

# **Energy Prices and the Global Business Cycle: Challenges and New Opportunities**

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# Key questions

1. The oil price decline and the global economy?
2. What are the prospects for resource rich economies?
3. Policy implications for Korea

## Sources for talk:

- ❑ Aastveit, K.A., H.C. Bjørnland and L.A. Thorsrud (2015) “What drives oil prices? Emerging versus developed economies” *Journal of Applied Econometrics*, 30, 1013-1028.

[http://www.bi.edu/InstitutterFiles/Samfunns%C2%B0konomi/CAMP/Working\\_CAMP\\_2-2012.pdf](http://www.bi.edu/InstitutterFiles/Samfunns%C2%B0konomi/CAMP/Working_CAMP_2-2012.pdf)

- ❑ Bjørnland, H.C. and L.A. Thorsrud (2016) “Boom or gloom? Examining the Dutch disease in two-speed economies”, forthcoming *Economic Journal*

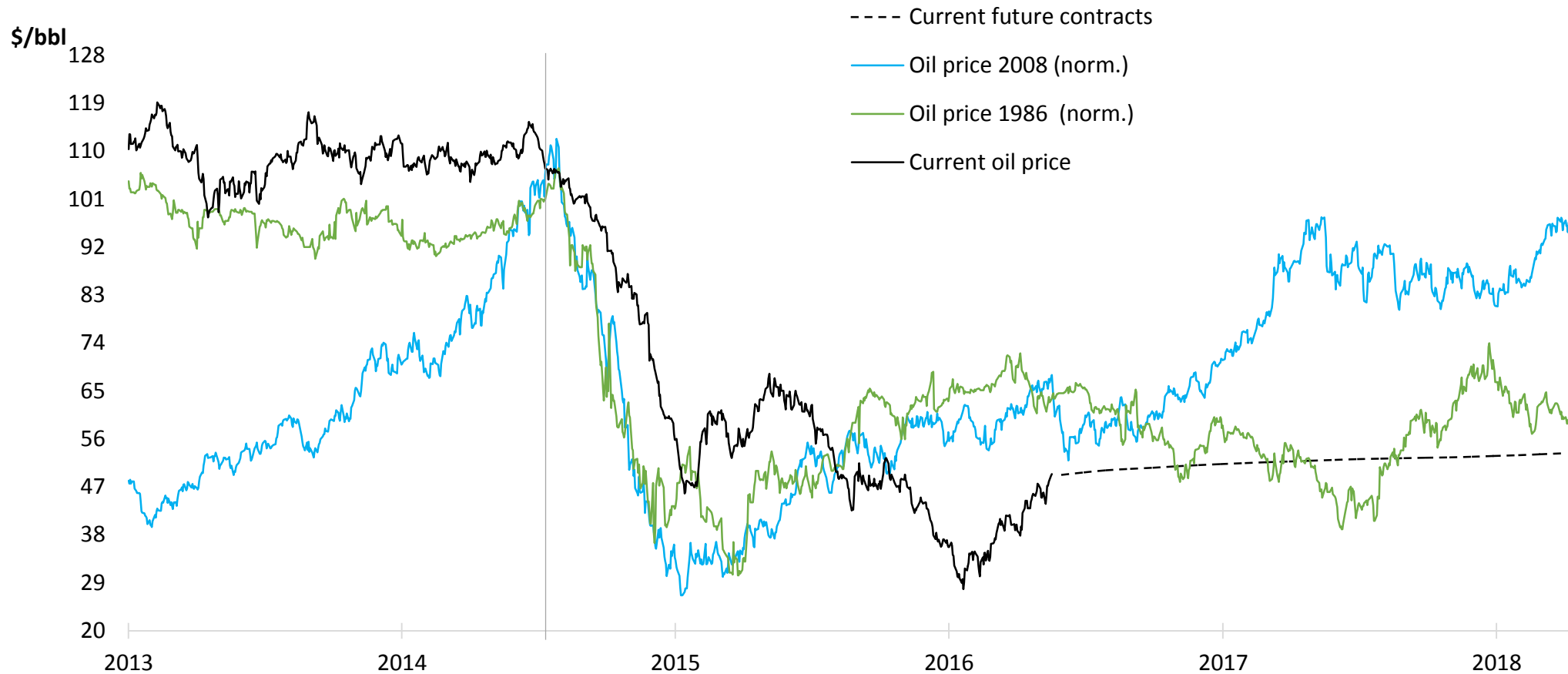
[http://www.bi.edu/InstitutterFiles/Samfunns%C2%B0konomi/CAMP/Working\\_CAMP\\_6-2014.pdf](http://www.bi.edu/InstitutterFiles/Samfunns%C2%B0konomi/CAMP/Working_CAMP_6-2014.pdf)

- ❑ Bjørnland, H.C., F. Ravazzolo and L.A. Thorsrud (2016) “Forecasting GDP with global components. This time is different”, Forthcoming in *International Journal of Forecasting*.

[http://www.bi.edu/InstitutterFiles/Samfunns%C2%B0konomi/CAMP/Working\\_CAMP\\_1-2015.pdf](http://www.bi.edu/InstitutterFiles/Samfunns%C2%B0konomi/CAMP/Working_CAMP_1-2015.pdf)

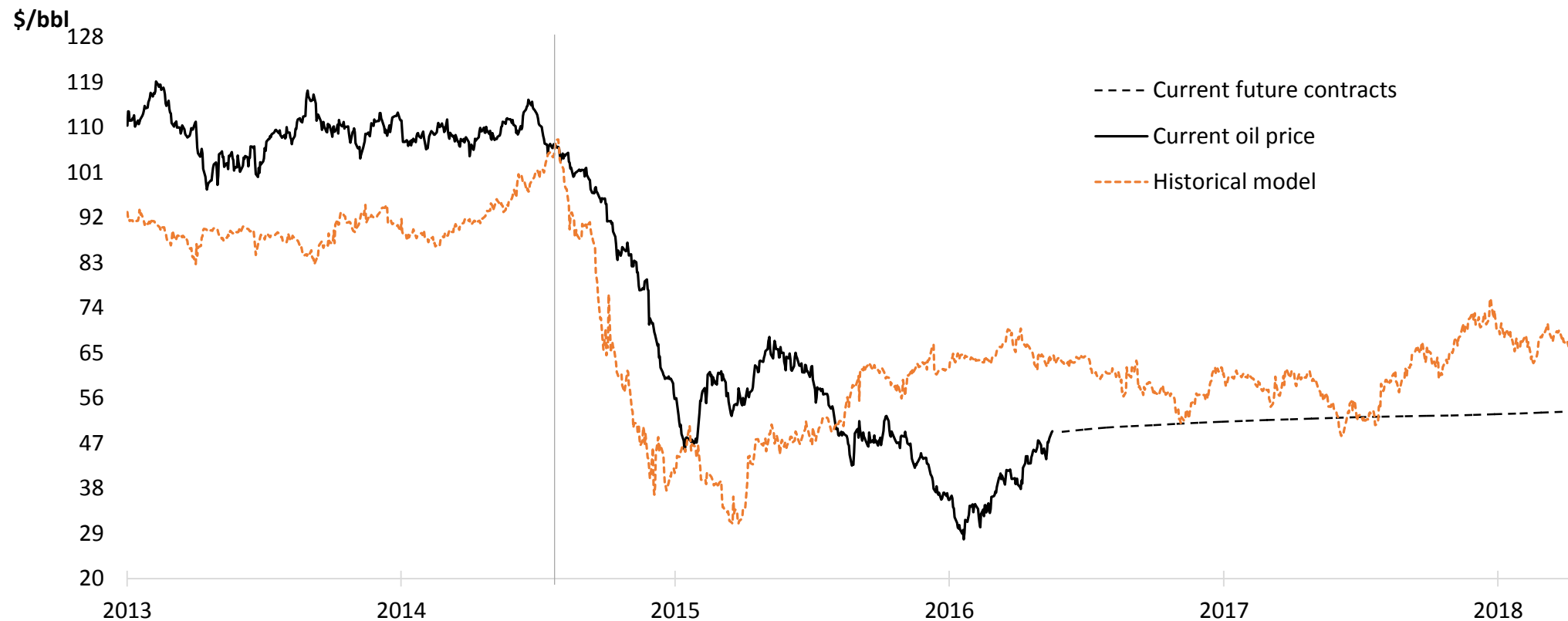
1. How do commodity and energy prices affect the global economy?

**Long way to recovery!** The current oil price decline versus the (supply driven) decline in 1986 and the (demand driven) decline in 2008;  
Crude oil - Brent



Source: Datastream and Hilde C Bjørnland

# Long way to recovery! The current oil price decline versus historical averages; Crude oil - Brent



Source: Datastream and Hilde C Bjørnland

# Oil prices and the macroeconomy –

Aastveit, Bjørnland and Thorsrud (JAE, 2015)

## Data:

- Quarterly data for 33 countries (18 developed, 15 emerging). Transformed to be stationary and then standardized
- GDP and industrial production for each country
- Sample: 1992.01 – 2009.04 ( $N = 66$ ,  $T = 72$ )

## Model (FAVAR):

- **Observation equation:**

$$X_t = \Lambda F_t + e_t, \quad (1)$$

where  $X_t = [\text{oilProd} \quad \text{GDP}^{US} \quad \text{GDP}^{China} \quad \text{oilPri} \quad Y]'$  and

$F_t = [\text{oilProd} \quad \text{devAct} \quad \text{emeAct} \quad \text{oilPri}]'$

- **Transition equation:**

$$F_t = \beta(L)F_{t-1} + u_t, \quad (2)$$

# Identifying structural shocks in the SVAR

4 shocks: oil supply, developed demand, emerging demand and oil specific demand

	Short run				Sign Restriction
	$\varepsilon^{oilSup}$	$\varepsilon^{devDem}$	$\varepsilon^{emeDem}$	$\varepsilon^{oilDem}$	
oilProd	+	0	0	0	
devAct	x	+	+	0	$\varepsilon^{devD}: devAct - emeAct > 0$
emeAct	x	+	+	0	$\varepsilon^{emeD}: emeAct - devAct > 0$
oilPri	x	x	x	+	

*Note:  $u_t = A_0 \varepsilon_t$ , the restrictions refer to the structure of  $A_0$ . The sign restrictions are imposed to hold for 2 quarters*

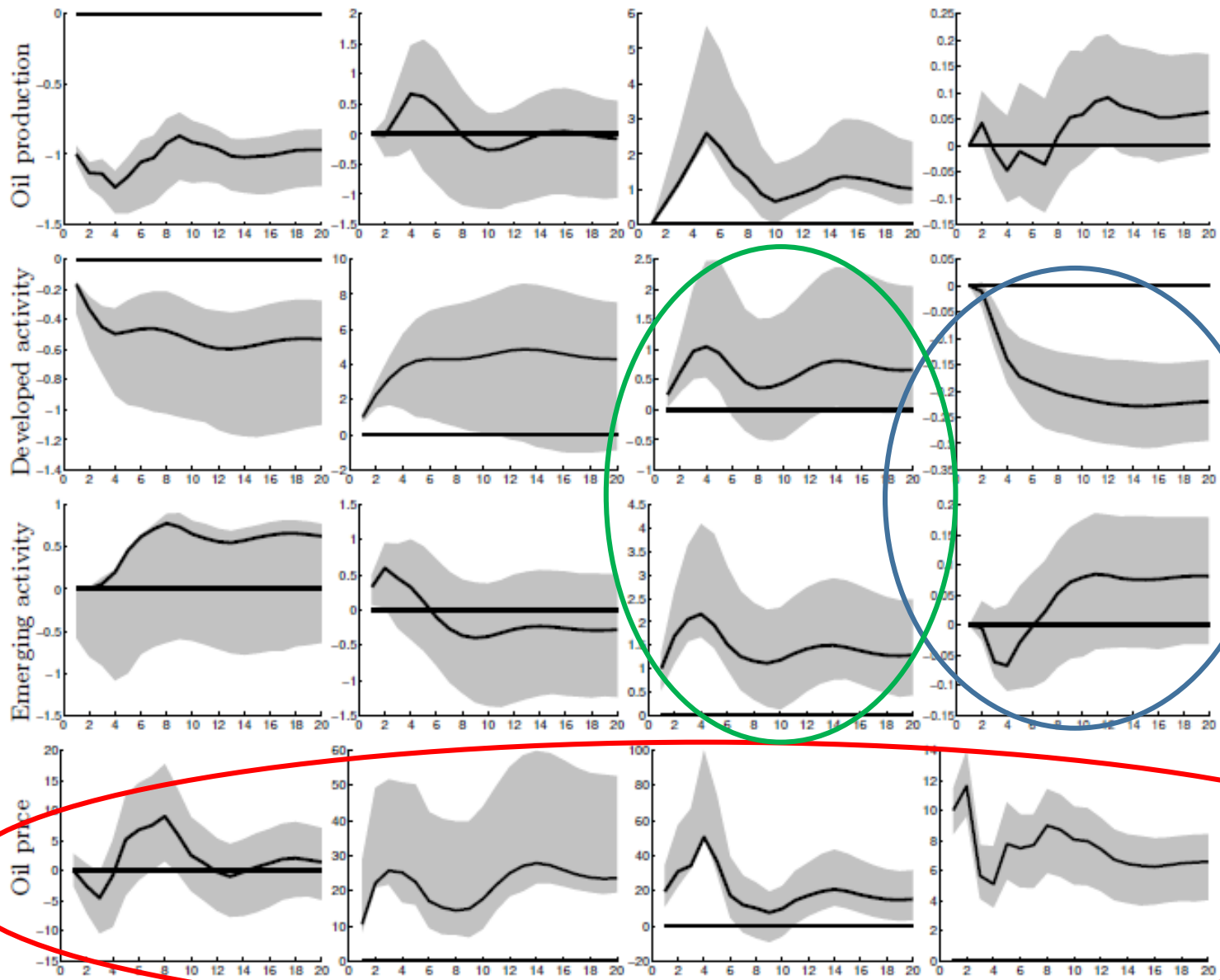
### Shocks

Oil supply

Developed demand

Emerging demand

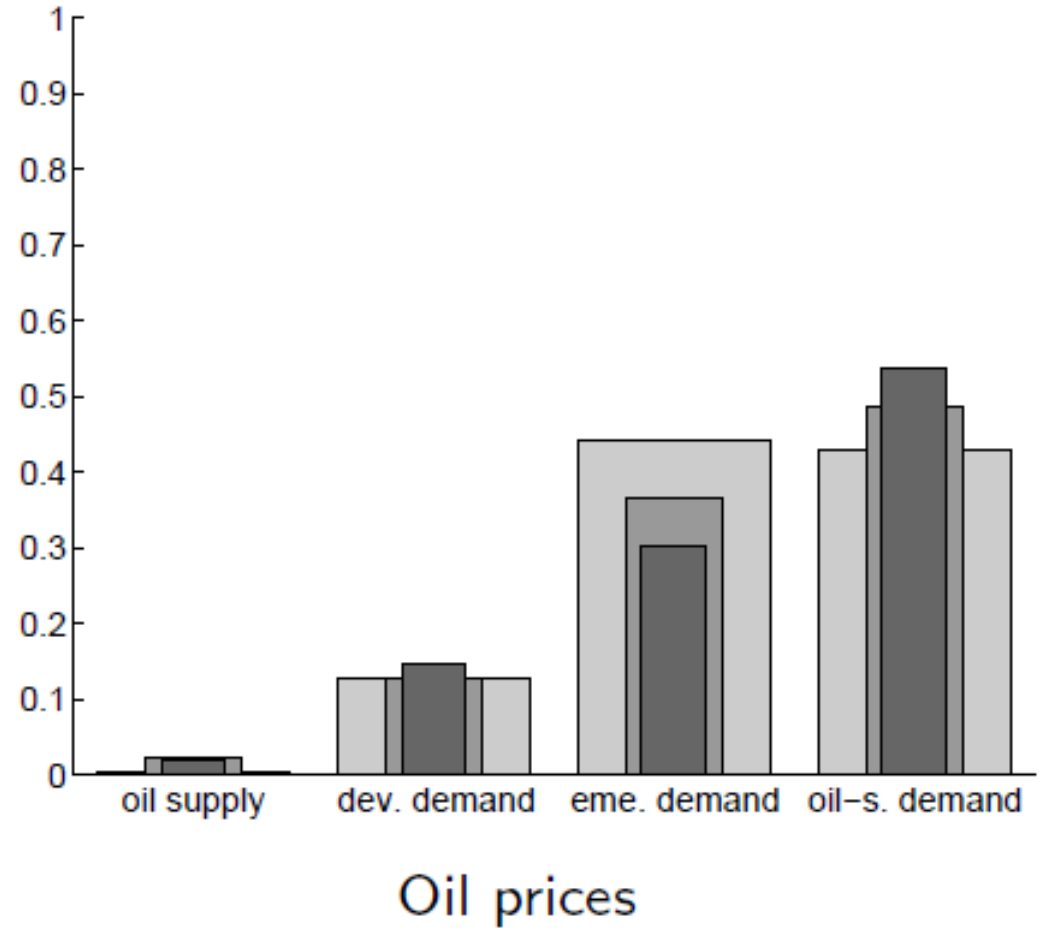
Oil-specific demand



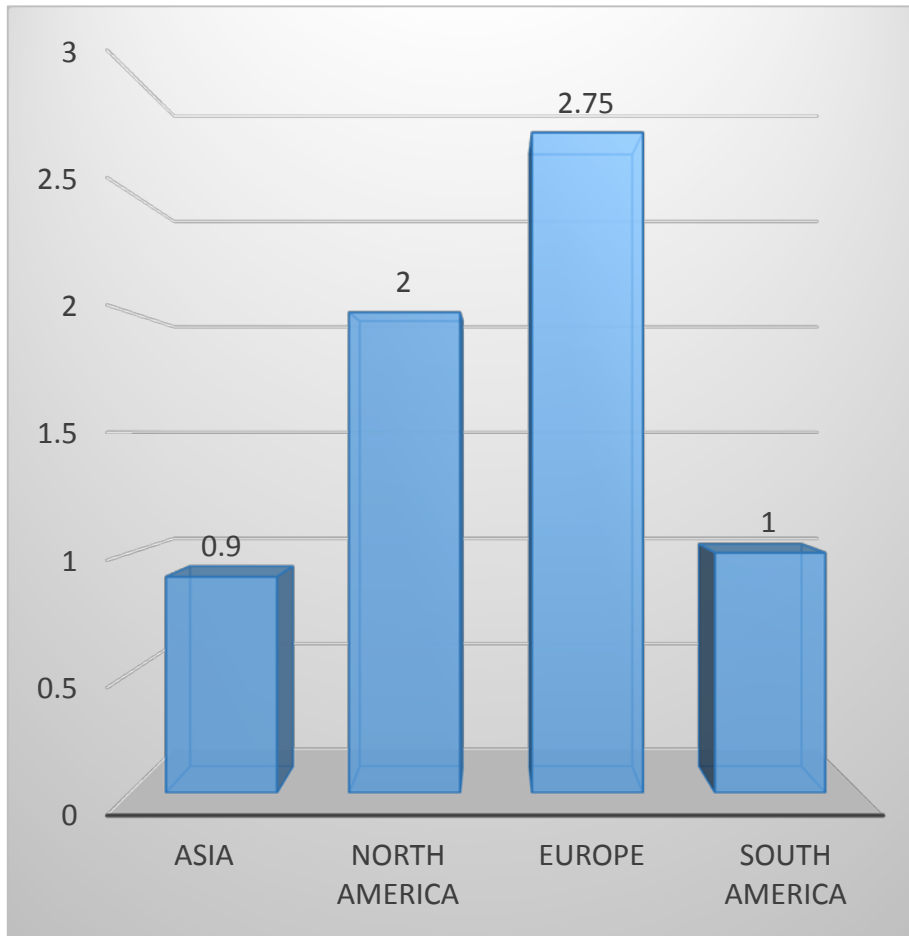
# Variance decomposition: Contributions to oil prices

50% of the variation in oil prices during the period 1996 -2013 is attributed to changes in demand from emerging Asian countries.

Oil specific demand equally important



The effect of a 50% decline in oil prices due to an oil specific shock ...?



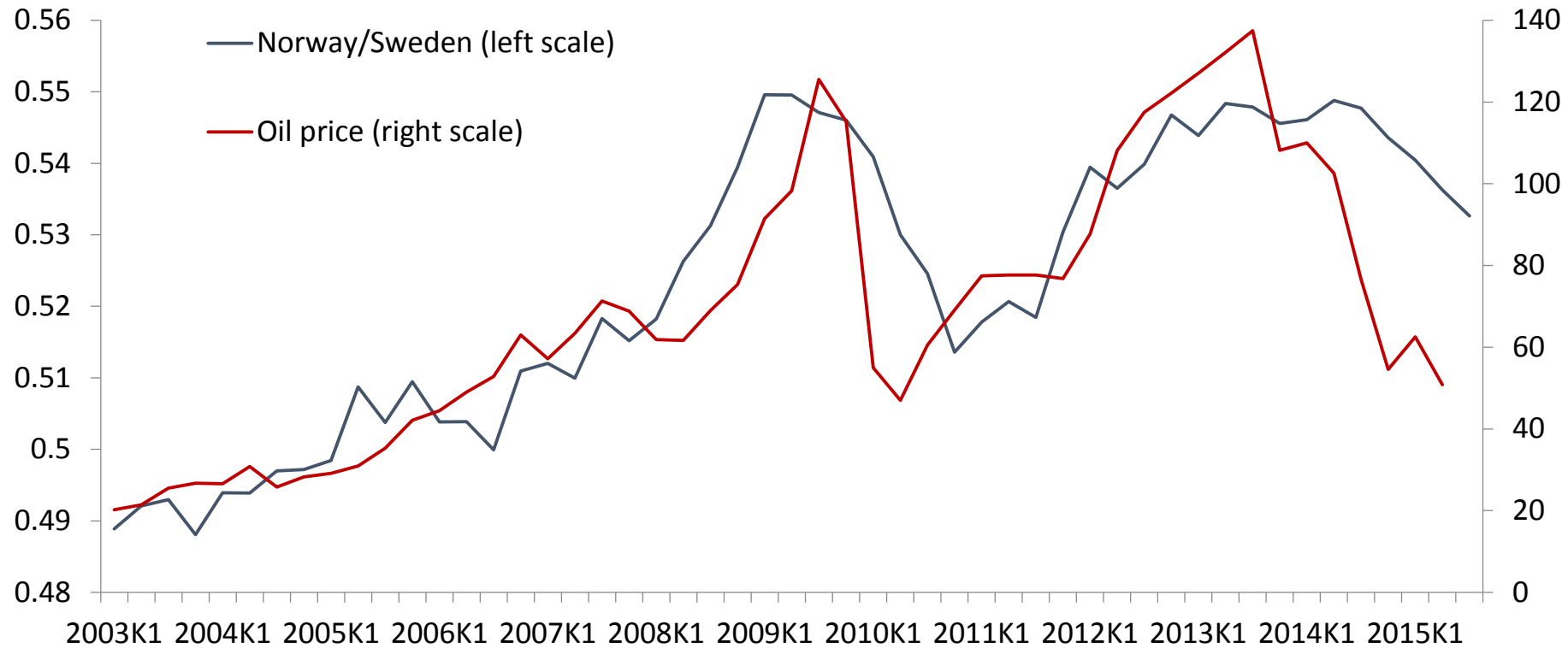
**Boost to consumers.... So why has the world not done better?**

Source: Aastveit, Bjørnland and Thorsrud (JAE, 2015)

# Boost to consumers... but trapped producers

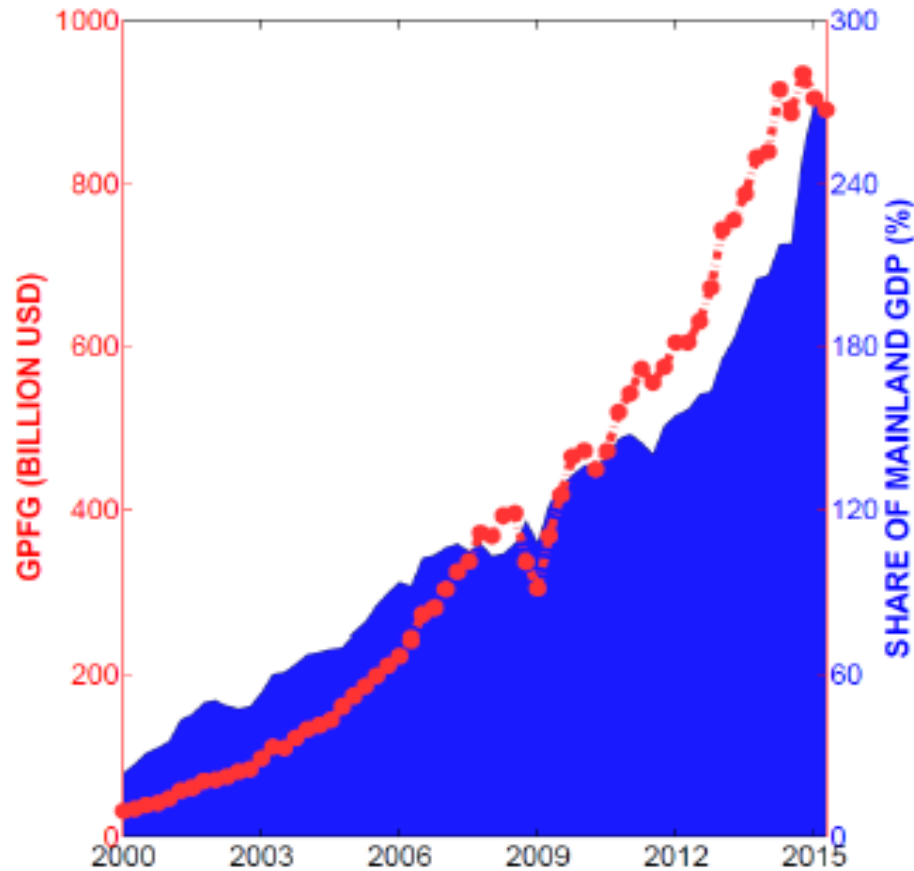
- Decline in commodity prices is also due to declining **global demand**. Other commodity prices are down
- Low interest rates: Real rates can not go much lower
- **BUST for energy firms, and their stock prices.** Effects beyond the energy sector: Companies in the energy sector behind much of the capital investment at a time when other sectors have been less willing to invest.
- Capital investment faces a significant scaling back.
- Spillovers to companies and their stock prices in other sectors, manufacturing, housing markets, hotels and restaurants etc.

# Oil exporters versus importers: Oil price and value added (mainland) Norway relative to Sweden



Source: SSB, SCB and Hilde C. Bjørnland

# Government Pension Fund Global (GPFG)



Invest in 9,000 companies  
and have investments in 78  
countries.

Source: Norges Bank

2. What are the prospects for commodity and energy exporters?

# Spillovers in developed research rich economies versus resource curse literature...

- Is it useful to compare Norway with Nigeria?
- Bjørnland and Thorsrud (EJ, 2016): Large spillovers from resource sector...
  - *E.g., Norway: Offshore oil extraction demands complicated technical solutions which could in itself generate positive knowledge externalities that benefit other sectors.*
- Share of GDP and productivity growth explained by resource boom: **Norway** 30/45 versus **Australia**: 15/6

Observation equation:

$$y_t = \lambda_0 f_t + \dots + \lambda_s f_{t-s} + \epsilon_t$$

Transition equation:

$$f_t = \phi_1 f_{t-1} + \dots + \phi_h f_{t-h} + u_t$$

with

$$\begin{bmatrix} \epsilon_t \\ u_t \end{bmatrix} \sim i.i.d.N \left( \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} R & 0 \\ 0 & Q \end{bmatrix} \right)$$

and autoregressive errors:

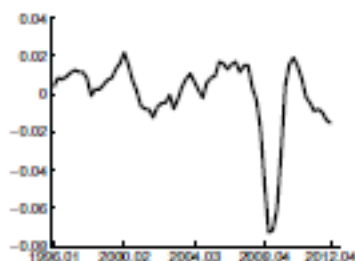
$$\epsilon_{t,i} = \rho_{1,i} \epsilon_{t-1,i} + \dots + \rho_{l,i} \epsilon_{t-l,i} + \omega_{t,i}$$

Restricting (see Bai and Ng (2013) and Bai and Wang (2012)):

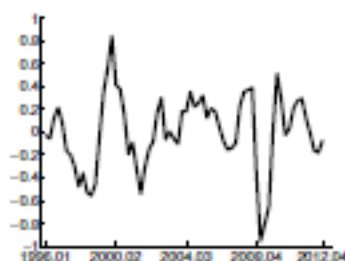
$$\lambda_0 = \begin{bmatrix} \lambda_{0,1} \\ \lambda_{0,2} \end{bmatrix} \quad \lambda_{0,1} = I_4 \quad (8)$$

Implication: All restrictions on the loadings - factors allowed to be correlated - facilitates SVAR analysis on the factors' law of motion and identification of structural shocks

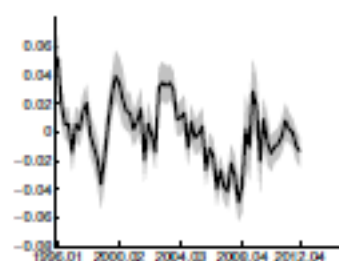
Global activity



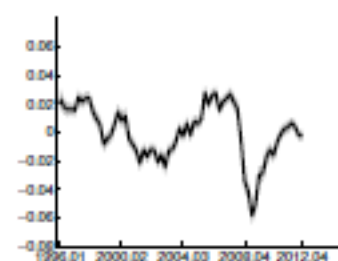
Real oil price



Resource activity



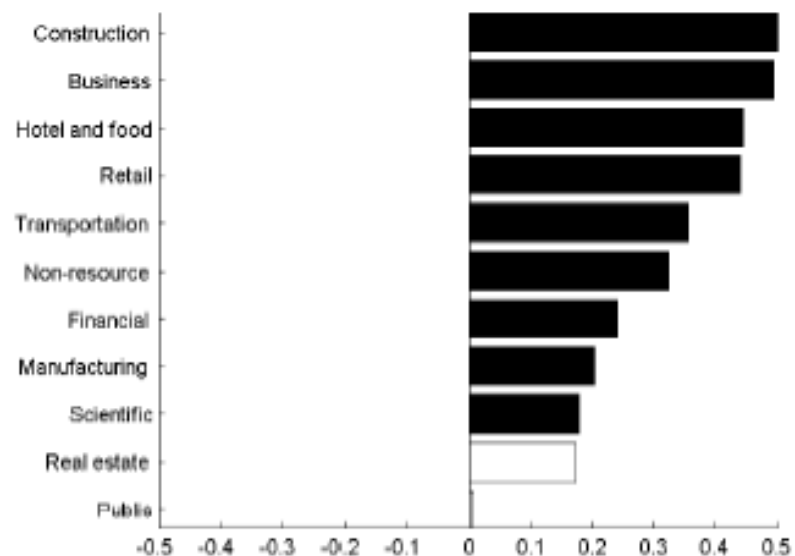
Domestic activity



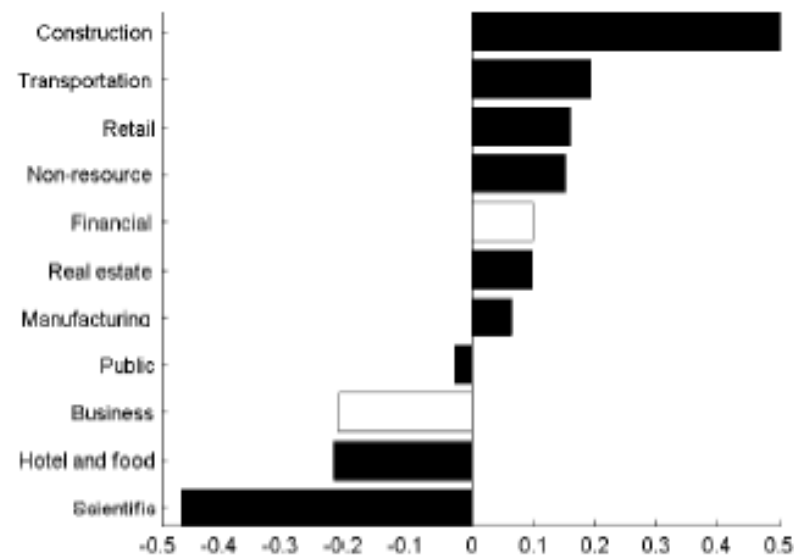
*Note: The figures display the estimated latent factors. The black solid lines are median estimates. The grey shaded areas are 68 percent probability bands*

# Large spillovers to other industries: Average effect of a 1% resource boom after three years, percent

## Norway



## Australia

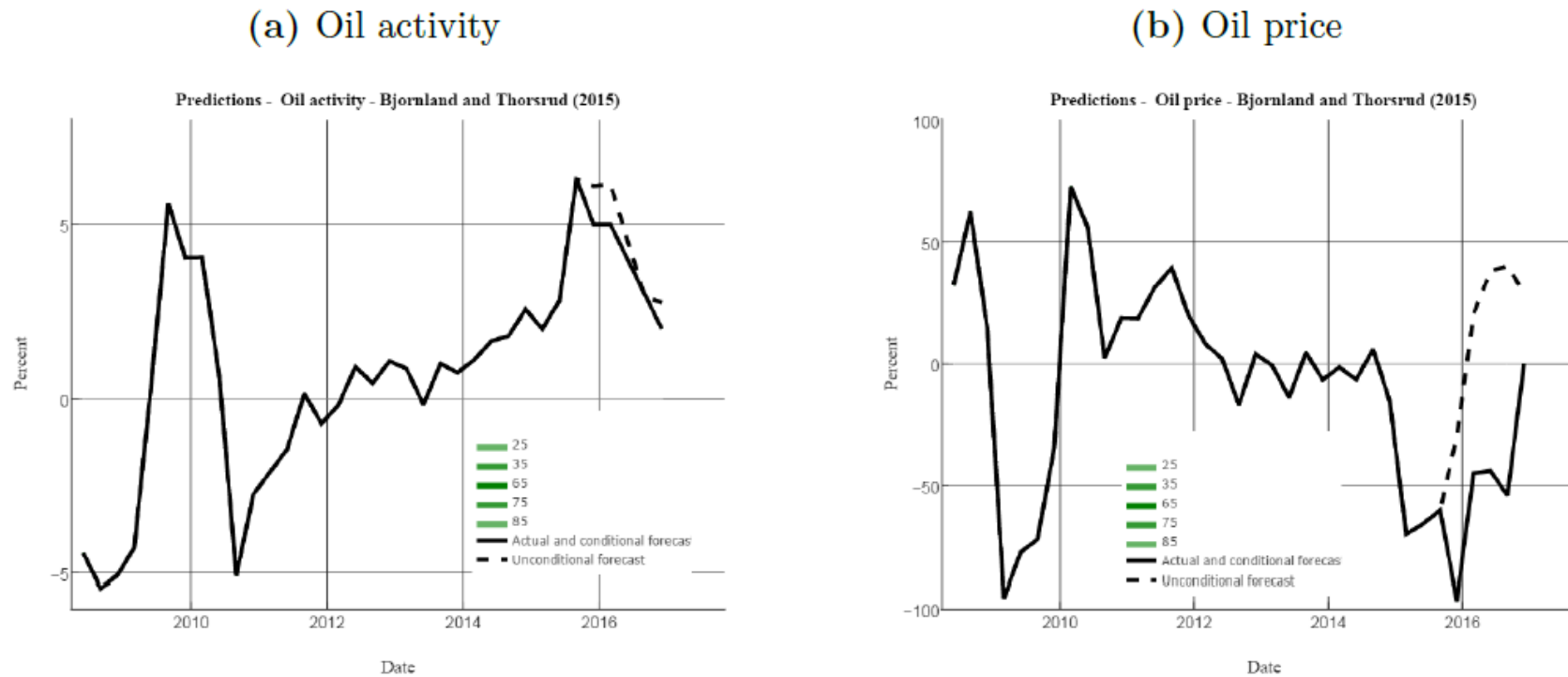


Source: Bjørnland and Thorsrud (EJ, 2016)

Conditional forecast ... What if oil prices remain at 36  
USD barrel?

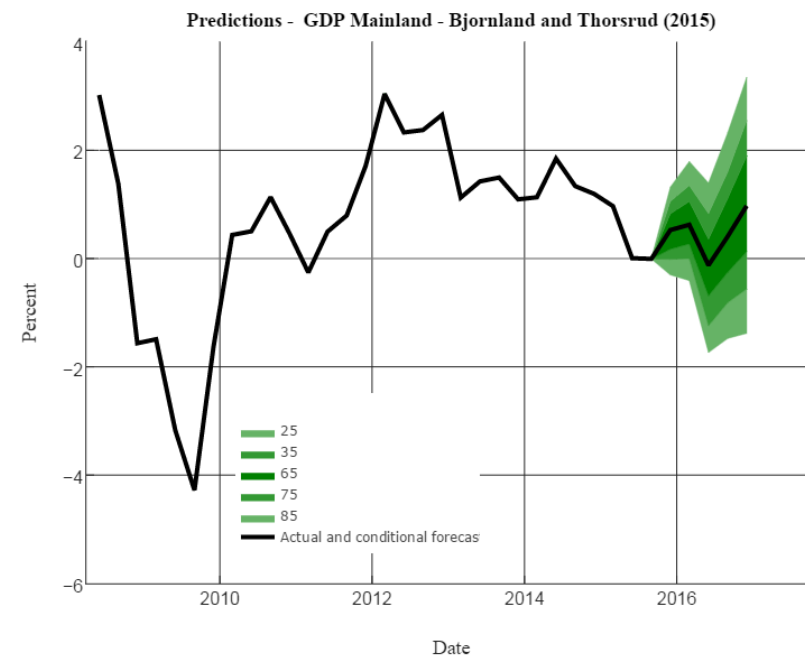
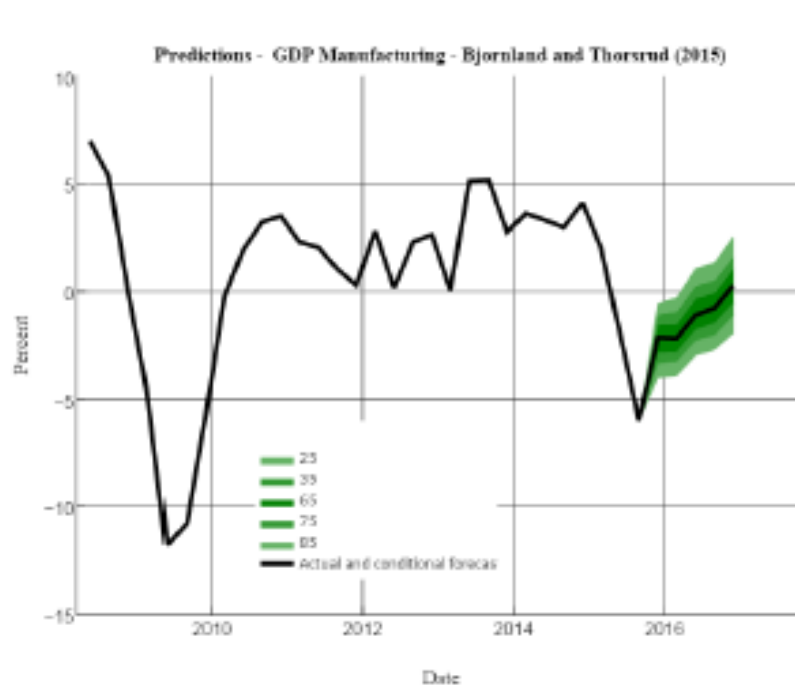
# Predictions for oil prices and oil activity 2016 - Unconditional and conditional forecast

Figure 1. Forecasts of factors



Kilde: Bjørnland og Thorsrud (2015)

Now the signs are reversed - Predictions for 2016, for Norway... Conditional forecast



Kilde: Bjørnland og Thorsrud (2015)

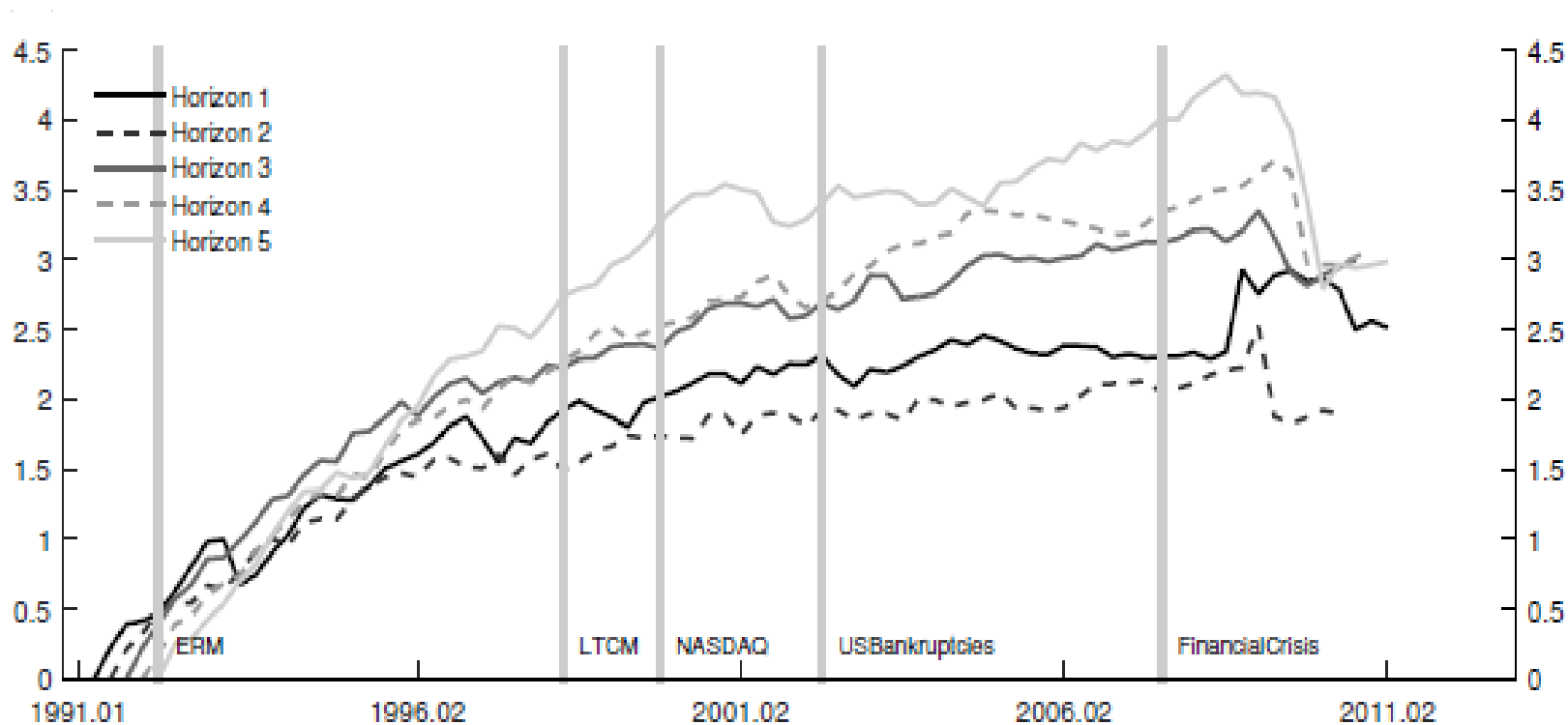
### 3. Policy implications for Korea

# Policy implications for Korea

- Oil importer and developed – small positive effects from current oil price decline
- Capital investments declining – hurt tradables
- Korea is related to both the global and the Asian business cycle

# Forecasting GDP with global components – CRPS score

## Relative out-of-sample forecasting performance

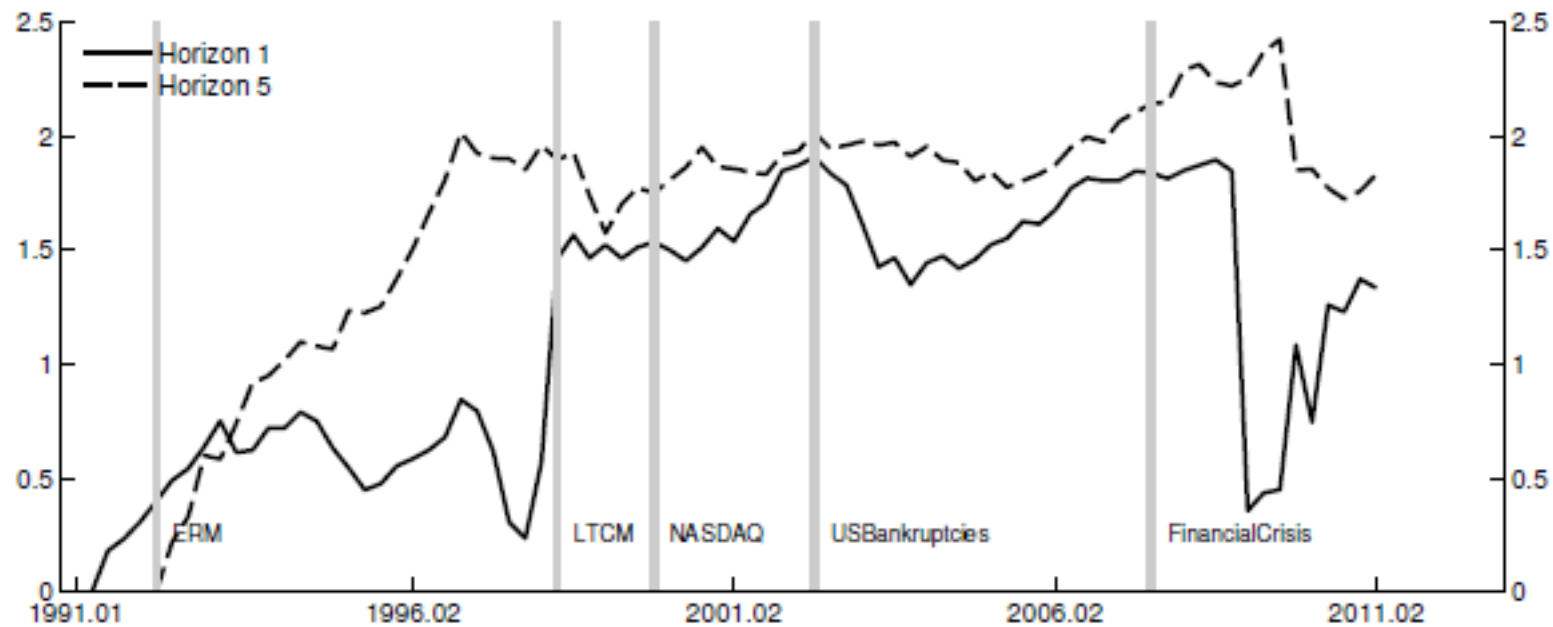


Forecasting GDP with global components. This time is different  
Bjørnland, H.C., F. Ravazzolo and L.A. Thorsrud (JIF,2016)

# Forecasting Asia with regional components – CRPS score

## Relative out-of-sample forecasting performance

(d) Asia

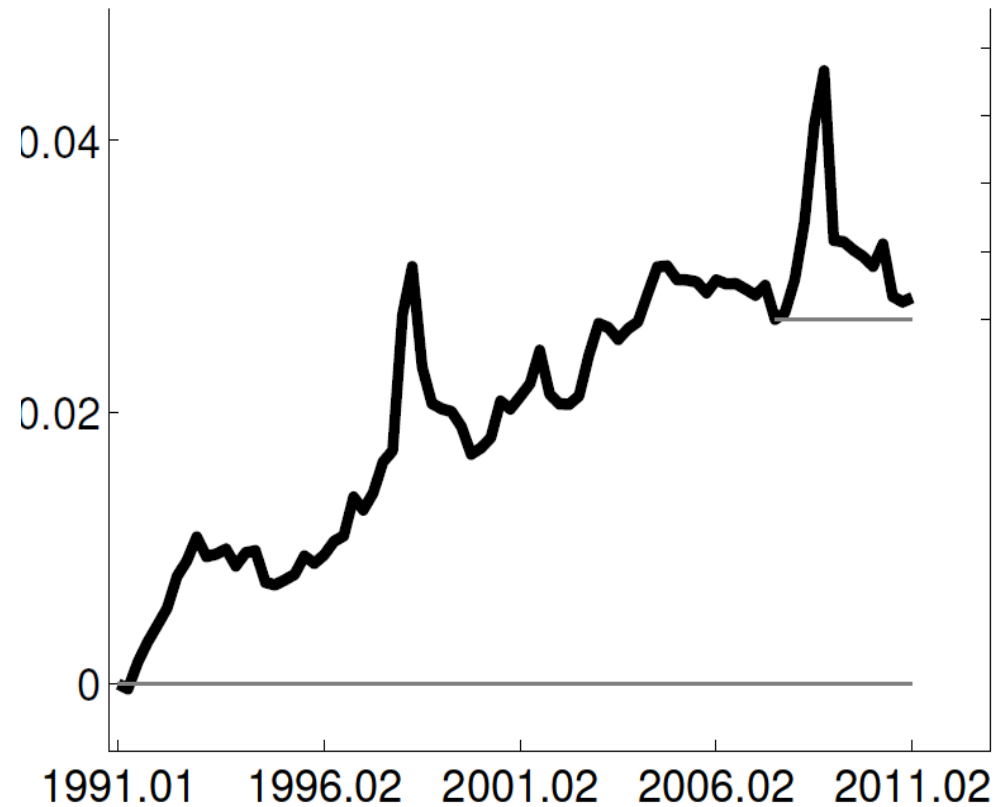


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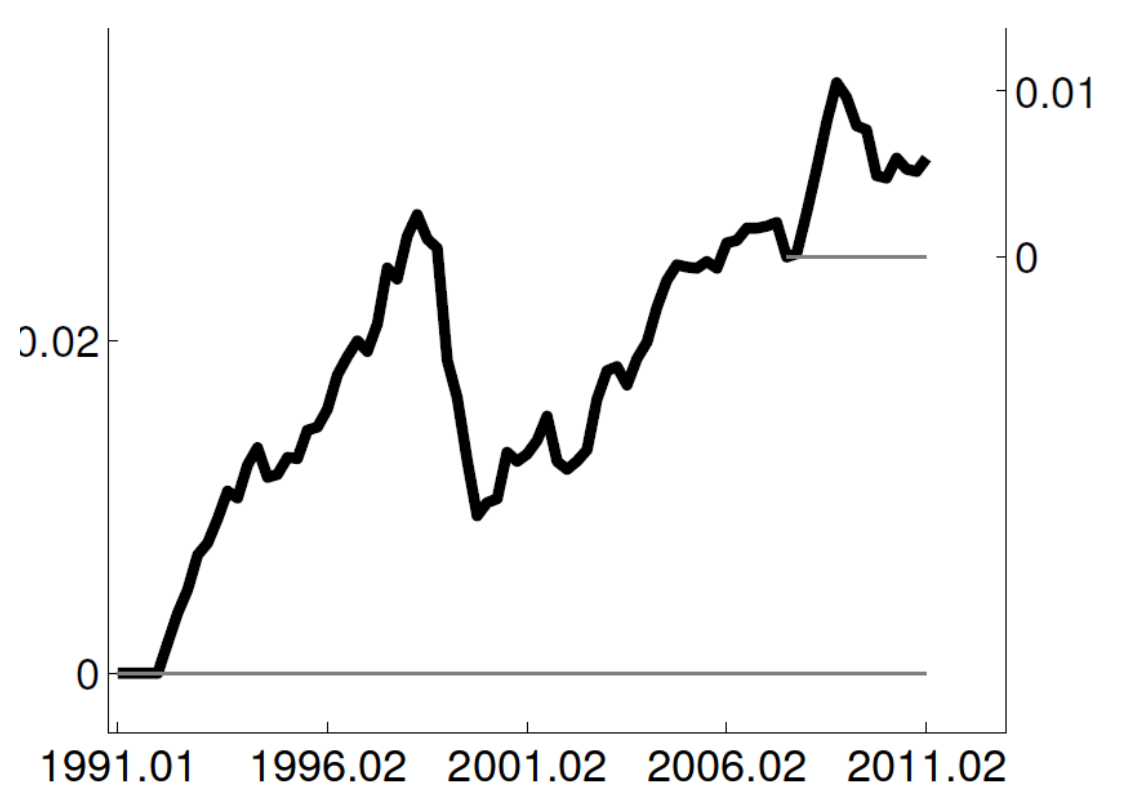
# Forecasting Korea with global and regional components

## 1-step ahead - Relative out-of-sample forecasting performance

### 1 -step ahead



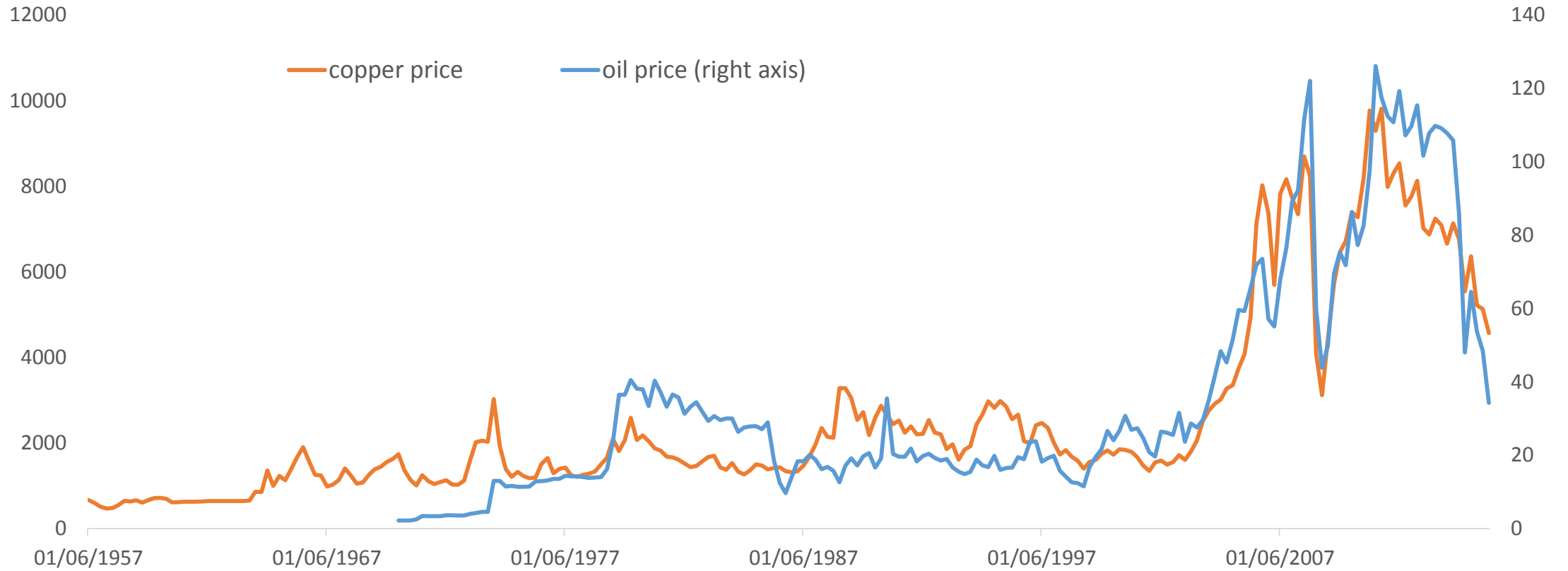
### 5- steps ahead



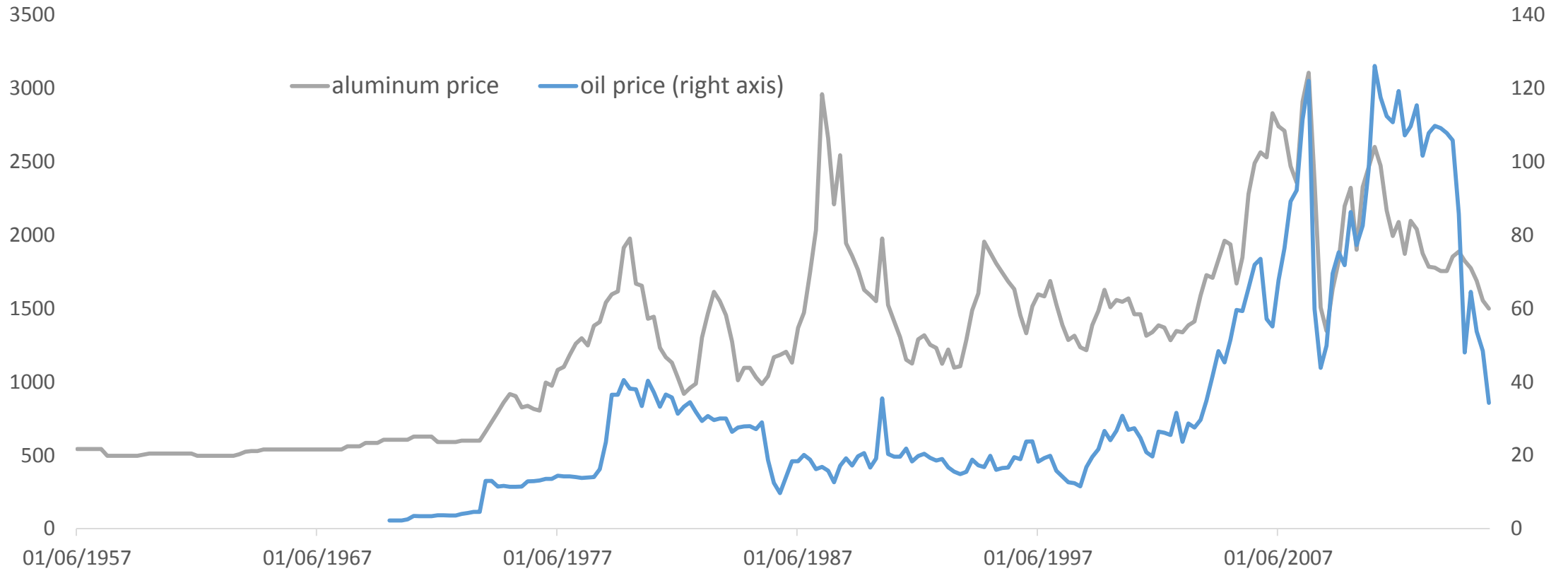
Thank you!

Extra slides

# Historical prices (Oil price and copper)



# Historical prices (Oil price and aluminum)



- Identify four structural shocks:
  - Global activity shock ( $e_t^{gact}$ )
  - Commodity price shock ( $e_t^{comp}$ )
  - Resource activity shock/resource booms ( $e_t^{ract}$ )
  - Non-resource (domestic) activity shock ( $e_t^{dact}$ ).
- The mapping between the reduced form residuals  $u_t$  and structural disturbances  $e_t$ ,  $u_t = A_0 e_t$ , is given by (recursive ordering):

$$\begin{bmatrix} u_t^{gact} \\ u_t^{comp} \\ u_t^{ract} \\ u_t^{dact} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} e_t^{gact} \\ e_t^{comp} \\ e_t^{ract} \\ e_t^{dact} \end{bmatrix}$$