Breaking the Spell with Credit-Easing:

Self-Confirming Credit Crises in Competitive Search Economies*

(Work in progress)

Gaetano Gaballo† and Ramon Marimon‡

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†Banque de France - We thank them, but don't blame them for what we say.

‡European University Institute, UPF - Barcelona GSE, NBER and CEPR.

Monetary policy in the aftermath of the financial crisis.

- The Financial Crisis and the follow-up Great Recessions have opened up a range of questions on how *inside* and *outside* money interrelate, how a financial squeeze can have severe real effects, in particular, about the role of *unconventional monetary policies* when conventional interest rate policies seem ineffective.

- We focus on one of these policies – *Credit Easing* – providing a rationale for it.

- In our economies there is not a 'coordination problem'– as in models of *Self-Fulfilling credit freezes*,– but a possible 'misperception problem', which may persist in *Self-Confirming credit crises*

Different Policy Responses to Credit Market Freezes

- Credit market freezes both in US (2008) and Europe (2010);
- Similar responses $\Rightarrow$ Lowering the cost of money;
  - by lowering the policy rate, QE intervention, collateral framework...
- Different responses $\Rightarrow$ Large-scale *Credit-Easing* has been implemented in US, but not in Europe;
  - the CB takes risk in lending directly to the private sector...
  - ...or subsidizing banks to do that.
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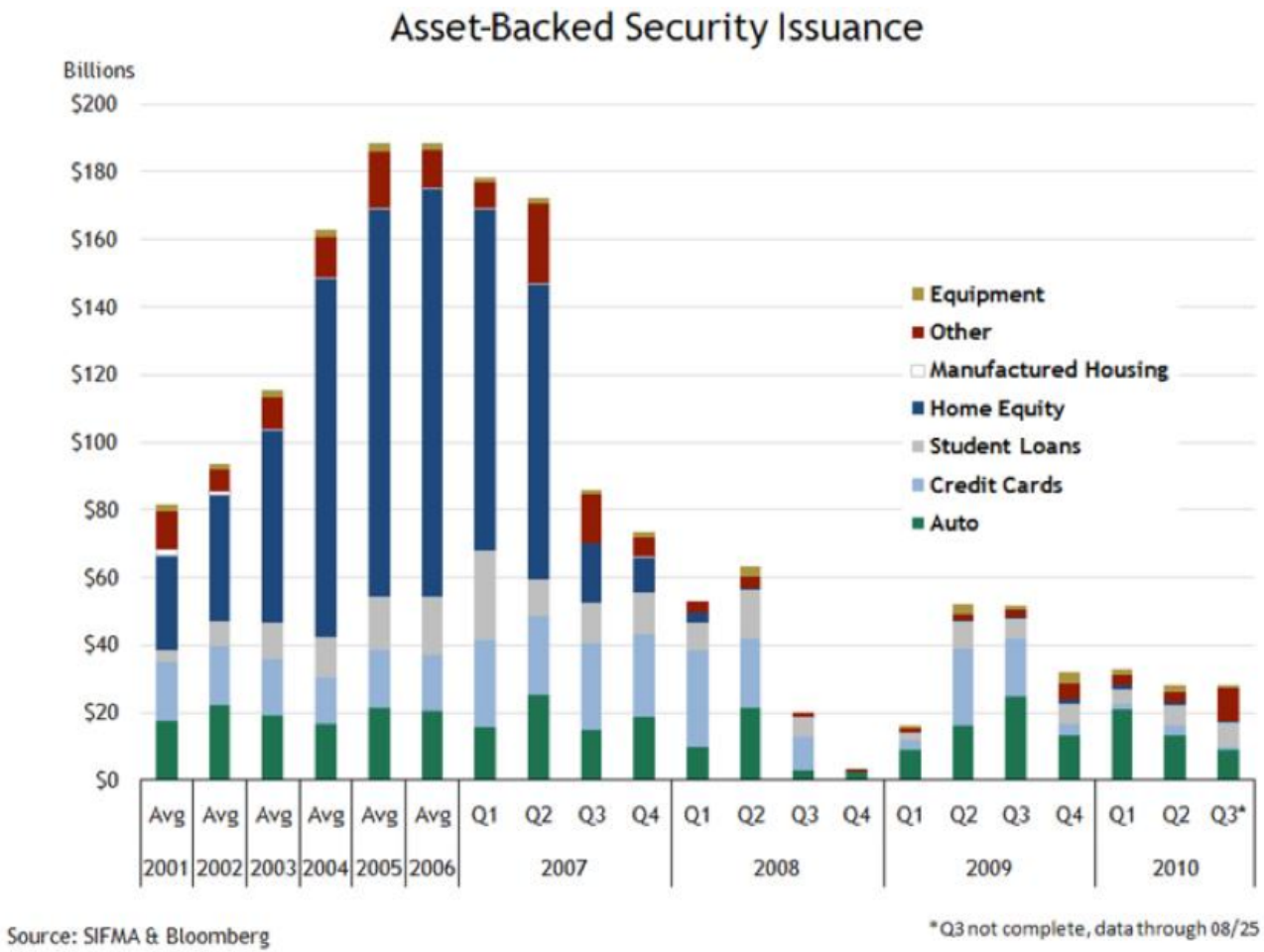
  (although, it was not very successful in UK, where the BofE didn't take any risk...)
- The ECB and the BofE announce this week their program to *strengthen the SME loan securitisation market*...
  Will this SME - ABS program work?

ABS Market Freezes



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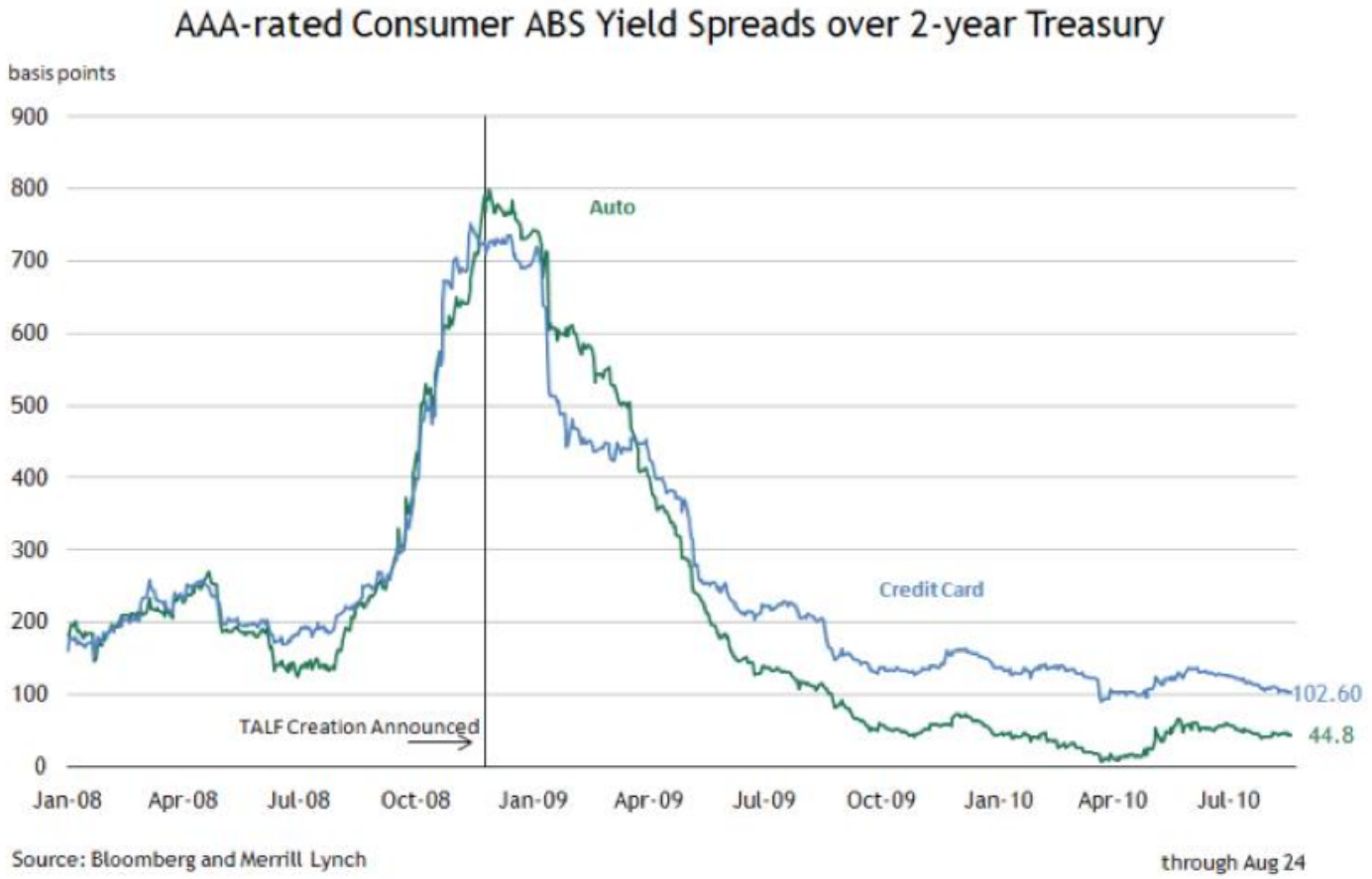

TALF as explained by the NYFed

www.newyorkfed.org/education/101talf.html

- Panic in the ABS market:

- "Beginning of mid-2007,...the number of defaults started to rise"
- "Investors...started to fear that more defaults were coming..."
- "Investors either could not or did not want to continue buying ABS"

- Successful (ex-post) '*lending* against the wind':

- "The Fed lent a total of $ 71.1 billion to investors in highly-rated ABS"
- "As of May 2011, there has not been a single credit loss"
- "Also, as of May 2011, TALF loans have earned $1.2 billion in interest income for the US taxpayer"

A challenge to Economic Theory

- Was the Fed better informed or just lucky?
- How should a CB react when "lowering the cost of money" is not effective?
- Which market failure can *Credit-Easing* policy cure that other policies cannot?

Self-Confirming Equilibrium (SCE)

- We introduce SCE (Fudenberg and Levine (ECMA, 1993), Sargent (AER, 2008)) in competitive credit-search economies.

- In fact, we introduce a more demanding equilibrium concept – in terms of identifying *subjective* and *objective* beliefs – we call it: *Strong Self-Confirming Equilibrium* (SSCE).

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- Banks are stuck in a pessimism trap resulting in excessive credit tightening;
  - in a SCE ($=$ REE)
    - high perceived risk $\Rightarrow$ high interest rates $\Rightarrow$ high risk
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  - banks are wrong about unobserved conterfactuals ($\neq$ REE):
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- Neither a unique equilibrium model nor multiple REE;
- Rigorous framework to discuss how subjective beliefs matters: only excessive risk-taking can be SSCE (without being REE).

Credit Easing as Social Experimentation

- Private vs social value of experimentation:
  - experiment as a public good;

- The CB can be even more pessimistic of banks but still find socially valuable to experiment with easier credit conditions;
- If successful, the policy provides observables which confute pessimism and restore social efficiency.
  - If not it clears the uncertainty.
- Experimenting through the market: large-scale banks' subsidy to induce "learning by doing".

Connection with the literature

- We do not rely on a coordination failure across banks like in (multiple REE) *Self-Fulfilling Equilibria*
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  - in contrast to Bebchuk and Goldstein (2011);
- We do not presume the CB can do something that the private sector cannot
  - in contrast to Gertler and Karadi (2011) and Correia, De Fiore, Teles and Tristani (2014);
- Policy (conv. and unconv.) plays a major role.
  - in contrast to Chari and al. (2010);
- gives social value to experimentation
  - in contrast to robustness: Sargent and Hansen (2007);

The economy

- A continuum of *firms* and of *private banks*, and a Central Bank.
- *Competitive* firms (= entrepreneurs) need funds to implement projects;
  (one firm can only realise one project).

- *Projects* can be risky or riskless and the entrepreneur chooses on which type of project to invest; there is only idiosyncratic risk.

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- *Competitive* private banks borrow money in the interbank market and lend to firms by offering credit lines at fixed interest rates;
  (banks do not observe investments and one bank is identified with one credit line).
- A *benevolent* fiscal-monetary authority controls the cost of money and can also gather taxes or provide subsidies; it has the same information than the private banks.
- In its simple version, the economy lasts one period;
  in its general version, it is a dynamic economy where in every period the one-period-economy decisions are taken, without accumulation of assets and debts.

Directed Search in the Credit Market

- Each entrepreneur applies to one credit line and, correspondingly, each credit line only finances one project; (search-matching frictions).

- The number of matchings in the credit market are given by

$$M\left(a(R),\, o(R)\right) = Aa(R)^{\gamma} o(R)^{1-\gamma}$$

  where $a\left(R\right)$ and $o\left(R\right)$ are, respectively, the mass of applications and offers in the credit market at interest rate R.

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- The probability that an application to a credit line R is accepted is $p(R) = M\left(a(R),\, o(R)\right)/a(R)$.
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- The probability that an offer to a credit line R is accepted is $q(R) = M\left(a(R),\, o(R)\right)/o(R)$.
- NOTE: Alternatively, we could consider a frictionless economy with Bertrand competition (but we don't here).

Firms

- A firm has two available technologies, $\{r,\ s\}$ producing (per-unit of investment): $Y > 0$ with prob. α and 0 with prob. $(1-\alpha)$, at per-unit cost k:

  risky: $\alpha \in (0,1)$ and $k = 0$,

  safe: $\alpha = 1$ and $k > 0$.

- If the loan is approved, the firm invests I in one of the technologies, and pays back to the bank $I(1+R)$ if $Y > 0$ and I if $Y = 0$.

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- There is a quadratic investment cost and, therefore, investment I yields, respectively:

$$\Pi\left(R, r, I\right) = \alpha(y - R)I - \frac{1}{2}I^2,$$

$$\Pi\left(R, s, I\right) = Y - k - R - \frac{1}{2}I^2$$

- The firm's type is $\omega \equiv (\alpha,\ k)$
  (All firms have the same ω, but banks do not observe ω).

Firms

- The value of a credit contract R to a firm of type ω is given by its choice of
  - the technology $\varsigma^* \in \{r,\ s\}$,
  - and the level of investment $I^* \geq 0$,

  that maximise its expected profits. That is, $(\varsigma^*, I^*) = (\varsigma^*(R), I^*(R)) \in f(R,\ \omega)$, where

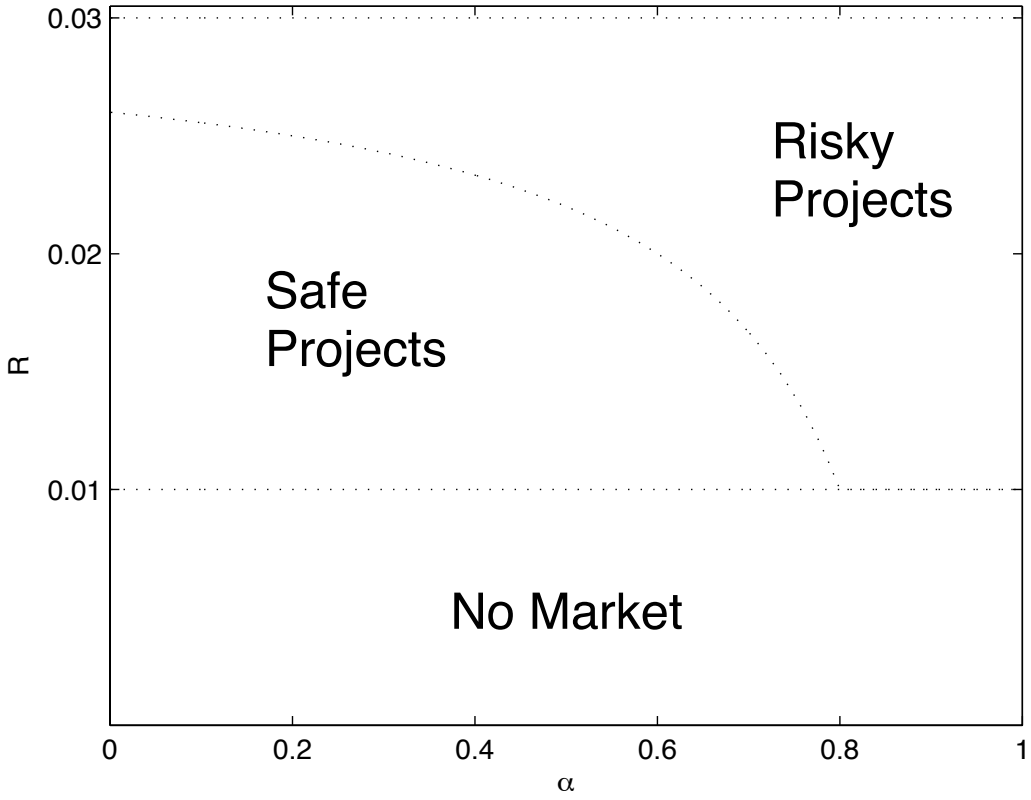
$$f(R,\ \omega) = \arg\max_{\{\varsigma \in \{r,\ s\},\ I \geq 0\}} p(R)\Pi\left(R, \varsigma, I\right).$$

- The firm chooses R^*, among the set of offered contracts H^*, which maximises its expected profits.

- Let $J(R^*) = p(R^*)\Pi\left(R^*,\ f(R^*,\ \omega)\right)$.

The choice of projects by firms

(given k)



- $Y = 0.03;\ R_{CB} = 0.01;\ k = 0.004.$

Banks

- If a bank borrows from the CB at R_{CB} and offers a credit line at R, depending on which technology the select firm uses, expects to gain:

$$\begin{aligned} \pi\left(\mathsf{s}, R, R_{CB}\right) &= R - R_{CB}, \\ \pi\left(r, R, R_{CB}\right) &= \alpha R - R_{CB}. \end{aligned}$$

- Therefore, given ω, the expected value of a credit line is

$$V\left(R\right) \equiv q\left(R\right) I^{*}(R) \pi\left(\varsigma^{*}(R), R, R_{CB}\right).$$

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- Given a cost c of posting a credit line, R' belongs to H^{*} if, there is a $R^{*} \in H^{*}$ and

$$R' = \arg\sup_{R \geq 0} \mathrm{E}^{\beta}\left[V\left(R\right) - c\right]$$

$$\text{s.t. } p\left(R\right) \mathrm{E}^{\beta}\left[\Pi\left(R, \varsigma^{*}, I^{*}\right)\right] = J(R^{*})$$

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- Notice that we have restricted 'equilibrium beliefs' as in the *directed search* literature.

Directed search for credit: summary of timing

1. Competitive banks can borrow at a rate R_{CB} controlled by the CB
2. A bank chooses at which R opens a full-allotment credit line, which costs c, filled with prob. $q(R)$
3. Competitive firms type ω choose to which posted R to apply for credit, with success prob. $p(R)$
4. A firm also chooses: the technology $\varsigma(R)$ and the size $I(R)$ of the investment
5. *If* the project is successful a firm pays back $I(1+R)$ to the bank, only I otherwise
6. Banks pay back their loan $I(1+R_{cb})$ *irrespective* of the project success

- A bank needs to anticipate the choices of a firm!

Strong Self-Confirming Equilibrium (*SSCE*)

Given ω a *Strong Self-Confirming Equilibrium* *is a set* H^* *of interest rates such that, for each* $R^* \in H^*$*:*

i) *firms maximise expected profits,*

ii) *banks maximise expected profits (subject to the 'marginal prices vs. queues' constraint), resulting in* $V(R^*) = c$*.*

iii) *banks correctly anticipates firms' reaction locally: there is an open neighbourhood of* R^**,* $\Im(R^*)$*, such that for any* $R \in \Im(R^*)$

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- In a *SSCE* banks' priors about firms' type away from the equilibrium are not restricted!
- The standard definition of *Self-Confirming Equilibrium* would only require *banks correctly anticipating firms' reaction in equilibrium*:

$$\mathrm{E}^{\beta}\left[V(R^*)\right] = V(R^*).$$

Rational Expectations Equilibrium

A $R^* \in H^*$ *is a* ***REE*** *if, in addition to (i) & (ii),*

iii′) *banks correctly anticipates firms' reaction globally:*

$$\mathrm{E}^{\beta}\left[V(R)\right] = V(R)$$

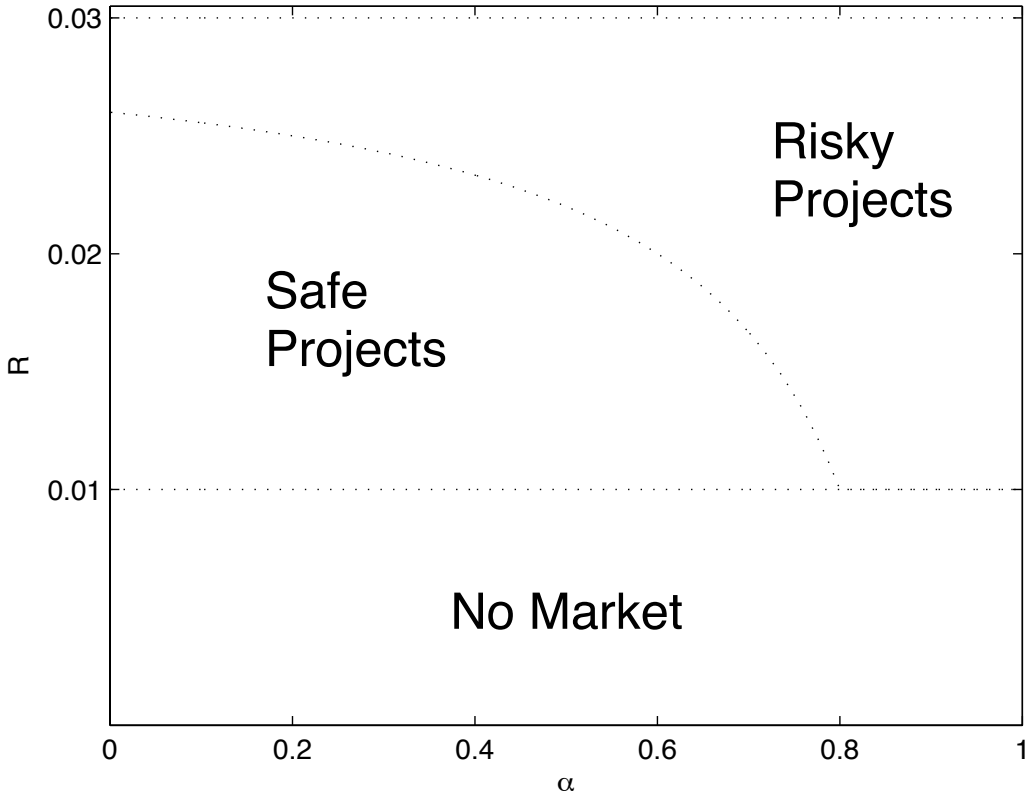
for any $R \geq 0$.

Exercise

Exercise: Show that if banks observe k but not α there can be a *Self-Confirming Equilibrium* which is not a *REE*, but there cannot be a *Strong Self-Confirming Equilibrium* which is not a *REE*.

The choice of projects by firms

(given k)



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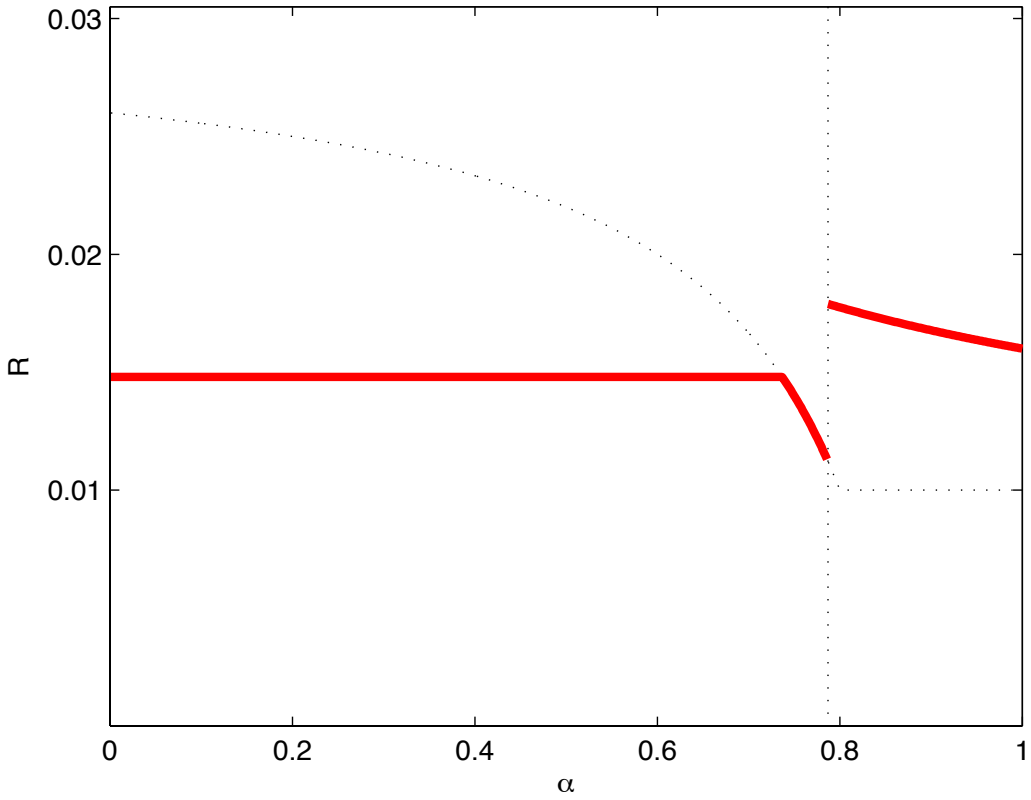
Unique REE



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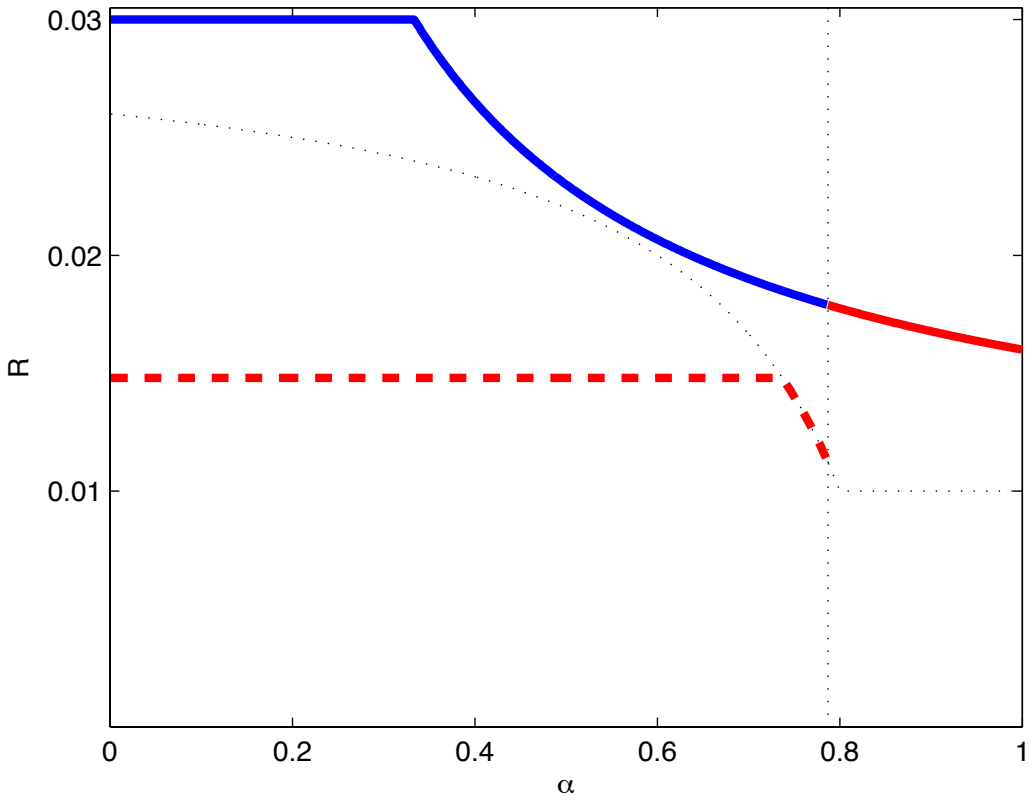

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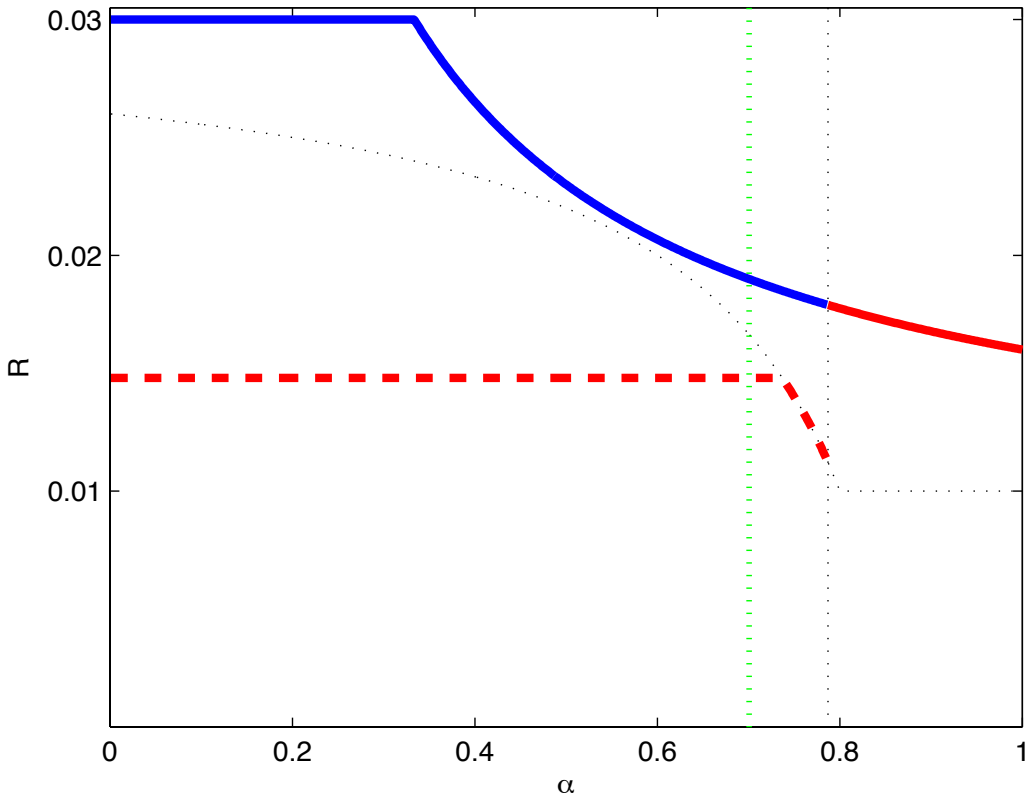

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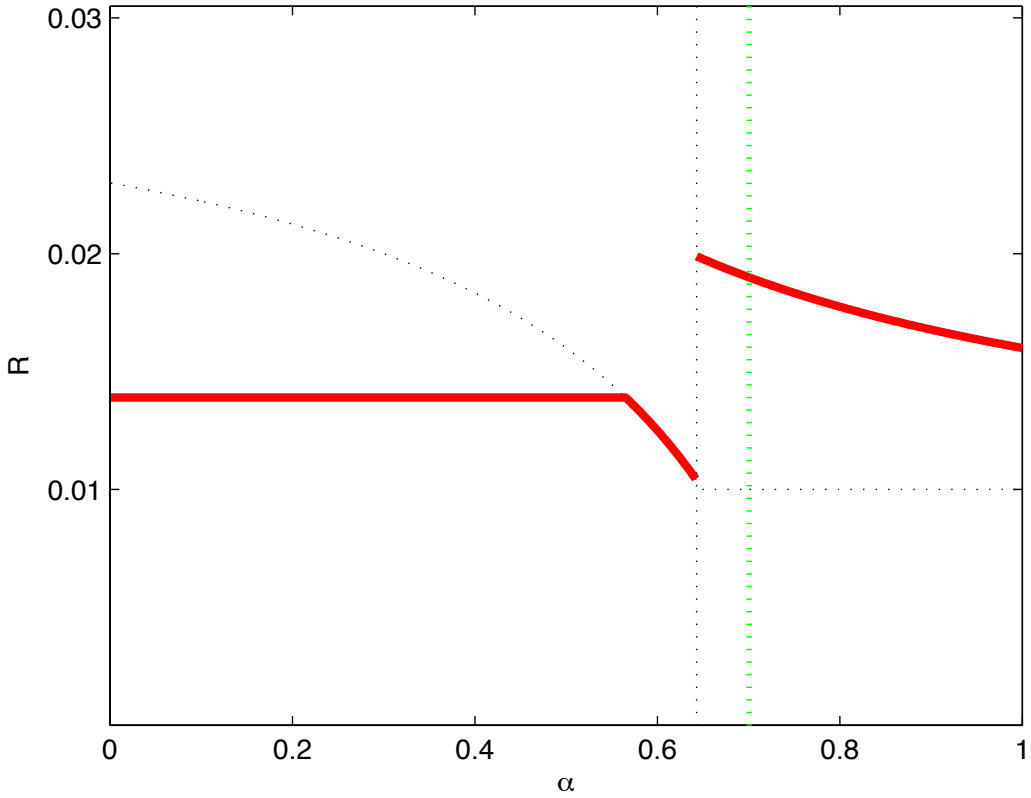
Perceived Equilibrium



- $Y = 0.03$; $R_{CB} = 0.01$; $\mathrm{E}^{\beta}[k] = 0.007$. Green line $\alpha = 0.7$.

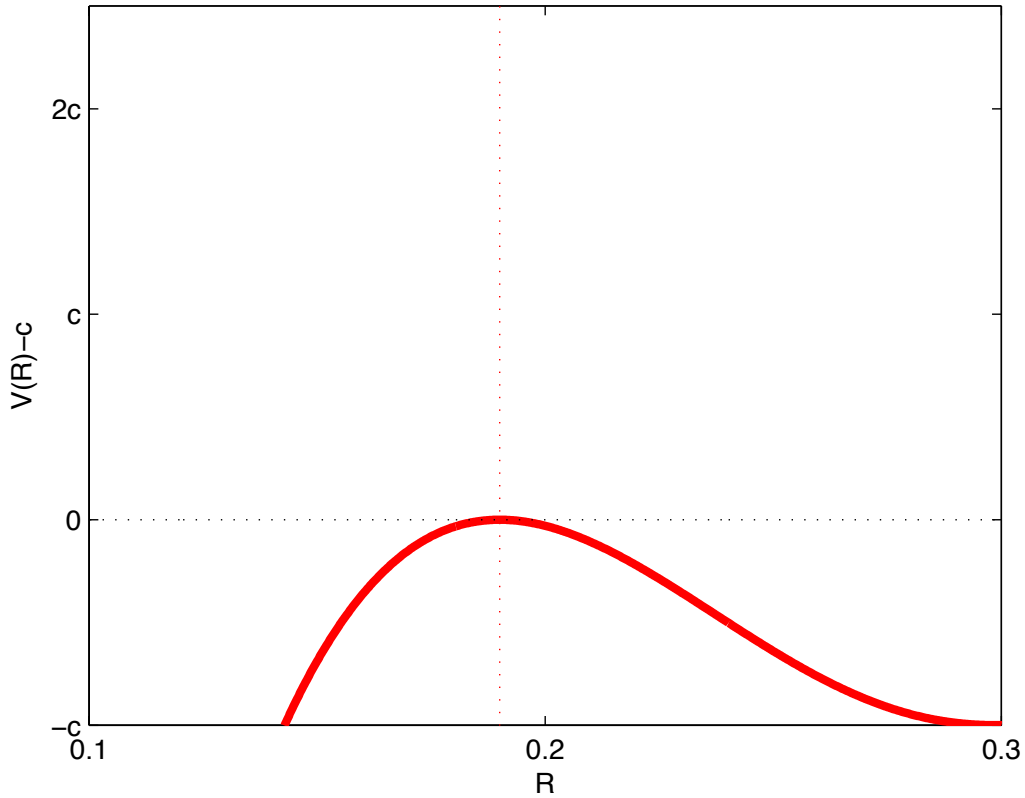
Farhi's shortages

Safe Asset Shortage

	$ bn		% of World GDP	
	2007	2011	2007	2011
US Federal Government Debt held by the public	5,136	10,692	9.20%	15.80%
Held by the Fed	736	1,700	1.30%	2.50%
Held by private investors	4,401	8,992	7.90%	13.30%
GSE obligations	2,910	~~2,023~~	5.20%	~~3.00%~~
Agency- and GSE-backed mortgage pools	4,464	~~6,283~~	8.00%	~~9.30%~~
Private-issue ABS	3,901	~~1,277~~	7.00%	~~1.90%~~
German and French government debt	2,492	3,270	4.50%	4.80%
Italian and Spanish government debt	2,380	~~3,143~~	4.30%	~~4.70%~~
Safe assets	**20,548**	**12,262**	**36.90%**	**18.10%**

Note: Numbers are struck through if they are believed to have lost their "safe haven" status after 2007.
Source: Federal Reserve, Haver Analytics, Barclays Research

Perceived Equilibrium Profits



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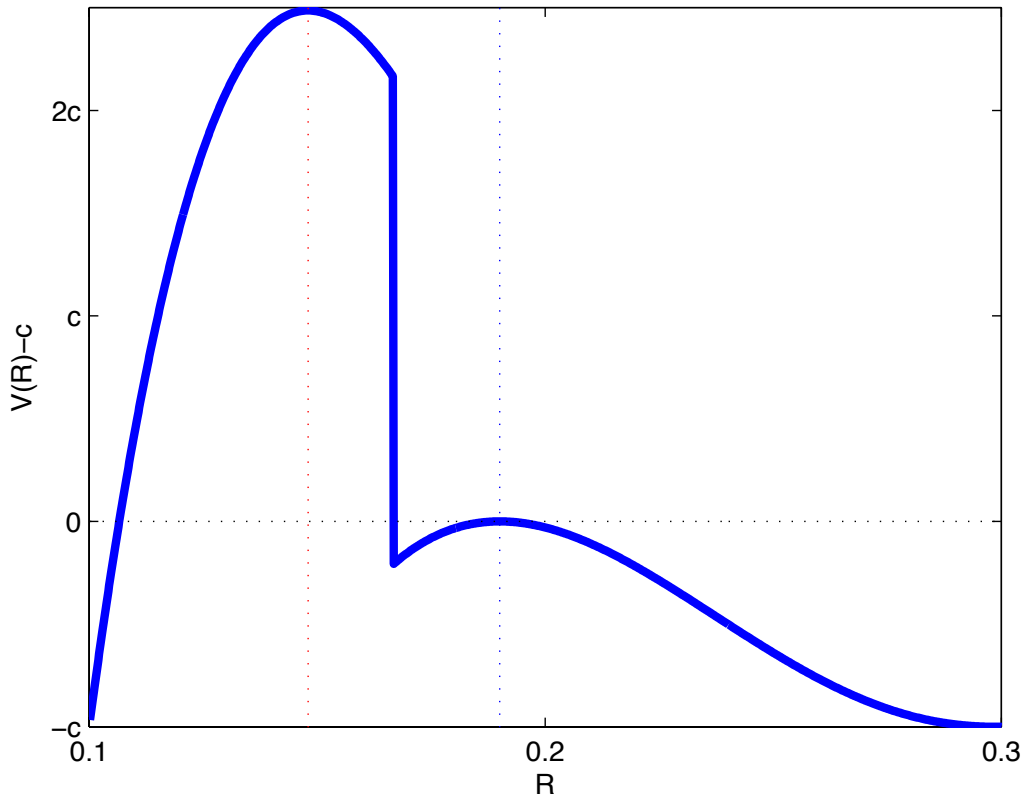

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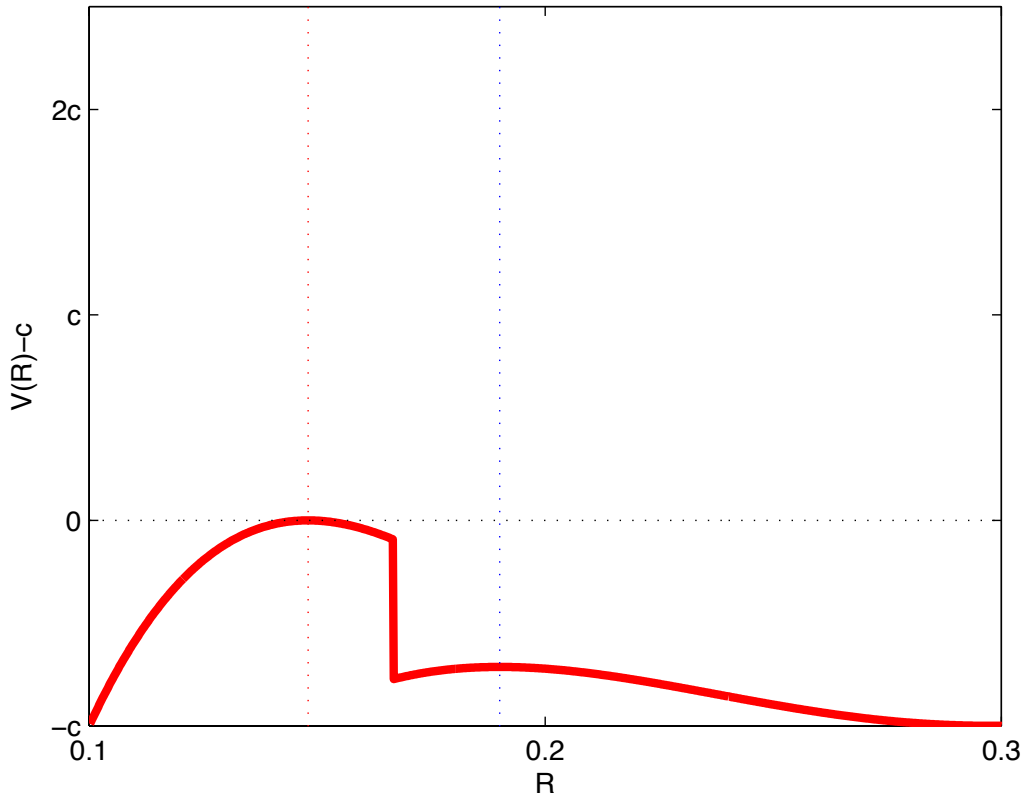

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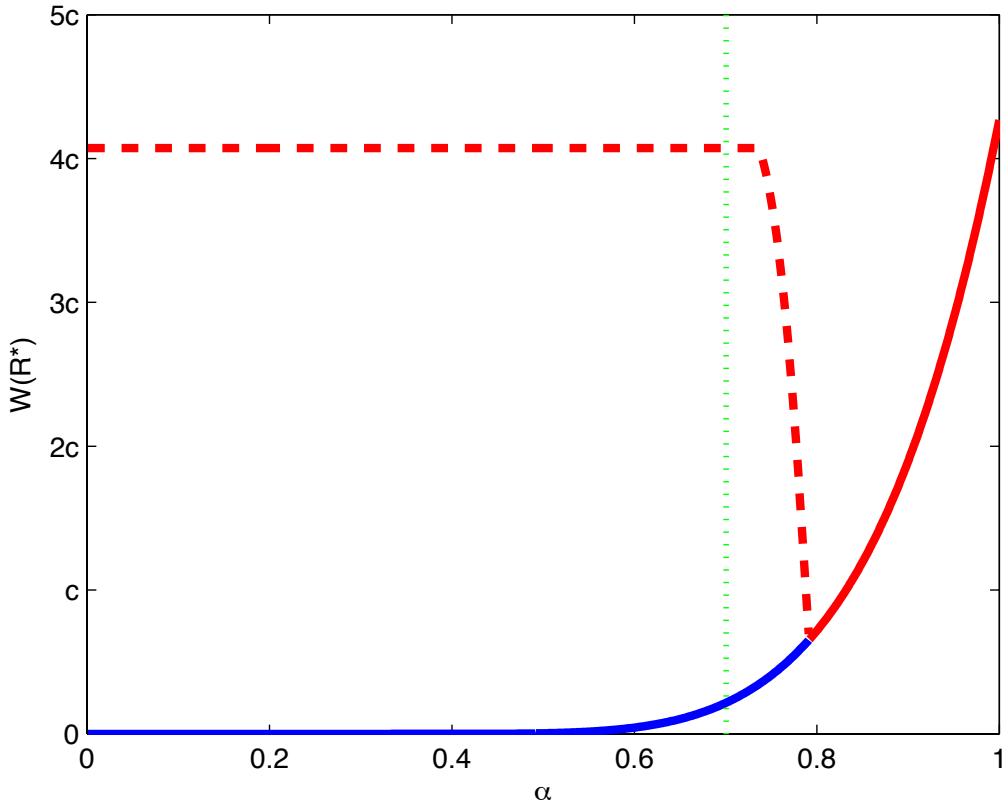
Private vs. public value of experimentation

- In the dynamic economy (contracts last one period) : private banks may never experiment, neither privately nor in cooperation
  - since the outcome becomes public information, gains would last just one period (feature of the competitive environment!);
  - pessimistic beliefs give no room for cooperation.
- The experiment is a public good.
- An experiment that the CB must implement through the banking system (a feature that enhances learning-by-doing).
- A risky experiment for the CB...

Social Welfare



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The social value of experimentation

- In an intertemporal perspective the objective of the CB is to maximize the social welfare

$$\mathrm{W}_t = \mathrm{E}^{\beta}\left[\sum_{\tau=0}^{\infty} \delta^{\tau} \mathrm{w}_{t+\tau}\right],$$

  with $\mathrm{w}_t = J_t^* - T_t + V_t\left(R^*\right) - c$, evaluated with the same β belief-system.

- J_t^* is the value to firms: $J_t^{s,*}$ or $J_t^{r,*}$

- T_t is the cost of performing the experiment.

The social value of experimentation

- Suppose ζ is the probability that the CB attaches to $k = 0.004$ (otherwise $k = 0.007$). The social value of experimentation is

$$\Delta \mathrm{W}_t = \mathrm{E}^{\beta}\left[\Delta \mathrm{w}_t\right] + \zeta \frac{\delta}{1-\delta}\left(J_t^{s,*} - J_t^{r,*}\right).$$

- Large-scale experiment if $\mathrm{E}^{\beta}\left[\Delta \mathrm{w}_t\right] > 0$ otherwise with a controlled experiment $\Delta \mathrm{w}_t => 0$; (peanuts).

Subsidising Banks' risks !

- If a bank borrows from the CB at R_{CB} and offers a credit line at R,
  and the CB follows a *Credit Easing* policy of covering eventual losses with a *subsidy*,
  depending on which technology the select firm uses, expects to gain:

$$\begin{aligned} \pi\left(s, R, R_{CB}\right) &= R - R_{CB}, \\ \pi\left(r, R, R_{CB}\right) &= (\alpha + (1-\alpha)sub)R - R_{CB}. \end{aligned}$$

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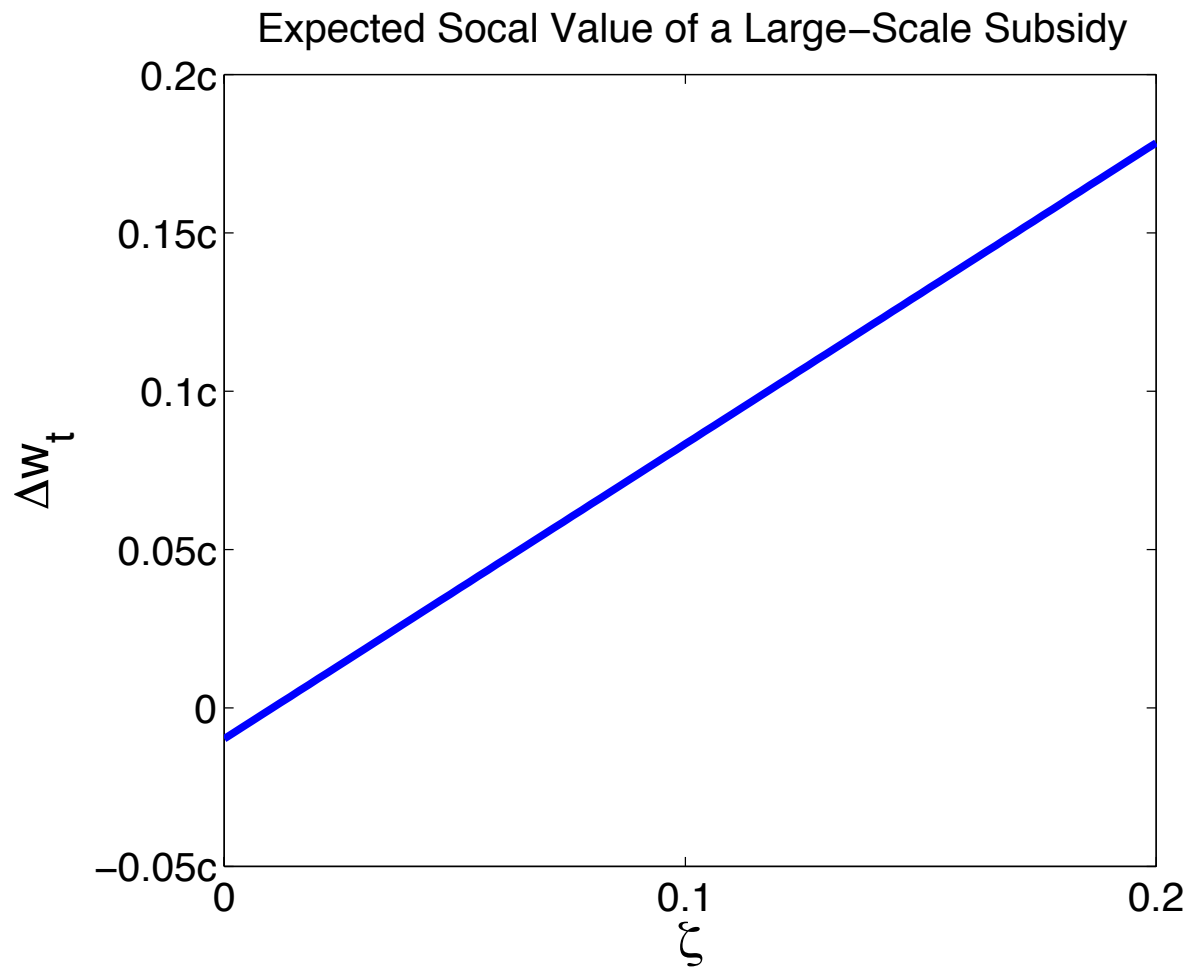

- $Y = 0.03;\ R_{CB} = 0.01;\ k = 0.004,\ \alpha = 0.7,$ sub$= 1$!!.

Self-Confirming Equilibria vs. Self-Fulfilling Equilibria

- In our economies there is not a 'coordination problem'– as in models of *Self-Fulfilling credit freezes*,– but a possible 'misperception problem', which may persist in *Self-Confirming credit crises*
  - A policy of direct credit to banks? Can help with SFE, but not with SCE.
  - Credit easing can help in both
    (but there is no experimentation in SFE: the CB must know the SFE structure).
  - Structural solution? Vertical (SCE) rather than horizontal integration (SCE)!

Extensions

- A full fledged dynamic model with heterogeneous firms (straightforward).
- Taking into account Adverse Selection (easy) and
  Moral Hazard (we only need that at low interest rates firms prefer the safer technology)
  (pessimistic beliefs account for worse case scenarios)

Our results and the European credit crisis

- Liquidity in the interbank market does not transmit to the private sector
  - especially true in Italy, Portugal and Spain,
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- Two possible causes:
  - firms are fundamentally weak $\longrightarrow$ no role for any liquidity policy
  - banks are trapped in SSCE $\longrightarrow$ credit policies can play a major role
    - the experiment is worth it, even if the result is negative!

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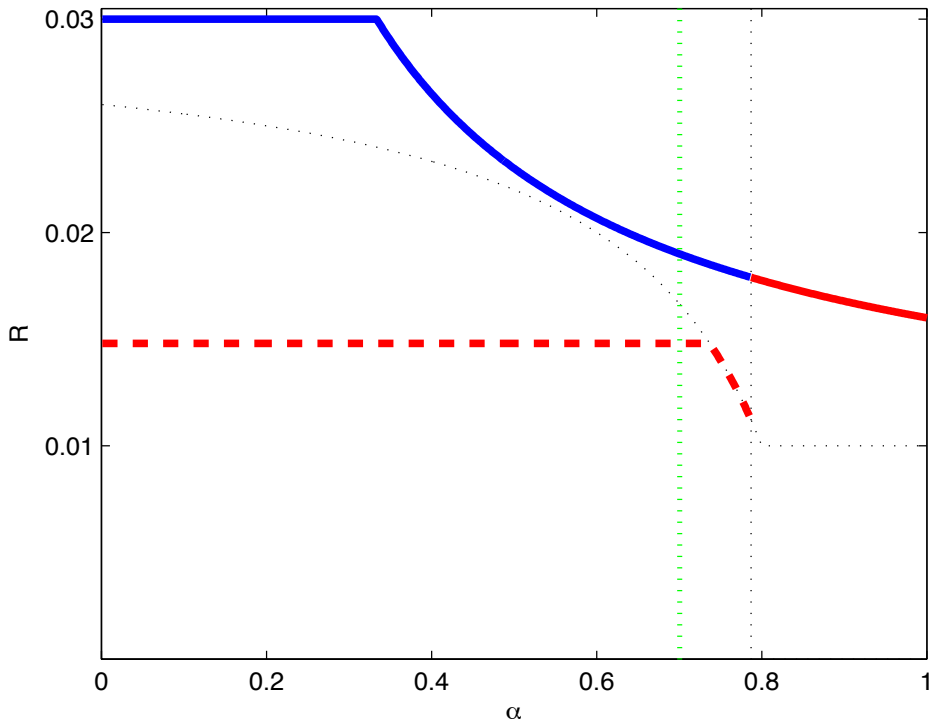
  Will this SME - ABS program work?
  Is this an experiment to 'break the spell' or just rhetoric?

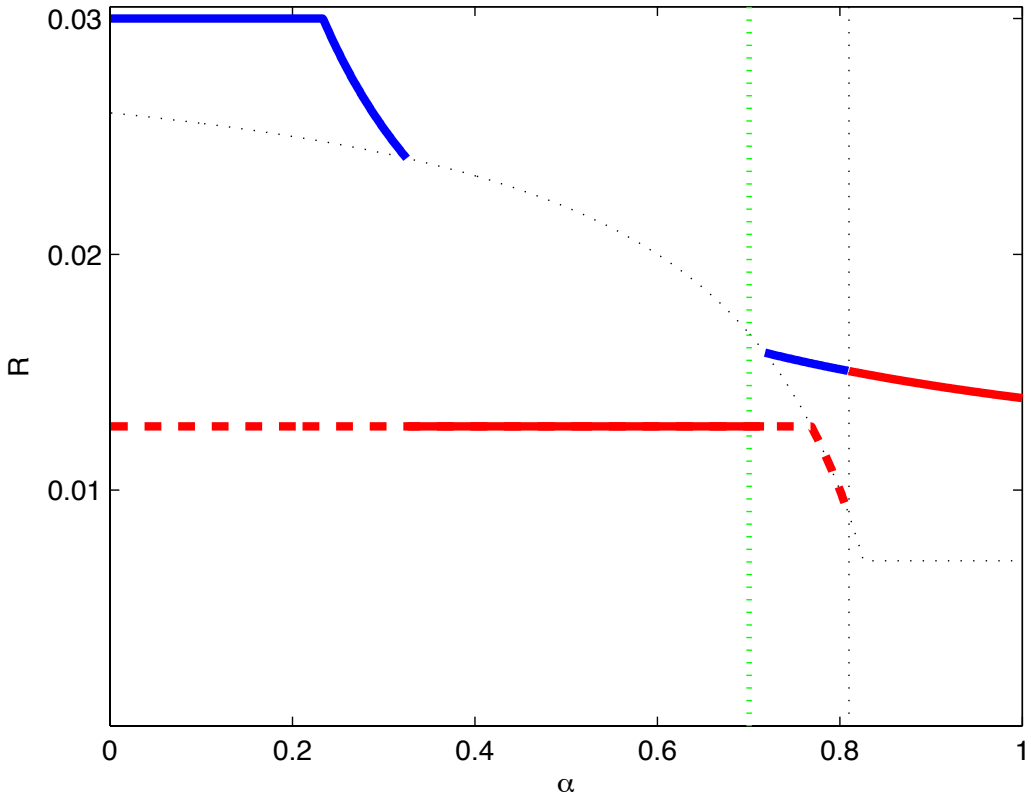
The effect of conventional policy

SSCE



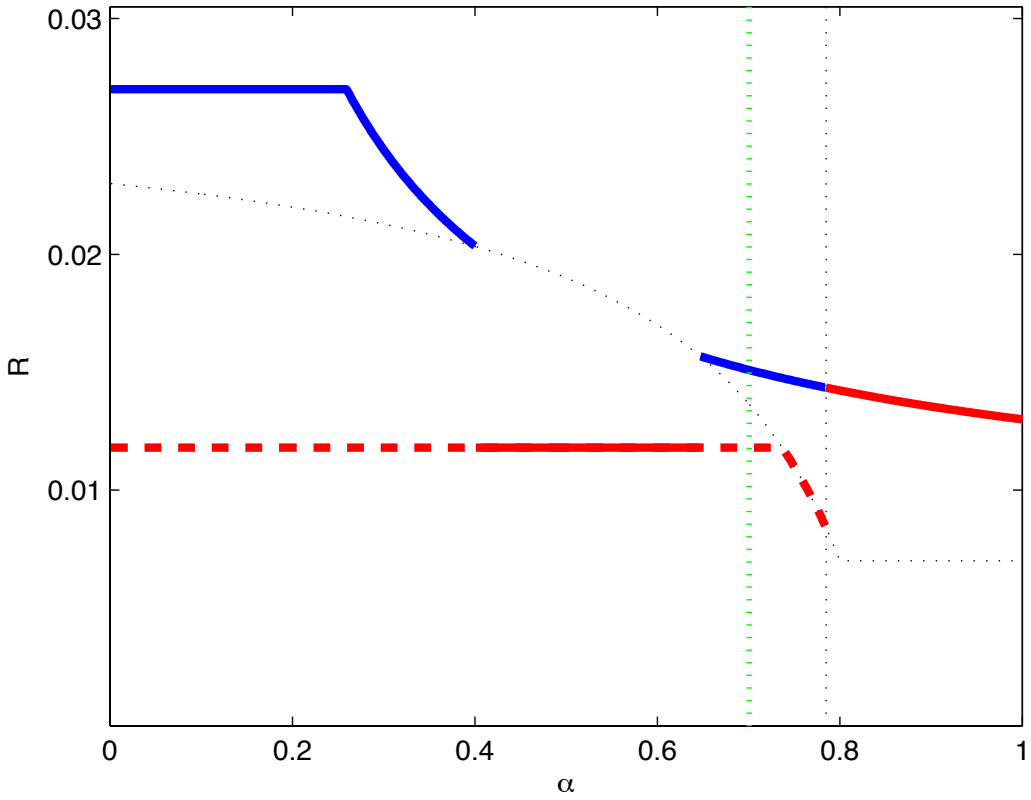
- $Y = 0.03;\ R_{CB} = 0.01;\ k = 0.004$. Green line $\alpha = 0.7$.

Interest rate policy



- $Y = 0.03$; $R_{CB} = 0.007$; $k = 0.004$. Green line $\alpha = 0.7$.

Lower returns



- $Y = 0.027$; $R_{CB} = 0.007$; $k = 0.004$. Green line $\alpha = 0.7$.

CONCLUSION

“Mario Draghi pledges to do
'whatever it takes' to save euro”

but Super Mario wouldn't just pledge...

Super Mario would also

experiment!

Super Mario would also

experiment!

Thanks!

The end