Macroeconomic Transitions and the Transmission Mechanism: Evidence from Turkey

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January 2012

Abstract

This paper investigates changes to the macroeconomic transmission mechanism in Turkey following a major reform of monetary policy in the early 2000s. We use a Threshold VAR (TVAR) framework to test for and then estimate a model with endogenous transitions between regimes. We detect two regimes, with a clear transition between them in 2003-4. The pre-reform regime is characterized by high inflation, passive monetary policy and persistent responses to shocks. The post-reform regime is characterized by low inflation, active and credible monetary policy and markedly less persistent responses to shocks. Using a model that contains sufficient variables to capture diverse transmission mechanisms, working through the real exchange rate, domestic credit and monetary policy, we find evidence of sharp changes in transmission mechanisms. Post-reform, the response of Turkey to macroeconomic shocks has changed to be similar to those in other modern, market-orientated economies.

JEL Classification: C32, E31, E42, E58.

Keywords: Monetary Policy, Transmission Mechanism, Regime Changes, Turkey.

1. Introduction

This paper investigates changes to the macroeconomic transmission mechanism following a major change in monetary policy regime. We consider the case of Turkey. Following decades of inflation, volatile output growth and frequent large and destabilizing nominal exchange rate depreciations, Turkey enacted a package of reforms in the early 2000s aimed at promoting macroeconomic stability through the establishment of a credible monetary policy framework. These reforms appear to have been a success; inflation has fallen, exchange rate volatility has fallen and output growth has become more stable. Indeed, in sharp contrast to previous global crises, Turkey has weathered the financial crisis beginning in 2008 with less volatility in exchange rate and inflation rates than many other countries.

This paper investigates the impact of these reforms on the macroeconomic transmission mechanism in Turkey. The transmission mechanism describes the response of macroeconomic variables such as output, the price level, interest rates and the exchange rate to a variety of shocks. There are suggestions in the literature that the transmission mechanism may have changed. Karasoy *et al.* (2005) find evidence of a changed monetary policy rule, Kara and Ogunc (2005) argue that the impact of the exchange rate on the domestic economy has changed, while Basci *et al.* (2007) argue that the importance of interest rates and domestic credit has changed. This paper takes a wider perspective by examining changes in the transmission mechanism as a whole, rather than specific aspects of it.

Much contemporary macroeconomic analysis focuses on the transmission mechanism (summarised in Christiano *et al.*, 1999 and Boivin *et al.*, 2010). This literature emphasises the complexity the transmission mechanism, which is seen as operating through many distinct channels. Mishkin (1996) distinguishes between interest rate, exchange rate, equity price, bank lending and separate corporate and household balance-sheet channels. Boivin *et al.*

(2010) discuss interest rate, wealth, intertemporal substitution, exchange rate, bank-based and balance sheet channels. Other models highlight alternatives such as liquidity and risk-taking channels (Cooley and Quadrini, 2004, Borio and Zhu, 2008). Central Banks also highlight the diverse ways in which policy rates affect the real economy. For example, the Bank of England's view of the transmission mechanism is that changes in policy rates affect money market interest rates, asset prices, the exchange rate and expectations (Bank of England, 2009) while the ECB (2010) places more emphasis on effects working through the labour market and the supply of credit. This is reflected in the variables included in our empirical model; we use output, prices, a short-term interest rate, the amount of credit in the economy and the real exchange rate. The span of these variables is wide enough to encompass the diverse transmission mechanisms considered in the literature while retaining parsimony.

The literature also emphasises likely changes in the transmission mechanism over time. Transmission reflects structural macroeconomic relationships as well as the behaviour of policymakers. Changes in structural relationships or in the policymaking environment will therefore change the transmission mechanism. We model possible changes in the transmission mechanism using a Threshold VAR (TVAR) model (Tsay, 1998). This is a natural extension of the standard approach is modelling the transmission mechanism using a VAR (Peersman and Smets, 2003, Christiano *et al.*, 2010).

Our use of a TVAR framework is motivated by a number of factors. The most obvious alternative approach is to assume a regime break on a particular date and estimate separate models using data from either side of that break. We prefer the TVAR approach since it allows us to test for the existence of multiple regimes and to date switches of the economy between these regimes, rather than simply assuming the existence of and dating of regime change *a priori*. Other possible alternatives include using a model in which the coefficients of a VAR evolve over time (Boivin *et al.*, 2010) or a Markov-switching model in which transitions between regimes are random. Neither seems appropriate in this case; the clear change in the policy framework seems inconsistent with gradual evolution of parameters and random transitions.

Our model develops previous work by Kara and Ogunc (2005), who estimate VAR models compromising the output gap, nominal exchange rate depreciation, the core inflation rate and the inflation rate for the pre- and post-2001 period. We focus on the transmission mechanism as a whole rather than just the exchange rate channel investigated by Kara and Ogunc (2005), and are able to use more data from the post-reform period. Our work also complements the analysis of Basci *et al.* (2007) by providing econometric estimates to complement their more descriptive analysis.

The paper is structured as follows. We introduce our TVAR model in the next section. Section 3 outlines the data used in the estimation. The empirical results on nonlinear impulse responses and forecast error decompositions are presented in section 4. Finally, the paper ends with concluding remarks and policy suggestions.

2. Methodology

A VAR representation of our model can be written as,

$$X_t = \sum_{i=1}^{p} A_i X_{t-i} + \sum_{i=1}^{q} B_i Z_{t-i} + \varepsilon_t \quad , \qquad (1)$$

where the vector X_t contains observations on the endogenous variables at time *t*, $X_t = [y_t\, p_t\, i_t\, c_t\, e_t]'$, where y is (log) output, p is the log price index, i is the short-term interest rate, c is the (log) amount of credit and e is the (log) real exchange rate. The vector Z_t contains observations on exogenous variables at time *t*, $Z_t = [oil_t^p\, y_t^{us}\, i_t^{us}\, 1]'$, where oil^p is the (log) oil price (in US Dollars), y^{us} is (log) US output, i^{us} is the US policy rate (the effective federal funds rates rate) and 1 is a constant). ε_t is a vector of structural shocks at time t, $\varepsilon = [\varepsilon_y\, \varepsilon_\pi\, \varepsilon_i\, \varepsilon_c\, \varepsilon_e]'$. *A* and *B* are coefficient matrices. The transmission mechanism is captured by the impulse response functions that describes the response of the endogenous variables to the shocks in ε_t.

The TVAR model (Atasanova, 2003; Balke, 2000) is a simple extension of the VAR model is which the economy has two regimes and switches between them depending on the value of a threshold variable. Our TVAR model is:

$$X_t = I[c_{t-d} \geq \gamma]\left(\sum_{i=1}^{p} A_i^1 X_{t-i} + \sum_{i=1}^{q} B_i^1 Z_{t-i}\right) + I[c_{t-d} < \gamma]\left(\sum_{i=1}^{p} A_i^2 X_{t-i} + \sum_{i=1}^{q} B_i^2 Z_{t-i})\right) + u_t \qquad (2)$$

where c is the threshold variable and γ is the threshold; $I(c_{t-d})$ is a dummy indicator function that equals 1 when $c_{t-d} \geq \gamma$, and 0 otherwise. Equation (2) states that the economy is in regime 1 when the threshold variable, lagged d periods, exceeds or is equal to the threshold; otherwise, the economy is in regime 2. The model allows us to estimate the regime-specific parameters (A_1^1, A_1^2, B_1^1 and B_1^2), the threshold value (γ) and the delay parameter (d).

We follow the conventional procedure in specifying and estimating our TVAR model. We begin with the VAR model in (1). We first determine *p* and *q*, the number of lags of endogenous and exogenous variables, on the basis of the Akaike and Hannan-Quinn Information Criteria (considering up to 12 lags of each). We then test for the existence of multiple regimes using the *C(d)* threshold test statistic proposed by Tsay (1998). If this test is significant, we reject the linear VAR in (1) in favour of the nonlinear TVAR in (2). The null hypothesis is $H_0 : A_i^1 = A_i^2, B_i^1 = B_i^2$, in which case the model is linear and (2) simplifies to (1). The testing procedure re-orders the data according to ascending values of the threshold variable and estimates (1) using a sub-sample of the data (in practice, if the first m_0

observations of the re-ordered sample; we consider both m_0=50 and m_0=100,). These estimates are then used to generate predicted residuals for the remainder of the sample. If the model is linear, the predicted residuals will be uncorrelated with the explanatory variables in the arranged regression. These predicted residuals are therefore regressed on the explanatory variables and the C(d) statistic calculated as the test for the joint significance of the explanatory variables. The test statistic follows a chi-squared distribution with $k(pk+qv+1)$ degrees of freedom under the null, where which k and v are the number of variables in X_t and Z_t. We calculate *C(d)* statistics for a range of candidate transmission variables and delay parameters considering a delay of up to 12 periods for each variable. If there is evidence of multiple regimes, we select the delay parameter d for each transition variable as the value which that maximises the Tsay test statistic and then determine the threshold value γ using a grid search, choosing the value that maximizes the Akaike Information Criterion (AIC). We then estimate the model and calculate impulse response functions.

3. Data

We use monthly data for the period 1986:1 to 2010:11, using data drawn from the International Financial Statistics (IFS) database of the IMF. This timespan gives us sufficient information to investigate the issues at hand. We use monthly data in order to maximise the number of observations on the post-reform regime: with a plausible breakpoint in the early years of this decade, quarterly data would not give sufficient observations to estimate the dynamics of this regime. As a consequence, we use industrial production as a proxy for GDP. This standard assumption is perhaps less questionable in the case of a middle-income emerging economy such as Turkey. We measure the price level using the consumer price index. The short-term interest rate is the interbank rate and credit is measured as the total volume of credits in the financial system in terms of real Turkish Lira.

<Insert Table 1 about here>

An important methodological issue concerns whether to specify our model using levels or first differences. Table 1 reports p-values for Augmented Dickey-Fuller and Phillips-Perron unit root tests: they suggest that our variables are I(1) over the full sample.[1] Many studies have estimated VAR models using the levels of nonstationary variables (e.g. Bernanke and Blinder, 1992, Bernanke and Gertler, 1995). In doing so they have adapted the logic of Fuller's (1976, Theorem 8.5.1) demonstration that differencing does not help to achieve asymptotic efficiency in an autoregressive model and merely results in a loss of information to the VAR framework.

A related issue concerns whether to include the price level or the inflation rate in the model: although most of the literature uses the inflation rate, some influential studies, eg Bernanke and Gertler (1995), use the price level. In our data, the inflation rate is I(1) in the early part of the sample but I(0) in the later part (this is not uncommon, e.g. Halunga *et al.*, 2009). Using price level rather than the inflation rate avoids potential distortions caused by using a variable whose order of integration potentially switches between regimes.[2] However, we do use the inflation rate as a candidate transition variable.

4. Empirical Results

Table 1 presents *C(d)* using the interbank rate and the inflation rate as candidate transition variables, using $p=3$ and $q=4$ and d=1,2,3. There is a strong rejection of the assumption of

[1] We also applied Zivot and Andrews (1992) unit root test, which allows for one endogenous structural break in the series. This test rejects the null hypothesis of a unit root with a break for all variables. The results are not reported but are available upon request.
[2] Our main results are broadly robust to using the inflation rate, but there are some differences and estimates are less well determined.

constant parameters, with all the reported tests statistics rejecting the null hypothesis of linearity. In all cases the strongest rejection occurs where $d=1$. This is therefore selected as the delay parameter, indicating swift regime transitions based on the value of the transition variable in the previous month.

<Insert Table 2 and Figure 1 about here>

The estimated threshold values for this value of *d*, obtained from grid search, are 28.2% for the interbank rate and 22.1% for the inflation rate. Both transition variables give similar regime classifications (see Figure 1). With the interbank rate, there is a single regime transition, in March 2004. With the inflation rate, the economy is in the first regime until July 2003, after which date it is entirely in the second regime. The first regime can be viewed as one of high-inflation, running from the start of our sample in 1986 to mid-2003 or early-2004. During that time the Turkish economy experienced severe economic crises in 1994 and 2001, triggered by banking sector fragility and accumulating current account deficits (Akyürek, 2006). The second regime can be characterized as a low inflation regime; inflation was reduced to single digits by the end of 2004 and has remained comparatively low and stable since.

Tsay's $C(d)$ statistics are designed as tests of the TVAR against the linear VAR. Following Panagiotidis and Pelloni (2007) we also applied other linearity tests to estimated residuals from the linear VAR in (1), the Tsay (1986), Engle (1982) and Brock et al. (1996) BDS tests, the Hinich (1996) bicovariance test and the McLeod and Li (1983) test. These are designed as general tests of the linearity hypothesis rather than tests against a specific nonlinear alternative. These tests confirmed the rejection of the linear VAR in (1).[3]

<Insert Table 3 about here>

[3] The results of those tests are not reported here but available upon request from the corresponding author.

Table 3 presents estimated variance decompositions for output and the price level, calculated using estimates of (1) and (2).[4] Two key points emerge. First, there is clear evidence of changes in transmission mechanisms between regimes. In the pre-reform regime, the impact of both exchange rate and credit shocks falls more on output than on prices; this is reversed in the post-reform regime. At a 2-year horizon, the combined effect of these shocks explains only 19% of the variance of prices in the pre-reform regime compared to 63% in the post-reform regime. The corresponding figures for output are 35% and 14%. These changes imply that, post-reform, the real economy is better insulated from these shocks, a source of instability in the previous regime. Second, there is evidence of more effective stabilization policy. The contribution of output shocks to the variance of output and of price level shocks to the variance of prices is both lower and dies away more quickly in the post-reform regime. Related to this, the contribution of monetary policy shocks to the variances of output and prices is higher in the post-reform regime. This is evidence that monetary policy has a stronger impact on the real economy in this regime, suggesting a more credible policy regime.

<Insert Figure 2 and Figure 3 about here>

These findings are reflected in the estimated impulse response functions, presented in Figures 2-6.[5] The responses obtained from positive one-standard deviation shocks are plotted with their upper and lower one-standard-error bands in order to assess their significance over the 24 months horizon.[6] The impact of shocks in the post-reform period is often significantly different from the pre-reform regime and from a simple VAR model estimated using the full

[4] We present estimated variance decompositions and impulse responses using the interbank rate as the transition variable.
[5] In order to compare impulse responses under different regimes, we scale the responses of each variable by the standard deviation in each regime (Enders, 2003). By doing so we are comparing the response to shocks of equal magnitude in each regime.
[6] The standard error bands are generated from 1000 draws by Monte Carlo Integration based on Sims and Zha (1999).

sample which largely reflects results from the pre-reform period although the relative shortness of the post-reform periods means that the confidence intervals for that regime are relatively wide at long horizons. Output falls in a persistent response to a real exchange rate shock in the pre-reform period whereas the response in the post-reform period is mainly insignificant. A large and persistent response of the price level to credit shocks is also replaced by a small and insignificant response in the post-reform period. As Figure 4 shows, the response of prices and output to interest rate shocks is also smaller in the post-reform period, with the disappearance of a strong “price puzzle” in the post-reform period especially noteworthy. This is consistent with evidence from other countries that the “price puzzle” maybe an artifact of accommodative monetary policy (Castelnuovo and Surico, 2010). Taken together, these figures reinforce our main finding, that the transmission mechanism changed markedly following the reforms enacted in the early 2000s.

<Insert Figure 4 Figure 5 and Figure 6 about here>

The estimated impulse responses of the interest rate to output and price level shocks highlight the importance of monetary policy in achieving stabilization. It is notable that there is no interest rate response to output or price level shocks in the high inflation regime; monetary policy appears to be completely passive to these key macroeconomic variables. By contrast, there is a strong monetary policy response to output shocks in the low inflation regime, indicating a much more active pursuit of policy goals. The response of interest rates to the price level is more complex, with an initial accommodating reduction in rates being unwound a year after the initial shock.

4. Conclusions

This paper has developed a simple empirical macroeconomic model of Turkey that focuses on changes in the transmission mechanism that generate changes in output, the price level and other key macroeconomic variables in response to a variety of shocks. Recognising the major reform of economic policy following the crisis of 2001, we have tested for the existence of multiple regimes. Having detected these, we estimated a TVAR model that allows the structure of the macroeconomic model to vary across distinct regimes and used these estimates to calculate impulse response functions that describe the response of endogenous variables to macroeconomic shocks and to decompose the variance of endogenous variables into components that reflect the effect of shocks.

We have found clear evidence of a change in the transmission mechanism and dated this to 2003-4; the change in regime therefore reflects changes in the macroeconomic policy environment. The Turkish economy can be characterized as being in a high inflation regime from the start of our sample until the reforms took effect; since then it has been in a more stable low inflation regime. We found clear evidence of changes in the response of output and the price level to a variety of shocks, to the real exchange rate, the amount of credit in the economy and the policy interest rate; from this we conclude that the transmission mechanism did change.

Our paper argues that there was a marked changed in all aspects of the transmission mechanisms in Turkey following the successful implementation of the reform program. A natural development of our work would be to consider individual transmission mechanisms in more detail to assess how it has changed. This would require a more detailed and structural model than that used in this paper. We hope to address this in future work.

References

Akyürek, C., 2006. The Turkish crisis of 2001: a classic? Emerging Markets Finance and Trade 42, 5–32.

Atasanova, C., 2003. Credit market imperfections and business cycle dynamics: a nonlinear approach. Studies in Nonlinear Dynamics & Econometrics 7, Article 5.

Balke, N., 2000. Credit and economic activity: credit regimes and non-linear propagation of shocks. Review of Economics and Statistics 82, 344-349.

Bank of England 1999. The transmission mechanism of monetary policy 2011. Available at http://www.bankofengland.co.uk/publications/other/monetary/montrans.pdf 2012.

Başçı, E., Özel, Ö., Sarıkaya, Ç., 2007. The monetary transmission mechanism in Turkey: new developments. The Central Bank of the Republic of Turkey, Research and Monetary Policy Department Working Paper 07/04.

Bernanke, B., Blinder, A., 1992. The Federal funds rate and the channels of monetary transmission. The American Economic Review 82, 901-921.

Bernanke B., Gertler, M., 1995. Inside the black box: the credit channel of monetary policy transmission. The Journal of Economic Perspectives 9, 27-48.

Boivin, J., Kiley, M.T., Mishkin, F.S., 2010. How has the monetary transmission mechanism evolved over time? NBER Working Paper 15879.

Borio, C., Zhu, H., 2008. Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism? BIS Working Papers 268.

Brock, W.A., Dechert,W., Scheinkman, J., LeBaron, B., 1996. A test for independence based on the correlation dimension. Econometrics Reviews 15, 197–235.

Christiano, Lawrence J., Eichenbaum, Martin, Evans, Charles L., 1999. Monetary policy shocks: what have we learned and to what end? In: Taylor, J.B., Woodford, M. (Eds.), Handbook of Macroeconomics, vol. 1A, part 1. Elsevier, North-Holland, Amsterdam, pp. 65–148.

Christiano, L. J., Trabandt, M., Walentin, K., 2010. DSGE Models for Monetary Policy Analysis. In: Friedman, B. M., Woodford, M. (Eds.), Handbook of Monetary Economics. Elsevier, 2010, pp. 285-367.

Cooley, T. F., Quadrini, V., 2004. Optimal monetary policy in a Phillips-curve world. Journal of Economic Theory 118, 174–208.

Çiçek, M., 2005. Türkiye'de parasal aktarım mekanizması: VAR yaklaşımıyla bir analiz. İktisat İşletme ve Finans 233, 82-105.

Castelnuovo, E., Surico, P., 2010. Monetary policy, inflation expectations and the price puzzle. The Economic Journal 120, 1262–1283.

Enders, W. (2003) *RATS Programming Manual*. Estima: Evanston, IL.

European Central Bank 2010. Transmission mechanism of monetary policy 2010. available at http://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html 2012.

Fuller, W.A., 1976. Introduction to Statistical Time Series. Wiley Series in Probability. Wiley, New York.

Halunga, A, Osborn, D., Sensier, M., 2009. Changes in the order of integration of US and UK inflation. Economics Letters 102, 30-32.

Hinich, M.J., 1996. Testing for dependence in the input to a linear time series. Journal of Nonparametric Statistics 6, 205–221.

Kara, H and Ogunc, F., 2005. Exchange rate pass-through in Turkey: It is slow, but is it really low? The Central Bank of the Republic of Turkey, Research and Monetary Policy Department Working Papers 05/10.

Karasoy, A., Kunter, K., Us V., 2005. Monetary transmission mechanism in Turkey under free float using a small-scale macroeconomic model. Economic Modelling 22, 1064– 1073.

McLeod, A.I., Li. W. K., 1983. Diagnostic checking ARMA time series models using squared-residual autocorrelations. Journal of Time Series Analysis 4, 269–273.

Mishkin, F., 1996. The channels of conetary transmission: lessons for monetary policy. NBER Working Paper 5464.

Panagiotidis, T., Pelloni, G. 2007. "Nonlinearity in the Canadian and US labor markets: univariate and multivariate evidence from a battery of tests, Macroeconomic Dynamics 11, 613-637.

Patterson, D.M., Ashley, R. A. 2000. A Nonlinear Time Series Workshop. London: Kluwer Academic.

Peersman, G., Smets, F., 2003. The monetary transmission mechanism in the euro area: more evidence from VAR analysis. In: Angeloni, I., Kashyap, A., Mojon, B. (Eds.), Monetary Policy Transmission in the Euro Area. Cambridge University Press, Cambridge, pp. 36–55.

Sims, C., 1992. Interpreting the macroeconomic time series facts: the effects of monetary policy. European Economic Review 36, 2–16.

Sims, C.A., Zha T., 1999. Error Bands for Impulse Responses. Econometrica 67, 1113-1156.

Tsay, R.S., 1986. Nonlinearity tests for time series. Biometrica 73, 461–466.

Tsay, R.S., 1998. Testing and modeling multivariate threshold models. Journal of the American Statistical Association 93, 1188–1998.

Zivot, E., Andrews D. W. K., 1992. Further evidence on the Great Crash, the oil-price shock and the unit root hypothesis. Journal of Business and Economic Statistics 10, 251-270.

Table 1a. Augmented Dickey-Fuller and Phillips-Perron Unit Root Tests

		Levels		First Differences	
		t-statistics	p-value	t-statistics	p-value
y_t	ADF	-1.4228	0.5712	-20.8484	0.0000
	PP	-1.3850	0.5898	-21.1938	0.0000
p_t	ADF	0.6432	0.8546	-9.5544	0.0000
	PP	0.9625	0.9110	-5.3522	0.0000
i_t	ADF	-2.9823	0.1390	-18.0571	0.0000
	PP	-2.3227	0.1655	-18.0653	0.0000
c_t	ADF	0.8472	0.9947	-13.2404	0.0000
	PP	0.8295	0.9944	-13.2404	0.0000
e_t	ADF	-1.2629	0.6474	-11.7153	0.0000
	PP	-1.1839	0.6822	-12.8079	0.0000
oil_t^p	ADF	-1.3077	0.6268	-13.0091	0.0000
	PP	-1.1993	0.6756	-13.0091	0.0000
i_t^{us}	ADF	-1.3624	0.6008	-6.1573	0.0000
	PP	-1.6657	0.4477	-8.4546	0.0000
y_t^{us}	ADF	-1.7745	0.3928	-4.8144	0.0001
	PP	-1.4851	0.5400	-18.4062	0.0000

Note: ADF is the augmented Dickey–Fuller test statistic and PP is the Phillips–Perron test statistic.

Table 1b. Descriptive Statistics

	y_t	p_t	i_t	c_t	e_t	oil_t^p	i_t^{us}	y_t^{us}
Mean	4.313	1.513	51.049	10.580	4.816	3.276	4.471	4.399
Median	4.320	2.407	48.095	10.328	4.760	3.006	5.070	4.482
Std. Dev.	0.284	3.135	42.161	0.851	0.226	0.603	2.436	0.194
Skewness	-0.056	-0.442	4.095	1.030	0.357	0.838	-0.123	-0.328
Kurtosis	2.049	1.699	29.847	2.799	2.079	2.561	2.289	1.531
Jarque-Bera	11.418	30.833	9716.389	53.413	16.910	37.361	7.051	32.246
Prob.	0.003	0.000	0.000	0.000	0.000	0.000	0.029	0.000
N. of Obs.	299	299	299	299	299	299	299	299

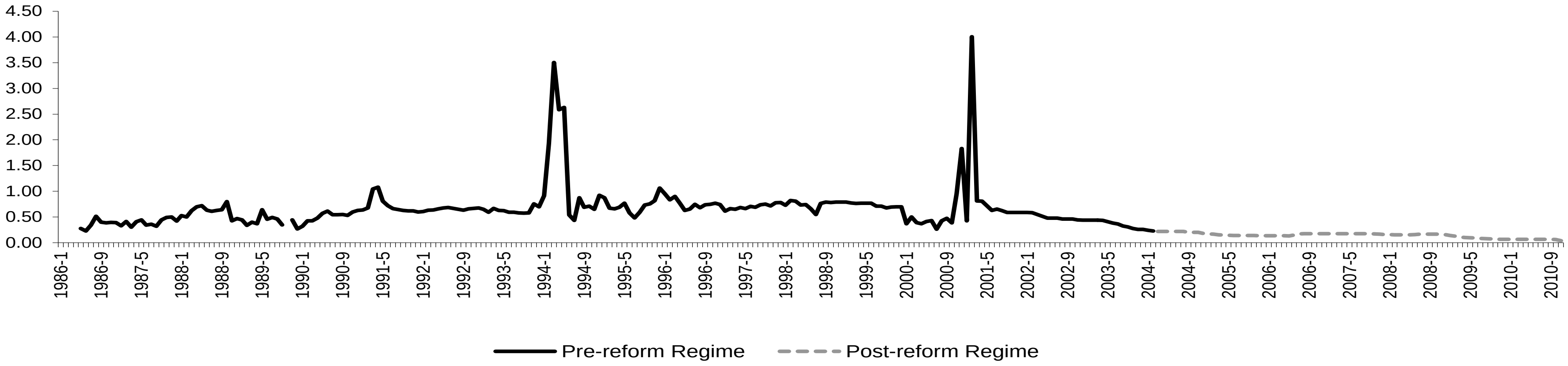
Table 2 . Multivariate Threshold Nonlinearity Test

Interbank Rate				Inflation			
d	m_0	*C(d)*	P-value	*d*	m_0	*C(d)*	P-value
1	50	216.95	0.000	1	50.00	216.77	0.000
1	100	197.62	0.000	1	100.00	210.21	0.000
2	50	185.83	0.001	2	50.00	132.00	0.000
2	100	187.34	0.001	2	100.00	143.65	0.000
3	50	177.50	0.004	3	50.00	116.33	0.010
3	100	172.74	0.007	3	100.00	139.71	0.000
γ	0.2208	AIC	-4834.6	γ	0.2820	AIC	-2319.63

Table 3. Decomposition of Variance for Output and Prices

	Output																
	Linear VAR						**Pre-reform Regime**						**Post-reform Regime**				
Step	y_t	p_t	i_t	c_t	e_t	Step	y_t	p_t	i_t	c_t	e_t	Step	y_t	p_t	i_t	c_t	e_t
1	100.000	0.000	0.000	0.000	0.000	1	100.00	0.000	0.000	0.000	0.000	1	100.000	0.000	0.000	0.000	0.000
6	72.179	0.102	24.900	0.660	2.158	6	77.040	2.273	1.831	3.220	15.636	6	57.394	0.060	39.310	1.331	1.904
12	65.846	0.159	30.862	1.318	1.815	12	60.966	3.370	7.878	7.348	20.438	12	50.912	0.149	42.995	3.820	2.124
18	64.142	0.473	30.610	2.414	2.360	18	54.855	2.945	11.050	12.099	19.050	18	48.198	0.430	41.351	6.720	3.301
24	62.702	1.053	29.583	3.612	3.050	24	52.292	2.562	10.710	16.618	17.819	24	45.632	0.929	39.192	9.802	4.447
	Prices																
	Linear VAR						**Pre-reform Regime**						**Post-reform Regime**				
Step	y_t	p_t	i_t	c_t	e_t	Step	y_t	p_t	i_t	c_t	e_t	Step	y_t	p_t	i_t	c_t	e_t
1	3.499	96.501	0.000	0.000	0.000	1	4.546	95.454	0.000	0.000	0.000	1	4.070	95.930	0.000	0.000	0.000
6	3.593	58.716	29.032	3.387	5.273	6	13.961	81.131	3.327	0.008	1.572	6	1.491	56.637	25.500	6.463	9.909
12	4.995	48.710	32.453	4.563	9.279	12	9.308	83.452	2.469	0.248	4.523	12	0.802	42.775	19.123	19.939	17.361
18	6.009	44.642	32.049	5.621	11.678	18	8.426	78.170	2.016	1.908	9.480	18	0.645	34.250	12.581	31.982	20.541
24	6.754	42.500	30.878	6.638	13.230	24	10.758	67.618	2.643	5.421	13.560	24	0.750	28.516	8.212	40.888	21.634

a. Threshold Variable: Interbank rate



b. Threshold variable: Inflation rate

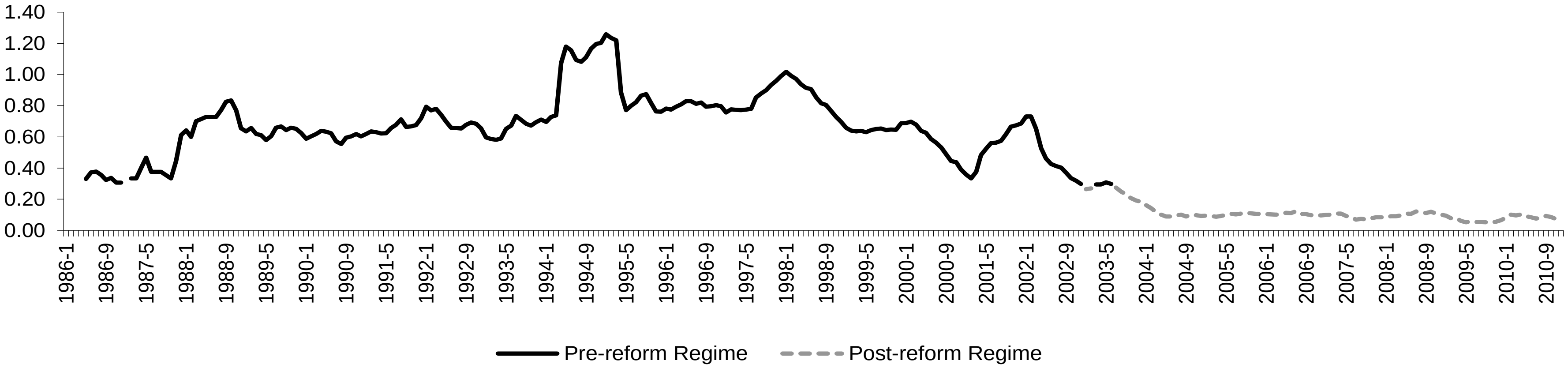


Fig. 1. Regime classification.

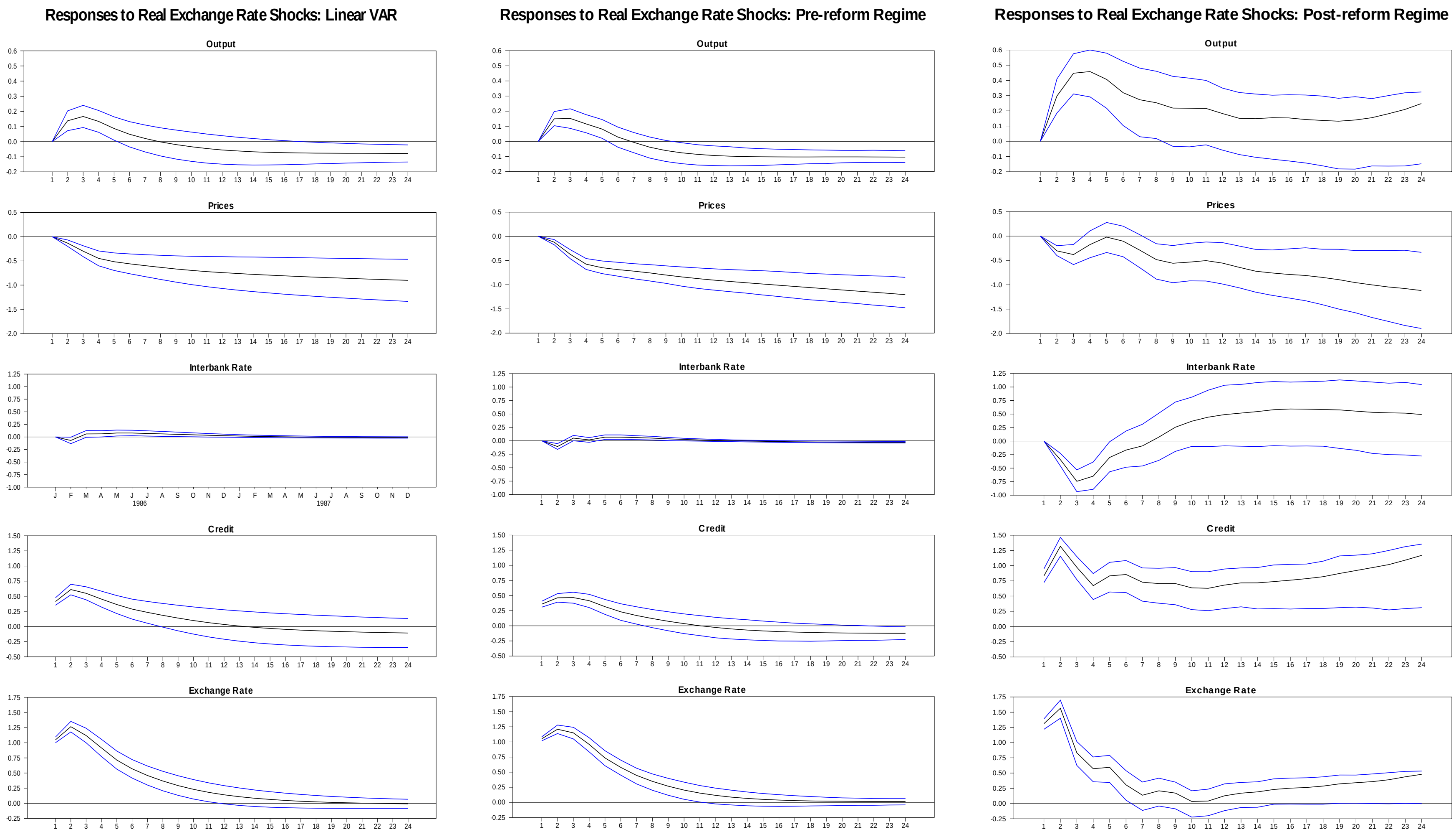


Fig. 2. Responses to one-standard-deviation real exchange rate shocks.

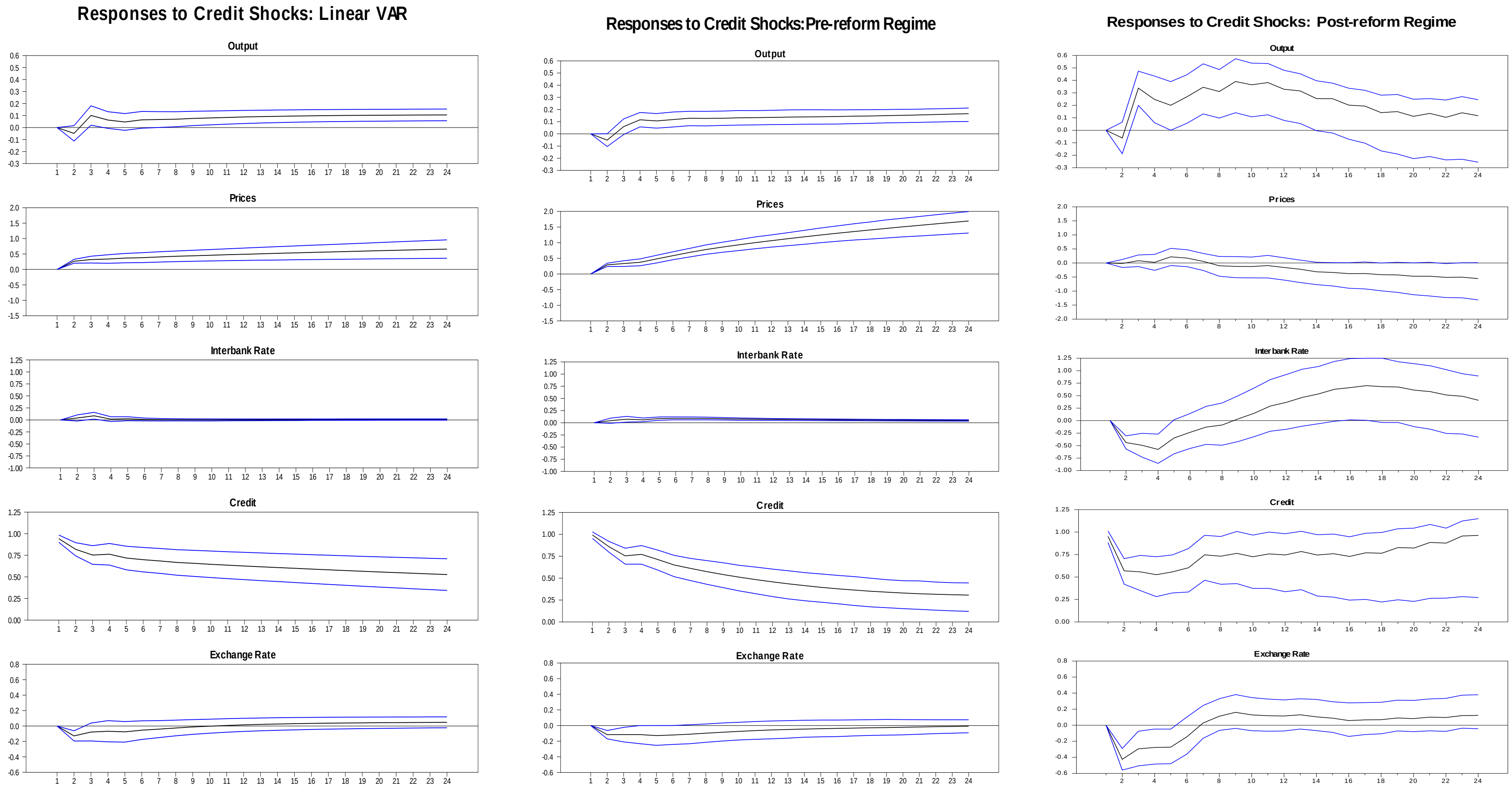


Fig. 3. Responses to one-standard-deviation credit shocks.

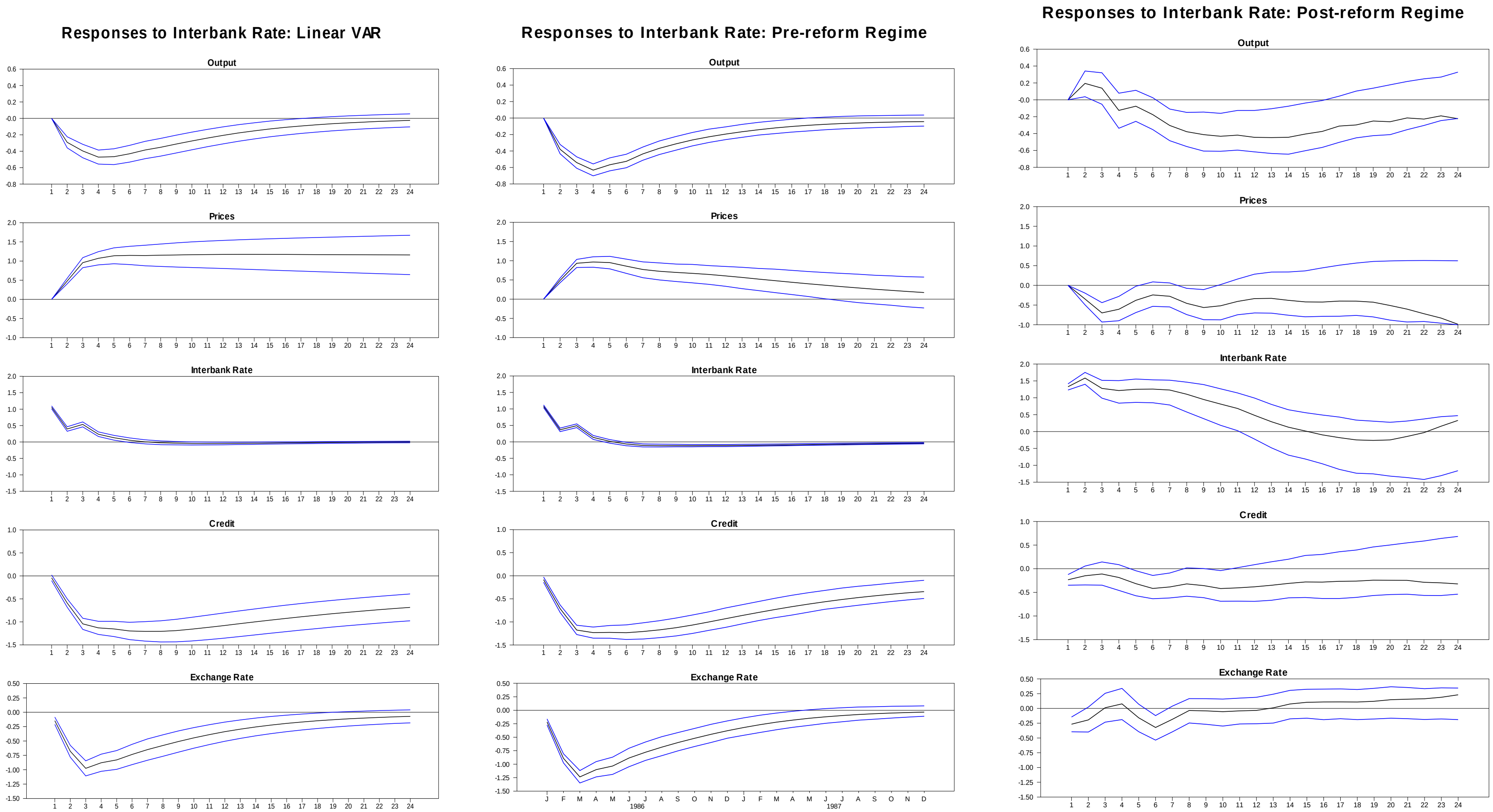


Fig. 4. Responses to one-standard-deviation interbank rate shocks.

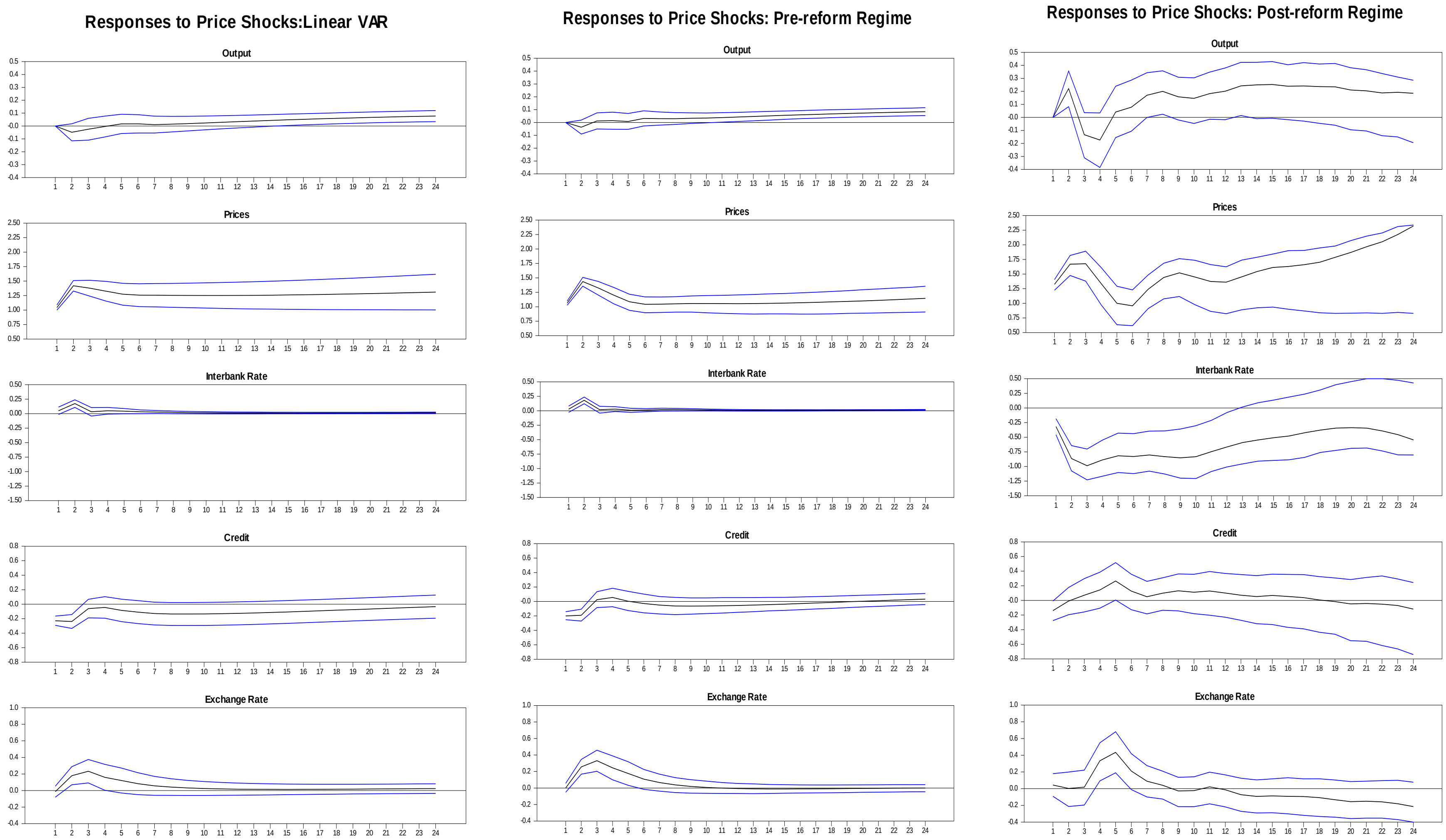


Fig. 5. Responses to one-standard-deviation price shocks.

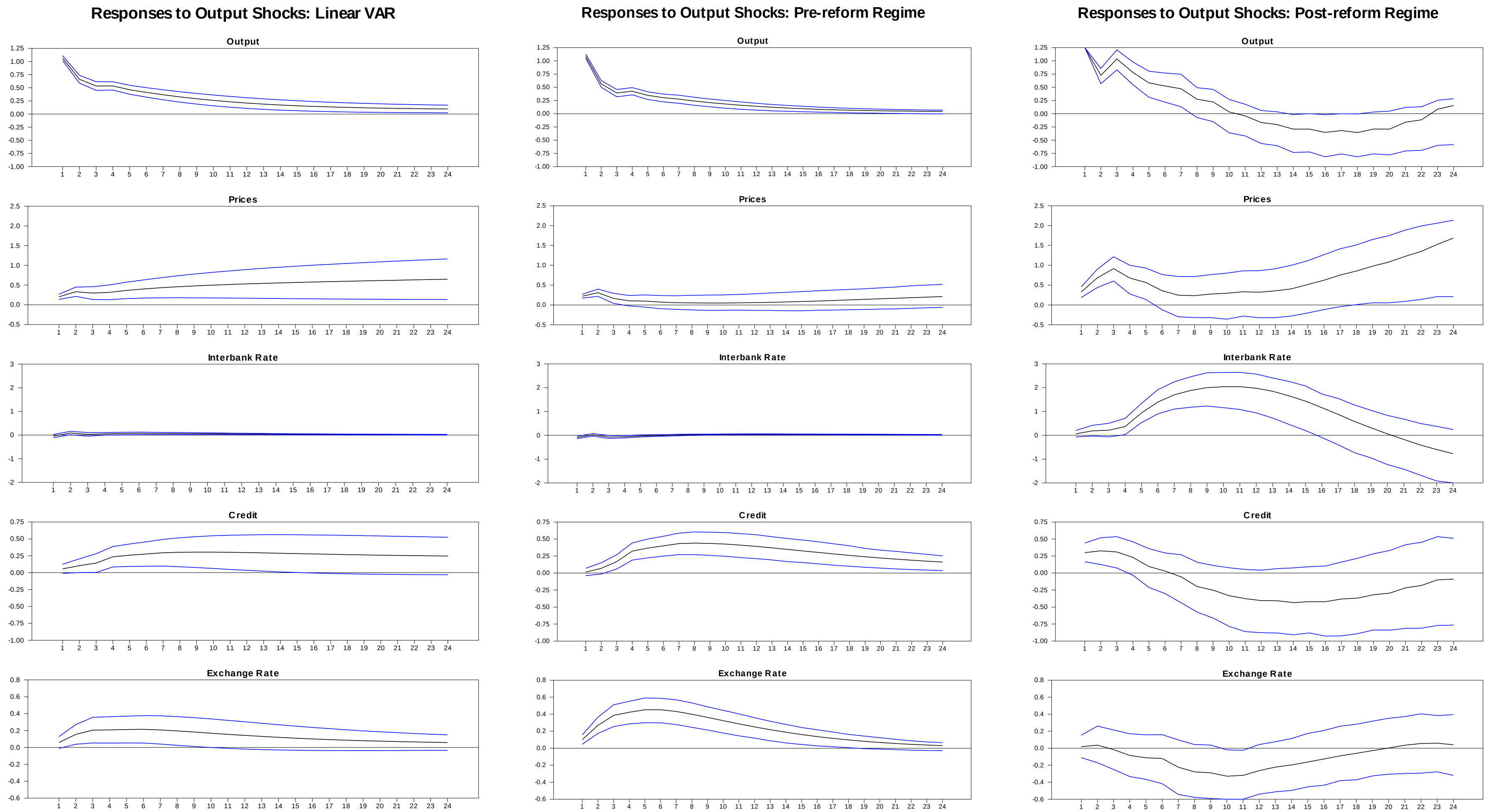


Fig. 6. Responses to one-standard-deviation output shocks.

Appendix: Data