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Macroeconomic transitions and the transmission mechanism: Evidence from Turkey

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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.

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 Başçı 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 (Borio and Zhu, 2008; Cooley and Quadrini, 2004). 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, 1999) 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

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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.

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 (Christiano et al., 2010; Peersman and Smets, 2003).

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 Başçı 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.

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

2. Methodology

A VAR representation of our model can be written as,

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

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 Zt 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 describe 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:

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

where c is the threshold variable and γ is the threshold; $I(c_{t\text{-}d})$ is a dummy indicator function that equals 1 when $c_{t-d} \geq \gamma$, and 0 otherwise. Eq. (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 Eq. (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

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