

The Asymmetric Effects of Monetary Policy on Economic Activity in Turkey

Cengiz Tunc Mustafa Kilinc

Central Bank of the Republic of Turkey

April 5, 2016

Motivation

- How the Monetary Policy Shocks (MPS) affect real economic activity?
- Examine the existence of asymmetric effects of MPS in economic expansion and recession and credit cycles.
- Two explanations for the existence of this asymmetry:
 - Alternative financing options
 - Convex short-run aggregate supply curve

Methodology and Contribution

- To test the asymmetric effects, we employ Markov Switching Model (MSM),
- How to measure MPS? Structural VAR.
- An important contribution of this paper is that it investigates the asymmetric effects of monetary policy shocks on the real economic activity not only in the aspect of commonly used economic expansions and recessions but also in the aspects of credit cycles.
- The first paper analyzing the asymmetric effects of MPS on real economic activity in Turkey during 2006-2014 period.

A Brief Literature Review

- Garica & Schaller(Economic Inquiry,2002) and Lo & Piger (JMCB,2005): MPS have larger effects on output growth in recession than expansion in US.
- Dolado & Maria-Doleros (EER,2000): similar results for Spain between 1977-97
- Peersman & Smets (ECB WP,2000) and (The Economic Journal,2005): In Europe, MPS have larger effects in recession than in expansion.
- Industrial heterogeneity (Ganley and Salmon (1997), Hayo and Uhlenbrock (2000), Dedola and Lippi (2005).

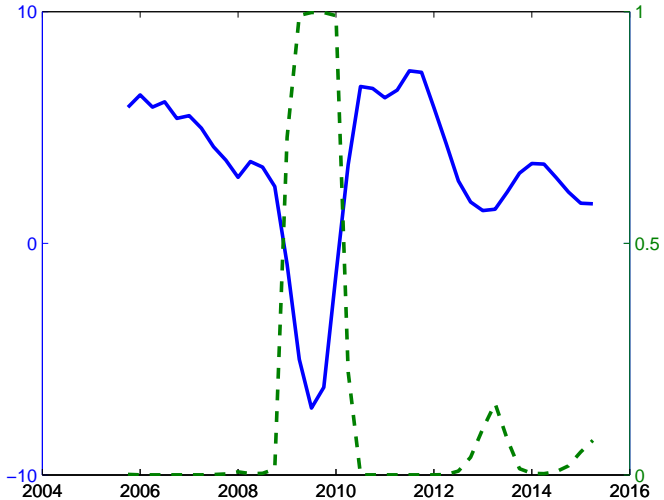
MRSM

- Economic expansion and recession, credit expansions and slowdowns
- Obtain probabilities of switches between regimes for each time period
- To estimate the probabilities of regime switches between states (i.e. ρ_g and ρ_b) for each time period

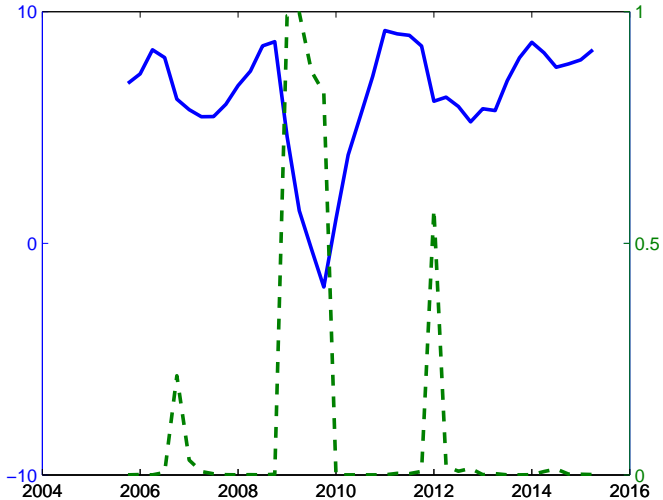
$$g_t - \mu_{s_t} = \rho_{s_t}(g_{t-1} - \mu_{s_{t-1}}) + \epsilon_t, \quad (1)$$

where g_t is the quarterly growth rate of the GDP at time t in the case of economic activity, and the yearly change in the stock of of business credits as a ratio to GDP in the case of credit cycles while μ_{s_t} represents the mean growth rate of GDP being in state s_t for the case of GDP and the mean of the net business credits to GDP ratio being in state s_t for the case of credit cycles.

GDP Growth and Regime Switching Probabilities from Business Cycles



GDP Growth and Regime Switching Probabilities from Credit Cycles



SVAR Model

- We use the monetary policy shocks estimated by Kilinc and Tunc (2014) for Turkey for the 2006Q1-2014Q4 period.
- They employ a structural VAR (SVAR) model which uses world energy price, world industrial production, and the federal funds rate as external variables and gross domestic product, the consumer price index, monetary aggregate, the real effective exchange rate, country risk premium, and the short-term interest rate as domestic variables.
- The model incorporates block exogeneity assumption, which implies that the shocks to the domestic variables of small open economies have no impact on the external variables neither contemporaneously nor in lag form but the shocks to the external variables could have even contemporaneous impact on the domestic variables of such economies.

Monetary Policy Shocks

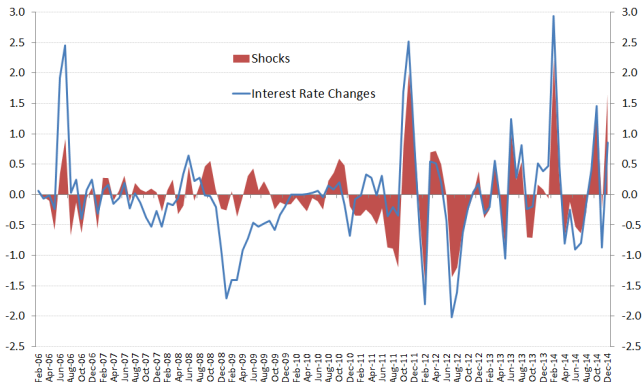


Figure: This figure displays the changes in the monthly-averaged interbank over-night interest rate (solid line) and the monetary policy shocks (shaded-area) generated for Turkey by Kilinc and Tunc (2014) for 2006-2014 time period.

Model

We use seemingly unrelated regression (SUR) method as there might be correlation between shocks affecting different sectors.

$$\Delta y_{i,t} = \alpha_i + \phi_{i,1} \Delta y_{i,t-1} + \phi_{i,2} \Delta y_{i,t-2} + \beta_i MP_{t-1} + \varepsilon_{i,t}, \quad (2)$$

where $\Delta y_{i,t}$ is the quarterly growth rate of sector i at time t and MP_{t-1} is the monetary policy shock at time $t-1$. This model assumes that a monetary policy shock at time t would affect the real economy in the following quarter to account for possible lags in the monetary transmission process.

MRSM

Following Peersman and Smets(2005), we then incorporate regime switching probabilities into the model

$$\Delta y_{i,t} = (\alpha_{i,0}\rho_{g,t} + \alpha_{i,1}\rho_{b,t}) + \phi_{i,1}\Delta y_{i,t-1} + \phi_{i,2}\Delta y_{i,t-2} + \beta_{i,g}\rho_{g,t-1}MP_{t-1} + \beta_{i,b}\rho_{b,t-1}MP_{t-1} + \varepsilon_{i,t}, \quad (3)$$

$$\rho_{g,t} + \rho_{b,t} = 1. \quad (4)$$

where $\rho_{g,t}$ and $\rho_{b,t}$ are the probabilities of being in states g and b at time t and $\beta_{i,g}$ and $\beta_{i,b}$ stand for the short-run coefficients for being in states g and b , respectively. In the case of economic activity, states g and b correspond to economic expansions and slowdowns and in the case of credit cycles, they correspond to strong credit growth and slow credit growth periods respectively.

Table: The Effects of the MPSs on the GDP: Simple Model

	α	ϕ_1	ϕ_2	β
Panel A GDP	0.772**	0.353**	-0.187	-0.17
Panel B Agriculture	0.803*	-0.131	-0.168	0.153
Industry	1.074**	0.293***	-0.335***	-0.336
Construction	0.169	1.209***	-0.492***	-0.106
Services	0.926***	0.199*	-0.183	-0.075
Panel C Wholesale and Retail Trade	0.885	0.369***	-0.438***	-0.075
Transportation and Storage	1.081**	-0.067	-0.083	-0.161
Accommodation and Food Services	1.298***	-0.272**	-0.058	-0.138
Information and Communication	0.574**	0.313**	0.267*	-0.022
Financial and Insurance Activities	2.393***	-0.091	-0.09	0.011
Real Estate Activities	0.503***	-0.179	0.367**	-0.008
Professional, Scientific and Technical Activities	2.908***	-0.132*	-0.234***	0.099
Administrative and Support and Technical Activities	1.678***	-0.01	-0.145**	-0.001
Public Administration and Defense	1.04***	-0.554***	-0.265***	0.051
Education	0.801***	-0.139	0.329***	0.051
Human Health and Social Work Activities	0.99***	-0.096	0.034	0.067
Art, Entertainment and Recreation	0.462*	0.213***	0.115*	-0.002
Other Service Activities	0.44***	0.037	0.104	-0.013
Activities of households as Employers	1.628***	-0.095	-0.055	-0.218

Table: The Effects of the MPSs on the Industrial Sectors: Simple Model

		α	ϕ_1	ϕ_2	β
Panel A	Total Industry	0.006	0.498***	-0.203	-0.004
Panel B	Manufacturing	0.006	0.465***	-0.16	-0.004
Panel C	Energy	0.01**	-0.19	0.022	0.003
	Mining and Quarrying	0.013**	0.063	-0.343**	-0.009*
	Manufacturing	0.007	0.3*	-0.083	-0.004
Panel D	Intermediate Goods	0.007	0.221*	-0.122	-0.004
	Durable Consumer Goods	0.025***	-0.488***	-0.482***	-0.004
	Nondurable Consumer goods	0.008*	-0.154	0.09	0
	Capital Goods	0.016	-0.105	-0.024	-0.011
Panel E	Man. of Food Products	0.016**	-0.259**	-0.186*	0.001
	Man. of Beverages	0.011**	-0.106	-0.111	0.001
	Man. of Tobacco Products	0.025**	-0.489***	-0.597***	0.025**
	Man. of Textiles	-0.002	0.148*	-0.193**	-0.007
	Man. of Wearing Apparel	0.001	0.195***	0.045	0.001
	Man. of Leather and Related Products	-0.002	-0.099	0.019	0.008
	Man. of Wood and Products of Wood and Cork	0.009*	0.462***	-0.056	-0.004
	Man. of Paper and Paper Products	0.014***	0.1	-0.182**	-0.007**
	Man. of Coke and Refined Petroleum Products	0.009	-0.257***	-0.288***	0.013
	Man. of Chemicals and Chemical Products	0.011	0.042	-0.19***	-0.001
	Man. of Pharmaceutical Products	0.025**	0.06	-0.258***	-0.009
	Man. of Rubber and Plastic Products	0.01	0.158**	-0.107*	-0.004
	Man. of Other Non-Metallic Mineral Products	0.003	0.236***	-0.079	-0.012***
	Man. of Basic Metals	0.01	0.071	-0.157*	0.001
	Man. of Fabricated Metal Products	0.01	0.203***	-0.033	-0.001
	Man. of Computer	-0.001	-0.013	-0.034	-0.013
	Man. of Electrical Equipment	0.016**	0.12	-0.161**	-0.002
	Man. of Machinery and Equipment	0.009	0.376***	-0.088	-0.004
	Man. of Motor Vehicles	0.02	0.292***	-0.394***	-0.011
	Man. of Other Transport Equipment	0.041	-0.318***	-0.071	-0.032
	Man. of Furniture	0.028**	-0.171**	-0.128*	-0.007
	Electricity Steam and Air Conditioning Supply	0.011**	0.033	-0.049	0.003

Table: The Effects of the MPSs on the GDP: Using Business Cycles

		α_1	α_2	ϕ_1	ϕ_2	β_g	β_b
Panel A	GDP	0.624	0.722	0.557***	-0.189	0.12	-6.333***
Panel B	Agriculture	0.718	1.299	-0.117	-0.17	0.224	-1.305
	Industry	1.025**	0.843	0.42***	-0.321***	0.078	-8.717***
	Construction	-0.176	1.245	1.18***	-0.347**	-0.153	0.772
	Services	1.005***	0.4	0.273**	-0.209*	0.125	-3.86***
Panel C	Wholesale and Retail Trade	0.885	0.275	0.543***	-0.412***	0.389	-9.077***
	Transportation and Storage	1.288**	-0.068	0.03	-0.128	0.082	-5.537**
	Accommodation and Food Services	1.141**	1.532	-0.255**	0.004	-0.296	3.115
	Information and Communication	0.788**	0.097	0.223	0.265*	-0.047	0.351
	Financial and Insurance Activities	2.446***	1.913**	-0.048	-0.125	-0.09	2.385
	Real Estate Activities	0.502***	0.481**	-0.204	0.401**	-0.009	0
	Professional, Scientific and Technical Activities	3.101***	2.301**	-0.138*	-0.257***	0.165	-1.001
	Administrative and Support and Technical Activities	1.811***	0.712	0.116	-0.221***	0.198	-4.222**
	Public Administration and Defence	0.967***	1.261*	-0.515***	-0.255***	0.039	0.288
	Education	0.937***	0.554	-0.194*	0.301**	0.015	0.865
	Human Health and Social Work Activities	0.967***	0.98**	-0.004	-0.028	0.122	-0.807
	Art, Entertainment and Recreation	0.607**	-0.079	0.235***	0.056	0.023	-0.519
	Other Service Activities	0.44**	0.416	0.008	0.14	-0.004	-0.13
	Activities of households as Employers	1.619***	1.446	-0.077	-0.042	-0.132	-1.808

Table: The Effects of the MPSs on the Industrial Sectors: Using Business Cycles

	α_1	α_2	ϕ_1	ϕ_2	β_g	β_b
Panel A Total Industry	0.395	1.142	0.673***	-0.188	0.019	-8.149***
Panel B Manufacturing	0.296	1.466	0.678***	-0.155	0	-9.741***
Panel C Energy	2.009***	-1.881	-0.365**	-0.263	0.497	0.835
Mining and Quarrying	1.456**	0.81	0.039	-0.367***	-0.833	-2.048
Manufacturing	0.395	1.276	0.532***	-0.085	-0.001	-8.932***
Panel D Intermediate Goods	0.679	0.411	0.27**	-0.116	-0.296	-3.207
Durable Consumer Goods	2.485***	1.312	-0.302**	-0.449***	0.155	-10.409**
Nondurable Consumer goods	0.802	0.577	-0.127	0.093	0.094	-1.221
Capital Goods	1.217	1.615	0.318**	-0.048	0.058	-23.605***
Panel E Man. of Food Products	1.343*	2.461	-0.267**	-0.091	-0.093	2.657
Man. of Beverages	1.308**	0.191	-0.091	-0.16**	0.251	-2.634
Man. of Tobacco Products	3.441**	-2.537	-0.491***	-0.68***	2.501**	5.755
Man. of Textiles	-0.272	0.655	0.321***	-0.233***	-0.354	-10.472***
Man. of Wearing Apparel	0.09	0.466	0.237***	-0.001	0.337	-4.438
Man. of Leather and Related Products	-0.381	1.575	0.131	0.022	1.352**	-12.8***
Man. of Wood and Products of Wood and Cork	0.164	2.438**	0.575***	0.008	-0.039	-8.124***
Man. of Paper and Paper Products	1.465***	1.018	0.082	-0.162**	-0.481	-3.819*
Man. of Coke and Refined Petroleum Products	2.354*	-7.08**	-0.22**	-0.283**	1.568	-2.206
Man. of Chemicals and Chemical Products	0.523	3.712*	0.065	-0.089	0.248	-7.216**
Man. of Pharmaceutical Products	2.627**	1.434	0.087	-0.252***	-0.584	-6.666
Man. of Rubber and Plastic Products	0.507	2.109	0.319***	0.006	0.109	-10.27***
Man. of Other Non-Metallic Mineral Products	0.318	0.13	0.213***	-0.021	-1.039**	-3.684
Man. of Basic Metals	1.669*	-2.359	-0.088	-0.046	0.342	-6.592
Man. of Fabricated Metal Products	1.127	0.765	0.192***	-0.065	0.007	-2.136
Man. of Computer	0.118	-0.766	-0.011	-0.056	-0.957	-6.977
Man. of Electrical Equipment	0.642	4.143**	0.414***	-0.16**	0.488	-14.175***
Man. of Machinery and Equipment	1.104	0.18	0.587***	-0.266***	0.354	-10.756**
Man. of Motor Vehicles	0.771	6.316*	0.547***	-0.258***	0.99	-41.304***
Man. of Other Transport Equipment	9.46**	-24.929**	-0.379**	-0.122	-4.463	23.341
Man. of Furniture	3.078**	0.884	-0.107	-0.122*	-0.075	-11.203*
Electricity Steam and Air Conditioning Supply	1.662***	-0.165	-0.076	-0.142	0.369	-0.005

Table: The Effects of the MPSs on the GDP: Using Credits for Cycles

		α_1	α_2	ϕ_1	ϕ_2	β_g	β_b
Panel A	GDP	1.746***	-2.735**	0.213	-0.548***	-0.002	-1.932**
Panel B	Agriculture	0.692	1.516	-0.172	-0.169	0.299	-0.625
	Industry	1.909***	-3.413**	0.213**	-0.491***	-0.036	-3.08**
	Construction	0.261	-0.384	1.143***	-0.447***	-0.129	-0.079
	Services	1.592***	-1.705**	0.093	-0.377***	0.039	-1.347*
Panel C	Wholesale and Retail Trade	2.221***	-6.33***	0.291***	-0.728***	0.052	-2.308
	Transportation and Storage	1.988***	-3.404**	-0.185**	-0.283***	0.135	-3**
	Accommodation and Food Services	1.209**	1.978	-0.253**	-0.039	-0.285	1.124
	Information and Communication	0.563*	-0.103	0.383**	0.279**	-0.035	0.001
	Financial and Insurance Activities	2.484***	2.031**	-0.012	-0.145	-0.248	2.168**
	Real Estate Activities	0.493***	0.49**	-0.206	0.411**	-0.005	-0.037
	Professional, Scientific and Technical Activities	3.331***	1.377	-0.179**	-0.283***	0.172	-0.633
	Administrative and Support and Technical Activities	2.651***	-1.663*	-0.143**	-0.347***	0.171	-1.713*
	Public Administration and Defence	0.975***	1.547**	-0.578***	-0.265***	0.075	-0.049
	Education	0.83***	1.047*	-0.154	0.296***	0.024	0.29
	Human Health and Social Work Activities	0.954***	1.159**	-0.12	0.044	0.158	-0.569
	Art, Entertainment and Recreation	0.598**	-0.236	0.219***	0.086	-0.049	0.187
	Other Service Activities	0.398**	0.452	0.037	0.176**	-0.035	0.189
	Activities of households as Employers	1.931***	0.745	-0.142	-0.108	-0.197	-0.472

Table: The Effects of the MPSs on the Industrial Sectors: Using Credits for Cycles

	α_1	α_2	ϕ_1	ϕ_2	β_g	β_b
Panel A Total Industry	0.241	2.79*	0.617***	-0.072	-0.059	-2.619**
Panel B Manufacturing	0.214	2.995	0.577***	-0.033	-0.114	-2.847**
Panel C Energy	1.327**	-0.304	-0.347**	-0.083	0.174	1.685
Mining and Quarrying	1.043	2.821	0.056	-0.309**	-0.938*	-1.106
Manufacturing	0.423	2.395	0.389**	-0.005	-0.108	-2.4*
Panel D Intermediate Goods	0.241	2.724	0.254**	0.012	-0.385	-1.12
Durable Consumer Goods	2.728***	1.774	-0.477***	-0.479***	-0.063	-1.708
Nondurable Consumer goods	0.822	0.517	-0.162	0.092	0.045	0.058
Capital Goods	2.041	0.64	-0.036	-0.03	-0.18	-5.015
Panel E Man. of Food Products	1.46*	1.99	-0.254**	-0.155	-0.133	0.883
Man. of Beverages	1.388***	-0.6	-0.132*	-0.119	0.235	-0.104
Man. of Tobacco Products	2.047	-0.867	-0.413***	-0.54***	1.114	9.898***
Man. of Textiles	-0.421	1.218	0.098	-0.158**	-0.697	-0.882
Man. of Wearing Apparel	-0.053	0.731	0.193***	0.078	-0.043	0.724
Man. of Leather and Related Products	-0.684	1.214	-0.041	0.169**	0.108	3.163
Man. of Wood and Products of Wood and Cork	0.586	3.294**	0.45***	0.013	-0.015	-3.023**
Man. of Paper and Paper Products	1.429***	1.803	0.064	-0.171**	-0.492	-1.471
Man. of Coke and Refined Petroleum Products	1.677	-4.296	-0.295***	-0.265**	1.595	1.334
Man. of Chemicals and Chemical Products	0.364	6.002***	0.086	-0.095	-0.008	-2.077
Man. of Pharmaceutical Products	2.921**	2.308	0.037	-0.252***	0.021	-4.852*
Man. of Rubber and Plastic Products	0.556	3.877**	0.261***	0.006	0.061	-3.444**
Man. of Other Non-Metallic Mineral Products	0.233	1.006	0.235***	-0.05	-1.103**	-1.925
Man. of Basic Metals	0.604	2.13	0.139*	-0.037	0.064	-0.223
Man. of Fabricated Metal Products	0.725	2.857	0.202***	0	-0.099	-0.634
Man. of Computer	-0.976	2.777	-0.06	-0.089	-2.362	3.602
Man. of Electrical Equipment	1.087	5.234**	0.129*	-0.088	0.094	-2.514
Man. of Machinery and Equipment	0.951	1.6	0.386***	-0.094	-0.092	-1.819
Man. of Motor Vehicles	1.925	7.521	0.323***	-0.317***	0.648	-10.658**
Man. of Other Transport Equipment	9.644**	-32.902***	-0.375***	-0.105	-1.697	0.203
Man. of Furniture	3.285**	1.276	-0.137**	-0.158**	0.031	-3.489
Electricity Steam and Air Conditioning Supply	1.178**	1.281	-0.046	-0.031	0.251	0.352

Conclusion

- The effects of the monetary policy shocks on the GDP, industrial production and services are not observable if any of these asymmetries are disregarded.
- Economic activity responds to the monetary policy actions more strongly during economic contraction periods and during weak credit growths.
- Using credit cycles we find economically more feasible quantitative effects.
- Short time period problem.