

# **Macroeconomic and Financial Effects of Oil Price Shocks: Evidence for the Euro Area**

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# Available results

- **The oil price-macroeconomy relationship is a well studied issue; nevertheless the available evidence for the euro area is rather thin:**
  - **Asymmetric real effects** of oil price shocks (Jiménez-Rodríguez and Sánchez, 2005);
  - The **effects** of (negative) oil price shocks **depend on their source**: all of them are **inflationary also in the short-run** and **recessionary at different horizons** (Peersman and van Robays, 2009; Forni et al., 2012);
  - **Weaker stagflationary effects of both supply and demand oil shocks since the mid-1990s** than over the three previous decades, yet an **unchanged relative contribution of both shocks to the determination of oil price fluctuations** (Hahn and Mestre, 2011; ECB, 2010)
  - The above evidence is based on small-scale SVARs, considering evidence since the 1970s and through 2009 at most: **by neglecting recent economic developments, might not yield accurate guidance concerning the slump.**

# Contributions of the paper

- The paper investigates the **macroeconomic and financial effects of oil prices shocks in the euro area** since its creation in 1999 through 2015, with a special focus on the **recent slump**.
- The analysis is carried out **episode by episode**, within a **new large scale time-varying parameter framework**, based on the **semiparametric dynamic conditional correlation model (SP-DCC)** of Morana (2015) and a **broad information set**.
- The analysis is then **consistent with the view that "not all the oil price shocks are alike"**, yet without imposing any a priori identification assumption.
- Overall, our findings yield **new insights on the macro-financial impact of oil price disturbances for the euro area**.

# The data

- Comprehensive set of **monthly data** over the period **1999:1 through 2015:6**. The  $y_t$  vector contains 13 elements
- **Oil price shocks** (positive and negative) computed as Hamilton's net real WTI oil price changes (o; in € per Barrel);
- **Non-energy commodity prices**: the return on the real IMF non-energy commodities price index in € (c);
- **real activity**: industrial production growth rate (g);
- **nominal conditions**: harmonized CPI index inflation rate ( $\pi$ );
- **monetary policy stance conditions**: the real Eonia interest rate (s) and the rate of growth of real M3 (m).
- **competitiveness**: the real effective € exchange rate return (e);
- **unbalance conditions**: the EA current account balance (ca) in changes, the Morana (2016) EA financial condition index (fc).
- **revisions in market expectations** about the economic outlook: the Fama-French (1993) European size (smb), value (hml) and market (mkt) factors, plus the Charart (1997) European momentum factor (mom).

# Dynamic effects of oil price shocks

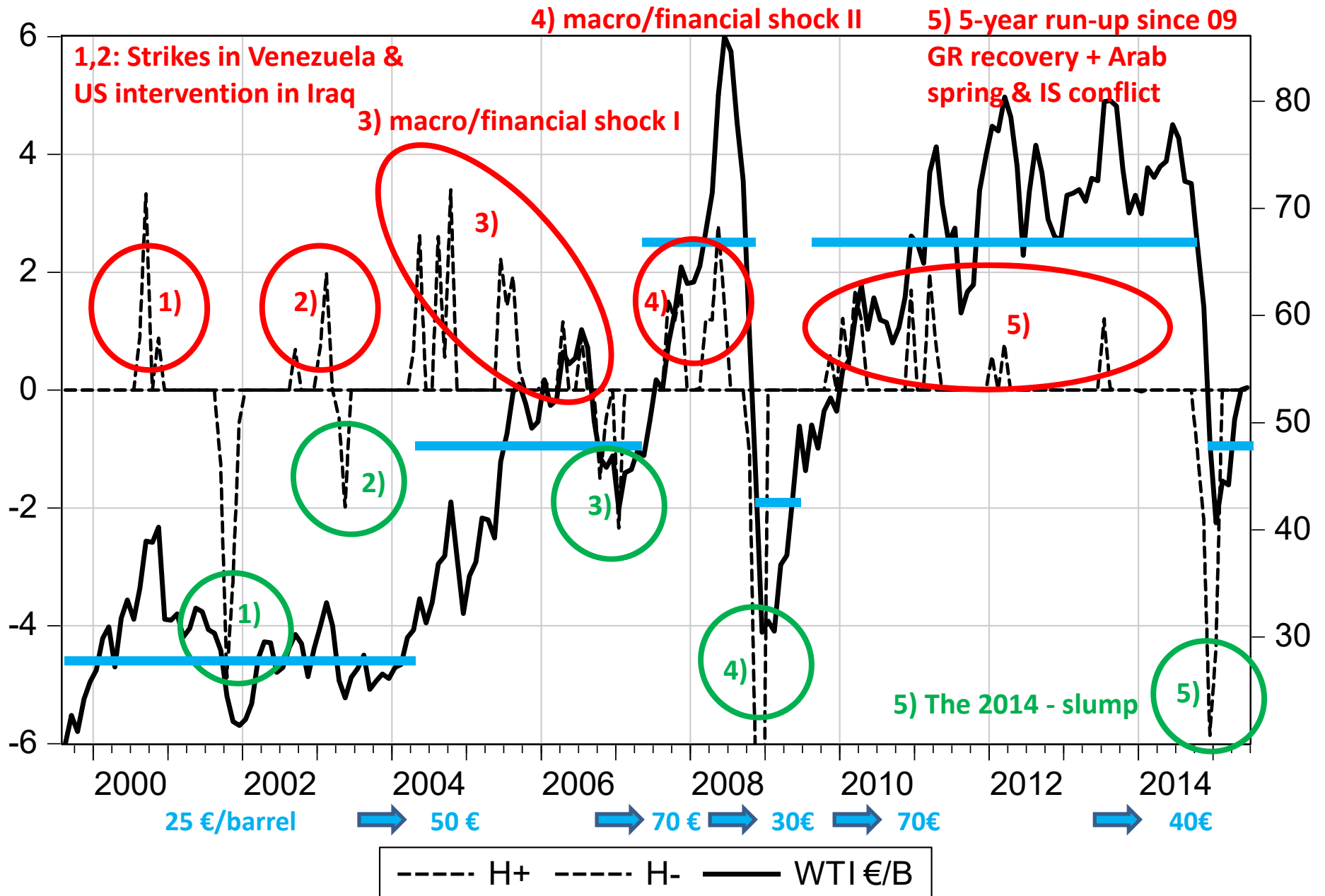
- The **sequence of time-varying conditional slope parameters** (time-varying dynamic multipliers) has been computed

$$\beta_{oj,tk} = \frac{\text{Cov}(y_{o,t}, y_{j,t+k} | I_{t-1})}{\text{Var}(y_{o,t} | I_{t-1})} \quad k = 0, 1, \dots$$

yielding the **dynamic response of the selected macroeconomic and financial variables to net changes in the real oil price (o)**. We focus on **5 episodes of sizable oil price increase and decrease**. For each of them we report **median cumulative dynamic responses**, which are scaled by the size of the corresponding median net price change in order to make them comparable across the various episodes.

- We do **not categorize the source of oil price shocks**; by evaluating their effects **episode-by-episode**, the analysis is, however, consistent with the view that "**not all the oil price shocks are alike**", yet with the advantage of **not imposing any a priori identification assumption**.

# Real oil price level (€/barrel) and shocks (%)



# The econometric model (SP-DCC, Morana, 2015)

- The variables  $y_{s,t}$   $s = 1, \dots, N$  are assumed to follow an AR( $p$ ) process in the conditional mean.

- The variables  $y_{s,t}$   $s = 1, \dots, N$  and their aggregates

$$y_{ij,t}^+ \equiv y_{i,t} + y_{j,t} \quad y_{ij,t}^- \equiv y_{i,t} - y_{j,t} \quad i, j = 1, \dots, N \quad i \neq j$$

are assumed to follow a GARCH(1,1) process in conditional variance

$$\text{Var}_{t-1}(y_{s,t}) \equiv h_{ss,t} = \omega_s + \alpha_s \varepsilon_{s,t-1}^2 + \beta_s h_{ss,t-1} \quad s = 1, \dots, N$$

$$\text{Var}_{t-1}(y_{ij,t}^z) \equiv h_{ij,t}^z = \omega_{ij}^z + \alpha_{ij}^z \varepsilon_{ij,t-1}^z{}^2 + \beta_{ij}^z h_{ij,t-1}^z \quad z = +, - \quad i, j = 1, \dots, N \quad i \neq j$$

# The econometric model

- Conditional covariances and cross-covariances are determined according to the «polarization identity» of the covariance

$$\begin{aligned} Cov_{t-1} (y_{i,t}, y_{j,t+k}) &\equiv h_{ij,t} = \frac{1}{4} \left[ Var_{t-1} (y_{i,t} + y_{j,t+k}) - Var_{t-1} (y_{i,t} - y_{j,t+k}) \right] \\ &= \frac{1}{4} \left[ Var_{t-1} (y_{ij,tk}^+) - Var_{t-1} (y_{ij,tk}^-) \right] \\ &= \frac{1}{4} \left[ h_{ij,tk}^+ - h_{ij,tk}^- \right] \quad i, j = 1, \dots, N \quad i \neq j \quad k = 0, 1, \dots \end{aligned}$$

- Estimation is performed by ML.

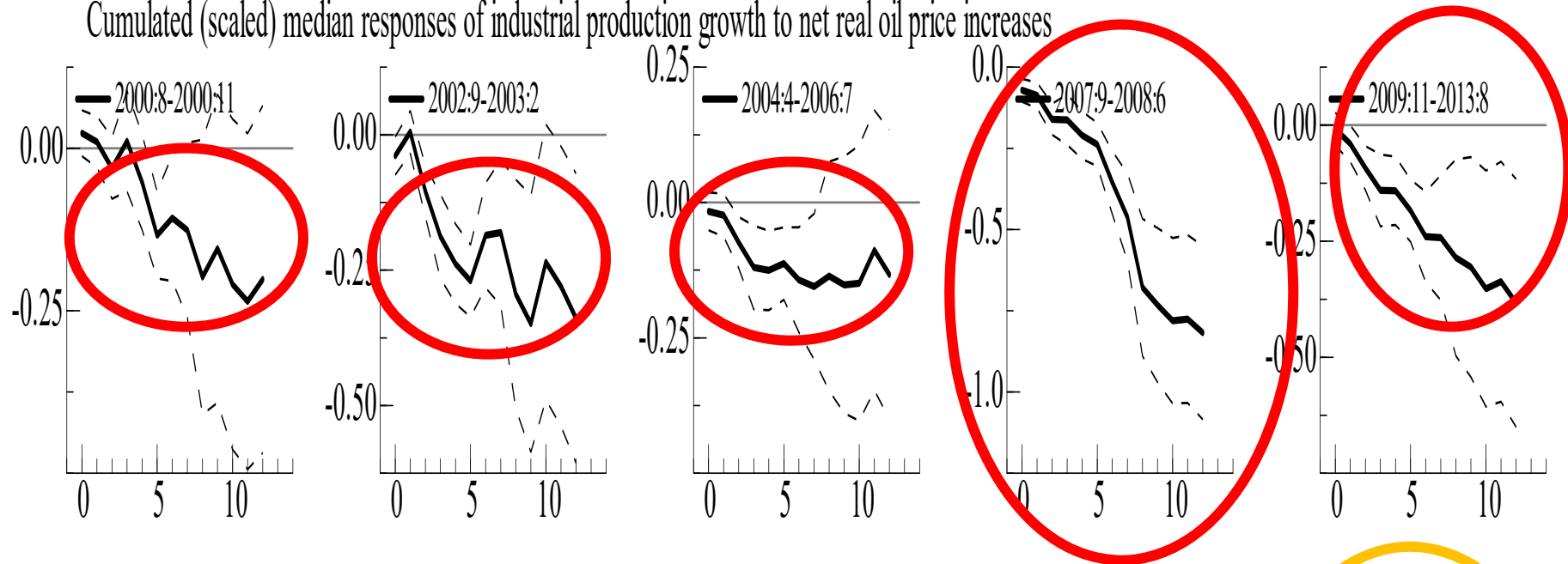


# Summary of the results

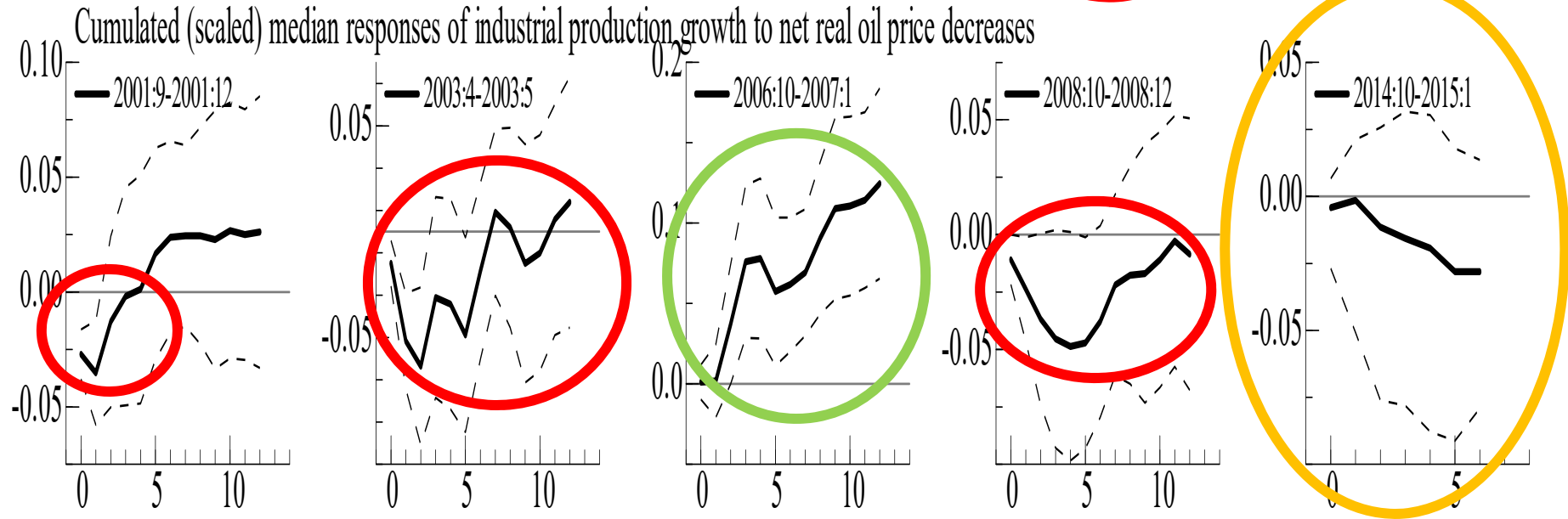
- **Asymmetric effects on real activity and the price level:** not only price hikes are contractionary; not only price contractions are deflationary.
- **Monetary policy accommodation of oil price shocks by the ECB.**
- **Symmetric effects on the real effective exchange rate, real non-energy commodity prices and the current account.**
- **Oil price shocks (both positive and negative) might have destabilizing financial effects, including the recent slump, corroborating the evidence of rising recession and deflation risk, as well as of worsening overall financial conditions.**

# Real activity responses

Cumulated (scaled) median responses of industrial production growth to net real oil price increases

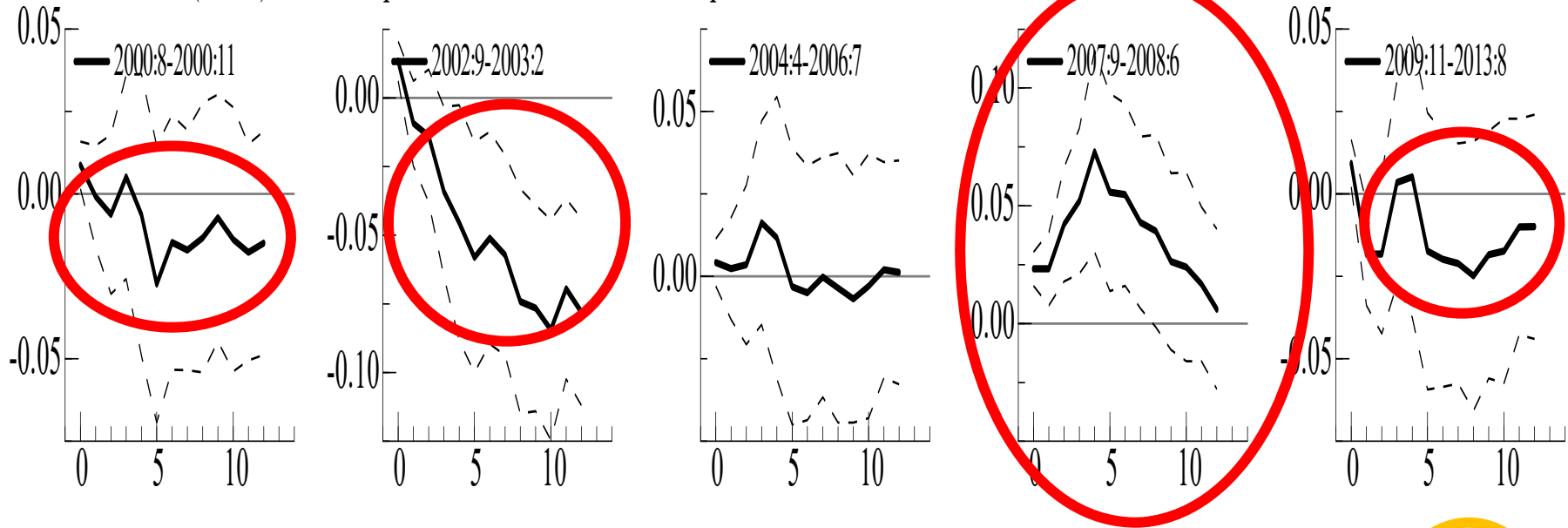


Cumulated (scaled) median responses of industrial production growth to net real oil price decreases

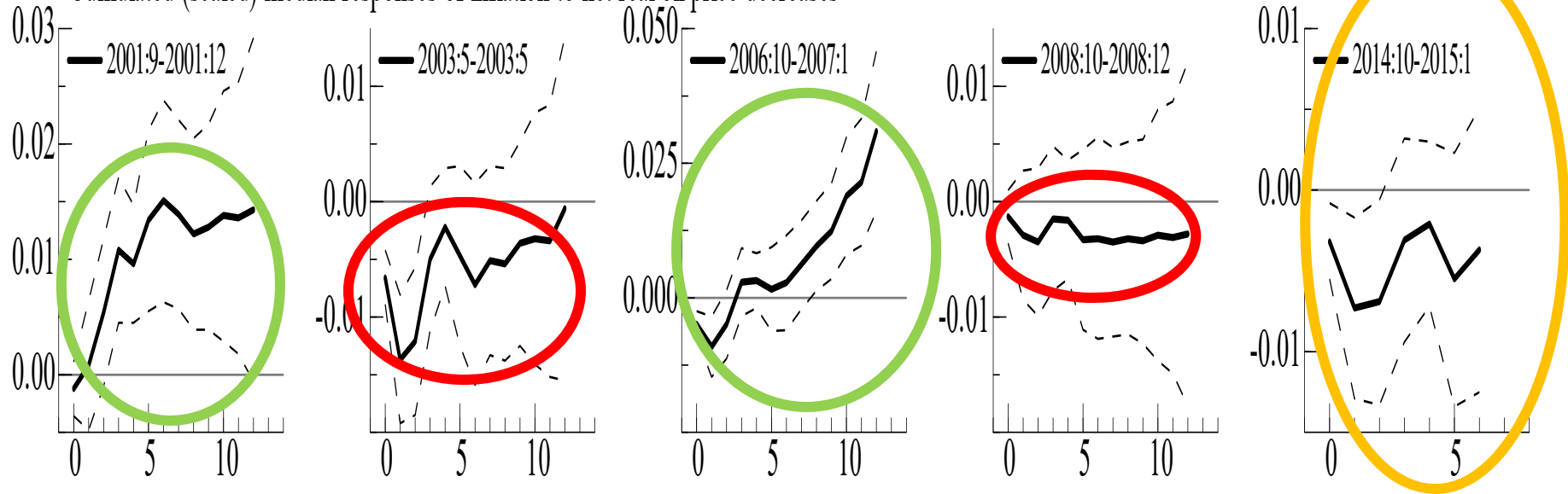


# CPI responses

Cumulated (scaled) median responses of inflation to net real oil price increases

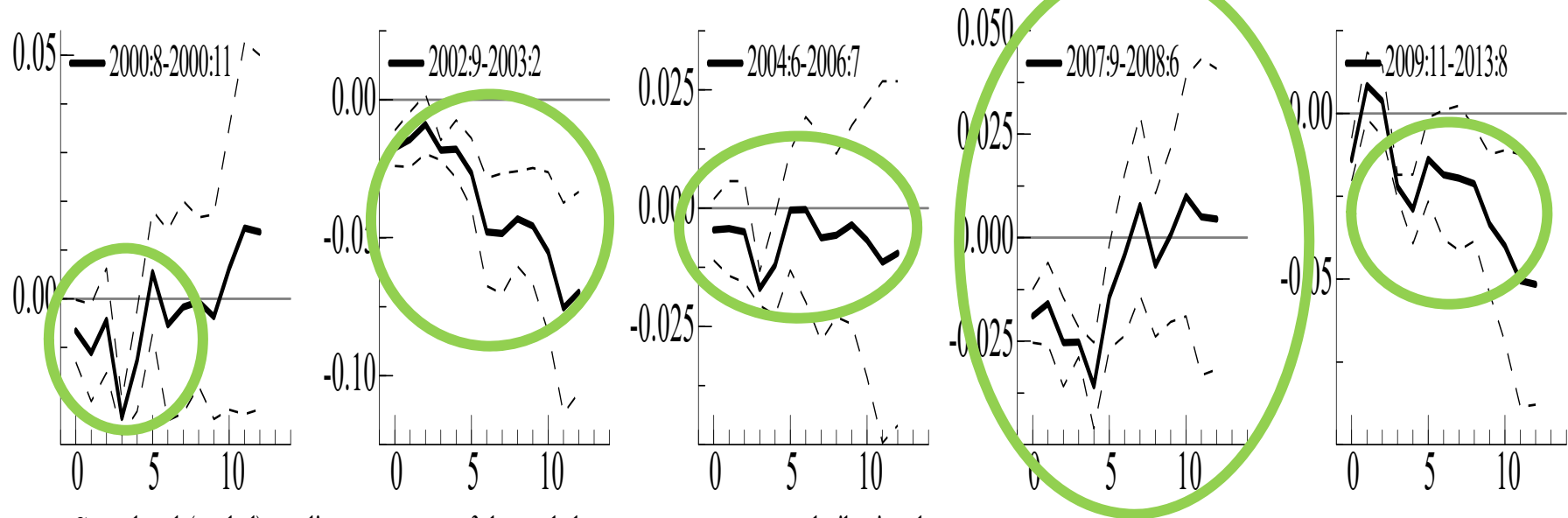


Cumulated (scaled) median responses of inflation to net real oil price decreases

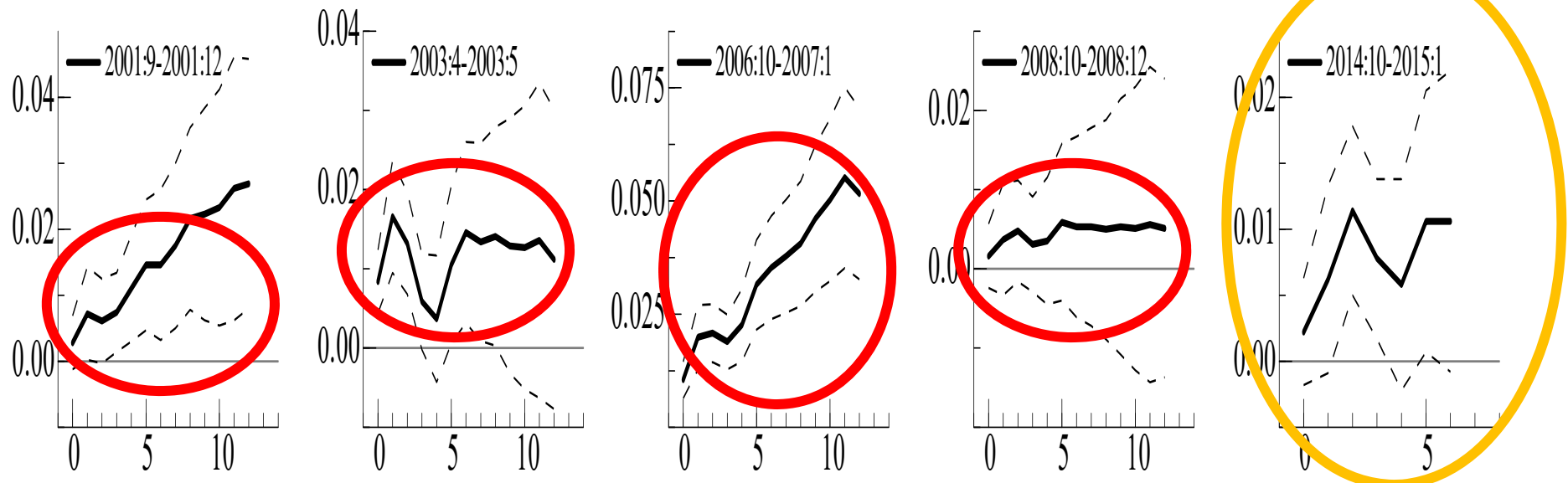


# Real short term interest rate responses

Cumulated (scaled) median responses of the real short term rate to net real oil price increases

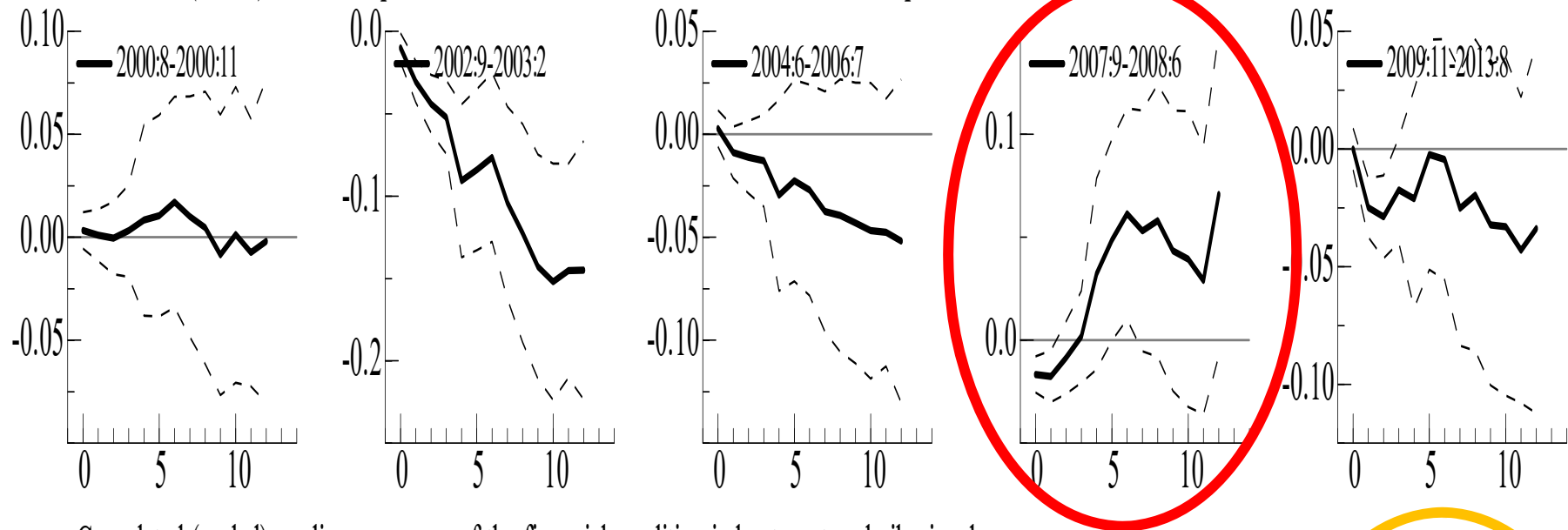


Cumulated (scaled) median responses of the real short term rate to net real oil price decreases

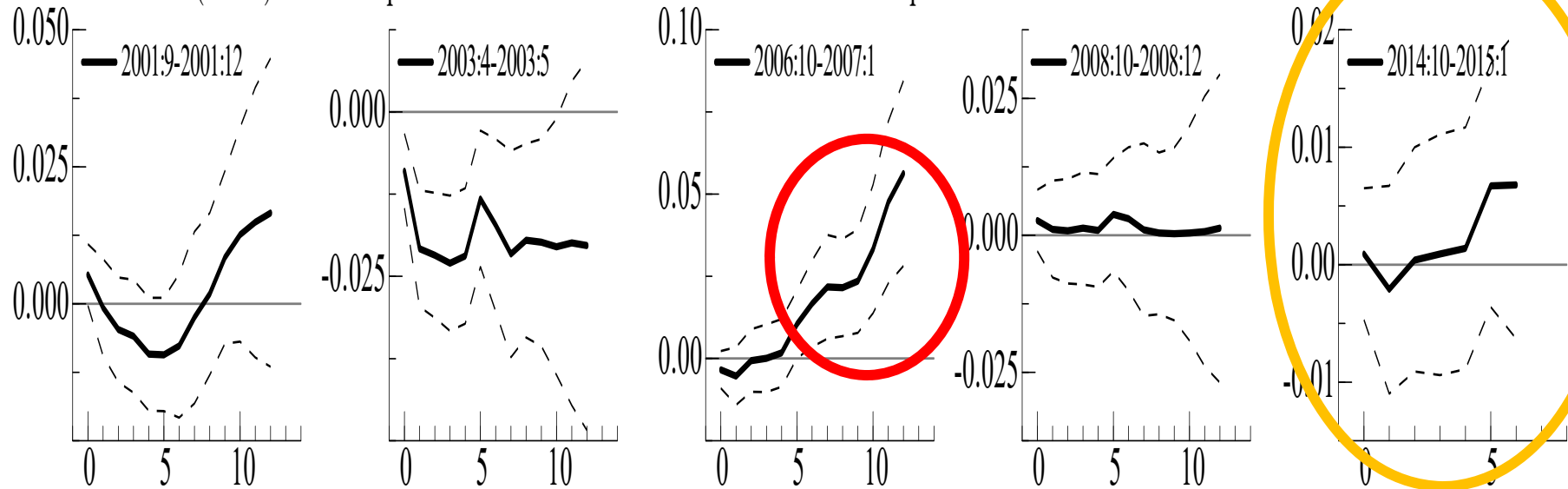


# Financial condition index responses

Cumulated (scaled) median responses of the financial condition index to net real oil price increases



Cumulated (scaled) median responses of the financial condition index to net real oil price decreases



# Conclusions

- **New time-varying parameter model of the euro area economy: consistent with the view that "not all the oil price shocks are alike", yet without imposing a priori restrictions or categorizing the origin of oil price shocks.**
- **New insights on the macroeconomic and financial effects of oil price shocks for the euro area: 1999-2015:**
  - **asymmetric real effects: net oil price increases have led to a contraction in industrial production** over the whole sample; net price decreases have yield some expansionary effects only in the early and mid-2000s. Evidence of **recessionary effects of oil price slumps are also detected, likewise for the most recent episode.**
  - **the real effects of oil price shocks appear to increase with their magnitude and the level achieved by the oil price itself.** In this respect, the **2008 boom was surely peculiar for the size of its real effects**, twice as large than for any other episode since the 2000s; it was also peculiar **for its larger inflationary impact**, as deflationary rather than inflationary dynamics can be observed in the other cases.

# Conclusions

- it is likely that the **post-2009 oil price run-up** might have contributed to **slowing down recovery** in the euro area.
- **Deflationary effects also follow from net oil price contractions.** In this respect, **the current oil price slump would have imparted both a recessionary and deflationary bias, through higher real interest rates and macroeconomic uncertainty.** Ensuing **financial distress is also signaled** by the financial condition index and momentum risk factor.
- Overall, our findings have a **key policy implication**: **In so far as Q.E. failed to generate inflationary expectations within the expected environment of soft oil prices, the case for a more expansionary use of fiscal policy than in the past might become compelling,** in order to counteract the deflationary and recessionary threats to the euro area.