Accepted Manuscript

Title: The Impact of US Policy Uncertainty on the Monetary Effectiveness in the Euro Area

Authors: Mehmet Balcilar, Riza Demirer, Rangan Gupta, Reneé van Eyden

PII: S0161-8938(17)30092-3
DOI: http://dx.doi.org/10.1016/j.jpolmod.2017.09.002
Reference: JPO 6384

To appear in: *Journal of Policy Modeling*

Received date: 21-1-2017
Revised date: 2-6-2017
Accepted date: 20-8-2017

Please cite this article as: Balcilar, Mehmet., Demirer, Riza., Gupta, Rangan., & van Eyden, Reneé., The Impact of US Policy Uncertainty on the Monetary Effectiveness in the Euro Area.*Journal of Policy Modeling* http://dx.doi.org/10.1016/j.jpolmod.2017.09.002

The Impact of US Policy Uncertainty on the Monetary Effectiveness in the Euro Area

Mehmet Balcilar*, Riza Demirer**, Rangan Gupta*** and Reneé van Eyden***

[*] Department of Economics, Eastern Mediterranean University, Famagusta, via Mersin 10, Northern Cyprus, Turkey and Department of Economics, University of Pretoria, Pretoria, 0002, South Africa; IPAG Business School, Paris, France. Email: mehmet@mbalcilar.net.
[**] Department of Economics & Finance, Southern Illinois University Edwardsville, Edwardsville, IL 62026-1102, USA. Email: rdemire@siue.edu.
[***] Corresponding author. Department of Economics, University of Pretoria, Pretoria, 0002, South Africa. Email: rangan.gupta@up.ac.za.
[****] Department of Economics, University of Pretoria, Pretoria, 0002, South Africa. Email: renee.vaneyden@up.ac.za.

Abstract

This paper examines the role of U.S. economic policy uncertainty on the effectiveness of monetary policy in the Euro area. Using a structural Interacted Vector Autoregressive (IVAR) model conditional on high and low levels of U.S. economic policy uncertainty, we find that uncertainty regarding policy changes in the U.S. dampens the effect of monetary policy shocks in the Euro area, with both price and output reacting more significantly to monetary policy shocks when the level of U.S. policy uncertainty is low. We argue that the U.S. government's actions regarding policy changes in the U.S. is a source of uncertainty for Euro area investors and high levels of policy uncertainty that spill over from the U.S. drive Euro area investors to adopt a wait-and-see approach, leading to a relatively weaker (and sometimes insignificant) response of price and output to monetary tightening in the Euro area. The findings underscore the importance of market integration and coordination of economic policy changes on the effectiveness of monetary policy on the macroeconomy on both sides of the Atlantic. Our results thus, provide evidence in favour of the policy ineffectiveness hypothesis in the Euro area contingent on the economic policy uncertainty of the U.S.

Keywords: Economic Policy Uncertainty, Monetary Policy, Interacted Structural Vector Autoregressive Model

JEL codes: C32, C51, C54, E30, E31, E32, E52

1. Introduction

The literature on the impact of monetary policy, primarily based on constant parameter and time-varying structural vector autoregressive (VAR) models, on the macroeconomy is huge to say the least (see for example, Aastveit et al., (2013) for a detailed literature review in this regard). A related and relevant question, especially in the wake of the recent financial crisis, is whether monetary policy is less effective when uncertainty is high. Theoretical research by Bernanke (1983), Dixit and Pindyck (1994), and more recently Bloom (2009) and Aastveit et al., (2013) tend to suggest that the answer to the above question is most likely *yes*. The basic notion is that elevated uncertainty causes agents to postpone decisions until more information becomes available, and this cautiousness makes them less responsive to changes in the interest rate. Hence, policymakers must act aggressively if they aim to stabilize the economy.

While the policy ineffectiveness proposition is theoretically well-established, empirical evidence on it is limited only to Aastveit et al., (2013). These authors utilize the interacted Vector Autoregressive (IVAR) methodology developed by Tobin and Weber (2013) and Sá et al. (2014) treating uncertainty as an exogenous interaction variable. The authors start by evaluating the policy inefficiency hypothesis on U.S. data, and thereafter extend the analysis by estimating how the U.S.-based uncertainty measures interact with the transmission of monetary policy shocks in Canada, the United Kingdom and Norway. They find that monetary policy shocks affect economic activity considerably weaker when uncertainty is high, especially for Canada and the U.S. Similarly, conclusions are also reached by Gupta and Jooste (2015) using a sign-restricted panel VAR (PVAR) model, when analysing the effectiveness of unconventional monetary policy in eight OECD countries (OECD countries (Canada, Germany, France, Italy, Japan, Spain, UK and US)) contingent on the levels of their respective economic policy uncertainty.

Interestingly however, there is a voluminous (and growing) recent strand of international literature that has looked into the question of how movements in uncertainty affect economic activity (see for example, (Alexopoulos and Cohen, 2009; Bloom, 2009; Bachmann and Bayer, 2011; Knotek and Khan, 2011; Bachmann et al., 2013; Colombo, 2013; Jones and Olson, 2013, Mumtaz and Zanetti, 2013; Mumtaz and Surico, 2013; Benati, 2014; Karnizova and Li, 2014; Alessandri and Mumtaz, 2014; Balcilar et al., 2015, forthcoming; Caggiano et al., 2014a, 2014b, Custelnuova et al., 2015; Mumtaz and Theodoridis, 2015, forthcoming; Baker et al., 2015; Carriero et al., 2015; Jones and Olson, 2015; Jurado et al., 2015; Rossi and

Sekhposyan, 2015, Sin; 2015). Amongst this large set of studies, barring Colombo (2013), Jones and Olson (2015), and Sin (2015), all the other studies have analysed the impact of a country's own uncertainty on its macroeconomic variables. Colombo (2015) looked at the impact of U.S. uncertainty on Euro Area macroeconomic variables, while Jones and Olson (2015) did the same for U.K. and Japan. Sin (2015) studied the role of Chinese uncertainty on the macroeconomy of Taiwan and Hong Kong. All three aforementioned studies report significant spillover of foreign uncertainty on the domestic economies. In fact, Colombo (2015) showed that the contribution of the U.S. uncertainty shock on the European aggregates is quantitatively larger than the one exerted by a Euro area-specific shock.

Against the backdrop, of significant impact of U.S. uncertainty on the Euro area, we use an IVAR model to investigate the impact and effectiveness of Euro area domestic monetary policy on macroeconomic aggregates for the Euro area, conditional on U.S. uncertainty. In other words, we analyse the role of high and lows levels of U.S. uncertainty on the monetary policy ineffectiveness proposition of the Euro Area, based on a sign-restricted structural VAR model over the monthly period of 1999:01-2015:03. Our paper can thus be considered as an extension to the work of Colombo (2013). Note that, as far as the measure of U.S. uncertainty is concerned, consistent with Colombo (2013), we use the newspaper based measure of economic policy uncertainty developed by Baker et al. (2015). Alternatively, Mumtaz and Zanetti (2013), Mumtaz and Surico (2013), Alessandri and Mumtaz (2014), Mumtaz and Theodoridis (2015, forthcoming), Carriero et al., (2015) Jurado et al., (2015), Ludvigson et al., (2015), and Rossi and Sekhposyan (2015) recover measures of uncertainty from stochastic volatility in the error structure of estimated structural VAR models. While there exists no clear-cut consensus in terms of which approach to use in constructing measures of uncertainty, the news-based measures of uncertainty, as developed by Baker et al., (2015), seems to have gained tremendous popularity in various applications in macroeconomics (see Strobel (2015) for a detailed review of alternative measures of uncertainty). This is most likely due to the fact that data (not only for the U.S., but also other European and emerging economies) based on this approach is easily and freely available for use, and does not require any complicated estimation of a model to generate it in the first place. To construct the index, Baker et al. (2015) perform month-by-month searches of newspapers for terms related to various forms of economic and policy uncertainties.

Our findings suggest that economic policy uncertainty in the U.S. indeed interacts with the influence of monetary policy in the Euro area. We observe that uncertainty regarding policy changes in the U.S. dampens the effect of monetary policy shocks, with both price and output reacting more significantly to monetary policy shocks when the level of U.S. policy uncertainty is low. We argue that the U.S. government's actions regarding policy changes in the U.S. is a source of uncertainty for Euro area investors and high levels of policy uncertainty that spill over from the U.S. drive Euro area investors to adopt a wait-and-see approach, leading to a relatively weaker (and sometimes insignificant) response of price and output to monetary tightening in the Euro area. We finally propose several channels through which U.S. policy uncertainty interacts with the effectiveness of monetary policy in the Euro area. Our findings underscore the importance of market integration and coordination of economic policy changes on the effectiveness of monetary policy on the macroeconomy in both sides of the Atlantic. The outline of the paper is as follows: Section 2 contains a data description and discussion of methodology used; Section 3 contains the empirical results, while Section 4 concludes.

2. Data and methodology

2.1 Data

We aim to estimate how economic U.S. policy uncertainty influences the transmission of monetary policy shocks in the Euro area. We use monthly macroeconomic data from 1999:01 to 2015:03 and Baker's (2015) policy-related economic uncertainty measure for the U.S. This economic policy uncertainty (EPU) index relies on three components: a news-based component quantifying newspaper coverage on economic policy uncertainty; a measure of the Federal tax code provisions; and a measure of disagreement among forecasters. For the Euro area we use the following macroeconomic variables: the Harmonised Index of Consumer Prices (*hicp*), the industrial production index (*ip*), and the Euro Interbank Offered Rate (e*uribor*) to represent macroeconomic measures for the price level, output and short-term interest rate, which serves as a proxy for the monetary policy rate in the Euro area. With exception of the interest rate variable, all series are transformed using natural logarithms. The economic policy uncertainty variable is obtained from www.policyuncertainty.com, while the Euro area macro variables were derived from the Organisation for Economic Co-operation and Development (OECD) macroeconomic indicators database.

2.2 Methodology

To study how time-varying policy uncertainty in the U.S. affects the transmission mechanism of monetary policy in the Euro area, we estimate a structural interacted VAR (IVAR) model. By interacting macroeconomic variables with an uncertainty index, we allow the impact of monetary policy to change with the degree of uncertainty. The model specification builds on the interacted panel VAR model developed by Towbin and Weber (2013) and Sáa et al. (2013), and is similar to the approach of Aastveit et al. (2013) who apply a separate model to each country in their analysis. Notably with this approach time-variation in the effect of policy is directly linked to the specific determinant, unlike studies that use VARs with stochastically time-varying coefficients, such as Canova and Gambetti (2009) and Primeceri (2005).

We use the following interacted VAR model:

$$Y_t = A_0 + B_0 X_t + \left(\sum_{l=1}^{L} A_l Y_{t-1} + B_l Y_{t-1}^{MP} X_t\right) + CZ_t + E_t \qquad (1)$$

where E_t is a vector of reduced form residuals at time *t*. The vector Y_t contains prices, output and the interest rate for the Euro area. The model allows variables in Y_t to interact with X_t, our U.S. policy uncertainty measure. X_t is also included as an additional regressor, and is assumed to be exogenous in the model. Note that in our exercise we want to quantify the extent to which the response of the endogenous variables to the interest rate shock changes with the level of uncertainty. Therefore, in all three equations we interact uncertainty X_t with the Euro policy interest rate only, as captured by the the use of the term Y_{t-1}^{MP}. A_0 is a vector of constant terms, while B_0, A_l, B_l and C are parameter vectors for the interacted variable (X_t), the endogenous variables (Y_t), the interaction term ($Y_{t-1}^{MP} X_t$) and the exogenous variables (Z_t), respectively. *L*, the lag-length, was set at 13 obtained based on the Akaike Information Criterion (AIC). The choice of this lag-length is also in line with the extant literature on the impact of interest rate changes on the economy, which is believed to take more than a year to feed-in (Walsh, 2010). We have tested the inclusion of the oil price, but results are robust to the inclusion of real oil prices. In addition, as in Colombo (2013), we also included the Euro area economic policy uncertainty index developed by Baker et al., (2015), in the list of endogenous variables, but our results were qualitatively similar.

In order to study the incidence of policy effectiveness in our econometric model, we need to identify monetary policy shocks. Our identification strategy is based on a sign-restriction approach as in Uhlig (2005). Specifically, the identifying assumption here is that a monetary policy shock is associated with an increased interest rate, a fall in the price level, and a fall in output, for at least six months, i.e., two quarters.

Uhlig's (2005) agnostic identification procedure can be described as follows[1]: we want to define a monetary policy shock impulse vector as one in which the sign restrictions hold. Furthermore, to account for identification issues, Uhlig (2005) recommends supplementing the above-mentioned identification assumptions by imposing a prior, which, in turn, is proportional to a Normal-Wishart. Empirically, the following steps are carried out:

1. take n_1 draws from the VAR posterior and n_2 draws from an independent uniform prior;
2. determine the impulse vector;
3. at horizon $k = 0,...,K$, compute the impulse response functions (IRFs) for each draw;
4. verify whether the IRFs comply with the sign restrictions;
5. keep the draw when all the IRFs comply with the sign restrictions. Reject the draw in case any of the IRF does not satisfy the sign restrictions;
6. stop the process after acquiring n_3 IRFs with the required sign. The error band computations are based on the draws used.

This paper uses $n_1 = n_2 = 200$, $n_3 = 1000$ and $K = 5$ in the estimations.

To evaluate the importance of the interaction effects, we compute the estimated impulse responses of monetary policy shocks at two different levels of the economic policy uncertainty indicator. We use *above* and *below* the mean of the historical distribution of the U.S. uncertainty measure, denoted $\square^{h\square\square h}$ and $\square^{\square\square\square}$, respectively. With the assigned values for the interaction variable $\square_{\square}$, the estimated VAR reduces to:

[1]Please refer to the original source for further details.

$$\square_{\square}^{h\square\square h} = \widehat{\square_0}^{h\square\square h} + \sum_{\square=1}^{\square}\left(\widehat{\square_\square}^{h\square\square h}\square_{\square-\square}\right) + \hat{\square}\,\square_\square + \widehat{\square_\square}$$

(2) $$\square_{\square}^{\square\square\square} = \widehat{\square_0}^{\square\square\square} + \sum_{\square=1}^{\square}\left(\widehat{\square_\square}^{\square\square\square}\square_{\square-\square}\right) + \hat{\square}\,\square_\square + \widehat{\square_\square}$$

(3)

where $\widehat{\square_0}^{h\square\square h} = \widehat{\square_0} + \widehat{\square_0}\square^{h\square\square h}$ and $\widehat{\square_0}^{\square\square\square} = \widehat{\square_0} + \widehat{\square_0}\square^{\square\square\square}$. Similarly, $\widehat{\square_\square}^{h\square\square h} = \widehat{\square_\square} + \widehat{\square_\square}\square^{h\square\square h}$ and $\widehat{\square_\square}^{\square\square\square} = \widehat{\square_\square} + \widehat{\square_\square}\square^{\square\square\square}$. These are standard reduced form VAR-models, and there is therefore no further complication associated with using the restrictions discussed above to identify a monetary policy shock and analyse its effects at high and low levels of uncertainty.

3. Empirical results

Figures 1 and 2 provide the impulse responses of industrial production (*ip*), consumer prices (*hicp*), and short term interest rates (*euribor*) to a monetary policy shock of one percentage point when the EPU index is above and below its historical mean level, respectively. The immediate positive effect observed in Figures 1c and 2c for Euribor is consistent with the characteristic of a monetary policy shock, implied by a significant positive effect observed on the short term interest rate on impact. Examining the confidence intervals reported in Figures 1c and 2c, we observe that the impact on interest rates is mainly a short term one, which turns insignificant after about 8 months following the shock in both uncertainty environments. Comparing the impulse responses for high and low uncertainty environments, however, we observe a larger impact on interest rates in the case of high policy uncertainty which might reflect the political risk premium embedded in short term rates due to the high level of uncertainty regarding the cost of potential policy changes. In a related study, Pástor and Veronesi (2013) argue that the high level of uncertainty regarding the cost of potential policy changes drives a risk premium whose magnitude is larger, especially during weaker economic conditions. It can thus be argued that, despite the similar initial reaction of short term rates to monetary policy shocks during high and low political uncertainty environments, the political risk premium embedded in the yield curve due to heightened level of political uncertainty drives the relatively stronger intermediate term response observed in Figure 1c (and Figure 3 in the Appendix).

In the case of industrial production presented in Figures 1a and 2a, we observe a negative initial reaction of output to monetary policy shocks in both uncertainty environments, with a relatively larger reaction observed on impact under high policy uncertainty. However, the intermediate and long-run reaction of output to monetary policy shocks is more pronounced and stronger in the case of low uncertainty with the long-run impact turning positive in the range of two to four percent after about one year. Despite the stronger negative initial response of output under high policy uncertainty (around 10%) compared to that under low uncertainty, we observe a stronger lagged negative effect on output in the case of low uncertainty environment. Considering the relatively stronger positive effect on interest rates reported in Figure 1c under high uncertainty, the relatively weaker effect on production seems somewhat counterintuitive and suggests that uncertainty regarding U.S. economic policy potentially dampens the effect of policy shocks in the Euro area.

One channel through which uncertainty dampens the impact of monetary shocks on output is that the high level of uncertainty regarding potential policy changes leads to a larger risk premium that firms require from investment projects, rendering those projects unprofitable given the current level of cost of capital projections. It is also possible that lenders price the political uncertainty into the loan contracts offered to firms seeking financing for their investments. In fact, in a recent study, Francis, et al. (2014) find that a one standard deviation increase in the political risk exposure of a firm is related to about a 5% increase in the price of the loan offered. It can thus be argued that the high level of uncertainty deters firms from short-term investment decisions due to higher borrowing costs driven by the larger political risk premium embedded in interest rates. At the same time, it can also be argued that high levels of uncertainty increase the value of the real option associated with the investment project as argued by Aastveit et al. (2013). The increase in the value of the real option, i.e. option to wait, during periods of high policy uncertainty thus makes production less responsive to monetary policy shocks as firms rather postpone their investments and wait to learn more about the political costs associated with the potential new policies.

On the other hand, in the case of low uncertainty (reported in Figure 2a, and Figure 3 in the Appendix), firms and investors benefit from what Pástor and Veronesi (2013) call the put protection the government provides to the market and thus are more likely to initiate new investments as the implicit put protection becomes more valuable when political uncertainty is less.[2] The anticipation of no significant change in economic policies during periods of low political uncertainty coupled with the implicit put protection offered by the government thus make it more likely for firms to give the go-ahead for current projects in the pipeline. This

[2] Pástor and Veronesi (2013) argue that the government's action to replace a poorly working policy during bad times can be considered as a put option the government provides to the market.

readiness to undertake investments during periods of low policy uncertainty thus makes production more sensitive to monetary policy shocks. This is in fact consistent with the stronger lagged effect on output reported in Figure 2a with a peak negative response around 7% occurring about 6 months following the shock when policy uncertainty is low. Interestingly, we also observe that the long-run response of output turns positive after about a year following the shock when uncertainty is low although the reaction is insignificant at the given confidence level.

Finally, examining the reaction of prices to monetary policy shocks reported in Figures 1b and 2b, we do not observe a significant difference in the impulse responses of prices under high and low uncertainty environments. As expected, we observe that prices react negatively to monetary tightening at the same rate in the short and intermediate term. However, we also observe a larger impact on price in the case of low uncertainty, especially after about one year following the shock (Figure 3 in the appendix). Furthermore, comparing Figures 1b and 2b, we see that the price reaction turns largely insignificant in the long run under high uncertainty while a more persistent and negative impact is in place under low uncertainty. This evidence, coupled with our prior discussion on output, clearly suggest that the impact of monetary policy shocks in the Euro area is more significant and persistent when the U.S. economic policy uncertainty is low. It can thus be argued that the U.S. government's actions regarding policy changes in the U.S. is a source of uncertainty for Euro area investors and policy makers alike and high levels of policy uncertainty that spills over from the U.S. drives investors to take a wait-and-see approach in their investment decisions as they cannot fully anticipate how changes in U.S. economic policy will translate into potential policy changes in the Euro area. The higher level uncertainty regarding U.S. policy changes, in turn, makes monetary policy less effective in the Euro area, which is evidenced by the relatively weaker (or insignificant) reaction of price and output to monetary tightening.

4. Conclusion and policy recommendation

The effectiveness of monetary policy on the macroeconomy has been examined in numerous studies and in different contexts. Recent research, however, has focused on the role of market uncertainty in the transmission of monetary policy shocks. A number of theoretical and empirical studies including Bernanke (1983), Dixit and Pindyck (1994), and more recently Bloom (2009) and Aastveit et al., (2013) suggest that monetary policy would be less effective during periods when economic uncertainty is high. In fact, using several alternative uncertainty measures, Aastveit et al., (2013) document that high U.S. uncertainty is associated with lower policy influence both in the U.S. and Canada while no significant effect is observed for the UK and Norway. Given the evidence on financial integration across international markets and the impact of U.S. uncertainty on Euro area macroeconomic variables (e.g. Colombo, 2015), this paper examines the role of U.S. economic policy uncertainty on the effectiveness of monetary policy in the Euro area.

Using a monthly data set of output, price and short term interest rates for the Euro area over the period 1999:01-2015:3, we build a structural Interacted Vector Autoregressive (IVAR) model of Euro area macroeconomic variables conditional on high and low-levels of U.S. economic policy uncertainty. Our findings indicate that U.S. economic policy uncertainty has a significant bearing on the response of macro variables to monetary policy shocks in the Euro area. We observe that uncertainty regarding policy changes in the U.S. dampens the effect of monetary policy shocks in the Euro area, with both price and output reacting more significantly to monetary policy shocks when the level of U.S. policy uncertainty is low. We argue that the U.S. government's actions regarding policy changes in the U.S. is a source of uncertainty for Euro area investors and high level of policy uncertainty that spills over from the U.S. drives Euro area investors to take a wait-and-see approach, leading to a relatively weaker (and sometimes insignificant) response of price and output to monetary tightening in the Euro area.

While financial integration may play a role in the significance of U.S. economic policy uncertainty in our tests, we argue that high levels of economic policy uncertainty in the Euro area, partially driven by uncertainty in the U.S., potentially lead to a larger political risk premium embedded in the cost of financing and thus cost of capital for firms. The higher cost of capital coupled with the increase in the value of the real-option in a high uncertainty environment then makes it optimal for firms to postpone their investments until they learn more about the likelihood of policy changes in the Euro area and the costs associated with the potential new policies. As a result, the reluctance of firms to initiate new investments in a high policy uncertainty environment leads to weaker impulse responses of output and prices during such periods, dampening the effect of the monetary policy shock.

On the other hand, firms and investors benefit from the put protection the government provides to the market as it is more likely for the government to replace a poorly working policy when the current policy is not working. The implicit put protection, that becomes more valuable in a low uncertainty environment, then makes firms more willing to initiate new investments, making macroeconomic variables more sensitive to monetary policy shocks during such periods. In short, our tests suggest that economic policy uncertainty in the U.S. indeed interacts with the influence of monetary policy in the Euro area and that high uncertainty regarding U.S. economic policy changes makes monetary tightening less effective in the Euro area. Overall, our findings underscore the importance of market integration and coordination of economic policy changes on the effectiveness of monetary policy on the macroeconomy on both sides of the Atlantic. In sum, our results provide empirical evidence validating the policy ineffectiveness hypothesis for the Euro area contingent on the economic policy uncertainty of the U.S. economy. This implies that policy makers may therefore need to act more aggressively in a high policy uncertainty environment to ensure the desired policy outcome in order to stabalise the economy, underscoring the fact that it may be preferrable to act decisively (but occasionally incorrectly) than to deliberate on policy, generating policy-induced uncertainty.

References

Aastveit, K. A., Natvik, G., & Sola, S. (2013). Economic uncertainty and the effectiveness of monetary policy. Norges Bank, Working Paper No. 2013/17.

Alessandri, P., & Mumtaz, H. (2014). Financial regimes and uncertainty shocks. School of Economics and Finance, Queen Mary, University of London, Working Paper No. 729.

Alexopoulos, M., & Cohen, J. (2009). Uncertain times, uncertain measures. University of Toronto Department of Economics Working Paper, 352.

Bachmann, R., & Bayer, C. (2011). Uncertainty business cycles-really? National Bureau of Economic Research, Working Paper No. w16862.

Bachmann, R., Elstner, S., & Sims, E. (2013). Uncertainty and Economic Activity: Evidence from Business Survey Data. American Economic Journal: Macroeconomics, 5(2), 217-49.

Baker, S. R., Bloom, N., & Davis, S. J. (2015). Measuring economic policy uncertainty (No. w21633). National Bureau of Economic Research, Working Paper No. w21633.

Balcilar, M., Gupta, R., and Jooste, C. (Forthcoming). Long Memory, Economic Policy Uncertainty and Forecasting US Inflation: A Bayesian VARFIMA Approach. Applied Economics.

Balcilar, M., Gupta, R., & Segnon, M.K. (2015). The Role of Economic Policy Uncertainty in Predicting U.S. Recessions: A Mixed-Frequency Markov-Switching Vector Autoregressive Approach. Department of Economics, University of Pretoria, Working Paper No. 201558.

Benati, L. (2014). Economic policy uncertainty and the great recession. Mimeo, University of Bern, available from http://www.bbk.ac.uk/ems/research/Seminar_info/uncertainty.

Bernanke, B. S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. The Quarterly Journal of Economics, 98(1), 85-106.

Bloom, N. (2009). The impact of uncertainty shocks. Econometrica, 77(3), 623-685.

Caggiano, G., Castelnuovo, E., & Nodari, G. (2014). Uncertainty and Monetary Policy in Good and Bad Times. Dipartimento di Scienze Economiche" Marco Fanno", Working Paper No. 0188.

Caggiano, G., Castelnuovo, E., & Groshenny, N. (2014). Uncertainty shocks and unemployment dynamics in US recessions. Journal of Monetary Economics, 67, 78-92.

Castelnuovo, E., Caggiano, G., & Pellegrino, G. (2015). Estimating the Real Effects of Uncertainty Shocks at the Zero Lower Bound. Dipartimento di Scienze Economiche" Marco Fanno", Working Paper No. 0200.

Canova, F., & Gambetti, L. (2009). Structural changes in the US economy: Is there a role for monetary policy? Journal of Economic Dynamics and Control, 33(2), 477-490.

Carriero, A., Mumtaz, H., Theodoridis, K., & Theophilopoulou, A. (2015). The Impact of Uncertainty Shocks under Measurement Error: A Proxy SVAR Approach. Journal of Money, Credit and Banking, 47(6), 1223-1238.

Colombo, V. (2013). Economic policy uncertainty in the US: Does it matter for the Euro area? Economics Letters, 121(1), 39-42.

Dixit, A. K., & Pindyck, R. S. (1994). Investment under uncertainty. Princeton University Press.

Francis, B. B., Hasan, I., Zhu, Y. (2014). Political uncertainty and bank loan contracting. Journal of Empirical Finance 29, 281–286

Gupta, R., & Jooste, C. (2015). Unconventional Monetary Policy Shocks in OECD Countries: How Important is the Extent of Policy Uncertainty? Department of Economics, University of Pretoria, Working Paper No. 201587.

Jones, P. M., & Olson, E. (2015). The International Effects of US Uncertainty. International Journal of Finance & Economics, 20(3), 242-252.

Jurado, K., Ludvigson, S. C., & Ng, S. (2015). Measuring Uncertainty. The American Economic Review, 105(3), 1177-1216.

Karnizova, L., & Li, J. C. (2014). Economic policy uncertainty, financial markets and probability of US recessions. Economics Letters, 125(2), 261-265.

Knotek II, E. S., & Khan, S. (2011). How do households respond to uncertainty shocks? Federal Reserve Bank of Kansas City Economic Review, 96(2), 5-34.

Ludvigson, S. C., Ma, S., & Ng, S. (2015). Uncertainty and Business Cycles: Exogenous Impulse or Endogenous Response? National Bureau of Economic Research, Working Paper No. w21803.

Mumtaz, H., & Surico, P. (2013). Policy Uncertainty and Aggregate Fluctuations. Queen Mary University of London, School of Economics and Finance, Working Paper No. 708.

Mumtaz, H., & Theodoridis, K. (Forthcoming). The Changing Transmission of Uncertainty shocks in the US: An Empirical Analysis. Journal of Business and Economic Statistics.

Mumtaz, H., & Theodoridis, K. (2015). Common and Country Specific Economic Uncertainty. Queen Mary University of London, School of Economics and Finance, Working Paper No. No. 752.

Mumtaz, H., & Zanetti, F. (2013). The impact of the volatility of monetary policy shocks. Journal of Money, Credit and Banking, 45(4), 535-558.

Pástor, L., Veronesi, P. 2013. Political uncertainty and risk premia. Journal of Financial Economics 110, 520–545.

Primiceri, G. E. (2005). Time varying structural vector autoregressions and monetary policy. The Review of Economic Studies, 72(3), 821-852.

Rossi, B., & Sekhposyan, T. (2015). Macroeconomic uncertainty indices based on nowcast and forecast error distributions. The American Economic Review, 105(5), 650-655.

Sá, F., Towbin, P., & Wieladek, T. (2014). Capital inflows, financial structure and housing booms. Journal of the European Economic Association, 12(2), 522-546.

Sin, C. Y. C. (2015). The economic fundamental and economic policy uncertainty of Mainland China and their impacts on Taiwan and Hong Kong. International Review of Economics & Finance, 40(C), 298-311.

Strobel, J. (2015). On the different approaches of measuring uncertainty shocks. Economics Letters, 134, 69-72.

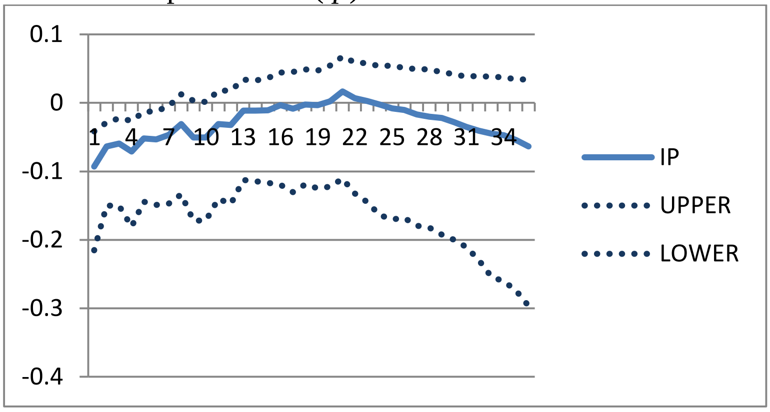
Towbin, P., & Weber, S. (2013). Limits of floating exchange rates: The role of foreign currency debt and import structure. Journal of Development Economics, 101, 179-194.

Uhlig, H. (2005). What are the effects of monetary policy on output? Results from an agnostic identification procedure. Journal of Monetary Economics 52 (2), 381–419.

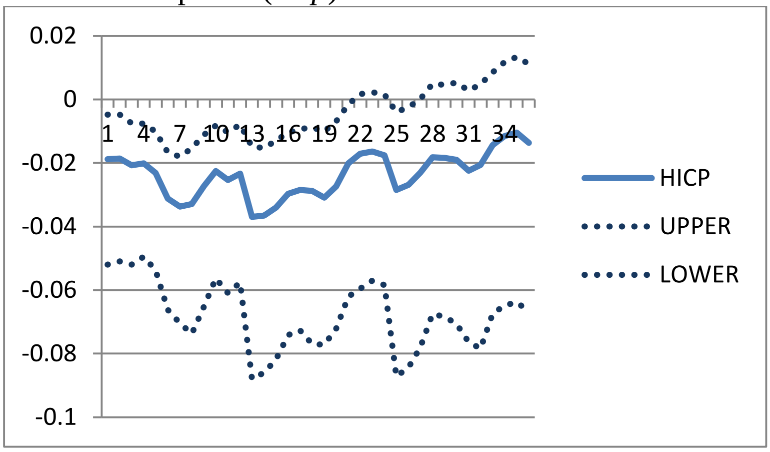
Walsh, C. E. (2010). Monetary theory and policy. MIT press.

Figure 1. The effect of monetary policy under *high* uncertainty.

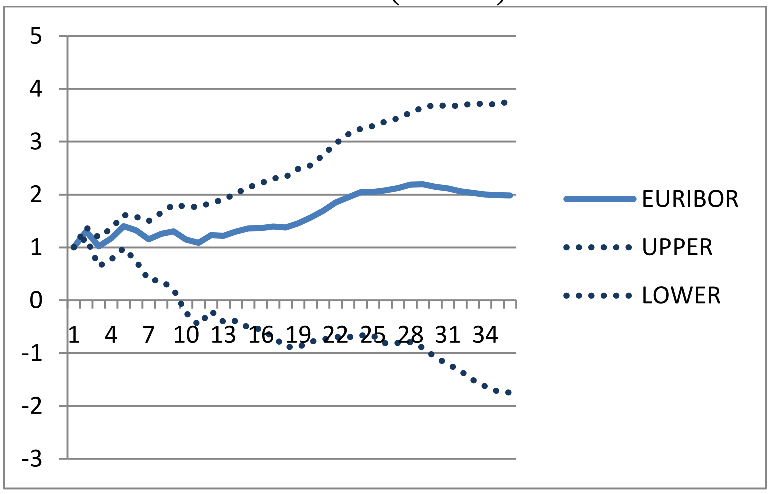
a. Industrial production (*ip*)



b. Consumer prices (*hicp*)



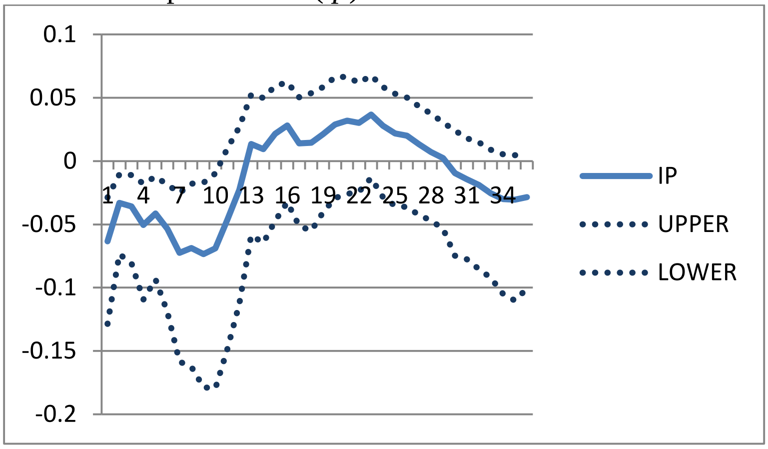
c. Euro interbank offered rate (*euribor*)



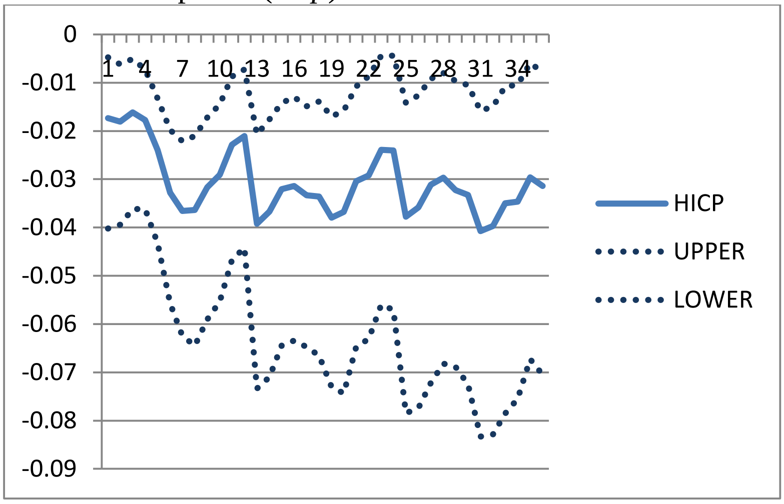
Note: The figures provide the impulse responses to a monetary policy shock of one percentage point when the EPU index is *above* its historical mean level. Industrial production (*ip*), harmonized index of consumer prices (*hicp*) and the Euro Interbank Offered Rate (*euribor*) are used to represent price level, output and ST interest rate, respectively. Solid line represents point estimates and dashed lines indicate the 68% confidence intervals.

Figure 2. The effect of monetary policy under *low* uncertainty.

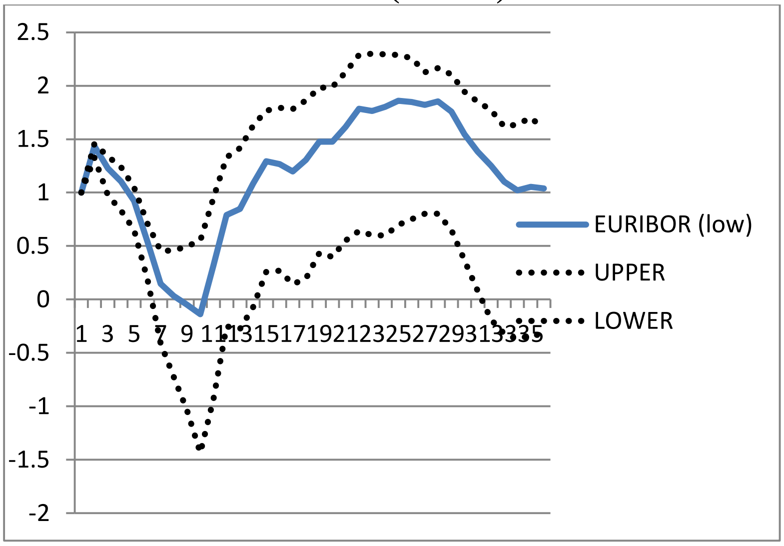
a. Industrial production (*ip*)



b. Consumer prices (*hicp*)

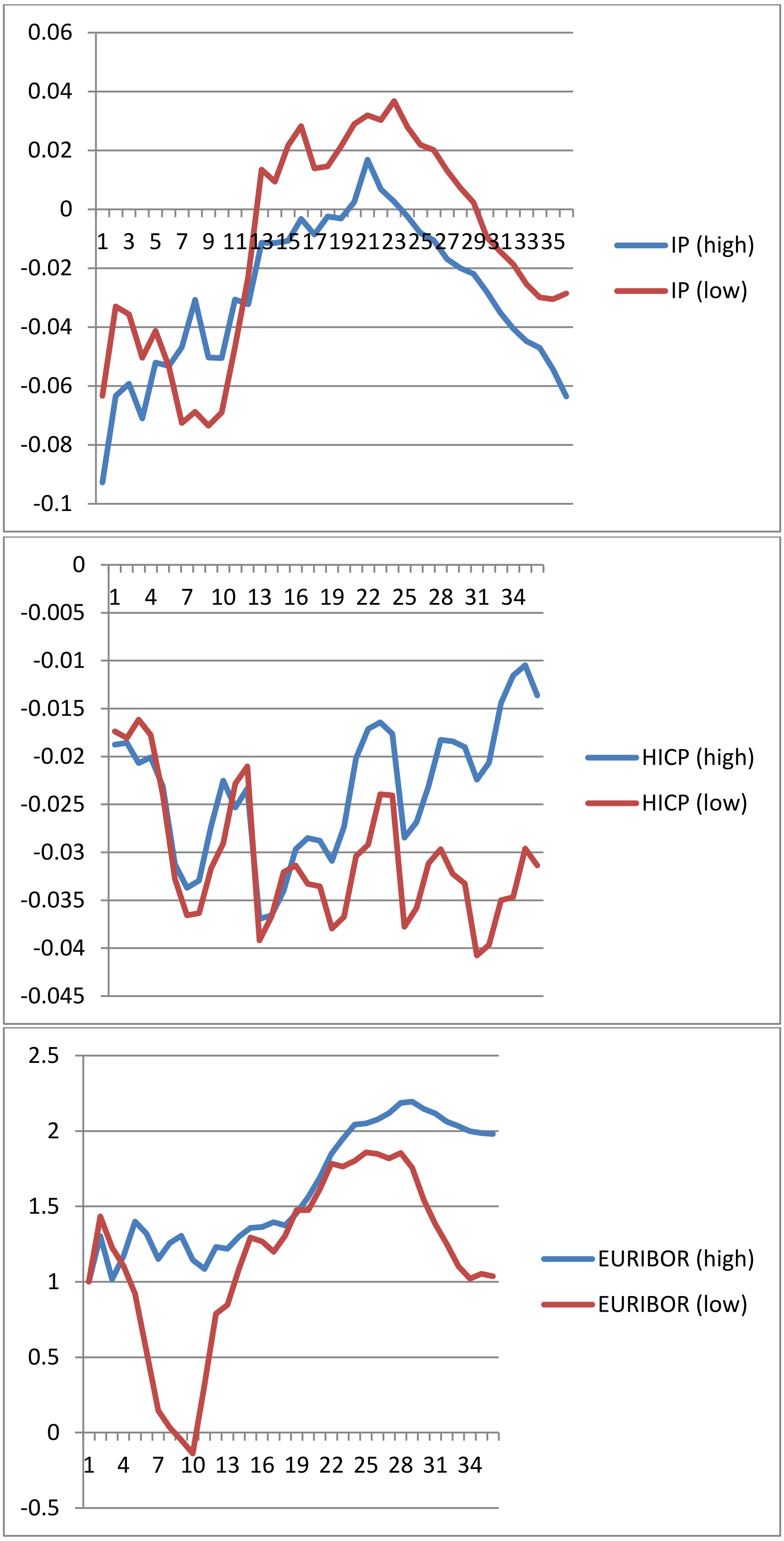


c. Euro interbank offered rate (*euribor*)



Note: The figures provide the impulse responses to a monetary policy shock of one percentage point when the EPU index is *below* its historical mean level. Industrial production (*ip*), harmonized index of consumer prices (*hicp*) and the Euro Interbank Offered Rate (*euribor*) are used to represent price level, output and ST interest rate, respectively. Solid line represents point estimates and dashed lines indicate the 68% confidence intervals.

AppendixFigure 3. Monetary policy shock and policy uncertainty.



Note The figures provide the impulse responses to a monetary policy shock of one percentage point when the EPU index is *above/below* its historical mean level. Industrial production (*ip*), harmonized index of consumer prices (*hicp*) and the Euro Interbank Offered Rate (e*uribor*) are used to represent price level, output and ST interest rate, respectively. High (low) indicates EPU index above (below) its historical mean level.