

Le contexte économique et financier de la transition écologique

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Labex REFI

Mines
June 13 2013.

I. What about the
markets efficiency
hypothesis ?

- I.1. Incomplete
markets
- I.2. Why market
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II. A macro
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- II.1. The
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- II.2. The role of
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- II.3. Global
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III. How to save
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- III.1. Most
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- III.2. Do prices
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- III.3. Managing
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IV. The energetic
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- IV.1. Kaya's
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- IV.2. Oil supply
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I. What about the market Inefficiency hypothesis ?

I.1. Incomplete markets

- Markets are said to be **efficient** whenever they allocate risk and capital in a first-best Pareto-optimal way.

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- **Second-best** efficiency is the right notion.
- I.1. Incomplete markets are generically **not even second-best efficient**.

Geanakoplos & Polemarchakis (1986), et alii.

Too bad... The invisible hand is invisible 'cause it does not exist!

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- **I.1. Incomplete markets can never be immune against sunspots.**
(Azariadis (1974), Guesnerie, Chiappori....)

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Does it reduce market inefficiency ?

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Elul (1995).

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E.g., Karine Berger and the French banking (non-)reform.

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- Who decides whether a new financial product is useful ?

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Uniqueness of the risk-neutral probability.

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Marked-to-market principle of Fair Value in the IFRS accounting norms ?

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- Giraud & Pottier (2012, 2013)

Only 3 kinds of market equilibrium are possible.
(General equilibrium with collateral constraints and money.)

Regime 1 : growth + inflation.

(Incompatible with the eurozone inflation target.)

Ex : the 30 Glorious Years.

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- **Régime 3**: Speculative Bubble whose bursting leads to a collapse.
Ex: Europe since 1980... ?

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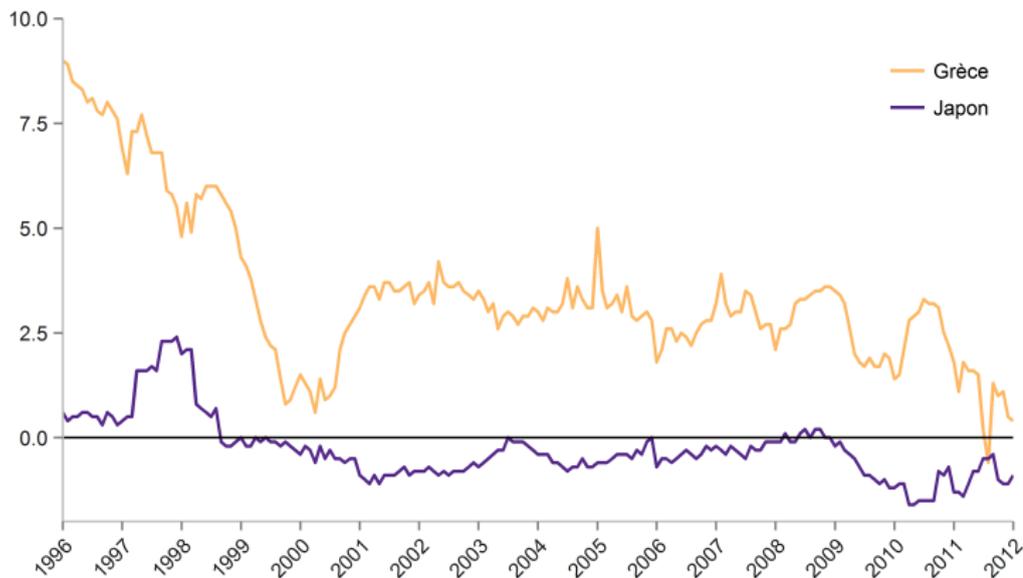
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L'inflation, en glissement annuel



Sources : Eurostat, Ministères des Affaires Intérieures et des Communications - Japon

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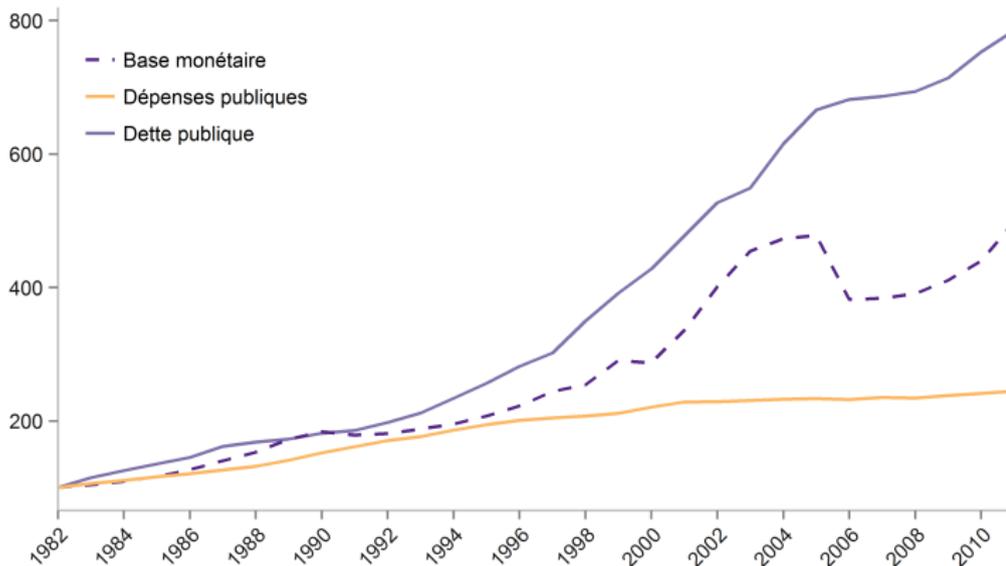
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Évolution des dépenses publiques, de l'endettement
public et de la masse monétaire au Japon - Base 100 en 1982



Sources : Bank of Japan; Ministry of Finance, Japan

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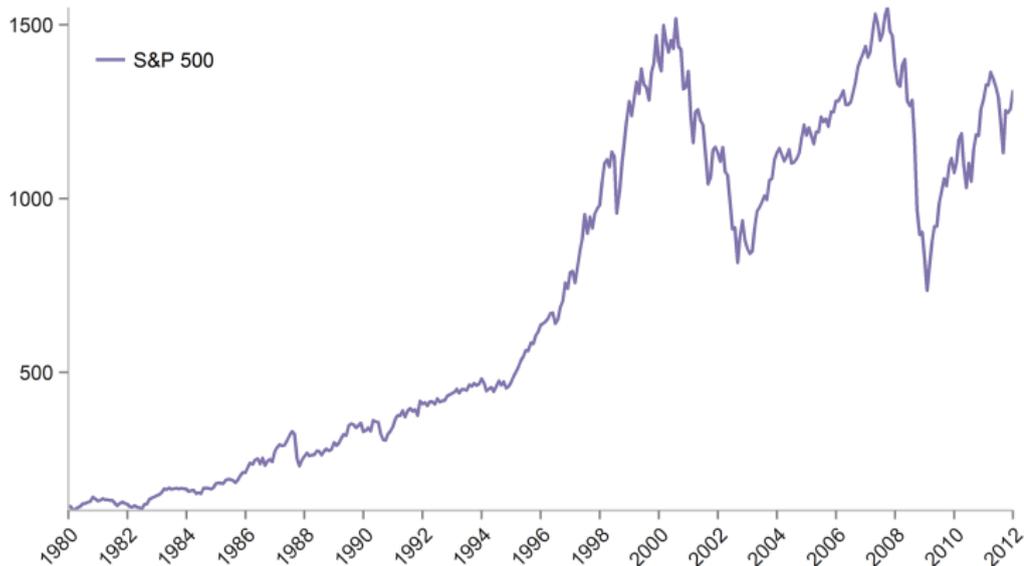
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Évolution de l'indice boursier S & P 500



Sources : Yahoo! Finance

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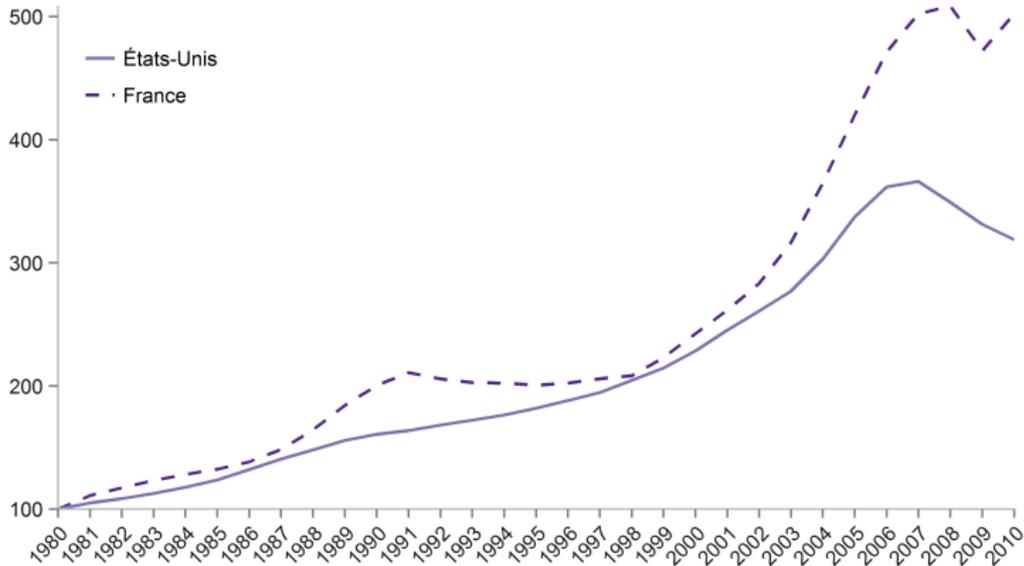
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Évolution du prix de l'immobilier



Sources : CGEDD, INSEE - France; OFHEO - États-Unis

Contexte
économique et
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Gaël Giraud

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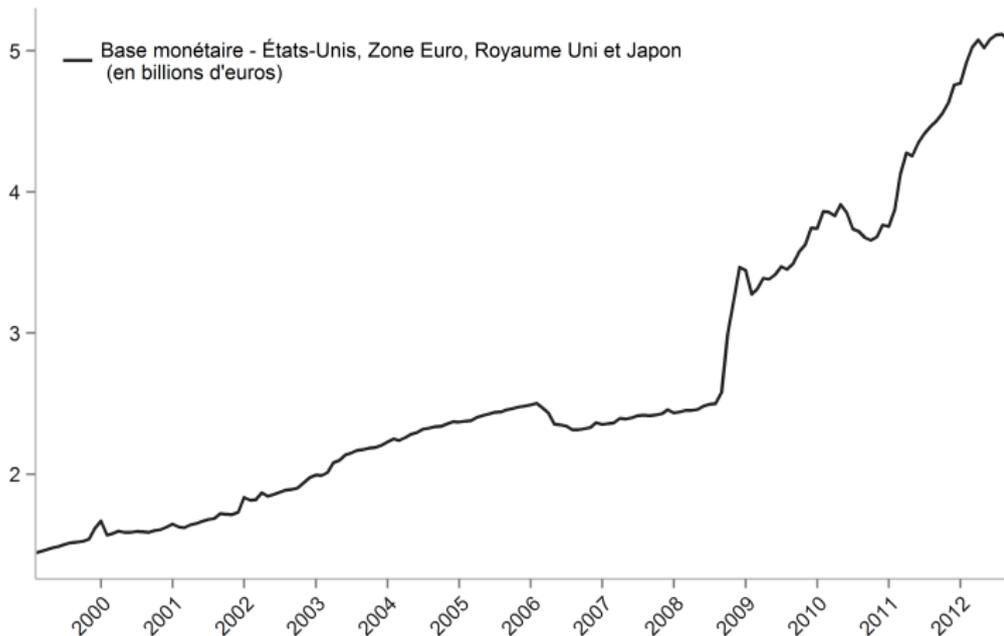
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Sources : Bank of Japan, BCE, Bank of England, Federal Reserve

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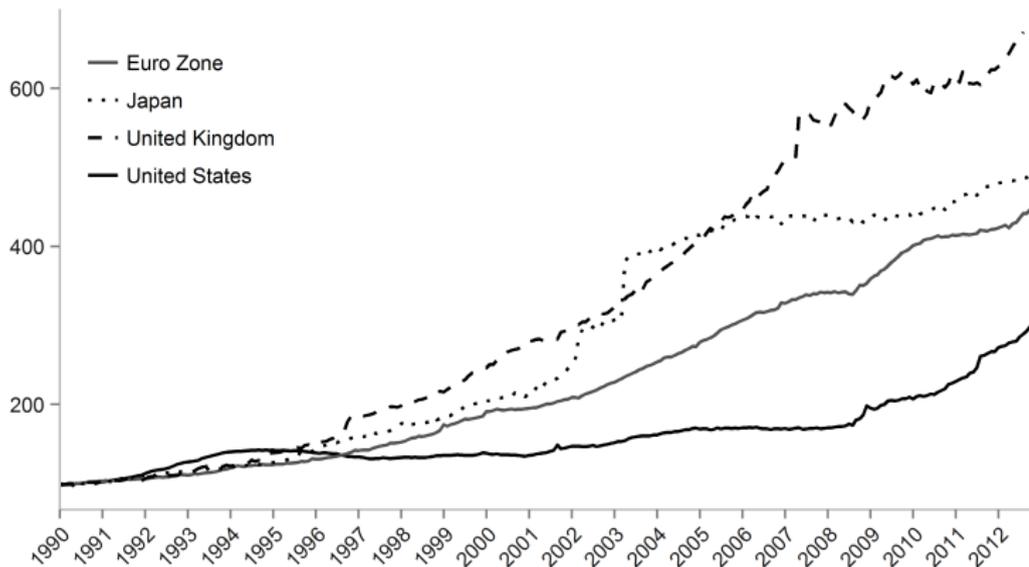
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Money Supply M1 (Index 1990 = 100)



Source : Ecowin, IMF IFS, Bank of England, ECB

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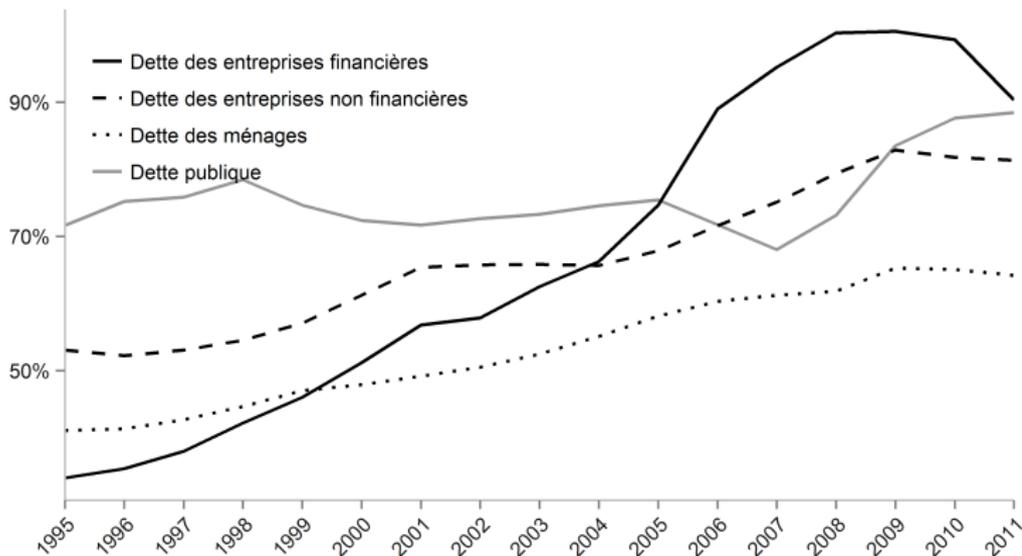
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Dettes* en pourcentage du PIB - Zone Euro (17 pays)



*La dette publique est au sens de Maastricht. Pour les autres secteurs, les instruments pris en compte sont les crédits et titres de dette, actions exclues. La dette est consolidée.

Sources : Eurostat

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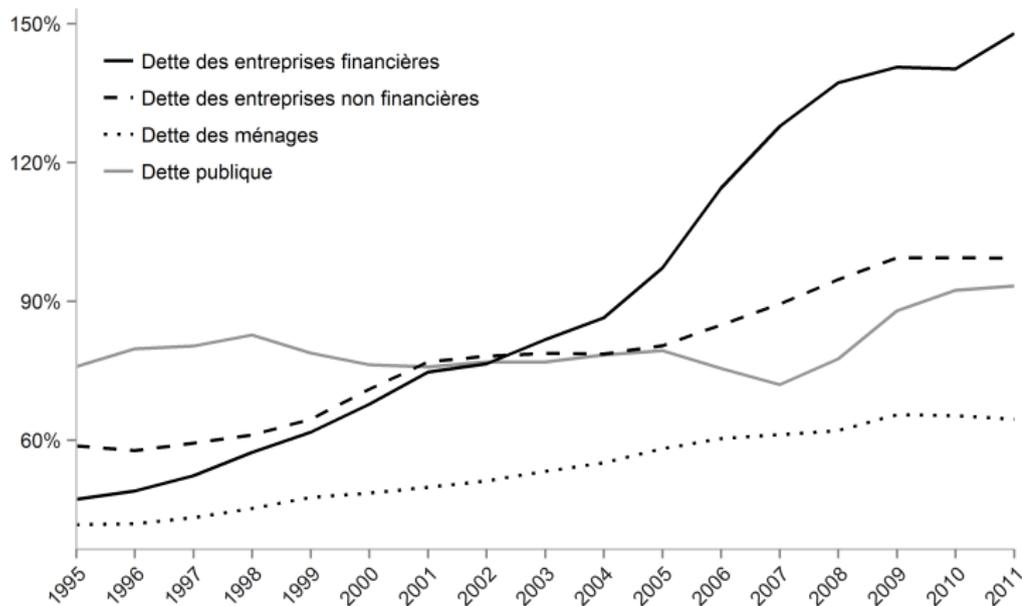
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o Dette non consolidée.



*La dette publique est une version non-consolidée de la dette publique au sens de Maastricht.
Pour les autres secteurs, les instruments pris en compte sont les crédits et les titres hormis les actions.

Source : Eurostat

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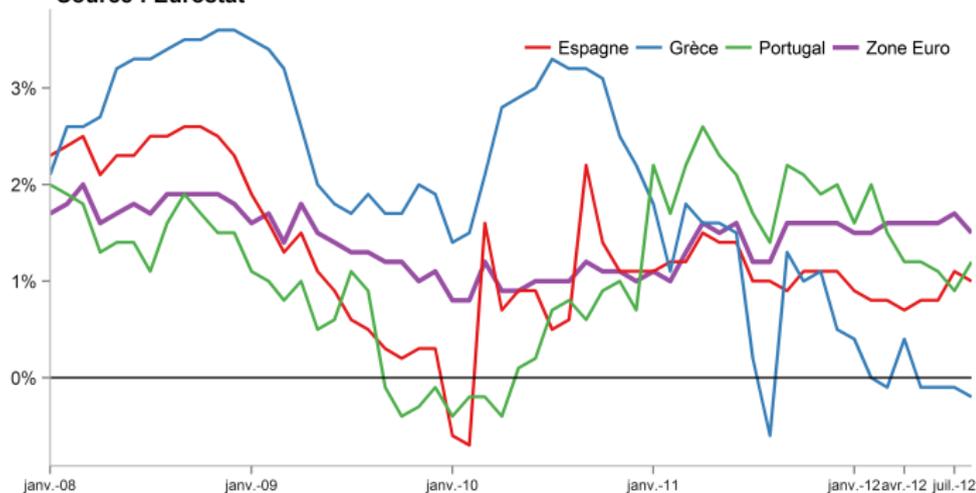
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Indices Harmonisés des prix des consommateurs, en glissement annuel
Prix de la nourriture, de l'alcool, du tabac et de l'énergie exclus
Source : Eurostat



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II. A macro perspective

II.2. The role of banks

- An entrepreneur is someone with an idea but not necessarily the finance needed to put that idea into motion. The entrepreneur therefore must borrow money to be able to purchase the goods and labor needed to turn his idea into a final product/service.

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- Indeed private banks create money everyday.

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- Indeed private banks create money everyday.
- Is money creation always inflationary ?

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- o Giraud, Hanh & Pham (2013)

Whenever there are universal banks

+ Securitization

+ low interest rate (Central Bank)

then, a (rational) bubble is fueled by money creation whose bursting leads to a collapse.

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- Giraud, Hanh & Pham (2013)

Whenever there are universal banks

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then, a (rational) bubble is fueled by money creation whose bursting leads to a collapse.

- When will the current bubble burst ?

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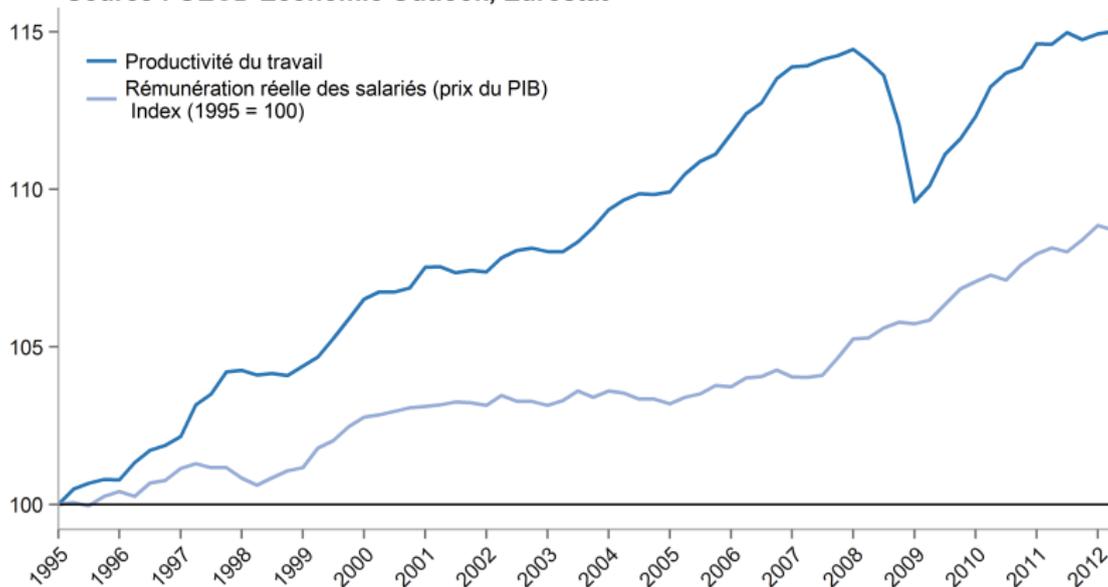
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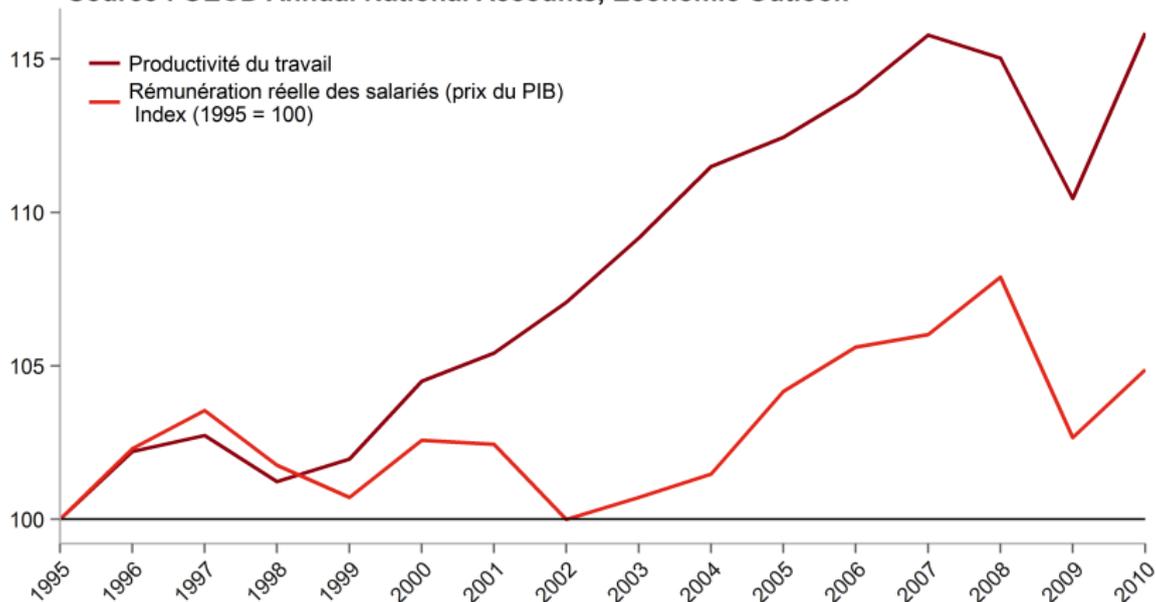
Productivité et salaires - Zone Euro (15 pays)

Source : OECD Economic Outlook, Eurostat



Productivité et salaires - Japon

Source : OECD Annual National Accounts, Economic Outlook

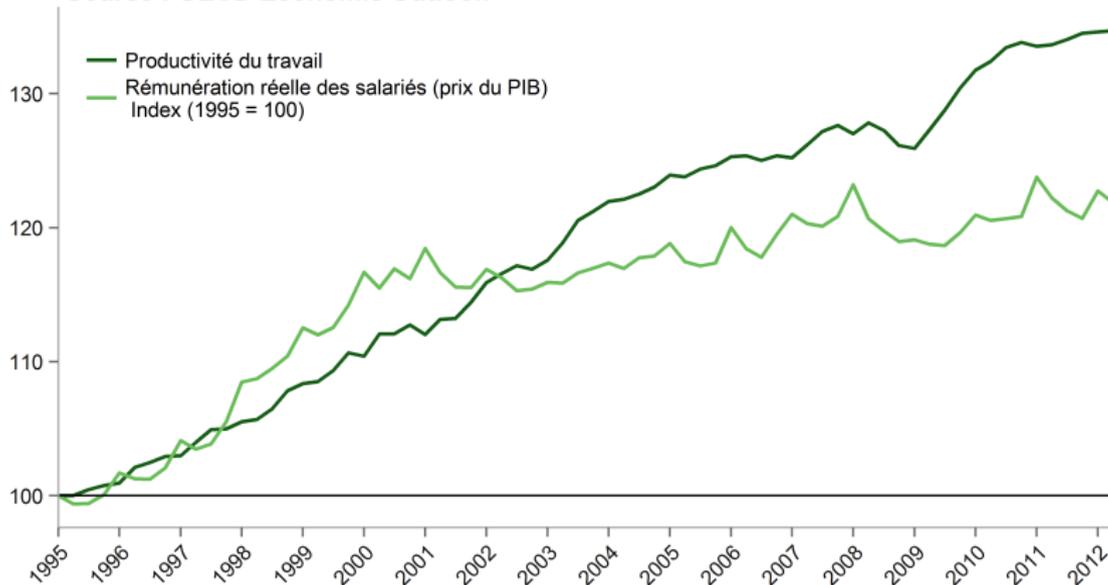


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Productivité et salaires - États-Unis

Source : OECD Economic Outlook



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- o Marked to market (IAS 39).
Who decide whether a market is liquid or not ?

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- Marked to market (IAS 39).

Who decide whether a market is liquid or not ?

- The CAPM.

*"In the end, we argue that, whether the model's problems reflect weaknesses in the theory or in its empirical implementation, the failure of the CAPM in empirical tests implies that **most applications of the model are invalid.**"* (Fama and French, 2004, p. 25).

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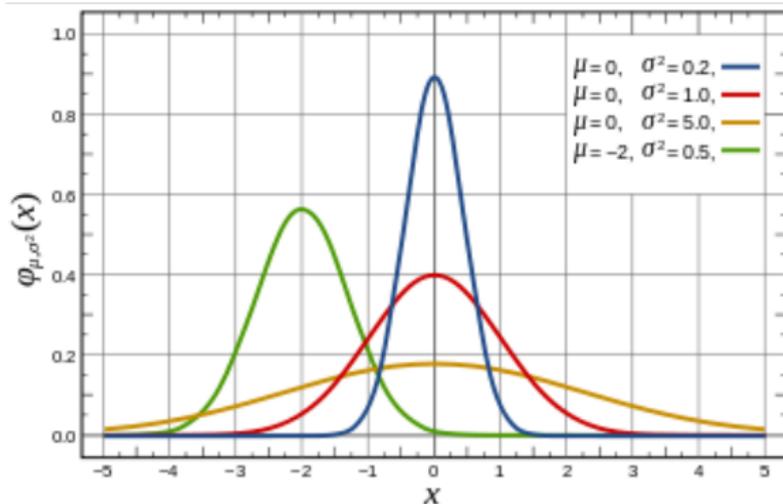
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- Stock prices are **not** Gaussian.



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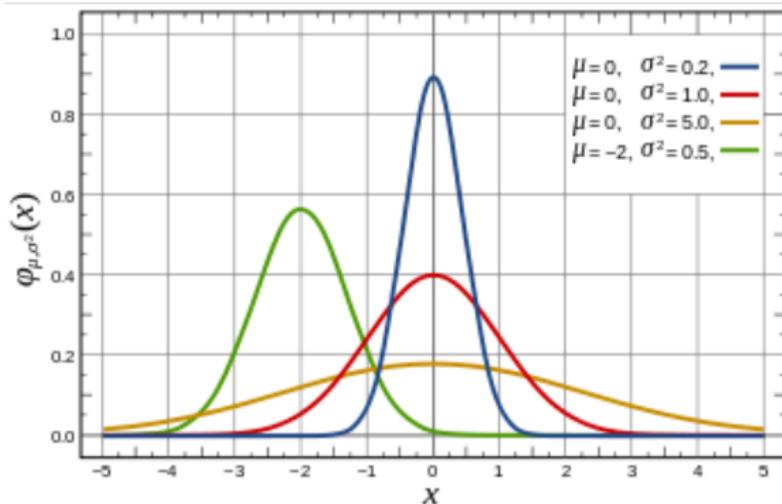
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- Stock prices are **not** Gaussian.



- An assumption omnipresent in Black-Scholes (cf. implied volatility).

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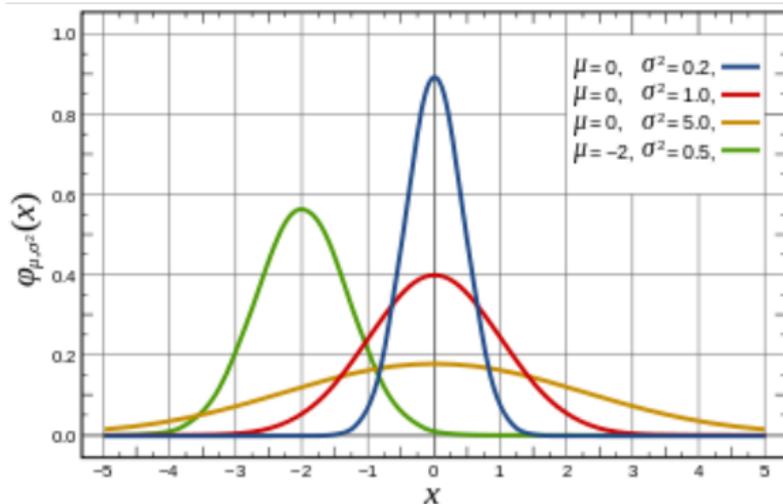
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- D. Guégan (GARCH models).

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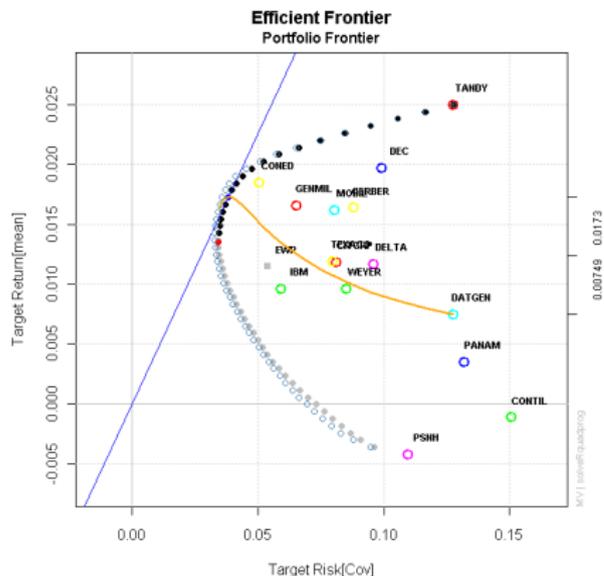
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- Sharpe (1970) influential paper does not work



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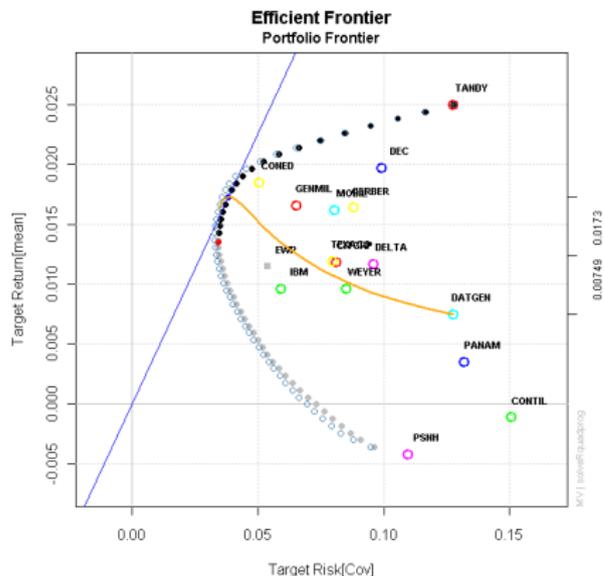
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- Stocks' returns are not related to the β

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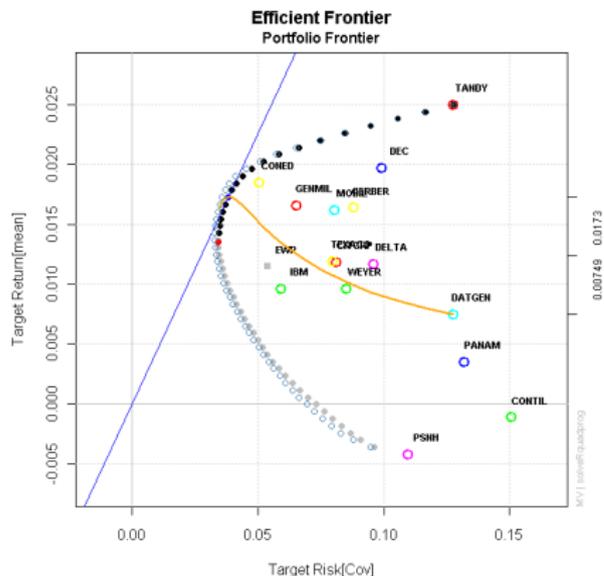
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- Stocks' returns are not related to the β
- It's possible to increase both the return **and** the vol by not picking the "growth stocks" (or "glamor stocks").

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- o Indeed, in real life, investors do **not** all share the same correct anticipation of prices.

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- o Indeed, in real life, investors do **not** all share the same correct anticipation of prices.
- o Investors do **not** all have access to a perfectly liquid credit market at no cost.

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- Indeed, in real life, investors do **not** all share the same correct anticipation of prices.
- Investors do **not** all have access to a perfectly liquid credit market at no cost.
- There are alternative financial models: fractals (Mandelbrot), GARCH, econophysics...

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- Investors do **not** all have access to a perfectly liquid credit market at no cost.
- There are alternative financial models: fractals (Mandelbrot), GARCH, econophysics...
- Why do banks keep the same utterly wrong models ?
Why are they so conservative ?
Strong need for experiences with new models.

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- Suppose you invest in an asset whose $ROE = 4.5\%$.
Volatility $\geq 3\% \Rightarrow$ **in every trajectory, you will go bankrupt !**
Although your gains follow a > 0 martingale.

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- III.1. Most
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- III.2. **Do prices
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- III.3. Managing
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- IV.2. Oil supply
shock

- Suppose you invest in an asset whose ROE= 4.5%.
Volatility $\geq 3\%$ \Rightarrow **in every trajectory, you will go bankrupt !**
Although your gains follow a > 0 martingale.
- Suppose your cash yields 10% return per annum.
Each year you toss a coin for half of your wealth. (+ 100%,
-100%).
Along each path, you will end up ruined.

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- Nicolas Bouleau, "Finance et environnement", forthcoming.
Steve Keen, *Debunking Economics* (2013).

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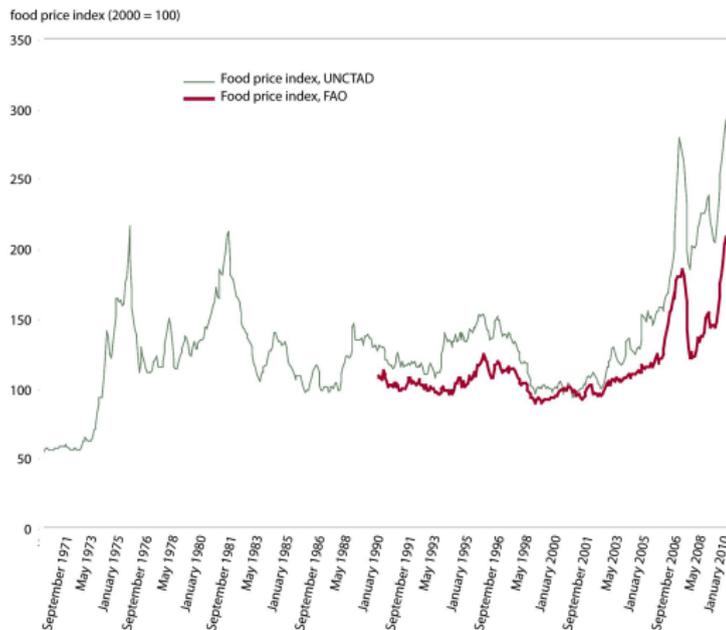
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- The impact on food indices is tremendous.



World food prices, UN Conference on Trade and Development (UNCTAD) and Food and Agriculture Organization (FAO), Sources: UNCTAD and FAO.

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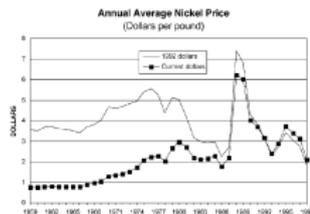


Prices in
current \$

Real prices
in current \$



of metals
gold
antimony
cadmium
nickel
palladium
zinc



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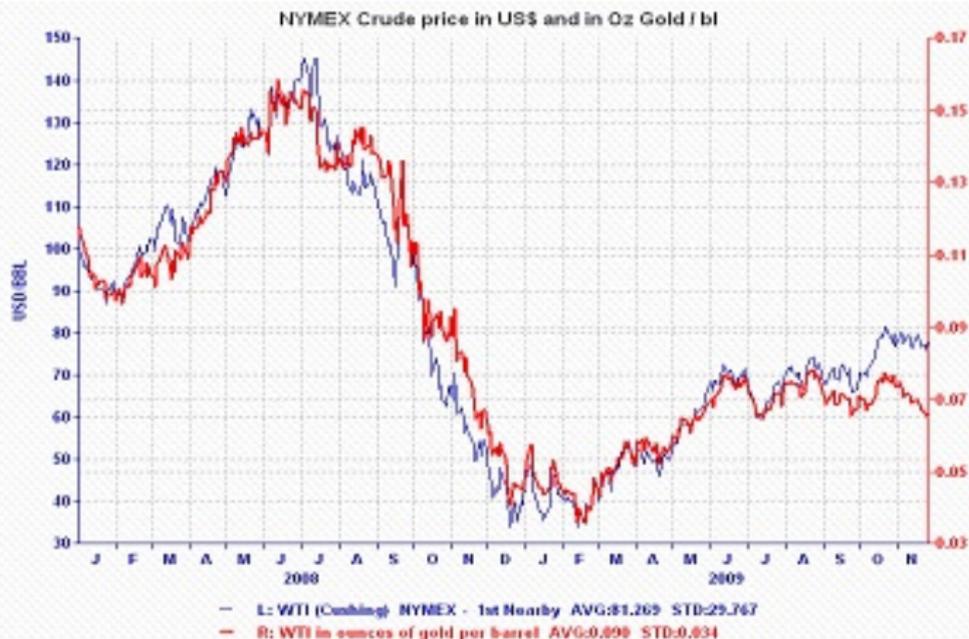
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- Financialization of the oil price:

Financialization of Oil Markets : why should Oil track Gold?



- High Frequency Trading.
Martin Bouygues.

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- High Frequency Trading.
Martin Bouygues.
- Dark pools. (Tapiero & de Peretti, forthcoming)
- What's the role of prices ??

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III. How to save finance ?

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- ▶ Large fraction of loans are secured by some form of collateral that will be forfeit in the event of default.

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- ▶ Large fraction of loans are secured by some form of collateral that will be forfeit in the event of default.
- ▶ Ex: pawn shop loans, home mortgages, corporate stocks and bonds, margin purchases of stocks, overnight repurchase agreements, derivatives...

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- ▶ Large fraction of loans are secured by some form of collateral that will be forfeit in the event of default.
- ▶ Ex: pawn shop loans, home mortgages, corporate stocks and bonds, margin purchases of stocks, overnight repurchase agreements, derivatives...
- ▶ U.S. households' debt: 14.5 \$ trillions (2008). Total value of the U.S. residential mortgage market exceeds \$5 trillions (2002).

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The most excellent
Historie of the *Merchant*
of *Venice*.

VVith the extreame crueltie of *Shylocke* the Iewe
towards the sayd Merchant, in cutting a iust pound
of his flesh: and the obtaining of *Portia*
by the choyse of three
chests.

*As it hath bene diuers times acted by the Lord
Chamberlaine his Seruants.*

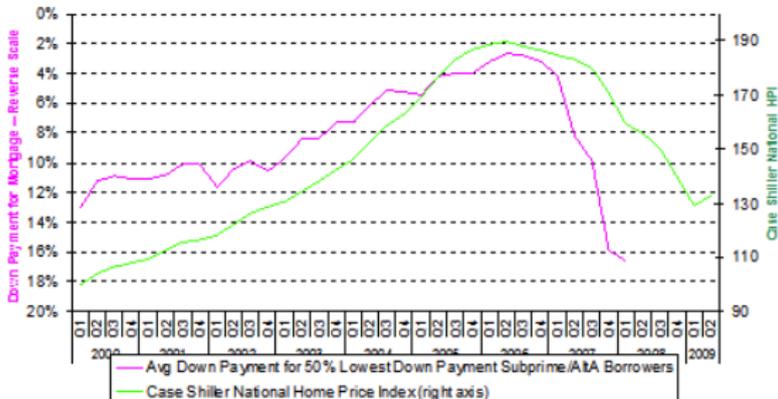
Written by William Shakespeare.



AT LONDON,
Printed by *I. R.* for Thomas Heyes,
and are to be sold in Paules Church-yard, at the
signe of the Greene Dragon.

1600.

Housing Leverage Cycle Margins Offered (Down Payments Required) and Housing Prices



Observe that the Down Payment axis has been reversed, because lower down payment requirements are correlated with higher home prices.

Note: For every AltA or Subprime first loan originated from Q1 2000 to Q1 2008, down payment percentage was calculated as appraised value (or sale price if available) minus total mortgage debt divided by appraised value. For each quarter, the down payment percentages were ranked from highest to lowest, and the average of the bottom half of the list is shown in the diagram. This number is an indicator of down payment required: clearly many homeowners paid down more than they had to, and that is why the top half is dropped from the average. A 13% down payment in Q1 2000 corresponds to leverage of about 7.7, and 2.7% down payment in Q2 2006 corresponds to leverage of about 37.

Note: Subprime/AltA issuance stopped in Q1 2008.

- ▶ John Geanakoplos (Yale).
- Darrell Duffie (Stanford).

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- ▶ John Geanakoplos (Yale).
Darrell Duffie (Stanford).
- ▶ Monitor the leverage rates and don't play...

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- ▶ John Geanakoplos (Yale).
Darrell Duffie (Stanford).
- ▶ Monitor the leverage rates and don't play...
- ▶ Social impact bonds ?
Socially Responsible Investment ?

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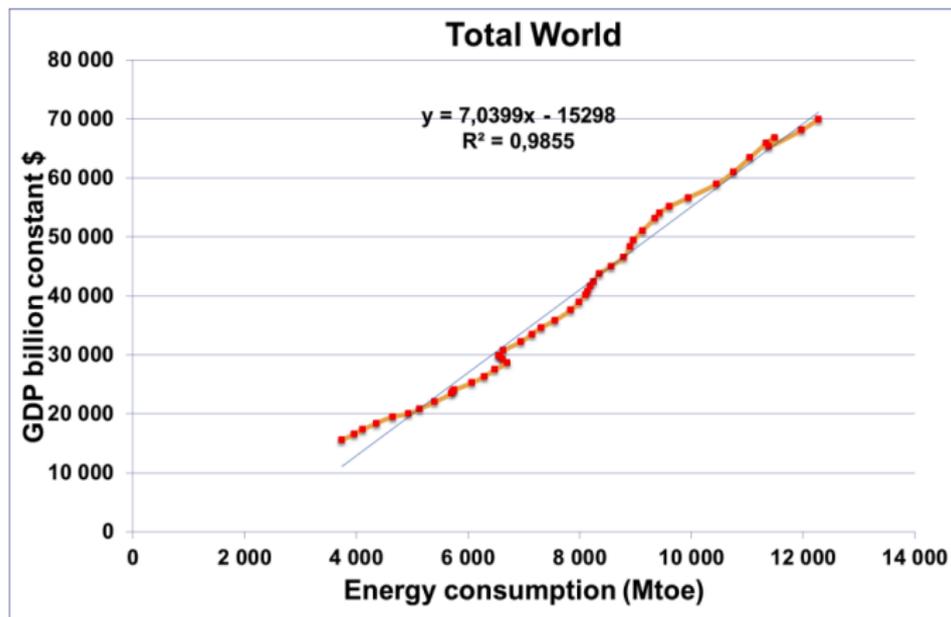
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IV.1. Kaya's equation



Source : Jancovici, BP statistical review, 2012, Shilling et al. 1977, EIA, 2012, et Banque Mondiale (PIB), 2012.

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$$\Delta \frac{Y}{Pop} = \Delta \left(\frac{E}{Pop} \times \frac{Y}{E} \right).$$

$\Delta \frac{Y}{Pop}$:= growth of GDP per capita.

$\Delta \frac{E}{Pop}$:= growth of energy consumption per capita.

$\Delta \frac{Y}{E}$:= growth of energy efficiency.

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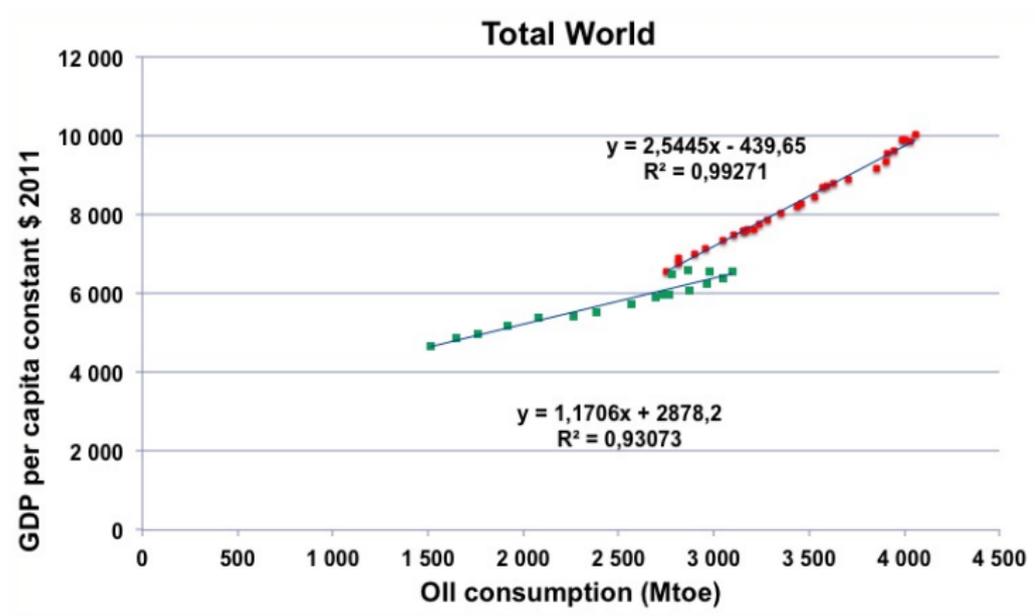
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- The relationship in terms of per capita quantities :



Source : Jancovici, BP statistical review, 2012, Shilling et al. 1977, EIA, 2012, et Banque Mondiale (PIB), 2012.

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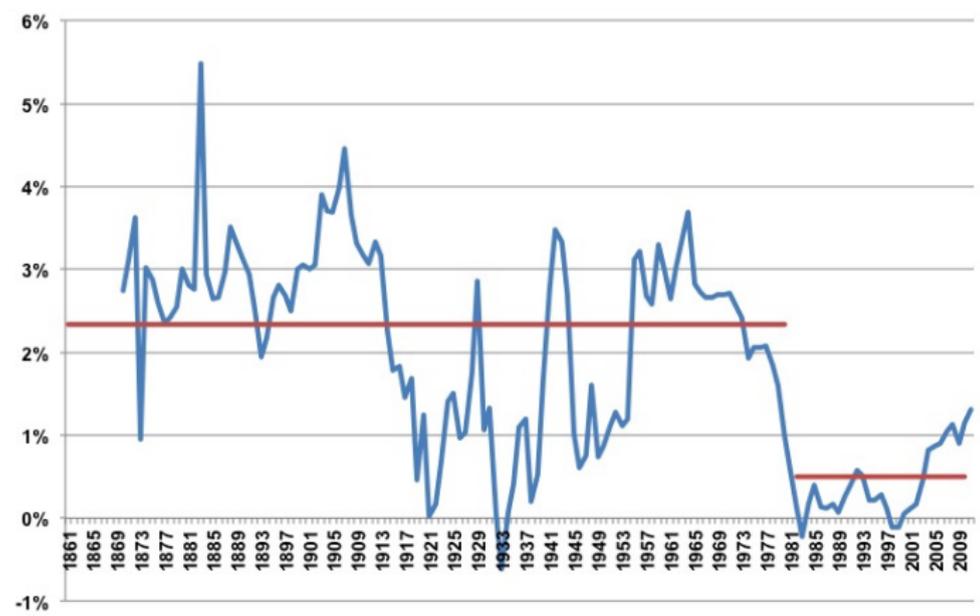
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- A break in the consumption of primary energy per capita



Source : Jancovici, BP statistical review, 2012, Shilling et al. 1977, EIA, 2012, et Banque Mondiale (PIB), 2012.

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- 1965-1981 : world average
 $3.5\% = 2.5\% + 1\%$

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- 1965-1981 : world average
 $3.5\% = 2.5\% + 1\%$
- 1981-2013 : world average
 $1.5\% = 0.5\% + 1\%$

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- 1965-1981 : world average
 $3.5\% = 2.5\% + 1\%$
- 1981-2013 : world average
 $1.5\% = 0.5\% + 1\%$
- Japan : 2000-2013 :
 $0\% = 0\% + 0\%...$

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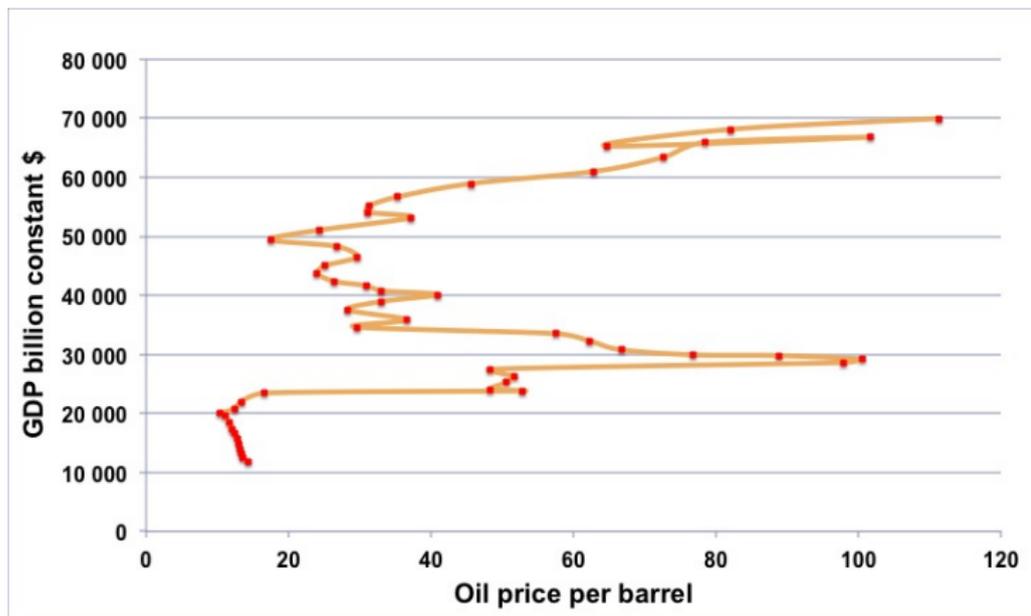
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- No such obvious relation in terms of energy prices.



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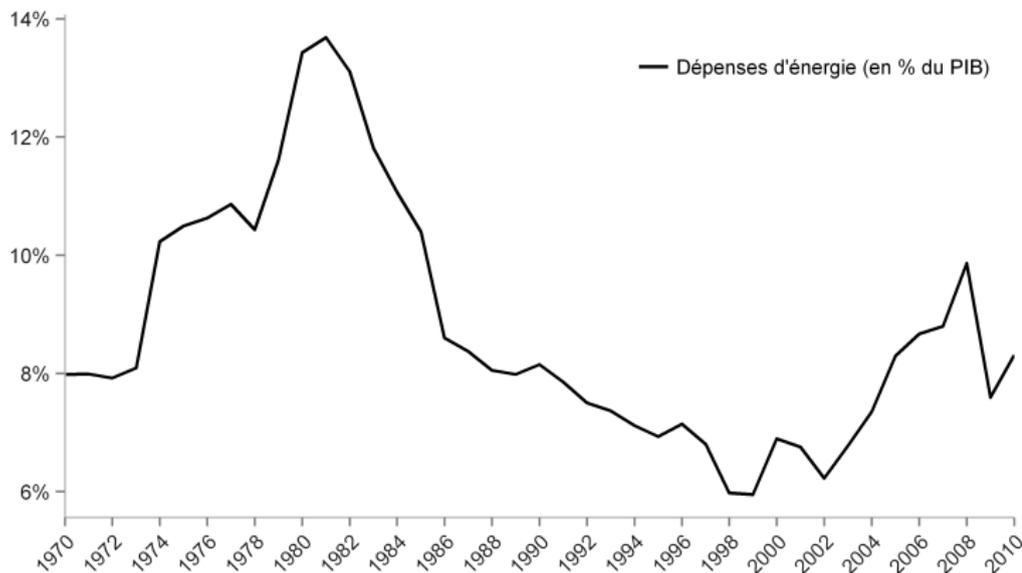
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Les dépenses de l'énergie dans le PIB - États-Unis



Source : Bureau of Economic Analysis, Energy Information Agency

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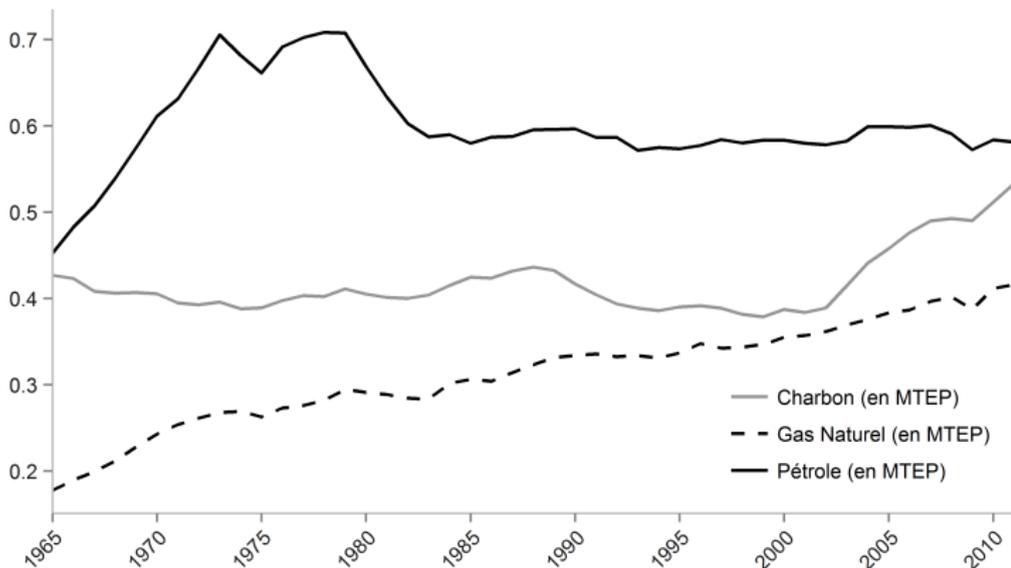
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Consommation mondiale annuelle d'énergie, par habitant



Source : BP Statistical Review of World Energy

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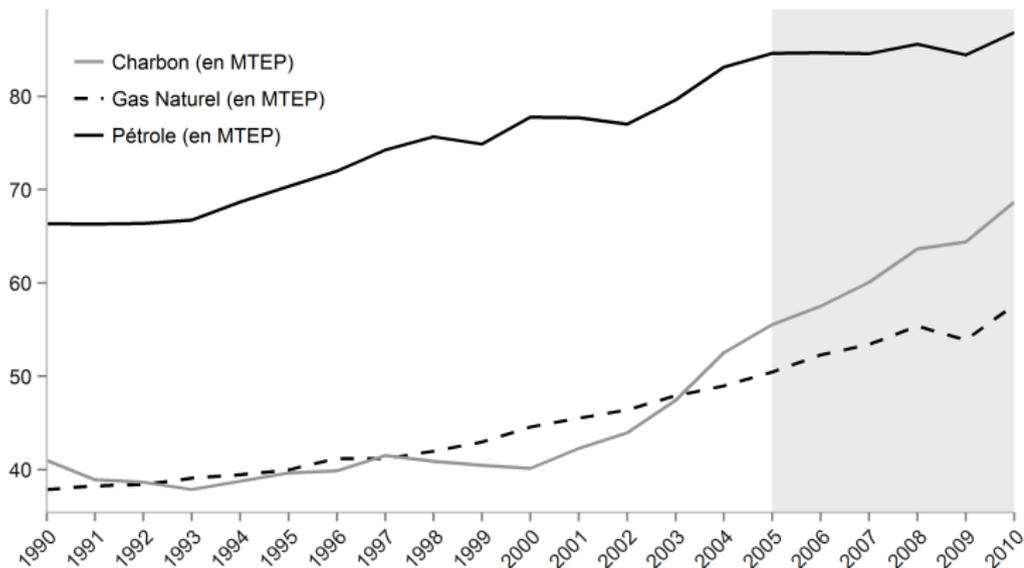
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Production mondiale d'énergie primaire



Sources : US EIA Historical Statistics for 1981-2010; The Shift Project

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- The “Peak oil”.

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- Hamilton (1983, 1996) : most of U.S. recessions were preceded by increases in the price of oil, suggesting an essential role for oil price increases as one of the main cause of recessions.

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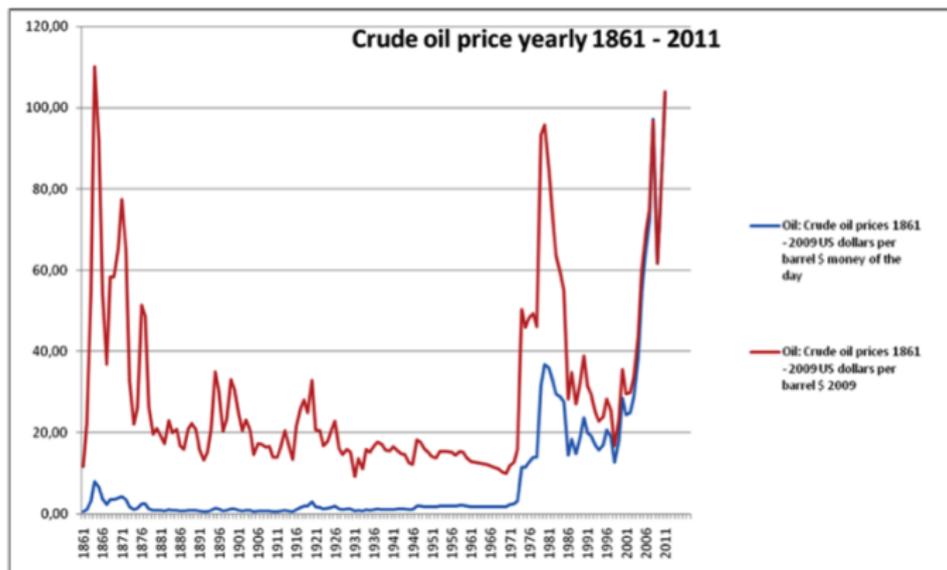
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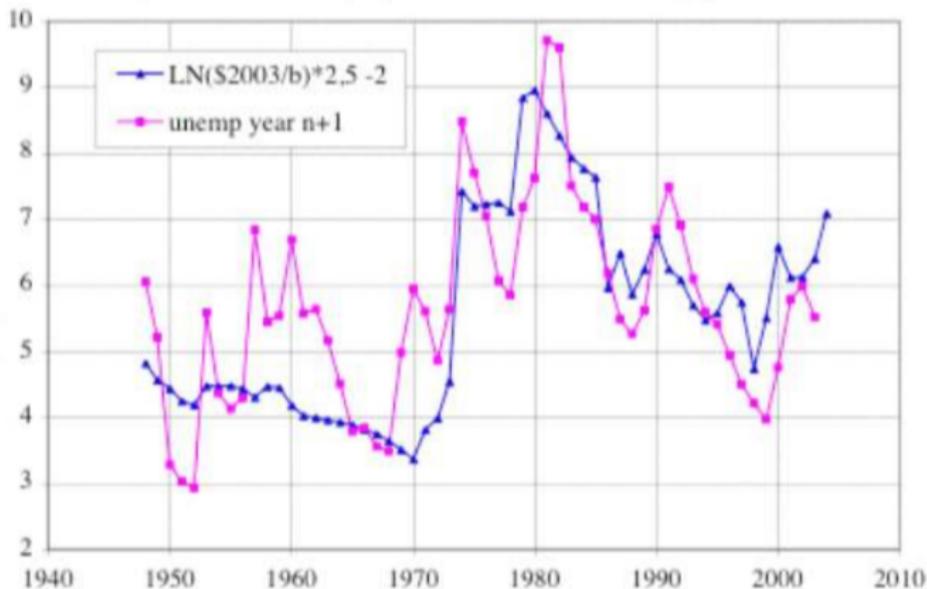
**IV.2. Oil supply
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- Hamilton (1983, 1996) : most of U.S. recessions were preceded by increases in the price of oil, suggesting an essential role for oil price increases as one of the main cause of recessions.
-

Prix du pétrole de 1860 à nos jours ...



- A disturbing correlation : The price of energy could be a major explanation of most of our recent macro-economic history...



il Giraud

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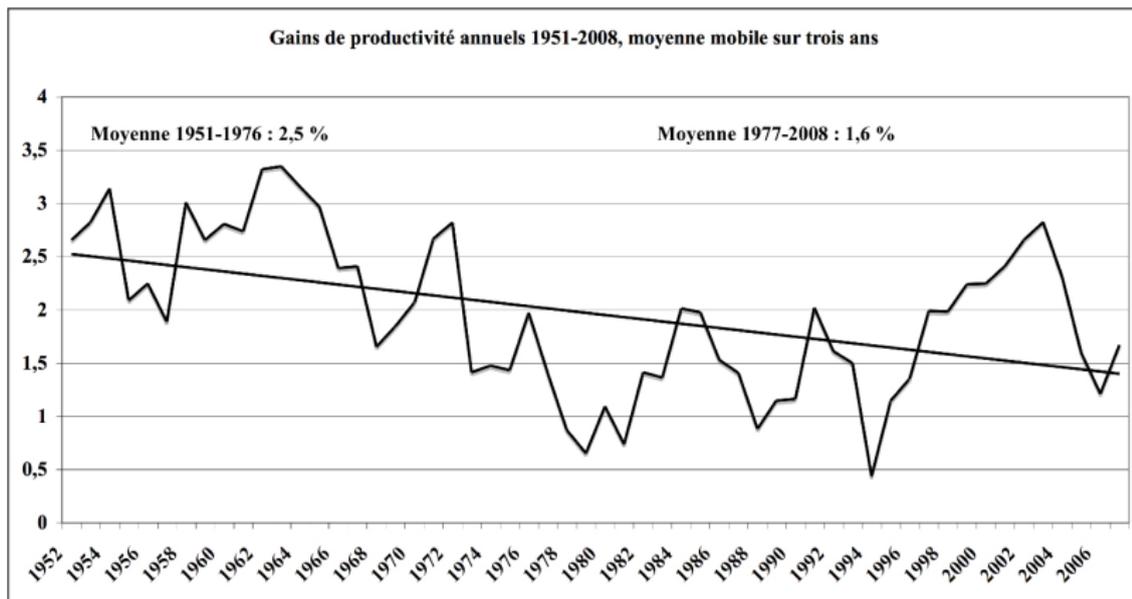
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Oil supply



The power of money creation.

Faustus II, Johann Wolfgang von Goethe:

Kanzler: *“Zu wissen sei es jedem, der's begehrt:*

Der Zettel hier ist tausend Kronen wert.

Ihm liegt gesichert, als gewißes Pfand,

Unzahl vergrabnen Guts im Kaiserland.

Nun ist gesorgt, damit der reiche Schatz,

Sogleich gehoben, diene zum Ersatz.

Kaiser: Und meinen Leuten gilt's für gutes Gold?

Dem Heer, dem Hofe gnügt's zu vollem Sold?

So sehr mich's wundert, muß ich's gelten laßen.

Mephistopheles: Ein solch Papier, an Gold und Perlen Statt,

Ist so bequem, man weiß doch, was man hat;

Man braucht nicht erst zu markten, noch zu tauschen,

Kann sich nach Lust in Lieb' und Wein berauschen.

I. What about the
markets efficiency
hypothesis ?

1.1. Incomplete
markets

1.2. Why market
prices can get so
wrong

II. A macro
perspective

II.1. The
trilemma

II.2. The role of
banks

II.3. Global
imbalances

III. How to save
finance ?

III.1. Most
models are wrong

III.2. Do prices
convey
information ?

III.3. Managing
the leverage rate

IV. The energetic
transition

IV.1. Kaya's
equation

IV.2. Oil supply
shock