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Measuring the impact of monetary policy on asset prices in Turkey

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ABSTRACT

Little is known about the impact of monetary policy on asset prices in emerging markets. This study applies the heteroscedasticity-based GMM for financial markets in Turkey. The results suggest that event study estimates are biased for some asset returns.

1. Introduction

It is crucial for central banks to obtain reliable estimates of the reaction of asset prices to monetary policy. However, there are two major difficulties in the measurement of this. First, while the asset prices are affected by the monetary policy decisions, the policy rate may also respond to changes in the asset prices. Second, some common factors, such as macroeconomic outlook and changes in risk preferences, can simultaneously affect both policy decisions and asset prices. In the literature, to overcome these problems, the most commonly adopted estimation method is the event study (ES) approach.[1] Rigobon and Sack (2004) (henceforth, RS) develop the heteroscedasticity-based generalized method of moments (GMM) estimation technique as an alternative to the ES approach. This technique is considered more reliable as it is valid under much weaker assumptions.

Studies using the heteroscedasticity-based estimation technique are very limited for emerging markets.[2] This study estimates the response of asset prices to monetary policy in Turkey, using the heteroscedasticity-based GMM. The impact of monetary policy on longer-term interest rates is found to be positive and diminishes with maturity for maturities longer than 9 months. Surprisingly, the policy rate has little effect on the foreign exchange value of the Turkish lira. Finally, an increase in the policy rate leads to a decline in the stock prices, where monetary policy has the greatest impact on the share prices of the financial sector firms.

2. Methodology

The dynamics of the short-term interest rate and asset prices are as follows:

$$\Delta i_t = \beta \Delta s_t + \gamma z_t + \varepsilon_t \quad (1)$$

$$\Delta s_t = \alpha \Delta i_t + z_t + \eta_t \quad (2)$$

where Δi_t is the change in the policy rate, Δs_t is the change in the asset price and z_t is a vector of exogenous variables which

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1 For two notable examples using the ES approach, see Kuttner (2001) and Gürkaynak et al. (2005).

2 See Rezessy (2005), Goncalves and Guimaraes (2007) and Duran et al. (2010), which is a parallel study on the Turkish stock market. For examples on developed countries, see Rigobon and Sack (2004), Bohl et al. (2007), Kholodilin et al. (2009).

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Table 1
Estimation results and diagnostic tests.

	$\hat{\alpha}_{ES}$		$\hat{\alpha}_{GMM}$		$\hat{\lambda}_{GMM}$		*OIR test*	*GMM vs. ES*
Yields on government bonds								
6 months	0.731^{***}	(*0.085*)	1.050^{***}	(*0.061*)	0.116^{***}	(*0.012*)	0.215	29.054^{***}
9 months	1.092^{***}	(*0.120*)	1.769^{***}	(*0.143*)	0.119^{***}	(*0.011*)	0.292	76.854^{***}
12 months	1.005^{***}	(*0.117*)	1.382^{***}	(*0.178*)	0.105^{***}	(*0.013*)	0.052	7.957^{***}
15 months	0.866^{***}	(*0.110*)	0.915^{***}	(*0.215*)	0.089^{***}	(*0.019*)	0.027	0.071
18 months	0.770^{***}	(*0.110*)	0.696^{***}	(*0.193*)	0.084^{***}	(*0.022*)	0.109	0.217
Benchmark Rate	0.724^{***}	(*0.112*)	0.623^{***}	(*0.172*)	0.085^{***}	(*0.024*)	0.113	0.610
21 months	0.716^{***}	(*0.113*)	0.611^{***}	(*0.168*)	0.085^{***}	(*0.024*)	0.111	0.721
24 months	0.687^{***}	(*0.115*)	0.558^{***}	(*0.161*)	0.085^{***}	(*0.025*)	0.115	1.307
27 months	0.670^{***}	(*0.115*)	0.502^{***}	(*0.172*)	0.083^{***}	(*0.025*)	0.169	1.742
30 months	0.659^{***}	(*0.114*)	0.447^{**}	(*0.189*)	0.081^{***}	(*0.025*)	0.312	1.982
33 months	0.648^{***}	(*0.112*)	0.411^{**}	(*0.197*)	0.078^{***}	(*0.025*)	0.559	2.139
36 months	0.637^{***}	(*0.110*)	0.399^{**}	(*0.198*)	0.076^{***}	(*0.025*)	0.857	2.090
Exchange rates								
TRL/USD	−0.224	(*0.315*)	−0.511	(*0.438*)	0.092^{***}	(*0.032*)	0.744	0.895
TRL/EUR	-0.516^{*}	(*0.333*)	-0.997^{***}	(*0.394*)	0.088^{***}	(*0.031*)	0.909	5.194^{***}
Stock indices								
ISE All	-2.760^{***}	(*0.754*)	-3.385^{***}	(*0.914*)	0.101^{***}	(*0.032*)	0.091	1.468
ISE 100	-2.856^{***}	(*0.775*)	-3.445^{***}	(*0.942*)	0.099^{***}	(*0.031*)	0.053	1.209
ISE 30	-2.928^{***}	(*0.828*)	-3.503^{***}	(*0.976*)	0.100^{***}	(*0.032*)	0.065	1.232
Industry	-2.258^{***}	(*0.704*)	-2.762^{***}	(*0.818*)	0.097^{***}	(*0.032*)	0.017	1.460
Services	-2.104^{***}	(*0.640*)	-2.634^{***}	(*0.817*)	0.101^{***}	(*0.032*)	0.140	1.093
Trade	-1.347^{**}	(*0.676*)	−1.433	(*0.931*)	0.097^{***}	(*0.034*)	0.138	0.018
Financial	-3.233^{***}	(*0.895*)	-3.982^{***}	(*1.050*)	0.102^{***}	(*0.031*)	0.155	1.864
IT	-1.778^{**}	(*0.785*)	-2.433^{**}	(*1.131*)	0.076^{***}	(*0.030*)	1.379	0.646

Notes: The standard errors are in parentheses. The maturity of the benchmark rate is around 20.4 months. GMM over-identification test has a $\chi^2(1)$ distribution. $F_{1,59}$ distribution is used for the Hausman-type biasedness test.
* Indicate the significance levels at 10% level.
** Indicate the significance levels at 5% level.
*** Indicate the significance levels at 1% level.

affect both Δi_t and Δs_t. In our setup, following RS, z_t is taken as an unobservable common factor. The variable ε_t is the monetary policy shock and η_t is the asset price shock. The shocks ε_t and η_t are assumed to be serially uncorrelated and to be uncorrelated with each other and with the common shock z_t.

In this paper, the parameter of interest is α, which measures the impact of a change in the policy rate Δi_t on the change in the asset price Δs_t. The ES approach estimates only Eq. (2) and uses the asset price changes directly after the announcement of the monetary policy committee (MPC) decision. The ES approach implicitly assumes that, in the limit, the variance of the policy shock becomes infinitely large relative to the variances of other shocks on policy dates.

The heteroscedasticity-based identification technique suggested by RS does not require such a strong assumption. In this approach, we only need to observe a rise in the variance of the policy shock when the MPC decision is announced, while the variances of other shocks remain constant, given that the parameters α, β and γ are stable. Since the GMM technique requires weaker assumptions, it can give more reliable estimates than the ES approach.

Two subsamples are essential to implement the GMM technique. *P* stands for the policy dates (days when the MPC decisions are announced) and *N* stands for the non-policy dates (days immediately preceding the policy days). This method uses a comparison of the covariance matrices of the variables on the policy and the non-policy dates, denoted by Ω_P and Ω_N. The difference in the covariance matrices is as follows:

$$\Delta\Omega = \Omega_P - \Omega_N = \frac{(\sigma_\varepsilon^P - \sigma_\varepsilon^N)}{(1-\alpha\beta)^2}\begin{bmatrix} 1 & \alpha \\ \alpha & \alpha^2 \end{bmatrix}.$$

As in RS, we denote $\lambda = \frac{(\sigma_\varepsilon^P - \sigma_\varepsilon^N)}{(1-\alpha\beta)^2}$. There are two parameters to be estimated, namely; α, the parameter of interest, and λ, a measure of the degree of heteroscedasticity that is present in the data. There are three moment conditions and two parameters to estimate. Therefore, overidentification restrictions enable us to test the model as a whole.

3. Data

Market interest rates are the yields on government bonds traded in the Istanbul Stock Exchange (ISE) secondary market. We use yield curve implied rates calculated using daily ISE data for various maturities. The policy rate is proxied by the yield on government bonds with one-month maturity. We take stock indices ISE All, ISE 100, ISE 30 and the indices of the manufacturing, services, trade, financial and IT sectors. The market rates are constructed as the daily changes of the interest rates in basis points while the stock indices and the exchange rates are in daily percentage changes. The sample covers the January 2005–December 2009 period with 60 policy decisions.[3]

4. Empirical results

The estimates for the parameter α using both the ES approach and the heteroscedasticity-based GMM method are reported in Table 1.[4] According to the GMM method, which is theoretically more reliable, yields on the government bonds with maturities ranging from 6 to 36 months respond to the change in the short-term interest rate significantly and in the same direction.

3 Long-term yields are unavailable before 2005.
4 See Aktaş et al. (2009) for an earlier version of ES results.

Monetary policy changes do not have a large impact either on the US dollar rate or on the euro rate. Even though the effect of the policy changes on the euro rate is found to be statistically significant, the estimated coefficient (0.997 in absolute value) is small in magnitude, suggesting that an increase in the unanticipated component of the policy rate would only cause a minor appreciation against the euro. It is important to note that the estimated responses of exchange rates under the heteroscedasticity-based identification method, while still small, are larger (in absolute value) than the corresponding estimates under the ES approach.

The responses of various stock indices to a rise in the short-term rate are significant and negative. While the ISE Financials give the largest response, the least response is given by the trade sector under the ISE Services. According to the GMM estimates, a 25 basis points increase in the short-term interest rate decreases ISE All Shares by 0.85%, ISE Financials by 0.99%, ISE Industrials by 0.69%, ISE Services by 0.65%, and ISE IT by 0.61%.

The diagnostics for the estimates are also reported in Table 1. The results of the tests confirm that the assumptions of the GMM method are more reliable. The fact that λ is significant suggests that the increase in the volatility of the policy date is sufficiently large for GMM estimation. The over-identification test results, reported in the fifth column, do not point to model misspecification. The difference between the ES and the heteroscedasticity-based GMM likely reflects a bias in the ES estimates. The potential biasedness of the event-study estimates compared to the GMM method is tested and reported in the last column. For interest rates with 6 to 12 months maturity, the ES estimates are found to be statistically biased. On the other hand, longer-term interest rates do not exhibit significant bias. The ES approach is found to be biased in estimating the response of the euro rate as well. The empirical results for the stock indices suggest that the ES estimates are not statistically biased compared to the GMM estimates.

5. Conclusion

This study estimates the impact of monetary policy on asset prices in Turkey using the heteroscedasticity-based GMM technique suggested by Rigobon and Sack (2004), which takes into account both the simultaneity and the omitted variables problems. The empirical results show that increases in the policy rate lead to a decline in stock prices, rises in government bond yields with longer maturities, and an economically insignificant appreciation of the domestic currency. We compare the results with the more widely applied event study method and find that the event study gives biased results in measuring the responses of short-term bond yields and the Turkish lira/euro exchange rate. We show that monetary policy transmission in Turkey, an emerging market and a small open economy, works very similarly to that in advanced economies.

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