

The Role of Monetary Policy During the Global Financial Crisis:

The Turkish Experience

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The main question and the bottom line

- What role did monetary policy play in softening the impact of the crisis?
- In the study, monetary policy primarily focuses on the choice of exchange rate regime and interest rate policy.
- While the recession was severe, model-based counterfactual analysis indicates that the monetary policy implemented by the Central Bank of Republic of Turkey (CBRT) significantly attenuated the impact of the recent crisis on the Turkish economy.



The recent global crisis...

- Sharp worldwide slowdown in economic activity.
- Acute episode of financial distress.
- Unprecedented counter-cyclical policy responses.



Why is Turkey an interesting case study?

- One of the hardest hit countries by the crisis:
 - Q1 2009 Real GDP: –14.5 percent (year-over-year)
- Central Bank of the Republic of Turkey (CBRT):
 - Cuts policy rates by 1025 basis points!
 - Also, the Turkish banking systems was resilient, no bailouts, bankruptcies—in fact, net profits!



Why is Turkey an interesting case study?

- One of the hardest hit countries by the crisis:
 - Q1 2009 Real GDP: –14.5 percent (year-over-year)
- Central Bank of the Republic of Turkey (CBRT):
 - Cuts policy rates by 1025 basis points!
- Was monetary policy effective in softening the impact of the crisis?



Quick Background on the Turkish Economy



How does the recent Turkish experience differ from the past?

- Intense financial crisis in 2001

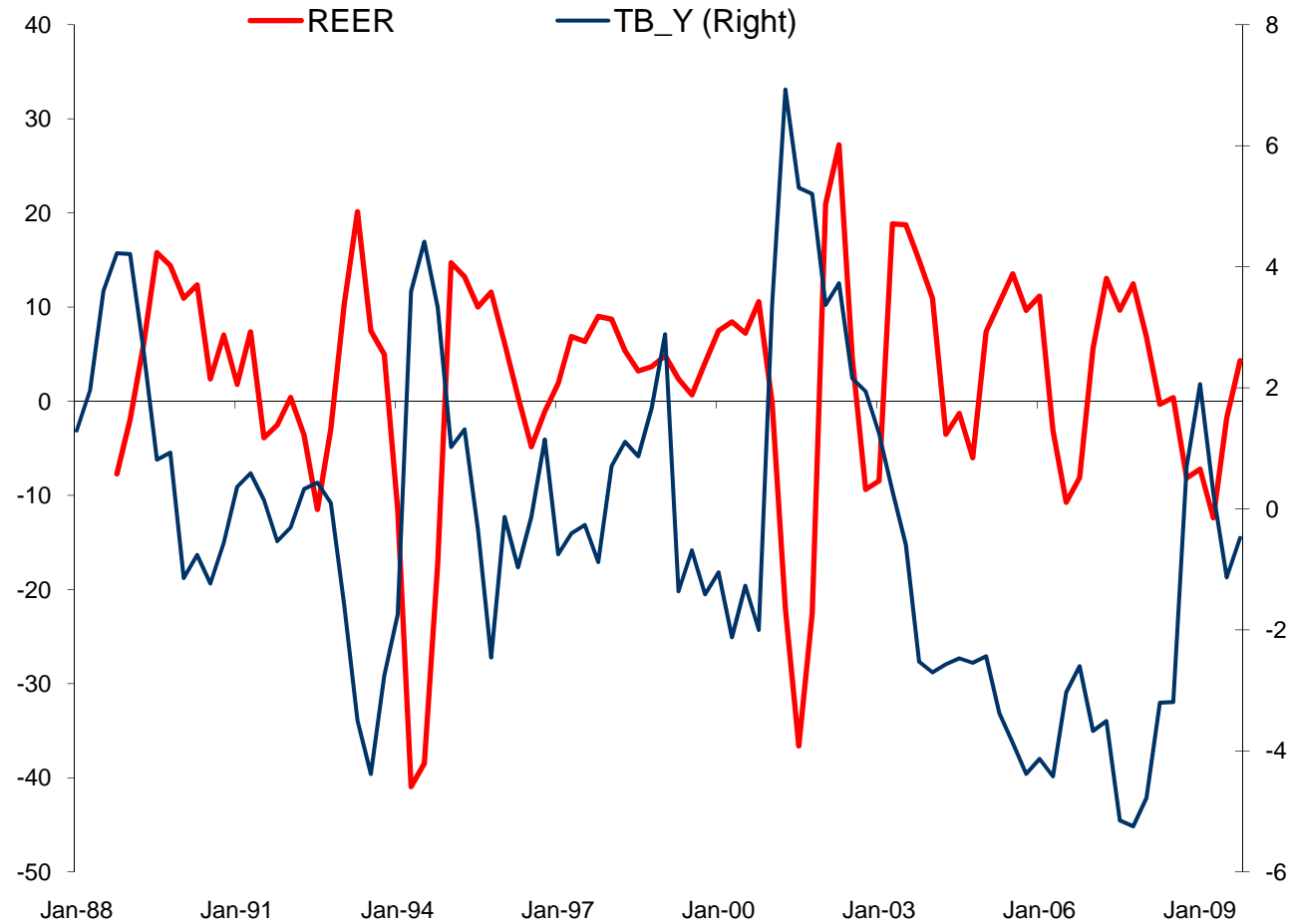
- During the run-up to the crisis:
 - Risk profile of banking system had increased,
 - Put viability of the peg (quasi-currency board) into question...

- Crisis:
 - Peg was eventually abandoned
 - Massive capital outflows (sudden stop)
 - Virtual collapse of banking system
 - Severe recession



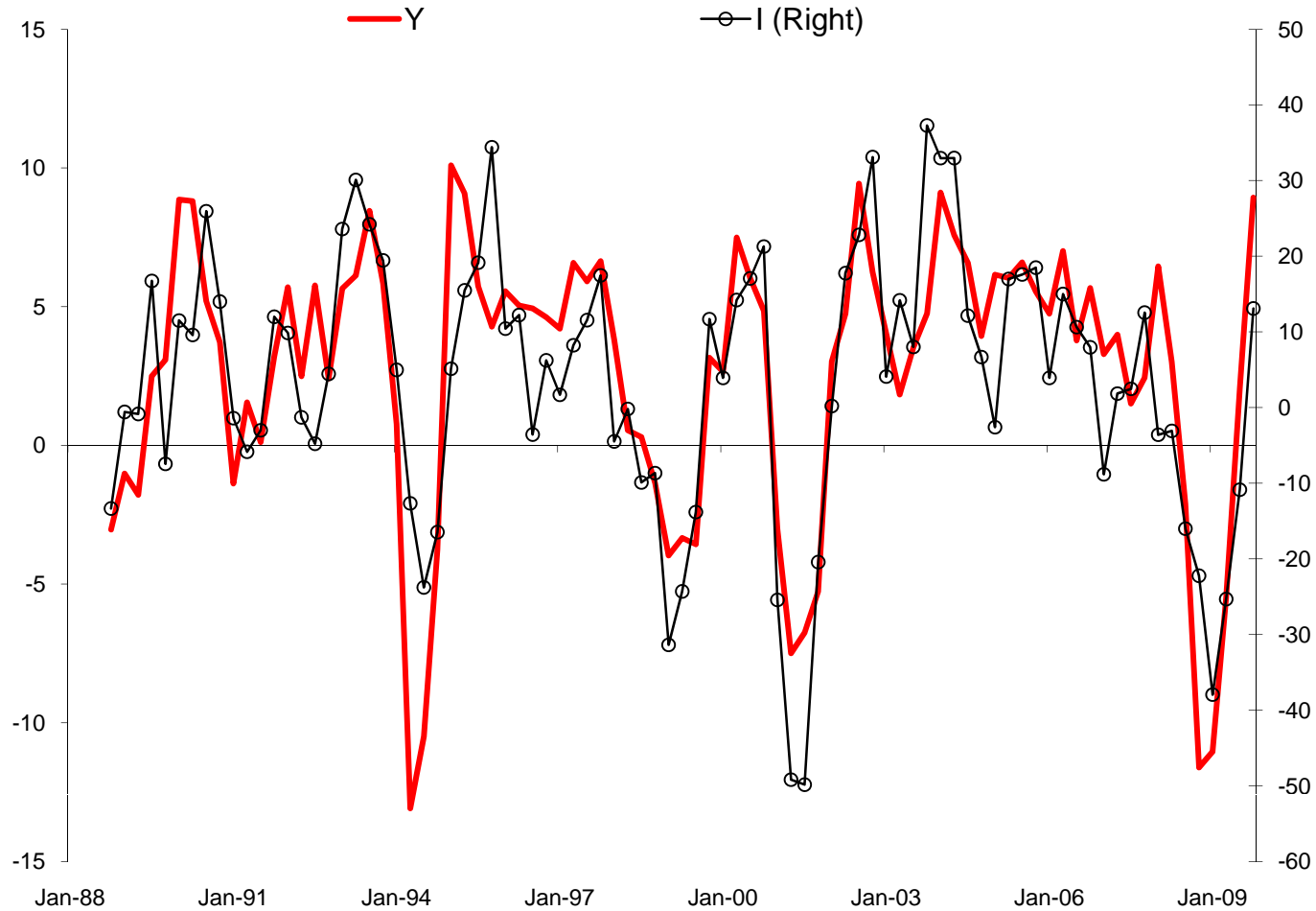
Selected Macroeconomic Indicators

(year-over-year growth rates and levels)



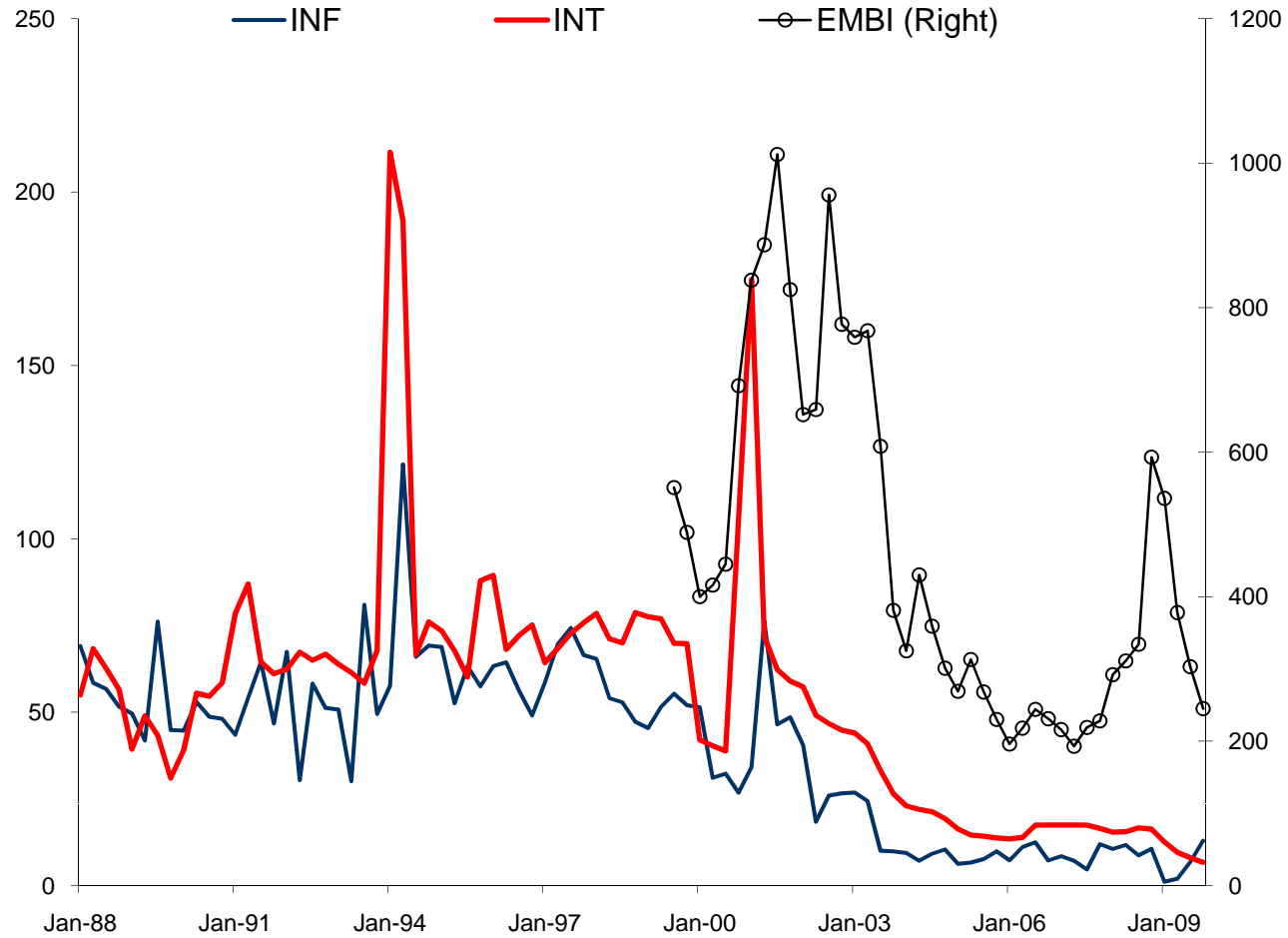
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Two critical reforms after the 2001 crisis

- This paper focuses primarily on two reforms to the monetary policy framework:
 - Float replaced peg
 - Inflation targeting
- If time permits: the banking system was overhauled



What role did these reforms play in softening the recent recession?

- In contrast to a peg, what was the role of the **float** in helping insulate the economy from the crisis?
- Relatedly, consistent with the attainment of the inflation targets, what was the role of the CBRT's **interest rate policy** in softening the impact of the crisis?





Addressing the Policy-Oriented Questions Using a Structural Model



An estimated DSGE model for the Turkish economy

- To address these questions, we develop and estimate a dynamic stochastic general equilibrium (DSGE) model for the Turkish economy.
- Model overview:
 - Micro-founded model derived from first principles
 - Optimizing agents try to maximize utility or profits
 - Model comprises first-order optimality and market clearing conditions.
 - Internally consistent structural model lends itself to estimation via the Kalman filter and Bayesian methods.

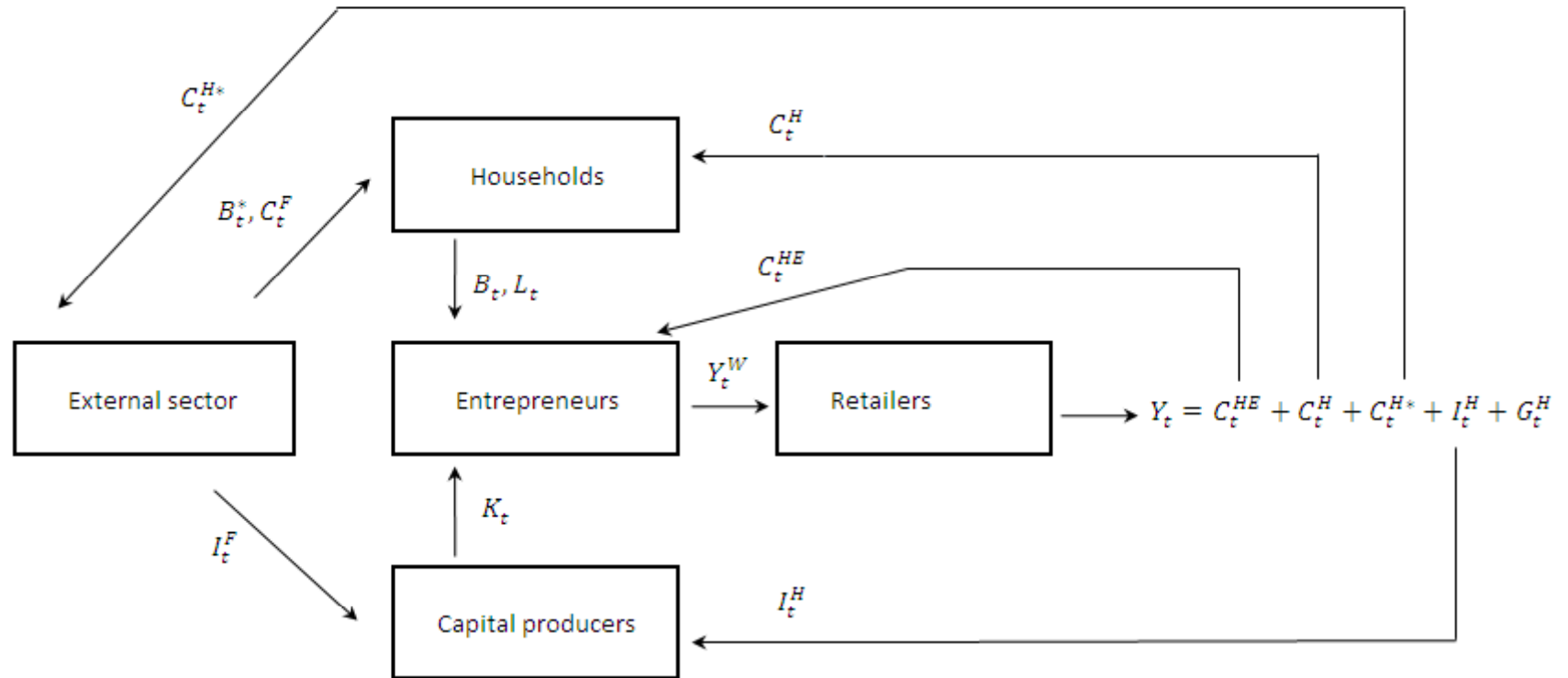


An estimated DSGE model for the Turkish economy

- Small open economy New Keynesian model is augmented with:
- Financial accelerator:
 - Bernanke, Gertler, and Gilchrist (1999)
 - Gertler, Gilchrist, and Natalucci (2006)
 - Elekdag and Tchakarov (2007)
- Bayesian estimation:
 - Smets and Wouters (2003, 2007)
 - Christiano, Eichenbaum, and Evans (2006)
- Builds upon Elekdag, Justiniano, and Tchakarov (2006):
 - Refined nominal and real rigidities
 - Nonstationary nominal and real trends



Model Schematic



An estimated open-economy DSGE model for the Turkish economy

- Financial accelerator
 - Time-varying pro-cyclical external finance premium:
 - Adverse shocks increase risk profile of entrepreneurs (via balance sheets),
 - Increasing cost of investment,
 - Thereby further depressing aggregate demand



An estimated open-economy DSGE model for the Turkish economy

- **Nominal rigidities**
 - Stick prices, wage, and thereby real wages,
 - Nominal wage and price indexation

- **Real rigidities**
 - Habit formation, investment adjustment costs, variable capacity utilization

- **Non-stationary dynamics**
 - Stochastic growth trend
 - Allows for a non-stationary inflation target

- **Our study represents a synthesis of well-known papers in the literature.**



The Transmission of Shocks

- Export demand shock (trade channel):

$$Y_t^H = C_t^H + C_t^{HE} + C_t^{H*} + I_t^H + G_t$$



- UIP shock (sudden stop shock):

$$i_t = i_t^* E_t \left[\frac{S_{t+1}}{S_t} \right] \Phi_t$$

The Transmission of Shocks

- Financial uncertainty shock:

$$Q_t K_{t+1} = NW_{t+1} + B_{t+1}$$

$$\chi_t(\cdot) = \chi_t(\text{leverage}) = \chi_t\left(\frac{\text{Assets}}{\text{Equity}}\right)$$

$$\chi_t(\cdot) = \chi_t\left(\frac{Q_t K_{t+1}}{NW_{t+1}}\right)$$

$$\chi'(\cdot) > 0, \quad \chi(1) = 1$$

$$E_t R_{t+1}^k = \chi_t(\cdot) E_t [R_{t+1}]$$



The Transmission of Shocks

- Financial uncertainty shock:

$$V_t = R_t^k [Q_{t-1} K_t - B_t]$$

$$NW_{t+1} = Q_t V_t + W_t^E$$

- Variations of this shock have been used by:
 - Elekdag and others (2006)
 - Christiano and others (2010)
 - Curdia (2009)
 - Gertler and Karadi (2009)



The Transmission of Shocks

- The empirical interest rate rule:

$$i_t = \rho i_{t-1} + \alpha E_t[\pi_{t+1} - \pi_{t+1}^T] + \beta gap_t + \gamma \Delta \hat{s}_t + \varepsilon_t^{PURE}$$

$$\pi_t^T = \rho \pi_{t-1}^T + \varepsilon_t^{TARGET}$$

$$\varepsilon_t^{Monetary_Policy} = \varepsilon_t^{PURE} + \varepsilon_t^{TARGET}$$



The Transmission of Shocks

Monetary transmission mechanism, operates via four main channels:

First, through the consumption Euler equation

Second, by affecting the opportunity cost of investment

Third via the exchange rate channel

Fourth, and finally, through the financial accelerator mechanism





Bayesian Estimation and Assessing Model Fit

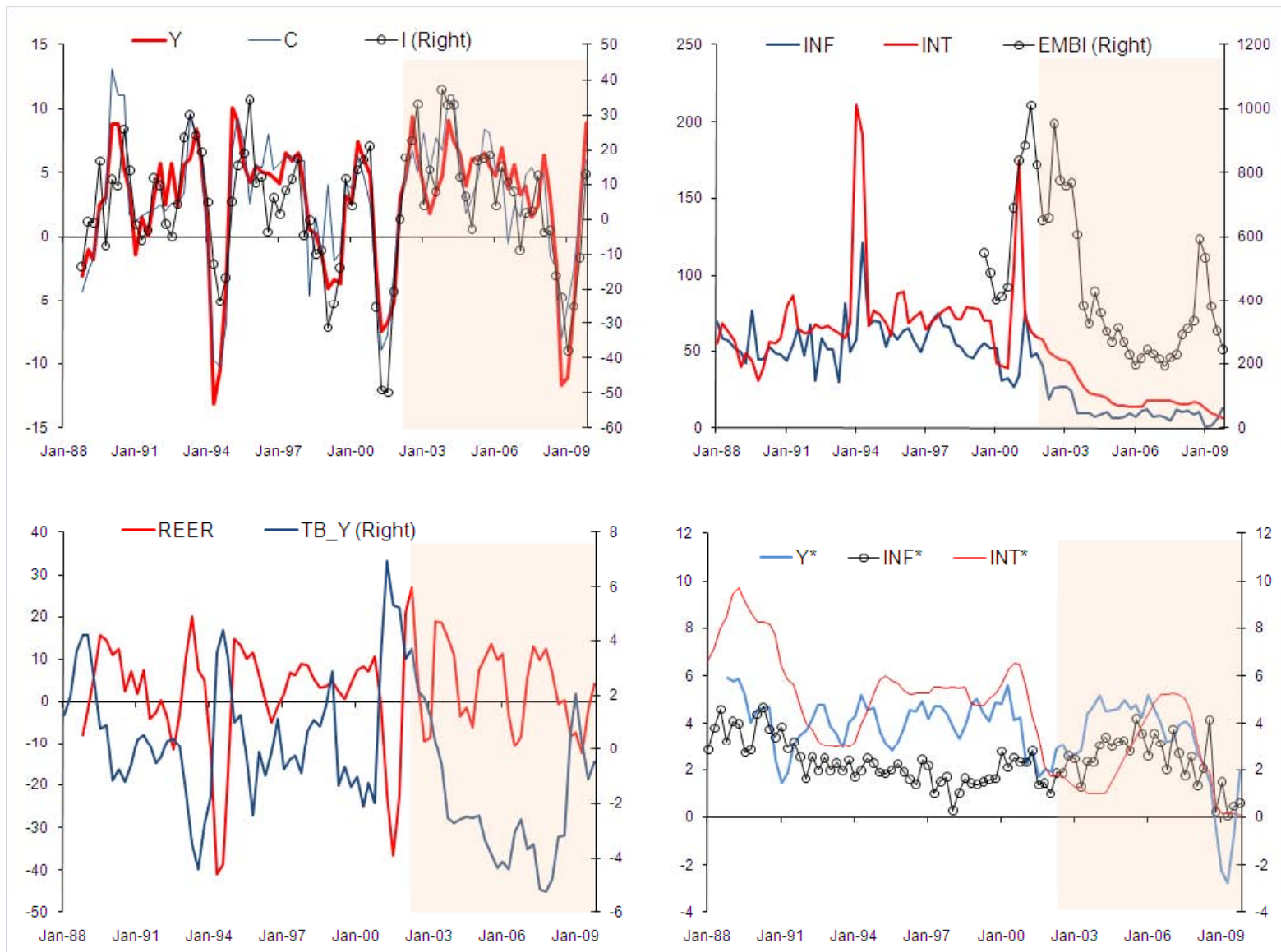
Bayesian estimation of the DSGE model

- Priors are set regarding parameters that determine model dynamics (not the steady state) and then estimated.
- Bayesian methods allow estimation over our short sample period of 2002-2009...
 - Del Negro and Schorfheide (2008) estimate a model for the Chilean economy using a 1999–2007 sample.
 - More data does not necessarily mean more informative data (particularly regarding the Turkish experience)
- Despite loose priors, estimates seem to be in line with those in the literature...



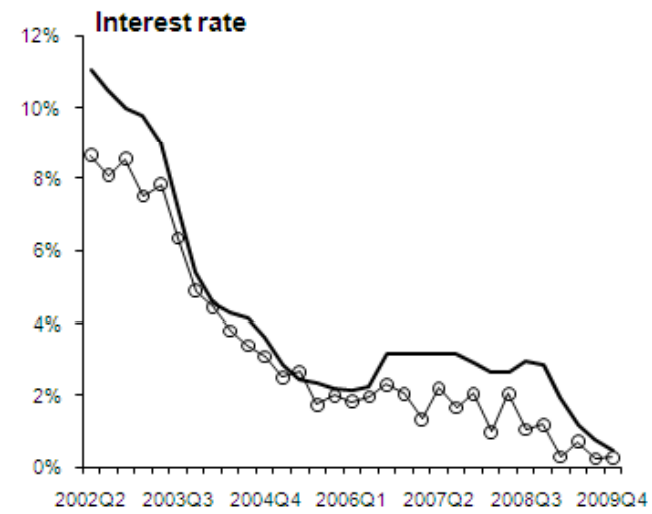
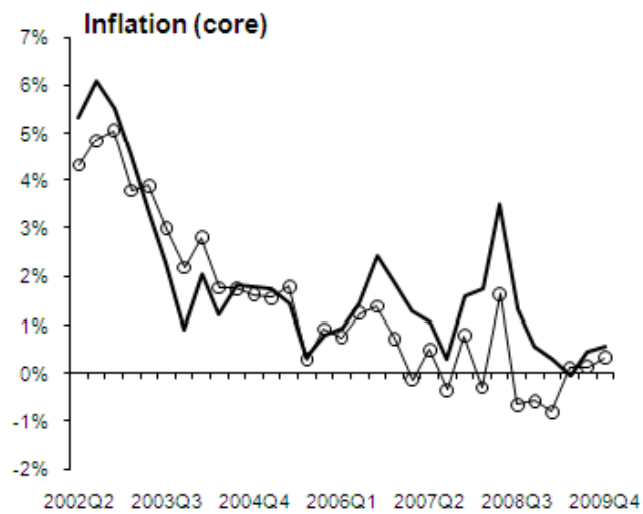
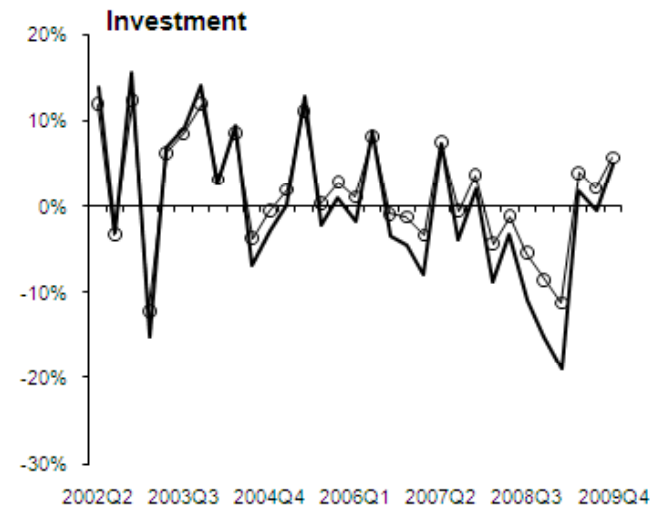
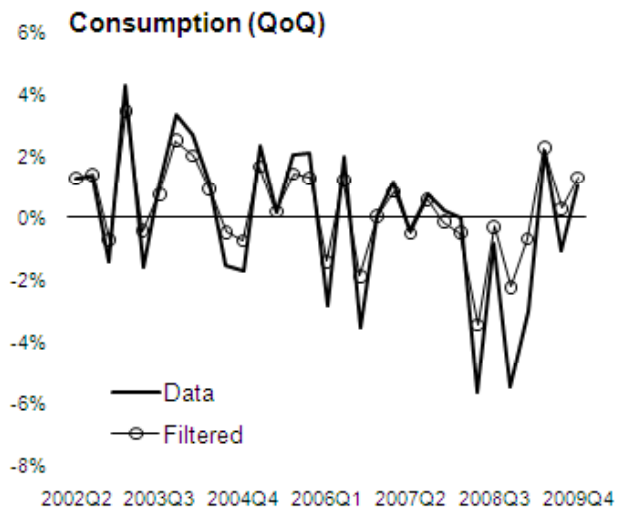
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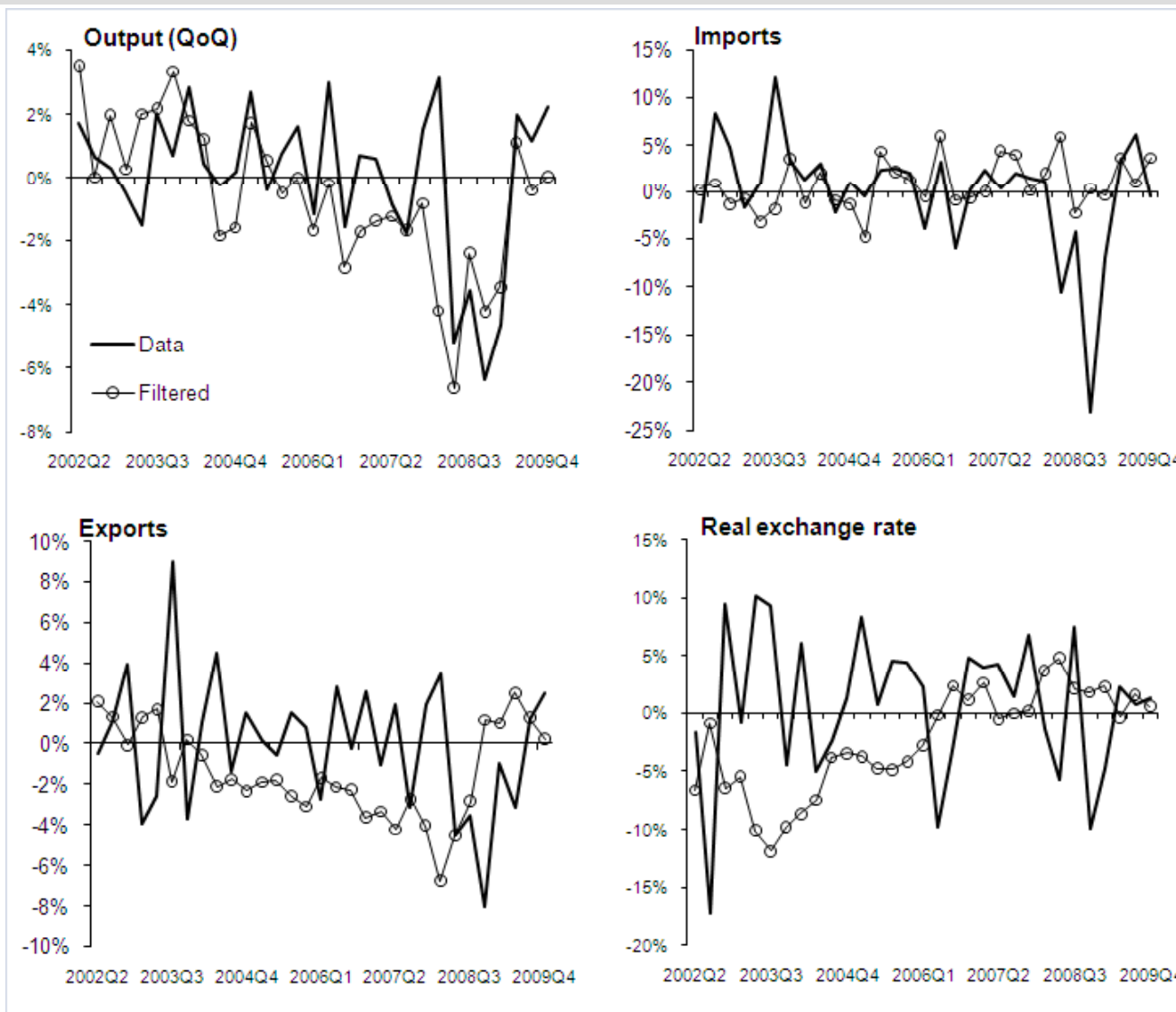


$$Y_t^{obs} = \{\pi_t^h, \pi_t, \Delta \ln C_t, \Delta \ln I_t, r\hat{e}r_t, i_t, \Delta \ln Y_t, \Delta \ln C_t^{H*}, \Delta \ln M_t, \Delta \ln Y_t^*, \pi_t^*, i_t^*\}$$

Model predictions and the data



Model predictions and the data



Exchange rate disconnect is prevalent as in other studies...

Model predictions and the data

Parameter	Prior distribution			Posterior distribution		
Description	Type	Mean	Standard deviation	Confidence intervals		
				Mean	5%	95%
Monetary policy						
Interest rate smoothing	Beta	0.70	0.20	0.58	0.40	0.78
Inflation reponse	Normal	1.40	0.10	1.48	1.32	1.63
Output gap response	Normal	0.25	0.10	0.12	-0.01	0.24
$\Delta(\text{Nom. exch. rate})$ response	Normal	0.10	0.05	0.16	0.08	0.24

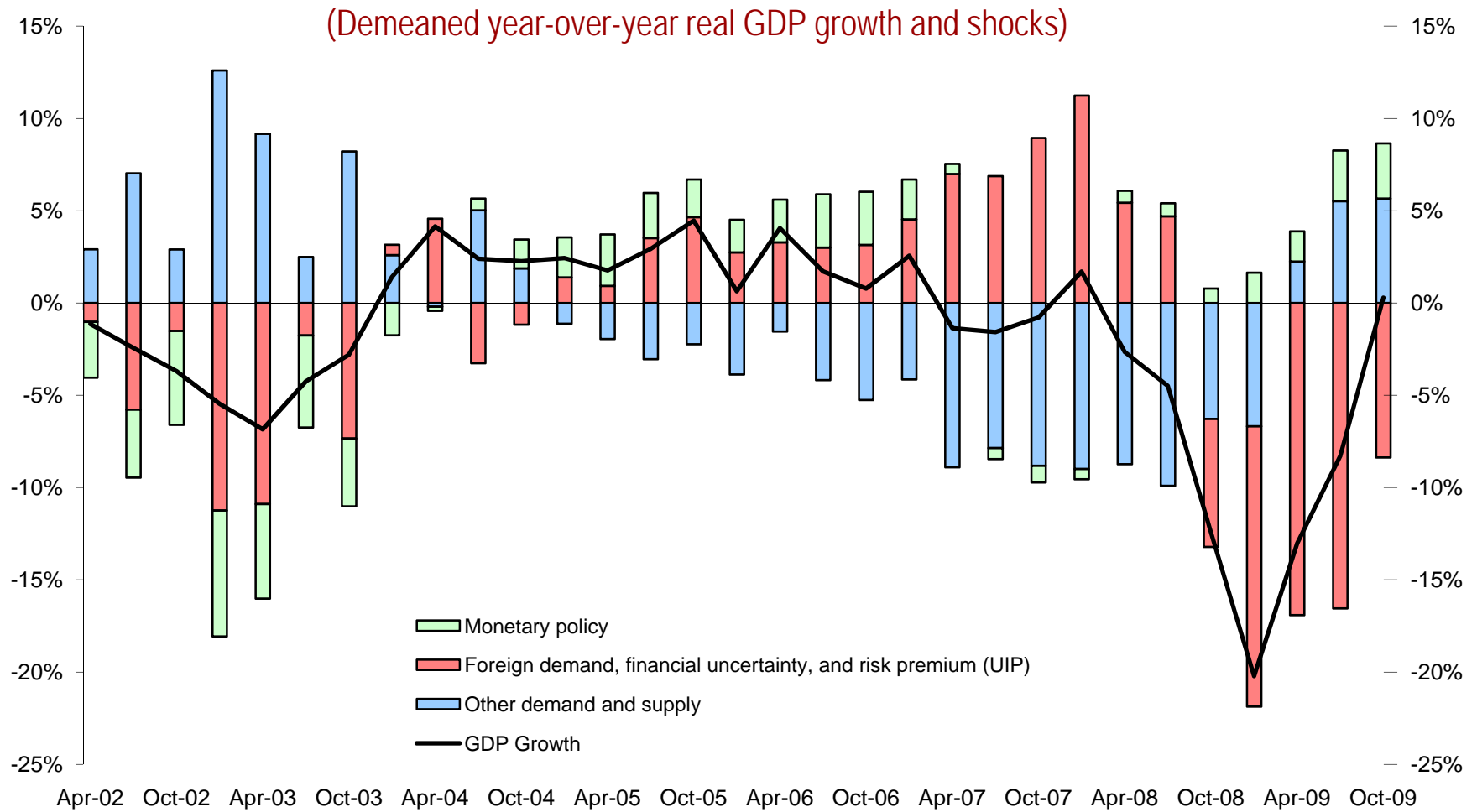




Was monetary policy effective in softening the impact of the crisis?

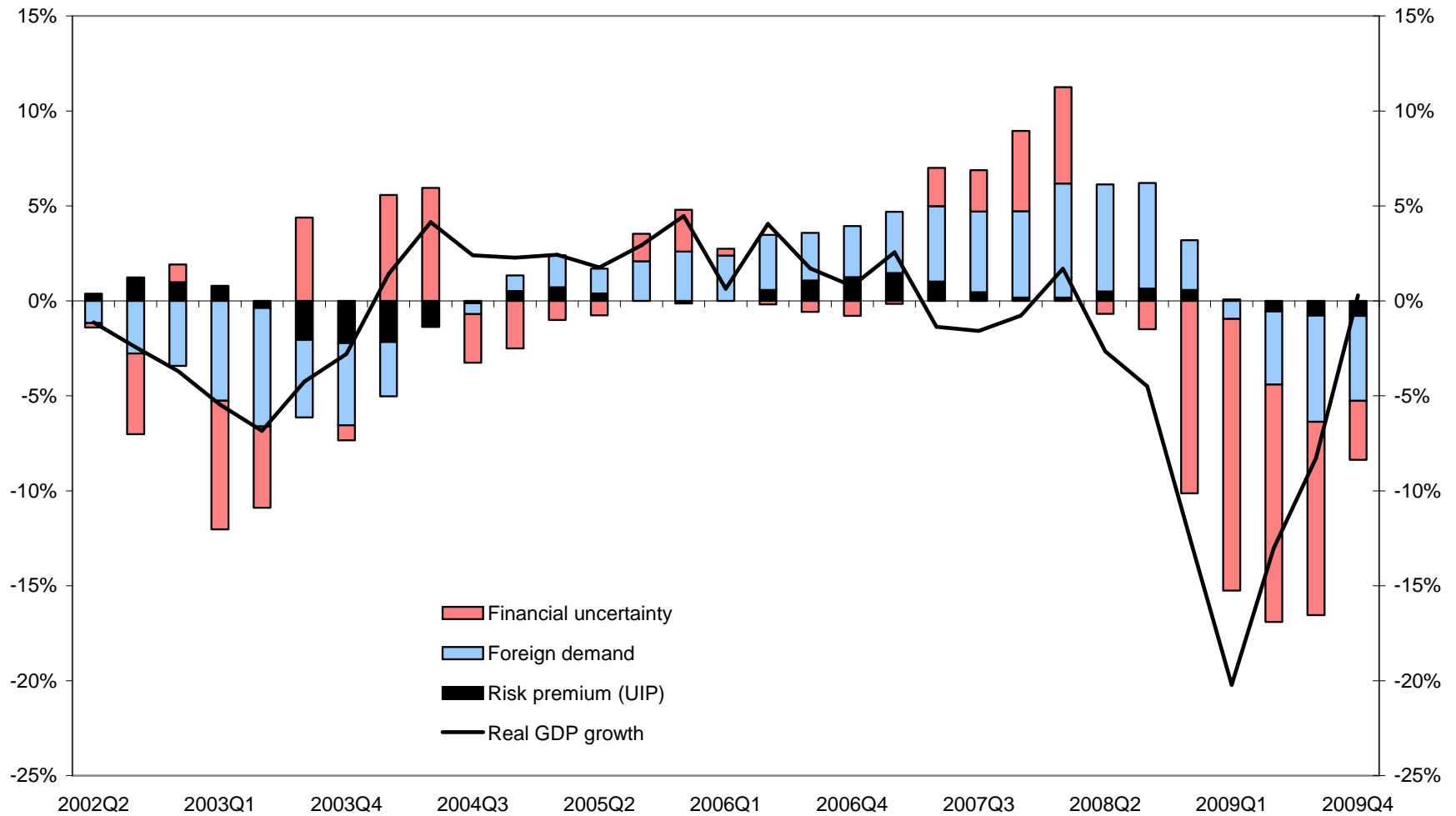


Historical Decomposition of Turkish Growth



"Crisis Shocks"

(Demeaned year-over-year real GDP growth and shocks)



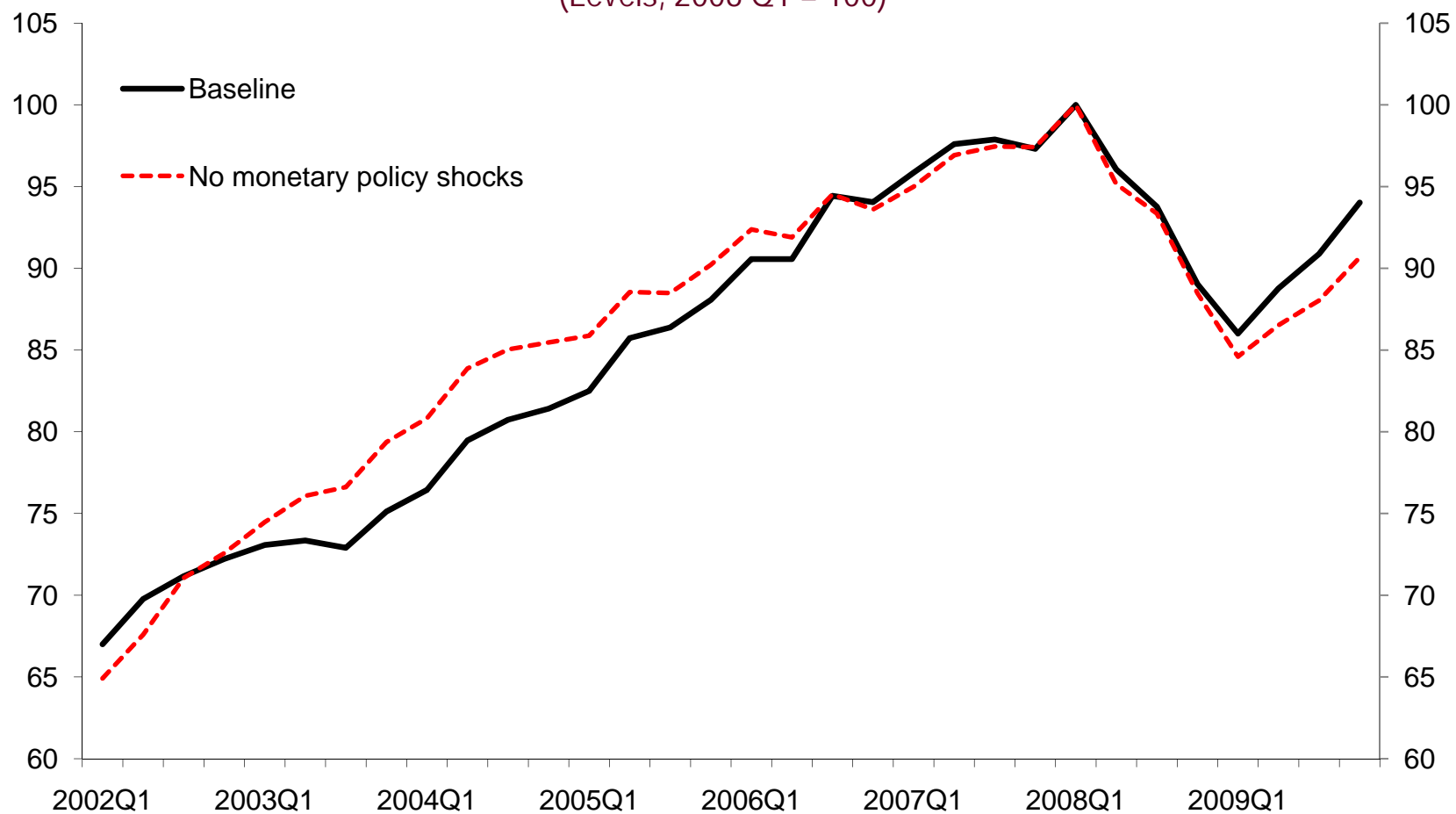


Counterfactual Exercise:

What would have been the evolution of economic activity without the (expansionary) monetary policy shocks?

Monetary policy counterfactual

(Levels, 2008 Q1 = 100)



Monetary policy counterfactuals



	Quarters	Cut in policy rate	Growth contributions of monetary policy owing to:	
			Pure Monetary policy shocks	Monetary policy shocks
Average				
2008Q4—2009Q4	5	1.98%	0.98%	1.96%
2009Q1—2009Q4	4	2.40%	0.78%	2.26%
<i>Christiano and others (2008)</i>				
United States (2001Q2-2002Q2)	4		0.75%	
Euro area (2001q4-2004q4)	13		1.27%	

Additional Counterfactual Exercises:

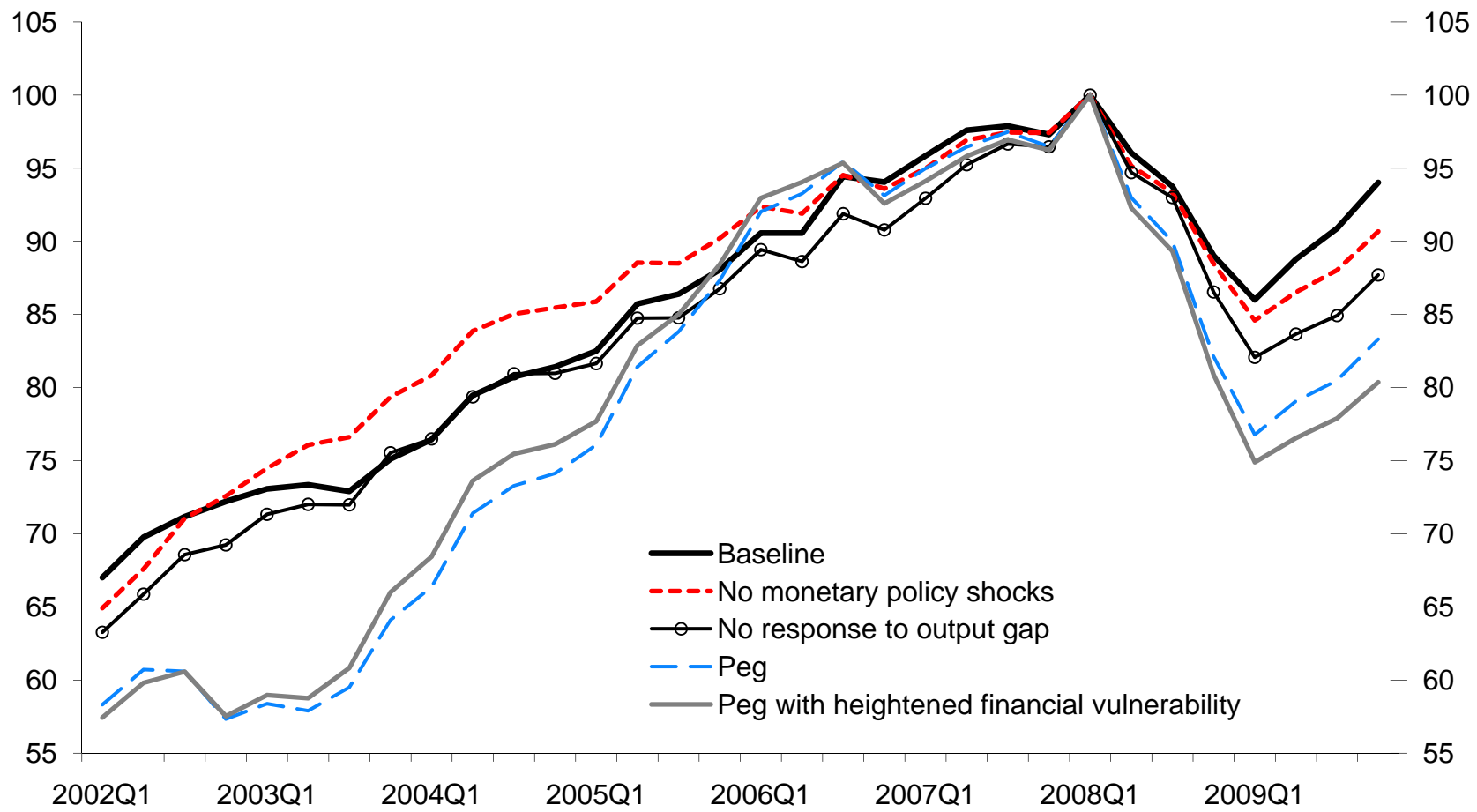
What was the role of:

Responding the output **gap**,
Flexible exchange rate regime,
Financial reforms?



Monetary policy counterfactual

(Levels, 2008 Q1 = 100)



Monetary policy counterfactuals

Growth contributions of monetary policy owing to:

	Quarters	Cut in policy rate	Growth contributions of monetary policy owing to:					All factors ([1]—[4])
			[0] Pure Monetary policy shocks	[1] Monetary policy shocks	[2] Responsive to the output gap	[3] Flexible exchange rate regime	[4] Reduced financial vulnerability	
Average								
2008Q4—2009Q4	5	1.98%	0.98%	1.96%	2.22%	4.19%	2.17%	10.54%
2009Q1—2009Q4	4	2.40%	0.78%	2.26%	2.57%	3.11%	2.40%	10.33%
<i>Christiano and others (2008)</i>								
United States (2001Q2-2002Q2)	4		0.75%					
Euro area (2001Q4-2004Q4)	13		1.27%					
Cumulative								
2008Q4—2009Q4	5	9.92%	4.90%	9.81%	11.10%	20.95%	10.85%	52.71%
2009Q1—2009Q4	4	9.61%	3.14%	9.02%	10.26%	12.44%	9.60%	41.33%
<i>Christiano and others (2008)</i>								
United States (2001Q2-2002Q2)	4		3.00%					
Euro area (2001Q4-2004Q4)	13		17.00%					



Summary: Monetary policy counterfactuals

	Real Growth Rates (In percent)		
	2009	Difference	Cumulative Difference
Baseline (actual)	-4.6		
No monetary policy shocks	-6.8	-2.2	-2.2
No response to output gap	-9.2	-2.4	-4.6
Fixed exchange rate regime	-12.1	-2.9	-7.5



Concluding remarks

- What role did monetary policy play in softening the impact of the crisis?
- While the economic contraction, particularly in 2009, was severe, our model-based counterfactual analysis indicates that the monetary policy implemented by the CBRT substantially mitigated the impact of the recent crisis.
- While we expect our main messages discussed above to remain, we welcome your comments to help us further refine the study.



Thank you

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The Turkish Experience



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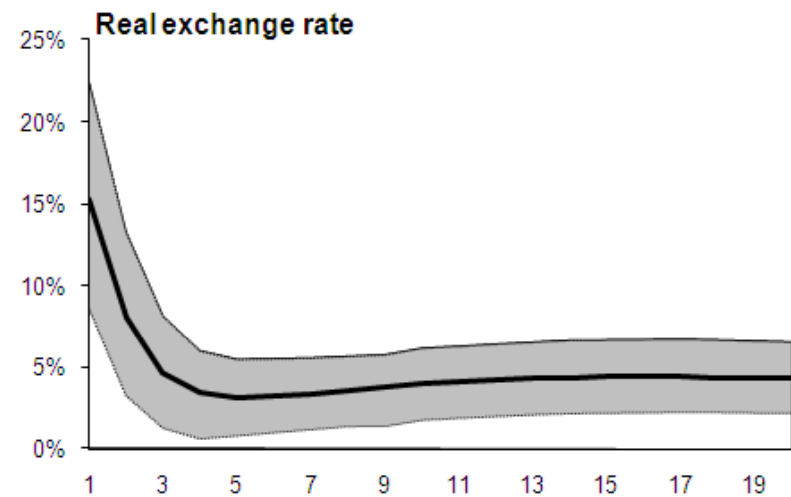
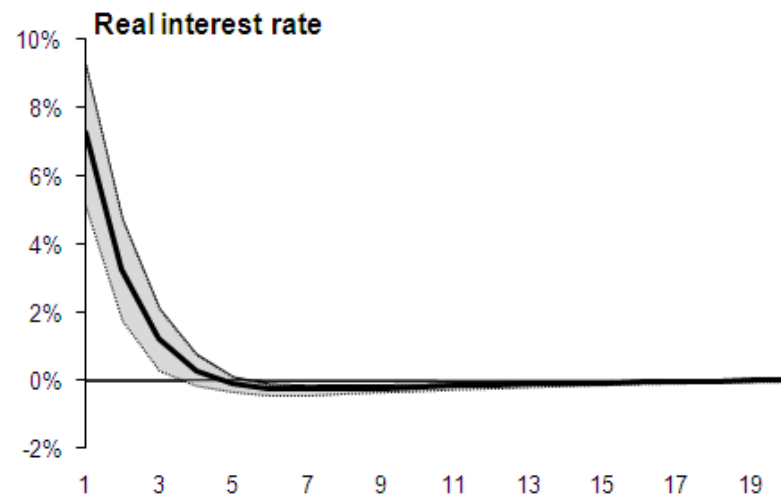
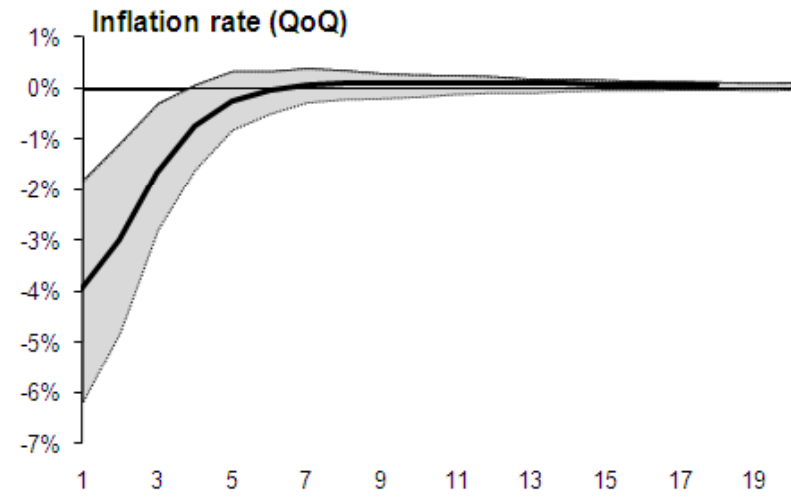
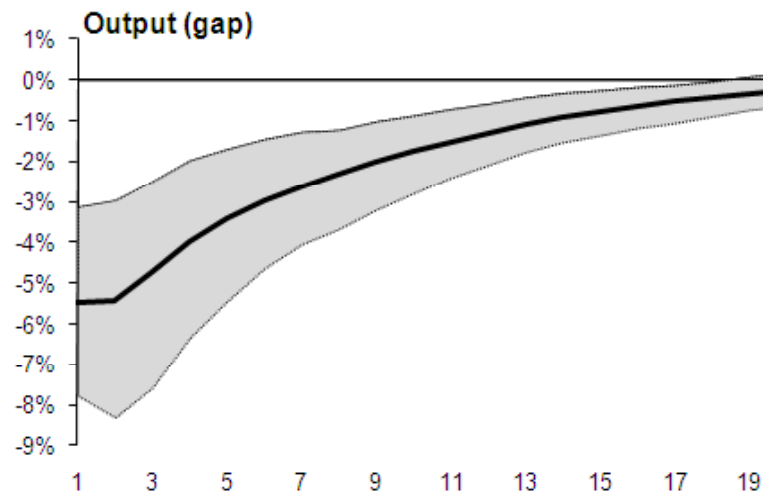
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Sensitivity Analysis: summary

		Log Data Density	Posterior odds ratio	Does baseline model's ratio exceed unity?
Baseline		407.686		
Sensitivity to frictions				
1	Financial accelerator	392.610	3.530E+06	Yes
2	Low price stickiness	405.690	7.362E+00	Yes
3	Low stickiness including wages	372.925	1.250E+15	Yes
4	Low habit persistence	379.825	1.259E+12	Yes
5	Low investment costs	377.874	8.857E+12	Yes
Sensitivity to shocks				
6	Technology (all)	359.201	1.140E+21	Yes
7	Investment-specific technology	366.929	5.021E+17	Yes
8	Preference	401.203	6.545E+02	Yes
9	Government	361.330	1.357E+20	Yes
10	Foreign output	268.225	3.694E+60	Yes
11	Financial (uncertainty and UIP)	404.866	1.678E+01	Yes
12	Unit root inflation target	400.280	1.647E+03	Yes
Sensitivity to policy rules				
13	Drop nominal depreciation (no ΔS rule)	403.802	4.864E+01	Yes
14	No ΔS rule with change in output and inflation	406.577	3.032E+00	Yes
15	No ΔS rule with yoy inflation	401.766	3.727E+02	Yes
16	No ΔS rule with yoy inflation lead	403.420	7.127E+01	Yes
17	Fixed exchange rate regime	387.050	9.166E+08	Yes



Turkey: Monetary Transmission Mechanism



What role did these reforms play in softening the recent recession?

- What role did the **financial reforms**—which lowered aggregate leverage ratios—play in mitigating the impact of the crisis?



Sector-specific financial ratios

2007	Value added	Firms	CR	ATO	Leverage	NI/NS	ROA	ROE
All		7,352	140.2	1.0	2.01	5.3	5.1	10.3
Agriculture	7.3	48	174.6	1.0	2.21	5.1	4.1	7.1
Manufacturing	16.6	3,530	164.4	1.3	2.23	3.5	4.2	10.0
Construction	4.8	733	135.0	0.5	2.97	6.7	2.4	12.2
Wholesale/retail Trade	12.1	1,662	145.7	2.1	2.87	1.8	3.4	12.1
Transportation/communication	13.7	360	142.9	1.6	2.45	3.8	3.6	11.7
FIRE/Public administration	21.8	239	175.5	0.6	1.83	20.6	4.0	9.1
Mean		1,095	156.3	1.2	2.43	6.9	3.6	10.4
Median		547	155.0	1.2	2.34	4.4	3.8	10.9
Standard deviation		1,323	17.4	0.6	0.43	6.9	0.6	2.0

2000	Value added	Firms	CR	ATO	Leverage	NI/NS	ROA	ROE
All		7,537	114.6	2.7	2.97	0.6	1.5	4.6
Agriculture	9.9	96	135.1	2.0	2.55	0.1	1.8	8.8
Manufacturing	20.1	3,901	139.7	1.7	2.56	2.7	3.8	13.0
Construction	5.0	1,004	106.2	1.0	3.85	5.7	3.0	20.1
Wholesale/retail Trade	12.7	1,436	125.5	3.1	3.41	1.7	4.8	22.2
Transportation/communication	12.2	338	113.2	2.3	2.48	0.1	-0.2	7.7
FIRE/Public administration	22.7	154	162.6	1.6	1.81	10.5	8.3	17.8
Mean		1,155	130.4	1.9	2.78	3.5	3.6	14.9
Median		671	130.3	1.8	2.55	2.2	3.4	15.4
Standard deviation		1,445	20.2	0.7	0.73	4.0	2.9	6.0

Source: CBT and authors' calculations.

Note: CR, ATO, NI, NS, ROA, and ROE denote the cash ratio, total asset turnover, net income, net sales, and return on assets and equity, respectively.

Leverage is defined as total assets over equity and NI/NS is the net profit margin.

Tabulated values denote industry averages.

Averages across all sectors denoted with "All". Descriptive statistics for major sector shown are below each section of the table.



Did the risk profile of the economy decrease after 2001?

- For the purposes of this paper:
- The financial system reforms are quantified by a summary statistic:
- The **aggregate leverage ratio** of the economy.
- A lower leverage ratio indicates less risk
- This is because assets are being financed with a larger share of equity



Monetary policy counterfactual: (demeaned) year-over-year growth rates

