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„The influence of US economic shocks on the emerging economies of Turkey and Mexico”

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Abstract

The impact of changes in short-term interest rates and monetary stimulus shocks in the US on Turkish and Mexican economies has been investigated using the structural vector autoregressive (VAR) model. This model has five domestic macroeconomic variables relating to Turkey and Mexico, and one exogenous shock variable relating to the US. In both countries, strong changes are found in four macroeconomic variables in response to US short-term interest rate and monetary stimulus shocks.

Keywords: Monetary policy, international transmission, macroeconomic interdependence, structural vector autoregressions

Abstract (Deutsch)

In dieser Magisterarbeit wurde der Einfluss untersucht, wie sich Änderungen vom amerikanischen kurzfristigen Zinssatz und Geldmengenschock auf die türkische und mexikanische Volkswirtschaften auswirken. Dafür wurde ein strukturelles Vektorautoregressionsmodell benutzt. Dieses Modell besitzt – bezogen auf die Türkei und Mexiko- fünf inländische, makroökonomische Variablen und eine exogene, amerikanische Schockvariable. Es wurden in beiden Ländern bei vier Variablen starke Schwankungen beobachtet, als Antwort auf einen kurzfristigen Zinssatz- und Geldmengenschock der USA.

Schlüsselwörter: Geldmengenpolitik, internationale Auswirkung, makroökonomische Unabhängigkeit, strukturelle Vektorautoregression

1 Introduction

The increased globalization of the world economy over the past thirty years has been reflected in the intensified dependence of emerging markets on developments in the US economy. While significant rise in capital inflows to emerging markets has been caused primarily by the structural reforms in these countries, it has also been driven by changing conditions in developed countries that have encouraged investors to diversify their portfolios into emerging country assets. Calvo, Leidermann and Reinhart (1993) concluded that especially conditions outside the developing markets explain the capital inflows from developed to the emerging markets. The first dramatic amount of large capital mobility from developed to developing countries commenced in the 1990s and ended with the Asian crisis in 1997 (Mishkin 1999). This crisis began in July 1997 in the East Asian countries and had destructive effects on their economies. The second one started in the beginning of the 2000s and ebbed in 2008 due to the global financial crisis, which began with the Lehman bankruptcy in September 2008. Dooley and Hutchison (2009) found that the emerging markets responded strongly to the crisis on the US financial market in 2008. Of course on the one hand capital inflows create benefits due to the increasing financial integration, but on the other hand it confronted policy makers with huge problems as a consequence of their potential to create loss of competitiveness, overheating and increased vulnerability to crisis. Cardarelli, Elekdag and Kose (2010) investigated net private capital inflows to 52 countries from 1987 to 2007. They found that capital inflows in emerging markets lead first to stronger GDP growth but that afterwards growth has often decreased dramatically. For example, in the case of the financial crisis in Asia, growth rates of countries like Thailand or

Indonesia had been in excess of 5% before 1997, but turned sharply negative in 1998. The reason for fluctuations in such macroeconomic variables is capital mobility.

In this paper, the effects of economic shocks originating in the US on two emerging economies, Turkey and Mexico, are measured and analyzed. We use a structural VAR model to analyze the influence of an US shock on domestic macroeconomic variables in Turkey and Mexico.

Turkey is in the “fragile five” group of countries (Morgan Stanley Research, 2013). All members of the “fragile five” group are characterized by emerging markets and impressive economic growth. Turkey has experienced massive economic development over the last 14 years, which has, in fact, always been connected with its political situation (Akyüz and Boratav, 2003). Many political crises and military interventions prevented Turkey from attaining stable and positive economic development for a long time; thus, crucial reforms and remediation of its economy were long missing. Moreover, currency fluctuations of the Turkish lira prevented long-term economic stability.

The "fragile five" – Turkey, Brazil, India, Indonesia and South Africa – are considered sensible if there is an outflowing of foreign capital due to higher interest rates on the US financial market which expected to guarantee higher returns. The reason for the vulnerability is that all “fragile five” countries have a big current account deficit. If a country’s current account deficit is stable over a long period, then it needs a continuous foreign capital inflow to finance this gap. Otherwise, countries with high current account deficits face financial crises if capital inflows are absent from foreign countries (Chang and Velasco, 1999). That is why economists describe the five emerging markets as “fragile”. This is one important argument, why I chose Turkey and Mexico as my investigations. The problem of a high current

account deficit is not limited to Turkey (Fig. 1). Mexico is not a member of the “fragile five”, due to the fact that there economic growth is much smoother. Mexico has created a more stable economy over the last 30 years. During the same period Mexico did not grow more than 3% per year, in real terms.

Another argument why I choose these two emerging countries is the assumption that the most vulnerable should be those countries which debt is owned by foreign investors, since that debt could be sell off which would increase borrowing costs for these countries. Is this the case? A good reason, why we should find strong evidence for fluctuations in macroeconomic variables in Turkey and Mexico after a US financial shock, is that foreign investors own more than 22% of Turkey´s debt market now (Fig. 2) and even more in Mexico. Foreigners own about 40% of Mexico's debt market now, compared with just 2.5% in 2003. Thus, it is reasonable to think that US monetary policy could play a crucial role in Turkey’s and Mexico´s economy. However, one important difference to Turkey — with regard to my investigations — is that Mexico is geographically closer to the US, which implies that it is able to maintain a very strong trade relationship with the US (Fig. 3) especially through the North American Free Trade Agreement (NAFTA). Turkey’s trade volume with the US is not that high (Fig. 4). Northern Mexico, in particular, maintains strong trade ties with the US, with oil being a main source of export earnings for Mexico (Lustig, 2000). In addition, money transfers from Mexicans living in the US are very important for the Mexican economy. Therefore, trade between the US and Mexico is more substantial than that between Turkey and the US. That is why we could expect that the shock in the US economy should fluctuate more the macroeconomic variables in Mexico. From my investigations we can draw a conclusion on whether trade relationship to the US economy plays an important role or not.

Simultaneously, the Fed had an expansive monetary policy during the period wherein Turkey and Mexico were growing, i.e. the period studied in my research (Fig. 5). The short-term interest rate had a fluctuating trend (Fig. 6). Until the second quarter of 1999 it had a downward trend. Then it showed an upward trend until the first quarter of 2001 and a downward trend again till the second quarter of 2014.

We know already that capital mobility is the reason for fluctuations in macroeconomic variables. But in emerging countries, it is important to know the source of economic influences (internal or external) and the transmission mechanism (money supply or interest rate shock) responsible for cyclical fluctuations. This research, therefore, uses two external channels: money supply and short-term interest rates. Short-term interest rates signify the interest rate in the money market in the short run. In countries like the US, the money supply channel is deemed important as federal banks often use unconventional methods to stimulate their economies.

In the recent years it gains in importance to understand the economic relationship or economic dependencies between the countries, due to the fact that we have a deeper understanding why a financial crises of one country could spill out to another country.

The next section summarizes some important research in the field of external economic shocks. Also, there are several studies that do not find evidence for fluctuations because of an economic shock. However, it is important to recognize that, with the advancement of globalization, these fluctuations have become stronger (Kose, Prasad and Terrones, 2003).

Since the early 1980s gross capital flows fluctuated approximately from 5% to 20% of the GDP of the advanced countries. This implies a significant increase in capital transmission between the countries. For emerging countries,

the gross capital flows have increased during the same period. This accounts for more than 5% of GDP in these economies. This trend still holds, due to which research on this topic is gaining importance (Kose, Prasad and Terrones, 2003).

Section 3 describes the empirical framework and theoretical background. After this section we have a closer look on the data and test them on an existence of a unit root. Then we present a model, before we present the result of the impulse response functions and the variance decomposition. Last but not least we conclude.

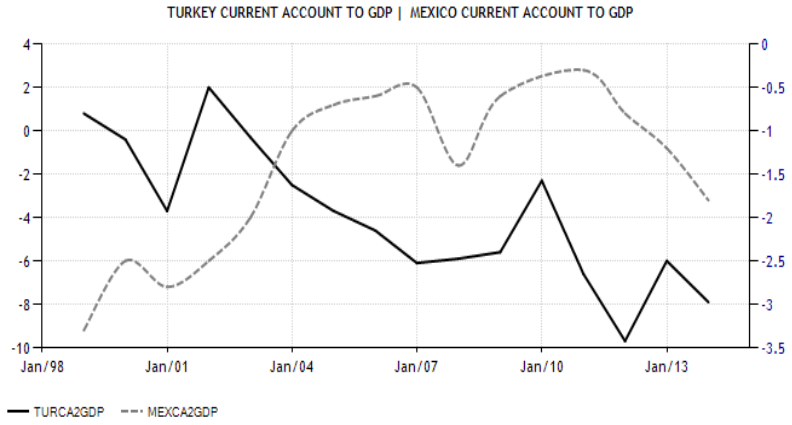

Fig. 1: Ratio of current account to GDP for Mexico and Turkey.
(Source: Trading Economics)

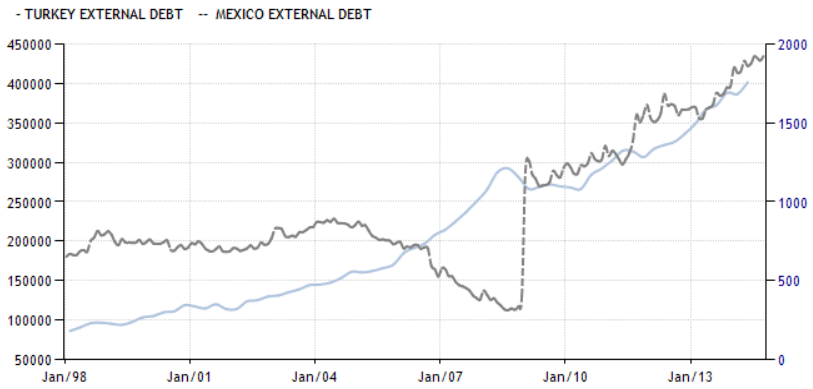

Fig. 2: Turkey and Mexico external debt.
(Source: Trading Economics)

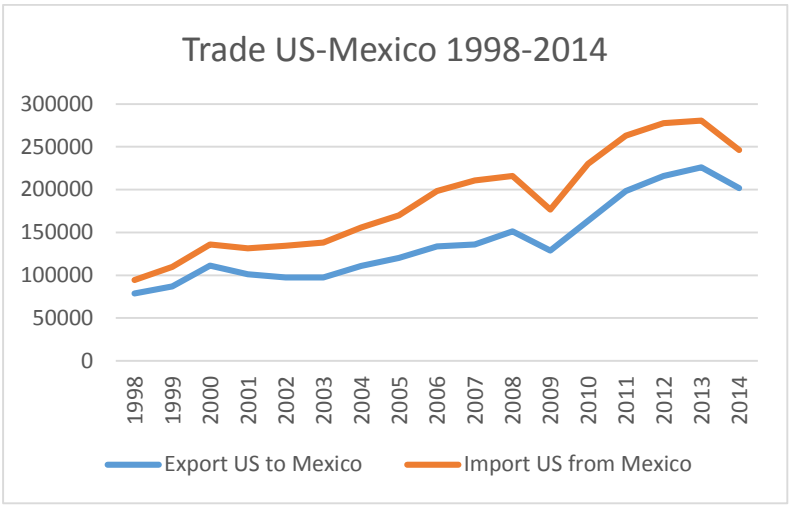

Fig. 3: US-Mexico bilateral trade (Million USD)
(Source: US Cencus Bureau)

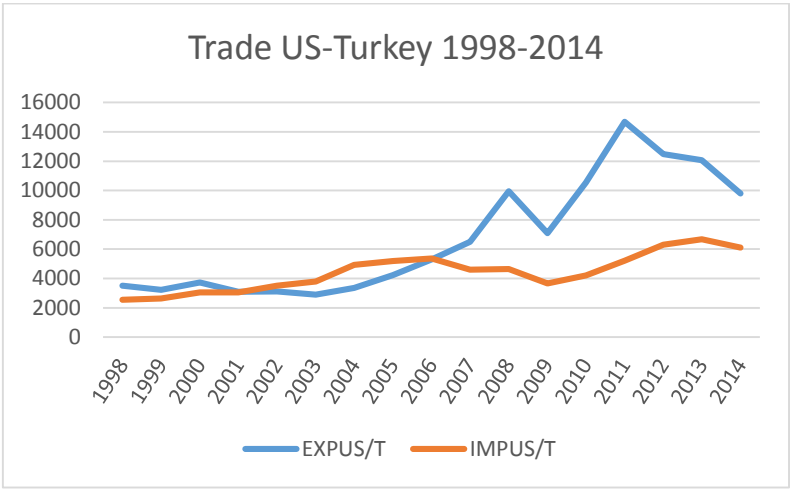

Fig. 4: Turkey–US bilateral trade (Million USD)
(Source: US Cencus Bureau)

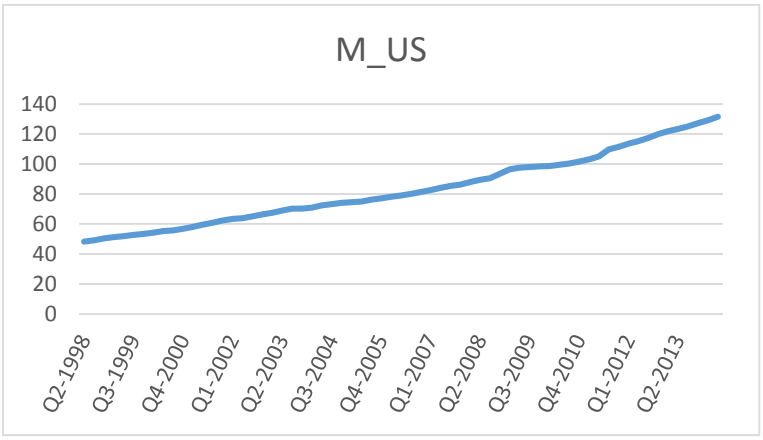

Fig. 5: Development of the aggregate money supply M3 of the US from 1998 Q2 until 2014 Q2.
(Source: OECD Data)

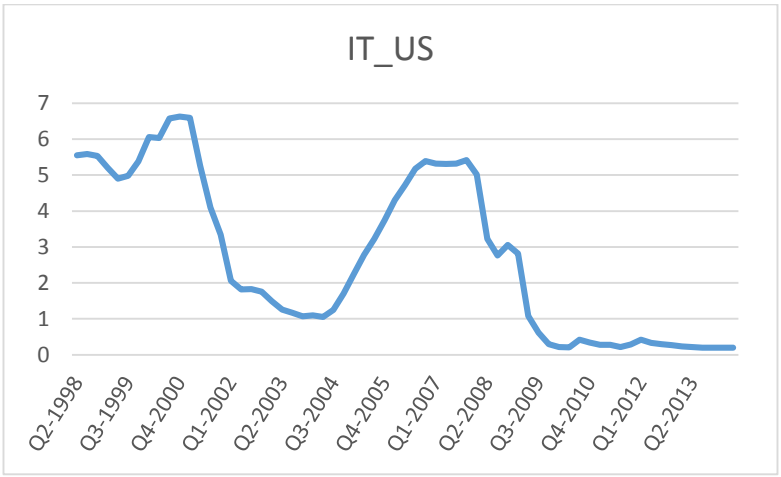

Fig. 6: Development of the short-term interest rate in the US from 1998 Q2 until 2014 Q2
(Source: OECD Data)

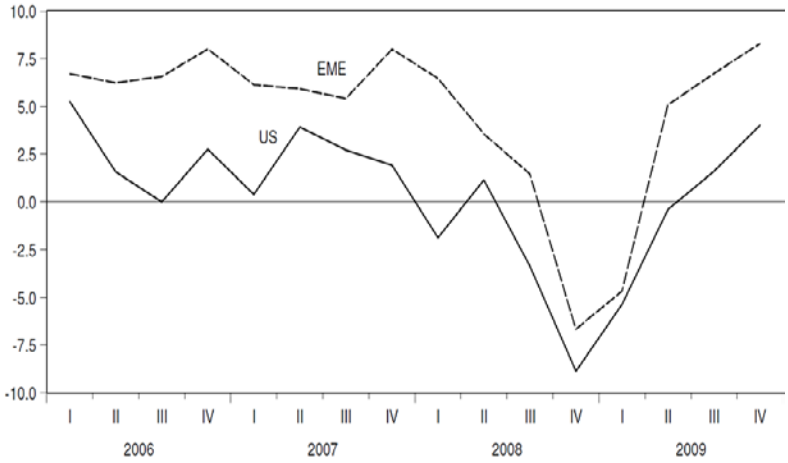

Fig. 7: Growth in GDP in Emerging Market Economies and the United States

(Source: Fink, Schüler (2013))

2 Research

In recent years there have been several studies on how external shocks influence the economies of some countries. As the trade hurdles between countries vanish with globalization, we find that the monetary policy of one country is also important for other countries. Monetary policy in one country can influence the economy of other countries—this is especially true for big economies like the US. For example, Kim et al. (2000) found that the US monetary policy influences G-6 output. In this transmission mode, changes in trade balance seem to play a minor role, whereas a decrease in global real interest rate seems very important. Maćkowiak (2007) researched on the impact of US shocks on macroeconomic fluctuations in emerging markets. He states that the price level and the real output in an emerging market respond to US monetary policy shocks, more than those in the US itself. These results are closer to the idea that “when the US sneezes, emerging markets catch a cold.” The monetary expansion of the Fed decreases the global real interest rate and seemingly increases the global aggregate demand for current goods and services of both the US and other countries. This has been theoretically suggested by the model developed by Svensson and Van Wijnbergen (1989). Canova (2005) attained strong evidence that the interest rate channel plays an important role in the US monetary disturbances. In addition, he found that the trade channel does not play a crucial role in this regard. Holman and Neumann (2002) found that US monetary policies influence the real activity in the US and Canada. Lastrapes and Koray (1990) researched the international transmission of monetary shocks under different exchange rate regimes for Germany, the UK, France, and the US. They obtained evidence that the

transmission of a monetary shock depends on the specific circumstances in countries. Kuszczak and Murray (1987) found strong evidence that the forecast error variance in Canadian macroeconomic variables could be explained by the US variables. They investigated the transmission of price, output, and interest rate shocks on the US and Canadian monetary variables. Miniane and Rogers (2007) researched on the effect of the US monetary shocks on exchange rates and foreign country interest rates. With their estimations, they tested whether countries with less open capital accounts systematically exhibit smaller responses. However, they found no essential evidence for this. Christiano and Eichenbaum (1995) suggested identifying monetary policy shocks with narrow monetary aggregates, which may serve as better proxies for monetary policy. Cetorelli and Goldberg (2011) found strong evidence that global banks played a crucial role in the transmission of the 2007 to 2009 crisis to emerging market economies. Arora and Cerisola (2001) researched on the impact of changes in US monetary policy on sovereign bond spreads in emerging market countries. They found out that US monetary policy is important for stabilizing capital flows and capital market conditions in emerging markets. Uribe and Yue (2006) found that the US interest shocks explains significant movements in aggregate activity in emerging markets. In response to an increase in an interest rate shock, emerging country spreads first fall and then display a large, lagged overshooting.

3 Empirical Framework and Theoretical Background

3.1 Introduction SVAR model

Multiple time series models can model the relations between different time series econometrically. Some sources distinguish structural and nonstructural models (see e.g. Clements, 1991). VAR models are nonstructural in that sense that they do not distinguish between endogenous and exogenous variables and that they allow feedback processes between all variables. Structural VAR models were developed in the 1980s. Structural models depends on an economic model and creates from this an estimated model. Especially, the critique on the large- scale macroeconometric models is a reason why the using of structural VAR models began (Killian, 2011). Large-scale macroeconometric models use large data sets and based forecasts on past correlations rather than using theoretical relationships. VAR models have the big advantages that they quit this “incredible” (Sims, 1980) identified restriction in contrast to the SVAR models. Normally, the legitimacy of these restrictions should be tested due to the data. The price of this flexible approach is that the degrees of freedom decreases and therefore the imprecision of the estimator increases and occurs finally the identification problem of the model.

Impulse response functions (IRF) represent the reactions of the variables to shocks hitting the system. SVAR models are needed for the analysis of structural impulse response functions and variance decomposition. For example, how does a change of the interest rate via the FED affect the inflation rate? To compute this effect, we will in the following see, that we have to identify the model. If the shocks are uniquely determined, then

the model is identified. It is necessary to know, which shocks are relevant for studying specific economic problems. Therefore, structural information has to be used to specify meaningful shocks (Lütkepohl, 2008). Due to the fact that structural shocks are not observable we have to choose different assumptions to identify them (Kilian, 2011). There are different possibilities to get these assumptions, which come from institutional knowledge, economic theory or other relevant constraints (Kilian, 2011). As we have as many assumptions as we need to identify the shocks, it is not possible to prove the structural assumptions empirically. I think that the most important issue in this research field is to use the assumptions to get a better understanding of how the economic systems works rather than if the assumptions hold or not.

Kilian (2011) mentioned:

"*Only after decomposing forecast errors into structural shocks that are mutually uncorrelated and have an economic interpretation can we assess the causal effects of these shocks on the model variables*."

As Kilian (2011) explained, the variables have to be uncorrelated to observe the effects of the shocks isolated from each other. But why mutually? Because these shocks are not observable, so actually we do not know if this assumption holds in reality.

Many early VAR did not include ad hoc assumptions for identification that could make no sense economically. Such VAR models - which are not theoretical - met with strong criticism (see e.g., Cooley and LeRoy, 1985). Cooley and LeRoy concluded that some VAR, which are not based on economic theory, are still valid. Those who attracted the most attention are based on incorrect analysis. In particular, however

the assumptions for the structure of a VAR model are not completely specified from economic theory and we have to think about if this necessary. Cooley and Dwyer (1998) claimed that actually — in practice — the SVAR models do not completely imply economic theory. Thus, they claimed that the many models are "*without much theory*". They often motivated by plausible considerations.

They showed that different assumptions about the shocks lead to different results. Cooley and Dwyer (1998) state the following:

"……*conclusions about the importance of technology and other shocks based on simple SVARs are certainly not invariant to the identifying assumptions and may not be very reliable as vehicles for identifying the relative importance of shocks*. (p. 85)

Furthermore, they concluded that at the same time, certain empirical regularities in the data would be revealed by SVARs and would appear robust. The authors represent a robustness concept, which implies that a conclusion – from their point of view- is only credible if different assumptions would lead to the same result. Assumptions with these purposes would be desirable but then they would not be informative (Cooley and Dwyer, 1998). Also the "strong theory", is based on several sensible assumptions. They used this "strong theory" to analyze the suitability of the SVAR model.

For a second example, Rudebusch (1998) summarized his comparison of three different SVAR specifications:

"…., *these three series give very different interpretations of the history of monetary policy surprises, and in several periods, the VAR series describes a stance for monetary policy that is greatly at variance with historical accounts*." (p.925)

Another interesting study about how SVAR works was conducted by Dolado et al. (2000). In this study — based on different structural hypothesis about the Phillips-curve — they measured the effect of a demand or supply shock on the unemployment rate. In a real business cycle model, the assumption is that monetary shocks do not have a contemporaneous effect on real variables like unemployment rate. The theory of monetarism, however, assumes that nominal shocks do not have an effect on the unemployment rate in the long run. Last but not least, the new Keynesian model assumes that nominal shocks have a significant effect on the unemployment rate in the short run. Based on these three different assumptions they researched —regarding the Phillips-curve — which conclusion you get from the results of three different SVAR models. Due to the fact that the models are exactly identified, we cannot empirically decide, which of these three SVAR models is the “right” one. Dolado et al. (2000) are instead interested in quantifying the effect of a supply or demand shock based on different theories and to investigate whether they are plausible or not.

3.2 Derivation of the SVAR model

Consider the following structural VAR model (see e.g. Bernanke 1986 or Sims 1986):

$$D_0 x_t = D_1 x_{t-1} + \ldots + D_p x_{t-p} + e_t \quad (1)$$

x_t is an nx1 vector of macroeconomic variables. The main problem in the estimation of structural VAR models is that you cannot directly estimate (1) and derive the true values of D_0 and $D_{1..}D_p$. We need further restrictions, due to the fact that the sampling information in the data is not sufficient (Kilian, 2011). These parameters D_i are said to be “unidentified”. The reason is that infinitely many different values for D_i all imply the same

probability distribution for the observed data (Kilian, 2011). Thus, we are not able to find out the true values for all D_i, if we only have the data.

Following assumptions for the error term e_t holds:

$E(e_t) = 0$, the expectation of the error terms is zero (2)

$E(e_t e_t') = \sum e = I_k$, i.e., identity matrix, subscript k is the rank of the matrix, diagonal elements are 1 and off diagonal are 0; (3)

We know from equation (3) that the variance-covariance matrix of e_t is normalized. This assumption has two implications. The first one is that the number of shocks and the number of variables are equal. For example in my model I have 6 variables, which implies that there are 6 structural shocks. The second implication, which follows from (3), is that the structural shocks are uncorrelated.

We can write the vector autoregressive model in a compact way:

$$D(L)x_t = e_t \quad (4)$$

D(L) is a matrix polynomial in the lag operator L:

$$D(L) = D_0 – D_1L – D_2L^2 - \ldots - D_pL^p \quad (5)$$

We want to estimate the structural VAR model. Therefore we have to derive its reduced-form. First, express x_t only as a function of $x_{t-1}+\ldots..+x_{t-p}$. That is why we divide both sides of (1) by D_0^{-1}. In this case we have following VAR:

$$D_0^{-1}D_0x_t = D_0^{-1}D_1x_{t-1}+\ldots+D_0^{-1}D_px_{t-p} +D_0^{-1}e_t. \quad (6)$$

Ordinary least squares estimation of the structural VAR would yield inconsistent parameter estimation. This problem can be

overcome by rewriting the VAR in reduced form. From (6) we get now the following reduced form:

$$x_t = A_1 x_{t-1} + \ldots\ldots + A_p x_{t-p} + u_t \qquad (7)$$

with $A_i = D_0^{-1} D_i$, i= 1,….,p, and $u_t = D_0^{-1} e_t$.

One important assumption is that the shocks e_t are orthogonal to each other. This assumption implies that there is no correlation between different disturbances. This means that different time observations are not correlated with each other. Now, however, the problem is that in the reduced form the error terms u_t are likely correlated. In this case we cannot measure the effect of an isolated shock on a variable. We can write expression (7) in a compact way:

$$A(L)x_t = u_t \qquad (8)$$

where $A(L) = I - A_1 L - A_2 L^2 - \ldots - A_p L^p$ denotes the autoregressive lag order polynomial.

The covariance matrix is described by

$$E(u_t u_t') = \sum_k. \qquad (9)$$

It is clear, that u_t are a weighted average of the structural shock e_t. This you can see from the relationship

$$u_t = D_0^{-1} e_t. \qquad (10)$$

But how is the economy structured? About this issue we want to know more. Thus, we are interested in the effects of e_t on x_t. To get knowledge about the shocks of e_t on x_t we have to identify D_0^{-1}. Because knowledge of D_0^{-1} would reconstruct the relationship $u_t = D_0^{-1} e_t$ and D_i, i= 1,…..,p, from $D_i = D_0 A_i$. The variance of u_t is the following:

$$V(u_t) = E(u_t u_t') = D_0^{-1} E(e_t e_t') D_0^{-1'}$$

$$= D_0^{-1} \sum_e D_0^{-1'},$$

from equation (3) we know already that $\sum_e = I_k$. Thus, $V(u_t) = D_0^{-1} D_0^{-1'}$, which is a system of non-linear equations. The

variance of u_t can have non-zero off-diagonal elements. Thus it allows non-zero correlation between u_t. The assumption that the shocks are orthogonal to each other is not enough for the identification. For a system, which has k variables, we need k(k-1)/2 additional assumptions to identify the shock uniquely. So we have to impose additional restrictions on the elements of D_0^{-1}. An important class of restrictions are the sequencing of the shocks. In this case, for example, we assume that some shocks have not an immediately effect of some variables, so that we do not observe a contemporaneous effect between a period on the variables.

If the model is formulated in first differences $\Delta x_t = x_t - x_{t-1}$, we can analyze the long run effects of a shock. If the difference have the form:

$$\Delta x_t = D_0 e_t + D_1 e_{t-1} + D_2 e_{t-1} + \ldots\ldots + D_q e_{t-p}$$

then the result of the (permanent) shock is

$$\lim_{h \to \infty} \frac{dx_{t+h}}{de_t} = D_0 + D_1 + D_2 + \ldots D_f \qquad \text{for } f > h$$

This means that the effect of the shock will accumulate over all periods. The restrictions, which result from the assumptions about the long-run effects, require a much higher computational cost than if we only consider restrictions about contemporaneous effects. Blanchard and Quah (1889) considered a simple example about short run restrictions, whereas the considerations about the long-run restrictions of King et al. (1991) and Gali (1992) are much more elaborated. Gali (1992) used short-run and long- run restrictions in his investigations. In regards to the short- run restrictions he mentioned:

"*Identification of those three shocks is achieved by imposing alternative sets of short-run restrictions that are either supported by independent empirical evidence or plausible on other empirical grounds*."

As we discussed before, the plausibility of restrictions is also emphasized here.

Especially in the last two decades, we find also critiques on the application of the SVAR model. Uhlig (1997) is one of the economists who criticized these kinds of models. He claimed that there would be a danger that we would just get out what we would have stuck in, though a bit more polished and with numbers attached. This critique, however, holds — in my opinion — for every kind of analysis that is motivated on empirical assumptions and does not hold only for this kind of specified analysis. The reality shows us that economic data are often not informative enough and previous economic knowledge is too unsecure and abstract, such that there is a hope to falsify economic theory with the help of empirical models.

I want to emphasize that three features of the structural form make it the preferred candidate to represent the underlying relationships:

1. True shocks e_t are not correlated. As I mentioned before, we do not know if this assumption holds in reality but this is a desired property. This is helpful for separating the effects of economically unrelated influences in the VAR. Of course, there are also examples, which confirm that this assumption holds. For example, we have to be very skeptical if an oil price shock (as an example of a supply shock) should be related to a shift in consumer preference towards a style of shoes (as an example of a demand shock); therefore these factors have to be statistically independent. (Wikipedia)

2. Shocks can have a contemporaneous impact on other variables. This is a very nice feature particularly if we use low frequency data. For example, a decreasing of indirect tax rate would not influence tax revenues at the day the decision is published, but one could find an effect in that quarter's data. (Wikipedia)

3. The SVAR models could be seen as a simplified method, which helps us to structure the complex real economy. The attractiveness of using this method could be that we use previous economic knowledge in a fashion such that we make simple assumptions about the shocks and to structure the observations from a theoretical perspective.

3.3 Theoretical Background

The standard Mundell–Fleming model pictures a country that is open and small; too small in effect, to have any measurable effect on the rest of the world. Macroeconomic links between this country and others point only in one direction: from the rest of the world toward this country, but not vice versa. If we want to study the macroeconomic interaction between countries, then the standard Mundell–Fleming model is no longer appropriate. Instead, we may employ a two-country Mundell–Fleming model. In addition, we assume that the exchange rate is flexible. This model predicts a depreciation of the exchange rate and a deterioration of the terms of trade in the US, which result in an improvement of the trade balance. This is commonly known as the expenditure-switching effect. However, the monetary expansion also stimulates domestic (US) demand, which may lead to an increase in imports and a worsening of the trade balance—the income absorption effect. The reason is that the demand for jobs rises, which leads to higher income in the US economy. This effect is important because it leads to a rising demand for goods, in general. These two effects move the trade balance in opposite directions. In the literature, researchers claim that the expenditure-switching effect dominates the income-absorption effect (Sousa and Zaghini, 2007). It could also be that the income effect dominates in the short run and the expenditure-switching effect in the long run. If the expenditure-switching effect dominates the income effect, then Turkey's GDP will contract. As the exports decrease and imports increase, production in Turkey will decrease, resulting in a lower GDP. In addition, we have a decrease in the consumer price index. If Turkey imports more than it exports then this leads to a current account deficit. This balance deficit has to be financed. So the interest rate has to increase in

Turkey to attract more capital from foreign investors. Due to capital mobility, this situation creates capital movements from the US to Turkey because the interest rate in Turkey is higher than that of the US, which is more attractive to investors. This implies that the lira appreciates even more against the dollar because the demand for the lira is higher than that for the dollar. In addition, the reduction of net exports has another effect: domestic income contracts due to reduced net exports, given the adverse effects of the foreign monetary stimulus provided by the US. Thus, lower net exports result from the appreciation of the lira against the dollar. However, the liquidity condition must be fulfilled. It says that money supply and money demand must be equal. The money demand goes down due to the fact that the labor income goes down. This leads to lower demand for money. This assumption is the same as in a closed economy. We will find the opposite effect in Turkey if the expenditure-switching effect is lower than the income effect.

We assume that a lower short-term interest rate in the US implies a depreciation of the dollar. The currency will depreciate, if we have a shock on the short-term interest rate, i.e. the short-term interest rate drops. The US bonds then become less attractive due to fact that the return of a bond goes down. The demand for foreign bonds become stronger because their return is relatively higher. In our two country framework, investors want to have bonds from Turkey. To buy Turkish bonds, investors require Turkish currency. In addition, the net imports of Turkey will be stronger as the lira–dollar exchange rate appreciates. The domestic production will reduce because exports will reduce. So the domestic income in Turkey will decrease because the supply of jobs is decreasing. However, it is also important to note that we assume that the switching effect dominates the income effect. We have the opposite reaction when the income effect dominates the switching effect.

From the US perspective, we expect a J-curve effect. This means that, after a financial shock originating in the US, the trade balance will worsen in the short run. In the long run it will be better as the switching effect dominates the income effect.

4 Data and Unit Root Test

OECD statistics provide the main sources of data for this study. I have taken the short-term interest rate of Turkey and Mexico from EUROSTAT statistics, and the GDP quarterly data of Turkey and Mexico from the Federal Reserve Economic Data. The data for the US financial shock I have also taken from the Federal Reserve Economic Data. The estimation periods are from 1998 Q2 to 2014 Q2. The empirical model is identical for each of these countries with their own macroeconomic values.

In statistics, Unit-root tests test whether a time-series variable is not stationary. A famous test - which is especially used in large samples - is the augmented Dickey–Fuller test (Dickey and Fuller, 1979). Tables 1−3 show the results of the unit-root test at the 5% level for all macroeconomic variables considered in this model. Tables 1 and 2 display the results for the macroeconomic variables in Turkey and Mexico, respectively. Table 3 shows the result for the exogenous variables of the US. We accept H_0 for all variables except the short-term interest rate in Mexico. This implies that every variable, except the short-term interest rate in Mexico, is non-stationary. The process used here was an AR(1) process however, in the case of an AR(2) process we accept H_0, except for the short-term interest rate in Mexico. If I used an AR process with one lag then the short-term interest rate of Mexico would also have a unit root.

Variable	Test Statistic	5% Critical Value
GDP	0.807	−2.920
Consumer price index	−0.035	−2.920
Money M3	3.592	−2.920
Short-term interest rate	−2.578	−2.920
Exchange rate	−1.772	−2.920

Table 1: Results of unit root tests for macroeconomic variables in Turkey at the 5% level

Variable	Test Statistic	5% Critical Value
GDP	0.207	−2.920
Consumer price index	−1.325	−2.920
Money M3	5.264	−2.920
Short-term interest rate	−4.016	−2.920
Exchange rate	−1.595	−2.920

Table 2: Results of unit root tests for macroeconomic variables in Mexico at the 5% level

Variable	Test Statistic	5% Critical Value
Money M3	0.207	−2.920
Short-term interest rate	−1.772	−2.920

Table 3: Results of unit root test for macroeconomic variables in the US at the 5% level

5 The Model

This section identifies a US monetary policy shock and its effect on the macroeconomic variables of Turkey and Mexico. As the basis of our analysis of external monetary shocks from the US, we need a model that explains the macroeconomic dynamics of Turkey and Mexico. I got the spirit for my model from the model of Sousa and Zaghini (2007), who researched the effects of a global monetary shock on the G5, although here we keep the quarterly data. I will add the exogenous variable of the US monetary policies in the first equation. Therefore, the domestic GDP is endogenous, which was exogenous in their paper in the short run due to the fact that my research is based on the relationship between one big economy and a small open economy, which even affects the GDP of the small economy in the short run. In addition, the commodity price index is replaced with the exchange rates of the emerging countries and the US. If we assume that the US monetary shock influences the domestic economies of Turkey and Mexico, then the exchange rate plays a crucial role. The working paper of Ncube et al. (2012) is near to my investigations. They researched how a US financial shock affects the economy of South Africa. The paper is also interesting as South Africa is also an emerging market with considerable economic growth in recent years. South Africa is also a member of the “fragile five” group, just like Turkey. In contrast to Ncube et al., I have not included the variable wealth for two reasons. First, they do not exactly explain their definition of wealth. Second, I find it difficult to measure wealth.

This model includes the assumptions of the Mundell–Fleming model. Contrary to the IS–LM model, it does not describe a closed but an open economy. There is evidence that the IS–LM

model predicts well for the US data (Gali, 1992). It does not explain, however, capital movements between two countries and further on not the transmission of economic shocks from one country to another. Thus, the prediction for the US data works only if you exclude capital mobility. With the Mundell–Fleming model, we can describe a common development of production, interest rates, and exchange rates in an open economy. It is worth noting that some of the results from this model differ from those of the IS–LM model because of the open economy assumption. Sousa and Zaghini (2007) include also the assumptions of the Mundell-Fleming model. Huh (1999) investigated the predictions of the Mundell-Fleming model in the case of Australia. The dynamic responses of the estimated model to the structural shocks matched most of the predictions of the Mundell-Fleming model. I have used six macroeconomic variables to describe how an external shock by the US could influence domestic macroeconomic variables in Turkey and Mexico.

Thus, the vector of the variables is as follows:

Y_t = (GDP_T, CP_T, M_T, IT_T, EXCH_US/T, M_US),

where GDP_T is the quarterly growth rate of real GDP, change over previous quarter, CP_T is the growth of the consumer price index in Turkey, M_T is the quarterly growth rate of monetary aggregate M3 of Turkey, IT_T is the quarterly growth of the short-term interest rate of Turkey in money markets, EXCH_US/T is the quarterly growth rate of exchange rate between the US dollar and the Turkish lira, M_US is the quarterly growth rate of the monetary aggregate M3 of the US.

The identification scheme is characterized by the following non-recursive structure of $B_0 u_t = e_t$:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & X_{16} \\ X_{21} & 1 & 0 & 0 & X_{25} & X_{26} \\ X_{31} & X_{32} & 1 & X_{34} & 0 & 0 \\ 0 & 0 & X_{43} & 1 & 0 & 0 \\ X_{51} & X_{52} & X_{53} & X_{54} & 1 & X_{56} \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} U^{GDP\_T} \\ U^{CP\_T} \\ U^{M\_T} \\ U^{IT\_T} \\ U^{EXCH\_US/T} \\ U^{M\_US} \end{bmatrix} = \begin{bmatrix} e^{GDP\_T} \\ e^{CP\_T} \\ e^{M\_T} \\ e^{IT\_T} \\ e^{EXCH\_US/T} \\ e^{M\_US} \end{bmatrix}$$

The diagonal elements of the matrix are 1, which is the value of the immediate reaction of a variable to its own shock. X_{ij} is the shock of j on i; for example, X_{16} means the influence of M_US on GDP_T. If there is no influence on the variable, then it is described by 0 in the matrix. The matrix is multiplied by the vector of the error terms (U^{GDP_T}, U^{CP_T}, U^{M_T}, U^{IT_T}, $U^{EXCH\_US/T}$, U^{M_T})´ on the right hand side we have the shock of each variable (e^{GDP_T}, e^{CP_T}, e^{M_T}, e^{IT_T}, $e^{EXCH\_US/T}$, e^{M_US})´. I only used short run restrictions, although economic theory often makes statements about the effect of shocks in the long run. For example, several economic models assume that nominal variables (e.g. monetary policy) have no effects on real variables (e.g. real GDP), whereas it is assumed that a real supply shock has an effect on macroeconomic variables in real terms (e.g. Blanchard and Quah 1889).

The first equation is for Turkey's GDP. It is only influenced by an external shock of the aggregate money supply by the US. The consumer price index is influenced by the GDP, exchange rate, and monetary supply aggregate of the US. The third equation defines the money supply of Turkey, which is influenced by a shock of the GDP and the short-term interest rate of Turkey and the aggregate money supply of the US. The short-term interest rate of Turkey's money market depends on the money supply of Turkey and on the US money supply. In this model, the US money supply is exogenous. I have used Ncube et al.'s idea, where the US money supply is also an

exogenous variable. Indeed, this macroeconomic variable of the US will also be influenced by other variables in reality. But I do not assume that it will be influenced by the macroeconomic variables of small open emerging markets like Turkey or Mexico. Therefore, their economies are too small. The next section describes the relationship among the macroeconomic variables.

The same matrix is used for Mexico. In the case of external shocks arising from the US through the interest rate channel, I have changed the last equation. In this case, in the last row of the matrix we have the external shock with the short-term interest rate of the US, instead of the external shock of the aggregate money supply by the US.

To choose the number of lags, I have used the information criteria. We fit the model AR(p) for different *p* and calculate the information criteria IC(p) and choose the *p* that minimizes the criterion. For the right number of lags I have taken the suggestion of the AIC criteria. In very small samples the AIC criteria performs badly. The AIC has been derived under the assumption of a normal distribution but asymptotically this does not play a role. In a small sample, this could play a role. Some researchers suggested using a variant of the AIC, under the name of AIC_u. The BIC is also not reliable in a small sample. There are versions of the BIC that perform better with smaller samples. The BIC is a consistent criterion. If the sample size goes to infinity, then the true lag order tends to be found with a probability of one. In comparison, the AIC is a criterion that targets efficiency. If the sample size goes to infinity, then the model minimizes the expected mean-squared error. In addition, AIC can say nothing about the quality of the model in an absolute sense. If a model fits poorly, then the AIC will not give any warning. Nevertheless, I used the AIC because several researchers also use it, even with smaller samples. The issue is

that there is no optimal selection criterion with smaller samples. The AIC suggests four lags in case of an external short-term interest rate shock by the US on the macroeconomic variables in Turkey. In the case of external monetary shocks by the US on the macroeconomic variables in Mexico, we obtain the suggestion to use three lags. In the case of Mexico, the same suggestions are found for the external shock through the short-term interest rate.

6 Results

6.1 Impulse Response Functions

Impulse response functions show how a shock (here: money supply of US and short term interest rate of US) in an estimated equation influences its own dependent (or response) variable and the values of other variables in the model. To analyze the impulse of a shock we need uncorrelated shocks, as it was derived in section 3.2. If the shocks are correlated with each other, then one shock changes also the other response variables. The result is that you cannot estimate the influence of an impulse of a shock on the changing variables.

6.1.1 Influence of US monetary shocks on Turkey

Figures 8–13 show the effects of a US monetary expansion shock, which represents an unexpected policy easing shock. In Fig. 8, a significant lira–dollar exchange rate appreciation is noted. This fulfils the first step and conforms to our assumption that the expenditure-switching effect is higher than the income effect. With the expansive monetary policy of the US, the lira–dollar exchange rate appreciates. We find a significant GDP contraction in Turkey in the first three steps (Fig. 9); after step three, the effect is no longer significant. This contraction conforms to our assumption. The influence on the consumer price index is insignificant (Fig. 10). We see that there is a significant effect on the aggregate money supply in Turkey (M3) (Fig. 11). Between steps 1 and 3, there is a significant decline in M3, which conforms to the predictions of the Mundell–Fleming model. We see that it has only a contemporaneously significant effect on the short-term interest rate of Turkey (Fig. 12) and declines, as predicted; however, there is no effect on

the short-term interest rate. In general, we find no evidence of a J-shaped curve. Therefore, we examine the effects of monetary shock by the US and find changes in four macroeconomic variables in Turkey.

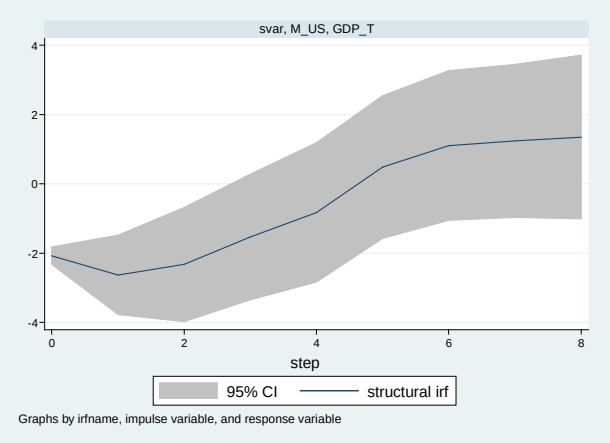

Fig. 8: Impulse M_US, Response GDP_T

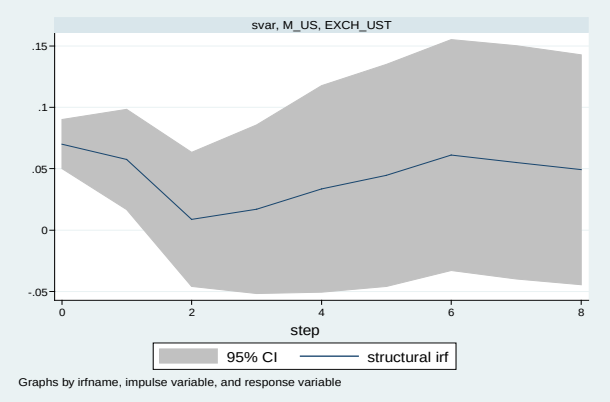

Fig. 9: Impulse M_US, Response EXCH_UST

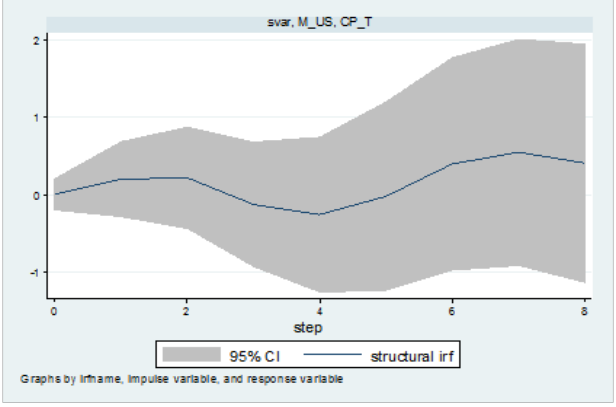

Fig. 10: Impulse M_US, Response CP_T

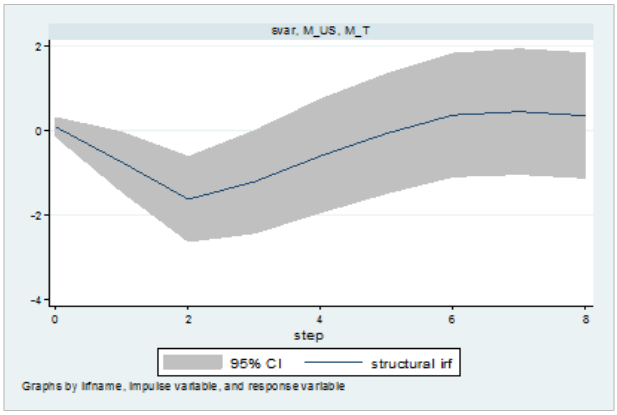

Fig. 11: Impulse M_US, Response M_T

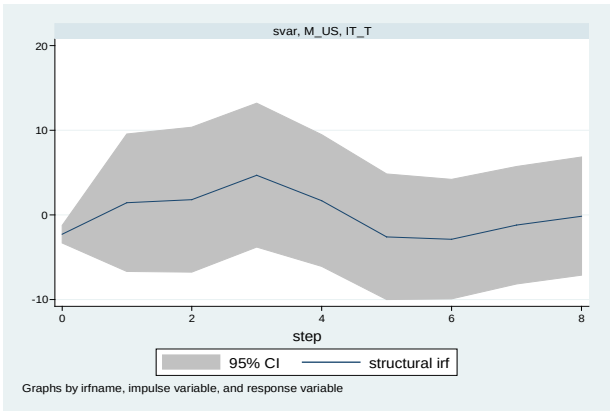

Fig. 12: Impulse M_US, Response IT_T

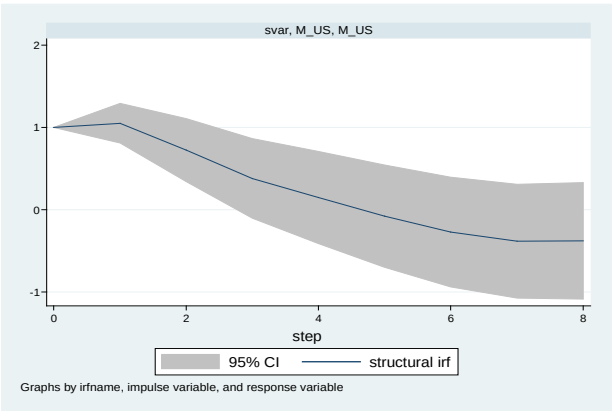

Fig. 13: Impulse M_US, Response M_US

6.1.2 Influence of US short-term interest rate shocks on Turkey

Figures 14–19 demonstrate the effect of US monetary shock through the short-term interest channel. We see that the lira–dollar exchange rate significantly appreciates for a small period between 0 and 2 (Fig. 14). This confirms that the switching effect is stronger than the income effect. The exchange rates of all other periods are insignificant. The short-term interest shock influences the GDP in Turkey over a long time (Fig. 15). From periods 2 to 4, we see a significantly positive effect on Turkey's GDP. In addition, there is a small significant upward jump. This effect is contemporaneous, which means it reflects the identifying assumptions in the structural VAR model. From periods 6–8, we observe a significantly negative effect on Turkey's GDP. This is what we know as the net export reduces, which, in turn, leads to reduced production in the country. The significant upward trend in the first period confirms that the income effect dominates the expenditure-switching effect. Between steps 0 and 2 it is, however, insignificant. The external US shock also has an effect on the short-term interest in Turkey (Fig. 17). In the first two periods, the short-term interest rate decreases. It significantly increases between steps 4 and 6. In the case of the effect on the Turkish GDP and on the short-term interest rate in Turkey, we can notice the J-curve effect. The effect on the consumer price index is not completely significant (Fig. 14). There is also no significant effect on the monetary aggregate in Turkey (Fig. 15), and these results do not conform to the expectations. The impact of a short-term interest rate shock by the US on Turkey's macroeconomic variables demonstrates that all the four observed variables are significantly disturbed.

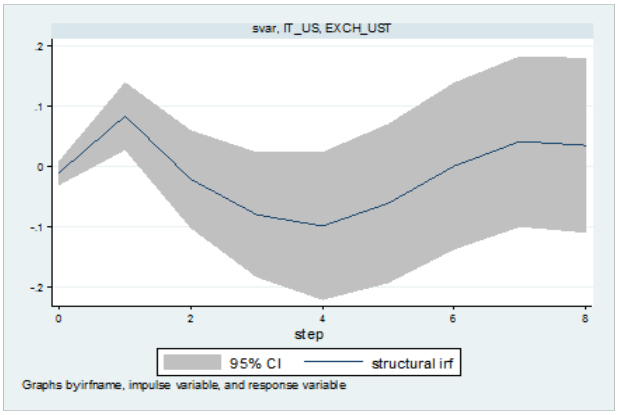

Fig. 14: Impulse IT_US, Response EXCH_UST

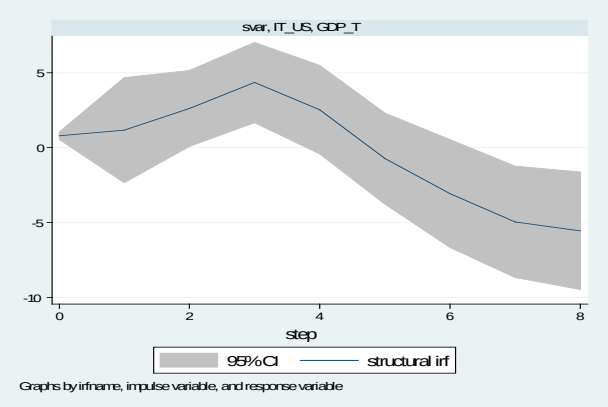

Fig. 15: Impulse IT_US, Response GDP_T

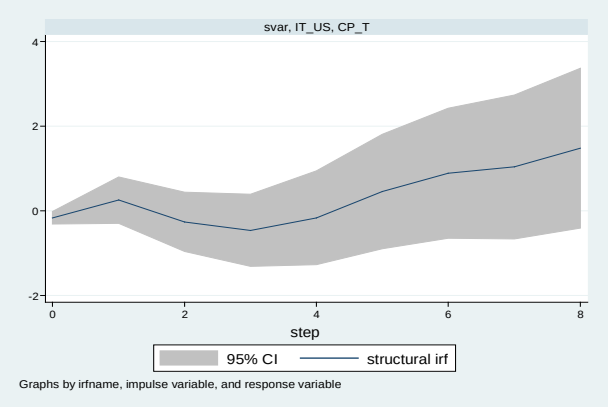

Fig. 16: Impulse IT_US, Response CP_T

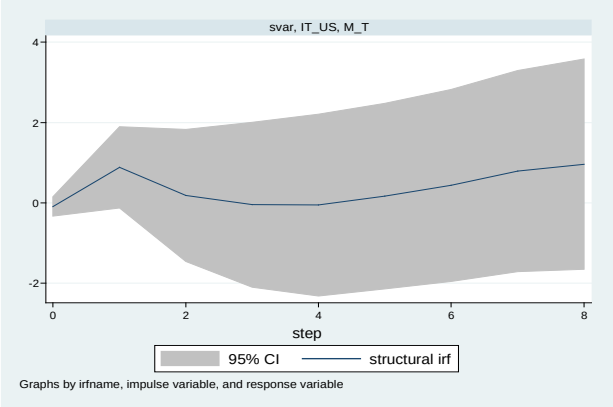

Fig. 17: Impulse IT_US, Response M_T

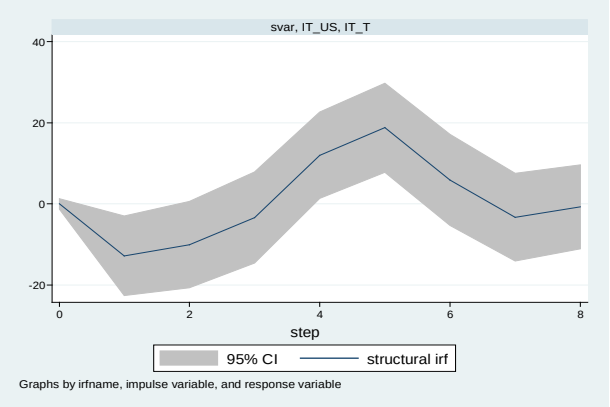

Fig. 18: Impulse IT_US, Response IT_T

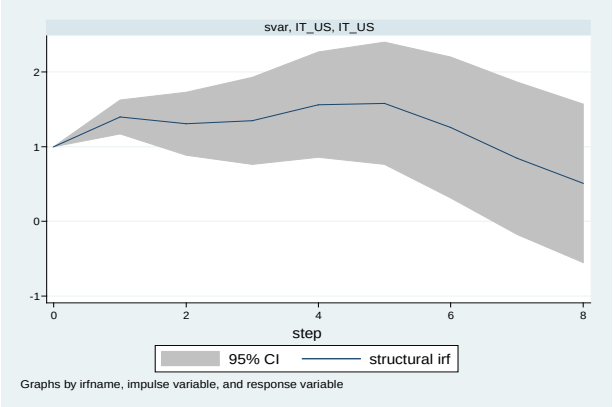

Fig. 19: Impulse IT_US, Response IT_US

6.1.3 Influence of US monetary shocks on Mexico

We use the same set of assumptions as for Turkey for examining the effects of an external monetary shock in the US on the emerging market of Mexico (Figs. 20–25). The first figure confirms an appreciation of the peso against the dollar (Fig. 20). In the first two periods, there is a significant appreciation of the peso against the dollar. We notice that the effect on Mexico's GDP is positively significant between steps two and four (Fig. 21), and insignificant for all other periods. The part which is significant is not in line with our prediction that an expansive monetary policy of the US contracts the output in Mexico. It does, however, show that the income effect dominates the switching effect during the significant period. The expansive monetary policy of the US also has also a positive influence on the monetary policy in Mexico (Fig. 23). This means that an expansive monetary policy adopted by the US leads to an expansive monetary policy in Mexico: the income effect dominates the switching effect. The large trade volume that Mexico has with the US emphasizes this result, since the Mexican economy profits in a crucial manner from the income effect in the US. Thus, the shock effect on the consumer price is significant for the first time; that is, the price index decreases when the expenditure switching cost is higher than the income absorption effect (Fig. 22), which conforms to our framework. If we assume that aggregate money supply decreases due to a lower income in Mexico, then this downward contemporaneous trend conforms to theory. There is, however, a period around step 2 that has a positive influence on the consumer price index. We cannot find a significant effect on the short-term interest in Mexico (Fig. 24).

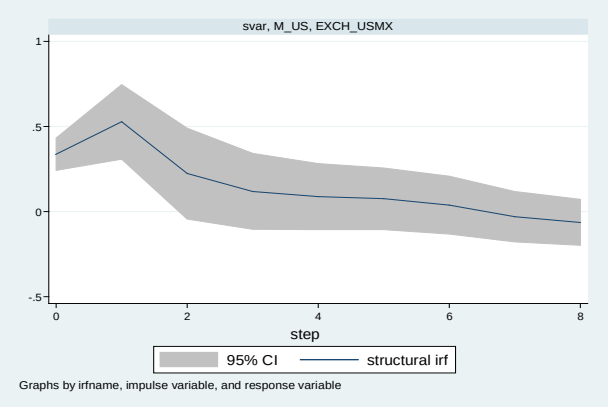

Fig. 20: Impulse M_US, Response EXCH_USMX

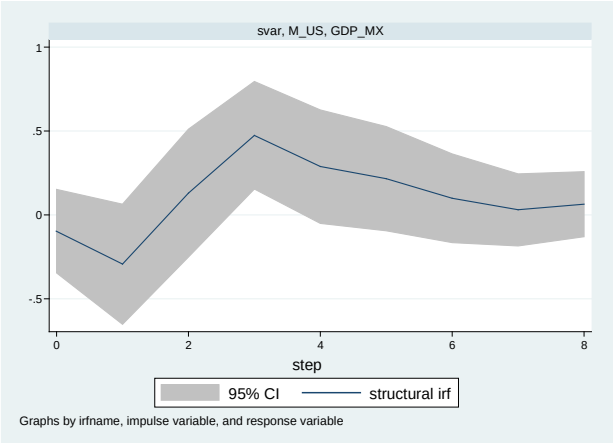

Fig. 21: Impulse M_US, Response GDP_MX

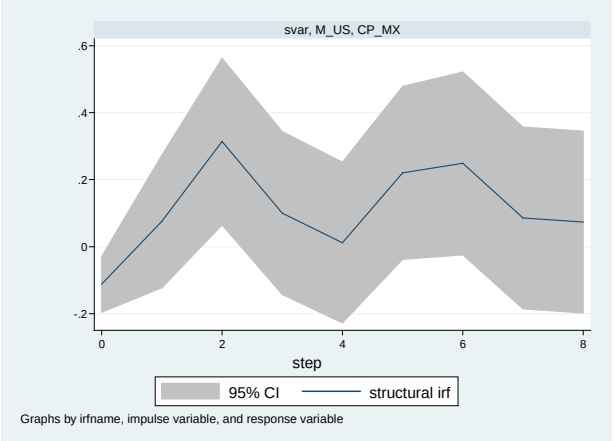

Fig. 22: Impulse M_US, Response CP_MX

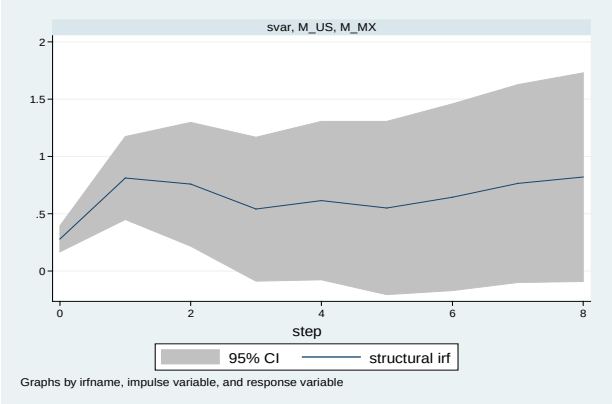

Fig. 23: Impulse M_US, Response M_MX

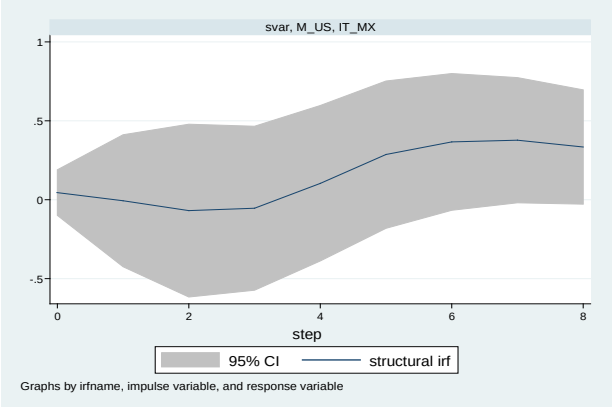

Fig. 24: Impulse M_US, Response IT_MX

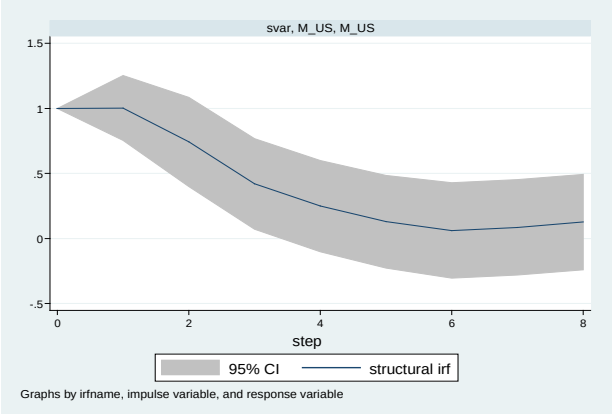

Fig. 25: Impulse M_US, Response M_US

6.1.4 Influence of US short-term interest rate shocks on Mexico

Figures 25−30 demonstrate the influence exerted on the macroeconomic variables of Mexico by a short-term interest rate shock in the US. The effect on the exchange rate changes during the eight steps (Fig. 25). First, it describes an appreciation of the dollar against the peso. However, between periods 3 and 5, there is a significant depreciation of the dollar against the peso, which confirms our assumptions. A positive influence on Mexico's GDP is detected between periods 2 and 4 (Fig. 26). In this period, it seems that the income absorption effect is stronger than the expenditure switching effect. After period 5 we have significant contractions of GDP, which yields a J-curve and fulfils the prediction that the expenditure switching effect is stronger in the long run. The effect on the consumer price index is only contemporaneous (Fig. 27). Although it jumps up, it is not significant for the entire duration after reaction. The short-term interest rate has a significant effect during the first period (Fig. 28). At this time, the short-term interest rate in Turkey jumps up. It also increases between periods 4 and 7. This confirms that the income-absorption effect in Mexico is greater than the expenditure effect.

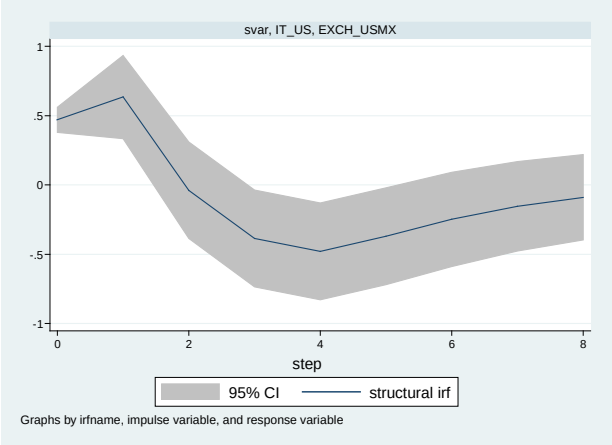

Fig. 26: Impulse IT_US, Response EXCH_USMX

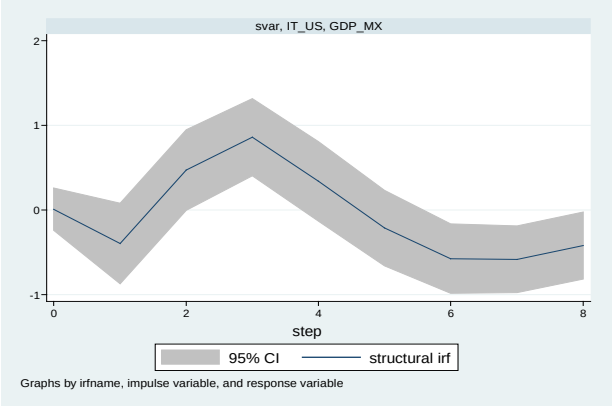

Fig. 27: Impulse IT_US, Response GDP_MX

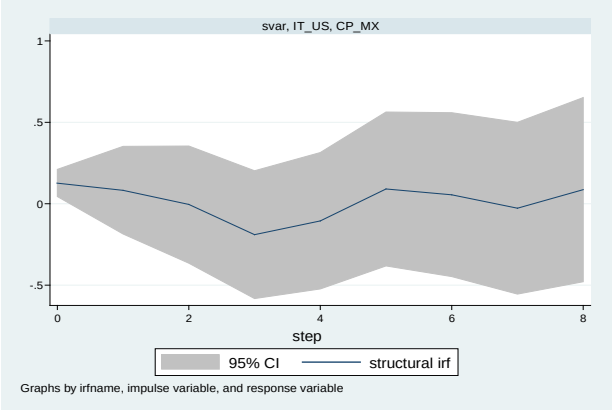

Fig. 28: Impulse IT_US, Response CP_MX

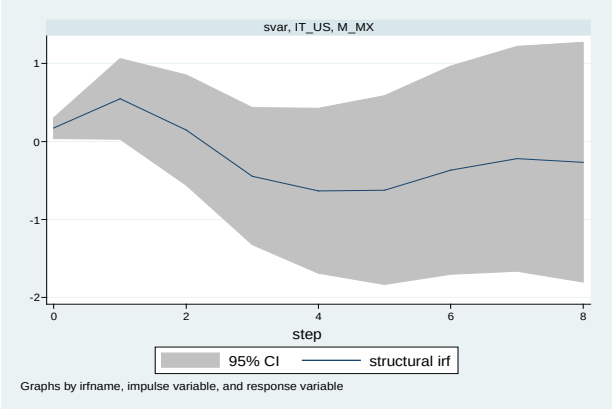

Fig. 29: Impulse IT_US, Response M_MX

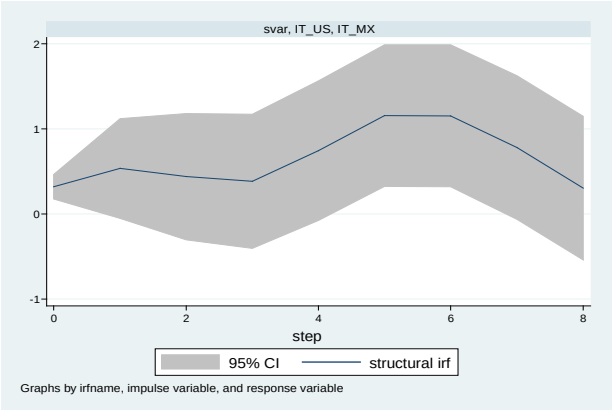

Fig. 30: Impulse IT_US, IT_MX

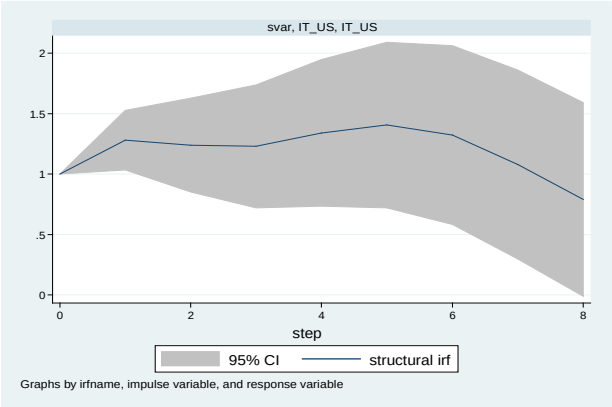

Fig. 31: Impulse IT_US, Response IT_US

6.2 Variance Decomposition

Variance decomposition gives the percentage shares of the forecast-error variance of a variable, which are due to its own shocks and to shocks in the other variables. To assess the importance of the US shocks for the domestic macroeconomic variables in Turkey and Mexico, the forecast error variances of the variables are decomposed with respect to the US shocks.

6.2.1 Variance Decomposition of Turkish variables explained by US money supply shock

Table 4 shows that a money supply shock of the US explaines a small share of the changes in macroeconomic variables in Turkey. In this case the relatively biggest part it owns in fluctuations in Turkeys GDP. The value is increasing over the periods. Especially — regarding to the Consumer price index and the exchange rate — the US money supply shock explains a very small part of the fluctations.

Period	GDP_T	CPT_T	M_T	IT_T	EXCH_US/T	M_US
0	0	0	0	0	0	0
1	0	0	0	0	0	100 %
2	0.06 %	0	0	0	0	99.9 %
3	0.05 %	0	0.10 %	0.02 %	0.01 %	99.9 %
4	0.09 %	0	0.03 %	0.04 %	0.02 %	99.8 %
5	0.30 %	0	0.07 %	0.07 %	0.02 %	99.5 %
6	0.63 %	0.01%	0.15 %	0.12 %	0.03 %	99.1 %
7	1.01 %	0.02 %	0.25 %	0.17 %	0.03 %	98.4 %
8	1.41 %	0.04 %	0.37 %	0.23 %	0.04 %	97.9 %

Table 4: Variance decomposition of Turkey´ s macroeconomic variables explained by the US money supply shock

6.2.2 Variance Decomposition of Turkish variables explained by US short-term interest rate shock

It turns out that the short-term interest shock contributes only a relatively small fraction to the forecast error variance of macroeconomic variables in Turkey. Also in this case the relatively biggest share of the fluctation it owns in the GDP in Turkey. The share of the short term interest rate shock in Turkey´s interest rate and exchange rate is 0.

Period	GDP_T	CP_T	MT_T	IT_T	ECH_US/T	IT_US
0	0	0	0	0	0	0
1	0	0	0	0	0	100 %
2	0.05 %	0	0	0	0	99.9 %
3	0.18 %	0	0.01 %	0	0	99.8 %
4	0.28 %	0	0.03 %	0	0	99.7 %
5	0.34 %	0.02 %	0.06 %	0	0	99.6 %
6	0.36 %	0.02 %	0.07 %	0	0	99.6 %
7	0.36 %	0.03 %	0.08 %	0	0	99.6 %
8	0.36 %	0.03 %	0.08 %	0	0	99.5 %

Table 5: Variance decomposition of Turkey´ s macroeconomic variables explained by the US short-term interest rate shock

6.2.3 Variance Decomposition of Mexican variables explained by US money supply shock

Table 6 shows that the money supply shock of the US owns relatively a big share of the fluctuations in the exchange rate. It increases over the periods and reaches a peak in the 8th period with 14%. Also for the fluctuations in the GDP, Consumer price and money supply in Mexico, the US shock owns a relative big share. All shares are increasing over the periods and reach a maximum in the last period. Compared with Turkey, the share in all fluctuations is significantly bigger.

Period	GPD_MX	CP_MX	M_MX	IT_MX	EXCH_MX/ US	M_US
0	0	0	0	0	0	0
1	0	0	0	0	0	100 %
2	0.40 %	0.07 %	0.15 %	0.15 %	0	99.2 %
3	0.50 %	0.29 %	0.15 %	0.50 %	1.00 %	97.5 %
4	0.42 %	1.52 %	0.22 %	0.93 %	3.80 %	93.1 %
5	0.56 %	3.20 %	0.53 %	1.23 %	7.50 %	86.7 %
6	1.10 %	4.33 %	1.26 %	1.44 %	10.8 %	81.1 %
7	2.20 %	4.70 %	2.51 %	1.15 %	12.9 %	76.3 %
8	3.18 %	4.57 %	4.24 %	1.56 %	14.00 %	72.4 %

Table 6: Variance decomposition of Mexico´ s macroeconomic variables explained by the US money supply shock

6.2.4 Variance Decomposition of Mexican variables explained by US short-term interest rate shock

Compared with the money supply shock, the share of the short-term interest rate in fluctuations in Mexico´s macroeconomic variables is relatively smaller. This we have seen also in the case of Turkey that the interest rate channel does not explain fluctuations in the same amount like the money supply channel. Nevertheless the shares of the shock are again relatively bigger than in the case of Turkey. Especially the fluctuations in the GDP in Mexico are explained by 4.72% in the 5th period by an US short term interest rate shock.

Period	GDP_MX	CP_MX	M_MX	IT_MX	EXCH_MX/ US	IT_US
0	0	0	0	0	0	0
1	0	0	0	0	0	100 %
2	0.83 %	0.13 %	0.15 %	0	0.02 %	99.9 %
3	2.52 %	0.83 %	0.32 %	0	0.02 %	96.2 %
4	4.04 %	1.21 %	0.31 %	0	0.02 %	94.5 %
5	4.72 %	1.12 %	0.26 %	0.02 %	0.14 %	93.8 %
6	4.71 %	0.94 %	0.24 %	0.03 %	0.41 %	93.7 %
7	4.52 %	0.84 %	0.13 %	0.03 %	0.70 %	93.8 %
8	4.32 %	0.72 %	0.11 %	0.03 %	0.93 %	94.0 %

Table 7: Variance decomposition of Mexico´ s macroeconomic variables explained by the US short-term interest rate shock

7 Conclusion

I have investigated the effects of two types of financial shock, namely, US monetary policy and short-term interest rates, on the emerging markets of Turkey and Mexico. I have found evidence of capital inflow from the US to these two countries. I have discovered that both channels influence several macroeconomic variables of Turkey and Mexico. I have found an influence of US monetary shocks on the exchange rate, GDP, short-term interest rates, and money supply of Turkey. Influences of the short-term interest shocks given by the US on the same variables, as in the case with the monetary shocks, have also been found. The same holds true for Mexico. However, in both countries, no strong influence on the consumer price index is found. We find similar results in both countries, although the trade relationship between Mexico and the US is much deeper than the trade relationship between Turkey and the US. So we can conclude that maybe the trade relationship to the US economy does not play an important role regarding to the fluctuations in domestic macroeconomic variables in Turkey and Mexico. Or other important facts could play an important role, like the saving rate of the domestic country, which is significant lower in Turkey than in Mexico. I want to emphasize that my model only describes the relationship between the two emerging markets and the US economy. It provides evidence that there is capital mobility from the US to Turkey and Mexico when there is a shock in the US economy. It also explains the changes in trade between the emerging countries and the US. However, the model and the framework are bounded by their explanation of the real world. Theoretical models could only explain a simplified illustration of the real economy. Insofar theoretical models are an

approximation to the reality, which is more or less “false”. It is crucial for the suitability of a model, however, how useful it is regarding its intended use.

As described in the introduction, the capital inflows to Turkey and Mexico from other countries are essential for these emerging countries to finance their trade balance deficits. Thus, capital from foreign countries is important for the economic success of Turkey. With our model, and the framework of Mundell–Fleming, we use a two-country closed economy to understand the capital fluctuation from the biggest country of the world to an emerging country. So there are many questions that our analysis does not address. It does not explain the economic success of Turkey and Mexico over the last 15 years. Our model and framework do not explain how the relationships with other countries change with capital flows from the US to Turkey or Mexico. Especially in Turkey you are always afraid of military interventions, which influence the economic development in a negative way. Military interventions decrease the confidence of investors to invest their capital in this country. Of course from history we know that economic development and political stability can also be correlated. No matter which relationship in Turkey exists, to imply the policy situation could improve the results of the model. Importance of politics is not limited only to Turkey. Also in Mexico the relationship between the political situation and the economic development plays an important role. This you can see in the Tequila crisis in 1994, when the Peso depreciates strongly against the Dollar. This leads to a policy crisis (e.g. the murder of presidential candidate the chief of the government party Luis Donaldo Colosio) which enhanced the financial crisis. For future study another idea to improve the model would be to introduce an energy shock. Examples for such global energy shocks are the Iraq war in 2003 and an increasing demand for oil via China, which had

significantly raised the oil price during my data period. This shock plays an important role for the two emerging countries. An important reason Turkey has a trade balance deficit is its energy imports, as it is a country poor in energy resources. Oil is the most important export good in Mexico, and its price plays here also an important role. So there are ideas regarding how we can change the model to improve the results. However, I think that the results, at least, provide strong evidence that the macroeconomic variables in Turkey and Mexico are influenced by the external shocks provided by the US, which was the aim of thesis.

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Appendix A

Dickey Fuller Test

In statistics, the Dickey–Fuller tests whether a time series is stationary. It is named after the statisticians David Dickey and Wayne Fuller, who developed the test in 1979.

Consider the AR (1) process

$$Y_t = \delta + \theta Y_{t-1} + \varepsilon_t$$

The important variable here is Θ. If Θ=1 we have a non-stationary time series. corresponds to a unit root. Test H_0 : Θ = 1 against H_A: Θ < 1.

The standard t-statistic for this hypothesis is given by

$$DF = \frac{\hat{\theta} - 1}{se(\hat{\theta})}.$$

The Dickey- Fuller test does not have a t-distribution. This is not even the case asympotically due to of the non- stationarity of the process.

The corresponding nonstandard distribution under the null is skewed to the left and has to be simulated.

Appendix B

Akaike information criterion (AIC)

The Akaike information criterion (AIC) is a measure of the relative quality of a statistical model, for a given set of data. As such, AIC provides a means for model selection.

AIC deals with the trade-off between the goodness of fit of the model and the complexity of the model. It is founded on information theory: it offers a relative estimate of the information lost when a given model is used to represent the process that generates the data.

For any statistical model, the AIC value is

$$AIC = 2k - 2\ln(L)$$

where *k* is the number of parameters in the model, and *L* is the maximized value of the likelihood function for the model.

AICc is AIC with a correction for finite sample sizes:

$$AICc = AIC + \frac{2k(k+1)}{n-k-1}$$

where *n* denotes the sample size. Thus, AICc is AIC with a greater penalty for extra parameters.

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