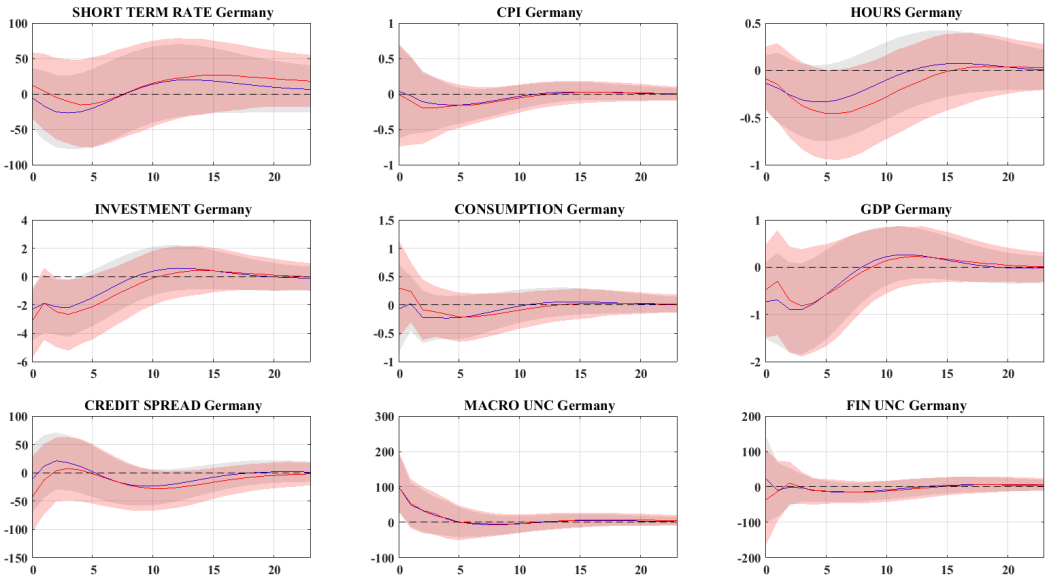
Figure 26:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.3 Germany

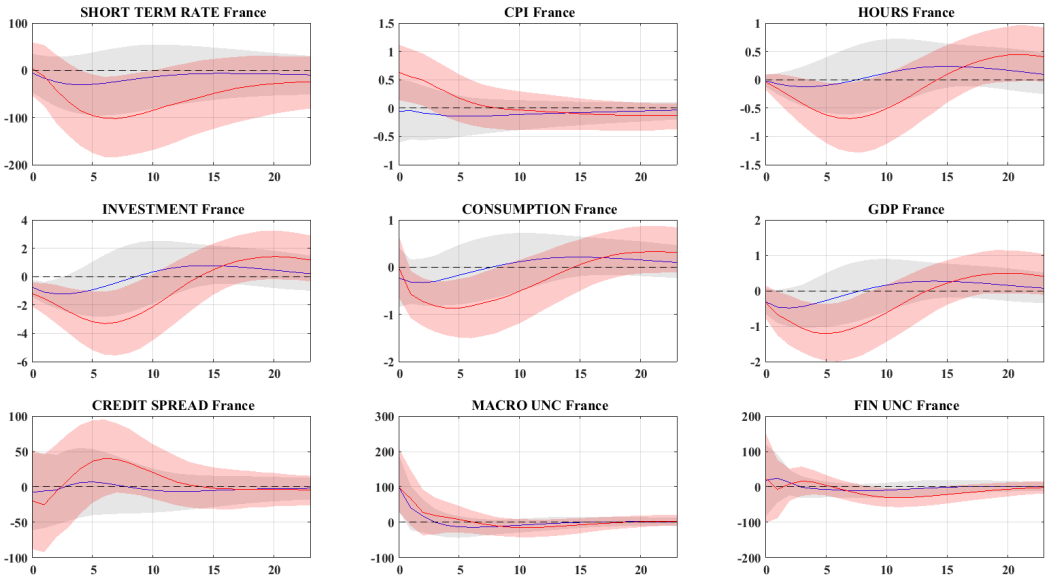
Figure 27:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.4 France

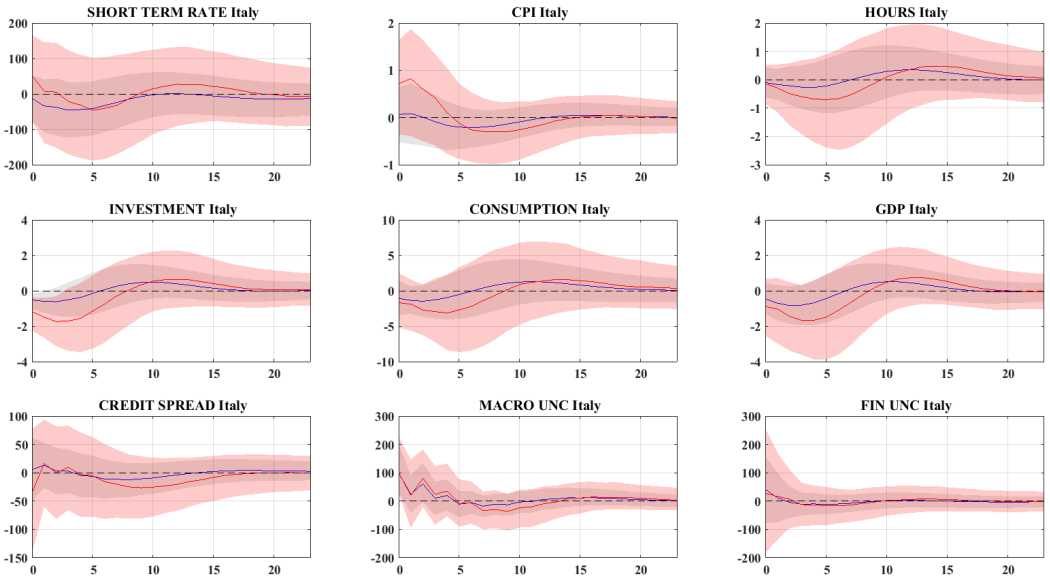
Figure 28:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.5 Italy

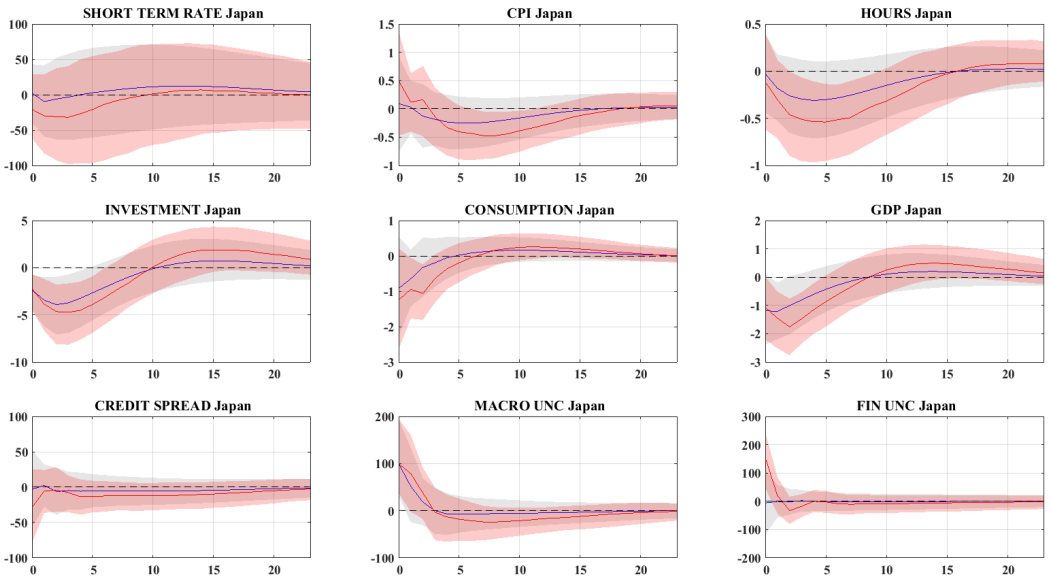
Figure 29:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.6 Japan

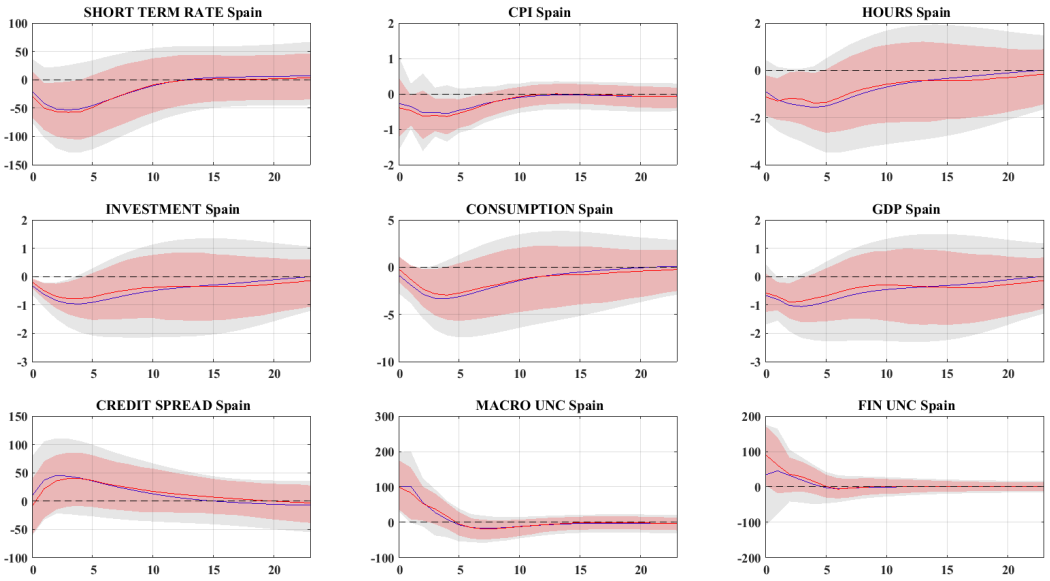
Figure 30:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.7 Spain

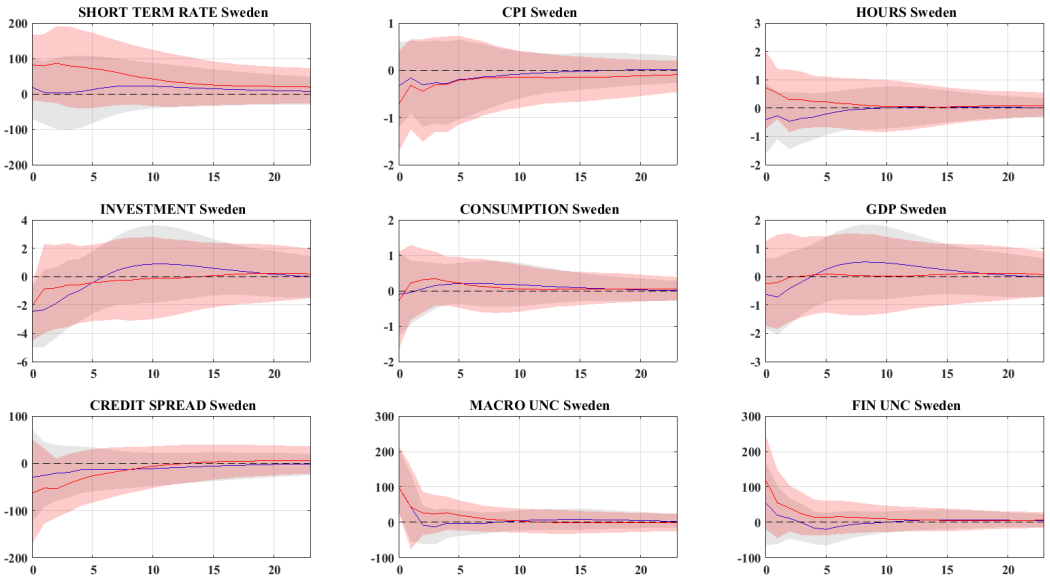
Figure 31:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.8 Sweden

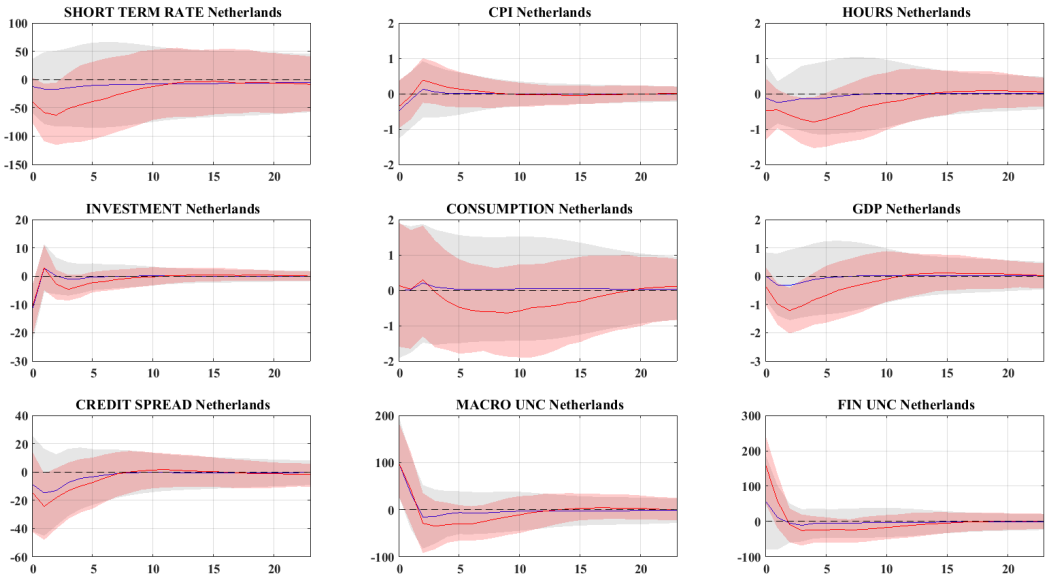
Figure 32:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.9 Netherlands

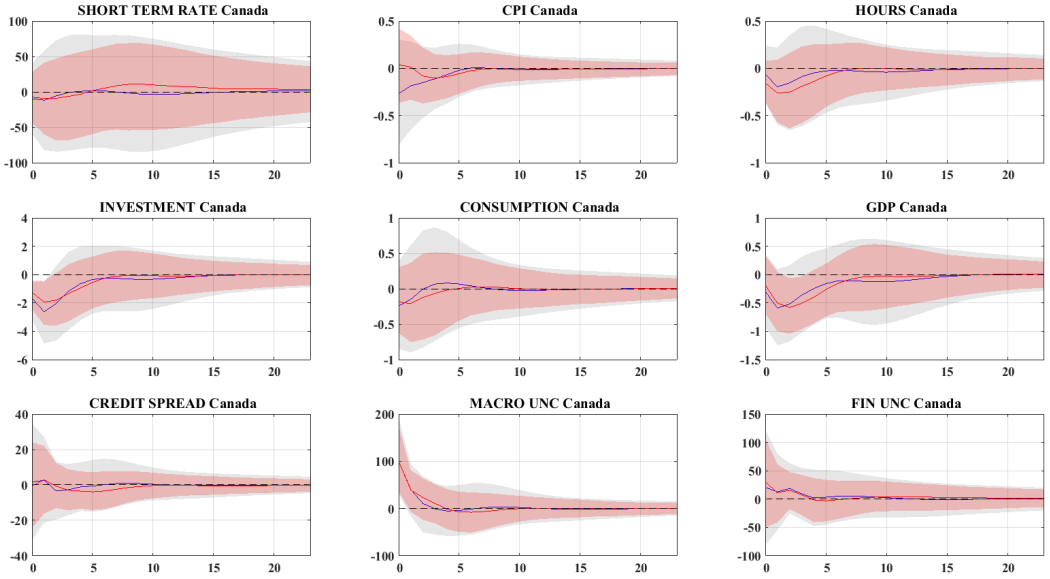
Figure 33:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.10 Canada

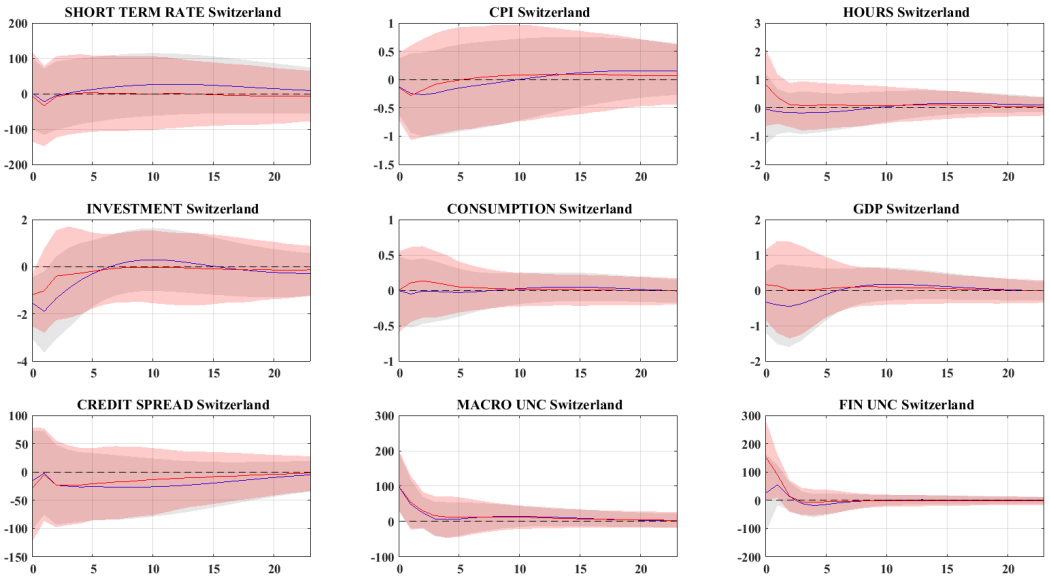
Figure 34:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

10.1.11 Switzerland

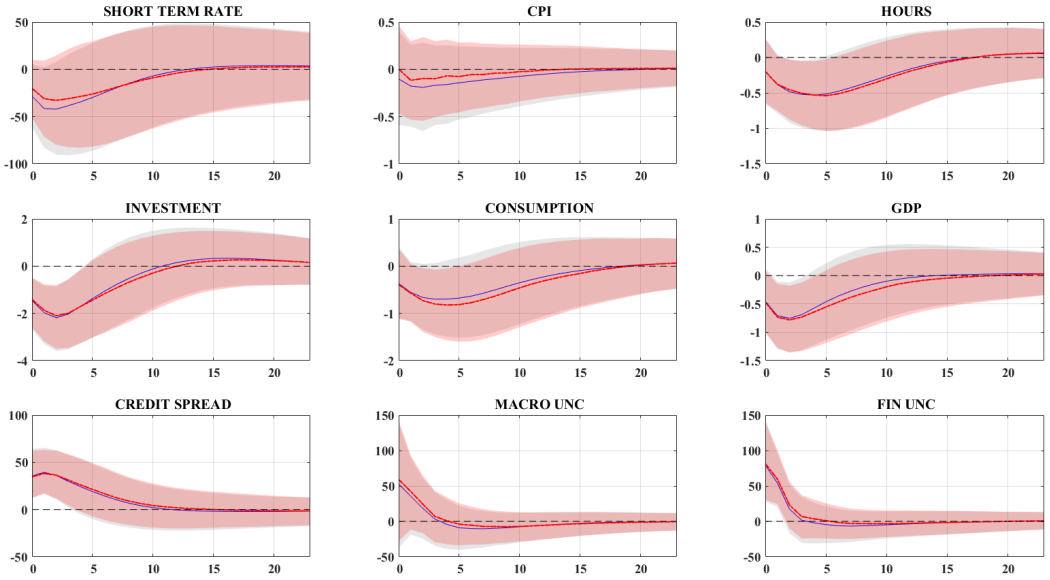
Figure 35:



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2).. Responses in red show the effect of adding narrative information.

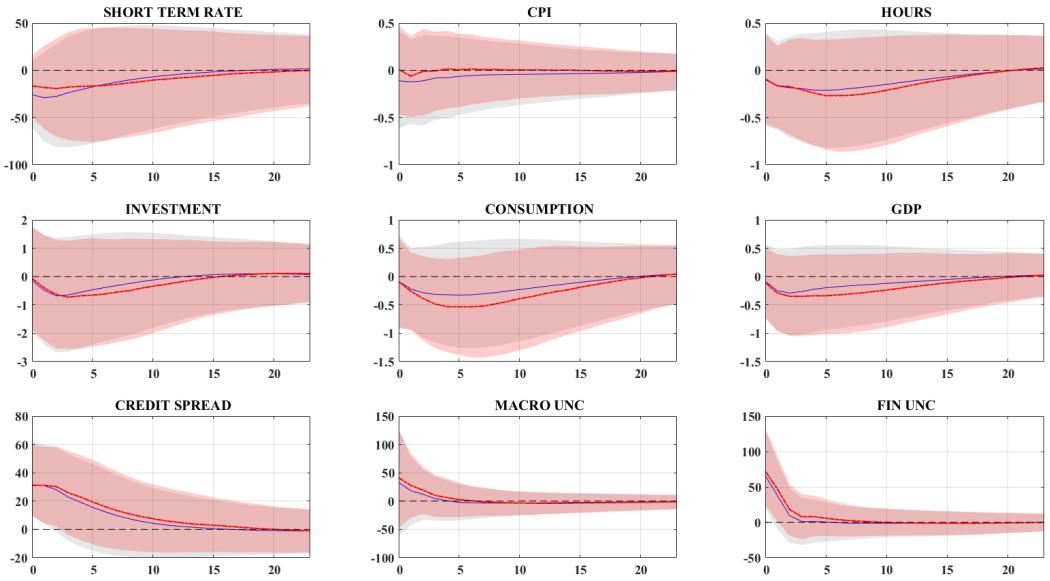
10.2 Financial Shock IRFs

Figure 36: Mean Group Estimates: Financial Shock in 2 Shock model



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2). Responses in red show the effect of adding narrative information.

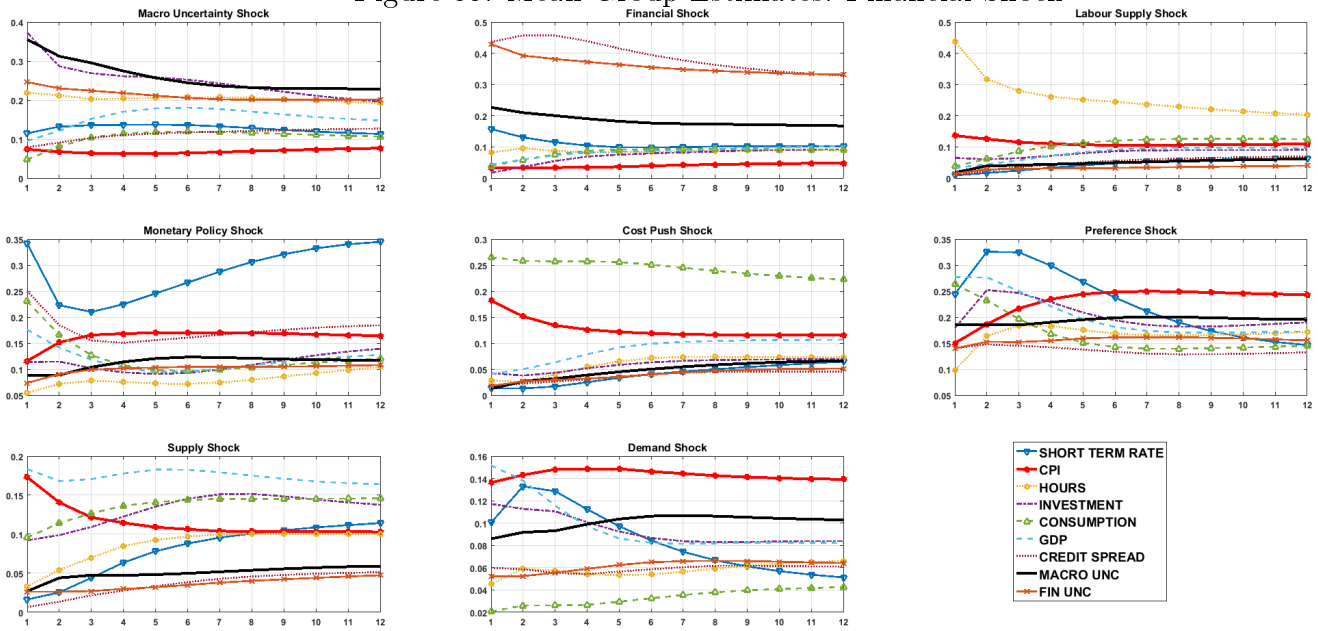
Figure 37: Mean Group Estimates: Financial Shock in 8 Shock model



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (2). Responses in red show the effect of adding narrative information.

10.3 Variance Decomposition from 8 shock model

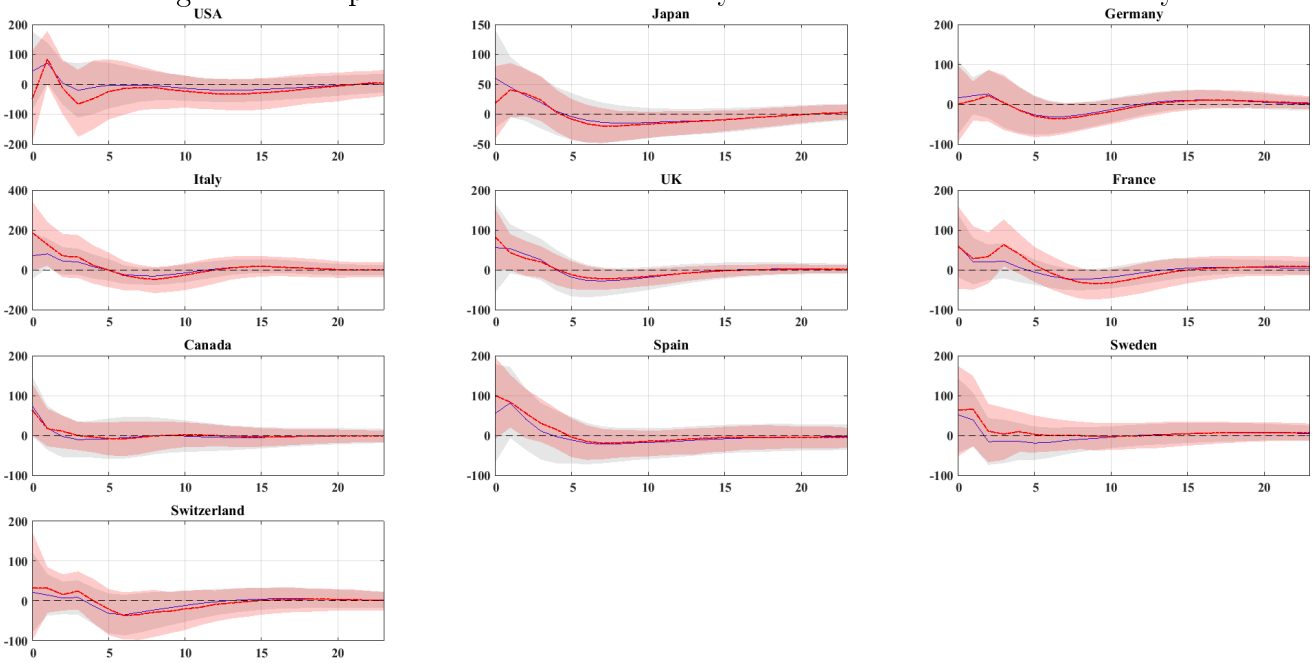
Figure 38: Mean Group Estimates: Financial Shock



Decomposition corresponds to model identified following sign restrictions in table (5) with narrative restrictions imposed for the macro and financial shocks.

10.4 Response of Global Uncertainty to Domestic Macro Uncertainty Shock

Figure 39: Response of Global Uncertainty to Domestic Macro Uncertainty Shock



Responses in blue (with 68% credible set in Grey) are results with standard sign restrictions given in table (6). Responses in red show the effect of adding narrative information.

11 Online Appendix V - Stochastic Volatility Filter

To ensure that only past information is used to estimate the time-varying volatility implied by the forecast errors in equation (2), we make a small modification to the stochastic volatility model of Jacquier et al. (1994). The forecast errors, y_t, are related to the latent time-varying volatilities, h_t, through the following non-linear state-space model:

$$y_t = \sqrt{h_t}\epsilon_t \tag{6}$$

$$\ln h_t = \ln h_{t-1} + v_t \tag{7}$$

Where $\epsilon_t \sim N(0,1)$ and $v_t = N(0,\sigma)$Equation (6) is the measurement equation and (7) is the state transition equation. The non-linear state-space makes the standard Kalman Filter infeasible. The approximate Kalman Filter, where the model non-linearities are ignored is known to be inaccurate, see for example, Kim et al. (1998). To estimate the latent state h_t we use a MCMC that samples from $p(h_t|h_{-t}, y_t)$ where h_{-t} refers to all other observations of h but h_t. Jacquier et al. (1994) noting the Markov structure of the above state-space note that $p(h_t|h_{-t}, y_t)$=$p(h_t|h_{t+1}, h_{t-1}, y_t)$. This is the case of the smoother. In the case where the problem is constrained to not be able to use future values in estimation, i.e. a filter, we can exploit the Markov structure to sample from $p(h_t|h_{-t}, y_t) = p(h_t|h_{t-1}, y_t)$. This can be broken down into:

$$p(h_t|h_{-t}, y_t) = p(h_t|h_{t-1}, y_t) = p(y_t|h_t)p(h_t|h_{t-1})$$

$$\propto h_t^{-1/2} \exp\left(\frac{-y_t^2}{2h_t}\right) h_t^{-1} \exp\left(\frac{-\left(\ln h_t - \ln h_{t-1}\right)^2}{2\sigma}\right)$$

The second line follows from the fact that y_t is conditionally normally distributed and h_t log-normally distributed. Thus we have a product of a normal and a log-normal distribution to sample from. Since the conditional sampling density for this is not known we use a accept/reject Metropolis-Hastings step. This step allows us to sample from a candidate distribution for which there is a known sampling method. As noted by the Jacquier et al. (1994), appropriate candidate density, q, is such that $p(x) \leq cq(x) \forall x$ and for which $p(x)/q(x)$ remains constant for the range of x where p has most of its density. Following Blake and Mumtaz (2012) we choose the log-normal density as the candidate density:

$$q(\Phi^{d+1}) = h_t^{-1} \exp\left(\frac{-\left(\ln h_t - \ln h_{t-1}\right)^2}{2\sigma}\right)$$

Where, d, refers to the draw in the MCMC sampler. We can use the known sampling properties of the log-normal density to sample from q. The target density is given by

$$\pi(\Phi^{d+1}) = h_t^{-1/2} \exp\left(\frac{-y_t^2}{2h_t}\right) h_t^{-1} \exp\left(\frac{-\left(\ln h_t - \ln h_{t-1}\right)^2}{2\sigma}\right)$$

A draw is accepted based on the acceptance probability $\alpha = \min\left(\frac{\pi(\Phi^{d+1})/q(\Phi^{d+1}|\Phi^d)}{\pi(\Phi^d)/q(\Phi^d|\Phi^{d+1})}, 1\right)$, see Blake and Mumtaz (2012). A draw is retained if $\alpha > u \sim U(0,1)$, otherwise we redraw. The algorithm makes a draw from q checks the acceptance criteria and repeats for 20 000 draws using the last 5000 draws to infer h_t. The random walk specification here is preferred as the filter will be more volatile than the smoothed estimates used in JLN. However, an AR(1) specification was also pursued with broadly similar results for the aggregate uncertainty indices.