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Drivers of Turkish Inflation

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Abstract

This paper investigates the drivers of Turkish inflation by using a structural vector autoregression model, where monthly data on global oil prices, unemployment rates, inflation rates, policy rates and exchange rates are used. The empirical results show that Turkish inflation increases following a negative policy rate shock, a positive exchange rate shock, or a positive global oil price shock. The volatility of Turkish inflation is mostly explained by global oil prices and exchange rate movements in the long run, while the contribution of exchange rate shocks to Turkish inflation has continuously increased over time. As additional empirical results show that exchange rate depreciation can be reduced by positive policy rate shocks, it is implied that a conventional monetary policy increasing policy rates following an increase in inflation or a depreciation of Turkish lira would be optimal to achieve and maintain price stability in Turkey, which is the primary objective of the Central Bank of the Republic of Turkey.

JEL Classification: E31, E52, F41

Key Words: Monetary Policy; Inflation; Unemployment; Exchange Rate; Turkey.

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Abstract

This paper investigates the drivers of Turkish inflation by using a structural vector autoregression model, where monthly data on global oil prices, unemployment rates, inflation rates, policy rates and exchange rates are used. The empirical results show that Turkish inflation increases following a negative policy rate shock, a positive exchange rate shock, or a positive global oil price shock. The volatility of Turkish inflation is mostly explained by global oil prices and exchange rate movements in the long run, while the contribution of exchange rate shocks to Turkish inflation has continuously increased over time. As additional empirical results show that exchange rate depreciation can be reduced by positive policy rate shocks, it is implied that a conventional monetary policy increasing policy rates following an increase in inflation or a depreciation of Turkish lira would be optimal to achieve and maintain price stability in Turkey, which is the primary objective of the Central Bank of the Republic of Turkey.

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1 Introduction

Emerging markets are highly vulnerable to the negative effects of high inflation (e.g., see Bick (2010), Yilmazkuday (2011) and Yilmazkuday (2013)). Although inflation rates in many emerging markets have decreased over time due to having successful monetary policies, the current Turkish inflation deviates by having one of the highest rates among emerging markets as of 2021 (i.e., the second following Argentina).[1] As Turkey has an inflation targeting regime with an independent central bank which states "The primary objective of the Bank is to achieve and maintain **price stability**." on its webpage, where **price stability** is highlighted, the drivers of Turkish inflation are important to understand to form optimal policy not only in Turkey but in also other emerging markets that have an inflation targeting regime. This topic is also important from the perspective of central bank independence, because, despite high inflation levels, "there has been an overwhelming increase in the number of political speeches from the government members that indicate a preference towards lower interest rates in Turkey" as indicated in studies such as by Demiralp and Demiralp (2019). Therefore, it is also essential to understand whether Turkish inflation can be reduced by a conventional monetary policy (of increasing policy rates) versus an unorthodox policy (of reducing policy rates).

Accordingly, this paper attempts to understand the drivers of Turkish inflation and the corresponding role of monetary policy by using a structural vector autoregression (SVAR) model. As studies such as by Borio and Filardo (2007), Mumtaz and Surico (2012) or Ha, Kose, Ohnsorge, and Yilmazkuday (2019) have suggested that global factors such as commodity or energy prices are potential external drivers of domestic inflation, we include global oil prices in our investigation. These global factors are especially important for Turkish inflation as the economy is heavily dependent on oil imports, and therefore, oil price spikes might be particularly costly for the economy due to oil price pass-through. Due to having

[1] Source: https://www.economist.com/finance-and-economics/2021/11/06/cautionary-tales-from-high-inflation-emerging-economies

vulnerable external position with foreign-denominated debt, current account deficit, and limited store of international reserves, Turkish inflation may be affected by these global factors relative more compared to other countries due to the corresponding effects on its exchange rate as well (e.g., see Ahmed (2020)). Considering global oil prices also captures global developments such as changes in aggregate demand changes in the global economy as suggested in studies such as by Gambetti, Pappa, and Canova (2008) or Charnavoki and Dolado (2014), although we take into account global factors other than oil prices in our robustness checks. The internal factors of monetary policy rate, unemployment rate, and exchange rates are also considered as potential drivers of domestic inflation as in studies such as by Christiano, Eichenbaum, and Evans (1999), Bjørnland (2009), Osorio and Unsal (2013), Globan, Arčabić, Sorić, et al. (2016) or Hałka and Kotłowski (2017). In this context, using a SVAR model is important to address potential endogeneity concerns as it is not only the case that inflation is driven by external and internal factors that are just introduced but also the case that internal factors of monetary policy, unemployment and exchange rate are driven by developments in inflation (e.g., see Leeper, Sims, Zha, Hall, and Bernanke (1996) or Gertler and Karadi (2015)).

The empirical investigation is based on monthly data covering the period between 2005:M1 and 2021:M8. The results based on impulse response functions suggest that policy rate pass-through into Turkish inflation is negative and significant, where 1% of a change in the policy rate results in about 0.7% of a reduction in inflation in the long run. The exchange rate-pass through into Turkish inflation is about 26% (consistent with studies such as by Kara and Öğünç (2008) or Yilmazkuday (2020)), whereas the oil price pass-through into Turkish inflation is about 14% in the long run (in line with studies such as by Dedeoğlu and Kaya (2014), Akcelik and Öğünç (2016) or Ozgur, Aydin, Karagol, and Ozbugday (2021)). The historical decomposition analysis further suggests that Turkish inflation has historically been driven by shocks of global oil prices and exchange rates, where the contribution of the latter has increased over time. Although policy rate shocks have also contributed to inflation historically, this contribution has been limited compared to those by shocks of exchange rates and global oil prices. The forecast error variance decomposition of Turkish inflation additionally suggests that about 40% of its variance is explained by global oil prices, whereas about 17% of its variance is explained by exchange rate movements. These empirical results are robust to the consideration of alternative estimation strategies or variables included in the analysis.

To summarize, the empirical results suggest that Turkish inflation is mostly driven by shocks of global oil prices and exchange rates. This is consistent with earlier studies such as by Ciccarelli and Mojon (2010), Mumtaz, Simonelli, and Surico (2011) or Charnavoki and Dolado (2014) who have shown that the contribution of global factors to domestic inflation is high and significant. The results are also consistent with studies such as by Patnaik, Shah, and Bhattacharya (2011) who have shown that the exchange rate channel plays a significant role in emerging markets. The empirical results also show that the contribution of positive policy rate shocks to Turkish inflation is negative and significant, although the magnitude of the contribution is relatively less compared to those of global oil prices and exchange rates; this is in line with earlier studies such as by Mohanty, Turner, et al. (2008) or Vonnák (2008). As additional results show that exchange rate depreciation can be reduced by higher policy rates, it is implied that a conventional monetary policy increasing policy rates following an increase in inflation or a depreciation of Turkish currency (lira) would be optimal to achieve and maintain **price stability** in Turkey, which is the primary objective of CBRT.

This paper contributes to the literature showing evidence for inflation-reducing effects of central bank independence (e.g., see Acemoglu, Johnson, Querubin, and Robinson (2008), Klomp and De Haan (2010) and Garriga and Rodriguez (2020)). Specifically, consistent with studies such as by Demiralp and Demiralp (2019) who have shown evidence for diminishing central bank independence in Turkey, reducing policy rates due to political pressures despite high inflation rates would not correspond to a successful monetary policy in Turkey based on the empirical results of this paper. These political pressures may also result in the depreciation of Turkish lira due to unorthodox economic and political implementations as indicated in studies such as by Akarsu et al. (2021), which would further increase the Turkish inflation due to the positive exchange rate pass-through shown in this paper. It is implied that myopic political pressures may rather result in even higher inflation rates that can hurt Turkish economic growth in the long run as indicated in studies such as by Bick (2010), Yilmazkuday (2011) and Yilmazkuday (2013). Therefore, a conventional (rather than an unorthodox) monetary policy would be optimal to fight against inflation in Turkey.

The rest of the paper is organized as follows. The next section introduces the estimation methodology and data, whereas Section 3 depicts the benchmark empirical results. Section 4 achieves several robustness checks based on alternative estimation strategies or variables. Section 5 concludes. The Online Appendix includes additional tables and figures that are not essential for the main text.

2 Methodology and Data

2.1 Estimation Methodology

The formal investigation is achieved by using the SVAR model of $z_t = (\Delta o_t, \Delta u_t, \Delta p_t, \Delta r_t, \Delta e_t)'$ based on monthly data, where Δo_t represents the percentage change in global oil prices, Δu_t represents changes in the Turkish unemployment rate, Δp_t represents the Turkish inflation rate measured as percentage changes in consumer price index, Δr_t represents changes in the Turkish policy rate, and Δe_t represents the percentage change in the exchange rate with respect to the U.S. dollar (measured as depreciation of the currency, Turkish lira).

The formal investigation is based on the following SVAR model:

$$A_o z_t = a + \sum_{k=1}^{9} A_k z_{t-k} + u_t$$

where u_t is the vector of serially and mutually uncorrelated structural innovations. For estimation purposes, the model is expressed in reduced form as follows:

$$z_t = b + \sum_{k=1}^{9} B_k z_{t-k} + e_t$$

where $b = A_o^{-1} a$ and $B_k = A_o^{-1} A_k$ for all k. The number of lags (of 9) has been determined by minimizing the Deviance Information Criterion across alternative lags (between 1 and 12) of which details are given in Figure 1. It is postulated that the structural impact multiplier matrix A_o^{-1} has a recursive structure such that the reduced form errors e_t can be decomposed according to $e_t = A_o^{-1} u_t$, where the sizes of shocks are standardized to unity.

The recursive structure imposed on A_o^{-1} requires an ordering of the variables used in the estimation. Accordingly, we utilize the ordering in $z_t = (\Delta o_t, \Delta u_t, \Delta p_t, \Delta r_t, \Delta e_t)'$, where we also impose block exogeneity such that shocks on other variables cannot have an impact on Δo_t that is determined globally, whereas shocks on Δo_t can affect other variables contemporaneously. Ordering Δu_t and Δp_t before Δr_t is to ensure that the monetary policy can immediately react to shocks in unemployment and inflation (as well as the global oil price shocks), which is a common assumption used in the literature (e.g., see Christiano, Eichenbaum, and Evans (1999)). The exchange rate is ordered after the policy rate so that it can immediately react to monetary policy disturbances as in studies such as by Bjørnland (2009).

The estimation is achieved by a Bayesian approach with independent normal-Wishart priors. This corresponds to generating posterior draws for the structural model parameters by transforming each reduced-form posterior draw. In particular, for each draw of the covariance matrix from its posterior distribution, the corresponding posterior draw for A_o^{-1} is constructed by using by triangular factorization so that the sizes of shocks are standardized to unity. In the Bayesian framework, a total of 2,000 samples are drawn, where a burn-in sample of 1,000 draws is discarded. The remaining 1,000 draws are used to determine the structural impulse responses, historical decompositions and forecast error variance decompositions. While the median of each distribution is considered as the Bayesian estimator, the 16th and 84th quantiles of distributions are used to construct the 68% credible intervals (which is the standard measure considered in the Bayesian literature).

2.2 Data and Descriptive Statistics

Turkish monthly data on consumer price index, policy rate, and (U.S. dollar) exchange rate have been obtained from the webpage of the Bank for International Settlements, whereas monthly data on the Turkish unemployment rate have been obtained from the webpage of the Organisation for Economic Co-operation and Development (OECD). Global oil prices are captured by the global price of Brent crude in U.S. Dollars per barrel that have been obtained from the webpage of Federal Reserve Economic Data (FRED). The sample period covers the months between 2005:M1 and 2021:M8.

Regarding the connection with the SVAR model, percentage changes in global oil prices Δo_t are obtained as the year-on-year log changes in the global Brent crude oil price. Changes in the unemployment rate Δu_t are obtained as the year-on-year changes in the unemployment rate. Inflation rate Δp_t is obtained as the year-on-year log changes in the consumer price index. Changes in the policy rate Δr_t are obtained as the year-on-year changes in the policy rate. Percentage changes in the exchange rate Δe_t are measured by year-on-year log changes in the U.S. dollar exchange rate (measured as depreciation of the currency). The monthly data series used in the SVAR model of $z_t = (\Delta o_t, \Delta u_t, \Delta p_t, \Delta r_t, \Delta e_t)'$ are also depicted over time in Figure 1.

3 Empirical Results

This section depicts the benchmark empirical results.

3.1 Drivers of Turkish Inflation

This section depicts the elasticity of Turkish inflation with respect to other variables, its historical decomposition over time, and its forecast error variance decomposition.

We first focus on the elasticity of inflation with respect to other variables obtained by the corresponding cumulative impulse response (CIR) functions. This is similar to earlier studies such as by Shambaugh (2008), Forbes, Hjortsoe, and Nenova (2018), Ha, Stocker, and Yilmazkuday (2020) or Yilmazkuday (2021) who have obtained continuous pass-through measures over time that are independent of the scale of the variables considered. Formally, the unemployment elasticity of inflation, which corresponds to the unemployment rate pass-through into Turkish inflation, is calculated according to the following expression:

$$\text{Unemployment Rate Pass-Through} = \frac{\text{CIR of Inflation to an Unemployment Shock}}{\text{CIR of Unemployment to an Unemployment Shock}}$$

Similarly, the policy elasticity of inflation, which corresponds to the policy rate pass-through into Turkish inflation, is calculated according to the following expression:

$$\text{Policy Rate Pass-Through} = \frac{\text{CIR of Inflation to a Policy Shock}}{\text{CIR of Policy Rate to a Policy Shock}}$$

The exchange rate elasticity of inflation, which corresponds to the exchange rate pass-through into Turkish inflation, is calculated according to the following expression:

$$\text{Exchange Rate Pass-Through} = \frac{\text{CIR of Inflation to an Exchange Rate Shock}}{\text{CIR of Exchange Rate to an Exchange Rate Shock}}$$

Finally, the global oil price elasticity of inflation, which corresponds to the oil price pass-through into Turkish inflation, is calculated according to the following expression:

$$\text{Oil Price Pass-Through} = \frac{\text{CIR of Inflation to an Oil Price Shock}}{\text{CIR of Oil Price to an Oil Price Shock}}$$

It is important to emphasize that these elasticity (or pass-through) measures can be calculated for any period following a shock.

The corresponding results are given in Figure 2. As is evident, policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 0.7% of a reduction in inflation after five years. The exchange rate-pass through is about 26% after five years, which is consistent with earlier studies such as by Kara and Öğünç (2008) or Yilmazkuday (2020). The oil price pass-through is about 14% after five years, which is in line with earlier studies such as by Dedeoğlu and Kaya (2014), Akcelik and Öğünç (2016) or Ozgur, Aydin, Karagol, and Ozbugday (2021). Finally, the unemployment rate pass-through is not different from zero when the 68% credible intervals are considered, except for the very short run. Therefore, based on elasticity measures, Turkish inflation is driven by the policy rate, exchange rate and global oil prices.

The historical decomposition of Turkish inflation is given in Figure 3, where, following its own shocks, inflation has historically been driven by shocks of exchange rates and global oil prices. Policy rate shocks have also contributed to inflation occasionally, although this has been limited compared to shocks of exchange rates and global oil prices. One additional detail to observe is that the contribution of exchange rate has increased over time. Hence, based on its historical decomposition, Turkish inflation is mostly driven by the exchange rate and global oil prices.

The forecast error variance decomposition of Turkish inflation is given in Table 1 for alternative horizons. As is evident, exchange rate and global oil prices contribute the most to the volatility of inflation, following its own shocks. Specifically, about 40% of the variance is explained by global oil prices, whereas about 17% of the variance is explained by exchange rate movements. Hence, based on its forecast error variance decomposition, Turkish inflation is mostly driven by the exchange rate and global oil prices.

Overall, Turkish inflation is mostly driven by shocks of global oil prices and exchange rates. This is consistent with earlier studies such as by Ciccarelli and Mojon (2010), Mumtaz, Simonelli, and Surico (2011), Patnaik, Shah, and Bhattacharya (2011) or Charnavoki and Dolado (2014) who have shown that contributions of global factors and exchange rates to domestic inflation are high and significant. As the empirical results also show that the contribution of positive policy rate shocks to Turkish inflation is negative and significant (in line with studies such as by Mohanty, Turner, et al. (2008) or Vonnák (2008)), it is implied that a conventional monetary policy increasing policy rates following an increase in inflation or a depreciation of Turkish currency (lira) would be optimal to achieve and maintain **price stability** in Turkey, which is the primary objective of CBRT.

3.2 Understanding Other Turkish Variables

This section focuses on the elasticity, historical decomposition, and forecast error variance decomposition of Turkish variables other than inflation. The corresponding tables and figures are depicted in the Online Appendix.

Based on the elasticity measures, unemployment increases with inflation, which is in line with having negative supply shocks in the Turkish economy resulting in higher inflation and higher unemployment. The positive effects of policy rate on unemployment can be explained by a contractionary monetary policy, whereas the negative effects of global oil prices on unemployment can be explained by higher demand in the global economy.

The policy rate goes down with higher unemployment, whereas it goes up with higher inflation, higher exchange rate or higher global oil prices. This is consistent with the implications of a monetary policy in an open economy (e.g., see Clarida, Gali, and Gertler (2001)), where the central bank increases its policy rate following an increase in inflation or a reduction in unemployment that can be caused by domestic factors as well as global factors. The exchange is mostly driven by positive inflation changes or negative policy rate changes, about one-to-one in the long run, which is consistent with the purchasing power parity (or a stable real exchange rate over time). It is implied that a conventional monetary policy increasing policy rates would be optimal to reduce the depreciation of Turkish lira.

Based on historical decomposition analyses, unemployment is mostly driven by global oil prices (following its own shocks), although the policy rate and inflation also contribute occasionally. The policy rate is determined by using the contribution of almost all variables over time, whereas the exchange rate is mostly driven by its own shocks, with minor contributions of inflation, policy rate and global oil prices. The forecast error variance decomposition analyses in the long run (i.e., after five years) suggest that unemployment and policy rate are mostly driven by global oil prices (following their own shocks), whereas the exchange rate is mostly driven by inflation and global oil prices (following its own shocks).

4 Robustness Checks

This section achieves several robustness checks to confirm the validity of the benchmark results depicted in the previous section. For these robustness checks, we focus on the drivers of Turkish inflation (measured by the forecast error variance decomposition of Turkish inflation after 5 years) and the effectiveness of the monetary policy rate on Turkish inflation (measured by the elasticity of Turkish inflation with respect to the Turkish policy rate over time).

4.1 Robustness #1

The first robustness that we consider is related to the ordering of variables. Specifically, as indicated in studies such as by Calvo and Reinhart (2002), central banks in emerging markets often raise interest rates to stem currency depreciation. This opens the possibility for the exchange rate (Δe_t) to be ordered before the monetary policy rate (Δr_t). Accordingly, for robustness #1, we utilize the alternative ordering of variables as in $z_t = (\Delta o_t, \Delta u_t, \Delta p_t, \Delta e_t, \Delta r_t)'$, where the only difference with respect to the benchmark model is the order of Δe_t and Δr_t.

The results in Table 2 show that the drivers of Turkish inflation are virtually the same when this alternative ordering of variables is considered. Similarly, the results in Figure 4 for this robustness #1 show that policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 0.9% of a reduction in inflation after five years. Therefore, the benchmark results are robust to consideration of alternative ordering of variables.

4.2 Robustness #2

The second robustness that we consider is related to the potential contribution of output growth on inflation as shown to be significant in studies such as by Nasir, Naidoo, Shahbaz, and Amoo (2018), Nasir, Al-Emadi, Shahbaz, and Hammoudeh (2019) and Nasir, Balsalobre-Lorente, and Huynh (2020). Accordingly, for robustness #2, we utilize the model of $z_t = (\Delta o_t, \Delta g_t, \Delta u_t, \Delta p_t, \Delta e_t, \Delta r_t)'$, where the only difference with respect to the benchmark model is the new variable of output growth Δg_t that is measured as year-on-year percentage changes in the production of total industry in Turkey obtained from FRED.

The results in Table 2 show that the drivers of Turkish inflation are virtually the same when the additional variable of output growth is considered. Similarly, the results in Figure 4 for this robustness #2 show that policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 0.8% of a reduction in inflation after five years. Therefore, the benchmark results are robust to consideration of including Turkish output growth.[2]

4.3 Robustness #3

The third robustness that we consider is related to the potential contribution of global economic activity on Turkish inflation as suggested in studies such as by Ha, Kose, Ohnsorge, and Yilmazkuday (2019) and Ha, Stocker, and Yilmazkuday (2020). Accordingly, for robustness #3, we utilize the model of $z_t = (\Delta a_t, \Delta o_t, \Delta u_t, \Delta p_t, \Delta e_t, \Delta r_t)'$, where the only difference with respect to the benchmark model is the new variable of global economic activity growth Δa_t that is measured as year-on-year changes in the index of global real economic activity obtained from FRED.

The results in Table 2 show that the drivers of Turkish inflation are very similar when the additional variable of global economic activity growth is considered; the only difference is that part of the contribution of global oil prices in the benchmark model is now achieved by the global economic activity growth as we call it as the global demand. Similarly, the results in Figure 4 for this robustness #3 show that policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 0.7% of a reduction in inflation after five years. Therefore, the benchmark results are robust to consideration of including global economic activity growth.

4.4 Robustness #4

The fourth robustness that we consider is related to the distinction between oil-specific supply shocks versus global demand shocks as in studies such as by Kilian (2009). Accordingly, for

[2] Although the results are not shown here to save space, the only difference (with respect to the benchmark model) of including Turkish output growth into our analysis is having its contribution to the forecast error variance decomposition of unemployment (about 22%).

robustness #4, we utilize the model of $z_t = (\Delta d_t, \Delta os_t, \Delta u_t, \Delta p_t, \Delta e_t, \Delta r_t)'$, where the only difference with respect to the benchmark model is replacing Δo_t with Δd_t that represents year-on-year percentage changes in global demand and Δos_t that represents year-on-year changes in oil-specific supply. In this model, Δos_t is measured by the residuals of a regression, where year-on-year percentage changes in oil prices (Δo_t) are regressed on year-on-year percentage changes in global price index of all commodities (obtained from FRED); Δd_t is measured as the fitted values of this regression.

The results in Table 2 show that the drivers of Turkish inflation are very similar when Δo_t in the benchmark model is replaced by Δd_t and Δos_t; the only difference is that the contribution of global oil prices in the benchmark model is now achieved by Δd_t (that we call as global demand) and Δos_t (that we call as oil supply). Similarly, the results in Figure 4 for this robustness #4 show that policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 1% of a reduction in inflation after five years. Therefore, the benchmark results are robust to distinguishing between oil-specific supply shocks versus global demand shocks.

4.5 Robustness #5

The fifth robustness that we consider is related to the U.S. monetary policy spillovers to emerging countries as discussed in studies such as by Bluedorn and Bowdler (2011) and Georgiadis (2016). Accordingly, we utilize the model of $z_t = (\Delta o_t, \Delta f_t, \Delta u_t, \Delta p_t, \Delta e_t, \Delta r_t)'$ for robustness #5, where the only difference with respect to the benchmark model is having year-on-year changes in federal funds rate Δf_t as an additional variable. In this model, Δf_t is measured based on the Wu-Xia shadow rates to control for the zero lower bound of federal funds rate as detailed in Wu and Xia (2016).

The results in Table 2 show that the drivers of Turkish inflation are very similar when the additional variable of Δf_t is considered; the only difference is that the contribution of global oil prices in the benchmark model is partly (about 5%) explained by changes in federal funds rate. Similarly, the results in Figure 4 for this robustness #5 show that policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 0.8% of a reduction in inflation after five years. Therefore, the benchmark results are robust to the consideration of including federal funds rate in the model.

4.6 Robustness #6

The sixth robustness that we consider is related to the effects of global financial cycles on the Turkish inflation as in studies such as by Loipersberger and Matschke (2022). Accordingly, for robustness #6, we utilize the model of $z_t = (\Delta o_t, \Delta v_t, \Delta u_t, \Delta p_t, \Delta e_t, \Delta r_t)'$, where the only difference with respect to the benchmark model is having year-on-year percentage changes in Chicago Board Options Exchange Volatility Index (VIX) Δv_t as an additional variable (that is obtained from FRED) to gauge the global financial market sentiment.

The results in Table 2 show that the drivers of Turkish inflation are very similar when the additional variable of Δv_t is considered; the only difference is that the contribution of global oil prices in the benchmark model is partly (about 10%) explained by changes in VIX. Similarly, the results in Figure 4 for this robustness #6 show that policy rate pass-through is negative and significant based on the 68% credible intervals. Regarding the corresponding magnitude, 1% of a change in the policy rate results in about 0.6% of a reduction in inflation after five years. Therefore, the benchmark results are robust to the consideration of global financial cycles.

5 Discussion of Results and Concluding Remarks

This paper has investigated the drivers of Turkish inflation that has deviated from inflation rates in other emerging markets. A structural autoregression model has been considered, where monthly data on global oil prices, Turkish inflation, unemployment rate, policy rate and exchange rate have been used.

The results based on impulse response functions have shown that policy rate pass-through into Turkish inflation is negative and significant, where 1% of a change in the policy rate results in about 0.7% of a reduction in inflation in the long run. The exchange rate-pass through into Turkish inflation has been shown to be about 26%, whereas the oil price pass-through into Turkish inflation has been shown to be about 14% in the long run. The historical decomposition analysis has further suggested that Turkish inflation has historically been driven by shocks of global oil prices and exchange rates, where the contribution of the latter has increased over time. Although policy rate shocks have also contributed to inflation historically, this contribution has been limited compared to those by shocks of exchange rates and global oil prices. The forecast error variance decomposition of Turkish inflation has additionally suggested that about 40% of its variance is explained by global oil prices, whereas about 17% of its variance is explained by exchange rate movements. These empirical results are robust to the consideration of alternative estimation strategies or variables included in the analysis.

It is implied that Turkish inflation is mostly driven by shocks of global oil prices and exchange rates, although the relatively lower contribution of positive policy rate shocks is still negative and significant. As additional empirical results show that exchange rate depreciation can be reduced by positive policy rate shocks, a conventional monetary policy of increasing policy rates following an increase in inflation or a depreciation of Turkish currency (lira) would be optimal to achieve and maintain **price stability** in Turkey, which is the primary objective of CBRT. Therefore, reducing policy rates due to political pressures despite high inflation rates, which is an unorthodox monetary policy, would not be successful to fight against Turkish inflation based on the empirical results of this paper. This result supports the importance of central bank independence for a successful monetary policy.

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Table 1 - Forecast Error Variance Decomposition of Inflation

Contribution of:	After 1 Month	After 1 Quarter	After 1 Year	After 5 Years
Unemployment	0.9%	0.7%	0.8%	1.6%
Inflation	88.2%	77.4%	46.2%	40.0%
Policy Rate	0.0%	0.1%	1.7%	3.5%
Exchange Rate	1.1%	5.5%	15.5%	17.1%
Global Oil Prices	9.8%	16.3%	35.7%	37.9%

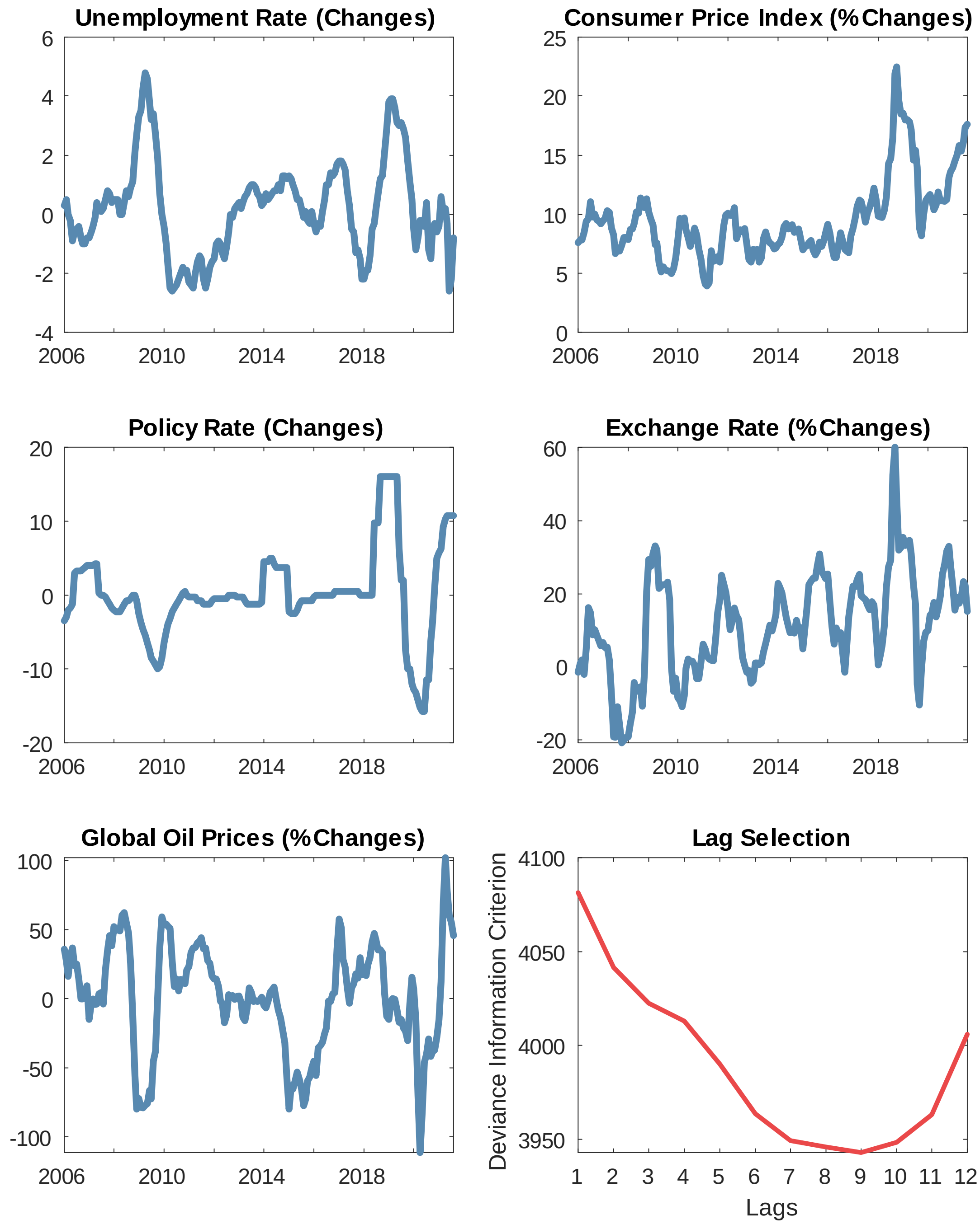
Notes: The estimates represent the median across 1,000 draws.

Table 2 - Robustness Checks for FEVD of Inflation After 5 Years

Contribution of:	#1	#2	#3	#4	#5	#6
Unemployment	1.7%	0.9%	2.0%	2.1%	1.7%	1.5%
Inflation	40.1%	42.3%	40.5%	40.1%	42.5%	37.4%
Policy Rate	4.0%	3.3%	3.0%	4.2%	3.1%	2.7%
Exchange Rate	16.3%	16.6%	20.2%	16.7%	15.5%	21.8%
Global Oil Prices	37.8%	35.7%	17.5%	–	31.9%	26.6%
Output Growth	–	1.2%	–	–	–	–
Global Demand	–	–	16.8%	31.6%	–	–
Oil Supply	–	–	–	5.3%	–	–
Federal Funds Rate	–	–	–	–	5.3%	–
CBOE Volatility Index	–	–	–	–	–	9.9%

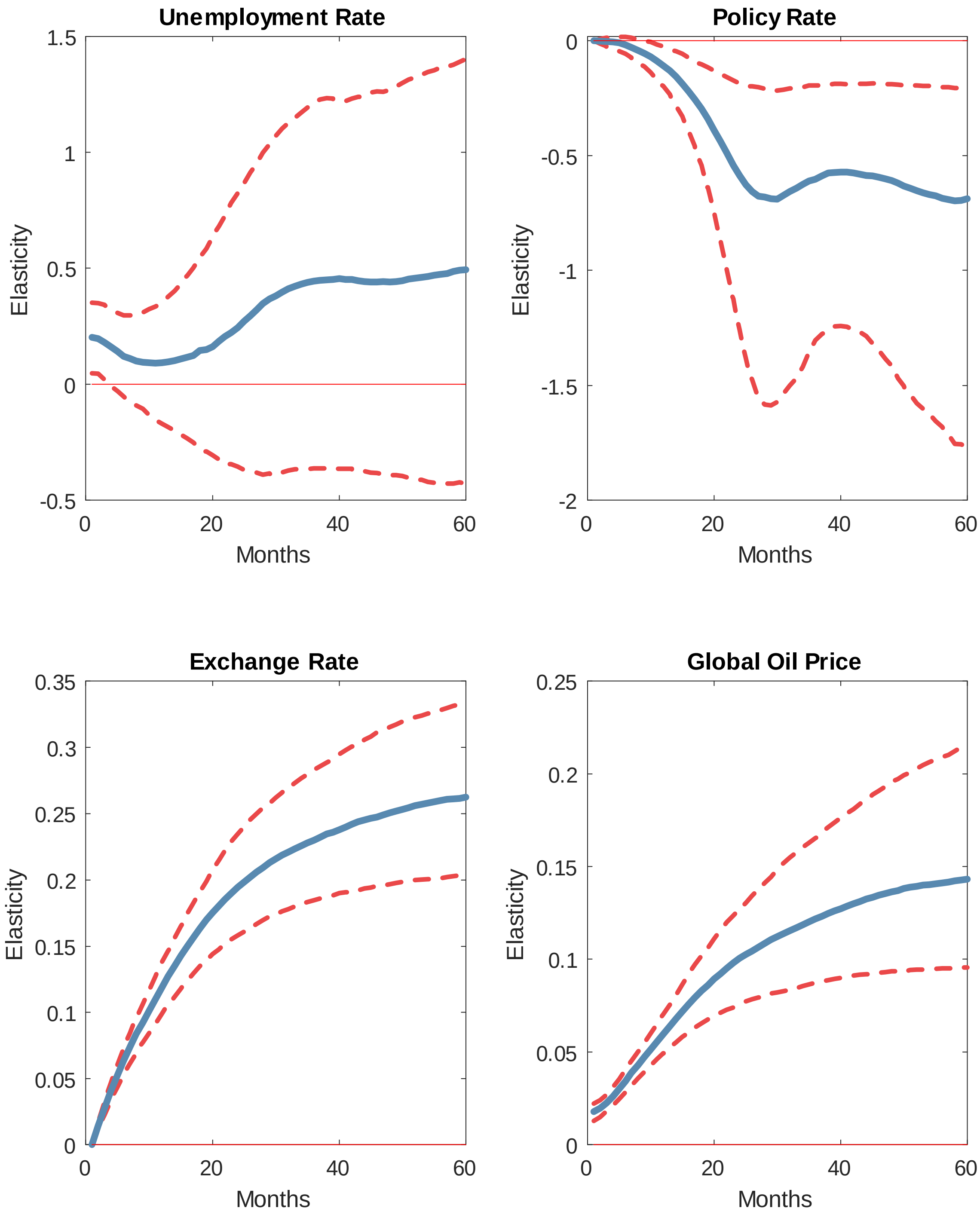
Notes: FEVD stands for forecast error variance decomposition. The estimates represent the median across 1,000 draws.

Figure 1 - Descriptive Statistics and Lag Selection



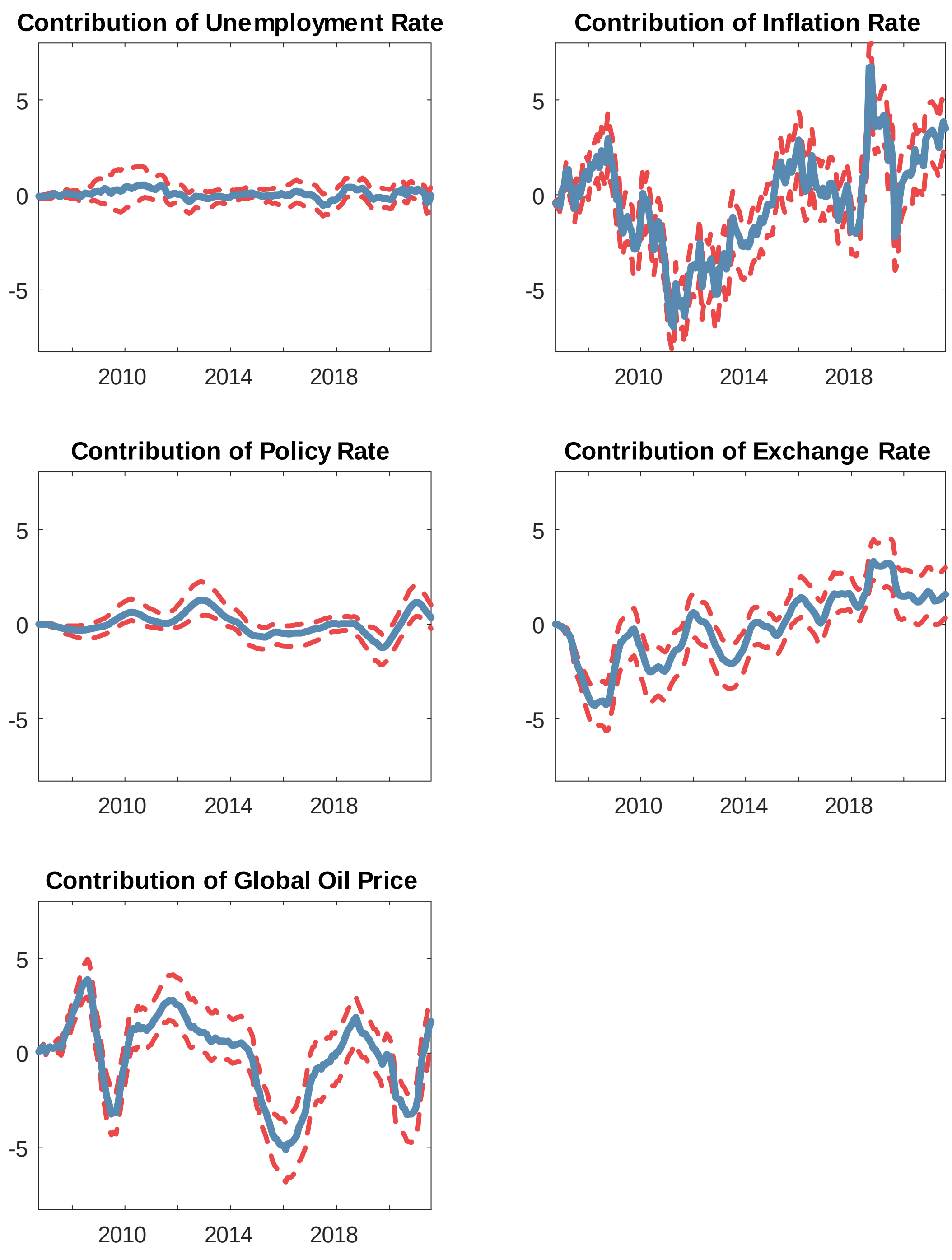
Notes: Series represent those used in the estimation.

Figure 2 - Elasticity of Inflation with Respect to Alternative Variables



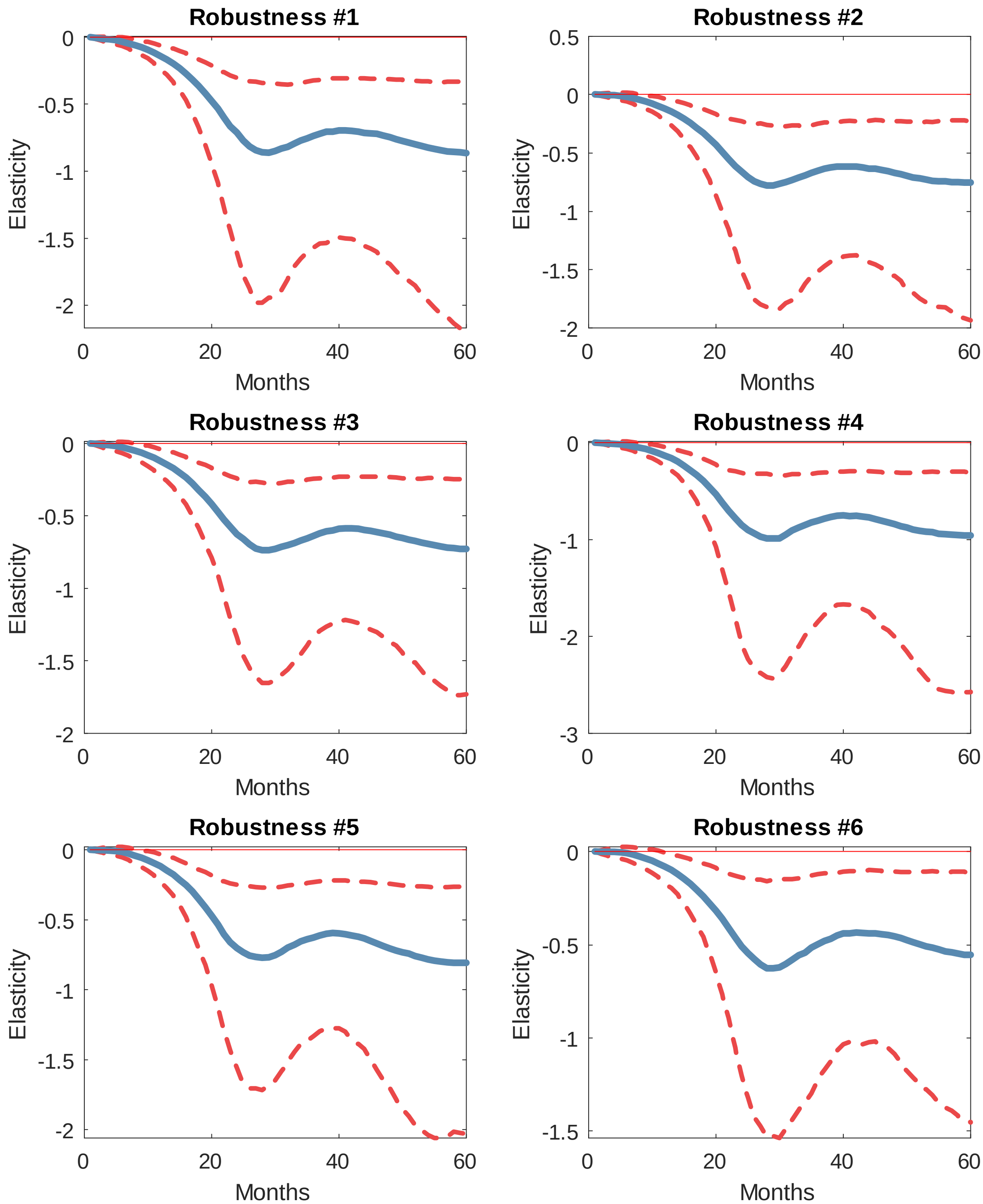
Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Figure 3 - Historical Decomposition of Inflation



Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Figure 4 - Robustness for Elasticity of Inflation with Respect to Policy Rate



Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

6 Appendix Tables and Figures (Online Publication)

Appendix Table A1 - Forecast Error Variance Decomposition of Unemployment

Contribution of:	After 1 Month	After 1 Quarter	After 1 Year	After 5 Years
Unemployment	98.3%	93.0%	76.6%	65.8%
Inflation	0.0%	0.4%	4.2%	6.4%
Policy Rate	0.1%	0.6%	5.5%	7.1%
Exchange Rate	0.0%	0.1%	0.9%	2.7%
Global Oil Prices	1.6%	6.0%	12.7%	18.0%

Notes: The estimates represent the median across 1,000 draws.

Appendix Table A2 - Forecast Error Variance Decomposition of Policy Rate

Contribution of:	After 1 Month	After 1 Quarter	After 1 Year	After 5 Years
Unemployment	2.4%	2.1%	3.5%	7.7%
Inflation	8.9%	11.3%	13.3%	12.1%
Policy Rate	86.8%	78.7%	47.4%	43.2%
Exchange Rate	0.6%	2.9%	14.8%	14.6%
Global Oil Prices	1.3%	5.0%	21.0%	22.4%

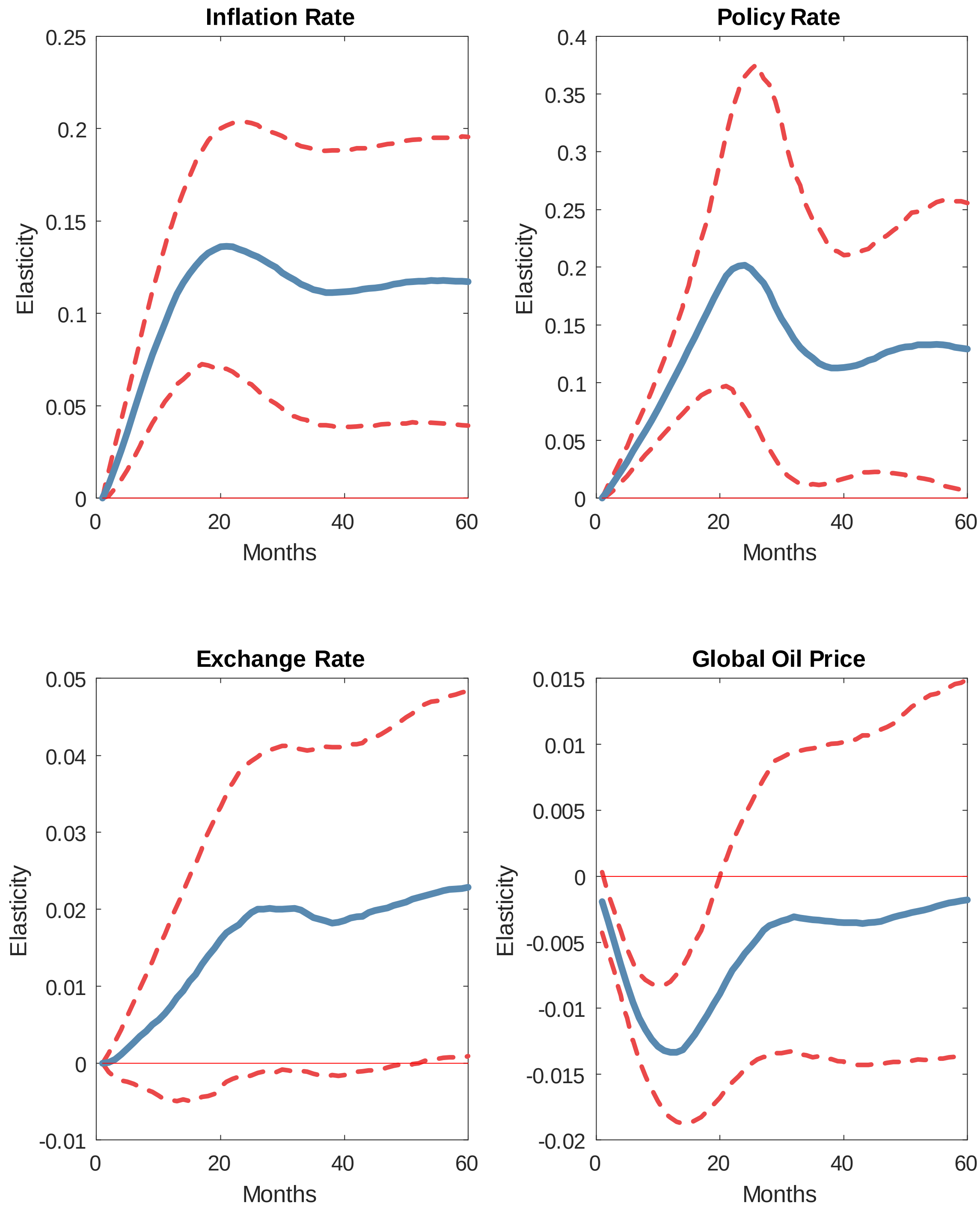
Notes: The estimates represent the median across 1,000 draws.

Appendix Table A3 - Forecast Error Variance Decomposition of Exchange Rate

Contribution of:	After 1 Month	After 1 Quarter	After 1 Year	After 5 Years
Unemployment	0.2%	0.5%	1.5%	2.5%
Inflation	8.5%	7.8%	7.5%	8.3%
Policy Rate	0.4%	0.5%	2.3%	3.5%
Exchange Rate	88.7%	89.3%	85.5%	79.3%
Global Oil Prices	2.1%	2.0%	3.2%	6.4%

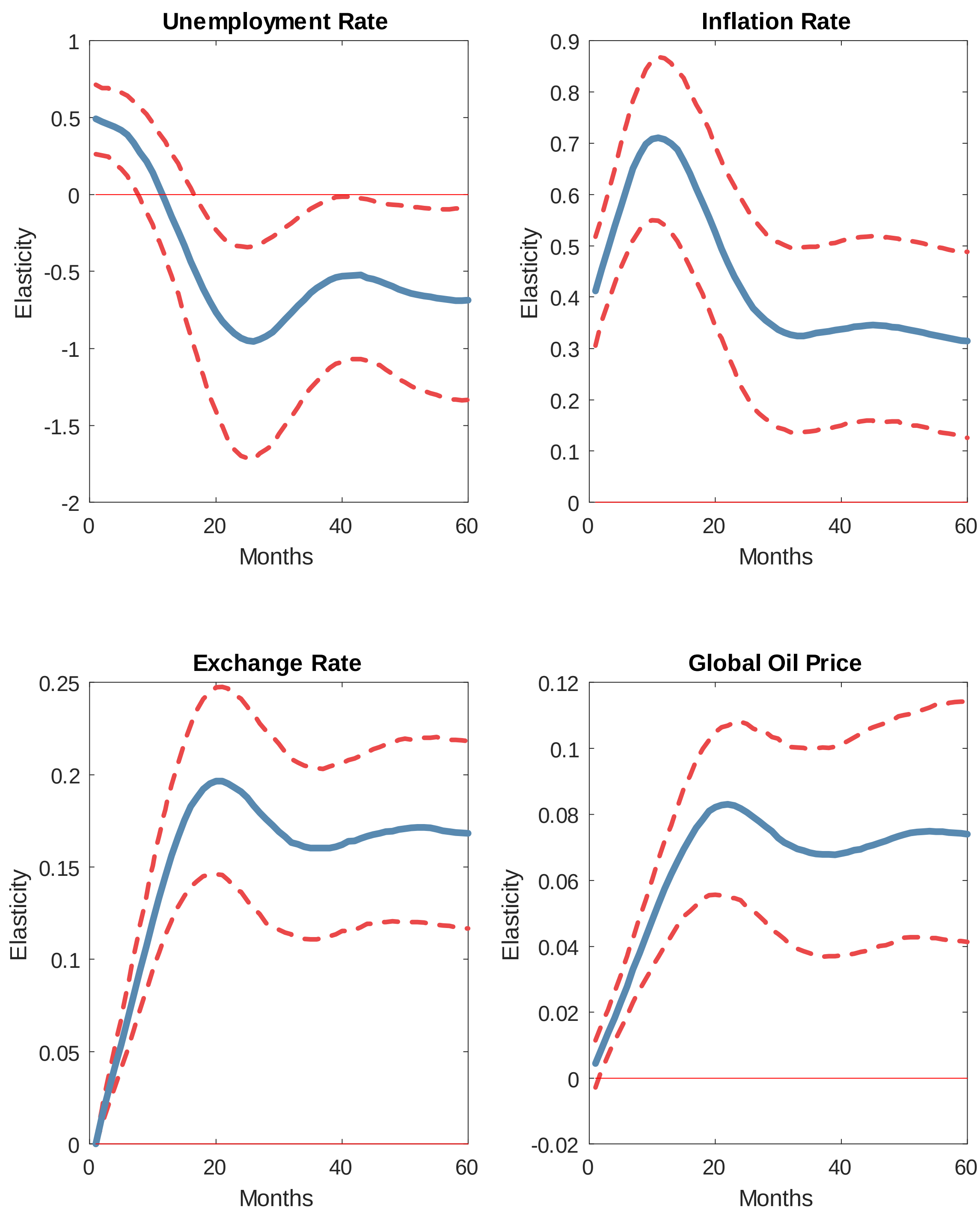
Notes: The estimates represent the median across 1,000 draws.

Appendix Figure A1 - Elasticity of Unemployment



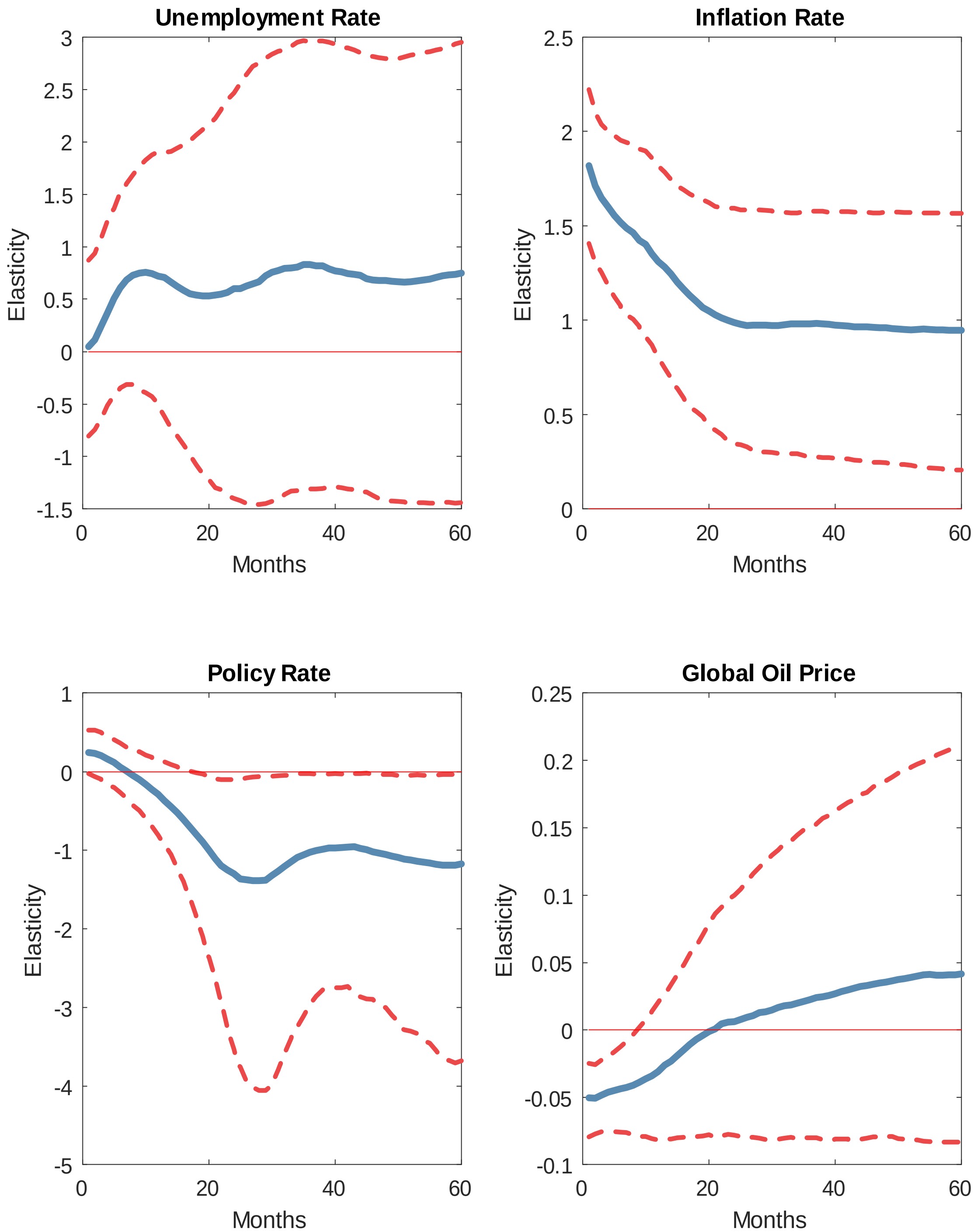
Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Appendix Figure A2 - Elasticity of Policy Rate



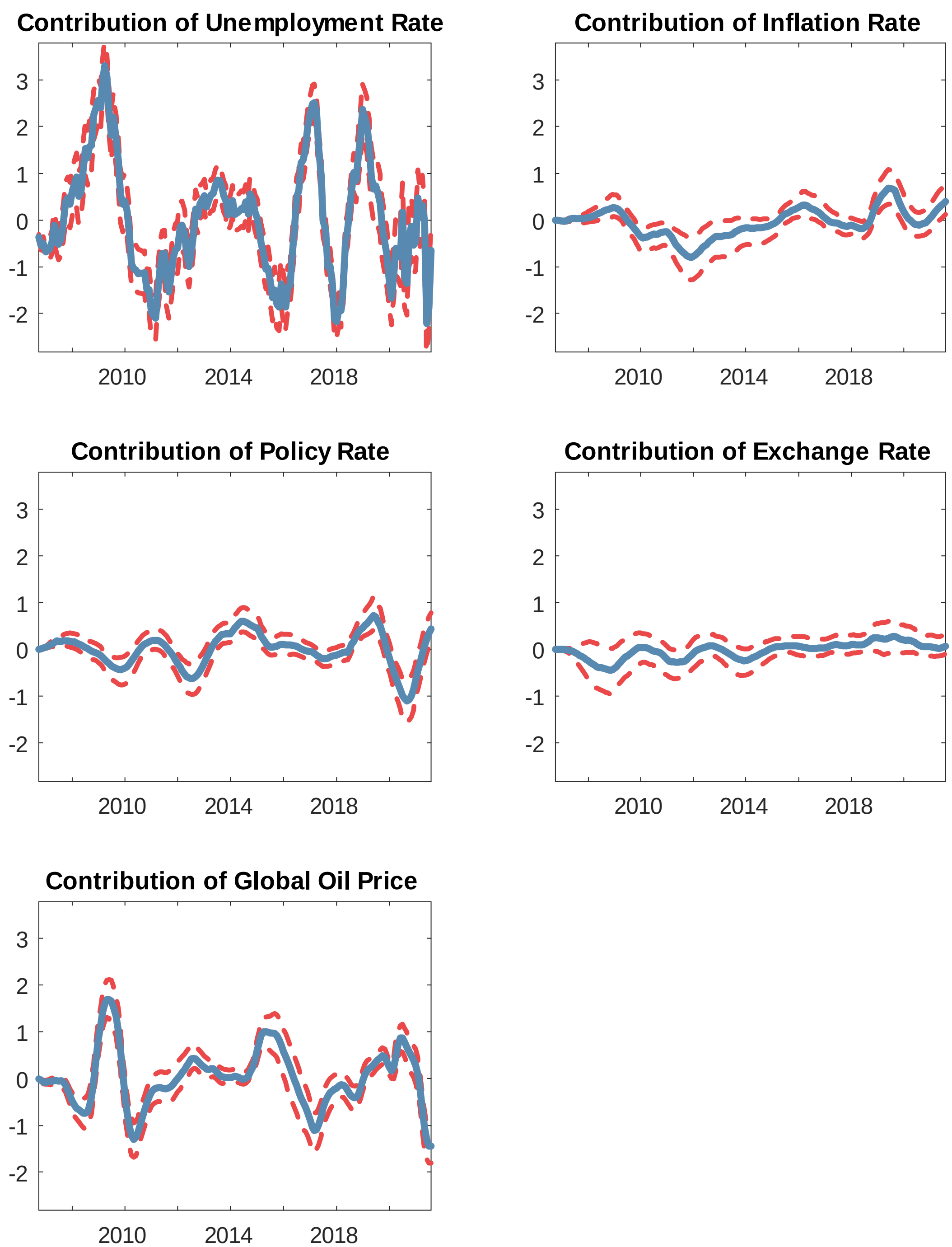
Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Appendix Figure A3 - Elasticity of Exchange Rate



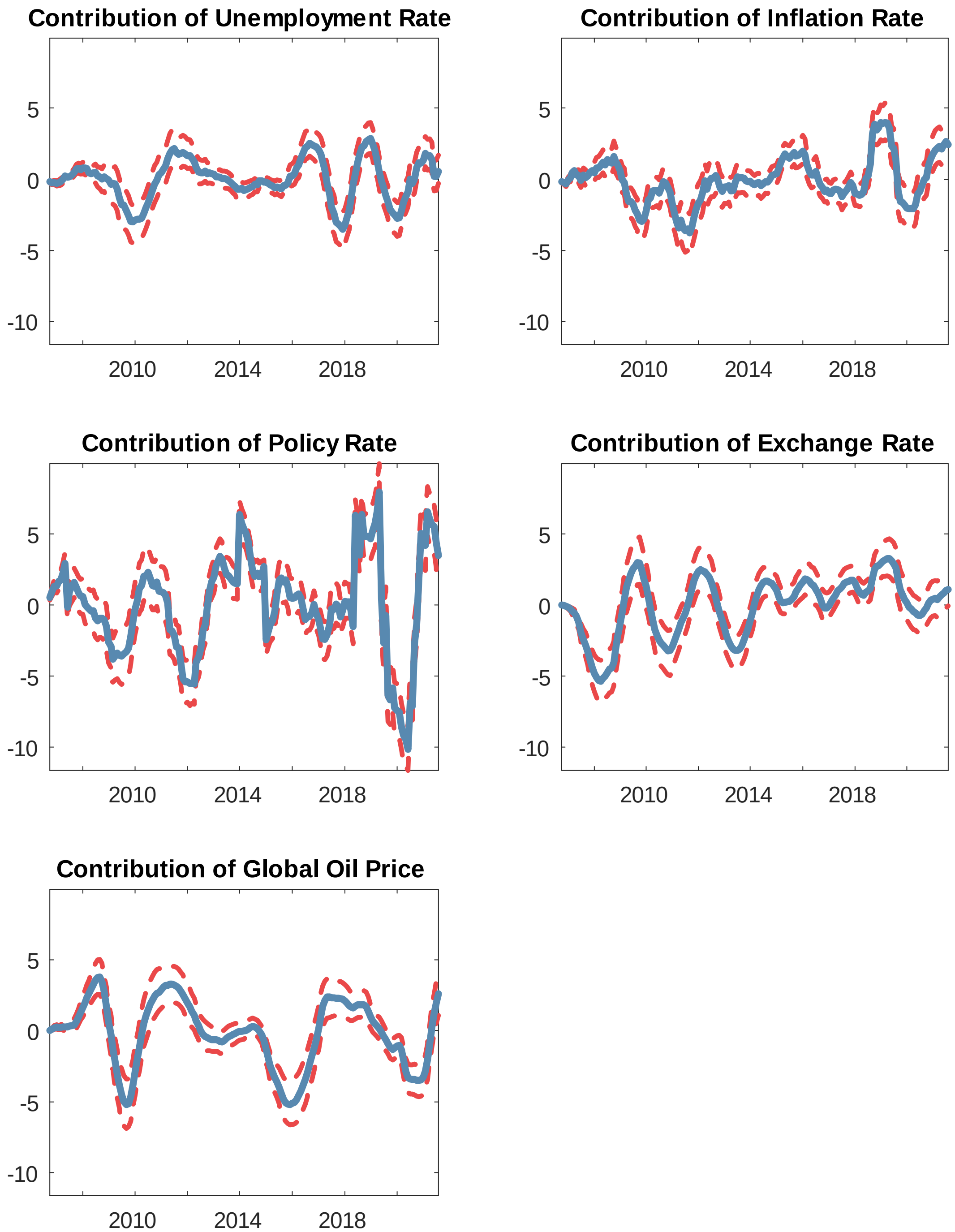
Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Appendix Figure A4 - Historical Decomposition of Unemployment Rate



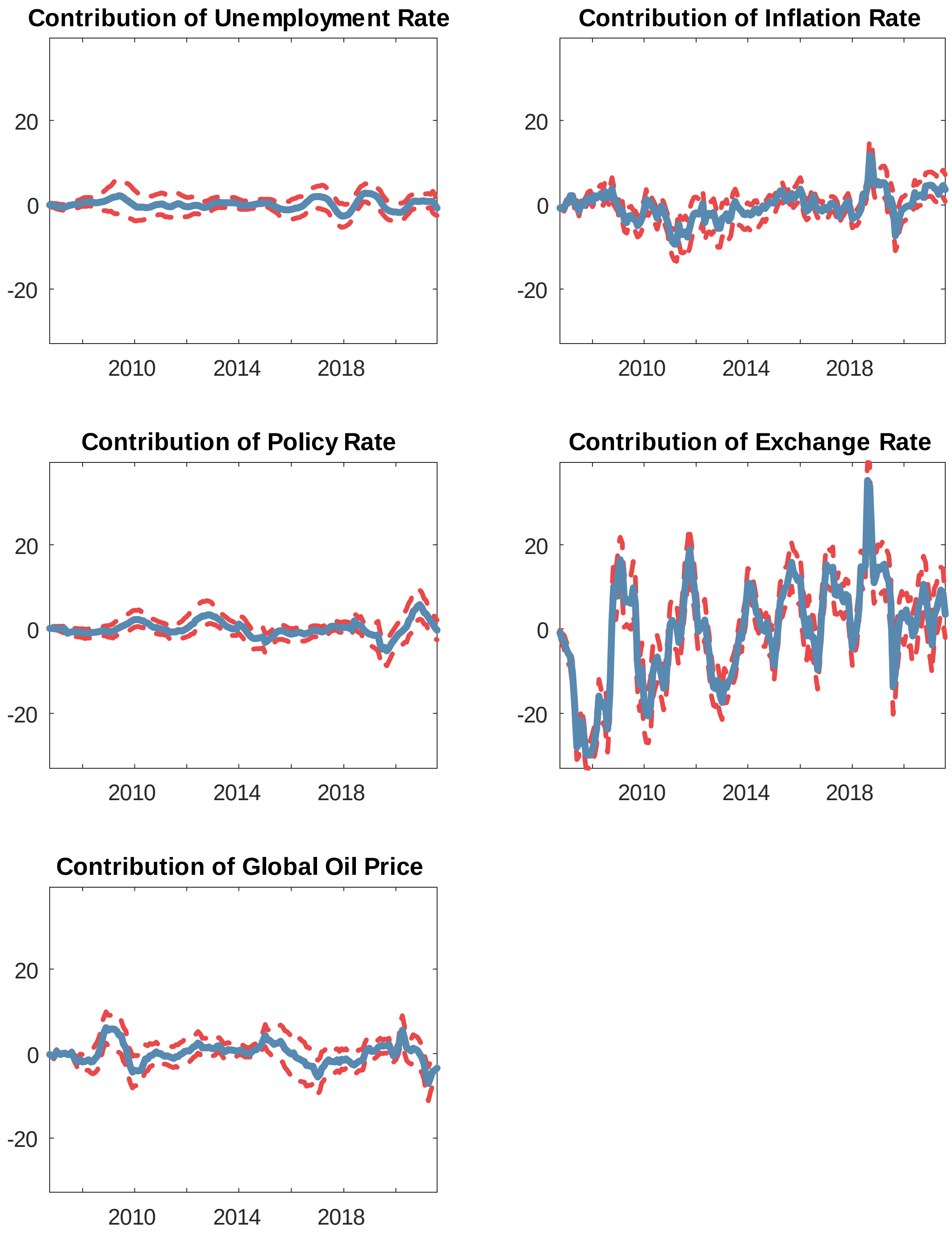
Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Appendix Figure A5 - Historical Decomposition of Policy Rate



Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.

Appendix Figure A6 - Historical Decomposition of Exchange Rate



Notes: The solid lines represent the estimates, while dashed lines represent lower and upper bounds that correspond to the 68% credible intervals.