CAISSE DES DÉPÔTS ET CONSIGNATIONS

The Chief Economist

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HOW CAN THE COUNTER-CYCLICAL NATURE OF THE EURO ZONE'S MONETARY POLICY BE LESSENED, COUNTRY BY COUNTRY, AND THE NUMBER OF ITS INTRUMENTS INCREASED?

(Patrick Artus)

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INTRODUCTION

We will show that the euro zone is heterogeneous from the point of view of the economic situation of countries and the transmission channels of monetary policy. This implies that, country by country, monetary policy can often be pro-cyclical; it cannot react to local situations and might even increase heterogeneity. The changeover to the new solvency ratios of Basle 2 is bound to worsen this situation.

We propose increasing the number of instruments in monetary policy, for example by giving each national central bank the possibility of changing statutory reserves on certain items in banks' balance sheets; and also modulate the solvency capital ratios according to the cycle. We will illustrate these proposals with two simple theoretical models.

JEL Classification: E 53, E 58, G 28.

1 – Heterogeneity of the euro zone and number of instruments in monetary policy

1 – 1 Within the euro zone, countries would need different monetary policies.

Let us look at trends in prices, asset prices, credit, demand and growth in the four major EMU countries.

Inflation rate differentials **(Chart 1)** widened significantly in 2002, ranging in early 2003 from 1% to 4%. While stock markets **(Chart 2)** have moved in lockstep, this is not at all the case with residential property prices **(Chart 3)** as they have risen very rapidly in Spain.

Situations in credit markets were also very different from one country to another: in 2002: stagnation in business loans in France and Germany, a moderate increase in Italy, and a noticeable one in Spain **(Chart 4)**. With regard to consumer loans, they grew very slowly in Germany, moderately in Italy and France, and very rapidly in Spain in line with the property boom **(Chart 5).**

Let us move on to the real equilibrium. Growth **(Chart 6)** has been steadily lower in Germany and Italy than in France and, foremost, in Spain, and this results from the weakness of all the components of domestic demand **(Chart 7)** other than productive investment that trended quite similarly in the various countries until early 2001 **(Chart 8),** as well as the chronic weakness of activity in construction in Germany **(Chart 9).**

Heterogeneity with regard to inflation, property prices, credit and real activity is therefore significant.

Chart 1
Inflation (Y/Y as %) (harmonised)

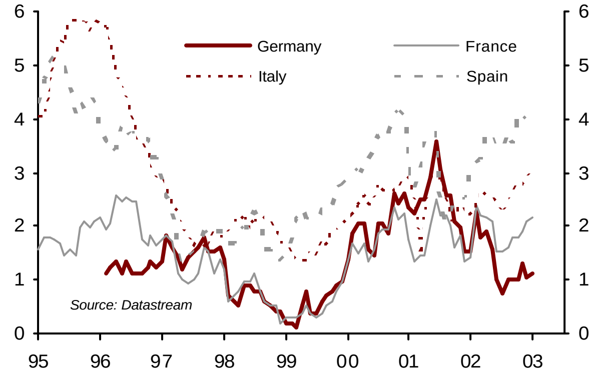


Chart 2
Stock market index (1995 = 100)

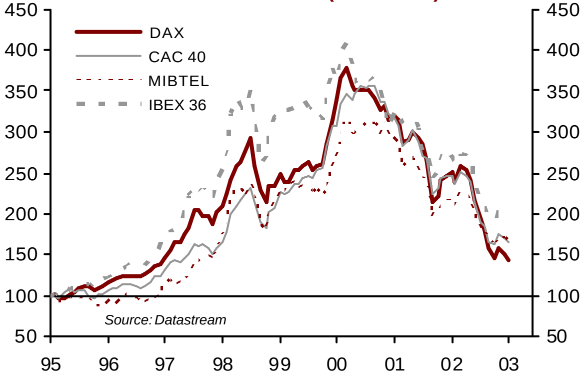


Chart 3
House prices (Y/Y as %)

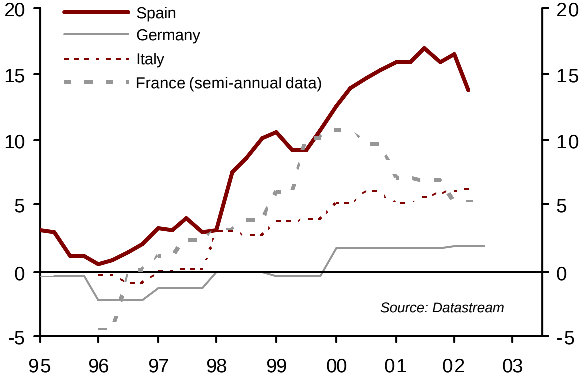


Chart 4
Bank loans to companies (Y/Y as %)

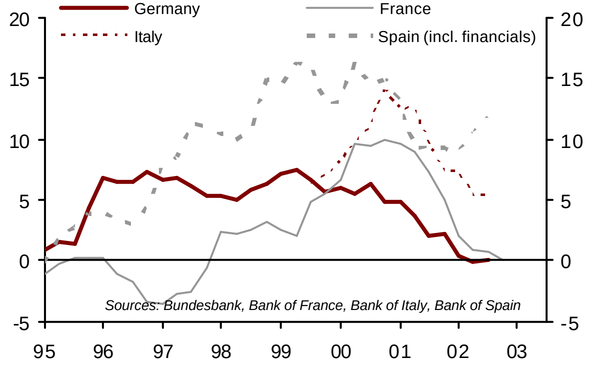


Chart 5
Bank loans to households (Y/Y as %)

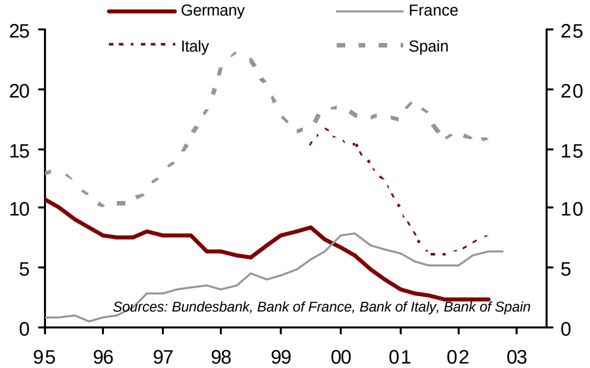


Chart 6
Real GDP (Y/Y as %)

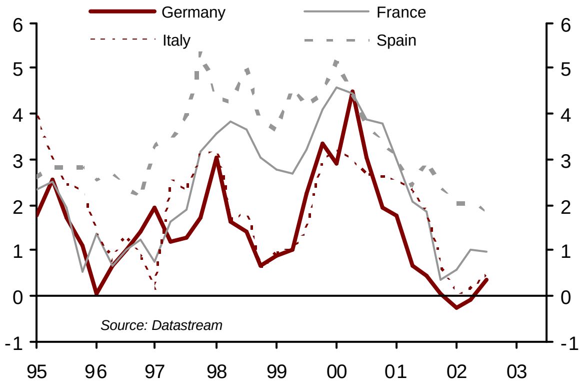


Chart 7
Domestic demand (in volume terms, Y/Y as %)

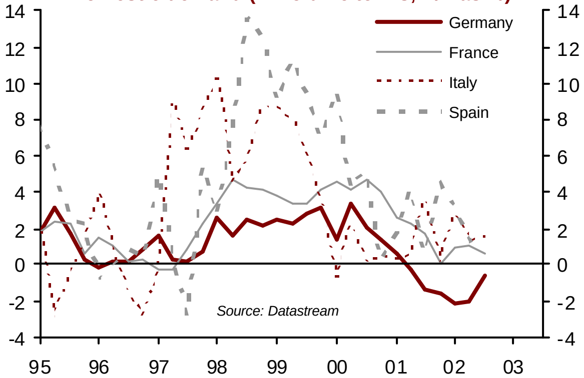


Chart 8
Productive investment
(in volume terms, Y/Y as %)

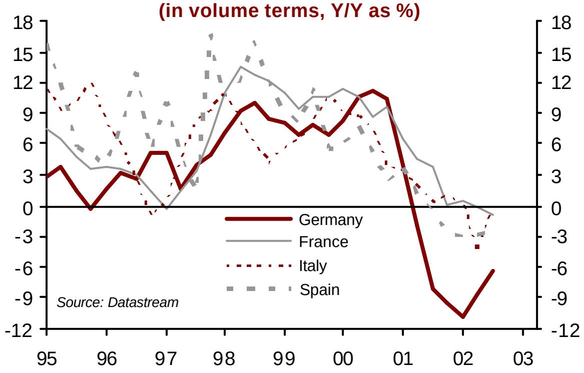
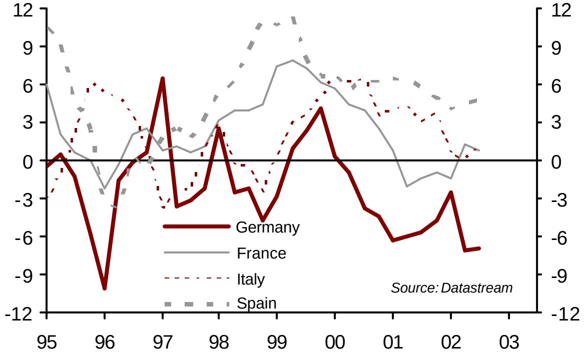


Chart 9
Housing investment
(in volume terms, Y/Y as %)



Faced with this diversity, the fact that these countries share a common nominal interest rate increases heterogeneity.

Real interest rates, both short- as well as long-term, are naturally far lower (in 2002-2003) in Spain at one extreme than in Germany at another **(Charts 10** and **11)**. The real long-term interest rate has been lower than the growth rate in Spain since 1997, and has been far higher most often in Germany **(Chart 12).**

Moreover, as is well known, the transmission channels of monetary policy diverge from one country to the next.

Chart 10
Real short-term interest rate (CPI) (harmonised)

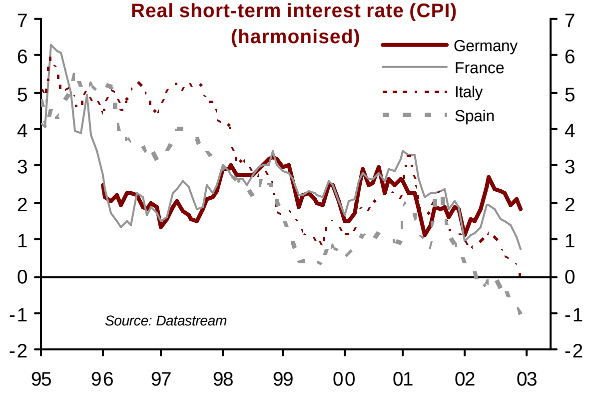


Chart 11
Real long-term interest rate (CPI) (harmonised)

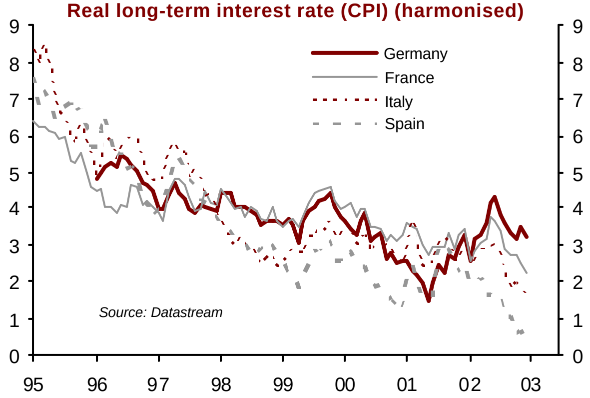


Chart 12
Real long-term interest rate – real GDP growth

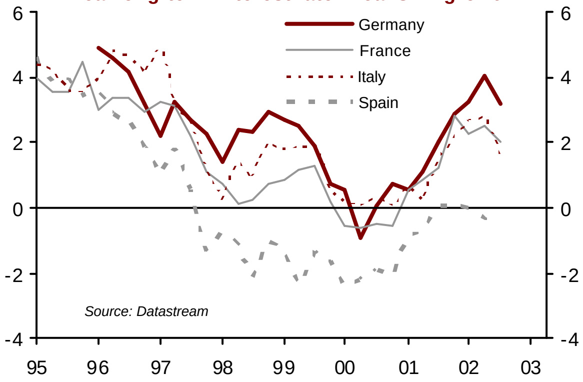


Chart 13
Bank loans to companies (as % of GDP)

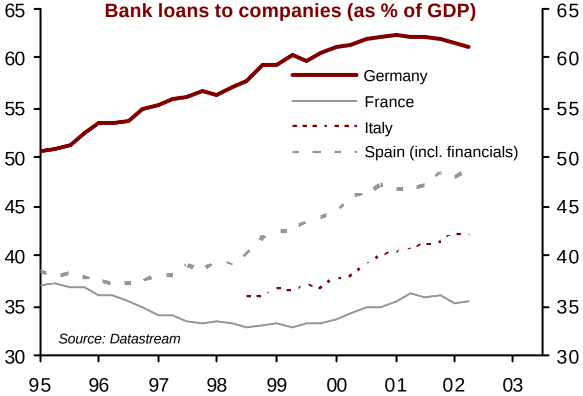


Table 1 below shows the weight of fixed-rate and floating-rate loans in mortgage loans.

Table 1
Structure of mortgage loans

Country	Floating-rate loans	Fixed-rate loans
Portugal	100	0
Finland	90	10
Spain	80	20
Germany	30	70
Italy	40	60
France	25	75
Netherlands	10	90

The decline in short-term interest rates stimulates therefore demand for mortgage loans significantly in Spain, but very little in Germany or France. On the corporate front, short-term loans are far more frequent in Italy than in the other countries **(Table 2).** The ways companies raise financing diverge: predominance of bank loans in Germany **(Chart 13),** lower leverage and larger weight of financing raised on the market **(Tables 3** and **4)** in the other countries. It is also well known that the degree of concentration of banking systems differs noticeably (very low concentration in Germany, concentration in France and Spain, **Table 5**) and this also leads to differences in the way banks react to moves in short-term interest rates.

Table 2
Weight of short-term loans in total lending to non-financial companies
(%)

Germany	33	Italy	73	Netherlands	32
France	30	Spain	36		

Table 3
Non-intermediated debts of non-financial companies
(% of GDP) (end-2000)

Germany	0.85	Italy	1.05	Netherlands	1.75
France	2.96	Spain	1.59		

Table 4
Credits / total debt of non-financial companies (%)

Germany	**59**	**Italy**	**30**	**Netherlands**	**32**
France	**15**	**Spain**	**21**		

Source: ECB

Table 5
Weight of 5 largest banks in banks' total assets (%)

Germany	**20**	**Italy**	**23**	**Netherlands**	**81**
France	**47**	**Spain**	**54**		

We therefore have:

- **heterogeneity in terms of economic situations**;
- **heterogeneity in terms of transmission channels of monetary policy**.

1 – 2 Monetary policy lacks degrees of freedom

Faced with this diversity, euro-zone monetary policy has just one degree of freedom: the repo rate. This means that it is impossible to dampen or boost activity or lending in just one country. Let us take the case of Spain: if the authorities of this country believe one has to dampen mortgage lending and the rise in house prices, they have no instrument to do so, since the ECB will not raise the repo rate of the euro zone for such a purpose.

This situation is worsened, as seen above, by the fact that in some countries (e.g. Spain) short-term interest rates matter primarily, while in others (e.g. Germany) long-term interest rates are far more important. A cut in short-term interest rates aimed at stimulating the German economy, paradoxically, will primary stimulate the Spanish economy that does not need any such stimulus.

What type of flexibility could be introduced, which would increase the number of degrees of freedom of monetary policy?

The following alternatives might be considered:

– give national central banks the possibility to modify, if required, the rates of banks' statutory reserves, or introduce such reserves on credits. It would naturally be very efficient if the Bank of Spain could introduce non-interest bearing statutory reserves on mortgage loans, which have risen far too fast in line with property prices. Currently, the system of statutory reserves is rigid, common to all countries, and bears only on certain allocations of capital **(Inset 1).** At end-2002, the statutory reserves of the euro zone stood at EUR 129 bn while banks' total assets amounted to EUR 11,100 bn.

Inset 1
Required reserves in the euro zone (to banks' liabilities)

0 % rate on:

- deposits of more than 2 years,
- repurchase agreements,
- debt securities with an initial maturity of more than 2 years.

2.0 % on:

- deposits of less 2 years
- debt securities of less than 2 years
- money market instruments

Calculations (period of constitution) are carried out on the 23rd day of each month, and statutory reserves bear an interest rate equal to the average repo rate during the period

- make the other banks' balance sheet ratios flexible and constraining **(Inset 2).**

Inset 2
Banks' balance sheet ratios

$$\text{Liquidity ratio} = \frac{\text{short term assets} + \text{liquid assets}}{\text{short term liabilities}}$$

$$\text{Permanent ressources ratio} = \frac{\text{equity} + \text{provisions} + \text{long term (> 5 years) ressources}}{\text{long term or illiquid assets}}$$

We are going to illustrate the first possibility by drawing on a simple theoretical model.

1 – 3 A theoretical model with flexible statutory reserves

a - The model

Our goal is to build a two-country model of a monetary union where:

– in the first country (Spain) loans are at a short-term interest rate or a floating rate, in the second country (Germany) loans are at a fixed and long-term rate;

– in the first country (Spain), demand is boosted by the cut in short-term interest rates decided by the central bank (the ECB) because of the weakness in activity in the second country (Germany);

– this effect is reinforced by a wealth effect (a property one in the case of Spain), as asset values climb in line with the robust activity and the rate cut;

– the central bank's target is to control the zone's average inflation (average inflation of 2 countries);

– monetary policy is far more efficient in the former country (Spain) than in the latter (Germany) since in Germany loans are extended at a fixed rate, and euro long-term interest rates are highly correlated with dollar long-term interest rates;

– we will introduce subsequently the possibility that modulating statutory reserves, required reserces increases the interest rate charged by the banks in the first country (Spain).

We are therefore going to differentiate Spain and Germany in terms of the nature of financings (fixed rate vs. floating rate, see above). But the literature [1] shows that transmission mechanisms in monetary policy differ from one country to another for other reasons:

- nature of corporate financing (bank loans or market financings, see above also);

- size of assets held by the private sector, as this influences wealth effects, i.e. those linked to mortgage collaterals;

- situation of banking sector (concentration[2] — see also above — liquidity, etc.).

We will represent these ideas as follows (the variables concerning the second country, Germany, are denoted with *).

Production levels

$$(1)\quad \begin{cases} y_t = -a\left((r_t + r) - (p_{t+1} - p_t)\right) + b\left(a_t - p_t\right) \text{ (Spain)} \\ y_t^* = -a\left(R_t - \left(p_{t+1}^* - p_t^*\right)\right) - bp_t^* - e \text{ (Germany)} \end{cases}$$

y stands for the production logarithm, r the Monetary Union's common short-term interest rate, R the long-term interest rate, p the price logarithm, a the logarithm of asset values (property) in Spain; $e(>0)$, stands for the negative demand shock that affects Germany. r stands for the possible rise in the cost of credit in Spain that would result from the utilisation of statutory reserves.

[1] ECB (2002), Allen-Gale (2000), BIS (1995), Ehrmann (2000), Gerlach-Smets (1995), Barron-Coudert-Mojon (1997), Britton-Whitley (1997), Clements, Kontomelis, Levy (2001), Guiso-Kashyap-Panetta-Terlizzese (2000).

[2] See the October 2002 special issue of the *Journal of Banking and Finance*.

Production grows with the real short-term interest rate in Spain (floating rate loans), with the long term one in Germany (fixed-rate loans). The wealth effect (in the practice in property) plays only in Spain, and Germany suffers from sluggish demand.

Inflation rates

They result very simply from:

$$(2)\ \begin{cases} p_{t+1} - p_t = qy_t & \text{(Spain)} \\ p^*_{t+1} - p^*_t = qy^*_t & \text{(Germany)} \end{cases}$$

Inflation rates rise in line with production.

Asset values in Spain

We suppose perfect substitutability between assets (property) and short-term securities (or the short-term loans that finance purchases of property), and we relate rents (revenue from assets) to production in value terms.

This leads to:

$$(3)\ a_{t+1} - a_t = r_t + r + \bar{r}\left(a_t - \left(p_t + y_t\right)\right)$$

$\bar{r}$ stands for the benchmark short-term interest rate. r stands for the rise in the cost of capital (the cost of credit) due to the introduction of official reserves in Spain. Since real estate assets are perfectly substitutable for mortgage credit (in the near term), their return is $r + r$.

This expression (3) results from the hierarchy according to which: $\frac{A_{t+1} - A_t + qP_tY_t}{A_t} = r_t + r$, where A stands for asset values (a is the logarithm of this value), P the level of prices, Y the level of production.

Long-term interest rates

We suppose that the long-term interest rate of the Monetary Union (the euro zone) depends partly on the dollar long-term interest rate $\bar{R}$, and otherwise on the fundamental interest rate Q that results from expectations about future short-term interest rates. This reflects what is observed in the facts: the euro long-term interest rate depends on the dollar long-term interest rate and anticipated euro short-term interest rates. This is written:

$$(4)\ \begin{cases} R_t = l\overline{R} + (1-l)Q_t \\ Q_{t+1} - Q_t = \overline{r}(Q_t - r_t) \end{cases}$$

The second equation of (4) expresses the equality between the yield on bonds (with respect to their euro components) and the short-term rate r_t. For the sake of simplicity, we suppose that $\overline{R} = \overline{r}$.

b - Behaviour of the central bank (ECB) and dynamics

The central bank cancels the overall inflation of the monetary union:

$$(5)\ p_{t+1} - p_t + p^*_{t+1} - p^*_t = 0$$

or:

$$(5')\ y_t + y^*_t = 0$$

We suppose that in $t = 0$ (before any shock), $p_0 = p^*_0 = 0$, therefore in all the periods $p_t + p^*_t = 0$.

We suppose that the central bank takes the long-term interest rate R as given. It chooses the short-term rate r to ensure that $y + y^* = 0$, i.e.:

$$(6)\ a r_t = -aR_t + ba_t - e - a r = -a l \overline{r} - a(1-l)Q_t + ba_t - e - a r$$

A rise in the long-term interest rate reduces production in Spain, and therefore leads to a decline in the short-term interest rate. A rise in r (additional cost of capital in Spain) reduces Spanish production, and consequently lowers the short-term rate. (6) implies:

$$(7)\ \begin{cases} (1-aq)y_t = a l \overline{r} + a(1-l)Q_t - bp_t + e \text{ (Spain)} \\ (1-aq)y^*_t = -a l \overline{r} - a(1-l)Q_t - bp^*_t - e \text{ (Germany)} \end{cases}$$

The unfavourable demand shock $(e > 0)$ in Germany drives down the short-term interest rate, and as a result stimulates production in Spain. A rise in the fundamental long-term interest rate Q_t reduces production in Germany, and thus has the same effect. The effects of a_t and r on production in the first country vanish, as they are eliminated by the reaction of the interest rate. We also have:

A rise in Q_t (the fundamental long-term interest rate) reduces r_t and increases y_t, it therefore reduces on two counts $a_{t+1} - a_t$. A rise in a_t (asset value) increases r_t, thus increases on two counts $a_{t+1} - a_t$ (see (3)). A rise in p_t (prices in Spain) reduces production y_t, and consequently can have an ambiguous effect on production in value terms $p_t + y_t$. r (the effect of statutory reserves on the capital user cost) disappears, since $r + r$ does not depend on r (see (6)).

The dynamics of the fundamental long-term interest rate is written:

(9) $Q_{t+1} - Q_t = l\bar{r}^2 + \bar{r}Q_t(2 - l) - \bar{r}\, {}^{b}\!/_{a}\, a_t + \bar{r}\, {}^{e}\!/_{a} + \bar{r}r$

A rise in Q_t directly increases $Q_{t+1} - Q_t$ (term $\bar{r}Q_t$ of (4)) and reduces r_t.

The characteristic polynomial of the dynamics of $p_t \left(p_{t+1} - p_t = qy_t\right)$, a_t, Q_t is written:

$$S(x) = \left(1 - \frac{bq}{1 - aq} - x\right)\left(x^2 - x\left(2 + \bar{r}(3 - l) + {}^{b}\!/_{a}\right)\right.$$

(10) $$\left. + \left(1 + \bar{r}(2 - l)\right)\left(1 + {}^{b}\!/_{a} + \bar{r}\right) - \bar{r}\,{}^{b}\!/_{a}(1 - l)\left(1 + \frac{a\bar{r}}{1 - aq}\right)\right)$$

$$+ \frac{qb\bar{r}^2(1 - l)(1 - aq - b)}{(1 - aq)^2}$$

thus:

(11) $$S(1) = \frac{\bar{r}bq}{1 - aq}\left[-{}^{b}\!/_{a} - \bar{r}\right] < 0$$

and this ensures dynamic stability (two roots higher than 1 and a root lower than 1).

Ignoring the useless constant exogenous terms, we find for the **long-term equilibrium** (denoted with ^) very simply:

$$(12)\quad \begin{cases} \hat{y} = 0 \\ \hat{Q} = \hat{r} = -r \ ; \ \hat{p} = \dfrac{e}{b} - r\,\dfrac{a}{b}(1-l) = \hat{a} \end{cases}$$

In the long term, the stability of the fundamental long-term interest rate Q implies that $Q = r$; price stability implies that $y = 0 = a(1-l)Q - bp + e$; the stability of asset values that $0 = r + r + \bar{r}(a-p)$; the choice of the interest rate by the ECB that $r = -(1-l)Q + \dfrac{ba}{a} - r - \dfrac{e}{a}$ with $Q = r$.

$e > 0$ (**contraction in demand in Germany**) does not lead to a long-term change in the interest rate, since $p = a = e/b$ balances the goods market without any move in the interest rate. The price in Spain rises to cancel the positive effect of the shock on production, and asset values rise by a similar extent since it follows in line with the return on assets linked to the price.

$r > 0$ (**rise in the cost of capital in Spain**) triggers an identical decline in the interest rate, to stabilise inflation, hence a rise in asset values identical to that in prices since the cost of capital $r + r$ does not vary, and a rise in prices to rebalance the goods market after the decline in the interest rate.

c – Short-term equilibrium and response to shocks

We call **short-term equilibrium** the economic equilibrium that occurs before the adjustment in prices (with $p_0 = p_0^* = 0$).

The two variables that are subject to a dynamics are then asset value a and the fundamental long-term interest rate R.

As these two variables are not predetermined, the short-term equilibrium is the one achieved when both variables have instantaneously jumped to the stationary solution (for a price value that has remained constant), or (still by ignoring the useless constant terms):

$$(13)\quad \begin{aligned} & a\left[b/a + \bar{r}(2-l) - \frac{b(1-l)\bar{r}}{1-aq} \right] \\ & = -r\left(1 + \frac{a\bar{r}}{1-aq}\right)(1-l) + \frac{e}{a}\left(1 + \frac{a\bar{r}}{1-aq}\right) \end{aligned}$$

Dynamic stability is ensured if $b/a + \bar{r}(2 - l) - b\,\dfrac{(1 - l)\bar{r}}{1 - aq} > 0$, , as we suppose.

We also have:

$$(14)\quad r\left[b/a + \bar{r}(2 - l) - \frac{b(1 - l)\bar{r}}{1 - aq}\right] = \frac{-\bar{r}e}{a}\left(1 - \frac{b}{1 - aq}\right) - r\left(\bar{r} + b/a\right)$$

and

$$(15)\quad \begin{aligned} &(1 - aq)y\left(b/a + \bar{r}(2 - l) - \frac{b(1 - l)\bar{r}}{1 - aq}\right) \\ &= -a(1 - l)\left(\bar{r} + b/a\right)r + e\left(\bar{r} + b/a\right) \end{aligned}$$

The equilibrium results from:

$$(16)\quad \begin{cases} r + r + \bar{r}(a - y) = 0 & (\text{stabilité de la valeur des actifs } a) \\ Q = r & (\text{stabilité du taux long fondamental}) \\ (2 - l)r = \dfrac{ba}{a} - r - e/a & (\text{fixation du taux court par la Banque Centrale}) \\ (1 - aq)y = a(1 - l)r + e & (\text{production en Espagne}) \\ y^* = -y & (\text{production en Allemagne}) \end{cases}$$

· **A decline in demand in Germany** $(e > 0)$ drives the interest rate r. down. This leads to a rise in a , the price of assets in Spain, which leads to a rise in Spanish production, hence the need to raise the short-term interest rate. This second effect is dominated by the first, as we suppose, if the wealth effect (measured by b) is not too high, and consequently $1 - aq - b > 0$.

We then have at equilibrium a decline in the interest rate r, a rise in the value of assets a, a rise in production y , and inflation in Spain.

The higher l is, the less the long-term interest rate varies with the short-term interest rate. (14) shows that this implies a stronger reaction to the decline in the short-term interest rate (since it hardly has an effect on production y^* in Germany), leading to a sharper rise in asset values and a more pronounced rise in production in Spain.

The wealth effect $(b > 0)$ increases the reaction of production to all types of shocks.

· **A rise in the cost of capital in Spain** $(r > 0)$ reduces production in that country and thus leads to a cut in the short-term interest rate. The rise in the cost of capital drives asset values down. If $l \approx 1$, the cut in the short-term interest rate has no effect on production in Germany; consequently, the short-term interest rate declines until production in Spain is not affected by the shock, i.e. until $r + r = 0$. The cost of capital then does not vary, nor do asset values.

d – Demand shock in Germany

The unfavourable demand shock in Germany $(e > 0)$ leads in the near term to an identical decline in short-term (r) and fundamental long-term interest rates (Q) (see (14)). The effective long-term interest rate R declines by a fraction $1 - l$ of the cut in the short-term interest rate. Asset values (property in Spain) rise sharply (see (13)) since there is both a decline in the interest rate and a rise in activity in Spain (see (15)). Inflation becomes positive in Spain, and negative in Germany.

Subsequently, there is an upward adjustment in prices in Spain (a decline in Germany since $p + p^* = 0$) and one gradually heads towards the long-term equilibrium (12) where asset values, in real terms $(a - p)$ the interest rates, r, Q et R, and production rates y and y^* are no longer affected by the shock.

The decline in prices, in the long term, brings production in Germany back towards its initial level.

If $l \to 1$ (weak dependency of the long-term interest rate on the short-term interest rate), the initial rise in the short-term interest rate does not stimulate production in Germany, and the only impact of the rate cut is to increase production in Spain, which then surges.

To correct the effects of this shock, the Spanish authorities can introduce non-interest bearing **required reserves** for their banks, and this leads to a rise in the interest rate on credits in relation to the interest rate set by the central bank. If $l \approx 1$, this policy is totally inefficient since monetary policy then no longer affects the economic equilibrium except in Spain, the interest rate set by the central bank declines by r .

In the intermediate situation $(0 < l < 1)$, a r rise in the cost of credit:

$$(17)\quad r = \frac{e}{a\left(1-l\right)}$$

offsets the effect of the shock on production and inflation rates, and asset values, in the near term, if prices in the long term and also in the long run (see (12)).

The closer l is to 1 (small reaction in the long-term interest rate to the short-term interest rate) the more the rise in r must be significant, because it is all the more offset by a further decline in the short-term interest rate.

We can thus see that it is possible, by driving upwards the cost of bank loans in Spain, to eliminate all the effects in the near term and in the long term of the demand shock in Germany.

2 – 1 Capital solvency ratios increase the need for flexibility

The current capital solvency system (Cooke ratio, **Table 6**), as has often been described, has a pro-cyclical effect. During recessions, the rise in defaults and bad loans results in a contraction in banks' equity. Consequently, the minimum capital demand becomes more difficult to comply with, and banks scale back their lending.

Table 6
Cooke ratio: capital requirements

Claims on	OECD states, central banks	Banks, public organisations, local authorities	All mortgage loans	Companies, individuals
Weighting	0%	20%	50%	100% *

100 = capital of 8% of assets concerned

This mechanism is perfectly visible today in Japan and also Germany.

Periods when bankruptcies rose in Japan (1997-98, 2000) were followed by a contraction in bank loans to companies (**Chart 14**). Bankruptcies, and the losses they resulted in, have led to a decline in the equity of Japanese banks, and driven them since 1998-99 to invest exclusively in assets that do not consume capital (government bonds) at the expense of lending (**Chart 15**). In Germany, from early 2000 onwards, the supply of consumer and business credit has decreased (**Chart 16**), and this certainly has led to a worsening in the contraction in investment, while banks' solvency ratios have deteriorated (Tier One between just 5% and 5.5% for three of the four major private banks).

Chart 14
Japan: Bank loans and number of bankruptcies

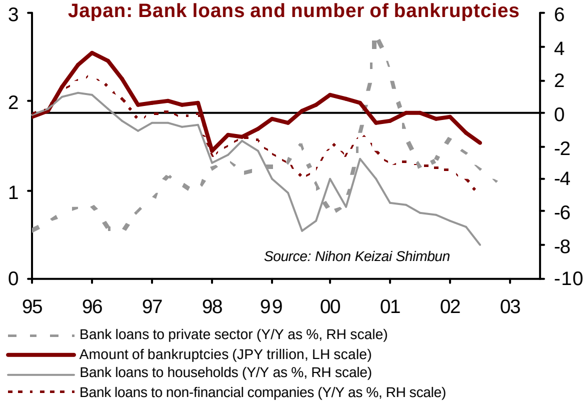


Chart 15
Japan: Banks' assets (JPY trillion)

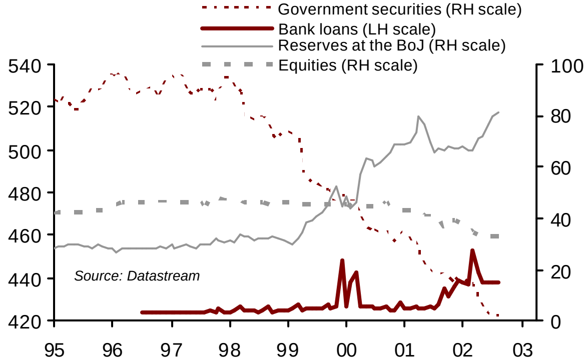
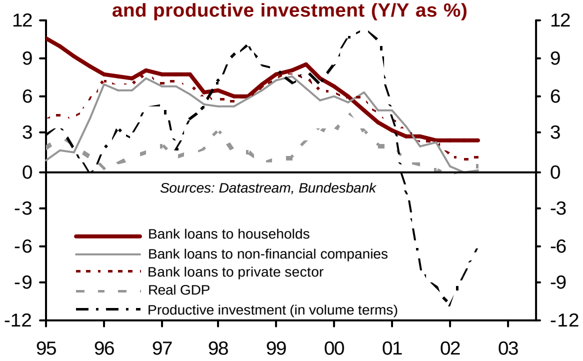


Chart 16
Germany: Bank loans, GDP and productive investment (Y/Y as %)



As is well known, minimum capital adequacy ratios have the perverse effect of inducing banks to take greater risks. For they must have more equity than they would wish spontaneously. This reduces their return on equity and, to increase it, banks must invest in riskier assets that have a higher expected profitability.

2 – 2 Basle 2 will worsen the pro-cyclical features of ratios

With the new system (Basle 2), the pro-cyclical features will be further worsened by the deterioration in the rating of companies during recessions.

In the "standard method" based on agency ratings and not on their internal models, banks will consume more capital when they lend to more lowly rated companies (**Table 7**). However, during economic slowdowns, the average rating deteriorates substantially (**Tables 8** and **9**) and does not improve during recoveries.

Table 7
Banks' capital requirements according to the rating of borrowers (method based on agency ratings)

Rating	AAA to AA-	A+ to A-	BBB + to BBB-	BB+ to BB-	B+ to B-	Below B-	Not rated
Sovereigns	0%	20%	50%	100 %	100 %	150 %	100 %
Banks (option 1)	20%	50%	100 %	100 %	100 %	150 %	100 %
Banks (option 2)	20%	50%	50%	100 %	100 %	150 %	50%
Banks (option 2, short-tern (=3-month) assets	20%	20%	20%	50%	50%	150 %	20%
Corporates	20%	50%	100 %	100 %	150 %	150 %	100 %
Retail	75%						
Mortgage loans	40%						
Securitised assets (ABS)	20%	50%	100 %	350 %	1250 %	1250 %	1250 %

Table 8
Euro zone (Corporates + financials)
Upgrade / Downgrade ratio *

1990	**- 0.111**
991	**0.391**
992	**0.860**
993	**0.789**
994	**0.556**
995	**0.587**
996	**0.143**
997	**0.071**
998	**0.147**
999	**0.253**
000	**0.198**
001	**0.603**
002	**-0.750**
003*	**0.778**

(until 24 January 2003)

* the ratio is defined as: $\frac{\#\,\text{upgrades} - \#\,\text{downgrades}}{\#\,\text{upgrades} + \#\,\text{downgrades}}$

It is equal to -1 when there are only downgrades and + 1 if there are only upgrades.

Table 9
Structure by rating of euro corporates

	January 2001			October 2002		
	Total	**Fin.**	**Corp.**	**Total**	**Fin.**	**Corp.**
AAA	25.3	40.9	0.4	23.2	0.4	0.08
AA	29.4	36.8	17.8	19.3	55.9	10.7
A	33.7	21.9	52.2	28.7	31.8	34.9
BBB	7.9	0.3	19.8	25.0	11.9	45.5
High-yield	3.8	0.0	9.7	3.8	0.1	8.1

Sources: Bloomberg. The structure is evaluated by drawing on Merrill Lynch benchmarks

Table 10
Default rate (%)

	2000	**2001**	**2002**
United States			
Investment grade	0.15	0.40	0.60
Speculative grade	6.98	9.72	7.32
EU			
Investment grade	0.16	0.00	0.40
Speculative grade	1.77	6.92	13.48

During recessions, banks will therefore have an incentive to slash their lending to less well rated companies, which precisely suffer from the highest default risk during a recession, thus leading to a worsening in deficits and the contraction in activity. Banks will be forced to do so since, during recessions, their results and their equity contract.

Naturally, a few correcting mechanisms have been introduced, such as the allowance of 10% to 20% of the capital required for loans to small and mid-sized companies in relation to loans to companies with a similar risk grading.

However, one can calculate that if the Basle 2 ratios were in force, the deterioration in the average creditworthiness of European companies would have increased the demand for capital of European banks by 20% (from 5.1% to 6%).

The pro-cyclical nature of capital ratios:

will probably increase the magnitude of cycles because of higher credit rationing during recessions;

increase heterogeneity between countries; a troubled country will be hit by a deterioration in the situation of its companies, leading probably to a contraction in lending that will worsen its gap in relation to other countries;

probably lead to a rise in the margins of banks on their loans that will lift them closer to bond spreads, and this points to the same conclusion. In early 2003, the credit spread for a BBB borrower in euros, in relation to interest rates on government securities, is around 190 basis points on the bond market and 110 basis points on bank loans.

We therefore recommend introducing the idea of modulating solvency ratios on the cycle (rise in periods of robust growth).

2 – 3 A model for the cyclical modulation of the capital adequacy ratio

In the future, the level of bank capital demanded will be more differentiated than currently, according to the level of risk of assets held by bank, the level of risk measured notably by the rating of borrowers (Basle Committee (1999)). The implementation of minimum capital adequacy ratios, in the past, was aimed at curtailing excessive risk-taking by banks or avoiding bank runs by showing depositors that banks have substantial reserves (Koehn-Santomero (1980), Keeley-Furlong (1990), Rochet (1992), Mishkin (2000)).

However, quite fast, the literature showed that a non-differentiated capital requirement ratio (following the level of risk of the bank's assets) did not achieve such a result, and could actually on the contrary increase the percentage of the riskiest assets in the portfolios of banks (Artus (1991), Furlong-Keeley (1989), Gennotte-Pyle (1991), Kahane (1977), Kim-Santomero (1988), Lam-Chen (1985), Morgan (1992), Pringle (1975), Santomero-Watson (1977), Sharpe (1978), Flannery (1989)). An intuitive reason for this result is the fact that, if shareholders have the return on capital as a target, forcing them to hold a larger capital base leads banks to seek the assets that have the highest expected return. Another criticism has been as follows: it is possible to limit risk-taking by banks without using capital requirements. Thus, if the banks have substantial rents, they will disinclined to run risks, since the cost of bankruptcy is then high (Bhattacharya (1982), Chan-Greenbaum-Thakor (1982), Hellman-Murdock-Stiglitz (2000)).

“First-generation” literature about the effects of capital requirements imposed on banks by regulators used a simple conceptual framework: partial equilibrium (in particular, one does not know where the capital of banks comes from), lack of any analysis of the role of banks (providers of liquidity, analysis of borrowers, etc.);

“Second-generation” literature is far more sophisticated; we obtain for example the following results:

- substituting banks’ capital for deposits reduces the liquidity of the economy and is detrimental, since capital is less efficient than liquidity in terms of exchanges (Gorton-Winton (1995)); moreover, excessively high demand for capital can lead banks not to operate, and this lowers well-being since banks provide information about borrowers;

- banks’ capital requirements can be used to ensure banks have an incentive to seek information about the investment projects of borrowers (Chiesa (2001));

- substantial capital reduces the risk of a run on banks, and consequently the bank is less disciplined: it increases the rents it extracts from lenders, it can decide to stop lending and thereby no longer examine the situation of borrowers (Diamond-Rajan (1999, 1999 b)). A bank with a small capital therefore fears a run on its deposits and this might therefore be optimal.

The other important question concerning the solvency ratios of banks relates to their link with the economic environment. It has often been argued that capital requirements increase the magnitude of recessions (Blum-Hellwig (1995), Thakor (1996), Bernanke-Lown (1991), Berger-Udell (1994), Berger-Kashyap-Scalise (1995), Hancock-Laing-Wilcox (1995), Peek-Rosengreen (1995)). The typical mechanism is as follows: during recessions, banks incur losses on their loans, and this reduces their capital and forces them to ration credit if minimum capital requirements bite in. The idea of lowering demand for capital during recessions has therefore appeared, but has been criticised since it does not induce banks to be prudent (Dewatripont-Tirole (1993)).

In this article we are going to study the possibility of modulating demand for capital according to the cyclical situation.

We model as follows the situation of the bank. It has funds (deposits) D with an exogenous (non-interest bearing) level; it has the choice between an asset with a risky return $R \approx N\left(\overline{R}_i, s_i^2\right)$; when the economic environment is good, we have $i = B$; when it is bad, we have $i = M$, with:

$$(18)\begin{cases}\overline{R}_B > \overline{R}_M \\ s_B^2 < s_M^2\end{cases}$$

and a non-risky asset with a return r, independent of the cyclical situation. When the economic environment is good, the likelihood that the environment will be good in the following period is q, that it will become bad is $1-q$. The bank's investments in two assets are made in a period and their returns are recorded in the following period. When the economic situation is bad, the likelihood that it will be bad in the following period is p, and that it will be good is $1-p$. The bank is perfectly informed, and knows q and p.

In a situation where the economic environment is good, the required capital is equal to $t_B(C_B+T)$, related to the bank's total assets, with C_B standing for the level of investments made by the bank in risky assets and T standing for the level of investments made by the bank in risky assets and
for the amount of investments in the risk-free asset.

The equilibrium of the bank's balance sheet thus implies:

$$(19)\quad T+C_B=\frac{D}{1-t_B}$$

If the economic environment remains good in the following period, the bank's assets in this period is:

$$(20)\quad T(1+r)+C_B(1+R_B)$$

If it becomes bad:

$$(20')\quad T(1+r)+C_B(1+R_M)$$

If the economic environment remains good, the bank defaults if:

$$(21)\quad T(1+r)+C_B(1+R_B)< D$$

If it is bad, if:

$$(21')\quad T(1+r)+C_B(1+R_M)< D$$

The expectation z of the bank's return on capital K (with $K = t_B(C_B + T)$) is therefore defined by:

$$(22)\quad 1+z = q\int_{\hat{R}_B}^{+\infty} \frac{T(1+r) - D + C_B(1+R_B)}{t_B(C_B+T)} f(R_B)dR_B + (1-q)\int_{\hat{R}_B}^{+\infty} \frac{T(1+r) - D + C_B(1+R_M)}{t_B(C_B+T)} g(R_M)dR_M$$

where $\hat{R}_B$ stands for the threshold of the return of the risky assets in the event of a good economic environment while investments are carried out under which there is bankruptcy, f the distribution of likelihood of R_B; g that of R_M.

We have:

$$(23)\quad 1+\hat{R}_B = \frac{D - T(1+r)}{C_B}$$

and one needs to take into account constraint (19).

We can therefore rewrite:

$$(22')\quad 1+z = q\int_{\hat{R}_B}^{+\infty} \frac{C_B(R_B - r) + D\left(\frac{1+r}{1-t_B} - 1\right)}{\frac{t_B}{1-t_B}D} f(R_B)dR_B + (1-q)\int_{\hat{R}_B}^{+\infty} \frac{C_B(R_M - r) + D\left(\frac{1+r}{1-t_B} - 1\right)}{\frac{t_B}{1-t_B}D} g(R_M)dR_M$$

with:

$$(23')\quad 1+\hat{R}_B = 1+r - \frac{D\left(\frac{1+r}{1-t_B} - 1\right)}{C_B}$$

The higher the outstandings of funds D, the lower the bankruptcy threshold $\hat{R}_B$ is (the less likely bankruptcy is), for a given value of investment C_B in the risky asset. The same point applies, if the coefficient of required capital t_B rises for a given value of C_B. If t_B rises, the bank has more capital, and if, since C_B is given, it invests more in the risk-free asset and this reduces the risk of bankruptcy.

We can lastly write:

$$(22'') \quad \begin{aligned} 1+z = q\int_{\frac{\hat{R}_B-\overline{R}_B}{s_B}}^{+\infty} \frac{C_B\left(s_B e+\overline{R}_B-r\right)+D\left(\dfrac{1+r}{1-t_B}-1\right)}{\dfrac{t_B}{1-t_B}D} h(e)de \\ +(1-q)\int_{\frac{\hat{R}_B-\overline{R}_M}{s_M}}^{+\infty} \frac{C_B\left(s_M e+\overline{R}_M-r\right)+D\left(\dfrac{1+r}{1-t_B}-1\right)}{\dfrac{t_B}{1-t_B}D} h(e)de \end{aligned}$$

where $e \approx N(0,1)$ and where h stands the distribution of likelihood of e and where:

$$(24) \quad \begin{cases} R_B = s_B e+\overline{R}_B \\ R_M = s_M e+\overline{R}_M \end{cases}$$

The optimal choice of C_B is spelled out in depth in the **Appendix.** We can carry out the same analysis when the investment in the risky asset R_M is made in a period of bad economic growth.

Assuming, as it is reasonable, that:

$$(25) \quad \begin{cases} q\left(\overline{R}_B-r\right)+(1-q)\left(\overline{R}_M-r\right)>0 \\ p\left(\overline{R}_M-r\right)+(1-p)\left(\overline{R}_B-r\right)<0 \end{cases}$$

i.e. that the excess future expected yield on the risky asset is positive in relation to the risk-free asset when the economic environment is good, negative when it is bad, we come to the following result:

increasing capital requirements when the economic environment is good cannot prevent the bank from investing all its funds in the risky asset;

in contrast, increasing capital requirements when the economic situation is bad can lead the bank to not invest in risky assets;

It is therefore impossible to prevent, when the cyclical situation is good, banks from over-investing in risky assets, and this entails a high risk of bankruptcy if the cyclical situation becomes bad. **It is also true, if the capital adequacy ratio is always high, that the bank invests in risky assets when the cyclical situation is good, and in risk-free assets when the economic situation is bad. But a low capital adequacy ratio when the economic situation is bad makes it possible for banks to invest in risky assets.** Modulating the capital adequacy ratio over the cycle does not allow investments in risky assets to be prevented, (loans to small companies for example) but allows this type of investment to be maintained when the economic situation is bad.

SUMMARY: need to give back degrees of freedom to monetary policy

Since requirements, in terms of monetary policy, are different from one country to another; and given that this heterogeneity is worsened by the fact that real interest rates are high in countries where the economy is less robust; and since it will be worsened even more by the introduction of new solvency ratios (Basle 2), it is important to pull out of a situation where the euro-zone monetary policy has only one degree of liberty, i.e. the repo rate.

For instance, the following proposals can be envisaged:

reintroduce flexibility in the rates of statutory reserves; the Bank of Spain could, for instance, increase statutory reserves on mortgage loans to dampen lending;

allow capital requirement ratios to be modulated on the cycle (rise during periods of robust growth), or, at least, recommend “dynamic provisioning”: banks, during periods of robust growth, provision beforehand future risks to a generous extent (in the event of a recession), and this resembles the cyclical modulation of capital ratios.

One could also use other policies than monetary policy, if there is a real estate bubble in Spain, why not repeal the tax deductibility of the amortisation of property goods acquired by debt financing?

APPENDIX

Maximisation of expected return

We have:

$$\frac{\partial(1+z)}{\partial C_B} = \frac{1}{\frac{t_B}{1-t_B}D}\Bigg[q\int_{\frac{\hat{R}_B-\overline{R}_B}{s_B}}^{+\infty}\left(s_B e + \overline{R}_B - r\right)h(e)de$$

$$+ (1-q)\int_{\frac{\hat{R}_B-\overline{R}_M}{s_M}}^{+\infty}\left(s_M e + \overline{R}_M - r\right)h(e)de \Bigg] \qquad \text{(A11)}$$

$$\left(0 \le C_B \le \frac{D}{1-t_B}\right)$$

$$\text{with } \hat{R}_B = \mathrm{r} - \frac{D\left(\frac{1+r}{1-t_B}-1\right)}{C_B}$$

and

$$\frac{\partial^2(1+z)}{\partial C_B^2} = \frac{1}{\frac{t_B}{1-t_B}D}\Bigg[\frac{q}{s_B}\frac{\partial\hat{R}_B}{\partial C_B}\left(r-\hat{R}_B\right)h\left(\frac{\hat{R}_B-\overline{R}_B}{s_B}\right)$$

$$+\frac{1-q}{s_M}\frac{\partial\hat{R}_B}{\partial C_B}\left(r-\hat{R}_B\right)h\left(\frac{\hat{R}_B-\hat{R}_M}{s_M}\right)\Bigg] > 0 \qquad \text{(A12)}$$

$$\text{since } \begin{cases} \hat{R}_B < r \\ \dfrac{\partial\hat{R}_B}{\partial C_B} > 0 \end{cases}$$

The possible maximum of C_B is $C_B = \dfrac{D}{1-t_B}$.

At this point, $\hat{R}_B = -t_B$ and:

$$\text{(A13)}\quad \frac{\partial(1+z)}{\partial C_B} = \frac{1}{\frac{t_B}{1-t_B}D}\left[q\int_{\frac{-t_B-\overline{R}_B}{s_B}}^{+\infty}\left(s_B e+\overline{R}_B-r\right)h(e)de + (1-q)\int_{\frac{-t_B-\overline{R}_M}{s_M}}^{+\infty}\left(s_M e+\overline{R}_M-r\right)h(e)de \right]$$

The derivative of the term between square brackets of the right-hand side member of (A13) in relation to t_B is:

$$\text{(A13')}\quad -q\frac{1}{s_B}\left(t_B+r\right)h\left(\frac{-t_B-\overline{R}_B}{s_B}\right)-(1-q)\frac{1}{s_M}\left(t_B+r\right)h\left(\frac{-t_B-\overline{R}_M}{s_M}\right)<0$$

When $t_B \to +\infty$, the term between square brackets tends towards:

$$\text{(A13'')}\quad q\left(\overline{R}_B-r\right)+(1-q)\left(\overline{R}_M-r\right)$$

In an initial situation of **a bad economic environment**, we have to replace q by p, $\overline{R}_M$ by $\overline{R}_B$ and $\overline{R}_B$ by $\overline{R}_M$, t_B by t_M, and C_B by C_M.

There is bankruptcy, in the following period if the return on the risky asset is lower than R_M such as:

$$\text{(14)}\quad 1+\hat{R}_M = \frac{D-T(1+r)}{C_M}$$

with $T+C_M = \dfrac{D}{1-t_M}$.

We therefore have, if the initial economic situation is bad in:

$$\text{(A15)}\quad \frac{\partial^2(1+z)}{\partial C_{M^2}} = \frac{1}{\frac{t_M}{1-t_M}D}\left[\frac{p}{s_M}\frac{\partial \hat{R}_M}{\partial C_M}\left(r-\hat{R}_M\right)h\left(\frac{\hat{R}_M-\overline{R}_M}{s_M}\right)+\frac{1-p}{s_M}\frac{\partial \hat{R}_M}{\partial C_M}\left(r-\hat{R}_M\right)h\left(\frac{\hat{R}_M-\overline{R}_B}{s_B}\right)\right]$$

$$\text{with } \hat{R}_M = r-\frac{D\left(\frac{1+r}{1-t_M}-1\right)}{C_M}$$

$$\begin{cases}\dfrac{\partial \hat{R}_M}{\partial C_M} > 0\\ \hat{R}_M < r\end{cases}$$

$$\text{therefore } \frac{\partial^2(1+z)}{\partial C_{M^2}} > 0$$

$$\text{(A16)}\quad \frac{\partial(1+z)}{\partial C_M} = \frac{1}{\frac{t_M}{1-t_M}D}\left[p\int_{-\frac{t_M-\overline{R}_M}{s_M}}^{+\infty}\left(s_M e+\overline{R}_M-r\right)h(e)de + (1-p)\int_{-\frac{t_M-\overline{R}_B}{s_B}}^{+\infty}\left(s_B e+\overline{R}_B-r\right)h(e)de\right]$$

in point $C_M = \dfrac{D}{1-t_M}$

The derivative of the term between square brackets of the right-hand side member of (A16) relative to t_M is:

$$-p\frac{1}{s_M}(t_M+r)h\left(\frac{-t_M-\overline{R}_M}{s_M}\right)-(1-p)\frac{1}{s_B}(t_M+r)h\left(\frac{-t_M-\overline{R}_B}{s_B}\right)<0$$

The term between square brackets tends towards:

$$p\left(\overline{R}_M-r\right)+(1-p)\left(\overline{R}_B-r\right) \text{ when } t_M\to+\infty.$$

If $q\left(\overline{R}_B-r\right)+(1-q)\left(\overline{R}_M-r\right)>0,$ whatever t_B (good initial economic situation), we have $\frac{\partial(1+z)}{\partial C_B}>0$ en $C_B=\frac{D}{1-t_B}$, thus $C_B=\frac{D}{1-t_B}$ since $\frac{\partial^2(1+z)}{\partial C_{B^2}}>0.$

If $q\left(\overline{R}_B-r\right)+(1-q)\left(\overline{R}_M-r\right)<0,$ when t_B is high, $\frac{\partial(1+z)}{\partial C_B}<0$ in $C_B=\frac{D}{1-t_B}$; when t_B is high $(t_B\to1)$ $\hat{R}_B\to-\infty,$ and $\forall C_B,$ $\frac{\partial(1+z)}{\partial C_B}\to q\left(\overline{R}_B-r\right)+(1-q)\left(\overline{R}_M-r\right).$

If $p\left(\overline{R}_M-r\right)+(1-p)\left(\overline{R}_B-r\right)<0,$ whatever t_M (bad initial economic situation) we have $\frac{\partial(1+z)}{\partial C_M}>0$ in $\frac{D}{1-t_M}$, thus $C_M=\frac{D}{1-t_M}$.

If $p\left(\overline{R}_M-r\right)+(1-p)\left(\overline{R}_B-r\right)<0,$ when t_M is high $(t_M\to1)$, $\hat{R}_M\to-\infty,$ $\frac{\partial(1+z)}{\partial C_M}<0$ in $C_M=\frac{D}{1-t_M}$, and, $\forall C_M,$ $\frac{\partial(1+z)}{\partial C_M}\to p\left(\overline{R}_M-r\right)+(1-p)\left(\overline{R}_B-r\right).$

Since $q > 1/2,\ p > 1/2, \text{si}\ \overline{R}_M - r \approx -\left(\overline{R}_B - r\right),$ we have:

$$\text{(A16)}\quad \begin{cases} q\left(\overline{R}_B - r\right) + (1-q)\left(\overline{R}_M - r\right) > 0 \\ p\left(\overline{R}_M - r\right) + (1-p)\left(\overline{R}_B - r\right) < 0 \end{cases}$$

The choice of t_B can therefore not prevent that $C_B = \dfrac{D}{1-t_B}$

A high t_M can lead to $C_M = 0.$

If $t_M \to 0,\ \ T + C_M \to D,\ \ \hat{R}_M \to r - \dfrac{rD}{C_M}$

$$\text{(A17)}\quad \begin{aligned} \frac{\partial(1+z)}{\partial C_M} = {} & \frac{1}{\frac{t_M}{1-t_M} D}\left[p\left(\overline{R}_M - r\right) \text{proba}\left(e > \frac{\hat{R}_M - \overline{R}_M}{s_M}\right) \right. \\ & + (1-p)\left(\overline{R}_B - r\right) \text{proba}\left(e > \frac{\hat{R}_M - \overline{R}_B}{s_M}\right) \\ & + p s_M \int_{\frac{\hat{R}_M - \overline{R}_M}{s_M}}^{+\infty} e h(e) de \\ & + (1-p) s_B \int_{\frac{\hat{R}_M - \overline{R}_B}{s_B}}^{+\infty} e h(e) de \end{aligned}$$

If $C_M \to 0,\ \ \hat{R}_M \to -\infty,$ and $\dfrac{\partial(1+z)}{\partial C_M} < 0$

If $C_M \to D,\ \ \hat{R}_M \to 0,$ and it is possible that $\dfrac{\partial(1+z)}{\partial C_M} > 0.$

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