On the optimal design of a Financial Stability Fund

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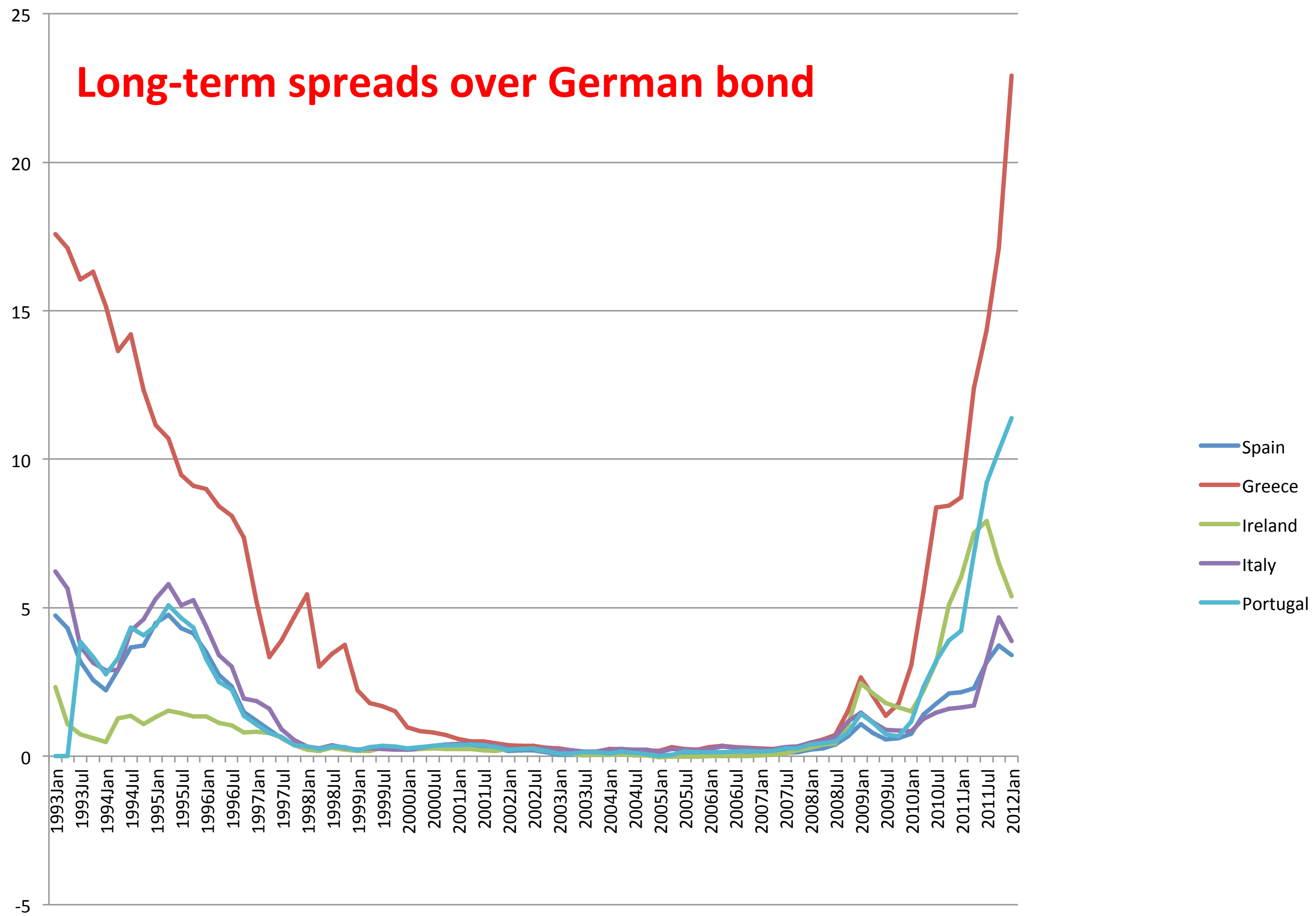
CIGS Conference on Macroeconomic Policy and Theory
May 29, 2012

Will the Euro Zone Go Up In Smoke?

(Newsweek Magazine, May 21, 2012)


Long-term spreads over German bond
25
20
15
10
5
0
-5
1993Jan
1993Jul
1994Jan
1994Jul
1995Jan
1995Jul
1996Jan
1996Jul
1997Jan
1997Jul
1998Jan
1998Jul
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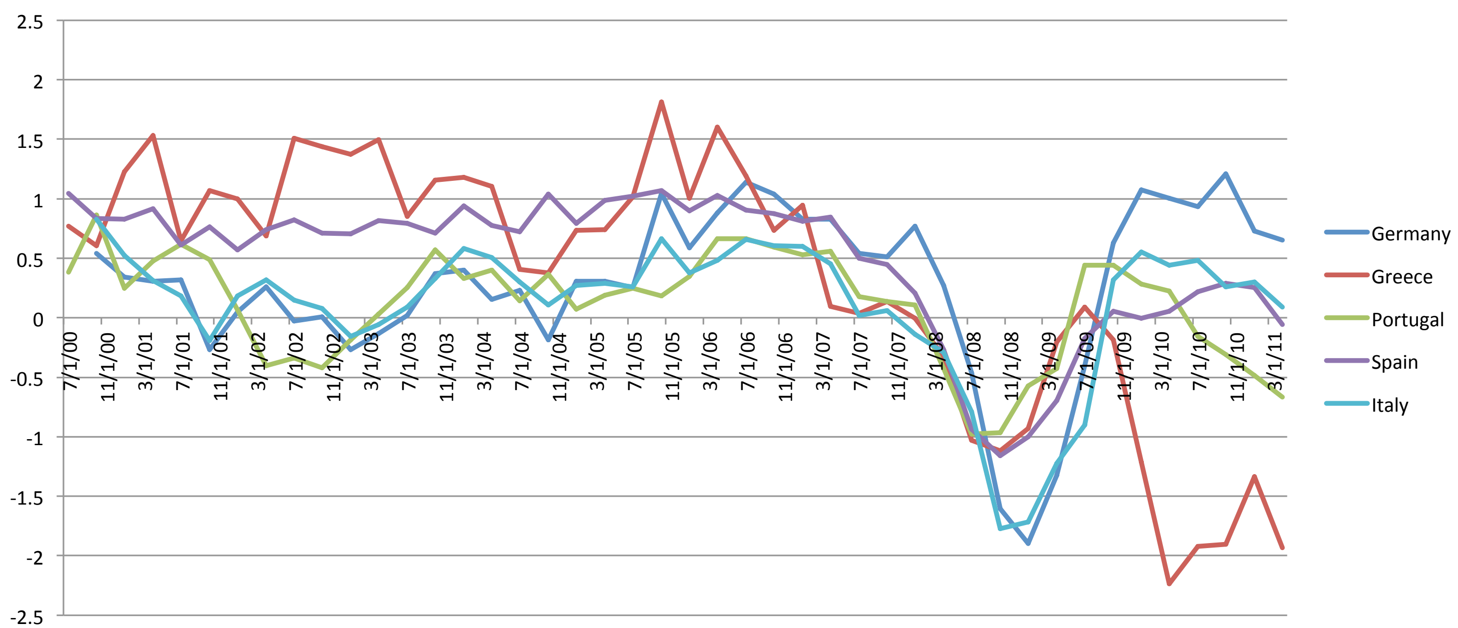
2005Jan
2005Jul
2006Jan
2006Jul
2007Jan
2007Jul
2008Jan
2008Jul
2009Jan
2009Jul
2010Jan
2010Jul
2011Jan
2011Jul
2012Jan
Spain
Greece
Ireland
Italy
Portugal

Primary deficit & surplus /GDP

(MA 2000Q2 – 2011Q2 source ECB)

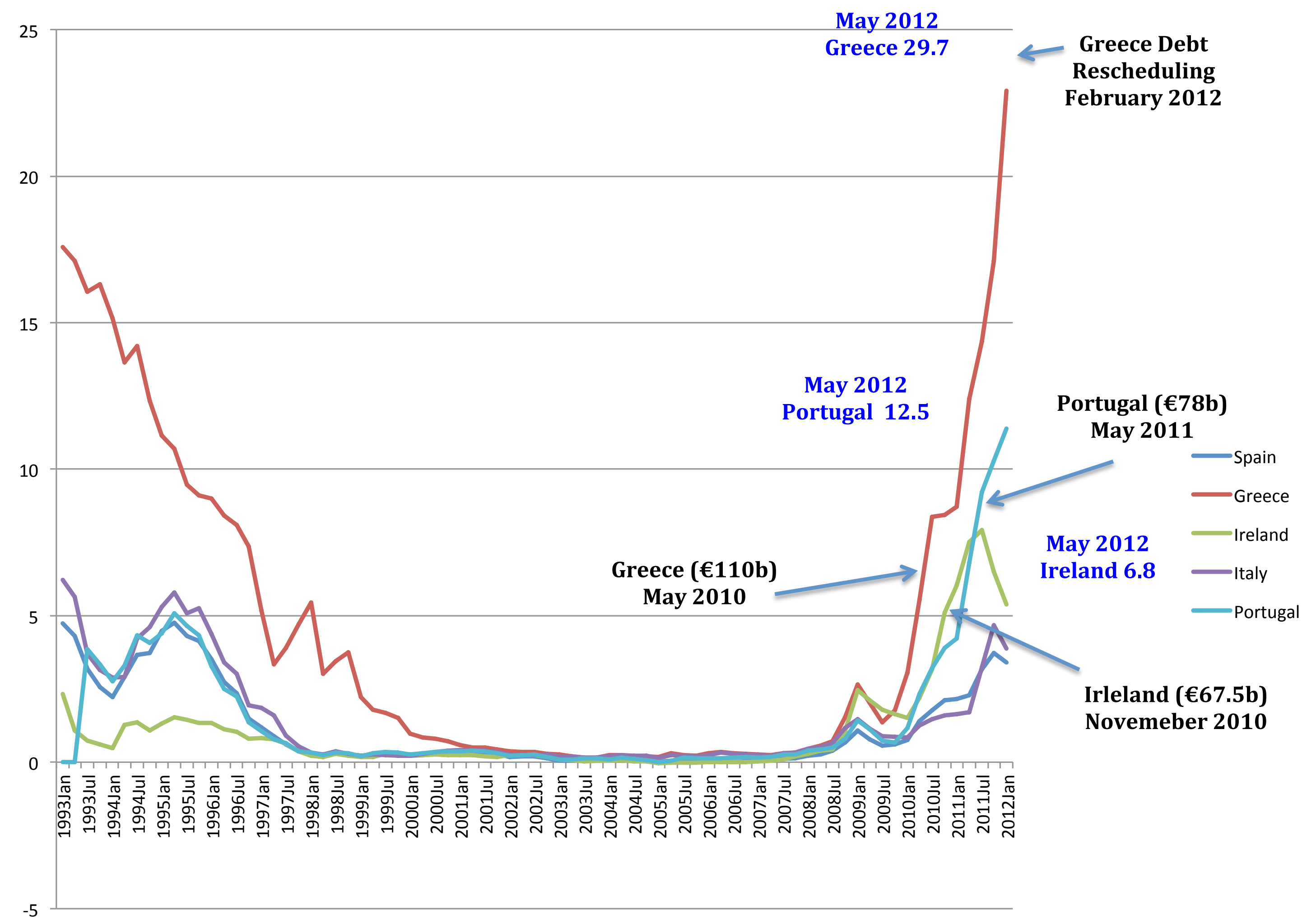
Not just a RBC recession?

GDP Growth rates (2000Q3 -2011Q2)



The Euro policy responses

- Maintain ECB mandate of price stability
- The indebted Euro countries keep using debt-financing (with very costly roll-overs)
- In spite of the "no-bailout clause" in the EU Treaty (Art. 125), a country's default is perceived catastrophic (bail-out, or partial-bailout expectations)
- Rescue packages with IMF: Greece, Ireland and Portugal
  IMF style: conditional (austerity) financial support (with Greece reschedule)



Long-term spreads over German bond

The Euro policy responses

- In spite of the "monetary financing prohibition" (Art. 123), large ECB debt purchase interventions (Italy and Spain, not Greece 2011-12, Spain again?)

- The European Fiscal Compact (2 March, 2012) setting deficit constraints in State constitutions (similar to US States)

- The creation of the **European Stability Mechanism** as a *Financial Stability Fund*; starts July 2012 !

The Euro policy responses

- Could have we done better?
- Can we do better?
- Will we learn?

A *Financial Stability Fund* as a Dynamic Mechanism Design problem

- The finance theories on the 'optimality of the debt contract' do not apply to the long-term relationship of countries in an Economic Union.

- Long-term contracts can provide risk-sharing and enhance investment opportunities.

- A *FSF* can either use only its own financial resources, or act as a *maturity transformation* facility, transforming non-contingent loans (from international markets, Central Banks, or households) into *contingent* loans to participants in the *FSF*.

A *Financial Stability Fund* as a Dynamic Mechanism Design problem

- However, a well designed *FSF* must take into account:

  The redistribution, or Hayek's, problem: the *participation constraints* of all the *FSF* members (and the *FSF* as lender)

  The moral hazard problem: the *incentive compatibility constraints* (not accounted for in this version)

The environment

- One risk-averse government-borrower & one risk-neutral fund-lender
- Lender: at the risk-free rate r
- Borrower's technology: leisure, $l = 1 - n$ & output, $y = \theta f(n)$
- Borrower's preferences: $u(c) + U(1 - n)$ & β, $1/(1 + r) \geq \beta$
- Markovian shocks: productivity, θ & government expenditure, G; i.e. an exogenous state $s = (\theta, G)$, with transition probability $\pi(s'|s)$.

Alternative borrowing & lending mechanisms

- *Complete markets* with full commitment (FB)
- *Incomplete markets* with & without default, (IMD) & (IM)
- *Financial Stability Fund* (FSF) with one-sided ($1S$) & two-sided limited commitment ($2S$)
- How would an IMD look if, with the same shocks, had a $2S - FSF$? (Greece with a proper ESM?)
- How much would it gain?

Incomplete markets without default

b = asset holdings at the beginning of the period (if $b < 0$ we call it debt)

$$V^{bi}(b, \theta, G) = \max_{c,n,b'} \left\{ u(c) + U(1-n) + \beta \mathrm{E} \left[V^{bi}(b', \theta', G') \mid \theta, G \right] \right\}$$

$$\text{s.t.} \quad c + G + qb' \leq \theta f(n) + b$$

- Resulting in policies: $c^i(b, \theta, G)$, $n^i(b, \theta, G)$ and $b'^i(b, \theta, G)$
- Since the lender is risk neutral: $q = \frac{1}{1+r}$
- Notice there is an implicit no default technology.

Incomplete markets with default.

Following Arellano (2008), if the country does not default on its debt, the value of b at (θ, G) is

$$V^{bid}(b,\theta,G) = \max_{c,n,b'} \left\{ u(c) + U(1-n) + \beta \mathrm{E}\left[V^{bia}(b',\theta',G') \mid \theta, G \right] \right\}$$

$$\text{s.t.} \quad c + G + q(\theta, G, b')b' \leq \theta f\left(n\right),$$

where, taking into account that default can occur next period,

$$V^{bia}(b,\theta,G) = max\{V^{bid}(b,\theta,G), V^{ai}(b,\theta,G)\}$$

Incomplete markets **with default.**

- The value in autarky is given by

$$V^{ai}(\theta, G) = \max_n \{u((\theta f(n) - G) + U(1-n)$$
$$+\beta \mathrm{E}\left[(1-\lambda) V^{ai}(\theta', G') + \lambda V^{bid}(0, \theta', G') \mid \theta, G\right]\}$$

- After default a government is in autarky, but can be re-enter the financial (incomplete) market with probability λ; λ small.

Incomplete markets with default

- The choice of default:

$$D(\theta, G, b) = 1 \text{ if } V^{ai}(\theta, G) > V^{bid}(b, \theta, G) \text{ and } 0 \text{ otherwise,}$$

- The price of new debt: $q(\theta, G, b') = \frac{1-d(\theta,G,b')}{1+r}$

- The expected default rate: $d(\theta, G, b') = \mathrm{E}\left[D(\theta, G, b') \mid \theta, G\right]$

- The debt interest rate: $r^i(\theta, G, b') = 1/q(\theta, G, b') - 1$

- The spread: $r^i(\theta, G, b') - r \geq 0$

Incomplete markets accounting

- Primary surplus (we also call it transfers, τ, and primary deficit if negative)

$$\begin{aligned} qb' - b &= \theta f(n) - (c + G) \quad \text{and, with default,} \\ q(\theta, G, b')b' - b &= \theta f(n) - (c + G) \end{aligned}$$

- Surplus = primary surplus + interest repayment (end of the period)

$$\begin{aligned} b' - b &= (qb' - b) + qb'(1/q - 1) \\ &= qb'(1 + r) - b \quad \text{and, with default,} \\ b' - b &= q(\theta, G, b')b'(1 + r^i(\theta, G, b')) - b \end{aligned}$$

The *Financial Stability Fund* as a long-term contract

$$\max_{\{c(s^t),n(s^t)\}} \quad \mathrm{E}\left[\mu_{b,0}\sum_{t=0}^{\infty}\beta^t\left[u(c(s^t))+U(1-n(s^t))\right]\right.$$

$$\left. + \mu_{l,0}\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^t \tau(s^t) \mid s_0\right]$$

s.t.

$$\mathrm{E}\left[\sum_{r=t}\beta^{r-t}\left[u(c(s^r))+U(1-n(s^r))\right] \mid s^t\right] \geq V^{af}(s_t)$$

$$\mathrm{E}\left[\sum_{r=t}\left(\frac{1}{1+r}\right)^{r-t}\tau(s^t) \mid s^t\right] \geq Z,$$

and

$$\tau(s^t) = \theta(s^t) f\left(n(s^t)\right) - c(s^t) - G(s^t), \quad t \geq 0.$$

The *Financial Stability Fund* as a long-term contract

- $V^{af}(s_t)$, is defined as $V^{ai}(s_t)$, except that λ is, in this case, the probability of returning to the fund with $b = 0$.

- $Z \leq 0$ is the outside value of the lender.

- The solution to the *FSF* maximization problem is:

  FB A first best contract, when $V^{af}(s_t)$ and Z are never binding, for $t > 0$.

  1S A one-sided limited enforcement contract, when only Z is never binding, for $t > 0$.

  2S A two-sided limited enforcement contract, when both participation constraints may bind, for $t > 0$.

The *Financial Stability Fund* as a long-term contract

Following Marcet & Marimon (1999, 2011), we can write the *FSF* contracting problem as:

$$\min_{\{\gamma_{b,t},\gamma_{l,t}\}} \max_{\{c_t,n_t\}} \mathrm{E}\left[\sum_{t=0}^{\infty} \beta^t \left(\mu_{b,t+1}\left[u(c_t)+U(1-n_t)\right]-\gamma_{b,t}V^A(s_t)\right)\right.$$

$$\left.+\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^t \left(\mu_{l,t+1}\tau_t-\gamma_{l,t}Z\right) \mid s_0\right]$$

$$\mu_{i,t+1}(s^{t+1})=\mu_{i,t}(s^t)+\gamma_{i,t}(s^t)\,,\ \mu_{i,0}(s_0) \text{ is given, for } i=b,l,$$

$\gamma_{i,t}(s^t)$ is the Lagrange multiplier of the participation constraint of agent i in period t, state s^t,
$\mu_{i,0}(s_0)$, $i=b,l$, is determined by the lender's *zero profit condition*.

The *Financial Stability Fund* as a long-term contract

Following Kehoe and Perri (2002), we can use as co-state variable $x_t = \frac{\mu_{l,t}}{\mu_{b,t}\eta}$, where $\eta \equiv \beta(1+r) \leq 1$, and $v_i(x,s) = \gamma_i(x,s) / \mu_i(x,s)$, $i = b, l$..

Resulting in policy functions $c(x,s), n(x,s), \tau(x,s)$ and $v_b(x,s), v_l(x,s)$, satisfying

$$u'(c(x,s)) = x' = \frac{1+v_l(x,s)}{1+v_b(x,s)}\frac{x}{\eta},$$

and

$$\frac{U'(1-n(x,s))}{u'(c(x,s))} = \theta f'(n(x,s)).$$

The *Financial Stability Fund* as a long-term contract

The value function of the *FSF* contracting problem takes the form:

$$FV(x,s) = xV^{lf}(x,s) + V^{bf}(x,s); \text{ where,}$$

$$V^{bf}(x,s) = u(c(x,s)) + U(1 - n(x,s)) + \beta \mathrm{E}\left[V^{bf}(x',s') \mid s\right]$$

and

$$V^{lf}(x,s) = \tau(x,s) + \frac{1}{1+r}\mathrm{E}\left[V^{lf}(x',s') \mid s\right]$$

Furthermore, $V^{bf}(x,s) \geq V^{af}(s)$, with equality if $v_b(x,s) > 0$ and, similarly, $V^{lf}(x,s) \geq Z$ if $v_l(x,s) > 0$.

Decentralizing the *FSF contract*

Following Alvarez and Jermann (2000), we can find competitive prices to value *FSF* contracts and compare them with the *IM* and *IMD* contracts.

The dual competitive economy

Let the borrower have access to a complete set of one-period Arrow securities...

$$\max_{\{c_b(s^t), n(s^t), a_b(s^{t+1})\}} \sum_{t=0} \sum_{s^t} \beta^t \pi\left(s^t\right)\left[u(c_b(s^t)) + U(1 - n(s^t))\right]$$

$$\text{s.t. } c_b(s^t) + \sum_{s^{t+1}|s^t} q\left(s^{t+1}|s^t\right) a_b\left(s^{t+1}\right) = \theta(s^t) f\left(n(s^t)\right) - G(s^t) + a_b(s^t)$$

$$a_b\left(s^{t+1}\right) \geq A_b\left(s^{t+1}\right)$$

- $q\left(s^{t+1}|s^t\right)$ is the price of the one-period state contingent
- $a_b\left(s^{t+1}\right)$ are the asset (contingent claims) holdings
- $A_b\left(s^{t+1}\right)$ is an endogenous borrowing limit

The dual competitive economy

The borrower's choice satisfies

$$q\left(s^{t+1}|s^{t}\right) \geq \beta^{t}\pi\left(s^{t+1}|s^{t}\right)\frac{u'\left(c_b\left(s^{t+1}\right)\right)}{u'\left(c_b\left(s^{t}\right)\right)}$$

with equality if $a_b\left(s^{t+1}\right) > A_b\left(s^{t+1}\right)$, as well as the present-value budget constraint.

The dual competitive economy

Similarly, let the lender have access to a complete set of Arrow securities...

$$\max_{\{c_l(s^t),a_l(s^{t+1})\}} \sum_{t=0} \sum_{s^t} \left(\frac{1}{1+r}\right)^t \pi\left(s^t\right) c_l(s^t)$$

$$\text{s.t. } c_l(s^t) + \sum_{s^{t+1}|s^t} q\left(s^{t+1}|s^t\right) a_l\left(s^{t+1}\right) = a_l(s^t)$$

$$a_l\left(s^{t+1}\right) \geq A_l\left(s^{t+1}\right)$$

The lender's choice satisfies, with equality if $a_l\left(s^{t+1}\right) > A_l\left(s^{t+1}\right)$,

$$q\left(s^{t+1}|s^t\right) \geq \left(\frac{1}{1+r}\right)^t \pi\left(s^{t+1}|s^t\right)$$

The dual competitive economy

The values for the borrower and the lender have a recursive form

$$
\begin{aligned}
W^b(a_b\left(s^t\right), s^t) &= u(c_b(s^t)) + U(1 - n(s^t)) + \\
&\quad \beta \sum_{s^{t+1}|s^t} \pi(s_{t+1}|s_t) W^b(a_b\left(s^{t+1}\right), s^{t+1}) \\
W^l(a_l\left(s^t\right), s^t) &= c_l(s^t) + \\
&\quad \frac{1}{1+r} \sum_{s^{t+1}|s^t} \pi(s_{t+1}|s_t) W^l(a_l\left(s^{t+1}\right), s^{t+1})
\end{aligned}
$$

The *decentralized FSF contract*

Let $\{c^*(s^t), n^*(s^t), \tau^*(s^t)\}$ be the allocation of a *FSF* contract...

$$\begin{aligned} q^*\left(s^{t+1}|s^t\right) &= \max\left\{\beta\pi(s_{t+1}|s_t)\frac{u'(c^*(s^{t+1}))}{u'(c^*(s^t))}, \left(\frac{1}{1+r}\right)\pi\left(s^{t+1}|s^t\right)\right\} \\ &= \max\left\{\beta\pi(s_{t+1}|s_t)\frac{1+v_l(x_{t+1},s_{t+1})}{(1+v_b(x_{t+1},s_{t+1}))\eta}, \left(\frac{1}{1+r}\right)\pi(s_{t+1}|s_t)\right\} \\ &= \left(\frac{1}{1+r}\right)\pi(s_{t+1}|s_t)\max\left\{\frac{1+v_l(x_{t+1},s_{t+1})}{1+v_b(x_{t+1},s_{t+1})}, 1\right\} \end{aligned}$$

If the lender's participation constraint is not binding: $\frac{1+v_l(x_{t+1},s_{t+1})}{1+v_b(x_{t+1},s_{t+1})} \leq 1$.
The price of a one-period bond: $q^f(s^t) = \sum_{s^{t+1}|s^t} q^*\left(s^{t+1}|s^t\right)$.
When the lender's participation constraint is binding, for some s^{t+1}, the spread is negative.

The *decentralized FSF contract*

asset holdings = present value of transfers

$$Q^*\left(s^t|s_0\right) = q^*\left(s^1|s_0\right)q^*\left(s^2|s^1\right)\ldots q^*\left(s^t|s^{t-1}\right)$$

$$\begin{aligned}
a_b\left(s^t\right) &= \sum_{n=0}^{\infty}\sum_{s^{t+n}|s^t} Q^*\left(s^{t+n}|s^t\right)\left[c^*\left(s^{t+n}\right) - \left(\theta(s^{t+n})f\left(n^*(s^{t+n})\right) - G\left(s^{t+n}\right)\right.\right. \\
&= -\sum_{n=0}^{\infty}\sum_{s^{t+n}|s^t} Q^*\left(s^{t+n}|s^t\right)\tau^*\left(s^{t+n}\right) \\
a_l\left(s^t\right) &= \sum_{n=0}^{\infty}\sum_{s^{t+n}|s^t} Q^*\left(s^{t+n}|s^t\right)c_l\left(s^{t+n}\right) = \sum_{n=0}^{\infty}\sum_{s^{t+n}|s^t} Q^*\left(s^{t+n}|s^t\right)\tau^*\left(s^{t+n}\right) \\
a_l\left(s^t\right) &= -a_b\left(s^t\right).
\end{aligned}$$

The *decentralized FSF contract*

Limited enforcement means, here, that the borrowing limits

$$A_b\left(s^{t+1}\right) = -\sum_{n=0}^{\infty} \sum_{s^{t+n}|s^t} Q\left(s^{t+n}|s^t\right) \left[\theta(s^{t+n}) f\left(n^*(s^{t+n})\right) - G\left(s^{t+n}\right)\right]$$

$$A_l\left(s^{t+1}\right) \geq Z = \sum_{s^{t+n}|s^t} (\frac{1}{1+r})^n (n^*(s^{t+n}),$$

satisfy

$$W^b(A_b\left(s^t\right), s^t) = V^{af}(s^t)$$

$$W^l(A_l\left(s^t\right), s^t) = Z$$

$\Longrightarrow$ expected transfers to the lender at the states where his participation constraint are binding can not be negative.

The duality between the *FSF contract* and the *competitive equilibrium*

$$
\begin{aligned}
V^{bf}(x,s) &= u(c(x,s)) + U(1-n(x,s)) + \beta \sum_{s'} \pi(s'|s) V^{bf}(x',s') \\
V^{lf}(x,s) &= \tau(x,s) + \frac{1}{1+r} \sum_{s'} \pi(s'|s) V^{lf}(x',s').
\end{aligned}
$$

$$
\begin{aligned}
W^{bf}(a_b,s) &= u(c_b(a_b,s)) + U(1-n(a_b,s)) + \beta \sum_{s'} \pi(s'|s) W^{bf}(a_b',s') \\
W^{lf}(a_l,s) &= c_l(a_l,s) + \frac{1}{1+r} \sum_{s'} \pi(s'|s) W^{lf}(a_l',s'),
\end{aligned}
$$

FSF accounting

- Primary surplus (we also call it transfers, τ, and primary deficit if negative)

$$\sum_{s'|s} q\left(s'|s\right) a_b\left(s'\right) - a_b(s) = c_l(a_l, s) = \tau(x, s)$$

- Surplus = primary surplus + interest repayment (end of the period)

$$\begin{aligned} a_b\left(s'\right) - a_b(s) &= \left[\sum_{s'|s} q\left(s'|s\right) a_b\left(s'\right) - a_b(s)\right] \\ &+ \left[a_b\left(s'\right) - \sum_{s'|s} q\left(s'|s\right) a_b\left(s'\right)\right] \end{aligned}$$

Contrasting *debt contracts* and *FSF contracts*

$$\log(c) + \frac{\gamma(1-n)^{1-\sigma}}{1-\sigma},$$

with $\sigma = 2$, $\gamma = 1$

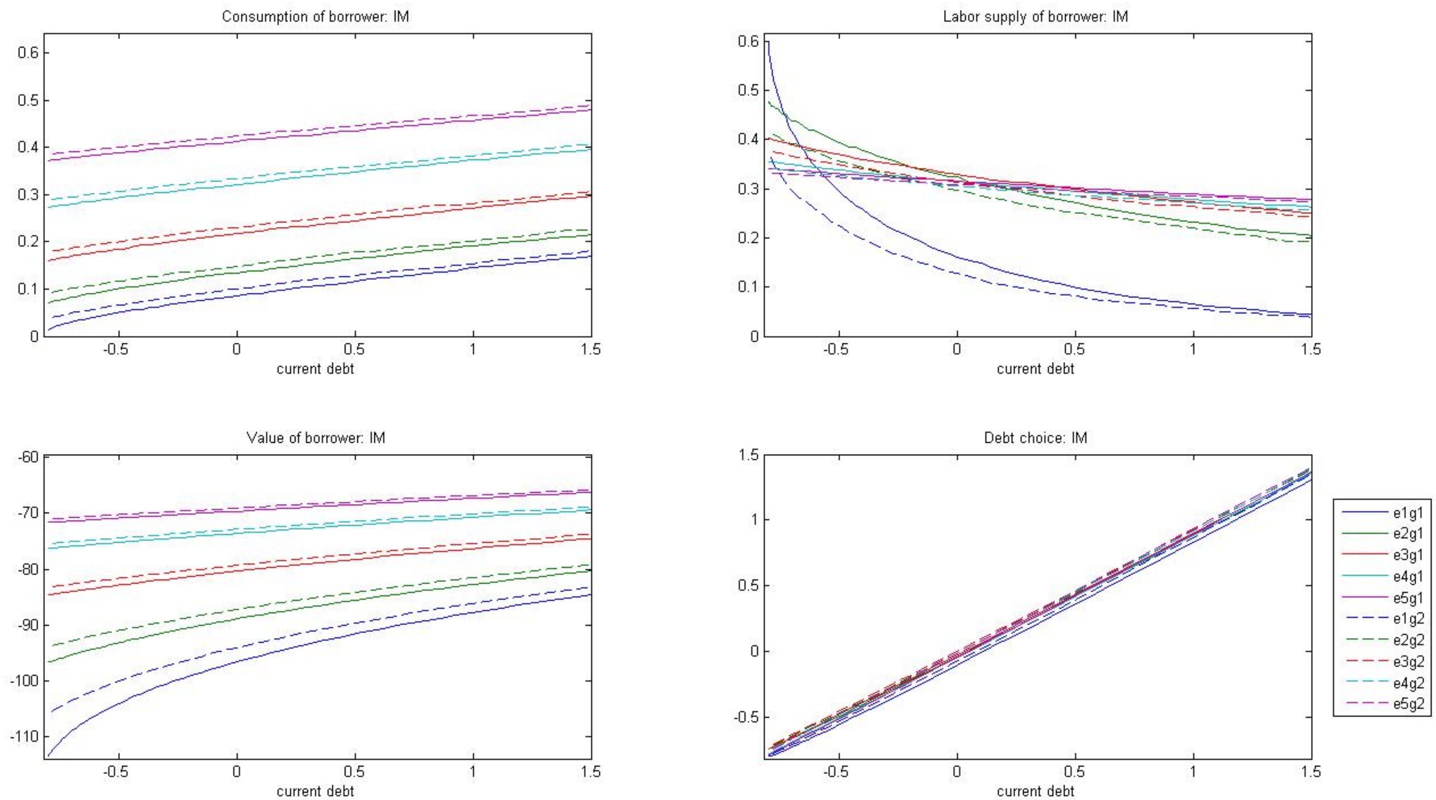
$$f(n) = n^{\alpha}, \text{ with } \alpha = 0.67.$$

- Borrower's discount factor $\beta = 0.96$, while $r = 0.01$;
  i.e. $1/(1+r) = 0.9901$ and $\eta = 0.9696$

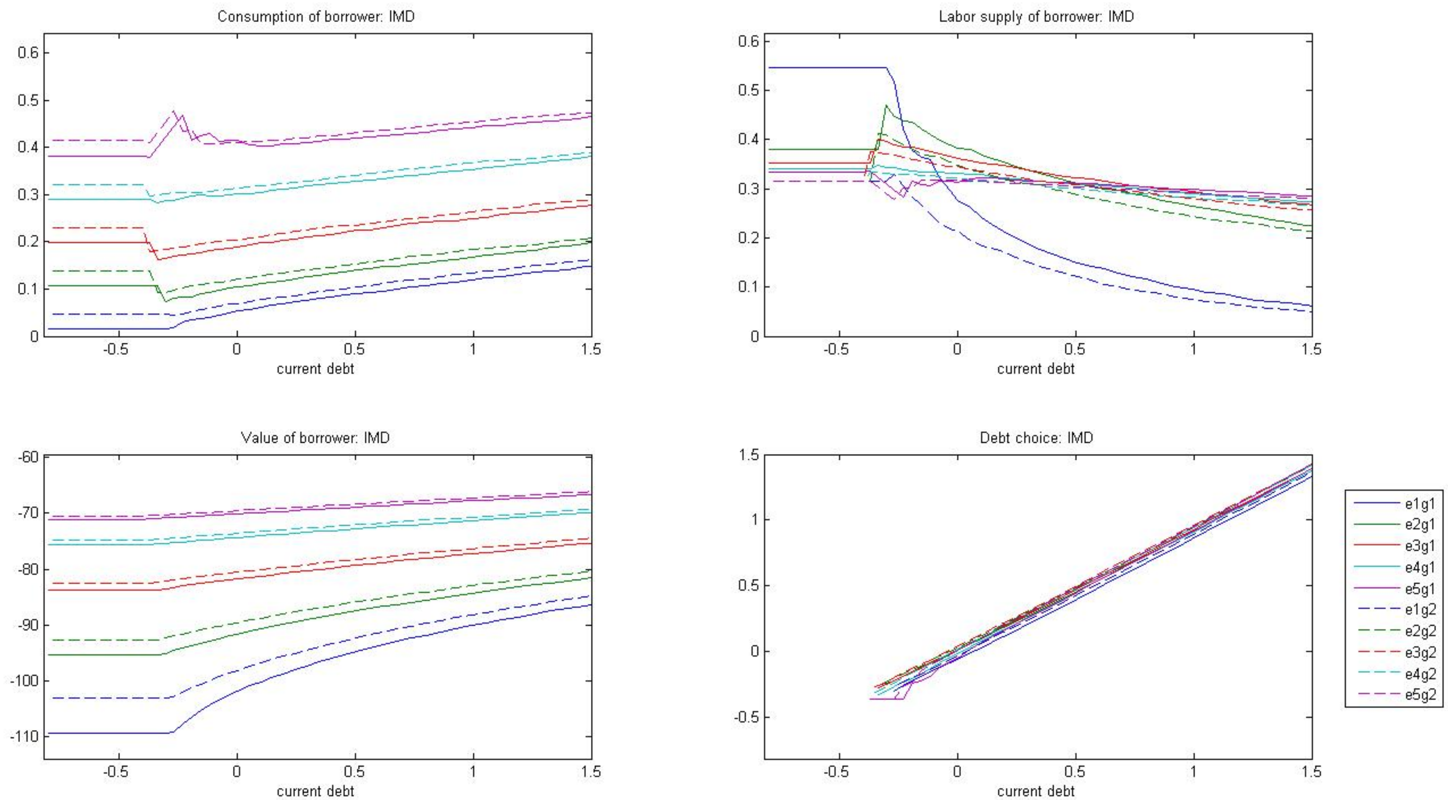
- The probability of returning to the market, or fund, after default is $\lambda = 0.0$

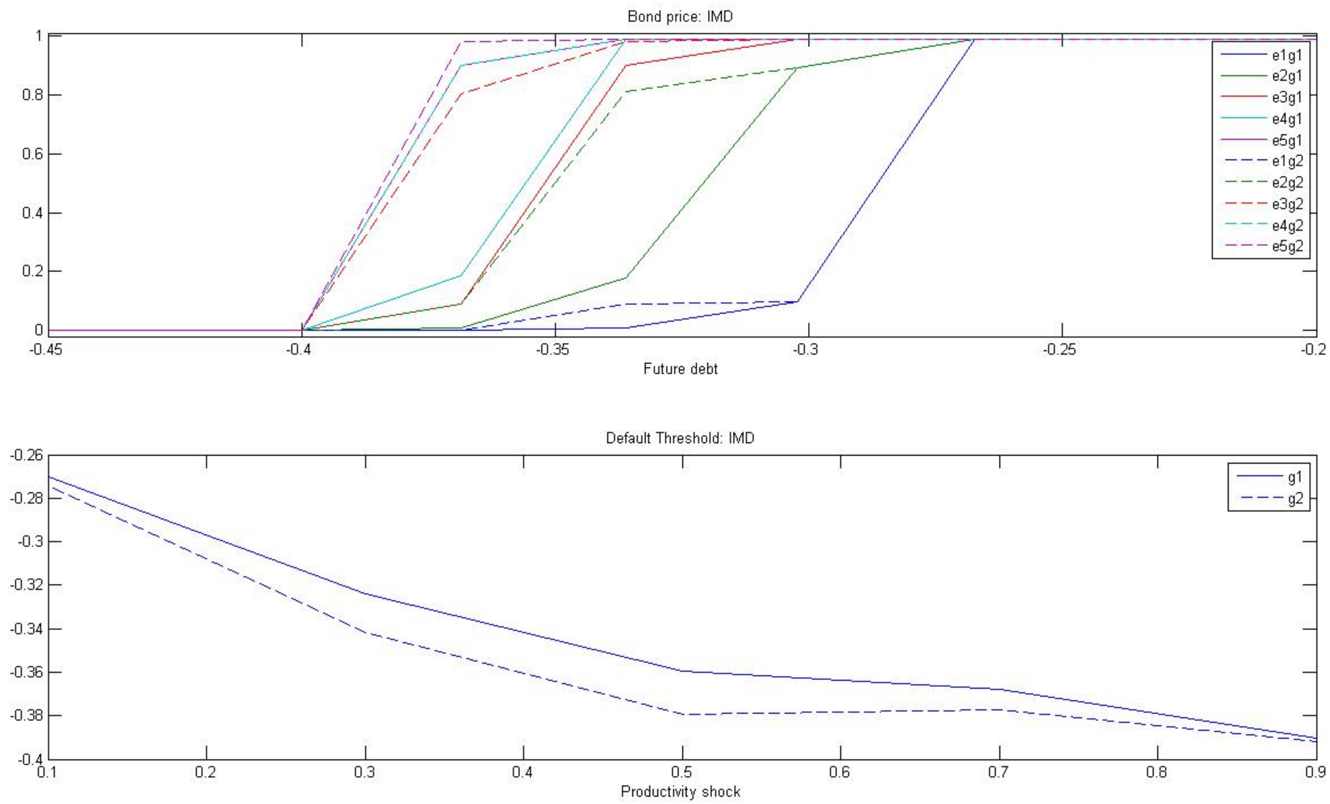
- In the two-sided limited enforcement contract (2S), $Z = -0.8$

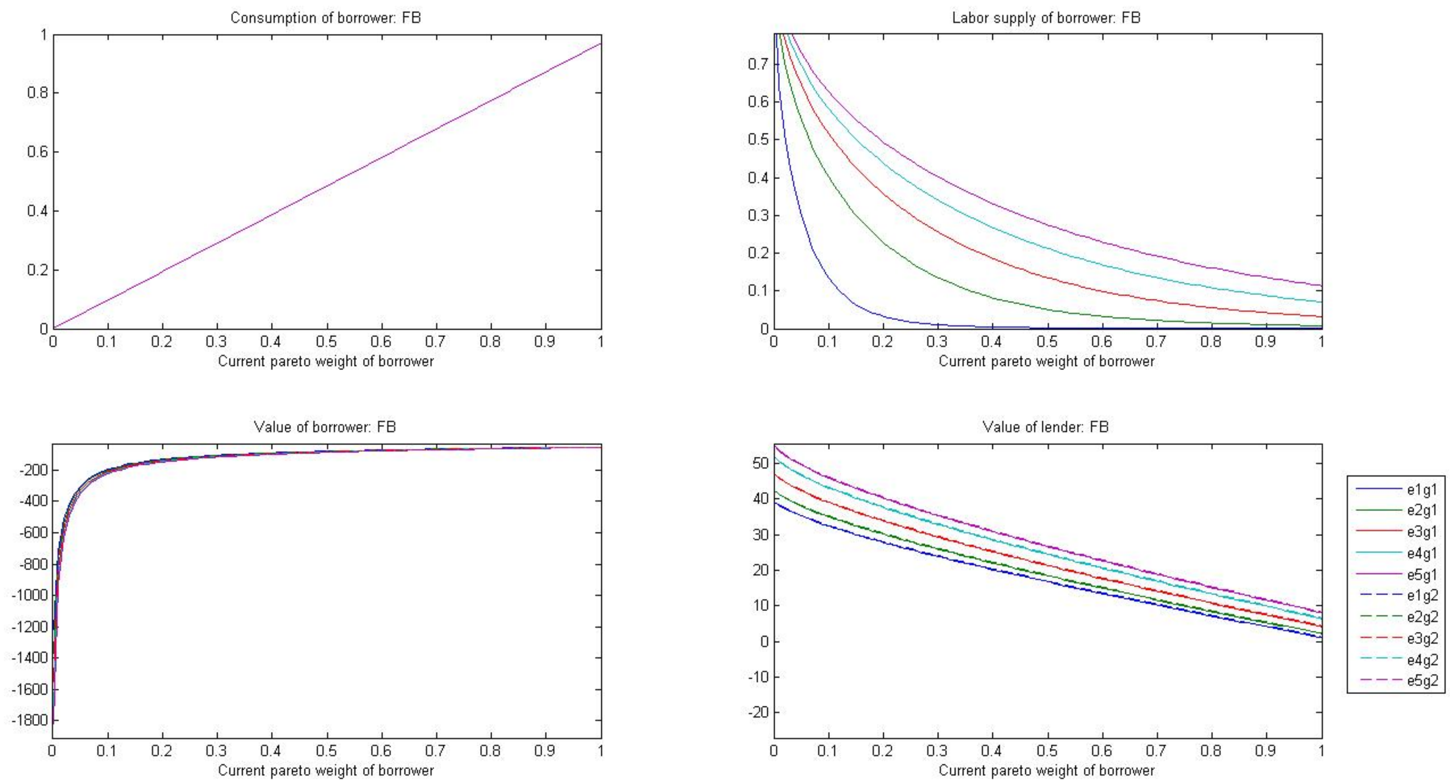
Contrasting *debt contracts* and *FSF contracts*: POLICIES



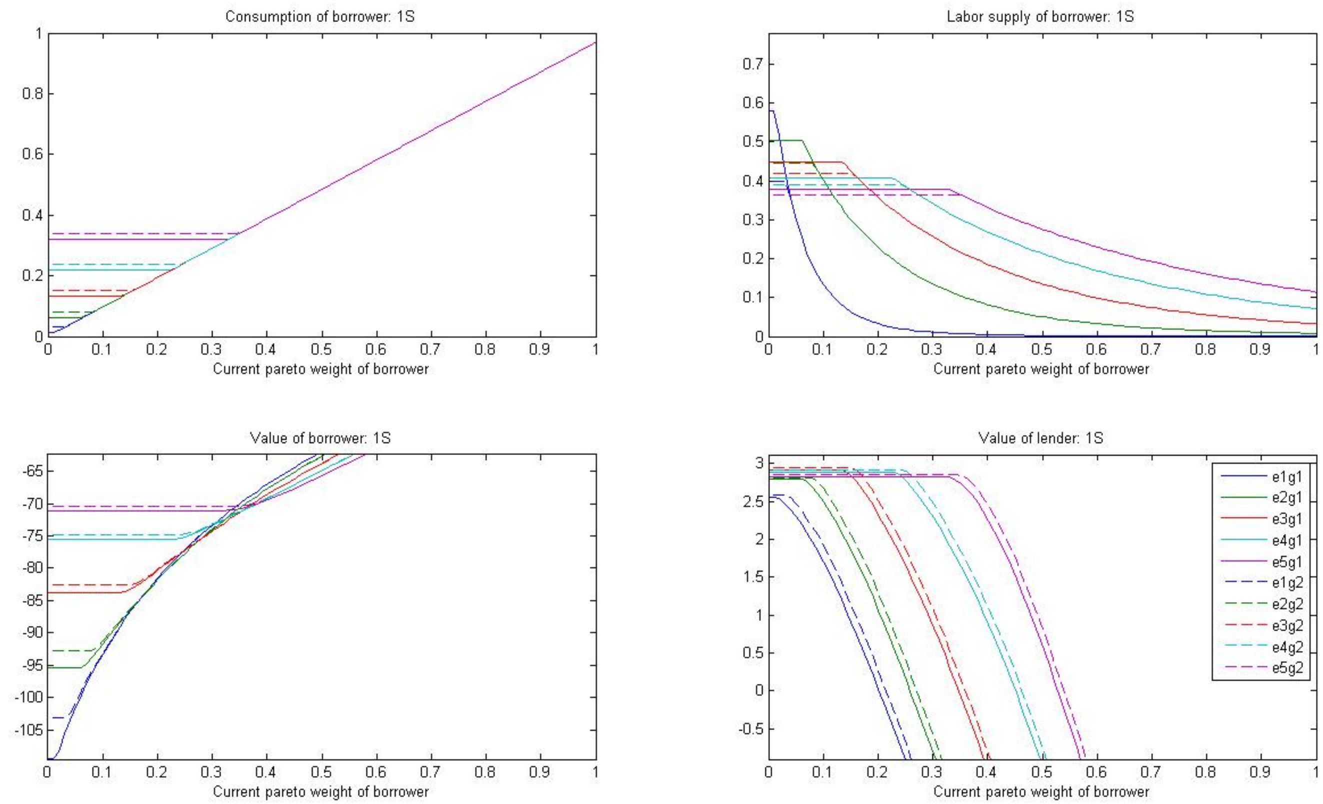
Consumption of borrower: IM
current debt
Labor supply of borrower: IM
current debt
Value of borrower: IM
current debt
Debt choice: IM
current debt
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2

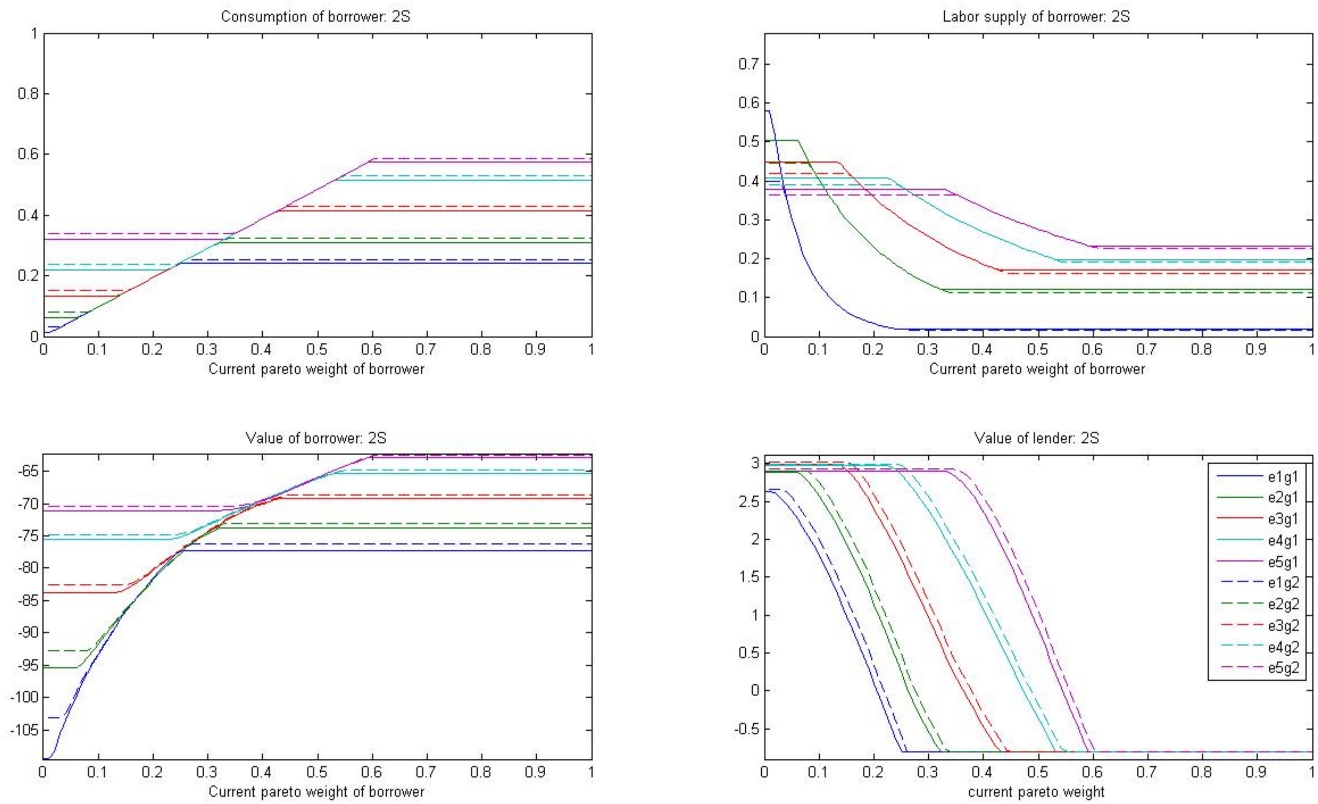

Consumption of borrower: IMD
Labor supply of borrower: IMD
Value of borrower: IMD
Debt choice: IMD
current debt
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2

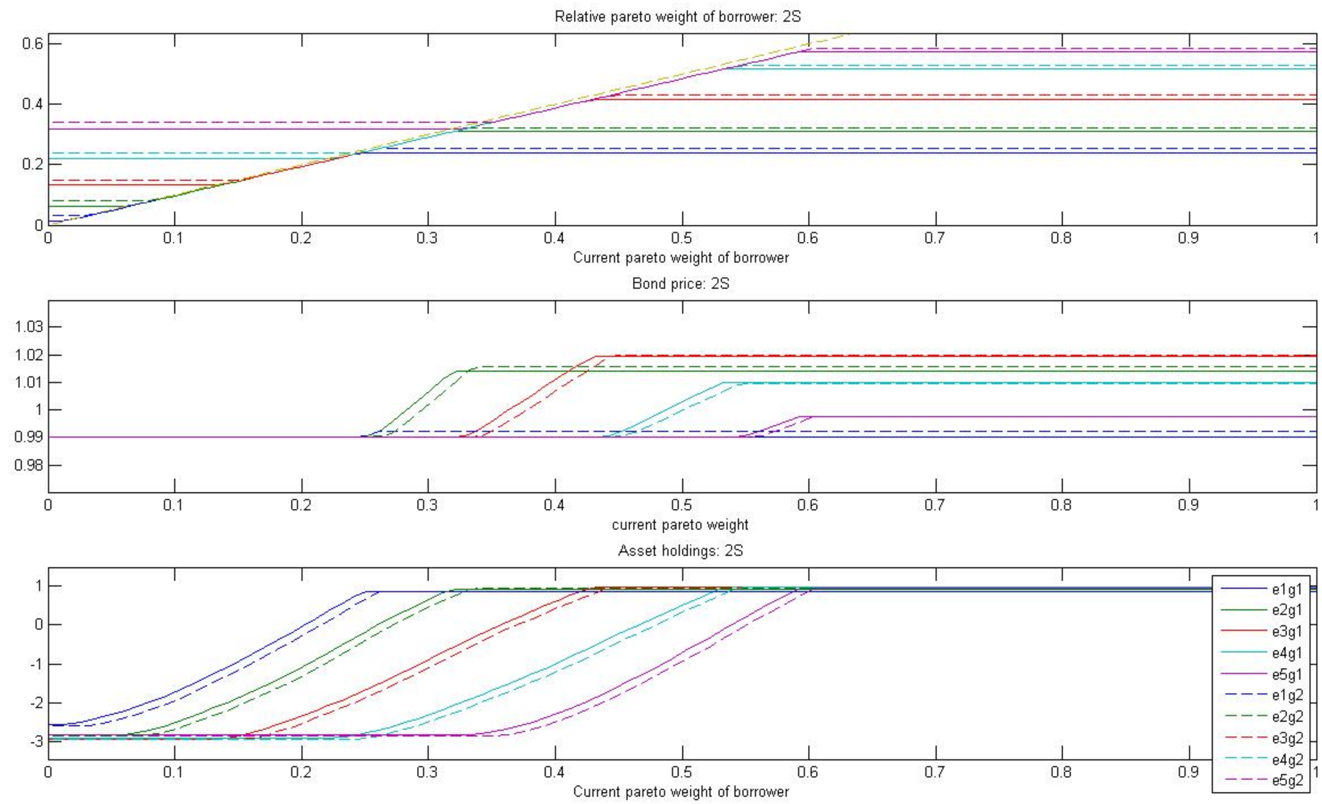

Bond price: IMD
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2
Future debt
Default Threshold: IMD
g1
g2
Productivity shock



Consumption of borrower: FB
Labor supply of borrower: FB
Value of borrower: FB
Value of lender: FB
Current pareto weight of borrower
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2

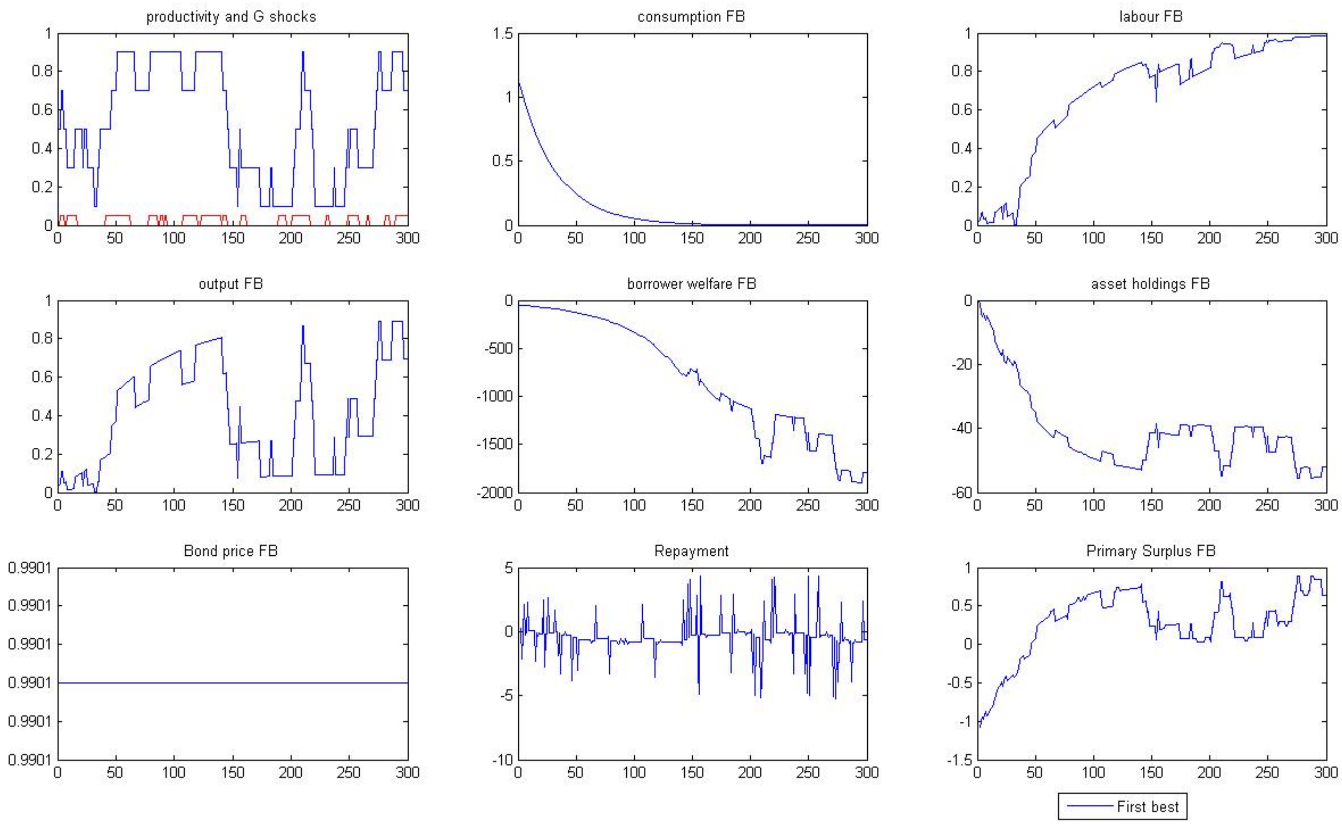

Consumption of borrower: 1S
Labor supply of borrower: 1S
Value of borrower: 1S
Value of lender: 1S
Current pareto weight of borrower
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2

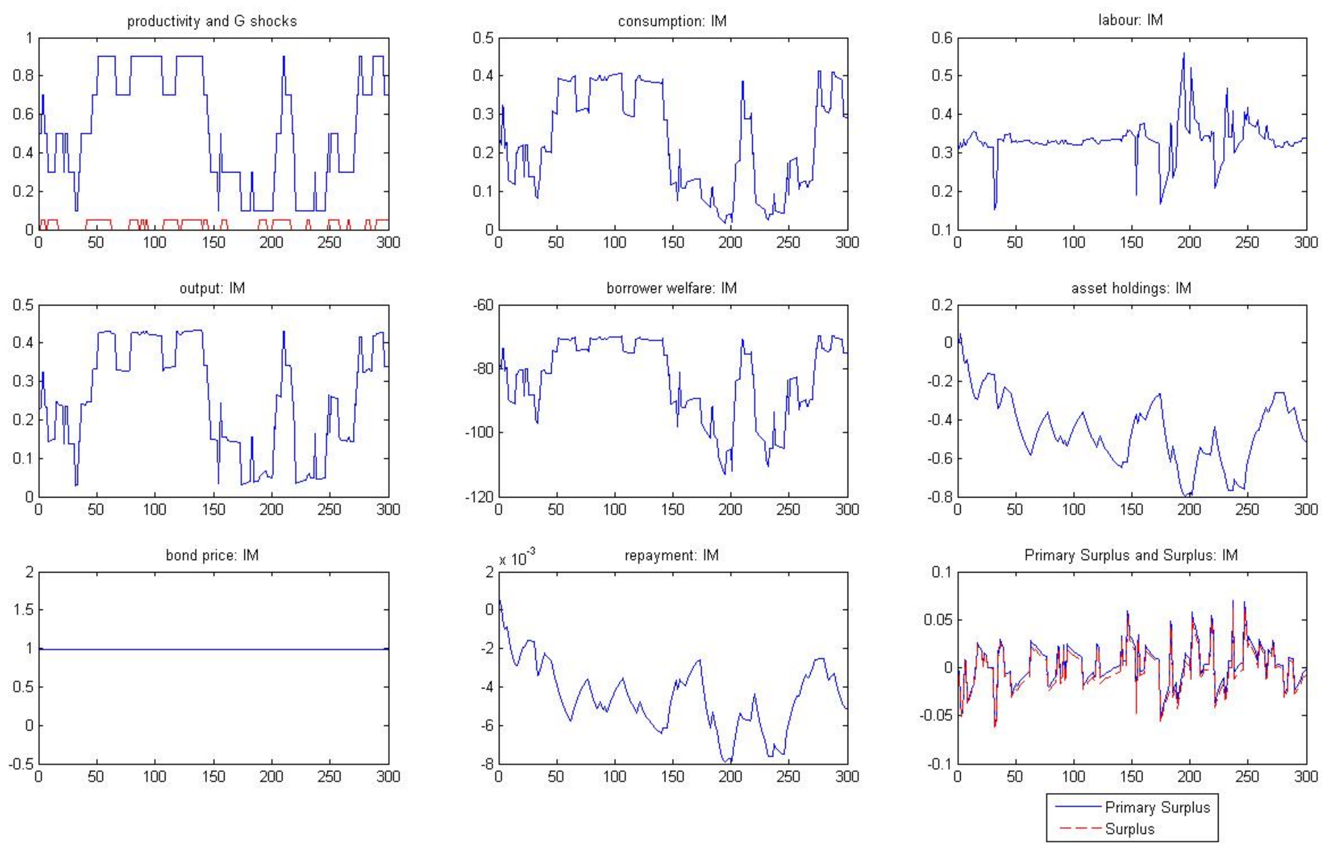

Consumption of borrower: 2S
Current pareto weight of borrower
Labor supply of borrower: 2S
Current pareto weight of borrower
Value of borrower: 2S
Current pareto weight of borrower
Value of lender: 2S
current pareto weight
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2

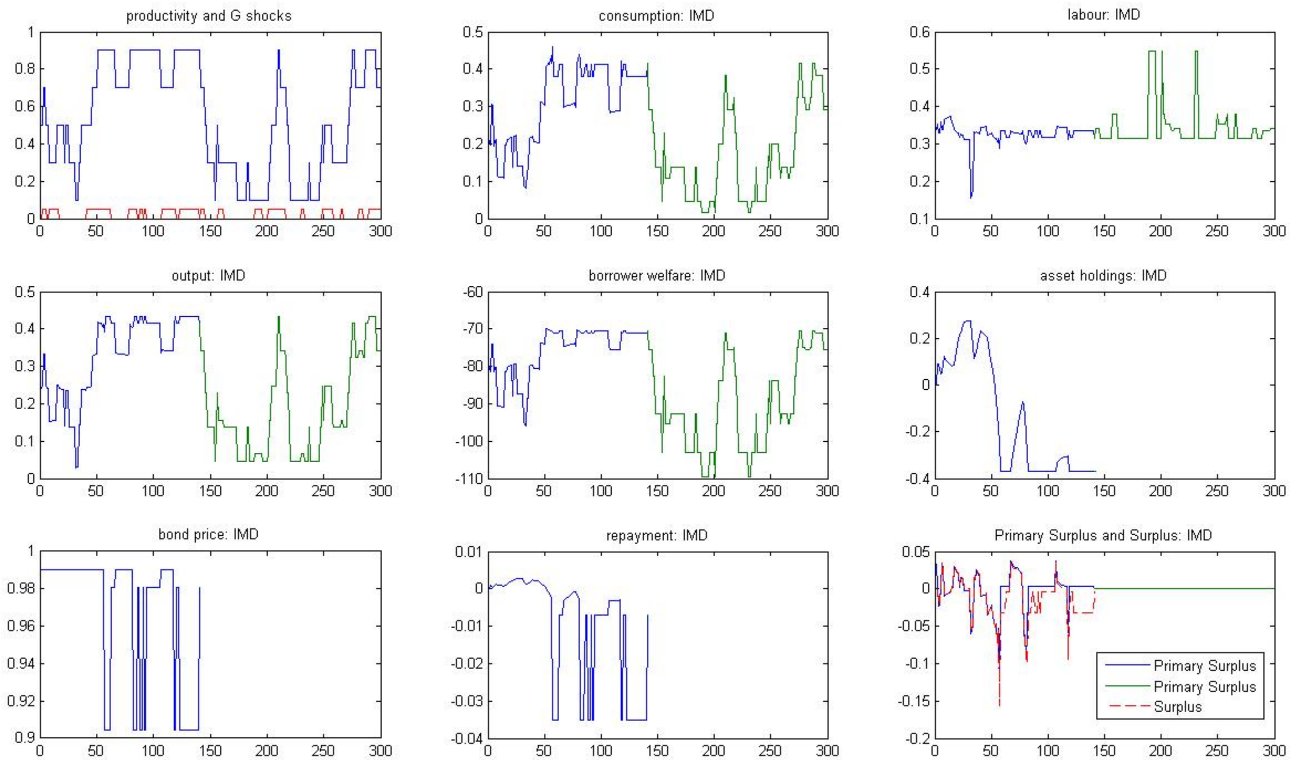


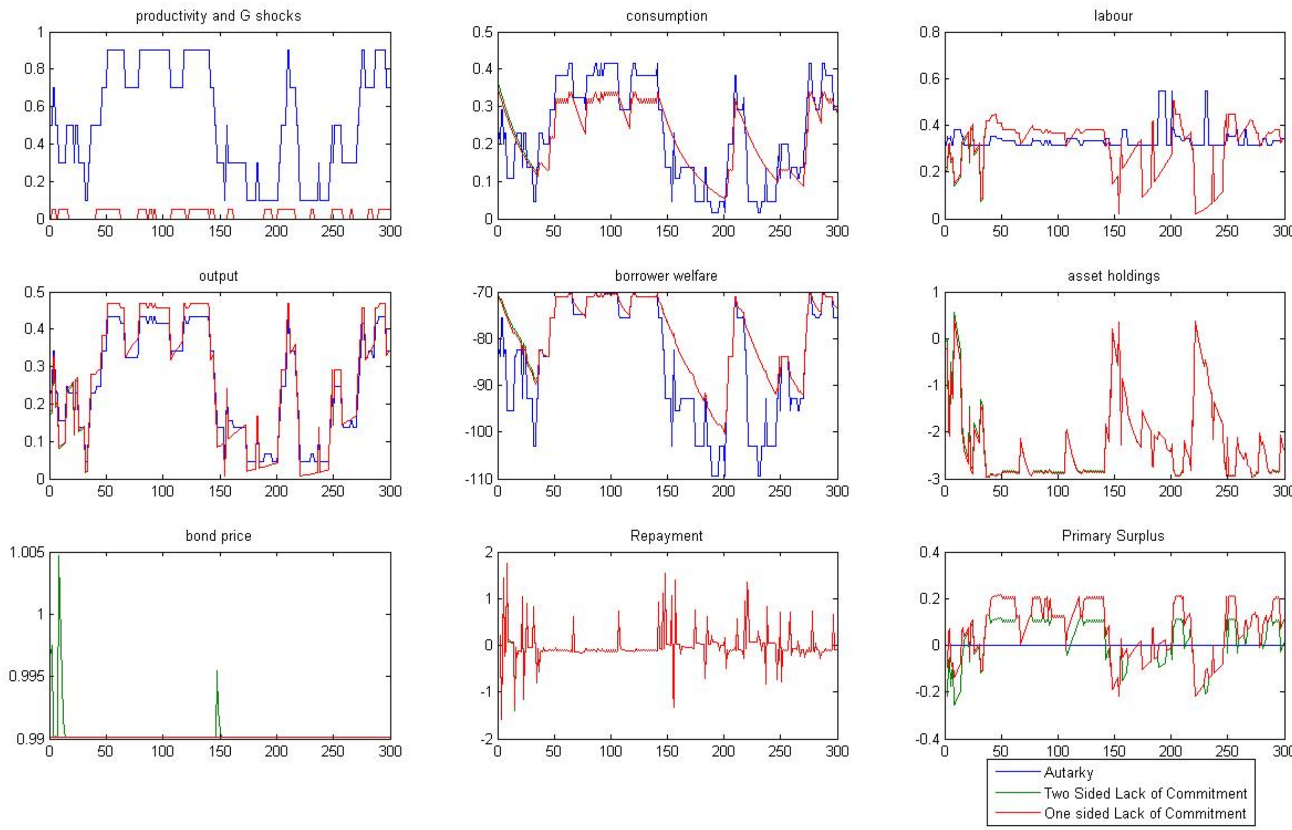
Relative pareto weight of borrower: 2S
Current pareto weight of borrower
Bond price: 2S
current pareto weight
Asset holdings: 2S
Current pareto weight of borrower
e1g1
e2g1
e3g1
e4g1
e5g1
e1g2
e2g2
e3g2
e4g2
e5g2

Contrasting *debt contracts* and *FSF contracts*: PATHS

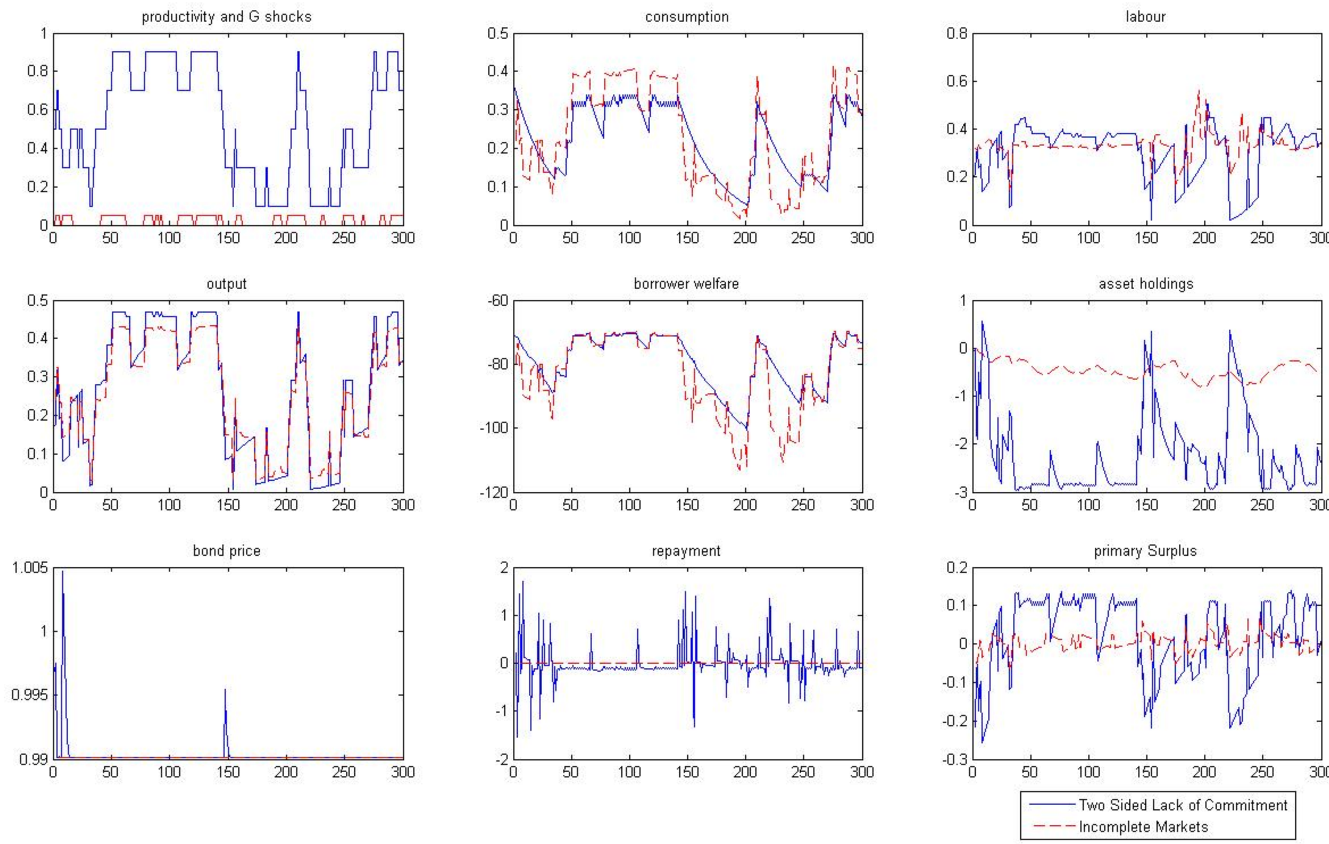

productivity and G shocks
consumption FB
labour FB
output FB
borrower welfare FB
asset holdings FB
Bond price FB
Repayment
Primary Surplus FB
First best


productivity and G shocks
consumption: IM
labour: IM
output: IM
borrower welfare: IM
asset holdings: IM
bond price: IM
x 10^-3
repayment: IM
Primary Surplus and Surplus: IM
Primary Surplus
Surplus

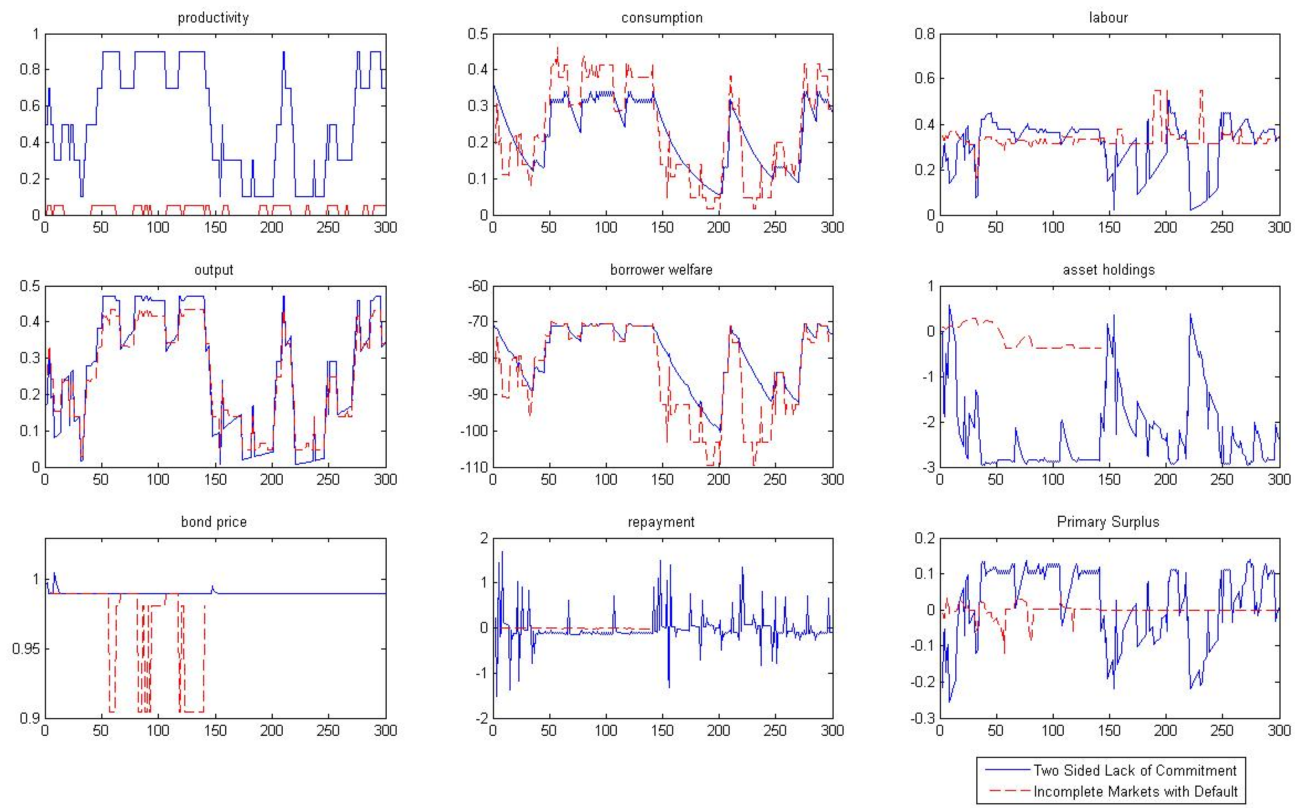

productivity and G shocks
consumption: IMD
labour: IMD
output: IMD
borrower welfare: IMD
asset holdings: IMD
bond price: IMD
repayment: IMD
Primary Surplus and Surplus: IMD
Primary Surplus
Primary Surplus
Surplus



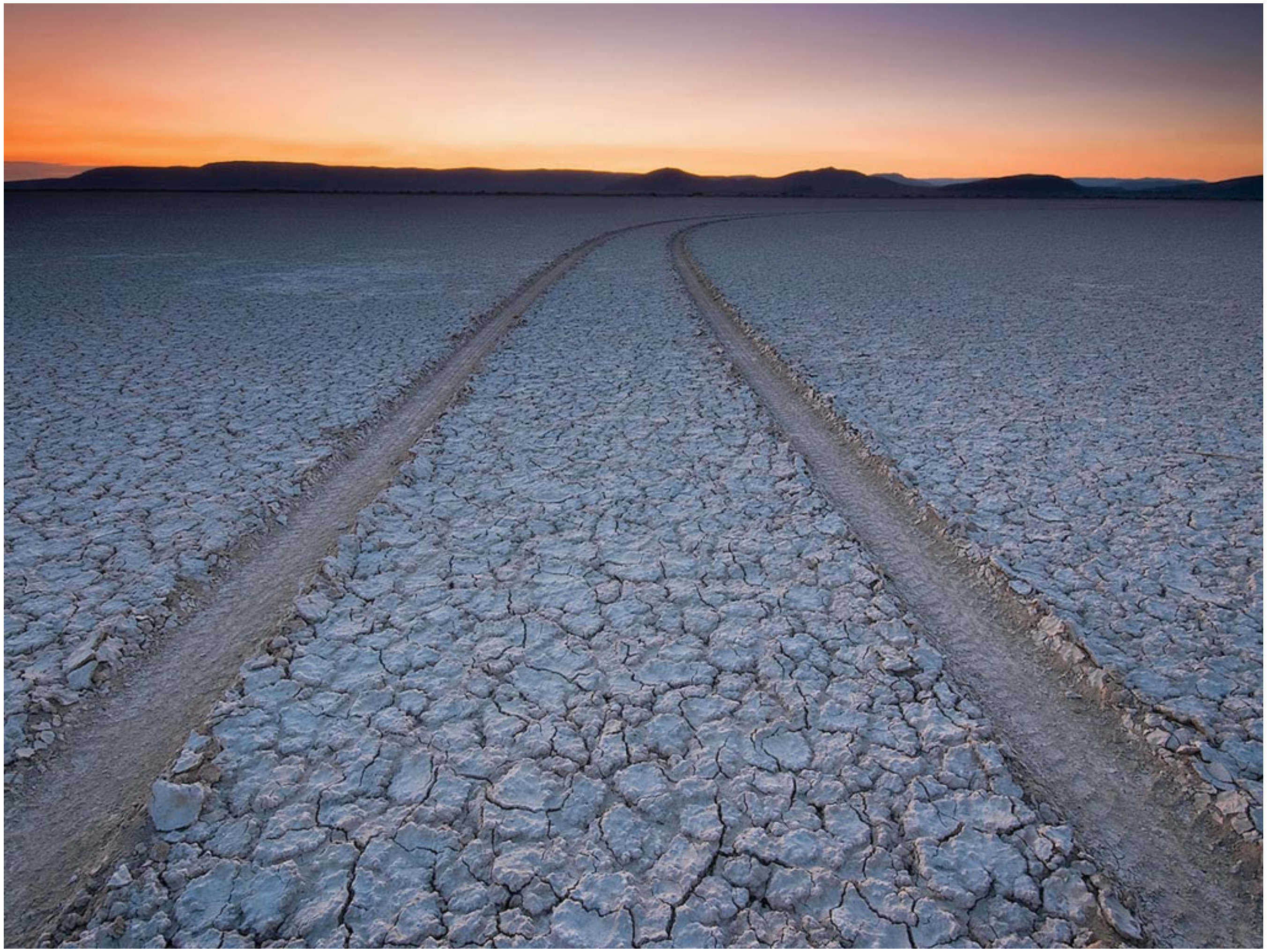
productivity and G shocks
consumption
labour
output
borrower welfare
asset holdings
bond price
Repayment
Primary Surplus
Autarky
Two Sided Lack of Commitment
One sided Lack of Commitment

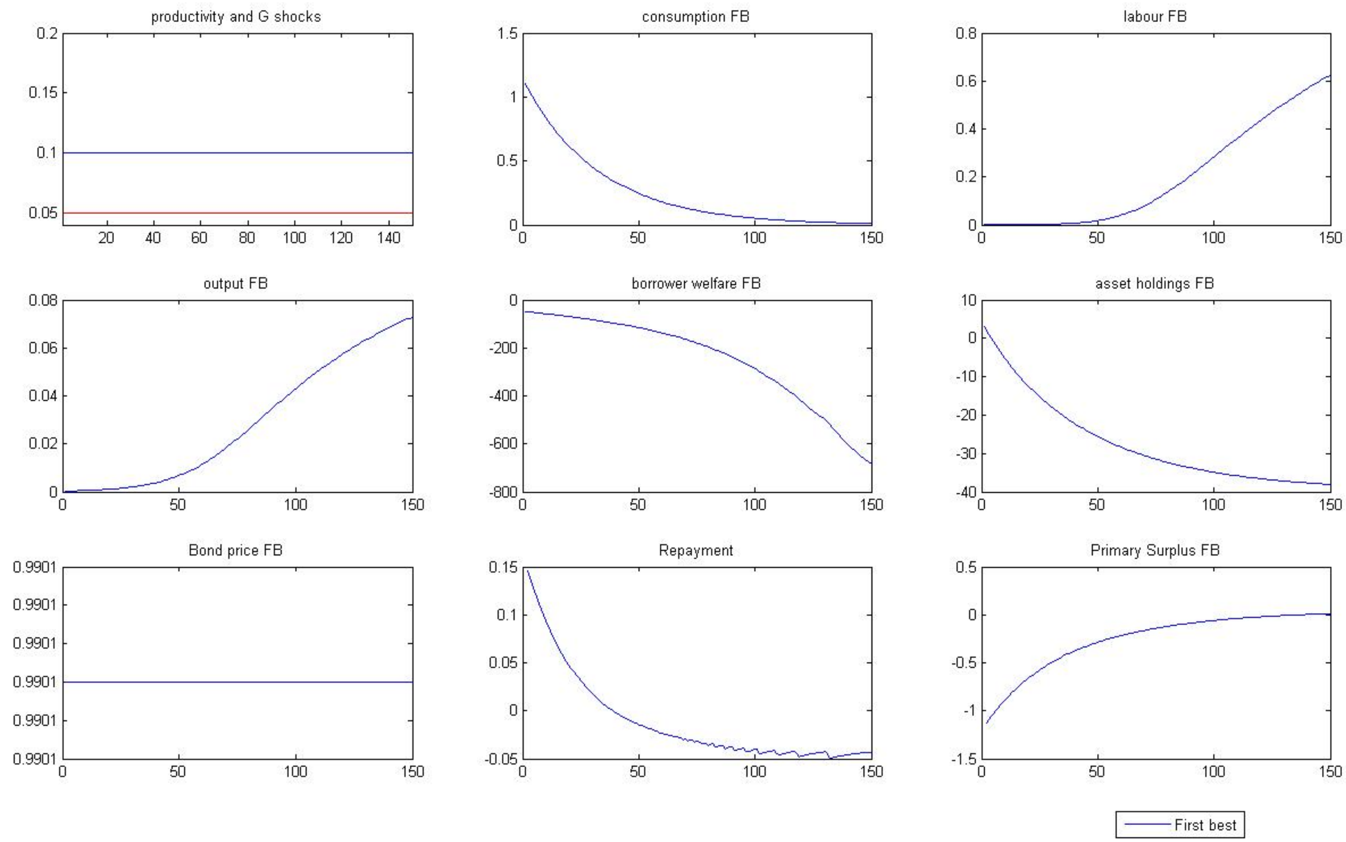


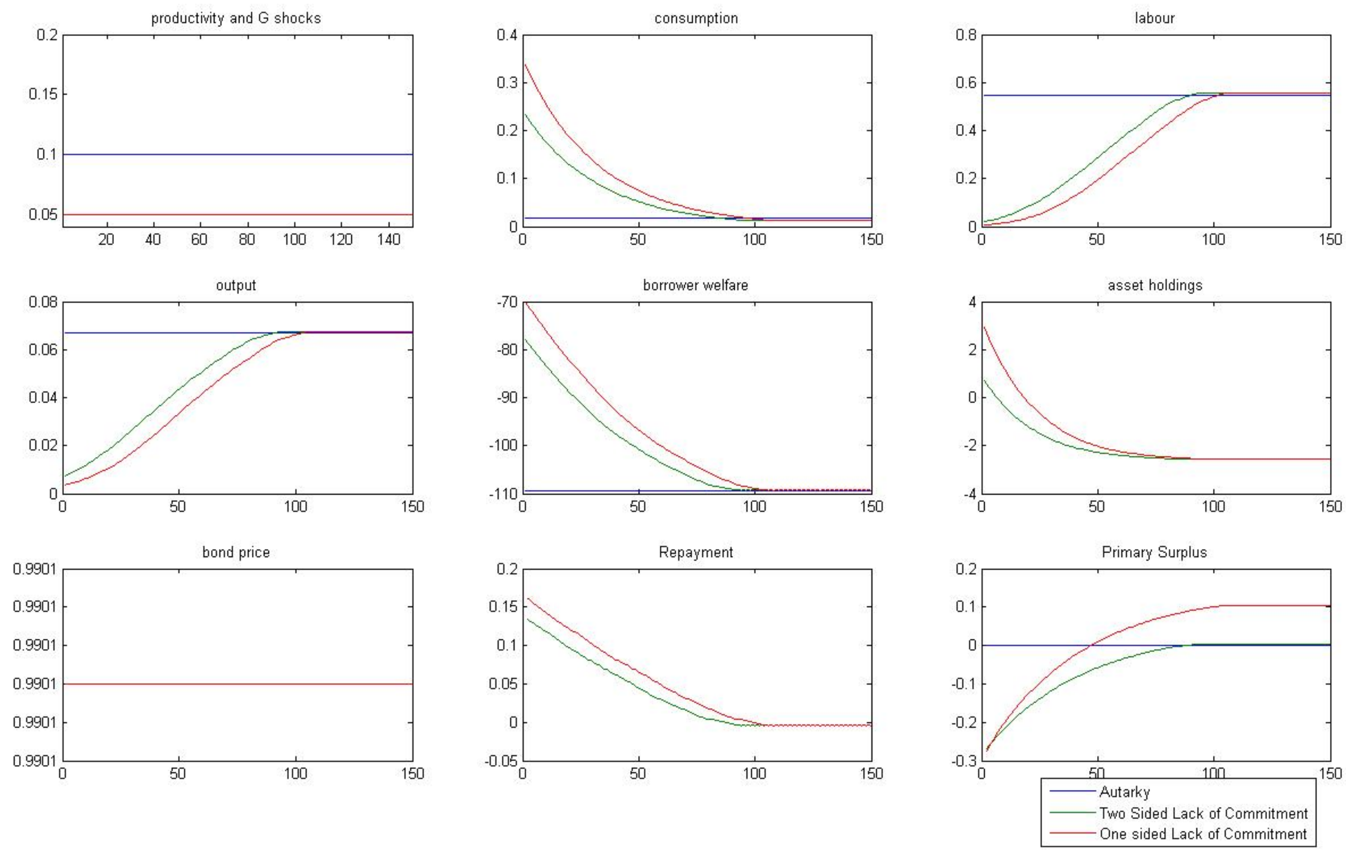
productivity and G shocks
consumption
labour
output
borrower welfare
asset holdings
bond price
repayment
primary Surplus
Two Sided Lack of Commitment
Incomplete Markets

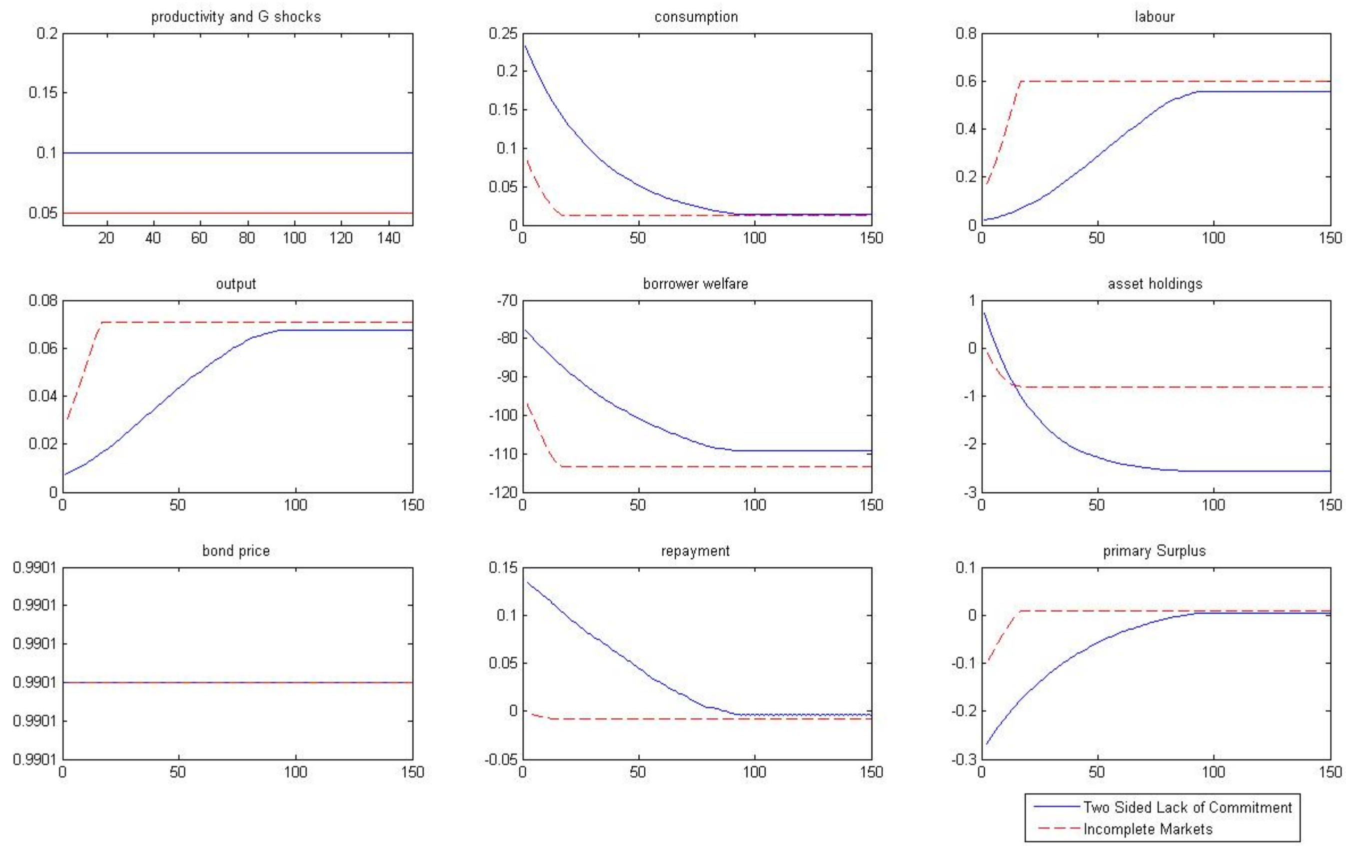

productivity
consumption
labour
output
borrower welfare
asset holdings
bond price
repayment
Primary Surplus
Two Sided Lack of Commitment
Incomplete Markets with Default

Contrasting *debt contracts* and *FSF contracts*: PERSISTENT (-) SHOCK

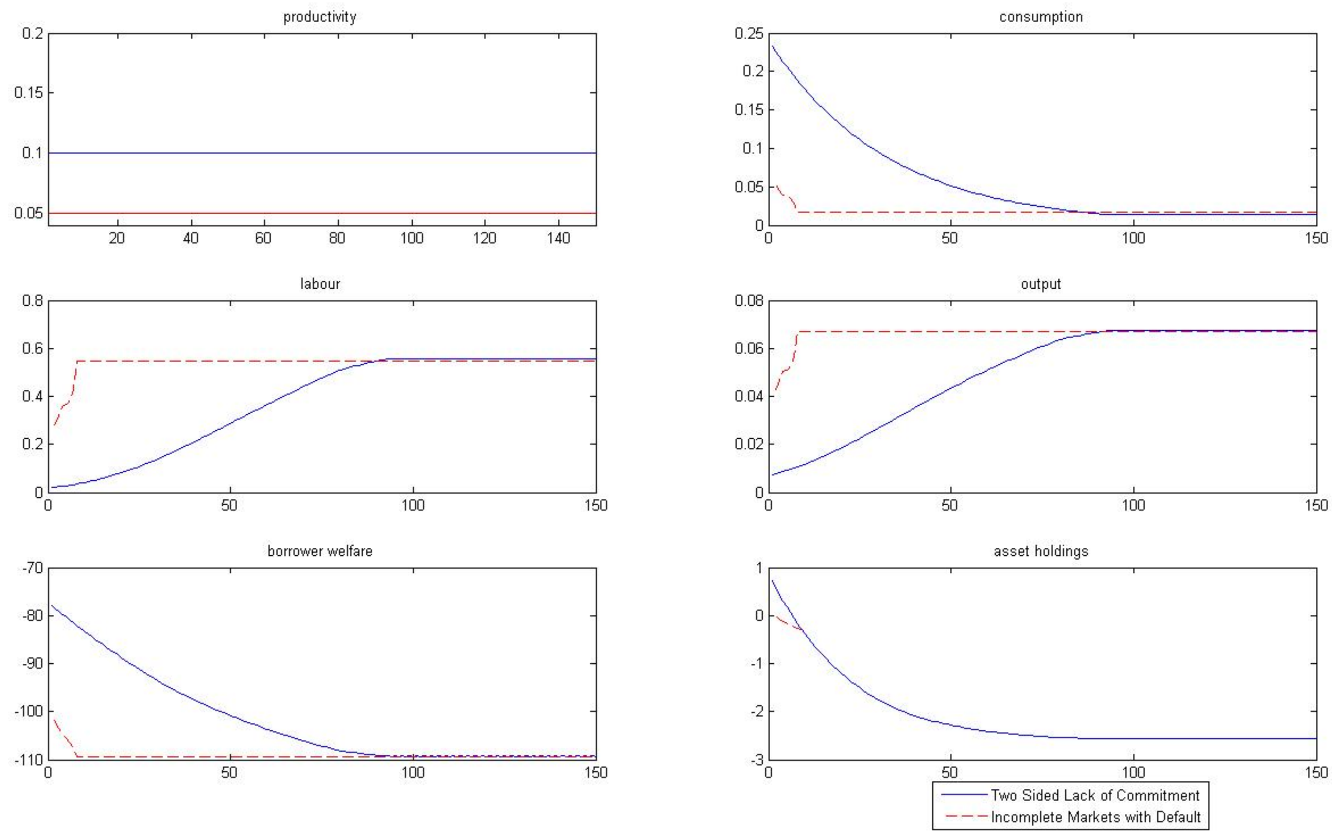



productivity and G shocks
consumption FB
labour FB
output FB
borrower welfare FB
asset holdings FB
Bond price FB
Repayment
Primary Surplus FB
First best


productivity and G shocks
consumption
labour
output
borrower welfare
asset holdings
bond price
Repayment
Primary Surplus
Autarky
Two Sided Lack of Commitment
One sided Lack of Commitment

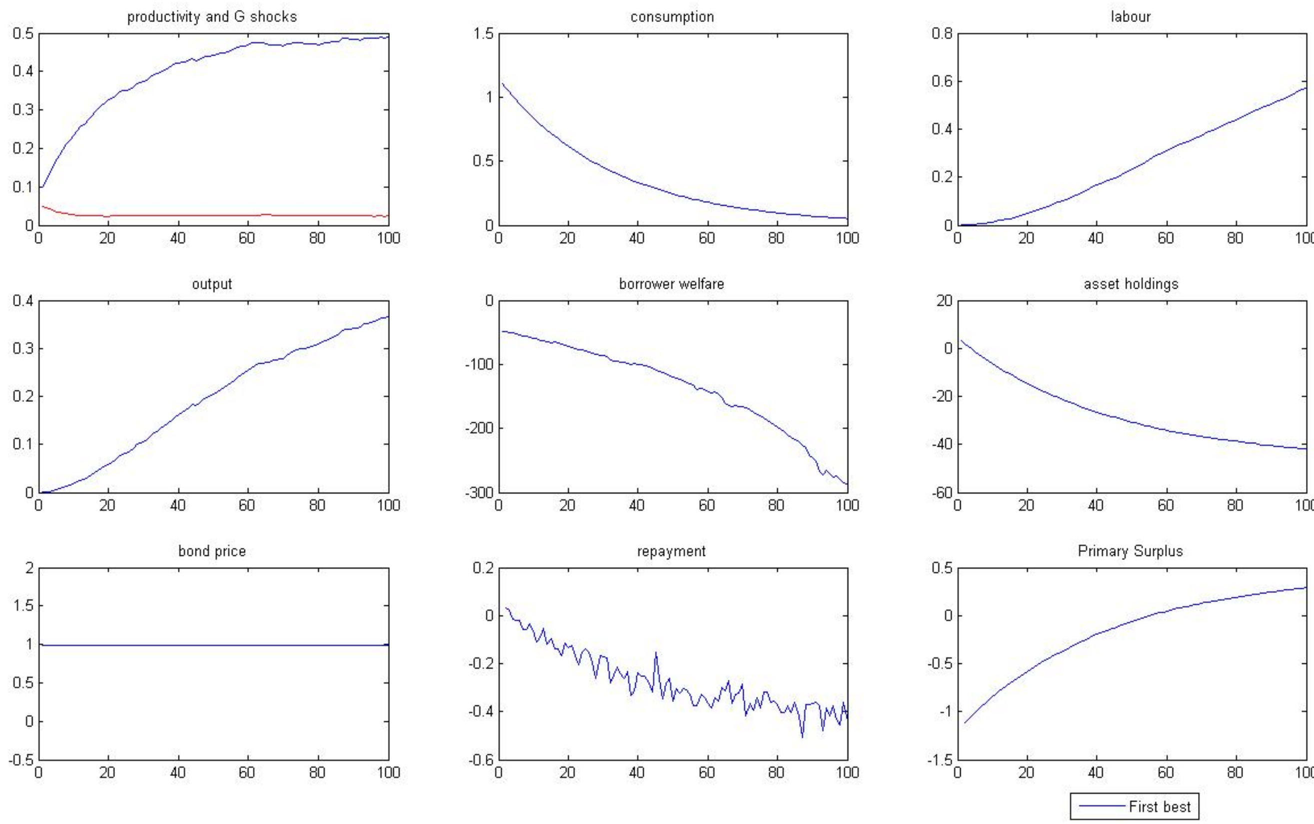


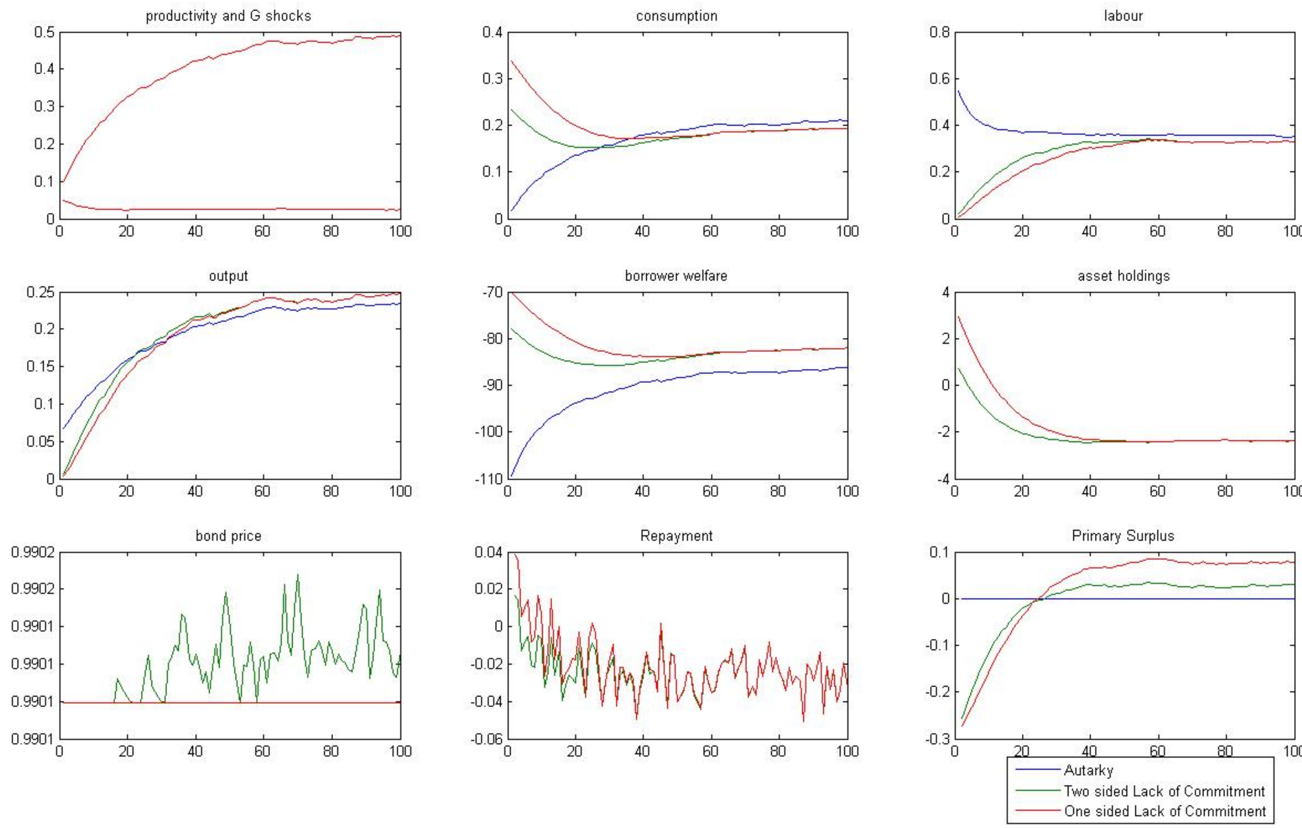
productivity and G shocks
consumption
labour
output
borrower welfare
asset holdings
bond price
repayment
primary Surplus
Two Sided Lack of Commitment
Incomplete Markets

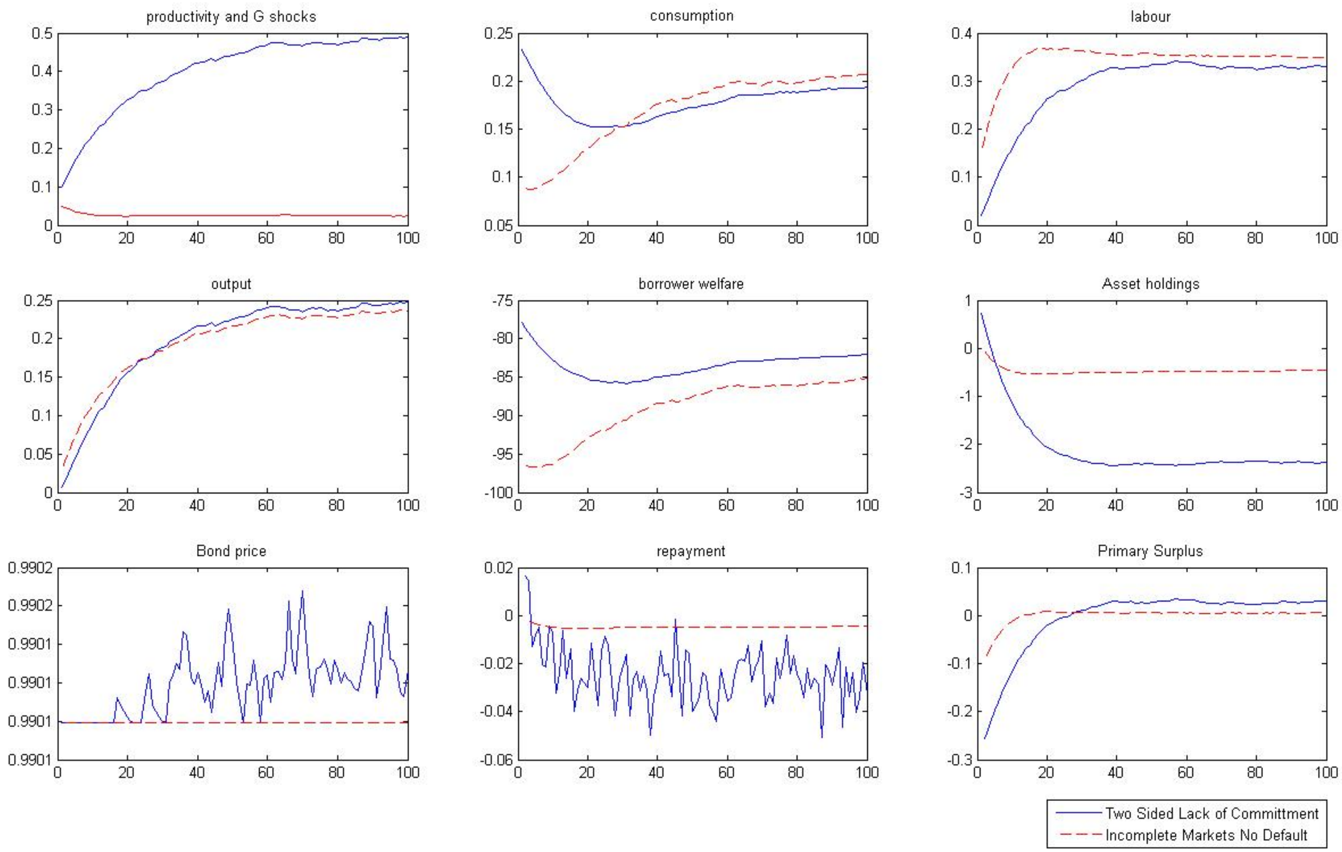

productivity
consumption
labour
output
borrower welfare
asset holdings
Two Sided Lack of Commitment
Incomplete Markets with Default

Contrasting *debt contracts* and *FSF contracts*: REACTION TO (-) SHOCK (impulse responses)

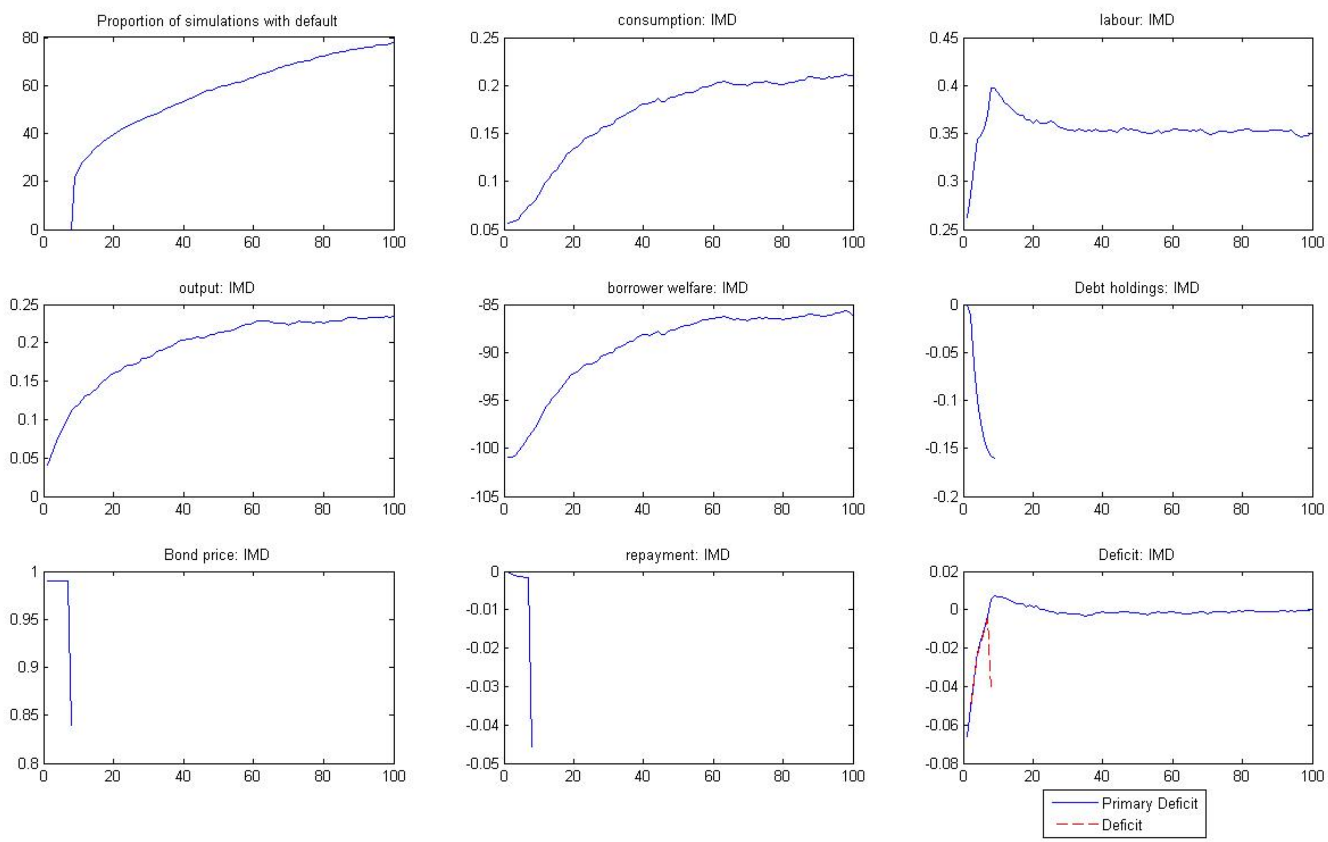

AP


productivity and G shocks
consumption
labour
output
borrower welfare
asset holdings
bond price
repayment
Primary Surplus
First best

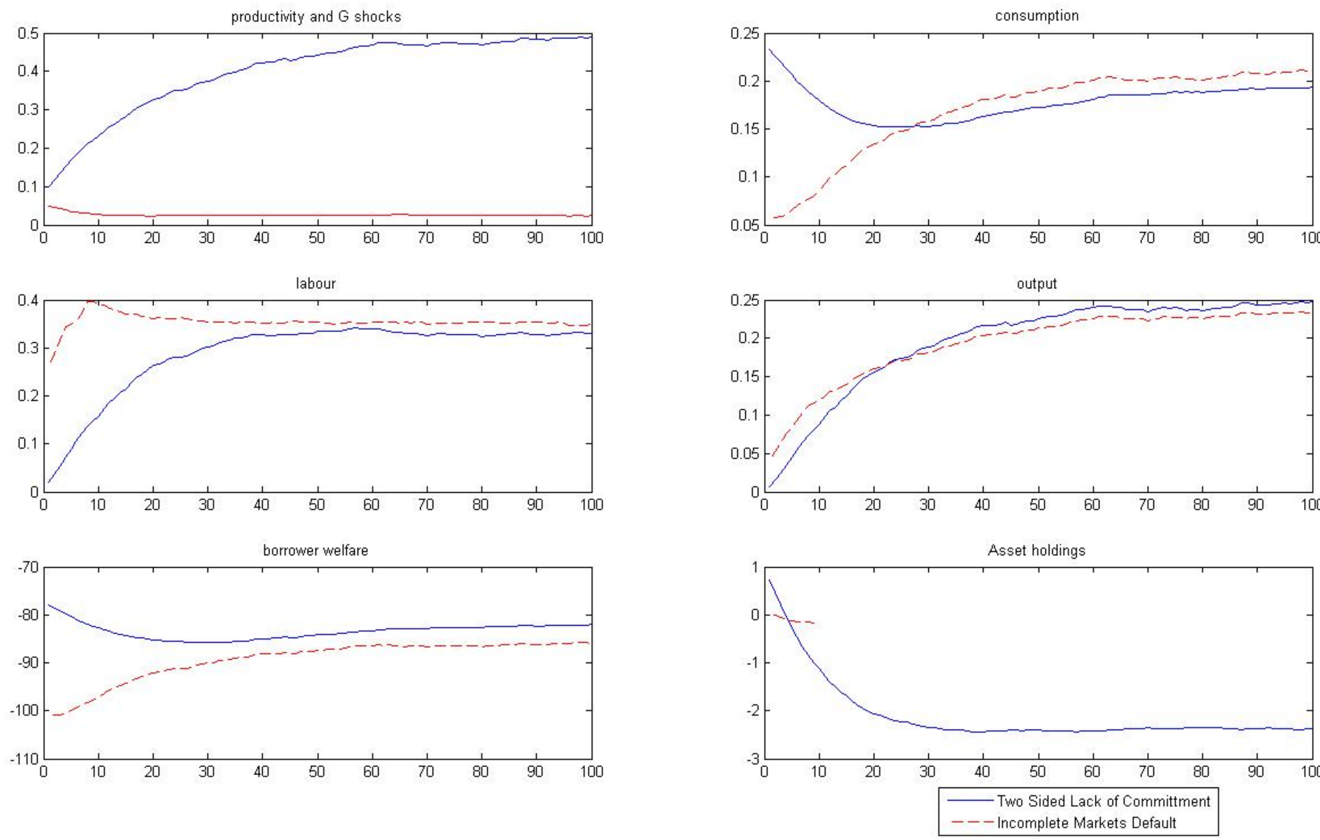

productivity and G shocks
consumption
labour
output
borrower welfare
asset holdings
bond price
Repayment
Primary Surplus
Autarky
Two sided Lack of Commitment
One sided Lack of Commitment



productivity and G shocks
consumption
labour
output
borrower welfare
Asset holdings
Bond price
repayment
Primary Surplus
Two Sided Lack of Committment
Incomplete Markets No Default



Proportion of simulations with default
consumption: IMD
labour: IMD
output: IMD
borrower welfare: IMD
Debt holdings: IMD
Bond price: IMD
repayment: IMD
Deficit: IMD
Primary Deficit
Deficit


productivity and G shocks
consumption
labour
output
borrower welfare
Asset holdings
Two Sided Lack of Committment
Incomplete Markets Default

Contrasting *debt contracts* and *FSF contracts*: SUMMARY

- Efficiency, FB, calls for consumption decay (impatience) & smoothing, and labour responding to productivity. 1S and 2S achieve these to the extent that *limited enforcement constraints* allow them (e.g. no decay).

- IM and IMD much less; in particular, when borrowers are close to their borrowing/default constraints.

- With *FSF contracts*, if participation constraints are very low, borrowers may need to work more when productivity is low.

- *FSF contracts* are able to exploit more (implicit) asset trading possibilities (e.g. more borrowing with 2S than with IM or IMD)

Contrasting *debt contracts* and *FSF contracts*: SUMMARY

- Persistent crisis and bad shocks exacerbate the differences between:
  - *debt contracts* and *FSF contracts*,
  - IM and IMD,
  - 1S and 2S.

- With the same underlying shocks, **recessions** are likely to be more severe with *incomplete markets*.

- With the same underlying shocks, there may be frequent episodes of **positive spreads** in IMD, but few – and harmless – **negative spreads** with 2S.

Contrasting *debt contracts* and *FSF contracts*: WELFARE


ΛΕΥΤΕΡΙΑ
ΑΝΑΡΧΙΚΟ
ΕΙΝΑΙ
ΤΟΥ

Debt contracts vs. *FSF contracts*: WELFARE

A simple measure, χ, of *consumption equivalence*. *FSF* with *two-sided limited commitment* vs. *incomplete markets* with and without *default*

Taking advantage of the decomposition of the welfare functions

$$V_c^{bj} = \log(c_j) + \beta E V_c^{bj\prime} = E_0 \sum_{t=0}^{\infty} \beta^t \log(c_{j,t})$$

$$V_n^{bj} = \gamma \frac{(1-n)^{1-\sigma}}{1-\sigma} + \beta E V_n^{bj\prime}$$

where $j = f, i$ for *FSF* and *incomplete markets*, respectively.
Total welfare is then equal to

$$V^{bj} = V_c^{bj} + V_n^{bj}$$

Debt contracts vs. *FSF contracts*: WELFARE

$$
\begin{aligned}
V^{bf} &= E_0 \sum_{t=0}^{\infty} \beta^t \log((1+\chi)c_t^i) + V_n^{bi} = \\
&= \frac{\log(1+\chi)}{1-\beta} + E_0 \sum_{t=0}^{\infty} \beta^t \log(c_t^i) + V_n^{bi} = \\
&= \frac{\log(1+\chi)}{1-\beta} + V_c^{bi} + V_n^{bi} \\
&= \frac{\log(1+\chi))}{1-\beta} + V^{bi} \\
\rightarrow &\quad (1+\chi) = \exp\left(\left(V^{bf} - V^{bi}\right)(1-\beta)\right)
\end{aligned}
$$

Debt contracts vs. *FSF contracts*: WELFARE

The welfare gains of a *FSF contract* can be very substantial!

	Average χ	First Period χ
Path Inc no def	0.174	0.378
Path Inc def	0.219	0.447
Pers Crisis Inc no def	0.594	1.060
Pers Crisis Inc def	0.414	1.513
Resp Shk Inc no def	0.317	1.060
Resp Shk Inc def	0.341	1.512

Conclusions

- This is preliminary work, but it is already very telling...
- Even accounting for limited redistribution (2S) a *FSF* can substantially improve efficiency, with respect to debt financing.
- Dynamic mechanism design provides a theoretical basis for *FSF* design.
- Furthermore, costly default events may be prevented or mitigated, even if the economy is subject to the same shocks.
- Similarly, the recession following a negative shock is substantially less severe with a *FSF*.

Conclusions

- While we have extensively borrowed from the existing theory, our analysis helps to better understand how different lending and borrowing mechanism work and compare.

- For example, how positive and negative spreads can be associated with IMD and, 2S, respectively.

- In the end, the application revalues the theory...

Conclusions

- Yet, there is still work ahead:

- To better calibrate the model to the Eurozone, or other economies.

- To analyze the capacity of the *FSF* for absorbing existing debts (we always initialize asset holdings to zero).

- Mostly, to account for moral hazard; e.g. changing G for $G(e), G'(e) < 0$, where e is costly, unverifiable, effort.

There is no future for the EMU, it will involve too much redistribution!

Using dynamic mechanism design, there should be a future for the EMU!

Thanks!