Investment in Russia: influence of key macroeconomic shocks

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Purpose of the research

- The goal is to examine the impact of several structural short- and middle-term shocks on Russian fixed capital investment growth during 2003-2016
- Stagnation and decline in Russian investment since 2013, before the oil price decrease and before sanctions. The simultaneous influence of several factors, revealing accumulated problems
- *"The main risk that threatens the medium-term forecast of Russian economic growth is maintaining low level of investment" (World Bank, 2015)*

The model and variables

- Sign restricted structural VAR
- Variables:
  - investment in fixed assets (volume index)
  - GDP (volume index)
  - non-financial corporations' loans from the Russian banking sector (in rubles, in real terms: / GDP deflator)
  - non-financial corporations' external debt (in US dollars, / inflation rate in the USA)
  - real interest rate for three-month interbank loans
  - real exchange rate of the ruble to the basket of dollar and euro
  - oil price, exogenous to all other variables (futures for Brent crude oil, in US dollars)
- Method is applicated to macroeconomic data: Jaaskela, Smith, 2011; Malick, Sousa, 2012; Deryugina et al., 2015
- Researches on Russia, close to my topic: Lomivorotov, 2014; Vaschelyuk, Polbin and Trunin, 2015

Econometric approach

- Fry, Pagan, 2011; Uhlig, 2005
- Reduced-form VAR model: $A(L) \cdot Y_t = u_t$
- u_t can be represented as linear combination of uncorrelated structural shocks e_t: $u_t = B \cdot e_t$
- If structural shocks covariance matrix is normalized, then $E(u_t \cdot u_t') = B \cdot E(e_t \cdot e_t') \cdot B' = B \cdot B'$
- Sign restrictions algorithm explores the following: let $\hat{e}_t = Q \cdot e_t$, where Q - orthogonal matrix. Then $u_t = BQ'Q \cdot e_t = \hat{B}_t \cdot \hat{e}_t$
- Hence we have new structural shocks set, while their properties are the same: $E(\hat{e}_t \cdot \hat{e}_t') = E(Q \cdot e_t \cdot e_t' \cdot Q') = E(e_t \cdot e_t')$
- The matrix Q that would satisfy sign restrictions is to be found by generating a set of random matrices

Structural shocks

Identified shocks:

- Terms of trade shock, i.e. the shock of oil prices
- Shock of foreign funding (access to global capital markets) in the form of changes in the size of non-financial corporations' external debt: financial sanctions are here
- Monetary policy shock, i.e. the shock of a short-term interest rate
- Demand shock in the form of public investment and infrastructural budget expenditures

Sign restrictions

- TT shock: ER changes, loans, GDP and INV within six months
- Shock of foreign funding: external debt adjustment, ER. External risk premium is transmitted to internal IR
- MP shock: interbank IR, ER (tightening - SR strengthening of the national currency), domestic loans, output
- Demand shock: impact on INV, IR (expected deficit), ER (expected deficit or reserve fund accumulation). On domestic credit: more budget financing - less borrowed funds required
- At least in one sign each shock must differ from all others. Hypothesis on difference in responses of local loans

	reer		*i_rate*		*L_lc*		*L_fx*		*GDP*		*INV*	
quarter	1	2	1	2	1	2	1	2	1	2	1	2
Terms of trade deterioration	–	–			–			–	–	–		–
Reduction of foreign funding	–		+	+	+		–	–		–		–
Monetary policy tightening	+		+	+		–				–		
Negative demand shock (reduction of budget investment expenditures)	+		–		+						–	

Empty cell means no imposed restriction.

Estimation of the model

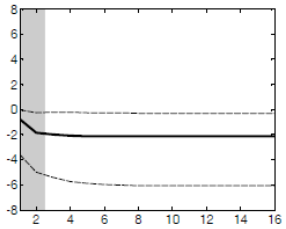
- Time series, except the interest rate, are seasonally adjusted and in the form of the first differences (of logarithms)
- 1 lag in VAR-model
- Quarterly data from 2003Q1 to 2016Q1 (53 observations)
- The number of matrices, which satisfy our sign restrictions, is 200
- IRIS Toolbox for Matlab

Estimation results: IRFs, ER and IR

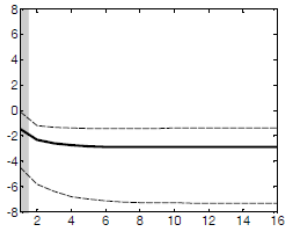
- ER is strongly influenced by external shocks and much less by monetary policy shock
- IR reacts similarly to external and monetary policy shocks
- Cumulative IRFs (percentage points to one std of shock). Negative shocks. Solid line - median model

reer

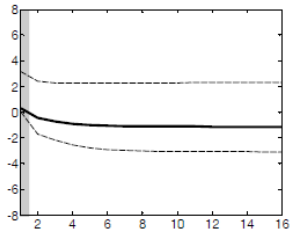
Terms of trade shock



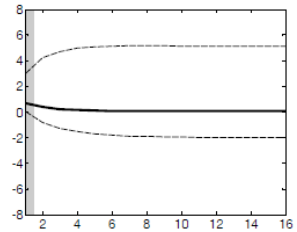
Shock of foreign funding



Monetary policy shock

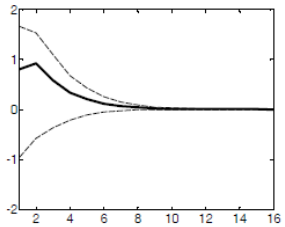


Demand shock (public investment)



i_rate

Terms of trade shock



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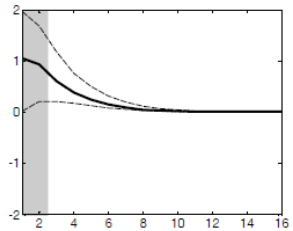
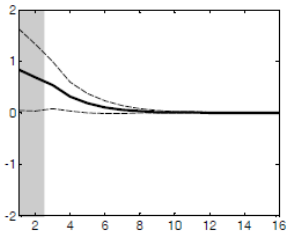
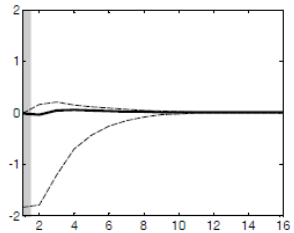


Monetary policy shock



Demand shock (public investment)

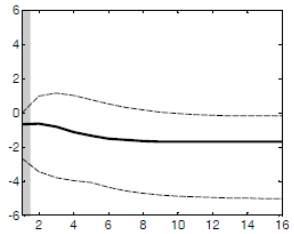


Estimation results: IRFs, local and FX loans

- Domestic corporate credit increases in case of negative shock of foreign funding: the hypothesis of SR substitution between loans is confirmed. The hypothesis concerning the influence of budgetary policy was also confirmed
- External loans react to external shocks predictably negatively. Monetary policy tightening results in the expansion of lending abroad

loans_local

Terms of trade shock



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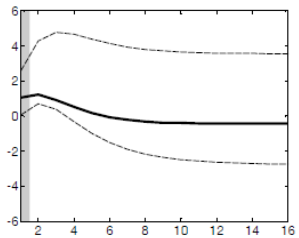
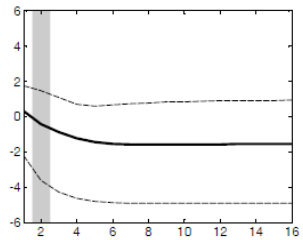
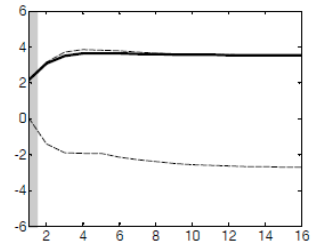


Monetary policy shock

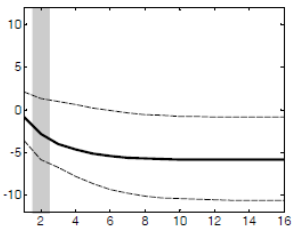


Demand shock (public investment)



loans_fx

Terms of trade shock



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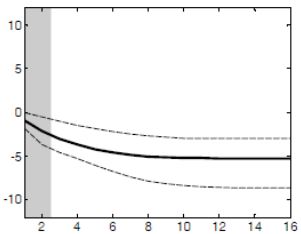
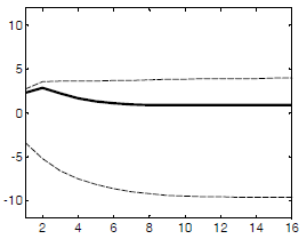
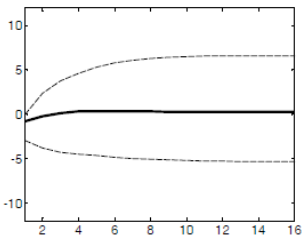


Monetary policy shock



Demand shock (public investment)

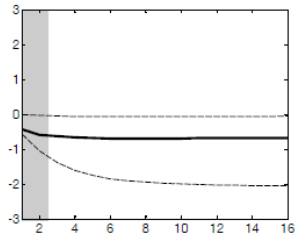


Estimation results: IRFs, output and investment

- The output depends more on external shocks and, to a lesser extent, on monetary policy. Demand shock impact is negligible
- The profile of investment responses is similar to the output, but with higher amplitude

GDP

Terms of trade shock



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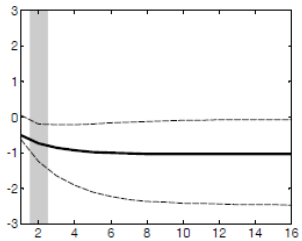
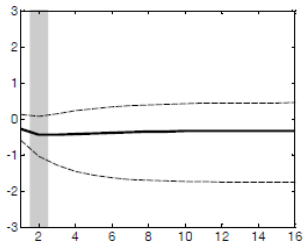
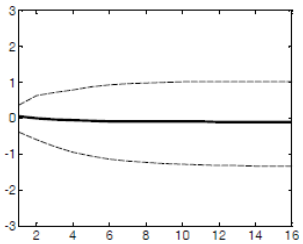


Monetary policy shock

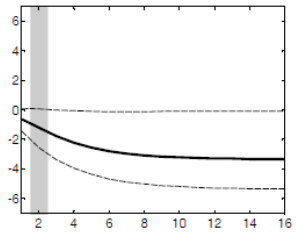


Demand shock (public investment)



INV

Terms of trade shock



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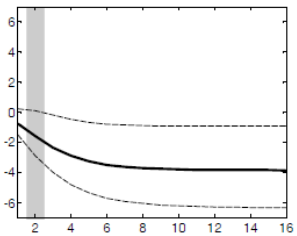
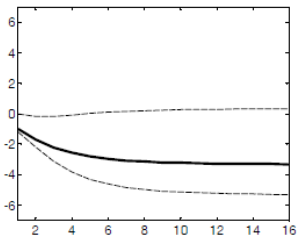
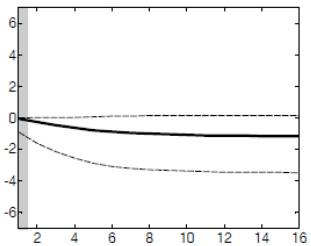


Monetary policy shock

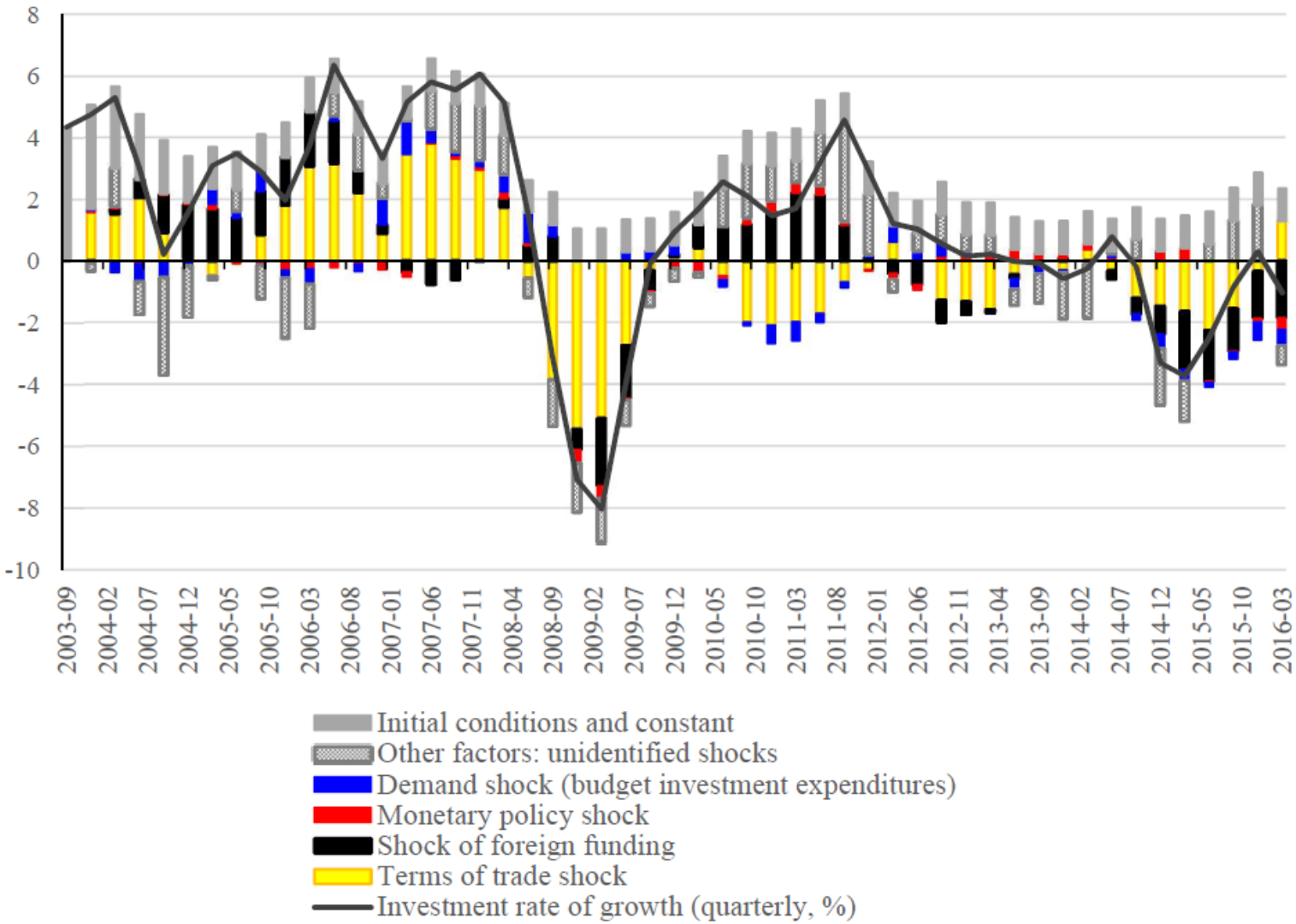


Demand shock (public investment)



Estimation results: decomposition of investment dynamics

- The decomposition is based on the median model chosen for all iterations and all shocks



Estimation results: decomposition of investment dynamics

- Terms of trade is the dominant factor, but since 2010 the contribution has been negative (despite high oil prices in 2010-2012)
- Foreign financing contribution is also substantial: period of sanctions
- Monetary policy is surprisingly insignificant
- Demand shock (public investment): barely noticeable in the post-2011 period (its introduction was an attempt to capture a factor that "pushes"investments upward in a number of periods)

Conclusion

- External shocks dominate in the dynamics of Russian investment
- Sudden restrictions of access to global capital markets were one of the main channel through wich western sanctions suppressed investment
- Operational measures of economic policy are unlikely to substantially improve the situation
- Lifting of sanctions could support investment, but only in the short-term period
- In the long run reforms are necessary in order to decrease dependence on external factors