Financial Crash, Commodity Prices and Global Imbalances

R. Caballero\textsuperscript{1,4} E. Farhi\textsuperscript{2,4} P-O. Gourinchas\textsuperscript{3,4}

\textsuperscript{1}MIT, \textsuperscript{2}Harvard, \textsuperscript{3}UC Berkeley, \textsuperscript{4}NBER

Global Financial Linkages, Transmission of Shocks and Asset Prices

European Central Bank, December 1-2, 2008
Bubbles, Commodity Prices and Global Imbalances

- Bubbles...

![Graph of S&P/Case Shiller Composite-10 Price Index (CPI deflated) with marked Asian Crisis and Subprime Crisis periods.]
Commodity Prices (2008 USD price of a barrel of WTI)...
Global Imbalances (CA deficits as percent of World GDP)

- 2.0%
- 1.5%
- 1.0%
- 0.5%
  0.0%
  0.5%
  1.0%
  1.5%
- 2.0%

% of World GDP


Asian Crisis
Subprime Crisis

U.S. Oil Producers Emerging Asia Europe & Japan

Global Imbalances (CA deficits as percent of World GDP)
The Economic Mechanism.

- **The Role of Asset Supply:**
  - Initial global scarcity of asset supply depresses world real interest rates (Caballero, Farhi & Gourinchas (2008));
  - Creates an environment that is prone to bubbles: Japan; EM Asia; NASDAQ; US housing market & subprime;

- **Initial Phase of the Crisis (June 2007 to June 08):**
  - Collapse of the US housing and credit bubble reduces further world asset supply;
  - Lowers real interest rates and makes commodity inventory accumulation profitable;
  - A commodity bubble develops: One shock, not two!
  - Commodity prices and asset prices are negatively correlated

- **Second phase of the Crisis (June 08-):**
  - Economic growth slows down....
  - Eliminates the asset market tightness
  - Collapse of the commodity bubble
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Oil and Stocks
Implications for Global Imbalances.

First Phase: Commodity Bubble and Stabilized Global Imbalances

- U.S. Financial crisis should provoke a dramatic rebalancing;
- The increase in commodity prices transfers wealth to commodity producers. They initially turn to the U.S. to store their newfound wealth in the U.S.
- These petrodollar flows limit severely the extent of rebalancing:

Second Phase: Growth Slowdown Provokes Two Offsetting Forces

- Reduction in asset supply; tends to depress interest rates and increase capital flows to the U.S;
- But collapse in commodity prices makes commodity producers poorer and reduces asset demand.
- This second effect dominates: rebalancing may accelerate in ’09.
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Quantitative Assessment.

The mechanism we highlight is in the right ballpark;

We explain:

- the decline in world interest rates,
- the surge and subsequent decline in oil prices,
- a small changes in inventories,
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The Model: The Global Equilibrium

- **Consumption**
  \[ C_t = \theta W_t \]
  
  \[ \begin{align*}
  X_t^d &= C_t/(1 + \alpha) \\
  p_t Z_t^d &= \alpha C_t/(1 + \alpha)
  \end{align*} \]

  \( X_t \) grows at rate \( g \); \( Z \) is constant.

- **Asset Supply**

  | Good Assets | \( V_t \) | \( \delta X_{t+s} \) |
  | Inventories | \( p_t I_t \) |
  | Rational Bubble | \( B_t \) |

- **Asset market equilibrium:**
  \[ W_t = V_t + p_t I_t + B_t; \]

- **Inventories:**
  \[ p_t / p_t \leq r_t \text{ with equality when } I_t \text{ or } I_t > 0; \]

- **Low asset supply:**
  \[ r_{ref} = \delta \theta / (1 + \alpha) < g; \]
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- **Bubbles equilibrium:**
  \[ q_t = \frac{p_t}{X_t} = \frac{\alpha}{Z} \]
  \[ r_t \sim g \quad t \to \infty \]
  \[ B_t \sim \frac{1 + \frac{\alpha}{\theta g}}{\theta g} \left( g - r^{ref} \right) X_t \]

- **Bubbleless equilibrium**
  \[ \begin{aligned}
  \dot{l}_t &= Z - \frac{\alpha}{q_t} \\
  \dot{q}_t &= (r_t - g) q_t
  \end{aligned} \]
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- Bubbles equilibrium:
  \[ q_t = \frac{p_t}{X_t} = \frac{\alpha}{Z} \]
  \[ r_t \sim g \]
  \[ B_t \sim 1 + \frac{\alpha}{\theta g} \left( g - r^{ref} \right) X_t \]

- Bubbleless equilibrium
  \[
  \begin{align*}
  \dot{l}_t &= Z - \frac{\alpha}{q_t} \\
  \dot{q}_t &= (r_t - g) q_t \\
  p_t l_t &\sim 1 + \frac{\alpha}{\theta g} \left( g - r^{ref} \right) X_t 
  \end{align*}
  \]
The Model: The Global Equilibrium

- **Bubbles equilibrium:**
  \[ q_t = \frac{p_t}{X_t} = \frac{\alpha}{Z} \]
  \[ r_t \sim_{t \to \infty} g \]
  \[ B_t \sim_{t \to \infty} \frac{1 + \alpha}{\theta g} \left( g - r^{ref} \right) X_t \]

- **Bubbleless equilibrium**
  \[ \dot{I}_t = Z - \frac{\alpha}{q_t} \]
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The Model: The Global Equilibrium

- Bubbles equilibrium:
  \[
  q_t = \frac{p_t}{X_t} = \frac{\alpha}{Z}
  \]
  \[
  r_t \sim \frac{1}{g} \left( g - r^{ref} \right) X_t
  \]
  \[
  B_t \sim \frac{1 + \alpha}{\theta g} \left( g - r^{ref} \right) X_t
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  \end{cases}
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  \[
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  \]
The impact of the subprime crisis (Phase I).

\[ q_t = \frac{p_t}{X_t} \]

\[ q_{t0} \]

\[ \bar{q} \]

\[ I_{t0} = 0 \]

\[ \bar{l} \]

\[ Z/g \]

\[ \dot{q} = 0 \]

\[ \dot{i} = 0 \]

Caballero, Farhi & Gourinchas (2008)
Global Rebalancing (Phase I).

Two regions: $U$ (US) and $M$ (Produces $Z$).
Start with Bubble located in $U$ (subprime) and no inventories.

- Short Run Rebalancing:
  - Inventories are still low, but $M$ is richer because of high $p$;
  - Implies even lower interest rates and recycling of petrodollars from $M$ to $U$.
  - With low short run price-elasticity, less rebalancing.
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Global Imbalances with price-elasticity < 1 (Phase I).

Panel A: Real Interest Rate (percent)

Panel B: normalized commodity prices

Panel C: \( p^* / W \)

Panel E: TB/X, U-region
Global Imbalances with price-elasticity $< 1$ (Phase I).

Panel F: Decomposition of TB/X
Orders of Magnitude (Phase I)

Initial Conditions:

| Cost of Financial Crisis (phase I) | $2-$4 trillion |
| Net Foreign Asset Position (relative to GDP) | 0.15 |
| Short run price elasticity of oil demand | 0.10 |
| Expenditure share on oil | 0.04 |

The Short Run Changes:

<table>
<thead>
<tr>
<th>Real Interest Rates (%)</th>
<th>Predicted</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inv.</td>
<td>1.16</td>
<td>0.06</td>
</tr>
<tr>
<td>No Inv.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude Oil Prices (%)</td>
<td>98</td>
<td>0</td>
</tr>
<tr>
<td>Trade Balance (% of GDP)</td>
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After 1 year, economic activity slows down.

Severe Growth Slowdown Assumption:

\[ \hat{g} < r^{ref} \]

Eliminates the global asset scarcity. Destroys commodities as an asset class.
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\[ \hat{g} < r^{ref} \]

Eliminates the global asset scarcity. Destroys commodities as an asset class.
The impact of the growth slowdown (Phase II).

\begin{align*}
\dot{q} &= 0 \\
\dot{i} &= 0
\end{align*}

\[ q_t = 0 \]

\[ I_t = 0 \]

\[ \bar{I} \]

\[ I_t = 1 \]

\[ q_t = 0 \]

\[ I_t = 0 \]

\[ \bar{q} \]

\[ q_{t_0} \]

\[ q_{t_1} \]

\[ A \]

\[ B \]

\[ C \]

\[ D \]

\[ E \]
Global Rebalancing (Phase II).

- Global supply of assets declines because of the decline in growth.
- $M$ is poorer because of decline in $p$; Reduces global demand for assets;
- Second effect dominates when inventory levels are low, global rebalancing accelerates.
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Panel C: p*I/W

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Orders of Magnitude (Phase II)

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## Orders of Magnitude (Phase II)

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<tr>
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Caballero, Farhi & Gourinchas
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This is not a concern for three reasons:
- Inventories respond slowly to financial crisis;
- Observed inventories reflect two opposing forces: increased demand from EM and speculation;
- Producers may be the most efficient inventory holders: inventories consist of the stock of proven in-the-ground oil reserves;

Speculation and Policy
- Futures (& futures’ taxation) have no effect on the equilibrium;
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The paper provides an asset view of the current crisis and related developments;

- The central feature is a chronic global shortage of financial assets;
- This shortage explains the sharp rise in oil prices and the limited global rebalancing following the subprime crisis;
- A more complete picture would include reversals, overshooting and firesales. The central message would remain the same: bad news for US financial markets is good news for oil and vice versa;
- The ultimate solution lies in the ability of EMs to produce sound stores of value.
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### Oil and Stocks

\[
\Delta p_t = \alpha + \beta \Delta S_t + \epsilon_t
\]

<table>
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<th>(3) monthly</th>
<th>(4) quarterly</th>
<th>(5) annual</th>
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<td>(2.74)</td>
<td>(1.36)</td>
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*First Stage regressions (dependent variable S&P 500)*

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Commodity Prices
Energy + biofuels

COAL
CORN
GASOLINE
CRUDE
HEATING OIL
CPI