On the link between oil price and exchange rate: a time-varying VAR parameter approach

Séminaire FIME (2014)

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EconomiX and IFPEN

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Context

1. **No clear-cut** result regarding the **direction** (literature) and **size** (different sample period) of the relationship between exchange rate & oil price.

2. Strong increase in volatility of exchange rate and oil price since 1970 (end of Bretton Woods, takeover of OPEC in 1973-1974).

3. Increasing financialization of commodity markets (since 1993-2000).

4. Petrodollar recycling and **commodities labeled in USD** (reinforced the link between HWWI and oil price).

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Motivation of the paper

1. A better understanding of the relationship between Oil Prices and Exchange Rates.
2. Assessing the **time-varying** nature of the relationship in order to reconciliate different findings in the literature (context 1).
3. Assessing the growing impact of financialization in influencing the relationship.

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Oil price causes USD

1. Positive link: Amano and Van Norden (1998a,1998b), Bénassy-Quéré et al. (2007), Chen and Chen (2007).

2. Negative link: Lizardo and Mollick (2010), Bénassy-Quéré et al. (2007) (from 2002 to 2004), Reboredo et al. (2014).

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USD causes oil prices

1. Negative link: Sadorsky (2000) and Krichene (2007).

2. Positive link: Zhang et al. (2008).

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2. Positive link: Zhang et al. (2008).

Bilateral causality

Percebois (2009) and Benhmad (2012).

Methodology: TVP-VAR

- The Time-varying parameter VAR model:

$$
\begin{aligned}
B_t Y_t &= d_t + C_{1,t} Y_{t-1} + \cdots + C_{p,t} Y_{t-p} + \Sigma_t v_t \text{ (structural)} \\
Y_t &= c_t + A_{1,t} Y_{t-1} + \cdots + A_{p,t} Y_{t-p} + \epsilon_t \text{ (reduced form)}
\end{aligned}
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where $A_{p,t} = B_t^{-1} C_{p,t}$, $c_t = B_t^{-1} d_t$ and $\epsilon_t = B_t^{-1} \Sigma_t v_t$.

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- Change in the relationship between variables over the sample period comes from 3 sources:

  1. The **contemporaneous** relationship B_t.
  2. The **propagation mechanism** or dynamics of the model $C_{p,t}$.

Methodology: TVP-VAR

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- Change in the relationship between variables over the sample period comes from 3 sources:

  1. The **contemporaneous** relationship B_t.
  2. The **propagation mechanism** or dynamics of the model $C_{p,t}$.
  3. The size of the **volatility** of variables Σ_t.

Why the relationship should be time-varying?

1. Strong increase in the volatility of foreign exchange market and oil price. In contrast, great moderation for real activity.

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2. Different nature of shocks underlying the dynamics of oil price (Kilian (2009)).

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1. Strong increase in the volatility of foreign exchange market and oil price. In contrast, great moderation for real activity.

2. Different nature of shocks underlying the dynamics of oil price (Kilian (2009)).

3. The growing financialisation of commodities markets.

Methodology: TVP-VAR

- Parameters of interest evolve according to:

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  1. model possible **abrupt break** in the evolution of parameters.

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  2. model **gradual changes** in the relationship between variables.

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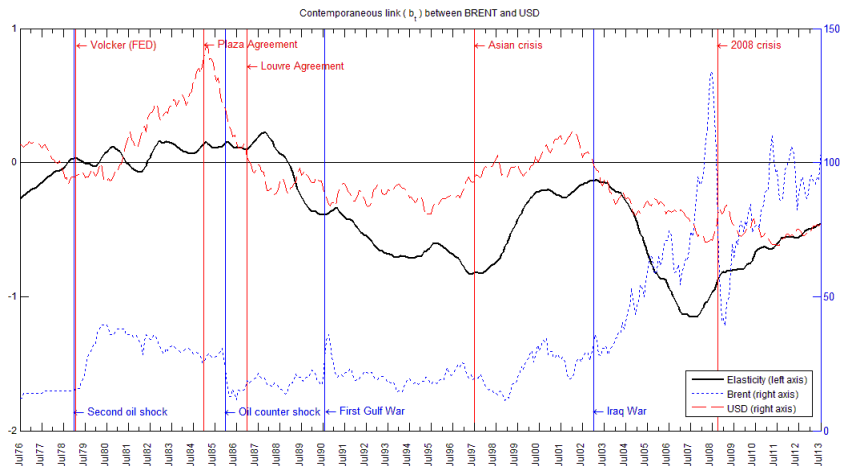
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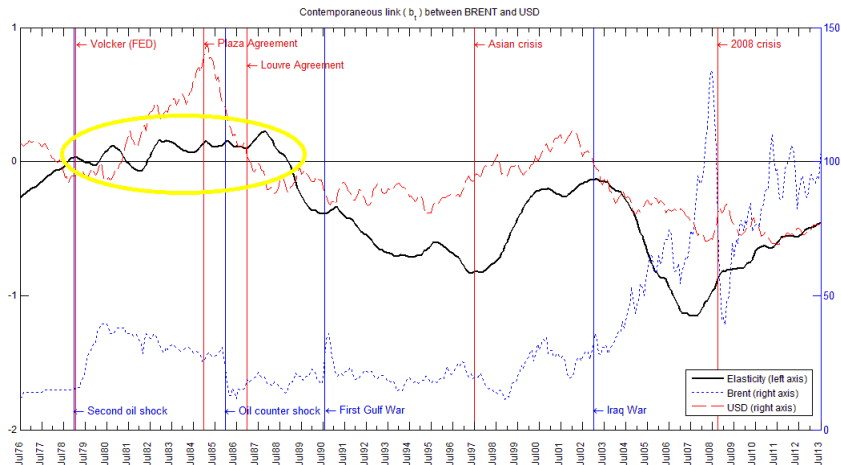b_t &= b_{t-1} + \zeta_t \text{ (for } B_t) \\
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- Estimation is conducted using **Bayesian Gibbs Sampling** methodology (and forward and backward **Kalman filter**).

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Elasticity between Oil price and effective USD
Elasticity between Oil price and HWWI
Elasticity between Oil price and Dry-Cargo
Forecast Error Variance Decomposition (FEDV)

Brent and Effective USD

Contemporaneous link (b_t) between BRENT and USD

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Brent and Global activity

Contemporaneous link (b_t) between BRENT and GLOBAL-ACTIVITY

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FEDV Brent
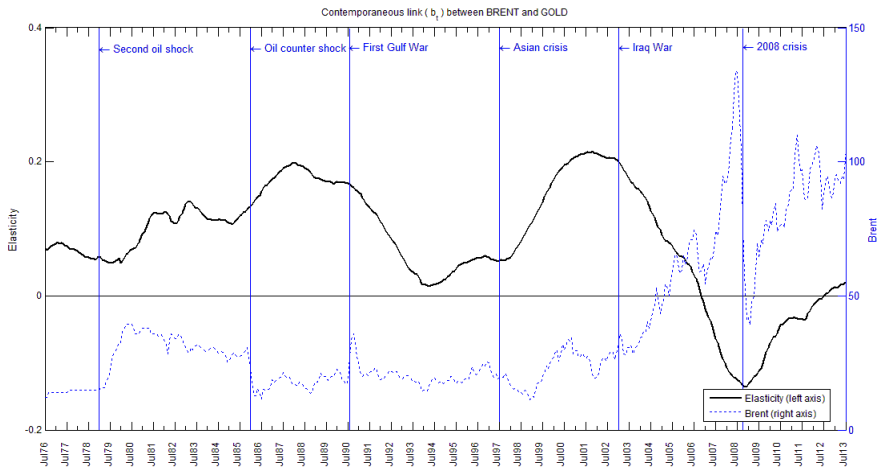

Forecast Error Variance Decomposition of BRENT

Conclusion

- Relationship between oil price and exchange rate (elasticity and volatility) is **time-varying**.
- The relationship is **negative** since 1989: "Target revenue strategy - Demand driven".
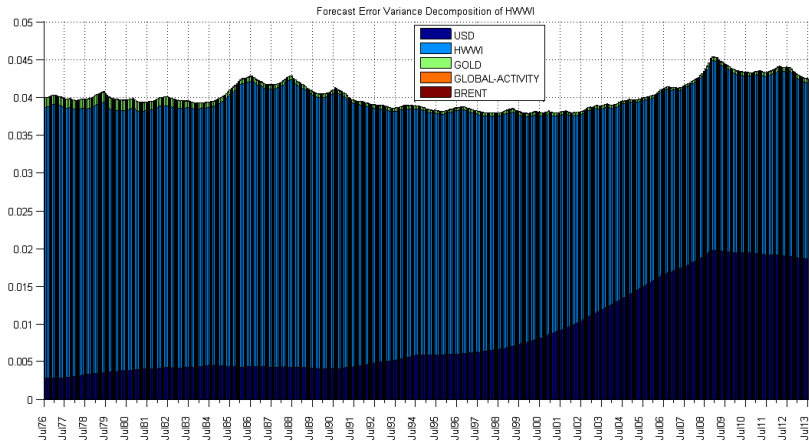- **Increasing role of commodities** markets in the oil price dynamics.
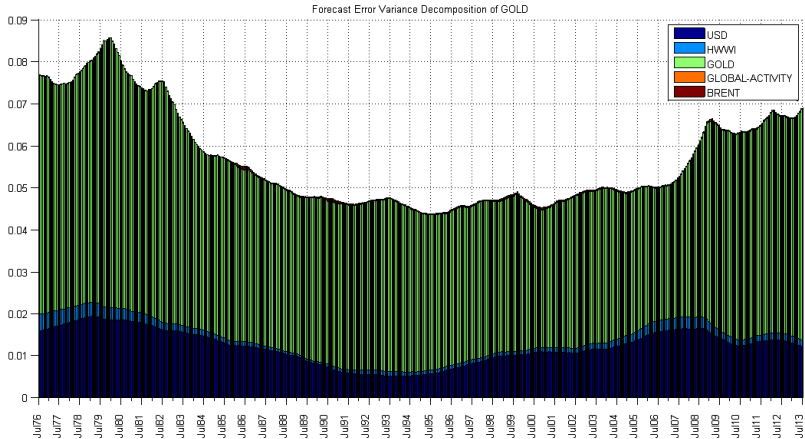
Thank you for your attention.

Backslides (BRENT/GOLD)

Contemporaneous link (b_1) between BRENT and GOLD

Backslides (FEDV HWWI)

Forecast Error Variance Decomposition of HWWI

Backslides (FEDV GOLD)

Forecast Error Variance Decomposition of GOLD

Backslides (FEDV USD)

Forecast Error Variance Decomposition of USD