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Summary

In this paper the oil price-macroeconomy relationship is investigated from a global perspective, by means of a large scale macro-financial-econometric model. In addition to real activity, fiscal and monetary policy responses and labor and financial markets are considered as well. We find that oil market shocks would have contributed to slowing down economic growth since the first Persian Gulf War episode. Among oil market shocks, supply side disturbances were the largest contributor to macro-financial fluctuations, accounting for up to 12% of real activity variance. The latter shocks would have exercised recessionary effects during the first and second Persian Gulf War and 2008 oil price episodes; preferences, speculative and volatility shocks would have also contributed to exacerbate the recessionary episodes. As long as oil supply will keep expanding at a lower pace than required by demand conditions, a recessionary bias, determined by higher and more uncertain real oil prices, may then be expected to persist also in the near future.

Keywords: Oil Price, Oil Price-Macroeconomy Relationship, Macro-finance Interface, International Business Cycle, Factor Vector Autoregressive Models

JEL Classification: C22, E32, G12

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The oil price-macroeconomy relationship since the mid-1980s: A global perspective

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Abstract

In this paper the oil price-macroeconomy relationship is investigated from a global perspective, by means of a large scale macro-financial-econometric model. In addition to real activity, fiscal and monetary policy responses and labor and financial markets are considered as well. We find that oil market shocks would have contributed to slowing down economic growth since the first Persian Gulf War episode. Among oil market shocks, supply side disturbances were the largest contributor to macro-financial fluctuations, accounting for up to 12% of real activity variance. The latter shocks would have exercised recessionary effects during the first and second Persian Gulf War and 2008 oil price episodes; preferences, speculative and volatility shocks would have also contributed to exacerbate the recessionary episodes. As long as oil supply will keep expanding at a lower pace than required by demand conditions, a recessionary bias, determined by higher and more uncertain real oil prices, may then be expected to persist also in the near future.

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1 Introduction

Theoretically, an oil price increase may affect real activity *directly* through different channels, working from both the demand and supply side. For instance, an increase in the real oil price may lead to a contraction in aggregate demand for net oil importing countries through the *oil price drag*, i.e. by transferring income to net oil exporting countries. As the negative impact on domestic demand may be mitigated by the increase in external demand (*recycling income effect*), due to boosted import of net oil exporting countries, the overall implications of the oil price drag mechanism are however not clear-cut.

Moreover, as higher oil and energy prices may lead to an increase in the general price level, an oil price shock may lead to a contraction in aggregate demand also by reducing real money balances, affecting private investment through the associated increase in the real interest rate.

Recessionary effects of an oil price shock can however be expected even if the general price level were not affected; for instance, private consumption may contract due to *discretionary* income and *precautionary savings* effects, as households would dispose of a lower real income after paying energy bills, also facing a higher likelihood of future unemployment or longer unemployment duration (Edelstein and Kilian, 2009); also *uncertainty* effects may be relevant, as higher and more volatile energy prices may lead consumers and firms postponing the purchase of durables and irreversible investment decisions, respectively (Bernanke, 1983; Pindyck, 1991); similar effects can be expected through an *operating costs* channel, as consumers would postpone the purchase of durables (complement in use of energy), while firms would save on capital usage, due to rising marginal costs and decreasing labor and capital productivity (Pindyck and Rotemberg, 1984; Rotenberg and Woodford, 1996).

In addition to the above direct effects, *indirect effects*, due to changes in consumption patterns and technologies, leading to *reallocation* of capital and labor both within and across sectors, may be posited: if capital and labor are sector or product specific, and cannot be moved rapidly across or within sectors, an oil price increase, shifting preferences in favor of more efficient durables and technologies, would lead to capital and labor unemployment (Hamilton, 1988).

Reallocation and uncertainty effects would imply an *asymmetric* response of real activity to energy prices, with a contraction in real activity being triggered by a positive shock, and yet no real effects in the case of a negative shock. Similarly for the real money balances effect, in so far as real wages are only downward rigid (Mork, 1994). Moreover, as the implementation

of preemptive restrictive monetary policies might lead to stronger negative responses of real activity to oil price shocks than otherwise would occur in the case of unchanged policy rate (Bernanke et al., 1997), the *monetary policy* transmission mechanism may yield an additional source of asymmetry.

Since the 1990s, the empirical literature has focused on different features of the oil price-macroeconomy relationship, concerning its relevance, the presence of asymmetric responses, the sources of shocks and the role of the Great Moderation: to date, 10 out 11 postwar US recessions would have been proceeded by sharp increases in oil prices (Hamilton, 1983, 2010, 2011).

Empirical evidence in favor on the asymmetry feature of the oil price-macroeconomy relationship was initially provided by Mork (1989) and Mork et al. (1994), yet challenged by Hooker (1996). The use of different oil price shock measures, than actual relative price changes, led however to a confirmation of Mork (1989) initial findings: in particular, oil shocks would be more likely to affect real activity when they occur in an environment of low oil price volatility (Lee et al., 1995)[1] or when they are not compensating previous price decreases, i.e. when they are *net* oil price increases (NOPI; Hamilton, 1996).[2]

Stability of the oil price-macroeconomy relationship through the 2000s, within a non linear econometric framework, has also been established by Hamilton (2003), Kim (2007), Koop and Potter (2010), Rasmussen and Roitman (2011), while the relevance of the reallocation effect has been confirmed by regional (Engeman et al., 2011b; for US states) and sector studies (Davis and Haltinwanger, 1999; Lee and Ni, 2002; Herrera et al., 2010; Ramey and Vine, 2012). In particular, it has been found that job destruction would be more sensitive to oil price shocks than job creation, as well as that energy intensive sectors (automobile, chemicals, rubber and plastic) would respond differently (supply shortages), and more strongly, than other sectors (demand shortages), to oil price shocks. Support for the uncertainty channel has fi-

[1] The oil price shock measure used by Lee et al. (1995) is in terms of the standardized residuals from a GARCH model for oil price growth.

[2] The net oil price (NOPI) is measured by the maximum of (a) zero and (b) the difference between the log-level of the price series for the current quarter and its maximum value in the previous four quarters. Hamilton (2003) has provided an interpretation of the NOPI in term of an instrumental variable for exogenous oil supply disruptions. Recent contributions have also established further NOPI's properties, in terms of: *i*) *out of sample* forecasting power for business cycle regime transitions for industrialized countries, yet not containing incremental information, relative to GDP, for *in sample* predictions (Engeman et al., 2011a; Raymond and Rich, 1997); *ii*) real-time forecasting properties for US real GDP growth (Ravazzolo and Rothman, 2010; Carlton, 2010); *iii*) explanatory power for asymmetries in Solow's residuals for OECD countries (Daniel et al., 2011); *iv*) uncertainty measure, when interacted with firm's volatility (Lee et al., 2010).

nally been provided by Ferder (1996) and, more recently, Elder and Serletis (2010) and Miller and Ni (2011).

The finding of asymmetry in the oil price-macroeconomy relationship is however not clear-cut. For instance, a skeptical view has recently been stated by Edelstein and Kilian (2007, 2009) and Kilian and Vigfusson (2011a,b): by comparing dynamic multipliers, measuring the response of US consumption, investment, and GDP to positive and negative energy price shocks, no evidence of asymmetric responses has been found. The latter results would then cast doubts on the reallocation and uncertainty channels of transmission of energy price shocks, favoring the (symmetric) discretionary income, precautionary savings and operating costs explanations.

Moreover, the evidence of a contribution of systematic monetary policy to the deepening of US recessions since the 1970s, initially provided by Bernanke et al. (1997), has been challenged by Hamilton and Herrera (2004), pointing to a stronger direct role of oil price shocks on real activity; Balke et al. (2002), casting doubts on the asymmetry feature of output growth being due to monetary policy only; Herrera and Pesavento (2009), pointing to a weaker influence of systematic monetary policy on macroeconomic fluctuations since the setting in of the Great Moderation; Kilian and Lewis (2011), even finding no evidence of a significant contribution of monetary policy to US recessions since the 1970s.

According to the taxonomy in Kilian (2009), the understanding of the oil price-macroeconomy relationship would require distinguishing among different sources of oil price shocks. Only supply determined oil price shock would in fact trigger a downturn in real economic activity, not necessarily being stagflationary; differently, demand determined oil price shocks, being driven by the same momentum driving real activity, would not be recessionary. The resilience shown by industrialized countries to the 2008 oil price shock, rather than being explained by a declining oil share (Nakov and Pescatori, 2010), lower real wage rigidity (Blanchard and Galí, 2010; Blanchard and Riggi, 2009) and lower volatility of oil demand and supply shocks (Baumeister and Peersman, 2009), may then be seen as the consequence of the better anchoring of inflation expectations, in the face of demand driven oil price shocks (Kilian, 2010).

In the light of the contrasting empirical evidence, the paper then aims at assessing the recessionary effects of oil price shocks from a global perspective, contributing to the literature along different perspectives.

Firstly, global modeling of the oil price-macroeconomy relationship is carried out, considering macro-financial data for fifty countries, including OECD and emerging countries, and a comprehensive description of the oil market. Both observed and unobserved factors, proxying for determinants

of the global business and financial cycle, as well as for expectations about future fundamentals and economic/financial fragility conditions have been considered. Hence, rather than undertaking a country by country analysis, the study aims at a global perspective on the oil price-macroeconomy relationship, which has so far been neglected in the literature. The investigation has then be performed within the framework of a large scale macro-financial-econometric model, rather than within the standard small scale VAR setting.

Moreover, by controlling for macro-financial determinants behind the determination of flow and financial oil demand, more accurate identification of purely oil market supply side shocks should be achieved within the proposed framework, consistent with the view that recessionary consequences can be expected from supply driven oil price shocks only (Kilian, 2009).

Secondly, a broad empirical perspective on the oil price-macroeconomy is provided, considering, in addition to real activity, fiscal and monetary policy responses and labor and financial markets.

The main results are as follows. Firstly, in terms of forecast error variance decomposition, oil market shocks would in general exercise stronger effects on macro-financial variables in the long- than in the short-term: figures for real activity are 20% and 10%, respectively. Moreover, among oil market shocks, supply side disturbances would yield the largest contribution; in particular, oil market supply side shocks would account for up to 12% of real activity fluctuations, 7% for the unemployment rate, 20% for employment, 41% for real wages, and 9% for (core) inflation; consistent with their real effects, the latter shocks would then also sizably account for fluctuations in the policy variables, i.e. public expenditure (13%), liquidity (40%), and the real interest rate (7%). Similarly for financial variables, i.e. 30% to 35% for real stock market and housing prices, 10% to 23% for stock market volatility and the US$ exchange rate.

Secondly, in terms of impulse responses, the findings provide support to symmetric mechanisms, as described by the discretionary income, precautionary savings and operating costs channels, as well as to the uncertainty channel, which, within the framework considered in the paper, would not necessarily yield asymmetric effects. Indeed, by comparing the effect of positive and negative net production shocks, weak evidence of asymmetric effects on real activity can be found, the latter responding more strongly to negative than positive shocks in the very short-term only. Results are therefore more consistent with the *symmetric* than the *asymmetric* view of oil price shock real effects, yet providing a broader perspective in terms of oil market supply side disturbances, which may also stem from reserves and refineries activity. Consumption and inventories preferences shocks, as well as oil futures market speculative and volatility shocks, would also affect real economic activity.

Thirdly, the above mechanisms might account for the recessionary effects associated with some recent oil price episodes, i.e. the first and second Persian Gulf War and the 2008 oil price shock. In terms of historical decomposition, oil market shocks would have contributed to slowing down economic growth since the first Persian Gulf War episode.

In particular, during the first Persian Gulf War episode, oil market supply side shocks would have contributed to the depth of the 1990:2-1993:3 recession (-1.2%), and, at a lower extent, during the second Persian Gulf War episode, to the 2000:4-2003:2 recession (-0.24%). Oil market supply side conditions would have also exacerbated the recessionary effects of the subprime financial crisis in 2008 (-1.19%). Oil inventories preferences, nominal oil price volatility and oil futures market speculative shocks, would have also contributed to slowing down real activity over the three episodes investigated.

After this introduction, the paper is organized as follows. In Section 2 the econometric methodology is introduced, while in Section 3 the data are presented. Then, in Section 4 specification and estimation issues are discussed, while in Section 5, 6 and 7 the empirical results are presented. Finally, conclusions are drawn in Section 8.

2 The econometric model

The econometric model is described by two blocks of equations. The first block refers to the *observed* ($\mathbf{F}_{2,t}$) and *unobserved* ($\mathbf{F}_{1,t}$) global macro-financial factors and oil market demand and supply side variables ($\mathbf{O}_t$), collected in a $r \times 1$ vector $\mathbf{F}_t = \left[\mathbf{F}'_{1,t}\ \mathbf{F}'_{2,t}\ \mathbf{O}'_t\right]'$, while the second block to q macro-financial variables for m countries ($n = m \times q$ equations in total). *Global* and *local* economic dynamics are then modelled by means of the following reduced form dynamic factor model

$$
\begin{aligned}
(\mathbf{I} - \mathbf{P}(L))(\mathbf{F}_t - \boldsymbol{\kappa}_t) &= \boldsymbol{\eta}_t && (1)\\
\boldsymbol{\eta}_t &\sim i.i.d.(\mathbf{0}, \boldsymbol{\Sigma}_\eta) && (2)\\
(\mathbf{I} - \mathbf{C}(L))\left((\mathbf{Z}_t - \boldsymbol{\mu}_t) - \boldsymbol{\Lambda}\ (\mathbf{F}_t - \boldsymbol{\kappa}_t)\right) &= \mathbf{v}_t && (3)\\
\mathbf{v}_t &\sim i.i.d.(\mathbf{0}, \boldsymbol{\Sigma}_v) && (4)
\end{aligned}
$$

where $(\mathbf{F}_t - \boldsymbol{\kappa}_t), (\mathbf{Z}_t - \boldsymbol{\mu}_t) \sim I(0)$, $\boldsymbol{\mu}_t$ and $\boldsymbol{\kappa}_t$ are $n \times 1$ and $r \times 1$ vectors of deterministic components, respectively, with $r \leq n$, including an intercept term, and, possibly, linear or non linear trends components.

Global dynamics are described by the stationary finite order polynomial matrix in the lag operator $\mathbf{P}(L)$, $\mathbf{P}(L) \equiv \mathbf{P}_1 L + \mathbf{P}_2 L^2 + ... + \mathbf{P}_p L^p$, where $\mathbf{P}_j$, $j = 1, .., p$, is a square matrix of coefficients of order r, and $\boldsymbol{\eta}_t$ is a $r \times 1$ vector of i.i.d. reduced form shocks driving the $\mathbf{F}_t$ factors.

Local dynamics are modeled through the stationary finite order polynomial matrix in the lag operator $\mathbf{C}(L)$, $\mathbf{C}(L) \equiv \mathbf{C}_1 L + \mathbf{C}_2 L^2 + ... + \mathbf{C}_c L^c$, where $\mathbf{C}_j$, $j = 0, .., c$, is a square block (own country) diagonal matrix of coefficients of order n, partitioned as $\underset{n \times n}{\mathbf{C}_j} = diag \left\{ \begin{array}{cccc} \mathbf{C}_{j,11} & \mathbf{C}_{j,22} & ... & \mathbf{C}_{j,mm} \\ q \times q & q \times q & & q \times q \end{array} \right\}$. The contemporaneous effects of the global factors on each country variables in $\mathbf{Z}_t$ are measured by the loading coefficients collected in the $n \times r$ matrix $\mathbf{\Lambda} = \left[\mathbf{\Lambda}'_{F_1} \ \mathbf{\Lambda}'_{F_2} \ \mathbf{\Lambda}'_O \right]'$. Finally, $\mathbf{v}_t \sim i.i.d.(\mathbf{0}, \mathbf{\Sigma}_v)$ is the $n \times 1$ vector of reduced-form idiosyncratic (i.e. country-specific) disturbances, with $E\left[\eta_{jt} v_{is}\right] = 0$ for all i, j, t, s.

Consistent and asymptotically Normal estimation of the two-block specification in (1) and (3) is obtained by means of the procedures proposed in Morana (2011a,b), also shown to yield accurate estimation in small samples (see the Monte Carlo results reported in Morana, 2011a,b).

The reduced form vector autoregressive (VAR) representation of the dynamic factor model can be written as

$$(\mathbf{I} - \mathbf{A}(L)) (\mathbf{Y}_t - \boldsymbol{\gamma}_t) = \boldsymbol{\varepsilon}_t, \tag{5}$$

where $\mathbf{Y}_t = [\mathbf{F}'_t \ \mathbf{Z}'_t]'$, $\boldsymbol{\gamma}_t = [\boldsymbol{\kappa}'_t \ \boldsymbol{\mu}'_t]'$,

$$\mathbf{A}(L) = \begin{pmatrix} \mathbf{P}(L) & \mathbf{0} \\ [\mathbf{\Lambda}\mathbf{P}(L) - \mathbf{C}(L)\mathbf{\Lambda}] & \mathbf{C}(L) \end{pmatrix},$$

$$\boldsymbol{\varepsilon}_t \equiv \begin{bmatrix} \boldsymbol{\varepsilon}_{1,t} \\ \boldsymbol{\varepsilon}_{2,t} \end{bmatrix} = \begin{bmatrix} \mathbf{I} \\ \mathbf{\Lambda} \end{bmatrix} [\boldsymbol{\eta}_t] + \begin{bmatrix} \mathbf{0} \\ \mathbf{v}_t \end{bmatrix},$$

with variance-covariance matrix

$$E\left[\boldsymbol{\varepsilon}_t \boldsymbol{\varepsilon}'_t\right] = \mathbf{\Sigma}_\varepsilon = \begin{pmatrix} \mathbf{\Sigma}_\eta & \mathbf{\Sigma}_\eta \mathbf{\Lambda}' \\ \mathbf{\Lambda}\, \mathbf{\Sigma}_\eta & \mathbf{\Lambda}\, \mathbf{\Sigma}_\eta \mathbf{\Lambda}' + \mathbf{\Sigma}_v \end{pmatrix}.$$

The structural vector moving average representation for the global model in (1) can then be written as

$$(\mathbf{F}_t - \boldsymbol{\kappa}_t) = \mathbf{H}_F(L) \mathbf{K}^{-1} \boldsymbol{\xi}_t, \tag{6}$$

where $\boldsymbol{\xi}_t$ is the vector of the r structural shocks driving the common factors in $\mathbf{F}_t$, i.e. $\boldsymbol{\xi}_t = \mathbf{K}\, \boldsymbol{\eta}_t$, $\mathbf{K}$ is a $r \times r$ invertible matrix, and

$$\mathbf{H}(L) \equiv \begin{pmatrix} \mathbf{H}_F(L) & \mathbf{0} \\ \mathbf{H}_{FZ}(L) & \mathbf{H}_Z(L) \end{pmatrix} \equiv (\mathbf{I} - \mathbf{A}(L))^{-1}.$$

By assumption the structural factor shocks are orthogonal and have unit variance, so that $E\left[\boldsymbol{\xi}_t \boldsymbol{\xi}'_t\right] = \mathbf{K}\, \mathbf{\Sigma}_\eta\, \mathbf{K}' = \mathbf{I}_r$. To achieve exact identification of

the structural disturbances, additional $r(r-1)/2$ restrictions need to be imposed. Since $\boldsymbol{\eta}_t = \mathbf{K}^{-1}\boldsymbol{\xi}_t$, imposing exclusion restrictions on the contemporaneous impact matrix amounts to imposing zero restrictions on the elements of $\mathbf{K}^{-1}$, for which a lower-triangular structure is assumed. Operationally, $\mathbf{K}^{-1}$ (with the $r(r-1)/2$ zero restrictions necessary for exact identification imposed) is estimated by the Choleski decomposition of the factor innovation variance-covariance matrix $\boldsymbol{\Sigma}_\eta$, i.e. $\hat{\mathbf{K}}^{-1} = chol(\hat{\boldsymbol{\Sigma}}_\eta)$. Forecast error variance and historical decompositions can then be obtained by means of standard formulas.

See the Appendix for a detailed account of the econometric methodology.

3 The data

The dataset is composed of seasonally adjusted quarterly macroeconomic time series data for 31 advanced economies (Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom), 5 advanced emerging economies (Brazil, Hungary, Mexico, Poland, South Africa), and 14 secondary emerging economies (Argentina, Chile, China, Colombia, India, Indonesia, Malaysia, Morocco, Pakistan, Peru, Philippines, Russia, Thailand, Turkey), for a total of 50 countries. The (main) data source is IMF *International Financial Statistics*.[3]

Concerning the block of equations in (3), for each of the 50 countries, apart from some exceptions, 17 macroeconomic variables are employed, namely *real GDP*, *private consumption* and *investment* growth, *public expenditure to GDP ratio* growth, *nominal bilateral US$ exchange rate* (value of 1 US$ in units of country currency) returns, *CPI inflation rate*, *M2 or M3 to GDP ratio* growth, *nominal M2/M3* growth, *civilian employment* growth, *unemployment rate* changes, *real wages* growth, *real stock prices* returns, *real housing prices* returns, *real short and long term interest rates*, *real effective exchange rate* returns, *bank loans to the private sector to GDP ratio* growth. A total of over 800 equations is then considered in block (3). For OECD countries the macro-financial sample extends from 1980:1 through 2010:3, while for non OECD countries only from 1995:1 through 2010:3. Different samples are therefore employed in estimation.

[3] Other data sources employed are FRED2 (Federal Reserve Bank of St. Louis); OECD and BIS (unofficial) house price data sets, and International Energy Agency (IEA-OECD) data sets.

Concerning the block of equations in (1), a total of 33 variables are considered in the vector $\mathbf{F}_t$.

Firstly, 11 variables are included in the vector of (global) observed factors $\mathbf{F}_{2,t}$, i.e. the Bagliano and Morana (2011) *US economic/financial fragility* index (FRA) in differences, the Fama and French (1993) *size* and *value* factors (SMB, HML), the Carhart (1997) *momentum* factor (MOM), the Pastor and Stambaugh (1997) *stocks' liquidity* factor (PSL), the S&P 500 stock return *volatility* in differences (FV), computed from an asymmetric GARCH model, the real *gold* price (GD) return, real IMF *non-energy commodities* price index returns (M), the *US fiscal* (Fd) and *trade deficit* (Td) *to GDP ratios* in differences, the Adrian, Etula and Muir (2011) *leverage* factor (LEV). The sample for the observed macro-financial factors extends from 1980:1 through 2010:3.

Secondly, 10 additional variables, concerning global oil demand and supply conditions have been included in the vector $\mathbf{O}_t$, namely *world oil reserves* growth (R), net *world oil production changes* (increase: Pp, decrease: Pm), *OECD oil refinery margins* growth (RM), *world oil consumption* (C) growth, *OECD oil inventories* rate of growth (INV), *real WTI oil price* (OP) return, *nominal WTI oil price volatility* in differences (OV), computed from a GARCH model, the twelve-month *futures basis*, i.e. the ratio of the nominal twelve-month futures-spot price spread over the nominal spot oil price (FB), and the growth rate of the oil futures market *Working* (1960)-T index (WT). The sample for the latter oil market variables extends from 1986:1 through 2010:3.

Thirdly, 12 variables have been collected in the vector of (global) unobserved factors $\mathbf{F}_{1,t}$; the latter have been obtained from (3)[4], using a first order own diagonal dynamic structure, as suggested by the BIC information criterion, and subsets of homogeneous variable; hence, a *real activity* factor (Y) has been obtained from the real GDP, private consumption and investment growth series; a *fiscal stance* factor from the public expenditure to GDP ratio growth series (G); a global bilateral *US$ exchange rate* index from the various bilateral exchange rates against the US$ returns (X); a *nominal* (*core inflation*) factor (N) from the inflation rate and the nominal money growth, short and long term interest rate series; an *excess liquidity* index (L) from the M3(M2) to GDP ratio and the private loans to GDP ratio growth series; an *employment* factor (E) from the civilian employment growth series; an *unemployment rate* factor (U) from the unemployment rate in changes series;

[4] $\hat{\mathbf{F}}_{1,t}$ has been obtained by conditioning with respect to $\mathbf{F}_{2,t}$ and only a subset of the variables considered in $\mathbf{O}_t$, i.e. the real oil price and the real non-energy commodities price index, which are avavilable since 1980:1. The other oil market variables are availble only since 1986:1.

a *real wage* factor (W) from the real wage growth series; a *real stock market return* factor (F) from the real stock market price index return series; a *real housing return* factor (H) from the real housing price index return series; a *real short term rate* factor (R) from the real short term interest rate series; a *term spread factor* (TS) from the term spread series.[5]

4 The global economy model: specification and estimation

The global economy model in (1) counts 33 endogenous variables, collected in the vector $\mathbf{F}_t = \left[\mathbf{F}'_{1,t}\ \mathbf{F}'_{2,t}\ \mathbf{O}'_t\right]'$. For PC-VAR estimation 12 principal components of $\mathbf{F}_t$, jointly accounting for 80% of total variance, and three lags were selected, according to Monte Carlo results (Morana, 2011b) and specification tests.

Given the scope of the analysis, the focus is on the identification of the oil market structural shocks, carried out by means of the Choleski decomposition approach discussed in the methodological section. The selected ordering is as follows: reserves, net oil production changes (negative and positive), refinery margins, employment and the unemployment rate, real activity, the fiscal stance, the US fiscal and trade deficit to GDP ratios, the nominal factor, real wages, oil consumption, excess liquidity, the real short term rate and term spread, real housing prices, the US$ exchange rate index, stock market volatility, the size and value Fama-French factors, the Carhart momentum factor, the Pastor-Stambaugh liquidity factor, the Adrian-Etula-Muir leverage factor, the Working-T speculative index, the futures market basis, oil inventories, the real oil price, nominal oil price volatility, the real non-energy commodities price index, real stock market prices, real gold prices and the Bagliano-Morana economic/financial fragility index.

The selected ordering is then based on the following rationale concerning the working of the oil market:

i) the oil market supply side is constrained by geophysical conditions, reacting with at least one quarter delay to macro-financial disturbances;

ii) oil consumption is contemporaneously determined by world business cycle conditions;

iii) inventories are contemporaneously affected by oil market demand and supply side conditions, as well as fundamental and non fundamental financial factors;

[5] Detailed results are available from the author upon request.

iv) the real oil price and nominal oil price volatility are contemporaneously determined by oil market supply side, flow and financial oil demand conditions, and inventories; they also react with delay to additional fundamental financial factors.

Concerning the block of oil market variables, ten structural shocks can then be identified, i.e. an *oil reserves* shock, *net positive* and *negative production* shocks, a *refinery margins* shock, *oil consumption* and *inventories preferences* shocks, *other real oil price* and *nominal oil price volatility* shocks, and *Working-T* and *futures basis* shocks.

The interpretation of the *own equation* shocks in terms of reserves, net production and refinery margins shocks is clear-cut, each of the latter accounting for about 100% of the own variable fluctuations at the impact (not reported). Moreover, being the former net of the contemporaneous effect of the macroeconomic variables driving flow oil demand, and the latter also of the effect of the (financial) variables driving financial oil demand, the own oil consumption and inventories shocks bear the interpretation of preferences shocks. Similarly for the real oil price and nominal oil price volatility own shocks, which are referred to as *other* real oil price and nominal oil price volatility shocks, without seeking economic interpretation. Finally, the oil futures market speculative shocks, i.e. the Working-T and futures basis shocks, account for 55% (each) of the own variable fluctuations in the very short-term (not reported). Both shocks, by being orthogonal to the set of macroeconomic and financial shocks driving flow and fundamental financial oil demand, would therefore capture non fundamental financial features of the oil futures market. Additional supporting evidence for the proposed interpretations is provided by impulse responses (see Morana, 2012).

5 Forecast error variance decomposition

In order to assess the contribution of oil market disturbances to macro-financial fluctuations, median forecast error variance decompositions have been computed up to a horizon of ten years (40 quarters); it is referred as very short-term the horizon within 2 quarters, short-term the horizon between 1 and 2 years, medium-term the horizon between three and five years, and long-term the 10-year horizon. Rather than focusing on the contribution of each structural shock, results are discussed with reference to various categories of shocks, distinguishing among oil market supply side shocks (SUP: reserves, net negative and positive production, refinery margins), oil consumption (C) and inventories (INV) preferences shocks, oil futures market speculative shocks (SPC: Working-T index, futures basis), (*other*) real

oil price (OP) and nominal oil price volatility (OV) shocks, macro-financial shocks (MF: all the remaining 23 shocks).[6]

As shown in Table 1, oil market supply side shocks (SUP) would yield a sizable contribution to both real and financial variables fluctuations, strongest in the medium- to long-term, apart from the real short-term interest rate and *core* inflation. For instance, about 10% of real activity, employment and real wage fluctuations would be accounted for by supply side shocks in the very short-term; 5% for the unemployment rate and public expenditure; figures for long-term effects would be 12% for real activity and public expenditure, 7% for the unemployment rate, 20% for employment and 41% for real wages. Oil market supply side shocks would also account for sizable fluctuations in real housing and stock market prices in the very short- and long-term (5% and 30%, respectively), as well as in stock market volatility (10% to 23%), and excess liquidity (10% to 40%); similarly for the US$ exchange rate index, core inflation, and the real short-term interest rate (8% to 10%).

Much weaker effects on macro-financial conditions would be exercised by other oil market shocks; moreover, inventories preferences shocks and oil futures market speculative shocks would matter more for macroeconomic variables than financial variables (2% to 4%), and the other way around for oil consumption shocks (3% to 6%).

6 Impulse response analysis

Concerning the transmission mechanisms of structural oil market shocks, the results of the impulse response analysis are reported in Tables 2-3, over selected horizons, as for the forecast error variance decomposition analysis. In all cases, median cumulated responses have been computed with 90% significance bands. In the tables, significant figures at the 10% level are shown in bold.

6.1 Oil market supply side shocks

Firstly, a (unitary and permanent) positive *reserves* shock would lead to a short-term contraction in the real oil price (-1%; not reported) and to a long-term contraction in nominal oil price volatility (-0.75%, not reported). Then, a deflationary short-term effect can be noted (-0.02%), as well as a long-term positive effect on real activity (0.44%), consistent with weaker oil price uncertainty, as well as user costs, precautionary savings and discretionary income effects. An upward shift in the labor supply schedule can also

[6] A full set of results is available upon request from the author.

be found (-0.4%, employment; 0.06% unemployment rate; 1.18%, real wage), as well as an increase in real housing prices (0.79%). Consistent with improved overall macroeconomic conditions, a contractionary economic policy mix would be implemented following the shock (-0.44%, public expenditure; -0.54%, liquidity; 3 to 6 b.p, real interest rate); finally, the US% exchange rate would permanently depreciate (-0.42%) and real stock prices contract (-0.54%), while a short-term increase in stock market volatility (0.3%) can be noted.

Secondly, a *negative net production* shock (downward shift in the flow oil supply) would lead to a short-term increase in the real oil price (3.3%, not reported) and a long-term contraction in nominal oil price volatility (-1.02%, not reported). A short-term contraction in real activity (-0.11%) and an increase in core inflation (0.03%, long-term) can then be found, consistent with higher user costs, precautionary savings and discretionary income effects; yet, due to the contraction in nominal oil price uncertainty, real activity (0.62%) would increase in the long-term. An upward shift in the labor supply schedule can also be noted (-0.66%, employment; 1.87%, real wage). In the light of its short-term stagflationary effects, a restrictive policy mix would also be triggered by the shock (-0.58%, public expenditure; -1.36%, liquidity). Finally, a portfolio shift from riskier to safer assets, i.e. from stocks (-0.92%) to housing securities (1.38%), in the face of worsened macroeconomic conditions, can be noted, as well as a short-term increase in stock market volatility (0.3%). A temporary appreciation of the US$ exchange rate would also follow the negative production shock (0.11%).

Differently, a *positive net production* shock (upward shift in the flow oil supply) would lead to a contraction in the real oil price in the short-term (-1.9%, not reported), but to a permanent increase in nominal oil price volatility (1.3%, not reported). While the impact on real activity would be mostly not significant over the horizon investigated, due to the increase in nominal oil price uncertainty, real activity would however contract (-0.19%) in the long-term. A downward shift in the labor supply schedule can also be noted (0.6%, employment; -0.98%, real wages; -0.36%, unemployment rate - medium-term), as well as the implementation of a long-term expansionary policy mix (0.20%, public expenditure; 0.64%, liquidity), leading to a permanent increase in the real interest rate (2 b.p.). Consistent with improved macroeconomic conditions, a portfolio shift from housing securities (-0.55%) to stocks (0.50%) would also follow; finally, a permanent increase in stock market volatility (0.19%) and a US$ exchange rate depreciation (-0.2%) can be noted.

Thirdly, a positive *refinery margins* shock would lead to a permanent contraction in the real oil price (-1.4%, not reported) and a permanent increase

in nominal oil price volatility (0.52%, not reported). As refinery margins increase, in order to meet higher oil demand - driven, for instance, by booming economic conditions -, the real oil price would fall, consistent with a shift in the production mix favoring (relatively less expensive) medium and heavy sour crudes. Following the shock, (in order to avoid overheating) a contractionary policy mix would be implemented (-0.18%, public expenditure; -0.47%, liquidity), and, also due to increased oil price uncertainty, real activity would then contract (-0.21%, short-term); an upward shift in the labor supply schedule can also be noted (-0.79%, employment; 0.39%, the unemployment rate, 0.79%, real wages; long-term), as well as a contraction in real stock prices (-0.18%) and in stock market volatility (-0.32%); an US% exchange rate depreciation (-0.16%) can finally be noted.

Overall, the labor market response to oil market supply side shocks would involve labor supply adjustments. Moreover, by comparing the effect of positive and negative net production shocks, weak evidence of asymmetric effects on real activity can be found, the latter responding more strongly to negative shocks in the very short-term only; moreover, while supporting evidence for the uncertainty effect can be found, the latter not necessarily would be asymmetric; in fact, as volatility is modelled in changes, both positive and negative shocks are allowed for within the framework considered. Finally, some evidence of short-term stagflationary effects, following negative net oil production shocks, can be noted. Hence, the uncovered transmission mechanisms would be consistent with user costs, discretionary income, precautionary savings and uncertainty effects, which might then be seen as complementary, rather than alternative, channels.

6.2 Oil market demand side shocks

Fourthly, a positive *oil consumption preferences* shock would lead to a permanent increase in the real oil price (3.3%, not reported), yet dampening nominal oil price volatility (-0.39%, not reported), consistent with booming economic conditions and increased oil demand. Moreover, the shock would lead to an increase in real activity, due to lower oil price uncertainty, and core inflation (0.22% and 0.02%, respectively; long-term), as well as in employment (0.2%; -0.18%, unemployment rate; short-term;) and real stock (0.15%, short-term) and housing prices (0.54%, long-term). A dampening effect on stock market volatility (-0.23%) and the appreciation of the US$ exchange rate (0.48%) can also be noted. Consistent with improved economic conditions, a contractionary policy mix would then be implemented in the short-term (-0.12%, public expenditure; -0.05%, liquidity), leading to a permanent increase in the real interest rate (4 b.p.).

Differently, a positive oil *inventories preferences* shock would lead to a permanent contraction in the real oil price (-0.93%, not reported), dampening nominal oil price volatility (-0.56%, not reported). The shock (revealing an unexpected contraction in oil demand) would then exercise an expansionary effect on macro-financial conditions, leading to a permanent increase in real activity (0.22%) - achieved through reduced oil price uncertainty, as well as lower user costs and precautionary savings, and higher discretionary income effects - and an upward shift in the labor demand schedule (0.39%, employment, -0.41%, unemployment rate, 0.10% real wages). An increase in real housing (0.11%, long-term) and stock (0.11%, short-term) prices, as well as in stock market volatility (0.11%), can also be noted. Consistent with improved economic conditions, a contractionary policy mix would then be implemented in the short-term (-0.19%, public expenditure; -0.07%, liquidity), leading to a long-term contraction in the real interest rate (-1 b.p.); a permanent US$ exchange rate appreciation (0.15%) can finally be found.

6.3 *Other* real oil price and nominal oil price volatility shocks

Fifthly, a positive *other* real oil price shock (2.95%, not reported) would lead to a permanent increase in nominal oil price volatility (0.21%, not reported). Oil price uncertainty, as well as user costs, precautionary savings and discretionary income effects, may then account for the contraction in economic activity (-0.21%). A downward shift in the labor demand schedule (-0.11%, employment; -0.18%, real wages, 0.19%, unemployment rate), as well as a contraction in real housing prices (-0.16%) can be noted. In the light of worsened macroeconomic conditions, an expansionary policy mix would then be implemented (0.14%, public expenditure, long-term; 0.04%, liquidity, short-term). Finally, the US$ exchange rate would permanently depreciate (-0.12%).

Moreover, a positive *other nominal oil price volatility* shock (1.19%) would lead to a permanent increase in the real oil price (1.1%, not reported). A permanent contraction in real activity (-0.14%), due to uncertainty effects, as well as user costs, precautionary savings, and discretionary income effects, can then be noted. Consistent with worsened economic conditions, an expansionary policy mix would then be implemented (0.14% public expenditure; 0.27% excess liquidity), leading to a permanent contraction in the real short-term rate (-2 b.p.). An upward shift in the labor demand schedule (0.14%, employment; -0.42%, real wages (-0.42%), -0.09%, unemployment rate), a portfolio shift from housing securities (-0.17%) to stocks

(0.19%), an increase in stock price volatility (0.05%), and a US$ exchange rate appreciation (0.07%), can finally be found.

6.4 Oil futures market speculative shocks

Following positive *Working-T* and *futures basis* shocks, the real oil price would permanently increase (0.6% and 2.4%, respectively; not reported), while a permanent contraction in nominal oil price volatility can be noted (-0.2% and -0.1%, respectively; not reported), a kind of *liquidity effect*.

Moreover, a positive Working-T (excess speculation) shock - due to user costs, precautionary savings and discretionary income effects - would lead to a contraction in real activity (-0.15%, long-term), as well as to an upward shift in the labor supply schedule (-0.29%, employment; 0.31%, unemployment rate; 0.04% real wages). A contraction in housing and stock prices (-0.09% and -0.07%, respectively; short- to medium term), as well as an increase in stock market volatility (0.03%, short-term), can also be found. Consistent with worsened economic conditions, an expansionary policy mix (0.09% liquidity; 0.14% public expenditure; short-term) would then be implemented. A permanent US$ exchange rate appreciation (0.11%) can finally be noted.

Finally, consistent with booming economic conditions, the expected future increase in the real oil price, revealed by a positive future basis shock, might be related to stronger economic growth expected to persist in the future. A permanent increase in real activity (0.09%) and core inflation (0.01%), as well as an upward shift in the labor demand schedule (0.19% employment, -0.13%, unemployment rate, -0.2%, real wages), can then be noted. A contractionary fiscal policy (-0.07%, short-term), coupled by an expansionary monetary policy (0.16%, long-term), would also be triggered by the shock (-1 b.p., real interest rate), leading to a portfolio shift from housing securities (-0.16%) to stocks (0.02%, short-term), a permanent increase in stock market volatility (0.13%), and appreciation of the US$ exchange rate (0.13%).

7 The oil price-macroeconomy relationship since the mid-1980s

In order to assess the contribution of the various oil market shocks to actual real activity dynamics since the mid-1980s, in Figure 1 the cumulative historical decomposition (net of base prediction) for the latter variable is plotted. As is shown in the plot, oil consumption and inventories preferences shocks and *other* real oil price shocks would have contributed to slowing down real

activity over the whole sample considered; differently, oil market supply side shocks would have in general exercised recessionary effects since the first Persian Gulf War episode in the early 1990s (see below for details), with both oil reserves and production shocks determining the hump-shaped profile shown in the plot. In particular, among oil market disturbances, oil production shocks would have yield the largest contribution to real activity fluctuations. Moreover, nominal oil price volatility shocks would have contributed to both (increasing) trend and cyclical real activity dynamics over the time span investigated, consistent with the evidence of symmetric uncertainty effects. Finally, oil futures market speculative shocks would have mainly contributed to cyclical fluctuations, slowing down real activity growth over the 1990s, as well as during the second Persian Gulf War (2003) and the 2008 oil price shock episodes.

Overall, as shown in the bottom plots in Figure 1, since the mid-1980s macroeconomic and financial shocks would have largely determined trend and cyclical developments in real activity; an overall recessionary bias, exercised by of oil market shocks since the first Persian Gulf War episode, can however be noted.

According to NBER chronology, over the period investigated, three main recessionary episodes have affected the US (and the global economy as well), i.e. 1990:2 through 1993:3, 2000:4 through 2003:2, and 2008:2 through 2009:3. Since relevant oil market events can be associated with all of them, in the light of the above evidence, it may then be of interest to assess the actual contribution of the first and second Persian Gulf War and the 2008 oil price shock to global economic downturn. The results of the historical decomposition analysis (net of base prediction) are reported in Tables 4-9, for the selected macroeconomic and financial variables.

7.1 The first Persian Gulf War

An abrupt and large increase in the real oil price occurred in 1990:3 (38%), followed by an additional sizable increase in 1990:4 (17%), following the Iraqi invasion of Kuwait in August 1990; oil market supply side shocks sizably affected the real oil price during the episode (10% in 1990:3; 16% in 1990:4; -12% in 1991:1; -9% in 1991:2), as well as nominal oil price volatility (10% in 1990:3) (Morana, 2012).

As the beginning of the recession in the US is dated 1990:2, the first Persian Gulf War oil price episode, occurring in 1990:3, cannot be its trigger. However, as shown in Table 4 oil market supply side shocks did exercise a recessionary impact, leading to a -1.2% contraction in real activity (-0.52%

in 1990:3; -0.12% in 1991:1), lasting well beyond its resolution[7] (-0.37% in 1991:3; -0.19% in 1991:4). Similarly long lasting were the effects exercised on employment (-1.9%; 1991:1 through 1992:1) and the unemployment rate (1% in 1991). Evidence of stagflationary effects can also be noted (0.18%, core inflation, 1990:4-1991:1).

Oil market supply side shocks also accounted for a 4.32% increase in real wages (1990:3-1991:4), a -0.37% decline in real housing prices (1990:3-1990:4), a -4.42% contraction in real stock prices (1990:3-1991:3), a 4.14% increase in stock market volatility and a 0.69% appreciation of the US$ exchange rate (1990:4-1991:1).

Recessionary effects were also exercised by oil inventories preferences shocks, oil futures market speculative shocks, and *other* real oil price and nominal oil price volatility shocks. For instance, oil inventories preference shocks contributed with a -0.67% contraction in real activity (1990:3-1991:4); figures for oil futures market speculative shocks, *other* real oil price and nominal oil price volatility shocks are -0.22% (1991:1-1991:3), -0.12% (1990:3-1991:2) and -0.11% (1990:3), respectively.

Negative effects on employment (unemployment rate) can also be noted, i.e. -0.61% (0.66%), -0.14% (0.2%), -0.14% (0.13%), and -0.28% (0.13%), respectively, as well as on real wages (-0.04%, -0.12%, -0.07%, and -0.18%, respectively).

The economic policy response (1990:3-1991:4) to oil market supply side shocks involved expansionary fiscal policy (1.32%) and contractionary monetary policy (-2.24%); differently, the policy response was restrictive for oil consumption preferences (-0.35%, public expenditure; -0.17%, liquidity) and *other* nominal oil price volatility (-0.55%, public expenditure; -0.56%, liquidity) shocks, yet expansionary for oil inventories preferences (0.58%, public expenditure; 0.03%, liquidity) and oil futures market speculative (0.13%, public expenditure; 0.17%, liquidity) shocks (Tables 4-9). The overall policy response to oil market shocks then involved expansionary fiscal policy (1.09%) and contractionary monetary policy (-2.77%), yielding a 4 b.p. increase in the real interest rate (Table 10).

Hence, while the first Persian Gulf War cannot be taken as the trigger of the early 1990s recession, it did contribute to its depth and persistence. As shown in Table 10, the joint effect of oil market shocks during the first Persian Gulf War episode was slightly stagflationary (-0.15%, real activity; 0.09%, core inflation; 1990:3-1991:1). Moreover, while recessionary dynamics over

[7] The first Persian Gulf war episode can be considered concluded in 1991:1, following the -40% real oil price drop, as global oil production was restored through increased production by Saudi Arabia.

the period 1992:1-1993:3 cannot be related to oil market supply side shocks, other oil market shocks did contribute: figures for real activity are -0.3% for inventories preferences shocks, -0.7% for oil futures market speculative shocks, -0.35% and -0.55% for *other* real oil price and nominal oil price volatility shocks, respectively (Tables 5-9); -0.73% for the joint effect of oil market shocks (1992:2-1993:2; Table 10).

7.2 The technology bubble and the second Persian Gulf War

As shown in Table 4-9, oil market shocks would have contributed to the recessionary effects ensued by the burst of the dot.com bubble in 2000:2, previously to the second Persian Gulf war episode: -0.45% for oil market supply side shocks (2000:4-2001:1), -0.74% for oil consumption preferences shocks (2001:4-2002:3), -0.59% for oil inventories preferences shocks (2001:2-2002:3), and -0.48% for *other* real oil price shocks (2001:3-2003:2). However, acording to Morana (2012), oil market supply side shocks did not determine the 18% real oil price increase in 2003:1, occurring just before the US intervention in Iraq in April 2003; the second Persian Gulf War oil price shock episode was also very short-lived, and resolved within two quarters (-17%, 2003:2).

As shown in Table 4, the real effects of oil market supply side shocks were weaker than for the previous episode, only accounting for a -0.24% contraction in real activity (2003:1) and a -0.2% contraction in real wages (2002:4-2003:2). Other oil market shocks (Tables 5-9) did however contribute to recessionary dynamics, also leading to a contraction in real wages (in the range -0.03% through -0.26%).

For instance, *other* nominal oil price volatility shocks accounted for a -0.21% contraction in real activity (2002:4-2003:2), consistent with the sizable swing featured by the real oil price over the same time span, negatively impacting on labor (-0.23% and 0.22%, for employment and the unemployment rate, respectively) and financial markets (-0.15%, -0.34%, and 0.12%, for real housing prices, real stock prices, and stock market volatility, respectively).

Similarly for oil inventories preferences shocks, leading to a -0.47% contraction in real activity (-0.51% and 0.66%, for employment and the unemployment rate, respectively), while a smaller impact on real activity can be found for oil consumption preferences (-0.08%), *other* real oil price (-0.03%), and oil futures market speculative (-0.07%) shocks.

As shown in Table 10, oil market shocks jointly accounted for a -0.44% real activity contraction over the period 2002:4-2003:2, as well as for a -0.21%

contraction in employment and a 0.54% increase in the unemployment rate; differently from the previous episode, a contraction in real wages can also be noted (-0.57%).

The economic policy response was expansionary (2002:4-2003:2), concerning oil market supply side shocks (0.07%, public expenditure; 0.02%, liquidity), nominal oil price volatility shocks (0.23%, public expenditure; 0.08%, liquidity), oil futures market speculative shocks (0.13%, public expenditure; 0.19%, liquidity), and oil inventories preferences shocks (0.45%, public expenditure; 0.23%, liquidity), yet contractionary for oil consumption preference shocks (-0.29%, public expenditure; -0.23%, liquidity) (Tables 4-9). The overall policy response to oil market shocks was then expansionary (0.55%, public expenditure; 0.23%, liquidity), yielding a 4 b.p. increase in the real interest rate (Table 10).

7.3 The third oil price shock and the Great Recession

Important features of the 2008 oil price shocks surely were both the very high nominal oil price level (US$ 140, July 2008), comparable in real terms with the second oil price shock in the early 1980s, and volatility (100 US$ drop within 5 months; US$ 40, December 2008). As shown in Morana (2012), the shock was largely macro-finance driven: in fact, the 68% real oil price increase over the period 2007:2 through 2008:2 would be largely accounted for by macroeconomic shocks (58%). Oil market supply side (1.3%) and consumption preferences (3.9%) shocks also increased the real oil price over the same period, as well as in 2009:1-2009:2 (10% and 3.6%, respectively); similarly oil inventories preferences (3.9%) and oil futures market speculative (5.5%) shocks in 2009:2-2009:3.

As shown in Table 4, oil market supply side conditions did exacerbate the recessionary effects of the subprime financial crisis, accounting for a -1.19% contractions in real activity in 2008 (-0.34% in 2008:2, -0.3% in 2008:3, -0.55% in 2008:4). Yet, the impact on the labor market was more subdued than in previous episodes (0.28%, unemployment rate; 2008:2-2009:1), possibly due to the sharp contraction in real wages (-2.51%, 2008:2-2009:3). No stagflationary effects and a small negative impact on real housing prices (-0.53%; 2008:2-2008:3) can be noted.

Other nominal oil price volatility shocks (-0.27%; 2009:1-2009:2) - consistent with the large 2008 oil price swing -, oil consumption and inventories preferences shocks (-0.13%, 2008:4-2009:1 and -0.29%, 2008:2-2009:1, respectively), oil futures market speculative shocks (-0.22%, 2008:2-2009:3), and *other* real oil price shocks (-0.06%, 2008:2-2008:4), did also contribute to the economic slow down; figures for employment (unemployment rate; 2009:1-

2009:3) are -0.34% (0.33%), -0.04% (0.07%; 2009:1), -0.28% (0.31%; 2008:2-2009:3), -0.45% (0.50%), and -0.12% (0.07%), respectively; figures for real wages are in the range 0.12% through 0.70%.

Over the period 2008:2-2008:4, oil market shocks then jointly accounted for a -1.31% contraction in real activity, as well as for a 0.16% increase in the unemployment rate, and -1% and -5.6% contractions in real wages and stock prices.

The economic policy response to oil market supply side shocks was expansionary (1.49%, public expenditure; 2.3%, liquidity; 2008:2-2009:1), leading to a -30 b.p. contraction in the real interest rate. Similarly concerning oil futures market speculative shocks (0.42%, public expenditure; 0.34%, liquidity; - 2 b.p., real interest rate), yet contractionary for oil consumption preference shocks (-0.23%, public expenditure; -0.33%, liquidity; 2008:2-2010:3) and nominal oil price volatility shocks (-0.15%, public expenditure; -0.30%, liquidity) (Tables 4-9). Similarly to the previous episode, the overall policy response to oil market shocks was however expansionary (1.18%, public expenditure; 1.33%, liquidity), yielding a 29 b.p. increase in the real interest rate (Table 10).

8 Conclusions

Recent oil price level and volatility dynamics have revived the debate about the oil price-macroeconomy relationship, particularly in the light of the perceived resilience of the global economy to the 2008 oil price shock. Two broad categories of transmission mechanisms have been proposed in the theoretical literature, featuring symmetric and asymmetric effects. In addition to the oil price drag and real money balances channels, the discretionary income, precautionary savings, and operating costs mechanisms would all predict a symmetric impact of real oil price shocks on real activity; differently, the monetary policy, uncertainty and reallocation channels would predict asymmetric effects.

In the light of the contrasting empirical literature on transmission mechanisms, the paper then aims at assessing the recessionary features of real oil price shocks, yielding original contributions along different dimensions.

Firstly, global modeling of the oil price-macroeconomy relationship is carried out, considering macro-financial data for fifty countries, including OECD and emerging countries, and a comprehensive description of the oil market. Hence, rather than undertaking a country by country analysis, the study yields a global view on the oil price-macroeconomy relationship.

Secondly, a broad empirical perspective on the oil price-macroeconomy is

provided, considering, in addition to real activity, fiscal and monetary policy responses to oil market shocks, and labor and financial markets.

The main results of the paper are as follows. Firstly, in terms of forecast error variance decomposition, oil market shocks would sizably account for real activity fluctuations, i.e. 20% and 10% in the long- and short-term, respectively. Among oil market shocks, supply side disturbances would yield the largest contribution, i.e. up to 12% for real activity and 7% to 40% for the other macro-financial variables.

Secondly, in terms of impulse responses, the findings provide support to symmetric mechanisms, as described by the discretionary income, precautionary savings and operating costs channels, as well as to the uncertainty channel, which, in the framework considered, would not necessarily yield asymmetric effects. Indeed, by comparing the effect of positive and negative net production shocks, weak evidence of asymmetric effects on real activity can be found, the latter responding more strongly to negative shocks in the very short-term only. The findings are therefore more consistent with the *symmetric* than the *asymmetric* view of oil price shock real effects, yet providing a broader perspective in terms of oil market supply side shocks, stemming also from reserves and refineries activity. Consumption and inventories preferences and oil futures market speculative shocks might exercise sizable effects on real economic activity as well.

Thirdly, the above mechanisms might account for the recessionary effects associated with some recent oil price episodes, i.e. the first and second Persian Gulf War and the 2008 oil price shock. In terms of historical decomposition, oil market shocks would have contributed to slowing down economic growth since the first Persian Gulf War episode.

In particular, during the first Persian Gulf War, oil market supply side shocks would have contributed to the depth of the 1990:2-1993:3 recession (-1.2%), and, at a lower extent, during the second Persian Gulf War, to the 2000:4-2003:2 recession (-0.24%). Oil market supply side conditions would have also exacerbated the recessionary effects of the subprime financial crisis in 2008 (-1.19%). Other oil market shocks would have contributed to slowing down real activity over the three episodes investigated as well, oil inventories preferences, nominal oil price volatility and oil futures market speculative shocks, in particular.

Overall, not only new evidence on the recessionary features of *hypothetical* oil price shocks, but also new insights on recent *actual* oil price episodes, have then been provided.

The results of the paper have also clear-cut implications for current oil market developments. According to OECD-IEA figures, excess demand in the global oil market was 1 million barrels per day in 2010 and 0.6 million

barrels per day in 2011. As long as oil supply will keep expanding at a lower pace than required by demand conditions, as it has been recently occurring, as well as since mid-2000s, a recessionary bias, determined by higher and more uncertain real oil prices, may then be expected to persist also in the near future.

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9 Appendix: Estimation of the econometric model

The two-block specification is estimated by means of a two-stage approach.

Firstly, consistent and asymptotically Normal estimation of the set of equations in (3) is obtained following the iterative procedure proposed in Morana (2011a); the latter bears the interpretation of QML estimation performed by means of the EM algorithm:

• An initial estimate of the r_1 unobserved common factors in $\mathbf{F}_{1,t}$ is obtained through the application of Principal Components Analysis (PCA) to subsets of homogeneous cross-country data $\mathbf{Z}_i = \{\mathbf{Z}_{i,1}, ..., \mathbf{Z}_{i,T}\}$, $i = 1, ..., r_1$, $r_1 \leq q$;[8] then, an initial estimate of the polynomial matrix $\mathbf{C}(L)$ and the factor loading matrix $\mathbf{\Lambda}$ is obtained by means of OLS estimation of the equation system in (3). This is performed by first regressing $\hat{\mathbf{F}}_t$ on $\boldsymbol{\kappa}_t$ to obtain $\hat{\boldsymbol{\kappa}}_t$; then the actual series $\mathbf{Z}_t$ are regressed on $\boldsymbol{\mu}_t$ and $\hat{\mathbf{F}}_t - \hat{\boldsymbol{\kappa}}_t$ to obtain $\hat{\mathbf{\Lambda}}$ and $\hat{\boldsymbol{\mu}}_t$; $\hat{\mathbf{C}}(L)$ is then obtained by means of OLS estimation of the VAR model for the gap variables $\mathbf{Z}_t - \hat{\boldsymbol{\mu}}_t - \hat{\mathbf{\Lambda}}\left(\hat{\mathbf{F}}_t - \hat{\boldsymbol{\kappa}}_t\right)$ in (3).

• In the E-step the unobserved factors ($\mathbf{F}_{1,t}$) are estimated, given the observed data and the current estimate of model parameters, by means of principal components analysis (PCA), i.e. a new estimate of the unobserved common factors in $\mathbf{F}_{1,t}$ is obtained by means of PCA applied to the filtered variables $\mathbf{Z}_t^* = \mathbf{Z}_t - \left[\mathbf{I} - \hat{\mathbf{C}}(L)\right]\hat{\mathbf{\Lambda}}_*\left(\hat{\mathbf{F}}_{*,t} - \hat{\boldsymbol{\kappa}}_{*,t}\right)$, with $\hat{\mathbf{F}}_{*,t} = \left[\mathbf{F}_{2,t}' \ \mathbf{O}_t'\right]'$, $\hat{\mathbf{\Lambda}}_* = \left[\hat{\mathbf{\Lambda}}_{F_2}' \ \hat{\mathbf{\Lambda}}_O'\right]'$ and $\hat{\boldsymbol{\kappa}}_{*,t} = \left[\hat{\boldsymbol{\kappa}}_{F_2,t}' \ \hat{\boldsymbol{\kappa}}_{O,t}'\right]'$.

• In the M-step the likelihood function is maximized (OLS estimation of the $C(L)$ matrix is performed) under the assumption that the unobserved factors are known, conditioning on their E-step estimate, i.e. conditional on the new unobserved common factors, a new estimate of the polynomial matrix $\mathbf{C}(L)$ and the factor loading matrix $\mathbf{\Lambda}$ is attained as described in the initialization step. Convergence to the one-step QML estimate is ensured, as the value of the likelihood function is increased at each step.

Secondly, consistent and asymptotically Normal estimation of the set of equations in (1) is performed by means of PC-VAR estimation (Morana, 2011b), treating the consistently estimated factors as they were actually observed. The latter is achieved in the following steps:

• PCA is applied to $\mathbf{x}_t \equiv \hat{\mathbf{F}}_t - \hat{\boldsymbol{\kappa}}_t$ and the first s PCs, $\hat{\mathbf{f}}_t$, are computed;

• the dynamic vector regression

[8] For instance, a stock return global factor can be estimated by means of the application of PCA to the vector of cross-country stock return data, and so on.

$$\begin{aligned} \mathbf{x}_t &= \mathbf{D}(L)\hat{\mathbf{f}}_t + \boldsymbol{\varsigma}_t \\ \boldsymbol{\varsigma}_t &\sim I.I.D.\left(\mathbf{0}, \boldsymbol{\Sigma}_{\varsigma}\right), \end{aligned} \tag{7}$$

where $\mathbf{D}(L) \equiv \mathbf{D}_1 L + \mathbf{D}_2 L^2 + ... + \mathbf{D}_p L^p$ has all the roots outside the unit circle, is estimated by OLS to obtain $\hat{\mathbf{D}}(L)$;

• the (implied OLS) estimates of the VAR parameters in (1) are then obtained by solving

$$\hat{\mathbf{P}}(L)_{PCVAR} = \hat{\mathbf{D}}(L)\hat{\boldsymbol{\Xi}}_s',$$

where $\hat{\boldsymbol{\Xi}}_s$ is the matrix of the eigenvectors associated with the first s ordered eigenvalues of $\hat{\boldsymbol{\Sigma}}$ ($\boldsymbol{\Sigma} = E\left[\mathbf{x}_t \mathbf{x}_t'\right]$).

See Morana (2011a,b) for additional details concerning the estimation procedure.

Table 1: forecast error variance decomposition, contributions of subsets of structural shock

	Employment							Unemployment rate							Real activity						
	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF
0	0.0	0.0	0.0	0.0	0.0	90.0	0.8	0.0	0.0	0.0	0.0	0.0	99.1	9.6	0.0	0.0	0.0	0.0	0.0	90.5	0.0
2	0.2	0.4	0.4	0.0	0.0	86.6	4.8	0.5	1.0	1.0	0.1	0.3	92.4	1.9	1.5	0.3	0.5	0.1	0.0	95.8	0.2
4	0.5	0.7	0.8	0.0	0.1	85.7	4.7	0.8	1.5	1.3	0.1	0.1	91.5	1.8	2.4	0.7	0.7	0.2	0.1	94.2	0.5
6	0.6	0.8	0.9	0.0	0.3	85.7	5.0	0.8	1.7	1.4	0.2	0.2	90.7	2.3	2.3	1.2	0.7	0.5	0.2	92.7	0.6
8	0.5	1.1	1.0	0.1	0.5	84.5	5.8	0.7	2.0	1.6	0.3	0.2	89.3	2.9	2.3	1.9	0.8	0.7	0.1	91.2	0.5
12	0.6	1.6	1.2	0.2	0.4	82.0	6.7	0.7	2.8	1.9	0.5	0.1	87.4	3.7	2.2	2.8	1.1	1.1	0.2	88.8	0.6
20	0.3	2.0	1.6	0.2	0.3	78.9	7.2	0.4	3.5	2.3	0.7	0.1	85.8	6.2	1.7	3.2	1.4	1.4	0.3	85.9	0.3
40	0.2	2.0	1.7	0.2	0.3	75.4	7.1	0.3	3.8	2.6	0.7	0.1	85.3	12.2	1.5	3.1	1.2	1.4	0.4	79.9	0.2
	Public expenditure to GDP ratio							Nominal factor							Real wages						
	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF
0	0.0	0.0	0.0	0.0	0.0	94.9	1.7	0.0	0.0	0.0	0.0	0.0	98.3	9.8	0.0	0.0	0.0	0.0	0.0	90.3	0.0
2	0.5	0.6	0.3	0.1	0.1	96.1	8.5	0.4	0.3	0.9	0.1	0.2	89.6	10.2	0.0	0.1	0.3	0.3	0.1	88.9	0.5
4	0.6	0.9	0.7	0.1	0.1	96.0	6.7	0.4	0.3	0.6	0.0	0.4	91.7	15.4	0.0	0.3	0.3	0.5	0.5	83.0	0.6
6	0.5	1.3	0.8	0.3	0.1	95.2	5.2	0.4	0.2	0.5	0.0	1.0	92.6	20.3	0.0	0.4	0.3	0.5	1.2	77.4	0.5
8	0.4	1.8	1.0	0.4	0.1	94.1	4.7	0.8	0.3	0.4	0.1	1.0	92.8	25.1	0.1	0.3	0.3	0.5	1.4	72.3	0.4
12	0.3	2.4	1.2	0.7	0.3	92.4	4.1	1.7	0.5	0.3	0.2	0.9	92.2	30.8	0.1	0.2	0.3	0.4	1.3	67.0	0.3
20	0.3	2.4	1.3	0.8	0.6	89.5	4.8	2.6	0.7	0.3	0.4	0.6	90.7	36.9	0.1	0.1	0.3	0.3	1.3	61.0	0.3
40	0.2	1.9	1.0	0.7	0.9	82.3	6.4	2.9	0.7	0.2	0.5	0.4	88.8	41.2	0.2	0.0	0.3	0.3	1.3	56.6	0.2
	Real housing prices							US$ exchange rate index							Real stock market prices						
	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF
0	0.4	0.0	0.0	0.0	0.0	95.7	6.0	4.3	0.0	0.0	0.0	0.0	89.8	5.6	0.7	0.4	0.6	1.4	0.1	91.2	0.4
2	2.2	0.1	0.7	0.1	0.2	85.5	6.4	9.6	0.6	1.2	0.5	0.3	81.4	5.6	0.6	0.8	0.5	0.7	0.1	91.7	2.2
4	3.2	0.3	0.8	0.2	0.2	81.6	7.0	12.6	1.1	1.3	1.0	0.3	76.7	8.7	0.7	0.4	0.4	0.8	0.6	88.4	3.2
6	4.7	0.3	0.6	0.2	0.1	78.8	7.0	12.4	1.5	1.4	1.2	0.3	76.2	12.2	0.7	0.4	0.4	0.7	0.8	84.8	4.7
8	5.5	0.4	0.5	0.3	0.1	76.1	7.5	12.4	1.8	1.4	1.4	0.5	75.0	14.7	0.8	0.3	0.4	0.6	0.8	82.4	5.5
12	6.0	0.3	0.5	0.3	0.1	72.0	8.4	12.3	1.7	1.4	1.3	0.7	74.1	17.9	0.7	0.2	0.3	0.6	0.7	79.5	6.0
20	5.6	0.3	0.5	0.4	0.2	65.8	8.9	12.3	1.4	1.4	1.1	0.6	74.3	24.4	0.4	0.1	0.2	0.6	0.7	73.5	5.6
40	4.7	0.3	0.5	0.3	0.3	59.2	9.8	11.8	1.1	1.4	0.9	0.4	74.7	31.1	0.2	0.1	0.1	0.7	0.8	66.8	4.7
	Stock market volatility							Excess liquidity							Real short-term rate						
	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF	SUP	C	INV	SPC	OP	OV	MF
0	1.1	0.0	0.0	0.0	0.0	89.0	9.0	0.8	0.0	0.0	0.0	0.0	90.2	4.9	0.4	0.0	0.0	0.0	0.0	94.6	1.1
2	1.2	0.2	0.2	0.0	0.1	86.8	11.1	0.4	0.5	0.3	0.0	0.5	87.2	6.2	0.7	0.2	0.3	0.1	0.1	92.5	1.2
4	1.1	0.2	0.4	0.1	0.3	84.3	15.7	0.2	0.4	0.6	0.0	0.3	82.7	7.7	0.8	0.2	0.3	0.1	0.8	90.1	1.1
6	1.6	0.3	1.1	0.1	0.5	81.9	18.9	0.2	0.2	0.9	0.0	0.2	79.4	6.8	1.0	0.5	0.3	0.2	0.8	90.4	1.6
8	3.1	0.5	1.3	0.1	0.5	80.7	23.3	0.3	0.2	0.8	0.0	0.3	75.0	6.8	1.1	0.7	0.3	0.2	0.7	90.1	3.1
12	4.7	0.7	1.5	0.1	0.4	78.3	29.0	0.4	0.1	0.6	0.0	1.0	68.7	6.8	2.1	0.7	0.3	0.2	0.5	89.4	4.7
20	5.6	1.0	1.8	0.0	0.3	74.0	33.1	0.6	0.2	0.5	0.0	1.0	64.5	5.7	3.0	0.5	0.2	0.1	0.4	90.1	5.6
40	6.1	1.2	1.9	0.0	0.2	67.5	40.1	0.3	0.2	0.5	0.0	1.0	57.9	4.9	3.2	0.4	0.2	0.1	0.5	90.7	6.1

The table reports the forecast error variance decomposition, for selected variables at various horizons (impact (0) and 2 to 40 quarters), relatively to subsets of structural shocks: oil market supply side shocks (SUP, reserves, net production changes, refineries margins), oil consumption preferences shock (C), oil inventories preferences shock (INV), oil futures market speculative shocks (Working-T index, futures spread), other real oil price (OP) and nominal oil price volatility (OV) shocks, macro-financial shocks (MF; remaining 23 shocks).

Table 2: impulse response analysis, responses to oil market structural shock

	Employment										Unemployment rate									
	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV
0	**-0.04**	**-0.01**	**0.02**	**-0.07**	0.00	0.00	0.00	0.00	0.00	0.00	**0.01**	0.00	**0.01**	**0.02**	0.00	0.00	0.00	0.00	0.00	0.00
2	**-0.15**	-0.04	**0.12**	**-0.20**	**0.05**	**0.06**	**-0.05**	**0.04**	**-0.01**	-0.01	**0.06**	0.02	**-0.08**	**0.15**	**-0.07**	**-0.09**	**0.08**	**-0.05**	**0.03**	**0.05**
4	**-0.17**	**-0.13**	**0.20**	**-0.39**	**0.12**	**0.12**	**-0.11**	**0.08**	-0.01	**0.06**	0.02	0.05	**-0.09**	**0.27**	**-0.15**	**-0.17**	**0.15**	**-0.08**	**0.04**	-0.03
6	**-0.14**	**-0.25**	**0.36**	**-0.49**	**0.15**	**0.20**	**-0.17**	**0.09**	**-0.04**	**0.15**	-0.09	0.07	**-0.24**	**0.34**	**-0.16**	**-0.25**	**0.22**	**-0.09**	**0.09**	**-0.09**
8	**-0.13**	**-0.36**	**0.50**	**-0.61**	**0.18**	**0.28**	**-0.22**	**0.12**	**-0.09**	**0.19**	-0.12	0.10	**-0.35**	**0.43**	**-0.18**	**-0.35**	**0.26**	**-0.12**	**0.15**	**-0.09**
12	**-0.25**	**-0.44**	**0.61**	**-0.78**	**0.20**	**0.42**	**-0.29**	**0.18**	**-0.15**	**0.13**	-0.07	0.03	**-0.36**	**0.52**	**-0.18**	**-0.46**	**0.32**	**-0.16**	**0.21**	0.01
20	**-0.37**	**-0.54**	**0.62**	**-0.80**	0.03	**0.40**	**-0.30**	**0.20**	**-0.12**	**0.11**	-0.08	-0.06	**-0.27**	**0.44**	-0.03	**-0.42**	**0.32**	**-0.15**	**0.18**	0.05
40	**-0.38**	**-0.62**	**0.66**	**-0.79**	0.03	**0.39**	**-0.29**	**0.19**	**-0.11**	**0.14**	-0.19	-0.19	-0.23	**0.39**	-0.08	**-0.41**	**0.31**	**-0.13**	**0.19**	0.05
	Real activity										Public expenditure to GDP ratio									
	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV
0	**-0.03**	**-0.11**	**-0.05**	**-0.07**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.09**	**-0.05**	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2	0.01	0.00	0.00	-0.06	**0.14**	**0.07**	**-0.03**	**0.08**	**-0.05**	-0.02	0.01	**0.09**	**-0.06**	0.04	**-0.09**	**-0.09**	**0.05**	**-0.04**	**0.03**	**0.03**
4	**0.12**	0.04	-0.05	**-0.11**	**0.25**	**0.13**	**-0.07**	**0.10**	**-0.08**	**0.07**	-0.05	0.07	-0.06	**0.10**	**-0.12**	**-0.15**	**0.12**	**-0.07**	**0.06**	-0.03
6	**0.22**	0.04	0.07	-0.13	**0.24**	**0.24**	**-0.11**	**0.10**	**-0.15**	**0.08**	**-0.17**	0.08	**-0.15**	0.08	-0.07	**-0.23**	**0.15**	**-0.05**	**0.11**	-0.05
8	**0.23**	0.11	0.10	**-0.20**	**0.27**	**0.32**	**-0.14**	**0.13**	**-0.21**	0.02	**-0.20**	-0.01	**-0.16**	0.10	-0.09	**-0.27**	**0.16**	**-0.07**	**0.16**	0.03
12	**0.22**	**0.28**	-0.01	**-0.21**	**0.25**	**0.35**	**-0.18**	**0.13**	**-0.23**	**-0.08**	**-0.17**	**-0.21**	0.00	0.04	-0.02	**-0.25**	**0.18**	**-0.07**	**0.15**	**0.14**
20	**0.29**	**0.44**	-0.13	-0.08	**0.16**	**0.28**	**-0.15**	**0.10**	**-0.19**	**-0.12**	**-0.29**	**-0.37**	0.12	-0.13	0.05	**-0.18**	**0.14**	-0.03	**0.11**	**0.15**
40	**0.44**	**0.62**	**-0.19**	-0.01	**0.22**	**0.29**	**-0.15**	**0.09**	**-0.21**	**-0.14**	**-0.44**	**-0.58**	**0.20**	**-0.18**	-0.03	**-0.19**	**0.14**	-0.02	**0.14**	**0.18**
	Nominal factor										Real wage									
	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV
0	**-0.01**	0.00	0.00	**-0.01**	0.00	0.00	0.00	0.00	0.00	0.00	**0.13**	**0.03**	**-0.10**	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2	**-0.02**	**0.03**	0.00	**-0.01**	**0.01**	0.00	0.00	**0.01**	0.00	**0.01**	**0.22**	**0.10**	**-0.18**	**0.21**	-0.01	**0.04**	**0.04**	**-0.05**	**-0.06**	**-0.04**
4	**-0.01**	0.00	0.00	0.00	**0.01**	0.00	**0.00**	**0.00**	0.00	**0.01**	**0.31**	**0.36**	**-0.25**	**0.28**	-0.02	**0.09**	**0.04**	**-0.05**	**-0.11**	**-0.14**
6	0.00	**0.01**	**0.01**	0.00	**0.01**	0.00	**0.00**	0.00	0.00	**0.02**	**0.35**	**0.56**	**-0.37**	**0.33**	0.02	**0.10**	0.03	**-0.06**	**-0.11**	**-0.23**
8	0.00	**0.01**	**0.02**	0.00	**0.01**	**0.01**	**0.00**	**0.01**	**-0.01**	**0.01**	**0.47**	**0.73**	**-0.47**	**0.41**	0.00	0.07	0.03	**-0.10**	**-0.10**	**-0.23**
12	0.01	**0.02**	0.01	0.00	**0.02**	**0.01**	0.00	**0.01**	**-0.01**	**0.01**	**0.73**	**1.03**	**-0.58**	**0.53**	0.05	0.03	0.04	**-0.14**	**-0.12**	**-0.26**
20	0.01	**0.03**	0.00	0.00	**0.02**	**0.01**	0.00	**0.01**	**-0.01**	**0.01**	**0.95**	**1.46**	**-0.79**	**0.67**	0.13	0.03	0.04	**-0.17**	**-0.15**	**-0.34**
40	0.01	**0.03**	0.00	0.00	**0.02**	**0.01**	0.00	**0.01**	**-0.01**	**0.01**	**1.18**	**1.87**	**-0.98**	**0.79**	0.18	0.03	0.04	**-0.20**	**-0.18**	**-0.42**

The table reports impulse responses for various variables at selected horizons (impact (0) and 2 to 40 quarters), relatively to the oil market structural shocks: reserves (R), net negative production (Pm), net positive production (Pp), refineries margins (RM), oil consumption preferences (C), oil inventories preferences (INV), real oil price (OP), and nominal oil price volatility (OV). Figures in bold denote statistical significance at the 10% level.

Table 3: impulse response analysis, responses to oil market structural shock

	Real housing prices										US$ exchange rate index									
	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV
0	**0.04**	0.02	**-0.08**	-0.02	**0.03**	0.00	0.00	0.00	0.00	0.00	**-0.12**	**-0.05**	**-0.09**	0.00	**0.14**	0.00	0.00	0.00	0.00	0.00
2	**0.20**	**0.20**	**-0.23**	**0.06**	**0.18**	**0.05**	**0.05**	**-0.08**	**-0.04**	**0.06**	**-0.20**	**0.11**	**-0.13**	**-0.14**	**0.39**	**0.11**	0.01	**0.15**	**-0.10**	**-0.07**
4	**0.41**	**0.42**	**-0.17**	0.01	**0.32**	**0.09**	0.02	**-0.14**	**-0.07**	**0.07**	**-0.23**	0.05	**-0.25**	-0.01	**0.46**	**0.17**	**0.07**	**0.13**	**-0.16**	**-0.07**
6	**0.49**	**0.63**	**-0.14**	-0.08	**0.51**	**0.12**	-0.01	**-0.13**	**-0.12**	0.02	**-0.23**	0.03	**-0.23**	**-0.09**	**0.44**	**0.20**	**0.08**	**0.13**	**-0.16**	**-0.09**
8	**0.56**	**0.81**	**-0.21**	-0.12	**0.62**	**0.13**	-0.05	**-0.14**	**-0.14**	-0.01	**-0.30**	**0.10**	**-0.24**	**-0.10**	**0.47**	**0.21**	**0.09**	**0.15**	**-0.18**	**-0.13**
12	**0.64**	**1.09**	**-0.36**	-0.12	**0.66**	**0.14**	-0.08	**-0.13**	**-0.17**	-0.07	**-0.31**	0.07	**-0.27**	-0.09	**0.47**	**0.15**	**0.11**	**0.12**	**-0.14**	**-0.11**
20	**0.63**	**1.20**	**-0.50**	-0.06	**0.49**	**0.12**	**-0.09**	**-0.14**	**-0.14**	**-0.16**	**-0.36**	0.01	**-0.25**	-0.12	**0.50**	**0.14**	**0.12**	**0.13**	**-0.13**	**-0.09**
40	**0.79**	**1.38**	**-0.55**	0.02	**0.54**	**0.11**	-0.09	**-0.16**	**-0.16**	**-0.17**	**-0.42**	-0.10	**-0.20**	**-0.16**	**0.48**	**0.15**	**0.11**	**0.13**	**-0.12**	**-0.07**
	Real stock prices										**Stock market volatility**									
	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV
0	**-0.17**	-0.01	-0.02	**0.06**	**0.06**	**0.05**	**-0.05**	**0.02**	**0.09**	**-0.03**	**0.19**	**0.07**	0.00	**-0.12**	**-0.08**	0.00	0.00	0.00	0.00	0.00
2	**-0.18**	**-0.13**	**0.14**	-0.06	**0.07**	**0.11**	**-0.07**	0.00	**0.09**	0.02	**0.30**	0.06	**-0.09**	**-0.07**	**-0.09**	**-0.05**	**0.03**	**0.04**	0.01	**0.04**
4	**-0.12**	**-0.39**	**0.26**	-0.01	**0.11**	0.04	**-0.07**	-0.01	**0.11**	**0.14**	**0.10**	**0.34**	-0.04	**-0.14**	**-0.09**	0.03	**0.03**	**0.10**	**-0.03**	-0.08
6	**-0.13**	**-0.46**	**0.37**	-0.05	**0.10**	**0.06**	**-0.06**	-0.02	**0.09**	**0.15**	**-0.11**	**0.13**	**-0.08**	**-0.24**	**-0.16**	**0.07**	0.01	**0.13**	-0.01	**-0.08**
8	**-0.23**	**-0.45**	**0.38**	-0.10	**0.15**	**0.06**	**-0.06**	0.02	**0.09**	**0.11**	-0.06	-0.04	-0.03	**-0.19**	**-0.25**	**0.08**	0.01	**0.09**	0.00	-0.02
12	**-0.34**	**-0.55**	**0.34**	-0.11	0.08	0.03	**-0.06**	0.02	**0.12**	**0.13**	**-0.08**	**-0.12**	**0.12**	**-0.27**	**-0.23**	**0.09**	-0.01	**0.11**	0.00	0.01
20	**-0.46**	**-0.75**	**0.41**	-0.13	0.00	0.01	-0.05	0.02	**0.15**	**0.15**	**-0.11**	**-0.20**	**0.16**	**-0.30**	**-0.20**	**0.10**	-0.01	**0.12**	-0.01	**0.03**
40	**-0.54**	**-0.92**	**0.50**	**-0.18**	-0.01	0.01	-0.04	0.04	**0.16**	**0.19**	**-0.17**	**-0.29**	**0.19**	**-0.32**	**-0.23**	**0.10**	-0.01	**0.13**	0.00	**0.05**
	Excess liquidity										**Real short-term rate**									
	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV	R	Pm	Pp	RM	C	INV	WT	FB	OP	OV
0	**0.09**	**-0.04**	-0.01	**0.11**	**-0.05**	0.00	0.00	0.00	0.00	0.00	**0.06**	0.01	0.01	**-0.03**	**0.02**	0.00	0.00	0.00	0.00	0.00
2	**0.12**	**-0.23**	-0.02	**0.14**	**-0.04**	**-0.07**	**0.06**	0.00	**0.02**	**0.07**	**-0.03**	**-0.02**	**0.03**	**-0.02**	0.00	**-0.02**	0.00	0.00	**0.01**	**-0.01**
4	0.01	**-0.41**	**0.12**	0.04	-0.01	**-0.03**	**0.09**	**0.05**	0.01	0.02	**-0.03**	-0.01	**0.05**	**-0.02**	0.01	**-0.01**	**0.01**	0.00	**0.01**	**-0.03**
6	**-0.15**	**-0.51**	**0.10**	**-0.06**	0.05	0.00	**0.08**	**0.08**	0.02	0.03	-0.01	-0.01	**0.03**	0.00	**0.03**	**-0.03**	0.00	**-0.01**	**0.01**	**-0.01**
8	**-0.16**	**-0.64**	**0.18**	**-0.10**	0.07	0.00	**0.07**	**0.07**	**0.04**	**0.12**	**0.02**	**-0.02**	**0.04**	0.00	**0.03**	**-0.02**	**0.01**	**-0.01**	**0.01**	0.01
12	**-0.16**	**-0.86**	**0.42**	**-0.24**	**0.15**	**0.06**	**0.05**	**0.10**	0.01	**0.21**	0.02	0.00	**0.04**	-0.01	**0.05**	**-0.01**	0.00	-0.01	0.00	**-0.01**
20	**-0.37**	**-1.04**	**0.51**	**-0.41**	0.15	**0.12**	0.02	**0.15**	-0.01	**0.22**	**0.02**	0.01	**0.03**	-0.01	**0.04**	**-0.01**	0.00	-0.01	0.00	**-0.02**
40	**-0.54**	**-1.36**	**0.64**	**-0.47**	0.07	**0.10**	0.03	**0.16**	0.03	**0.27**	**0.03**	0.02	**0.02**	0.00	**0.04**	**-0.01**	0.00	**-0.01**	0.00	**-0.02**

The table reports impulse responses for various variables at selected horizons (impact (0) and 2 to 40 quarters), relatively to the oil market structural shocks: reserves (R), net negative production (Pm), net positive production (Pp), refineries margins (RM), oil consumption preferences (C), oil inventories preferences (INV), real oil price (OP), and nominal oil price volatility (OV). Figures in bold denote statistical significance at the 10% level.

Table 4: Historical decomposition over selected periods: contributions from oil market supply side shocks.

Oil market supply side shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT	SUP	ACT
1990(2)	0.42	-0.70	0.47	-0.23	-0.93	0.11	0.36	1.90	0.11	-0.02	-0.43	0.74	-0.42	-0.20	0.27	0.38	-0.09	-0.70	0.21	-0.64	-1.22	-0.01	0.31	-0.11
1990(3)	-0.52	-0.54	0.34	-0.39	-0.31	0.72	0.38	0.90	0.00	-0.08	0.39	0.85	-0.36	0.42	0.32	-0.22	-0.25	-0.48	-0.44	-1.94	0.36	0.66	-0.57	0.70
1990(4)	0.46	-0.35	0.23	-0.27	-0.03	0.91	0.53	0.25	0.16	0.08	0.14	1.08	-0.46	0.18	-0.46	-0.41	-0.12	-1.14	-1.15	-2.00	0.20	0.84	0.61	0.35
1991(1)	-0.12	-1.55	-0.22	-1.12	0.02	1.21	0.54	0.65	0.02	-0.08	0.14	0.82	-0.26	-0.46	0.38	0.60	0.21	0.13	-0.25	0.10	0.47	-0.64	0.08	-0.87
1991(2)	0.25	-0.37	-0.34	-1.26	0.27	1.29	1.55	2.04	-0.11	-0.07	0.24	0.76	-0.60	-0.80	0.14	0.03	0.46	-0.40	-1.51	-0.12	2.28	-0.69	-0.53	-1.97
1991(3)	-0.37	-0.81	-0.49	-1.41	0.41	0.76	0.87	0.99	-0.04	0.03	0.22	0.26	-0.27	-0.92	-0.07	-0.31	0.22	0.07	-1.07	-1.04	0.83	-0.24	-0.15	-0.52
1991(4)	-0.19	-0.13	-0.54	-1.54	0.32	0.74	0.52	0.63	-0.01	-0.06	0.19	0.29	-0.29	-1.39	-0.14	-0.04	0.16	0.11	0.21	-1.28	-0.66	-0.72	0.43	0.61
1992(1)	0.28	0.00	-0.26	-1.09	-0.25	1.44	0.19	1.25	0.10	-0.05	-0.16	-0.12	-1.12	-1.79	-0.05	0.62	0.17	-0.69	-0.31	-0.18	-0.77	1.42	0.00	-0.47
1992(2)	0.15	-1.05	-0.06	-1.49	-0.16	1.43	-0.02	1.79	-0.02	0.01	-0.41	0.67	-0.89	0.07	-0.17	-0.20	-0.11	-0.72	0.33	-0.86	-1.08	-1.05	0.38	-0.25
1992(3)	0.34	-0.45	0.11	-1.99	-0.26	1.34	0.15	1.61	0.04	0.04	-0.56	0.84	-0.45	-0.03	0.27	0.20	0.16	-0.85	-0.11	-1.92	-0.26	-0.75	0.17	0.85
1992(4)	0.21	-1.03	0.03	-2.47	-0.16	1.34	0.11	0.46	-0.07	0.02	-0.56	0.19	-0.20	-0.53	-0.05	-0.06	0.07	-1.19	-0.42	-0.52	0.31	-0.76	-0.51	-1.93
1993(1)	0.25	-1.02	0.02	-2.18	-0.24	1.09	0.54	1.05	-0.01	-0.19	-0.39	-0.72	-0.25	-1.30	0.14	-0.60	0.49	-1.41	-0.29	0.65	0.55	-0.83	-0.32	-1.22
1993(2)	0.18	-0.40	0.04	-1.53	-0.12	0.58	0.42	1.00	-0.05	-0.06	-0.17	-0.98	0.04	-1.34	-0.12	-0.25	0.35	-0.27	0.06	0.11	0.16	-0.49	0.02	0.26
1993(3)	0.25	-0.07	0.02	-1.08	-0.28	1.05	0.50	0.90	0.02	-0.22	-0.19	-0.92	-0.04	-1.42	0.07	0.10	0.65	-0.08	-0.28	0.58	0.23	-0.43	-0.16	-0.84
2000(4)	-0.31	-0.33	0.13	1.05	-0.17	-0.67	-0.27	-1.29	0.04	0.06	0.35	0.74	0.18	0.01	0.08	-0.01	-0.10	0.04	-0.26	-0.83	-0.03	0.43	-0.08	-0.94
2001(1)	-0.14	-0.71	0.09	0.84	0.21	0.06	-0.11	0.16	-0.05	-0.04	0.29	1.14	0.23	0.70	0.07	0.62	0.14	0.55	0.03	-0.35	0.26	0.43	0.00	0.27
2001(2)	0.01	-0.99	0.10	-0.54	0.04	0.21	-0.54	-0.45	0.02	0.03	0.00	1.01	0.14	0.46	-0.29	-0.95	0.14	-0.09	0.38	-0.23	-0.03	1.16	0.18	-1.14
2001(3)	0.00	-1.14	0.26	0.08	-0.17	0.81	-0.35	-0.02	0.00	-0.14	-0.13	1.50	0.07	1.25	0.14	0.78	0.21	0.24	0.31	-1.48	-0.25	-0.85	0.07	0.15
2001(4)	0.24	-0.95	0.39	-0.07	-0.16	1.22	-0.23	-0.85	-0.02	-0.16	-0.07	1.30	-0.06	-0.01	0.07	-0.24	0.35	0.16	0.07	0.37	0.30	0.74	-0.02	0.08
2002(1)	0.05	-0.59	0.36	-0.50	-0.33	0.20	-0.32	-0.70	0.01	0.16	-0.02	-0.02	-0.10	-1.21	-0.12	-0.44	0.16	0.21	-0.05	0.86	0.36	-1.01	0.14	0.08
2002(2)	0.15	-0.11	0.31	-0.36	-0.27	-0.07	-0.15	-0.55	0.03	0.02	-0.06	-0.42	0.10	-1.52	-0.02	-0.12	0.26	0.48	0.00	-0.50	-0.18	-0.54	0.25	1.25
2002(3)	0.15	-0.44	0.22	-0.39	-0.20	0.42	-0.04	0.49	0.00	-0.05	-0.02	0.52	0.22	0.26	0.08	0.27	0.47	0.86	-0.05	-2.09	0.16	1.01	-0.16	0.77
2002(4)	0.20	-0.19	0.21	-0.31	-0.13	0.87	0.06	-0.49	-0.02	-0.16	0.00	0.36	0.04	0.04	-0.09	-0.19	0.44	1.01	-0.19	0.13	0.42	1.82	-0.12	0.49
2003(1)	-0.24	-0.38	0.17	-0.35	-0.05	0.53	-0.36	-0.81	0.00	-0.08	0.01	0.29	0.16	0.17	-0.05	-0.38	0.07	0.20	0.25	-0.17	-0.45	-0.55	0.08	1.34
2003(2)	0.15	-1.07	0.23	-0.30	-0.21	0.45	-0.12	0.29	0.06	0.12	0.06	0.91	-0.18	0.68	0.13	1.18	-0.03	0.87	0.65	1.32	-0.95	-0.97	0.46	1.30
2008(2)	-0.34	-1.04	0.26	0.49	0.03	0.71	-0.60	-1.60	-0.02	0.01	0.47	1.84	0.58	1.32	-0.01	0.41	-0.37	-3.18	0.35	0.08	0.31	0.17	0.04	0.55
2008(3)	-0.30	-1.91	0.26	-0.34	0.04	1.24	-0.62	-0.73	-0.01	0.05	0.33	2.23	0.69	2.27	-0.03	0.33	-0.16	-2.73	0.29	-1.80	0.10	1.46	-0.27	-1.25
2008(4)	-0.55	-4.90	0.18	-1.69	0.11	2.66	-0.35	2.05	-0.04	-0.18	0.44	4.47	0.60	4.39	0.06	1.80	0.14	-2.12	0.15	-4.07	0.54	4.97	-0.64	-5.08
2009(1)	0.05	-4.97	0.13	-3.82	0.10	4.97	-0.34	1.57	0.03	-0.28	0.25	4.66	0.33	3.61	-0.32	-0.68	0.33	-1.94	0.13	-0.67	0.05	1.35	0.20	-0.71
2009(2)	0.22	-2.07	0.18	-3.32	-0.14	3.46	-0.49	-0.60	0.04	0.23	0.00	1.95	-0.11	0.52	0.00	-1.03	0.46	-1.58	0.44	1.85	-0.11	0.51	0.29	2.03
2009(3)	0.26	-0.47	0.22	-1.95	-0.24	1.65	-0.11	-1.25	-0.02	-0.20	-0.04	0.31	-0.18	-1.55	0.00	-0.53	0.32	-1.12	-0.01	1.79	0.22	-1.45	-0.03	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the contribution of the oil market supply side shocks (SUP, reserves, net production changes, refinery margins), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P), public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while SUP is the contribution yield by the oil market supply side shock.

Table 5: Historical decomposition over selected periods: contributions from oil consumption preferences shocks.

Oil consumption preferences shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT	C	ACT
1990(2)	0.01	-0.70	-0.04	-0.23	0.02	0.11	0.00	1.90	0.01	-0.02	-0.07	0.74	-0.13	-0.20	0.07	0.38	0.00	-0.70	0.05	-0.64	0.03	-0.01	0.43	-0.11
1990(3)	0.19	-0.54	0.01	-0.39	-0.02	0.72	-0.11	0.90	-0.02	-0.08	-0.17	0.85	-0.06	0.42	-0.08	-0.22	-0.03	-0.48	0.14	-1.94	-0.04	0.66	0.17	0.70
1990(4)	0.13	-0.35	0.09	-0.27	-0.15	0.91	-0.02	0.25	0.01	0.08	-0.10	1.08	0.02	0.18	0.03	-0.41	0.02	-1.14	-0.14	-2.00	0.33	0.84	-0.05	0.35
1991(1)	-0.10	-1.55	0.04	-1.12	0.02	1.21	0.00	0.65	-0.04	-0.08	0.03	0.82	-0.03	-0.46	0.13	0.60	0.02	0.13	0.05	0.10	-0.04	-0.64	-0.08	-0.87
1991(2)	0.04	-0.37	-0.03	-1.26	-0.03	1.29	0.07	2.04	0.02	-0.07	0.07	0.76	-0.04	-0.80	-0.11	0.03	0.08	-0.40	0.09	-0.12	-0.25	-0.69	0.08	-1.97
1991(3)	0.09	-0.81	0.03	-1.41	-0.04	0.76	0.02	0.99	0.02	0.03	-0.07	0.26	-0.04	-0.92	-0.04	-0.31	0.22	0.07	0.00	-1.04	-0.19	-0.24	0.24	-0.52
1991(4)	0.11	-0.13	0.02	-1.54	-0.02	0.74	-0.06	0.63	-0.02	-0.06	-0.11	0.29	-0.02	-1.39	0.06	-0.04	0.30	0.11	0.19	-1.28	-0.13	-0.72	0.46	0.61
1992(1)	0.31	0.00	0.13	-1.09	-0.15	1.44	-0.05	1.25	0.02	-0.05	-0.19	-0.12	-0.02	-1.79	-0.04	0.62	0.20	-0.69	0.08	-0.18	0.10	1.42	0.26	-0.47
1992(2)	0.16	-1.05	0.20	-1.49	-0.17	1.43	-0.10	1.79	-0.01	0.01	-0.11	0.67	0.04	0.07	0.04	-0.20	0.21	-0.72	0.00	-0.86	0.08	-1.05	-0.11	-0.25
1992(3)	-0.03	-0.45	0.10	-1.99	-0.09	1.34	0.06	1.61	-0.01	0.04	0.11	0.84	0.04	-0.03	0.13	0.20	0.22	-0.85	-0.01	-1.92	-0.03	-0.75	-0.08	0.85
1992(4)	0.00	-1.03	0.02	-2.47	-0.02	1.34	0.11	0.46	0.02	0.02	0.10	0.19	0.10	-0.53	-0.11	-0.06	0.13	-1.19	-0.11	-0.52	-0.12	-0.76	-0.19	-1.93
1993(1)	-0.11	-1.02	0.02	-2.18	0.04	1.09	0.00	1.05	0.01	-0.19	0.06	-0.72	0.23	-1.30	-0.02	-0.60	0.10	-1.41	-0.16	0.65	0.03	-0.83	-0.35	-1.22
1993(2)	-0.22	-0.40	-0.03	-1.53	0.13	0.58	0.00	1.00	-0.02	-0.06	0.13	-0.98	0.08	-1.34	0.15	-0.25	-0.08	-0.27	0.04	0.11	0.07	-0.49	-0.24	0.26
1993(3)	-0.08	-0.07	-0.05	-1.08	0.08	1.05	0.01	0.90	0.02	-0.22	0.11	-0.92	-0.06	-1.42	-0.10	0.10	-0.23	-0.08	0.00	0.58	-0.03	-0.43	-0.32	-0.84
2000(4)	0.03	-0.33	0.03	1.05	0.02	-0.67	-0.07	-1.29	0.00	0.06	-0.06	0.74	-0.01	0.01	-0.04	-0.01	0.08	0.04	0.02	-0.83	-0.06	0.43	-0.01	-0.94
2001(1)	0.01	-0.71	0.03	0.84	-0.02	0.06	-0.04	0.16	0.00	-0.04	-0.01	1.14	-0.04	0.70	0.10	0.62	0.12	0.55	0.14	-0.35	-0.04	0.43	0.25	0.27
2001(2)	0.14	-0.99	0.06	-0.54	-0.06	0.21	-0.01	-0.45	0.01	0.03	-0.05	1.01	-0.03	0.46	-0.07	-0.95	0.06	-0.09	0.03	-0.23	-0.03	1.16	0.12	-1.14
2001(3)	0.04	-1.14	0.07	0.08	-0.08	0.81	-0.01	-0.02	0.01	-0.14	-0.03	1.50	0.12	1.25	-0.02	0.78	0.11	0.24	-0.15	-1.48	0.14	-0.85	-0.14	0.15
2001(4)	-0.14	-0.95	0.02	-0.07	0.04	1.22	0.04	-0.85	-0.02	-0.16	0.10	1.30	0.19	-0.01	0.12	-0.24	0.00	0.16	-0.12	0.37	0.22	0.74	-0.33	0.08
2002(1)	-0.19	-0.59	-0.04	-0.50	0.09	0.20	0.04	-0.70	0.00	0.16	0.16	-0.02	0.08	-1.21	-0.03	-0.44	-0.19	0.21	-0.10	0.86	0.06	-1.01	-0.49	0.08
2002(2)	-0.24	-0.11	-0.09	-0.36	0.13	-0.07	0.05	-0.55	0.01	0.02	0.19	-0.42	-0.03	-1.52	-0.02	-0.12	-0.16	0.48	-0.04	-0.50	-0.15	-0.54	-0.34	1.25
2002(3)	-0.17	-0.44	-0.18	-0.39	0.16	0.42	0.07	0.49	0.01	-0.05	0.13	0.52	-0.01	0.26	-0.06	0.27	-0.16	0.86	-0.03	-2.09	-0.09	1.01	-0.09	0.77
2002(4)	-0.08	-0.19	-0.12	-0.31	0.13	0.87	-0.04	-0.49	0.01	-0.16	-0.04	0.36	-0.15	0.04	0.02	-0.19	-0.18	1.01	0.09	0.13	-0.07	1.82	0.39	0.49
2003(1)	0.16	-0.38	-0.04	-0.35	0.00	0.53	-0.13	-0.81	0.00	-0.08	-0.16	0.29	-0.04	0.17	-0.11	-0.38	-0.22	0.20	0.12	-0.17	0.00	-0.55	0.22	1.34
2003(2)	0.06	-1.07	0.07	-0.30	-0.09	0.45	-0.05	0.29	0.00	0.12	-0.09	0.91	-0.04	0.68	0.11	1.18	-0.14	0.87	-0.12	1.32	0.31	-0.97	0.13	1.30
2008(2)	0.09	-1.04	0.05	0.49	-0.06	0.71	-0.02	-1.60	0.01	0.01	-0.09	1.84	-0.11	1.32	0.03	0.41	-0.01	-3.18	-0.05	0.08	0.19	0.17	0.12	0.55
2008(3)	0.05	-1.91	0.00	-0.34	-0.02	1.24	-0.07	-0.73	-0.03	0.05	-0.04	2.23	0.05	2.27	-0.07	0.33	0.03	-2.73	-0.01	-1.80	0.00	1.46	-0.32	-1.25
2008(4)	-0.09	-4.90	0.01	-1.69	-0.02	2.66	0.07	2.05	0.01	-0.18	0.05	4.47	-0.03	4.39	0.12	1.80	0.04	-2.12	-0.06	-4.07	0.10	4.97	-0.11	-5.08
2009(1)	-0.04	-4.97	-0.04	-3.82	0.07	4.97	-0.06	1.57	-0.01	-0.28	0.00	4.66	-0.07	3.61	-0.10	-0.68	-0.01	-1.94	0.10	-0.67	-0.27	1.35	-0.22	-0.71
2009(2)	0.03	-2.07	0.01	-3.32	-0.05	3.46	-0.02	-0.60	0.03	0.23	-0.04	1.95	-0.10	0.52	-0.02	-1.03	0.08	-1.58	0.10	1.85	-0.15	0.51	0.12	2.03
2009(3)	0.07	-0.47	0.04	-1.95	-0.01	1.65	-0.08	-1.25	-0.01	-0.20	-0.11	0.31	-0.07	-1.55	0.02	-0.53	0.06	-1.12	0.12	1.79	-0.08	-1.45	0.13	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the contribution of the oil consumption preferences shocks (C), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P), public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while C is the contribution yield by the oil consumption preferences shock.

Table 6: Historical decomposition over selected periods: contributions from oil inventories preferences shocks.

Oil inventories preferences shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT	INV	ACT
1990(2)	-0.21	-0.70	-0.05	-0.23	0.06	0.11	0.03	1.90	0.03	-0.02	0.15	0.74	0.09	-0.20	0.08	0.38	-0.05	-0.70	0.02	-0.64	0.03	-0.01	-0.07	-0.11
1990(3)	-0.12	-0.54	-0.06	-0.39	0.09	0.72	-0.05	0.90	-0.02	-0.08	0.08	0.85	0.02	0.42	-0.05	-0.22	-0.03	-0.48	0.15	-1.94	-0.22	0.66	0.02	0.70
1990(4)	-0.01	-0.35	0.00	-0.27	0.03	0.91	0.03	0.25	0.00	0.08	0.08	1.08	-0.03	0.18	0.01	-0.41	0.06	-1.14	-0.27	-2.00	0.15	0.84	-0.12	0.35
1991(1)	-0.23	-1.55	-0.15	-1.12	0.21	1.21	0.00	0.65	-0.02	-0.08	0.21	0.82	0.13	-0.46	0.03	0.60	-0.08	0.13	-0.13	0.10	0.02	-0.64	-0.11	-0.87
1991(2)	-0.21	-0.37	-0.19	-1.26	0.21	1.29	0.00	2.04	0.02	-0.07	0.17	0.76	0.12	-0.80	0.01	0.03	-0.06	-0.40	0.06	-0.12	0.01	-0.69	-0.07	-1.97
1991(3)	-0.10	-0.81	-0.13	-1.41	0.15	0.76	-0.05	0.99	-0.02	0.03	0.04	0.26	-0.05	-0.92	-0.03	-0.31	-0.06	0.07	0.19	-1.04	-0.19	-0.24	-0.01	-0.52
1991(4)	0.00	-0.13	-0.08	-1.54	0.07	0.74	0.02	0.63	0.00	-0.06	0.00	0.29	-0.16	-1.39	-0.02	-0.04	-0.02	0.11	-0.04	-1.28	-0.01	-0.72	-0.01	0.61
1992(1)	-0.10	0.00	-0.11	-1.09	0.10	1.44	0.01	1.25	0.01	-0.05	0.04	-0.12	-0.06	-1.79	0.02	0.62	-0.06	-0.69	-0.05	-0.18	-0.02	1.42	0.02	-0.47
1992(2)	-0.08	-1.05	-0.12	-1.49	0.09	1.43	0.00	1.79	0.00	0.01	0.04	0.67	-0.03	0.07	0.00	-0.20	-0.05	-0.72	-0.01	-0.86	0.01	-1.05	0.05	-0.25
1992(3)	-0.05	-0.45	-0.09	-1.99	0.10	1.34	0.01	1.61	-0.02	0.04	0.02	0.84	-0.02	-0.03	-0.01	0.20	-0.05	-0.85	-0.01	-1.92	0.00	-0.75	-0.03	0.85
1992(4)	-0.05	-1.03	-0.09	-2.47	0.09	1.34	0.07	0.46	0.00	0.02	-0.01	0.19	-0.04	-0.53	0.01	-0.06	-0.03	-1.19	0.02	-0.52	-0.01	-0.76	0.00	-1.93
1993(1)	-0.03	-1.02	-0.08	-2.18	0.06	1.09	0.03	1.05	0.00	-0.19	-0.02	-0.72	-0.03	-1.30	-0.02	-0.60	-0.02	-1.41	-0.01	0.65	-0.04	-0.83	0.06	-1.22
1993(2)	0.03	-0.40	-0.06	-1.53	0.04	0.58	0.00	1.00	-0.01	-0.06	0.00	-0.98	-0.02	-1.34	-0.02	-0.25	0.00	-0.27	-0.08	0.11	0.09	-0.49	0.00	0.26
1993(3)	-0.02	-0.07	-0.06	-1.08	0.06	1.05	0.00	0.90	-0.01	-0.22	0.00	-0.92	-0.01	-1.42	0.02	0.10	-0.02	-0.08	0.07	0.58	0.00	-0.43	-0.01	-0.84
2000(4)	0.08	-0.33	0.15	1.05	-0.14	-0.67	-0.07	-1.29	0.01	0.06	-0.03	0.74	0.00	0.01	0.01	-0.01	0.04	0.04	-0.09	-0.83	0.00	0.43	-0.04	-0.94
2001(1)	-0.02	-0.71	0.10	0.84	-0.04	0.06	-0.02	0.16	-0.01	-0.04	0.07	1.14	0.11	0.70	0.03	0.62	0.02	0.55	-0.18	-0.35	0.09	0.43	-0.15	0.27
2001(2)	-0.15	-0.99	-0.01	-0.54	0.08	0.21	0.01	-0.45	0.00	0.03	0.17	1.01	0.19	0.46	0.04	-0.95	-0.01	-0.09	-0.11	-0.23	0.10	1.16	-0.11	-1.14
2001(3)	-0.14	-1.14	-0.07	0.08	0.13	0.81	-0.02	-0.02	0.00	-0.14	0.16	1.50	0.14	1.25	0.00	0.78	-0.02	0.24	0.03	-1.48	0.01	-0.85	-0.09	0.15
2001(4)	-0.09	-0.95	-0.06	-0.07	0.08	1.22	-0.01	-0.85	0.00	-0.16	0.12	1.30	0.03	-0.01	-0.01	-0.24	0.01	0.16	0.06	0.37	-0.05	0.74	-0.04	0.08
2002(1)	-0.08	-0.59	-0.06	-0.50	0.08	0.20	0.00	-0.70	0.00	0.16	0.08	-0.02	-0.04	-1.21	-0.01	-0.44	-0.02	0.21	0.04	0.86	-0.06	-1.01	0.00	0.08
2002(2)	-0.08	-0.11	-0.06	-0.36	0.05	-0.07	0.01	-0.55	0.01	0.02	0.04	-0.42	-0.05	-1.52	0.00	-0.12	-0.01	0.48	-0.02	-0.50	-0.06	-0.54	0.04	1.25
2002(3)	-0.05	-0.44	-0.07	-0.39	0.07	0.42	-0.02	0.49	-0.01	-0.05	0.04	0.52	0.00	0.26	-0.02	0.27	-0.03	0.86	-0.17	-2.09	0.00	1.01	0.02	0.77
2002(4)	-0.08	-0.19	-0.12	-0.31	0.18	0.87	-0.06	-0.49	-0.02	-0.16	0.15	0.36	0.11	0.04	0.01	-0.19	-0.09	1.01	-0.24	0.13	0.16	1.82	-0.16	0.49
2003(1)	-0.23	-0.38	-0.20	-0.35	0.25	0.53	-0.02	-0.81	0.00	-0.08	0.18	0.29	0.12	0.17	0.05	-0.38	-0.15	0.20	-0.01	-0.17	0.02	-0.55	-0.12	1.34
2003(2)	-0.16	-1.07	-0.19	-0.30	0.23	0.45	-0.08	0.29	-0.01	0.12	0.12	0.91	0.00	0.68	-0.03	1.18	-0.13	0.87	0.17	1.32	-0.16	-0.97	-0.06	1.30
2008(2)	-0.09	-1.04	-0.04	0.49	0.03	0.71	0.06	-1.60	0.00	0.01	0.02	1.84	-0.09	1.32	-0.01	0.41	0.02	-3.18	0.03	0.08	-0.14	0.17	0.08	0.55
2008(3)	-0.04	-1.91	-0.05	-0.34	0.04	1.24	0.06	-0.73	0.01	0.05	0.05	2.23	-0.01	2.27	-0.01	0.33	0.04	-2.73	-0.18	-1.80	0.13	1.46	0.03	-1.25
2008(4)	-0.11	-4.90	-0.09	-1.69	0.11	2.66	0.04	2.05	-0.02	-0.18	0.07	4.47	0.11	4.39	0.02	1.80	0.00	-2.12	-0.06	-4.07	0.10	4.97	0.00	-5.08
2009(1)	-0.05	-4.97	-0.09	-3.82	0.10	4.97	0.07	1.57	0.00	-0.28	0.00	4.66	0.05	3.61	-0.02	-0.68	-0.03	-1.94	0.08	-0.67	0.00	1.35	0.05	-0.71
2009(2)	0.04	-2.07	-0.04	-3.32	0.05	3.46	-0.01	-0.60	0.00	0.23	-0.06	1.95	-0.02	0.52	-0.04	-1.03	-0.03	-1.58	0.06	1.85	-0.09	0.51	0.03	2.03
2009(3)	0.07	-0.47	-0.02	-1.95	-0.02	1.65	-0.01	-1.25	0.01	-0.20	-0.04	0.31	-0.05	-1.55	0.00	-0.53	-0.03	-1.12	-0.07	1.79	0.05	-1.45	0.04	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the contribution of the oil inventories preferences shocks (INV), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P), public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while INV is the contribution yield by the oil inventories preferences shock.

Table 7: Historical decomposition over selected periods: contributions from oil futures market speculative shocks.

Oil futures market speculative shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT	SPC	ACT
1990(2)	-0.01	-0.70	-0.05	-0.23	0.05	0.11	0.00	1.90	0.00	-0.02	0.01	0.74	0.09	-0.20	-0.04	0.38	-0.06	-0.70	0.16	-0.64	-0.06	-0.01	0.09	-0.11
1990(3)	0.13	-0.54	0.06	-0.39	-0.02	0.72	0.01	0.90	0.00	-0.08	-0.03	0.85	0.08	0.42	0.00	-0.22	-0.11	-0.48	-0.10	-1.94	0.20	0.66	0.14	0.70
1990(4)	0.00	-0.35	0.00	-0.27	-0.04	0.91	-0.09	0.25	0.00	0.08	0.03	1.08	0.06	0.18	0.00	-0.41	-0.14	-1.14	-0.05	-2.00	0.17	0.84	0.19	0.35
1991(1)	-0.06	-1.55	0.05	-1.12	-0.04	1.21	0.01	0.65	-0.02	-0.08	0.01	0.82	0.01	-0.46	0.06	0.60	-0.05	0.13	-0.10	0.10	0.08	-0.64	-0.20	-0.87
1991(2)	-0.13	-0.37	-0.04	-1.26	0.10	1.29	0.04	2.04	-0.01	-0.07	0.04	0.76	0.06	-0.80	-0.03	0.03	0.08	-0.40	0.10	-0.12	-0.16	-0.69	-0.25	-1.97
1991(3)	-0.03	-0.81	-0.04	-1.41	0.08	0.76	0.04	0.99	0.01	0.03	0.06	0.26	0.01	-0.92	-0.02	-0.31	0.16	0.07	-0.01	-1.04	0.01	-0.24	-0.09	-0.52
1991(4)	0.03	-0.13	-0.06	-1.54	0.02	0.74	-0.07	0.63	0.02	-0.06	0.02	0.29	-0.05	-1.39	-0.07	-0.04	0.05	0.11	-0.02	-1.28	-0.13	-0.72	0.15	0.61
1992(1)	-0.03	0.00	0.00	-1.09	-0.01	1.44	-0.06	1.25	0.00	-0.05	0.02	-0.12	-0.09	-1.79	0.07	0.62	0.07	-0.69	0.05	-0.18	-0.02	1.42	0.04	-0.47
1992(2)	-0.06	-1.05	-0.04	-1.49	0.09	1.43	0.01	1.79	-0.02	0.01	0.03	0.67	0.00	0.07	0.00	-0.20	0.02	-0.72	0.05	-0.86	-0.16	-1.05	-0.16	-0.25
1992(3)	-0.15	-0.45	-0.07	-1.99	0.14	1.34	0.10	1.61	0.01	0.04	0.15	0.84	0.06	-0.03	0.06	0.20	0.13	-0.85	-0.16	-1.92	0.15	-0.75	-0.15	0.85
1992(4)	-0.21	-1.03	-0.17	-2.47	0.20	1.34	0.08	0.46	-0.02	0.02	0.19	0.19	0.10	-0.53	-0.02	-0.06	0.06	-1.19	0.05	-0.52	-0.10	-0.76	-0.14	-1.93
1993(1)	-0.15	-1.02	-0.16	-2.18	0.14	1.09	0.02	1.05	0.01	-0.19	0.15	-0.72	0.00	-1.30	-0.02	-0.60	0.02	-1.41	0.09	0.65	-0.08	-0.83	0.04	-1.22
1993(2)	-0.07	-0.40	-0.09	-1.53	0.09	0.58	-0.04	1.00	0.00	-0.06	0.01	-0.98	-0.11	-1.34	-0.03	-0.25	-0.10	-0.27	0.09	0.11	-0.20	-0.49	0.05	0.26
1993(3)	-0.03	-0.07	-0.07	-1.08	0.04	1.05	-0.03	0.90	0.02	-0.22	-0.04	-0.92	-0.09	-1.42	0.02	0.10	-0.04	-0.08	0.07	0.58	-0.10	-0.43	0.01	-0.84
2000(4)	0.19	-0.33	0.15	1.05	-0.21	-0.67	-0.11	-1.29	0.02	0.06	-0.19	0.74	-0.08	0.01	0.00	-0.01	-0.08	0.04	0.02	-0.83	0.04	0.43	0.20	-0.94
2001(1)	0.21	-0.71	0.25	0.84	-0.21	0.06	-0.05	0.16	0.00	-0.04	-0.20	1.14	-0.04	0.70	0.02	0.62	-0.01	0.55	-0.05	-0.35	0.10	0.43	-0.05	0.27
2001(2)	0.11	-0.99	0.18	-0.54	-0.21	0.21	-0.01	-0.45	-0.02	0.03	-0.10	1.01	0.00	0.46	0.01	-0.95	0.04	-0.09	0.02	-0.23	0.16	1.16	-0.06	-1.14
2001(3)	0.12	-1.14	0.18	0.08	-0.16	0.81	0.02	-0.02	0.00	-0.14	-0.06	1.50	0.06	1.25	-0.02	0.78	0.03	0.24	-0.03	-1.48	0.10	-0.85	0.02	0.15
2001(4)	0.08	-0.95	0.18	-0.07	-0.19	1.22	-0.03	-0.85	0.00	-0.16	-0.02	1.30	0.03	-0.01	0.02	-0.24	0.11	0.16	0.00	0.37	0.07	0.74	-0.03	0.08
2002(1)	0.09	-0.59	0.16	-0.50	-0.18	0.20	-0.04	-0.70	-0.01	0.16	-0.08	-0.02	0.01	-1.21	-0.04	-0.44	0.02	0.21	0.13	0.86	-0.18	-1.01	-0.04	0.08
2002(2)	0.11	-0.11	0.20	-0.36	-0.18	-0.07	-0.07	-0.55	0.01	0.02	-0.08	-0.42	-0.01	-1.52	0.02	-0.12	0.08	0.48	-0.04	-0.50	0.01	-0.54	-0.04	1.25
2002(3)	0.03	-0.44	0.18	-0.39	-0.15	0.42	-0.03	0.49	-0.02	-0.05	-0.05	0.52	-0.04	0.26	0.03	0.27	0.15	0.86	-0.03	-2.09	0.08	1.01	-0.23	0.77
2002(4)	0.04	-0.19	0.08	-0.31	-0.08	0.87	-0.02	-0.49	0.01	-0.16	-0.02	0.36	0.09	0.04	-0.05	-0.19	0.13	1.01	0.03	0.13	-0.17	1.82	-0.08	0.49
2003(1)	0.06	-0.38	0.13	-0.35	-0.06	0.53	0.00	-0.81	0.01	-0.08	0.05	0.29	0.04	0.17	0.05	-0.38	0.15	0.20	-0.18	-0.17	0.17	-0.55	0.05	1.34
2003(2)	-0.07	-1.07	0.01	-0.30	-0.01	0.45	-0.01	0.29	-0.02	0.12	0.10	0.91	0.06	0.68	0.00	1.18	0.10	0.87	0.15	1.32	-0.06	-0.97	-0.07	1.30
2008(2)	-0.02	-1.04	-0.06	0.49	0.07	0.71	0.09	-1.60	0.00	0.01	0.12	1.84	0.09	1.32	-0.05	0.41	0.12	-3.18	-0.05	0.08	-0.02	0.17	0.07	0.55
2008(3)	-0.05	-1.91	-0.08	-0.34	0.02	1.24	0.00	-0.73	0.02	0.05	0.10	2.23	0.00	2.27	0.00	0.33	-0.01	-2.73	-0.04	-1.80	-0.08	1.46	0.20	-1.25
2008(4)	-0.08	-4.90	-0.07	-1.69	0.14	2.66	0.05	2.05	0.01	-0.18	0.06	4.47	0.11	4.39	0.05	1.80	0.03	-2.12	0.01	-4.07	-0.06	4.97	-0.04	-5.08
2009(1)	-0.02	-4.97	-0.08	-3.82	0.14	4.97	0.04	1.57	-0.02	-0.28	0.04	4.66	0.07	3.61	0.01	-0.68	-0.02	-1.94	0.01	-0.67	0.15	1.35	-0.02	-0.71
2009(2)	-0.02	-2.07	-0.11	-3.32	0.10	3.46	-0.02	-0.60	0.01	0.23	0.04	1.95	0.06	0.52	-0.06	-1.03	-0.14	-1.58	0.05	1.85	-0.02	0.51	0.16	2.03
2009(3)	-0.03	-0.47	-0.05	-1.95	0.03	1.65	-0.04	-1.25	0.02	-0.20	0.06	0.31	0.01	-1.55	0.05	-0.53	-0.14	-1.12	-0.08	1.79	0.07	-1.45	0.08	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the contribution of the oil futures market speculative shocks (SPC), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P) , public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while SPC is the contribution yield by the oil futures market speculative shocks.

Table 8: Historical decomposition over selected periods: contributions from other real oil price shocks.

Other real oil price shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT	OP	ACT
1990(2)	-0.04	-0.70	-0.04	-0.23	0.05	0.11	-0.02	1.90	-0.01	-0.02	0.04	0.74	0.02	-0.20	-0.01	0.38	-0.02	-0.70	-0.23	-0.64	0.11	-0.01	-0.01	-0.11
1990(3)	-0.05	-0.54	-0.07	-0.39	0.03	0.72	0.05	0.90	0.01	-0.08	0.03	0.85	0.02	0.42	0.02	-0.22	-0.02	-0.48	0.18	-1.94	-0.05	0.66	0.07	0.70
1990(4)	0.01	-0.35	0.00	-0.27	0.02	0.91	-0.05	0.25	-0.02	0.08	0.00	1.08	0.00	0.18	-0.03	-0.41	-0.02	-1.14	0.03	-2.00	-0.01	0.84	-0.04	0.35
1991(1)	-0.02	-1.55	-0.02	-1.12	0.02	1.21	0.01	0.65	0.00	-0.08	0.00	0.82	-0.02	-0.46	0.02	0.60	-0.01	0.13	-0.01	0.10	0.04	-0.64	-0.10	-0.87
1991(2)	-0.06	-0.37	-0.05	-1.26	0.06	1.29	-0.03	2.04	0.01	-0.07	0.02	0.76	0.02	-0.80	0.00	0.03	-0.05	-0.40	-0.04	-0.12	-0.07	-0.69	0.00	-1.97
1991(3)	0.01	-0.81	-0.01	-1.41	-0.01	0.76	-0.01	0.99	0.01	0.03	-0.02	0.26	-0.03	-0.92	-0.01	-0.31	-0.01	0.07	0.20	-1.04	-0.04	-0.24	-0.01	-0.52
1991(4)	0.00	-0.13	0.02	-1.54	0.01	0.74	-0.06	0.63	-0.02	-0.06	0.01	0.29	-0.03	-1.39	-0.01	-0.04	-0.01	0.11	-0.11	-1.28	0.06	-0.72	-0.07	0.61
1992(1)	-0.06	0.00	-0.03	-1.09	0.03	1.44	0.02	1.25	0.01	-0.05	0.02	-0.12	-0.02	-1.79	0.03	0.62	-0.02	-0.69	0.12	-0.18	0.01	1.42	-0.02	-0.47
1992(2)	-0.05	-1.05	-0.02	-1.49	0.05	1.43	-0.09	1.79	0.00	0.01	0.04	0.67	0.03	0.07	-0.02	-0.20	-0.06	-0.72	0.05	-0.86	-0.05	-1.05	-0.06	-0.25
1992(3)	-0.06	-0.45	-0.02	-1.99	0.02	1.34	-0.04	1.61	0.00	0.04	0.05	0.84	0.00	-0.03	0.02	0.20	-0.03	-0.85	-0.13	-1.92	0.04	-0.75	-0.12	0.85
1992(4)	-0.08	-1.03	-0.04	-2.47	0.06	1.34	0.04	0.46	0.00	0.02	0.04	0.19	0.00	-0.53	0.02	-0.06	-0.04	-1.19	0.09	-0.52	-0.11	-0.76	0.00	-1.93
1993(1)	-0.02	-1.02	-0.02	-2.18	0.04	1.09	-0.02	1.05	0.00	-0.19	0.03	-0.72	-0.01	-1.30	-0.04	-0.60	-0.03	-1.41	-0.14	0.65	0.05	-0.83	0.00	-1.22
1993(2)	-0.06	-0.40	-0.04	-1.53	0.02	0.58	0.05	1.00	0.00	-0.06	0.03	-0.98	-0.01	-1.34	0.03	-0.25	0.00	-0.27	0.05	0.11	0.01	-0.49	0.06	0.26
1993(3)	-0.02	-0.07	-0.04	-1.08	0.05	1.05	0.00	0.90	-0.01	-0.22	0.02	-0.92	0.00	-1.42	-0.03	0.10	-0.02	-0.08	-0.05	0.58	0.05	-0.43	0.06	-0.84
2000(4)	0.02	-0.33	0.05	1.05	-0.04	-0.67	-0.10	-1.29	0.00	0.06	-0.02	0.74	0.00	0.01	0.03	-0.01	0.02	0.04	0.15	-0.83	-0.09	0.43	-0.11	-0.94
2001(1)	0.00	-0.71	0.06	0.84	-0.02	0.06	-0.05	0.16	-0.01	-0.04	0.01	1.14	-0.02	0.70	0.01	0.62	-0.01	0.55	0.06	-0.35	-0.03	0.43	-0.12	0.27
2001(2)	-0.05	-0.99	0.03	-0.54	0.00	0.21	-0.06	-0.45	0.01	0.03	0.04	1.01	0.00	0.46	0.01	-0.95	-0.02	-0.09	0.05	-0.23	0.03	1.16	-0.12	-1.14
2001(3)	-0.11	-1.14	-0.01	0.08	0.04	0.81	-0.10	-0.02	0.00	-0.14	0.10	1.50	0.05	1.25	0.02	0.78	-0.06	0.24	-0.06	-1.48	0.00	-0.85	-0.09	0.15
2001(4)	-0.11	-0.95	-0.02	-0.07	0.05	1.22	0.00	-0.85	0.00	-0.16	0.10	1.30	0.03	-0.01	0.03	-0.24	-0.04	0.16	-0.09	0.37	-0.02	0.74	-0.09	0.08
2002(1)	-0.10	-0.59	-0.03	-0.50	0.07	0.20	0.05	-0.70	-0.01	0.16	0.07	-0.02	0.02	-1.21	-0.01	-0.44	-0.03	0.21	-0.01	0.86	-0.08	-1.01	0.01	0.08
2002(2)	-0.07	-0.11	-0.05	-0.36	0.07	-0.07	0.06	-0.55	0.00	0.02	0.08	-0.42	0.03	-1.52	-0.01	-0.12	0.01	0.48	-0.03	-0.50	0.10	-0.54	0.05	1.25
2002(3)	-0.09	-0.44	-0.10	-0.39	0.10	0.42	0.03	0.49	0.00	-0.05	0.08	0.52	0.04	0.26	-0.01	0.27	-0.01	0.86	-0.12	-2.09	0.12	1.01	0.05	0.77
2002(4)	-0.06	-0.19	-0.11	-0.31	0.10	0.87	0.01	-0.49	0.00	-0.16	0.04	0.36	0.02	0.04	-0.02	-0.19	-0.03	1.01	0.12	0.13	-0.04	1.82	0.08	0.49
2003(1)	0.01	-0.38	-0.04	-0.35	0.06	0.53	-0.03	-0.81	-0.01	-0.08	-0.01	0.29	-0.01	0.17	-0.02	-0.38	-0.03	0.20	-0.03	-0.17	-0.04	-0.55	0.00	1.34
2003(2)	0.02	-1.07	-0.04	-0.30	0.02	0.45	0.02	0.29	0.00	0.12	-0.04	0.91	-0.05	0.68	0.01	1.18	-0.01	0.87	0.01	1.32	-0.02	-0.97	0.01	1.30
2008(2)	-0.02	-1.04	-0.01	0.49	0.01	0.71	0.02	-1.60	0.01	0.01	-0.02	1.84	-0.05	1.32	0.01	0.41	-0.04	-3.18	0.18	0.08	-0.12	0.17	0.08	0.55
2008(3)	0.02	-1.91	0.01	-0.34	0.00	1.24	-0.04	-0.73	-0.01	0.05	0.01	2.23	-0.05	2.27	-0.02	0.33	-0.03	-2.73	-0.28	-1.80	0.09	1.46	0.02	-1.25
2008(4)	-0.06	-4.90	-0.05	-1.69	0.02	2.66	0.13	2.05	0.01	-0.18	0.02	4.47	-0.01	4.39	0.05	1.80	0.01	-2.12	-0.09	-4.07	0.06	4.97	0.08	-5.08
2009(1)	0.00	-4.97	-0.03	-3.82	0.04	4.97	0.07	1.57	-0.01	-0.28	0.00	4.66	0.05	3.61	-0.05	-0.68	0.00	-1.94	0.02	-0.67	-0.03	1.35	0.16	-0.71
2009(2)	0.06	-2.07	-0.01	-3.32	-0.01	3.46	0.06	-0.60	0.00	0.23	-0.04	1.95	0.01	0.52	-0.01	-1.03	0.07	-1.58	-0.02	1.85	0.08	0.51	0.06	2.03
2009(3)	0.04	-0.47	-0.03	-1.95	0.01	1.65	0.05	-1.25	-0.01	-0.20	-0.04	0.31	0.01	-1.55	-0.01	-0.53	0.04	-1.12	0.01	1.79	0.01	-1.45	0.11	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the contribution of the other real oil price shocks (OP), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P) , public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while OP is the contribution yield by the other real oil price shocks.

Table 9: Historical decomposition over selected periods: contributions from other nominal oil price volatility shocks.

Other nominal oil price volatility shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT	OV	ACT
1990(2)	-0.14	-0.70	-0.11	-0.23	0.17	0.11	0.19	1.90	-0.01	-0.02	0.13	0.74	0.15	-0.20	0.00	0.38	0.09	-0.70	-0.25	-0.64	0.21	-0.01	-0.11	-0.11
1990(3)	-0.11	-0.54	-0.17	-0.39	0.21	0.72	0.12	0.90	0.00	-0.08	0.13	0.85	0.18	0.42	-0.06	-0.22	0.16	-0.48	0.05	-1.94	0.08	0.66	-0.07	0.70
1990(4)	0.06	-0.35	-0.11	-0.27	0.07	0.91	0.01	0.25	0.01	0.08	-0.01	1.08	-0.03	0.18	-0.07	-0.41	0.17	-1.14	0.21	-2.00	-0.10	0.84	0.02	0.35
1991(1)	0.19	-1.55	0.01	-1.12	-0.06	1.21	-0.09	0.65	0.01	-0.08	-0.16	0.82	-0.17	-0.46	-0.05	0.60	0.11	0.13	0.25	0.10	-0.27	-0.64	0.03	-0.87
1991(2)	0.23	-0.37	0.11	-1.26	-0.17	1.29	-0.15	2.04	0.03	-0.07	-0.24	0.76	-0.22	-0.80	0.00	0.03	0.02	-0.40	0.17	-0.12	-0.24	-0.69	0.06	-1.97
1991(3)	0.19	-0.81	0.16	-1.41	-0.23	0.76	-0.14	0.99	0.01	0.03	-0.21	0.26	-0.19	-0.92	0.04	-0.31	-0.08	0.07	0.09	-1.04	-0.14	-0.24	0.04	-0.52
1991(4)	0.09	-0.13	0.17	-1.54	-0.23	0.74	-0.02	0.63	0.00	-0.06	-0.12	0.29	-0.13	-1.39	0.07	-0.04	-0.11	0.11	-0.15	-1.28	0.02	-0.72	0.00	0.61
1992(1)	-0.09	0.00	0.10	-1.09	-0.03	1.44	0.09	1.25	-0.03	-0.05	0.07	-0.12	0.12	-1.79	0.07	0.62	-0.04	-0.69	-0.21	-0.18	0.16	1.42	-0.12	-0.47
1992(2)	-0.20	-1.05	-0.04	-1.49	0.08	1.43	0.19	1.79	0.00	0.01	0.19	0.67	0.19	0.07	0.04	-0.20	0.00	-0.72	-0.17	-0.86	0.20	-1.05	-0.07	-0.25
1992(3)	-0.17	-0.45	-0.13	-1.99	0.10	1.34	0.20	1.61	-0.01	0.04	0.16	0.84	0.10	-0.03	-0.02	0.20	-0.01	-0.85	-0.04	-1.92	0.00	-0.75	0.07	0.85
1992(4)	-0.07	-1.03	-0.13	-2.47	0.10	1.34	0.19	0.46	-0.02	0.02	0.10	0.19	0.03	-0.53	0.00	-0.06	0.03	-1.19	-0.14	-0.52	0.05	-0.76	0.06	-1.93
1993(1)	-0.07	-1.02	-0.15	-2.18	0.15	1.09	0.15	1.05	-0.01	-0.19	0.05	-0.72	-0.01	-1.30	-0.01	-0.60	-0.01	-1.41	-0.15	0.65	0.07	-0.83	0.08	-1.22
1993(2)	-0.03	-0.40	-0.17	-1.53	0.13	0.58	0.10	1.00	0.00	-0.06	0.00	-0.98	-0.03	-1.34	-0.04	-0.25	-0.01	-0.27	0.04	0.11	0.02	-0.49	0.08	0.26
1993(3)	0.08	-0.07	-0.13	-1.08	-0.02	1.05	0.11	0.90	0.01	-0.22	-0.11	-0.92	-0.21	-1.42	-0.01	0.10	-0.05	-0.08	0.00	0.58	-0.08	-0.43	0.17	-0.84
2000(4)	0.16	-0.33	0.04	1.05	-0.08	-0.67	-0.04	-1.29	0.01	0.06	-0.12	0.74	-0.10	0.01	-0.02	-0.01	0.14	0.04	0.04	-0.83	-0.04	0.43	-0.09	-0.94
2001(1)	0.13	-0.71	0.09	0.84	-0.11	0.06	-0.03	0.16	0.02	-0.04	-0.13	1.14	-0.11	0.70	0.01	0.62	0.09	0.55	0.05	-0.35	-0.12	0.43	-0.05	0.27
2001(2)	0.11	-0.99	0.11	-0.54	-0.07	0.21	-0.11	-0.45	0.00	0.03	-0.07	1.01	0.02	0.46	-0.03	-0.95	0.14	-0.09	0.16	-0.23	-0.07	1.16	-0.14	-1.14
2001(3)	0.12	-1.14	0.13	0.08	-0.19	0.81	-0.06	-0.02	0.04	-0.14	-0.10	1.50	-0.09	1.25	0.03	0.78	0.06	0.24	0.14	-1.48	-0.10	-0.85	-0.02	0.15
2001(4)	0.11	-0.95	0.16	-0.07	-0.20	1.22	-0.06	-0.85	-0.01	-0.16	-0.10	1.30	-0.11	-0.01	0.00	-0.24	-0.02	0.16	0.13	0.37	-0.24	0.74	0.04	0.08
2002(1)	0.03	-0.59	0.17	-0.50	-0.13	0.20	0.01	-0.70	0.00	0.16	0.01	-0.02	0.05	-1.21	0.08	-0.44	0.02	0.21	-0.24	0.86	0.14	-1.01	-0.12	0.08
2002(2)	-0.16	-0.11	0.03	-0.36	0.04	-0.07	0.07	-0.55	0.00	0.02	0.13	-0.42	0.15	-1.52	0.05	-0.12	-0.05	0.48	-0.13	-0.50	0.11	-0.54	-0.06	1.25
2002(3)	-0.14	-0.44	-0.05	-0.39	0.08	0.42	0.07	0.49	-0.01	-0.05	0.17	0.52	0.20	0.26	-0.03	0.27	0.03	0.86	0.01	-2.09	0.11	1.01	-0.07	0.77
2002(4)	-0.08	-0.19	-0.06	-0.31	0.03	0.87	0.11	-0.49	0.00	-0.16	0.10	0.36	0.04	0.04	0.01	-0.19	-0.03	1.01	-0.04	0.13	0.02	1.82	0.06	0.49
2003(1)	-0.06	-0.38	-0.08	-0.35	0.06	0.53	0.09	-0.81	-0.02	-0.08	0.05	0.29	-0.03	0.17	-0.02	-0.38	-0.09	0.20	-0.09	-0.17	-0.08	-0.55	0.12	1.34
2003(2)	-0.07	-1.07	-0.09	-0.30	0.13	0.45	0.06	0.29	-0.01	0.12	0.08	0.91	0.07	0.68	0.02	1.18	-0.03	0.87	-0.21	1.32	0.18	-0.97	-0.03	1.30
2008(2)	0.18	-1.04	0.04	0.49	-0.16	0.71	0.01	-1.60	0.01	0.01	-0.20	1.84	-0.27	1.32	0.04	0.41	-0.03	-3.18	-0.01	0.08	-0.12	0.17	0.09	0.55
2008(3)	0.09	-1.91	0.04	-0.34	-0.13	1.24	0.05	-0.73	-0.01	0.05	-0.16	2.23	-0.22	2.27	0.03	0.33	-0.11	-2.73	-0.08	-1.80	-0.12	1.46	0.09	-1.25
2008(4)	0.00	-4.90	0.02	-1.69	-0.06	2.66	0.13	2.05	-0.01	-0.18	-0.04	4.47	-0.04	4.39	0.07	1.80	-0.04	-2.12	-0.30	-4.07	0.15	4.97	-0.04	-5.08
2009(1)	-0.14	-4.97	-0.07	-3.82	0.11	4.97	0.19	1.57	-0.02	-0.28	0.11	4.66	0.13	3.61	0.03	-0.68	0.03	-1.94	-0.20	-0.67	0.23	1.35	-0.13	-0.71
2009(2)	-0.13	-2.07	-0.15	-3.32	0.13	3.46	0.20	-0.60	0.00	0.23	0.11	1.95	0.09	0.52	-0.04	-1.03	0.09	-1.58	-0.01	1.85	0.04	0.51	-0.03	2.03
2009(3)	0.00	-0.47	-0.12	-1.95	0.09	1.65	0.12	-1.25	-0.01	-0.20	0.03	0.31	0.01	-1.55	-0.05	-0.53	0.14	-1.12	0.09	1.79	-0.10	-1.45	0.00	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the contribution of nominal oil price volatility shocks (OV), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P), public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while OV is the contribution yield by the nominal oil price volatility shock.

Table 10: Historical decomposition over selected periods: joint contributions from oil market shocks.

Oil market shocks																								
	Y		E		U		W		P		G		L		R		H		F		FV		X	
	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT	OM	ACT
1990(2)	0.02	-0.70	0.18	-0.23	-0.57	0.11	0.56	1.90	0.13	-0.02	-0.18	0.74	-0.20	-0.20	0.37	0.38	-0.12	-0.70	-0.60	-0.64	-0.89	-0.01	0.63	-0.11
1990(3)	-0.47	-0.54	0.11	-0.39	-0.03	0.72	0.41	0.90	-0.02	-0.08	0.42	0.85	-0.13	0.42	0.15	-0.22	-0.28	-0.48	-1.92	-1.94	0.34	0.66	-0.24	0.70
1990(4)	0.65	-0.35	0.19	-0.27	-0.09	0.91	0.42	0.25	0.16	0.08	0.14	1.08	-0.43	0.18	-0.53	-0.41	-0.03	-1.14	-0.64	-2.00	0.73	0.84	0.60	0.35
1991(1)	-0.33	-1.55	-0.29	-1.12	0.18	1.21	0.47	0.65	-0.05	-0.08	0.23	0.82	-0.33	-0.46	0.57	0.60	0.20	0.13	0.29	0.10	0.30	-0.64	-0.37	-0.87
1991(2)	0.11	-0.37	-0.53	-1.26	0.45	1.29	1.48	2.04	-0.05	-0.07	0.29	0.76	-0.66	-0.80	0.01	0.03	0.54	-0.40	1.02	-0.12	1.59	-0.69	-0.71	-1.97
1991(3)	-0.22	-0.81	-0.49	-1.41	0.36	0.76	0.72	0.99	-0.01	0.03	0.02	0.26	-0.56	-0.92	-0.13	-0.31	0.46	0.07	-0.45	-1.04	0.29	-0.24	0.03	-0.52
1991(4)	0.03	-0.13	-0.48	-1.54	0.16	0.74	0.33	0.63	-0.02	-0.06	-0.01	0.29	-0.67	-1.39	-0.11	-0.04	0.37	0.11	-1.37	-1.28	-0.85	-0.72	0.96	0.61
1992(1)	0.32	0.00	-0.17	-1.09	-0.31	1.44	0.20	1.25	0.10	-0.05	-0.21	-0.12	-1.19	-1.79	0.10	0.62	0.32	-0.69	0.14	-0.18	-0.55	1.42	0.18	-0.47
1992(2)	-0.09	-1.05	-0.07	-1.49	-0.04	1.43	-0.01	1.79	-0.04	0.01	-0.24	0.67	-0.65	0.07	-0.12	-0.20	0.01	-0.72	-1.10	-0.86	-0.99	-1.05	0.03	-0.25
1992(3)	-0.12	-0.45	-0.10	-1.99	0.00	1.34	0.47	1.61	0.01	0.04	-0.07	0.84	-0.27	-0.03	0.45	0.20	0.43	-0.85	-1.46	-1.92	-0.09	-0.75	-0.14	0.85
1992(4)	-0.20	-1.03	-0.38	-2.47	0.27	1.34	0.61	0.46	-0.09	0.02	-0.13	0.19	-0.01	-0.53	-0.14	-0.06	0.22	-1.19	-0.01	-0.52	0.03	-0.76	-0.77	-1.93
1993(1)	-0.14	-1.02	-0.39	-2.18	0.19	1.09	0.74	1.05	0.00	-0.19	-0.12	-0.72	-0.07	-1.30	0.05	-0.60	0.56	-1.41	1.31	0.65	0.57	-0.83	-0.49	-1.22
1993(2)	-0.18	-0.40	-0.36	-1.53	0.29	0.58	0.52	1.00	-0.09	-0.06	0.00	-0.98	-0.05	-1.34	-0.01	-0.25	0.15	-0.27	-0.10	0.11	0.16	-0.49	-0.02	0.26
1993(3)	0.18	-0.07	-0.33	-1.08	-0.07	1.05	0.58	0.90	0.05	-0.22	-0.21	-0.92	-0.39	-1.42	-0.04	0.10	0.29	-0.08	0.77	0.58	0.08	-0.43	-0.27	-0.84
2000(4)	0.16	-0.33	0.56	1.05	-0.62	-0.67	-0.66	-1.29	0.07	0.06	-0.06	0.74	-0.01	0.01	0.05	-0.01	0.09	0.04	-0.71	-0.83	-0.19	0.43	-0.14	-0.94
2001(1)	0.19	-0.71	0.62	0.84	-0.18	0.06	-0.31	0.16	-0.06	-0.04	0.04	1.14	0.13	0.70	0.24	0.62	0.36	0.55	-0.40	-0.35	0.26	0.43	-0.12	0.27
2001(2)	0.17	-0.99	0.47	-0.54	-0.21	0.21	-0.72	-0.45	0.02	0.03	-0.01	1.01	0.32	0.46	-0.33	-0.95	0.35	-0.09	-0.76	-0.23	0.15	1.16	-0.13	-1.14
2001(3)	0.02	-1.14	0.57	0.08	-0.43	0.81	-0.52	-0.02	0.04	-0.14	-0.05	1.50	0.36	1.25	0.16	0.78	0.33	0.24	-1.72	-1.48	-0.09	-0.85	-0.24	0.15
2001(4)	0.08	-0.95	0.67	-0.07	-0.37	1.22	-0.28	-0.85	-0.05	-0.16	0.12	1.30	0.12	-0.01	0.24	-0.24	0.41	0.16	0.32	0.37	0.28	0.74	-0.47	0.08
2002(1)	-0.19	-0.59	0.55	-0.50	-0.40	0.20	-0.26	-0.70	0.00	0.16	0.22	-0.02	0.01	-1.21	-0.13	-0.44	-0.04	0.21	1.08	0.86	0.24	-1.01	-0.51	0.08
2002(2)	-0.28	-0.11	0.33	-0.36	-0.17	-0.07	-0.03	-0.55	0.07	0.02	0.30	-0.42	0.20	-1.52	0.03	-0.12	0.12	0.48	-0.23	-0.50	-0.16	-0.54	-0.10	1.25
2002(3)	-0.28	-0.44	0.00	-0.39	0.07	0.42	0.08	0.49	-0.03	-0.05	0.34	0.52	0.40	0.26	-0.01	0.27	0.45	0.86	-1.69	-2.09	0.38	1.01	-0.50	0.77
2002(4)	-0.06	-0.19	-0.13	-0.31	0.23	0.87	0.07	-0.49	-0.02	-0.16	0.22	0.36	0.14	0.04	-0.12	-0.19	0.24	1.01	0.35	0.13	0.34	1.82	0.17	0.49
2003(1)	-0.29	-0.38	-0.06	-0.35	0.24	0.53	-0.45	-0.81	-0.02	-0.08	0.11	0.29	0.24	0.17	-0.08	-0.38	-0.28	0.20	-0.23	-0.17	-0.38	-0.55	0.36	1.34
2003(2)	-0.09	-1.07	-0.02	-0.30	0.07	0.45	-0.19	0.29	0.04	0.12	0.22	0.91	-0.15	0.68	0.24	1.18	-0.26	0.87	0.67	1.32	-0.69	-0.97	0.44	1.30
2008(2)	-0.19	-1.04	0.24	0.49	-0.08	0.71	-0.44	-1.60	0.01	0.01	0.29	1.84	0.14	1.32	0.01	0.41	-0.31	-3.18	-0.36	0.08	0.10	0.17	0.47	0.55
2008(3)	-0.23	-1.91	0.18	-0.34	-0.05	1.24	-0.62	-0.73	-0.04	0.05	0.29	2.23	0.46	2.27	-0.09	0.33	-0.23	-2.73	-1.51	-1.80	0.12	1.46	-0.23	-1.25
2008(4)	-0.89	-4.90	-0.01	-1.69	0.29	2.66	0.06	2.05	-0.05	-0.18	0.60	4.47	0.73	4.39	0.37	1.80	0.17	-2.12	-3.73	-4.07	0.89	4.97	-0.75	-5.08
2009(1)	-0.21	-4.97	-0.18	-3.82	0.56	4.97	-0.04	1.57	-0.04	-0.28	0.40	4.66	0.54	3.61	-0.44	-0.68	0.31	-1.94	-0.81	-0.67	0.12	1.35	0.03	-0.71
2009(2)	0.21	-2.07	-0.14	-3.32	0.09	3.46	-0.30	-0.60	0.07	0.23	0.01	1.95	-0.07	0.52	-0.17	-1.03	0.52	-1.58	1.24	1.85	-0.25	0.51	0.63	2.03
2009(3)	0.42	-0.47	0.06	-1.95	-0.15	1.65	-0.07	-1.25	-0.02	-0.20	-0.14	0.31	-0.26	-1.55	0.01	-0.53	0.40	-1.12	1.73	1.79	0.17	-1.45	0.32	1.64

The table reports the historical decomposition (net of base prediction) for various macroeconomic and financial variables, relatively to the joint contribution of oil market shocks (OV), over selected sub periods. The macroeconomic and financial variables are real activity growth (Y), employment growth (E), unemployment rate changes (U), real wages growth (W), core inflation (nominal factor, P), public expenditure to GDP ratio growth (G), excess liquidity (L), real interest rate in changes (R), real housing price returns (H), real stock price returns (F), nominal stock price volatility (FV), nominal US$ exchange rate index return (X). For each of the macroeconomic and financial variables, ACT denotes the actual realization of the variable (net of base prediction), while OV is the contribution yield by the nominal oil price volatility shock.

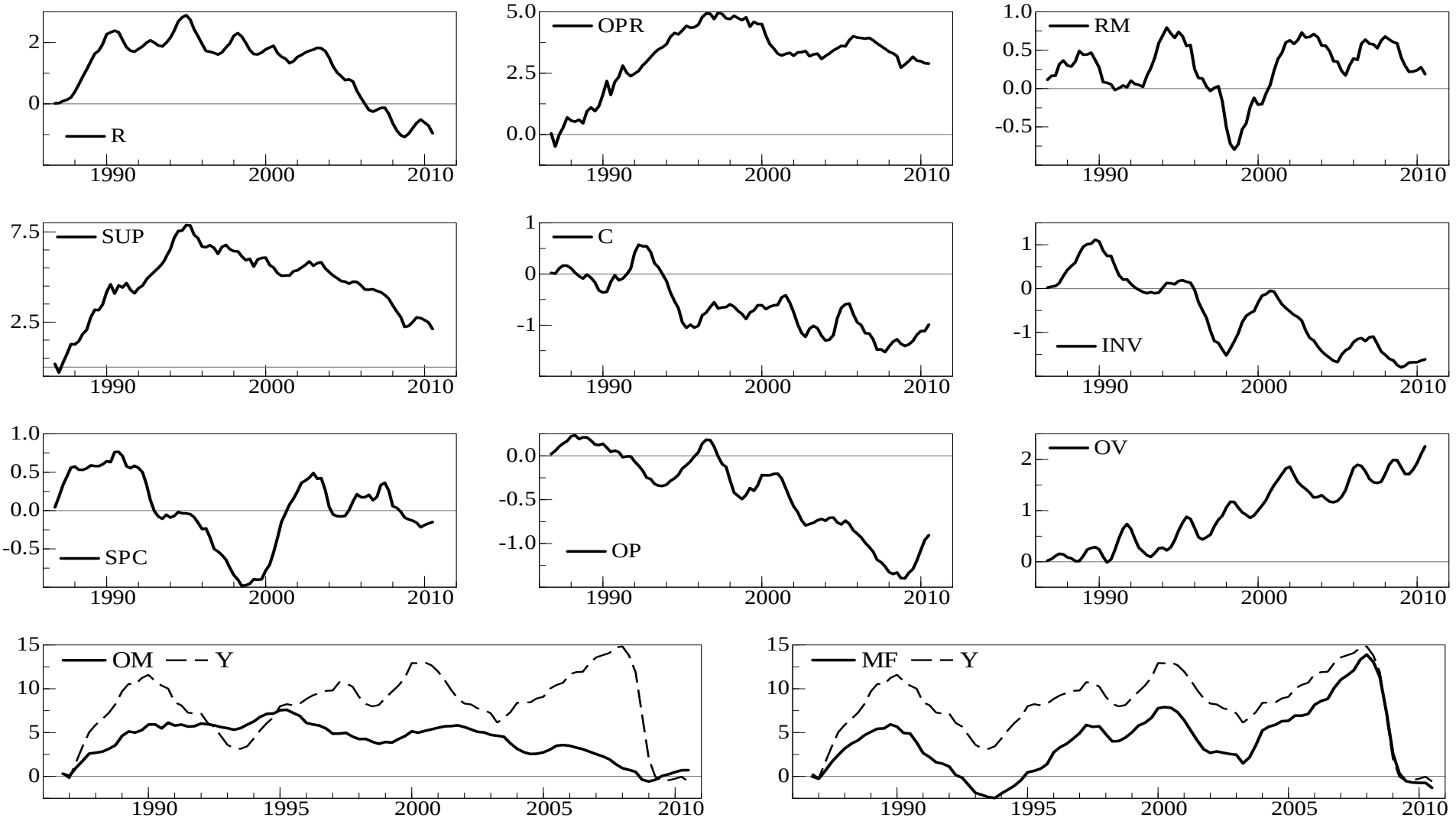

Figure 1: Cumulative historical decomposition; contribution of various categories of shocks to real activity. Reserves shocks (R), oil production shocks (OPR), refinery margins shocks (RM), oil market supply side shocks (SUP: R + OPR + RM), oil consumption (C) and inventories (INV) preferences shocks, oil futures market speculative shocks (SPC), other real oil price (OP) and nominal oil price volatility (OV) shocks; oil market shocks (OM: SUP + C + INV + SPC + OP + OV) and macro-financial shocks (MF, all the remaining shocks).

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