International capital mobility and fiscal policy

I. CADORET-DAVID[*], *N. PAYELLE*[**]

This work is intended to assess the degree of capital mobility in OECD countries. The answer to this question defines the internal or external nature of the constraints binding national governments policies. Two major results emerge : (i) capital is highly mobile in OECD area, over the 1970-1998 period, (ii) policymakers seem not to take account of an intertemporal solvency constraint, nor to have a medium term external equilibrium goal. The paper concludes that recent trends in fiscal policies could alter the consistency of the policy mix, what contributes to justify the implementation of fiscal rules.

The wave of financial deregulation during the last three decades, in OECD countries, was intended to promote a more efficient ressources allocation, notably through a greater international capital mobility.

Domestic economic policies and their impact are dependent on the degree of capital mobility. Following a Mundell-Fleming type macroeconomic textbook model, any fiscal policy implying large deficits, and financed by debt, results in a rise in interest rates, which crowds private investment out. In the case of a large interest elasticity of investment, the policy multiplicative effect is noticeably reduced. A such crowding out effect could of course be minimized in case of « ricardian agents ». But their saving supplement, in prevision of a future rise in taxes, would neutralize the contemporaneous effect of fiscal expansion on total spending. Moreover, few empirical evidence has been provided in supporting this hypothesis. Consequently, a low capital mobility combined with a significant investment sensitivity to interest rate, reduces the room to manœuvre for fiscal policy (as a regulation tool). Fiscal policy is then restricted to the automatic stabilizers, which ensure that government accounts stay balanced on average, since deficits and surpluses offset themselves.

On the contrary, this type of constraints on policymakers should be relaxed by a greater capital mobility since foreign capital inflows prevent any increase in domestic interest rates, and the fall in private investment. However, this net capital inflow is the counterpart of a deterioration in the current account , which means that the external part of aggregate demand is now crowded out. Furthermore, the economy becomes dependent on foreign countries and savers ; sooner or later trade balance surpluses will have to be realized, in order to pay back the accumulated debt. Finally, an important foreign debt due to excessive deficits is likely to entail a reversal in investors expectations, and a potential withdrawal of foreign funds. Globally, if governments take account of the intertemporal constraints that should guide their choices, their latitude in terms of fiscal regulation is reduced in the

[*] Université de Rennes 1, CREREG (UMR 6585).
[**] Université de Strasbourg 1, BETA (UMR 7522), Correspondant CREREG (UMR 6585).

medium term, even if the adjustment is easier in the very short term, in comparison with the case of a low capital mobility.

Whatever the degree of capital mobility is, conventional models suggest to restrict the use of fiscal policy to automatic stabilizers, in a way that insures debt sustainability. This conclusion is strengthened in rational expectations models, stressing the role of credibility. The involvement of fiscal authorities in this direction is also likely to improve the policy mix consistency, as it minimizes the risks of conflicts between fiscal and monetary authorities (when these ones are independent). A consistent policy mix ensures credible and more efficient policies, contributing to stabilize expectations and capital flows.

On these grounds, some fiscal rules have been set in the Stability and Growth Pact (SGP), for the EMU member countries. This seems to suggest that national fiscal authorities naturally don't care about the constraints mentioned above. Breaking these rules implies some sanctions. This framework is regularly criticized : first sanctions may be impossible to implement ; next the SGP seems too severe considering the current state of public finance in major European countries. Moreover imposing uniform rules where real economic structures are still heterogeneous can reveal itself risky. On the whole, the SGP has not been able to improve market perception about the relationships between the ECB and national governments. In this context, a «discretionary » cooperation between fiscal and monetary authorities could be a solution, since it is more flexible and could be fitted to each country. But this would require a similar view on short and long run fiscal constraints from both national fiscal authorities and the ECB. This conclusion holds outside the Euroland.

Consequently, at least two questions have to be addressed :

1) What is the degree of capital mobility in OECD countries ? The answer to this question determines the type of constraint binding government policies.
2) Do this constraints significantly restrict policymakers choices ?
   - If capital mobility is low, is the crowding out effect on private investment significant ?
   - If capital mobility is high, what is fiscal authorities decision time horizon : medium-long term or short term ? In the first case, an implicit current account balance objective should appear, not in the second. If governments are sensitive to long run constraints, a consistent policy-mix is expected. Otherwise, setting up fiscal « rules » seems appropriate.

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In order to answer these questions, we have first, to estimate the degree of capital mobility in OECD countries, over the last years, and next to determine the nature of the links between public deficit, private saving and investment (revealing internal or external crowding out effect, or a current account equilibrium target in the medium term).

Since the Feldstein and Horioka seminal paper (1980), a strong correlation between national saving and investment rates is taken as a possible measure of the (high / low) degree of international capital mobility. However, several objections have been formulated with regard to this empirical procedure.

First of all, several sources of endogeneity, which means factors that can affect both saving and investment behaviours, have to be taken into account to avoid spurious estimations. In particular, the current account equilibrium target quoted above is able to induce a significant correlation between national saving and investment, even if capital is highly mobile; which may be interpreted as a cointegrated relationship between the saving and investment rates. Nature of the observed correlation can be precised through decomposition of national saving rate into its private and its public parts, and their mutual reactions. This analysis is related to that of the potential intertemporal constraint on governement fiscal choices.

The econometrical method can also be reconsidered in the same direction, in order to distinguish the long-run equilibrium relationship between saving and investment rates, and their short-term dynamics. Whereas a cross analysis, like Feldstein and Horioka's one, gives an assessment of long-run mean relationship, time series techniques combined with panel analysis afford the advantage to catch both short and long run potential links between variables[1].

Our study aims at contributing to this vast debate. It studies the links between investment rate and saving rate, either national or separated in its private and public components, on a panel of 19 OECD countries, over the 1970 – 1998 period.

We first remind the basic principles of the FH analysis, its limits and its possible extensions, and we next investigate this question with an empirical analysis.

Part 1 – International mobility of capital : the FH approach and its limits

1) The analytical background

The traditional absorption approach of the balance of payments gives the following identities :

$$Y + IM = C + I + G + X \qquad (1)$$

[1] For instance, Coakley and Kulasi (1997) test the cointegration between the national saving and investment rates, on a large countries sample ; Jansen (1996) estimate an error correction model, that leads him to conclude to a raise in the degree of capital mobility, in the OECD countries, over the last 25 years.

$$Y - (C + I + G) = (X - IM) \quad (2)$$

$$Y - A = BTC \quad (3)$$

With Y : national income ; C : households final consumption ; I : national investment ; G : public spendings ; X : exports ; IM : imports ; A = C + I + G, the « absorption » and BTC = X – IM.

The current transaction balance indicates the size and the sign of the international borrowing since the balance of current payments equilibrium implies :

$$BTC + BCA = 0 \quad (4)$$

With BCA = Ke - Ks (+ ΔR), where Ke: capital inflows, Ks : capital outflows. BCA represents then net capital inflows, that is the net external borrowing (including potential changes in currency reserves : ΔR).

Previous equations imply that:

$$Y - A = BTC = -BCA \quad (5)$$

A country with a great internal « absorption » (A) compared with the created wealth (Y), has to borrow outside, which leads a current payments deficit (BTC < 0), financed by net capital inflows (or, if the case arises, by the currency reserves ΔR < 0). Recurrent deficits of this type could consequently entail an important external debt.

The intertemporal approach of the balance of payments broadens this analysis and synthetizes it with the « elasticity approach », showing how an intertemporal solvency constraint imposes itself on the Nations engaged in such a growing debt process. Ultimately, the economy has to realize some current surpluses to pay back accumulated debt, otherwise it becomes unsustainable. The external constraints takes a specific form (cf.infra) [2] :

Let be S, national saving :

$$S = Y - C - G \quad (6)$$

From (5), we obtain :

$$S - I = BTC = -BCA \quad (7)$$

Hence : $I = S - BTC$ (8)

Or equivalently : $I = S + BCA$ (9)

In a closed economy, saving and investment are always equal, while they can differ in an open economy, as investment may be financed either by national saving, or by net capital inflows. But a condition must be satisfied to exploit this opportunity : perfect international capital mobility.

Equation (9) can be rewritten : $S = I - BCA$ (10)

[2] Obstfeld and Rogoff, 1995.

National saving can finance either capital accumulation in the economy, or net claims on the rest of the world. In such a context, if capital is highly mobile, the international allocation of saving should exclusively depend on the spreads of expected real returns on physical capital in the different countries. In this case, saving net flows finally equalize the expected capital returns, and there is no reason to observe a strong correlation between investment and saving rates in each country.

This reasoning justifies the capital mobility measure chosen by FH (1980). They estimate the following equation:

$$\frac{I_j}{Y_j} = a + b \cdot \frac{S_j}{Y_j} + u_j \qquad (11)$$

on a sample of N OECD countries (j = 1, …, N). With Ij : national investment mean for different periods (1960s and 1970s), and Sj : national saving mean. Their regression results give β coefficients close to 1, which is interpreted as the evidence of a low capital mobility (conversely, β coefficients close to 0 would have suggested a high mobility).

This interpretation has been intensively discussed afterwards. First, a high β can be explained by several alternative arguments. Next, the correlation measure chosen by FH can be criticized.

In the next paragraph, we survey the critiques usually adressed to the FH approach, the solutions proposed, and the new results obtained.

2) The limits of the FH approach

FH results have been confirmed by numerous further reasearch, either in cross section or time series analysis : national saving and investment rates seem to be correlated in OECD countries (at least before the 2nd World War). Nevertheless, its interpretation in terms of capital mobility has been discussed.

For Dooley, Frankel and Mathieson (1987), a strong correlation between saving and investment will <u>not</u> be observed if the three following conditions are verified :

1) National investment rate depends on a representative national interest rate (r), to the exclusion of any other variable, that would be correlated with domestic saving. In other words, in the following regression equation :

$$\frac{I}{Y} = a - h \cdot r + e \qquad (12)$$

The error terme ε is totally random, that is uncorrelated with r, or with the savaing rate[3].

[3] Moreover it will probably be important, as the observed correlation between the investment rate and the interest rate is generally low.

2) The expected return in the rest of the world, on which saving and investment behaviours depend, has to be exogeneous. That means that the considered country is sufficiently small so that its financial markets don't influence the world interest rate.

3) National expected real return, has to be equal to foreign expected real return : $r = r^*$, which implies an infinite interest spread $(r - r^*)$ elasticity of the capital balance.

Hence, the covariance between saving and investment rates can be expressed like the sum of three components :

$$cov(I/Y, S/Y) = cov(\varepsilon, S/Y) - h.cov.(r^*, S/Y) - h.cov(r - r^*, S/Y) \quad (13)$$

If the first condition is verified, the first rightside term is equal to zero. If the second condition is satisfied, the second term is equal to zero. And finally, with the third condition the third term is equal to zero. The three conditions **altogether** are then necessary for a null correlation between I/Y and S/Y ; while only the last is connected with the perfect capital mobility hypothesis (the two others underline some exogeneous conditions and a size effect).

The endogeneity problem is central in the overall discussion of FH results. Indeed, several factors can simultaneously influence saving and investment behaviors, and induce a tight correlation between them, even in a context of high international capital mobility.

On time series data, the procyclical nature of both investment and saving (even expressed in percentage of PIB) constitues a first problem. However, data can be adjusted in order to correct for this fact. (cf. Sachs, 1981, for instance). The correlation coefficients are sometimes lower, but never nul.

Moreover, other endogeneity sources characterize cross section studies. In particular, saving and investment depend on the national income growth rate, which is itself set by population growth rate and productivity shocks[4]. Some authors[5] also mention the impact of non tradable goods. The insufficient international integration of goods markets brings closer to a situation of closed economy, explaining the strong correlation between saving and investment. Correcting for these effects significantly reduces the positive correlation, without being able to eliminate it[6].

A last source of endogeneity has particularly important implications in terms of economic policy, as mentioned above :a current balance equilibrium objective, at least in the medium-term. In this case, changes in private sector net saving are offset by changes in public sector net saving, in order to avoid too large fluctuations in current balance[7]. Contrary to a balance of payments equilibrium, this

[4] Obstfeld (1986), for instance.
[5] Murphy (1986), Wong (1990), for instance.
[6] Leachman (1991), for instance.
[7] Jansen (1996), Bayoumi (1990), McClure (1994), Tobin (1983), Westphal (1983), for instance.

policy goal (BTC = 0) can't conceal unsustainable deficit and external debt. In this case, the medium term equilibrium constraint is also binding on the capital balance BCA (+ΔR), which implies that saving and investment are as much correlated as in a closed economy.

In order to take account of this potential source of endogeneity, several methodological precautions have to be taken : first the distinction between private and public saving ; second the adaptation of the econometric tools.

3) The interest of the distinction between private and public saving

Let be Sp, the private saving, and Sg, the public saving :

$$Sp = Y - T - C \quad (14)$$

$$Sg = T - G \quad (15)$$

With T : net taxes on households and firms.

The national saving is given by :

$$S = Y - C - G \quad (16)$$

$$S = (Y - T - C) + (T - G) \quad (17)$$

$$S = Sp + Sg \quad (18)$$

From (8): $S = I + BTC$ (19)

hence: $Sp = I + BTC - Sg$ (20)

or: $Sp = I + BTC + (G - T)$ (21)

This equation shows that private saving can take three forms : internal investment (I), external assets accumulation (BTC), government debt acquisition (G – T). (21) can be rewritten :

$$BTC = Sp - I - (G - T) = Sp - I + Sg \quad (22)$$

The budget balance acts as an adjustment variable between private saving and national investment. A temporary deficit, due to the greater dynamism of national investment compared to private saving, prompts fiscal authorities to reduce their deficit or to increase their surplus, inducing a positive correlation between total domestic saving and investment ; and vice versa.

Several empirical studies suggest this type of relationship, without allowing a direct confirmation of such an external equilibrium objective[8]. In fact, a negative correlation between fiscal balance (Sg) and the spread between private saving and investment (that typically reveals such a policy) is also compatible with the crowding out of private investment by public spendings, in a context of low international capital mobility.

However, from a theoretical viewpoint, the causality between private saving, public saving, and investment, and so their mutual reactions over the time, are different in each hypothesis :

[8] See for instance Bayoumi (1990) and Söderström (1987) for oppsite results on this questions.

Low capital mobility + investment crowding out effect	High capital mobility + BTC equilibrium objective	High capital mobility *(without BTC equilibrium objective)*
$\downarrow$ Sp $\Rightarrow \downarrow$ I	$\downarrow$ Sp $\Rightarrow \uparrow$ Sg	Non significant links between Sp, I and Sg
$\downarrow$ Sg $\Rightarrow \downarrow$ I	$\uparrow$ I $\Rightarrow \uparrow$ Sg	Non significant links between I and Sg

In the case of low capital mobility with a crowding out effect, investment reacts to shocks on private and public saving ; but there is non reason for the fiscal balance to significantly react to shocks on investment and private saving.

On the contrary, the budget balance reacts significantly to these two types of shocks, in case of both a high capital mobility and an objective of external equilibrium. These relations disappear without any policy goals of this kind, when capital is highly mobile.

Thus, studying the reactions of private and public saving and investment to each other, gives us a mean to identify the exact nature of the potentially observed correlation.

As this distinction was impossible with the technique used by FH, the econometrical method must be adapted.

4) Econometrical techniques adaptation

Time series econometrics is a suitable way of catching variables dynamics, both in the long run and in the short run, respectively via cointegration analysis, and VECM modelization. It seems particularly convenient for studying the relationships between private saving, public balance and investment, in both the short and the long run, taking account of a medium term constraints on the external balance. Insofar as such a constraint may be temporarily violated in the short run, without jeopardizing the corresponding long term policy goal.

From a different framework, we come to conclusions close to those obtained by contemporary macroeconomic models, focusing on an intertemporal solvacy constraint. In this regard, the theoretical ground of the FH approach has been severely criticized. The regression equation (11) is neither a structural form, nor a reduced form. It seems to be a pure account identity. Coakley, Kulasi and Smith (1996), Coakley and Kulasi (1997), or Jansen (1996), for instance, replace the problem in a consistent theoretical framework, compatible with modern macroeconomic models. The intertemporal solvacy constraint induces some integration and cointegration properties, that can be tested before the construction of VECM. In particular, the saving and investment rates are cointegrated with a cointegration vector (1, -1). In other words, the current balance in stationnary.

If the cointegration hypothesis can't be rejected, then estimating VECM coefficients gives asymmetric information about the degree of capital mobility. A high short-run correlation doesn't enable to conclude in favor of a low capital mobility, since significant correlations can be generated in intertemporal general equilibrium models (see Obstfeld). However, low short-run correlations can be obtained only in models where capital is sufficiently mobile.

The results already obtained about the correlation between saving and investment rates are not really satisfying. They seem very dependent on the countries, the periods and the tests choosen by the authors.

That's why we now first present an updating of the initial empirical study made by FH ; and we next use another approach based on time series and panel econometrics to have a more complete empirical analysis on this question.

Partie 2 – Testing the degree of capital mobility in OECD countries

Following Feldstein and Horioka, a high cross-section association between saving and investment rates would indicate a low degree of capital mobility. For a sample of 16 OECD countries over the 1960-1974 period, they conclude to capital immobility. Estimations are obtained from the average saving and investment ratios from each country in the period and they reflect the long term.

For our empirical analysis on capital mobility we use panel (annual) data on 19 OECD countries over the 1970-1998 period. The mean and variance of saving and investment ratios over the full 29 years period are presented in table 1.

Table 1 *– Saving and investment ratios: descriptive statistics*

Période 1970-1998	I/Y	S/Y	Sprivate/Y	Spublic/Y
Mean	0.230	0.232	0.223	0.009
Total Variance	0.0024	0.0023	0.0018	0.0019
Within variance	0.0014	0.0008	0.0007	0.0008
Between variance	0.0010	0.0015	0.0011	0.0011

The mean and variance of saving and investment ratios are very similar (first two columns of table 1). But when we study the structure of the variance, the within variance is more important than the between one, in the total variance, in the case of investment ratio. It's the contrary in the case of the saving ratio. When we disaggregate total saving into two components: private and public saving ratios, total variance and its structure are quite similar, but the average public saving ratio is small comparing to the mean of public saving ratio.

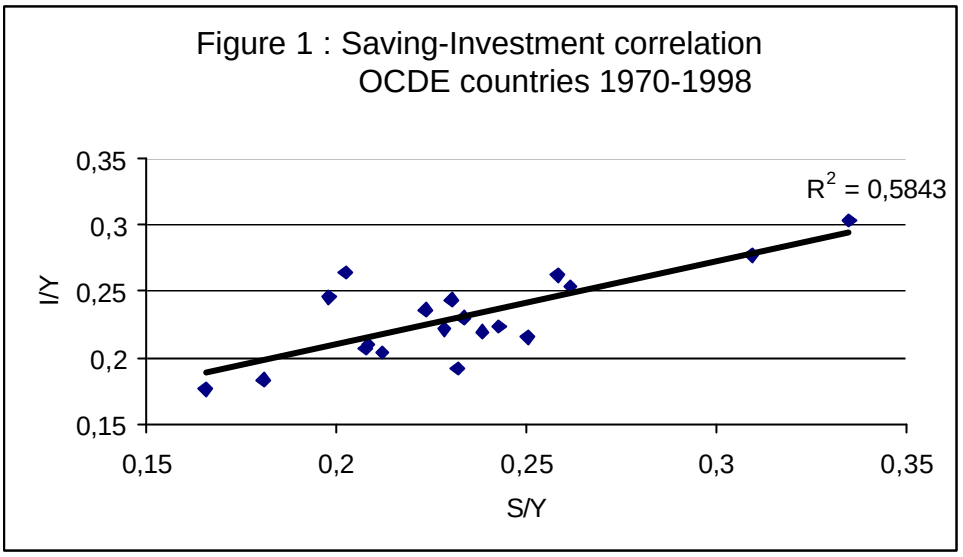
1) International Capital Mobility : Feldstein and Horioka results revisited

To assess the relationship between saving rates and investment rates, Feldstein and Horioka have estimated equations of the form:

$$\frac{I_j}{Y_j} = a + ß \cdot \frac{S_j}{Y_j} + u_j \qquad j = 1,....16 \tag{23}$$

Where I/Y and S/Y are the average of investment and saving ratios respectively, for each country, over the 1960-1974 period. I is investment, S is saving and Y is GDP. Their estimated β was not significantly different from unity, which has been interpreted as the evidence of capital immobility.

Over the 1970-1998 period, we observe that countries investment rates are less correlated with their national saving rates (figure 1).



When we split the full sample into ten-years long subsamples (1970-1979, 1980-1989, 1990-1998), we obtain the following results :

Table 2 : *Capital mobility: Feldstein Horioka approach*

	1970-1998	1970-1979	1980-1989	1990-1998
β	0.62 (27.77)*	0.69 (17.79)*	0.64 (14.78)*	0.39 (7.59)*
β Confidence interval	[0.57 ; 0.66]	[0.61 ; 0.76]	[0.55 ; 0.72]	[0.28 ; 0.50]
R^2	0.58	0.60	0.53	0.27

* indicates that the coefficient is significant at the 5 percent level

Correlations between saving and investment ratios decrease when we compare the first and the last period. β is significantly different from 0 but also significantly different from unity. The degree of capital mobility seems to have increased since 1970. However equation (1) considers the saving investment relation as a long run relation in which intercountry differences in saving rates reflect basic structural differences among countries.

We suggest two extensions of this empirical analysis of capital mobility. The first one uses panel data method to take account not only of structural differences among countries, but also of differences over time in countries. We introduce individual fixed effect in equation (1) for the 19 countries, over the period the 1970-1998, to use intra-country variability. The second one disaggregates national saving in two components: private and public saving. The following two equations are next estimated over the entire period and over subsamples:

$$\left(\frac{I}{Y}\right)_{jt} = a_j + ß\left(\frac{S}{Y}\right)_{jt} + u_{jt} \quad (24)$$

$$\left(\frac{I}{Y}\right)_{jt} = a_j + ß_1\left(\frac{S_{privée}}{Y}\right)_{jt} + ß_2\left(\frac{S_{publique}}{Y}\right)_{jt} + u_{jt} \quad (25)$$

Where j=1…19 and t=1970…1998 then by sub-periods 1970...1979, 1980…1989 and 1990….1998.

Table 3 : *Assessment of the degree of capital mobility (panel approach)*

	1970-1998	1970-1979	1980-1989	1990-1998
β	0.65 (13.48)*	0.76 (11.26)*	0.12 (1.63)	0.33 (5.04)*
S/Y and I/Y correlation	0.25	0.40	0.01	0.16
R^2	0.57	0.80	0.80	0.88
P-value (test :$\beta_1 = \beta_2=\beta$)	0.00	0.15	0.00	0.00
β_1	0.31 (5.80)*	0.84 (9.71)*	-0.07 (-0.84)	0.14 (1.82)
Sprivate/Y and I/Y correlation	0.06	0.33	0.004	0.024
β_2	0.89 (18.04)*	0.71 (9.06)*	0.27 (3.38)*	0.36 (5.75)*
Spublic/Y and I/Y correlation	0.38	0.30	0.06	0.20
R^2	0.64	0.80	0.82	0.89

* indicates that the coefficient is significant at the 5 percent level. Correlation coefficient are squared partial correlation coefficient, they take into account individual country specific effects. A Fisher test concludes to the presence of these effects.

On the 1970-1979 subsample, our results are similar to those obtained by Feldstein and Horioka, as the equality test $\beta_1 = \beta_2 = \beta$ is not rejected, the estimated value of β is equal to 0.76 and the saving and investment partial correlation reaches 40%. However, on the other subsamples, our results significantly differ : the constraint test $\beta_1 = \beta_2 = \beta$ is rejected. There is no correlation between private saving and investment ratios over the two subsamples 1980-1989 and 1990-1998. The partial correlation between investment and public saving rates is very low over the 1980-1989 period and is equal to 20% over the 1990-1998 period. This result can be explained either by a private investment crowding out effect, in connection with the public debt, in a context of low capital mobility, or, if capital is highly mobile, by a long run current account targeting.

In case of an eviction problem, investment reacts to private and public saving shocks, but primary deficit is not affected by private saving or investment shocks. On the contrary, current account targeting induces a reaction of the primary deficit to private saving and investment chocks.

To distinguish those different cases we have to use other techniques which combine times series and panel data analysis.

2) International Capital Mobility : time series and panel data

The panel data set of annual observations of investment, national, private and public saving rates from 1970-1998 for 19 OECD countries is used to test for unit roots and cointegration relations.

First, we test for unit roots in heterogeneous panel on the investment and saving (national, private and public) rates series. We apply a test based on the average of multiplier statistics computed for each group in the panel, the LM-bar test proposed by Im, Pesaran and Shin (1997). The LM-bar test allows for heterogeneity of the dynamics and error variance across groups. We also give results of the tbar statistics, based on the average of augmented Dickey Fuller tstatistics which has good performance on small sample.

Suppose that y_{it} are generated according to following finite-order AR(p_j+1) processes:

$$? y_{jt} = y_{jt} - y_{jt-1} = a_j + ß_j y_{jt-1} + \sum_{k=1}^{p_j} ?_{jk} ? y_{j,t-k} + u_{jt} \qquad (26)$$

The null hypothesis of unit root is $H_0 : ß_j = 0$ for each j, against the alternatives $H_1 : ß_j < 0$, $j = 1,..N_1$, $ß_j = 0$, $j = N_1 + 1,....N$ where N is the number of countries.

AIC and BIC tests have been used to determine the finite-order autoregressive processes and we retain p=2 for all j. We do not include trend variable in the equation because of the results with usual ADF tests by countries (they don't detect the presence of a trend in the series). Results for unit root test are presented in table 4.

Table 4 : *Unit Root test in saving and investment ratios*

	I/Y	S/Y	CA*	Sprivate/Y	Spublic/Y
Tbar	-1.6	-1.9	-1.2	-1.6	-2.0
LMbar	3.5	4.9	2.9	3.6	4.9
Conclusion**	I(1)	?	I(1)	I(1)	?

*CA=I/Y-S/Y, **Critical value Tbar = -1.8, LMbar=3.6 at 5%

Unit root tests reject the null of an unit root in national saving rate and private saving rate (at the 5% significance level), which indicates that, in some countries these two series are stationary. But the test doesn't reject the null of an unit root in the series I/Y, CA and Sprivate/Y.

For a comparison, the ADF test for a unit root rejects (at the 5% significance level) the unit root hypothesis in 3 countries for S/Y (Austria, Denmark and Portugal), in 11 countries for Spublic/Y (USA, Germany, France, Denmark, Finland, Netherlands, Portugal, Spain, Sweden, Australia and United-Kingdom), in 5 countries for I/Y (Germany, Italy, Finland, Norway), 5 countries for CA (Italy, Netherlands, Norway, Portugal, Spain) and 5 countries for Sprivate/Y (Denmark, Norway, Spain, Sweden, Australia).

Our results lead us to reject the hypothesis of a current account targeting, connected with intertemporal solvency constraint, in OECD countries. Saving and investment rates seem not to be stationary in difference since they aren't cointegrated with a cointegration vector (1,-1) over the 1970-1998 period.

We have next pursued the analysis by testing for cointegration between investment and savings rates. We apply the cointegration tests in heterogeneous panels with multiple regressors from Pedroni (1999). Seven statistics are calculated. Among these seven statistics, four are based on the within dimension, and three are based on the between-dimension. For the within dimension statistics (refer as panel cointegration statistics) the test for the null of no cointegration is implemented, versus the alternative hypothesis that presumes no potential heterogeneity across individual members of the panel. By contrast, for the between dimension statistics (refer as group mean panel cointegration statistics) the null of no cointegration is implemented versus the alternative hypothesis that allows heterogeneity across individual members of the panel.

Table 5 gives the seven statistics, which values have to be compared with a normal distribution. Cointegration tests don't reject, at the 5% significance level, the null of no cointegration between investment rate, private saving rate and public saving rate. The result is not surprising since we find that public saving rate is stationary in some countries. But the result doesn't change if we use less countries in the sample. Results are more difficult to interpret in the case of the relationships between investment and private saving rates: 4 statistics reject the null of no cointegration. A potential cointegration between private saving and investment rates could mean an imperfect capital mobility, the first determining the second in the long run. In this case, the result of non cointegration relation between public saving and investment would mean that: 1) the absence of crowding out effect can be attributed either to a low investment elasticity to interest rate, or to a limited impact of public deficits on the later; 2) government fiscal policy is not concerned with the intertemporal solvency constraint.

These results corroborate the findings of Haan and Siermann (1994), Sarno and Taylor (1998) and others that suggest saving and investment cointegrate only in few countries, but overturn findings of Coakley and Kalusi (1997) and Taylor (2002).

***Table 5** : Cointegration test in heterogenous panel*

	Panel				Group		
	v-stat	Rho-stat	pp-stat	Adf-stat	Rho-stat	pp-stat	Adf-stat
I/Y,Spr/Y, Spu/Y*	0.20	0.00	-0.93	-0.54	1.29	-0.34	-0.52
I/Y, Spr/Y	-0.003	-0.89	-2.48	-2.94	0.38	-2.08	-2.68

Spr/Y=Sprivate/Y, Spu/Y=Spublic/Y,

Our estimation strategy is the following : i) we first estimate individual VARs for each country, ii) we next compute individual forecast error variance decompositions, and individual impulse response functions, iii) based on the group mean estimator suggested by Pesaran and Smith (1995), we pool the outcome of the variance decomposition across the OECD countries, and finally, iv) on the basis of the same estimator, we pool the outcome of the impulse response across the countries. The group mean estimator suggests that individual dynamic equations should be estimated separately and the averages of estimated parameters and their standard errors calculated explicitly. The PVAR is given by the average of the function rather than the function of average. This approach allows performing a VAR on a panel, without loosing consistency.

Since investment and private saving rates are probably linked in the long run, all variables are included in the PVAR in levels forms. Differencing time series may remove important information concerning the comovements in these time series. Two lags of each variable and a constant term are included in the VAR. Two PVAR are investigated. The first one includes the following variables : Δlny, r, I/Y, S/Y where y is real GDP and r is the real interest rate, while the second one disaggregates national saving into private saving and public saving, and includes : Δlny, r, I/Y, Sprivate/Y, Spublic/Y.

Table 6 gives variance decomposition of the first VAR model.

***Table 6 :** VAR model with national saving rate - Pooled variance decomposition*

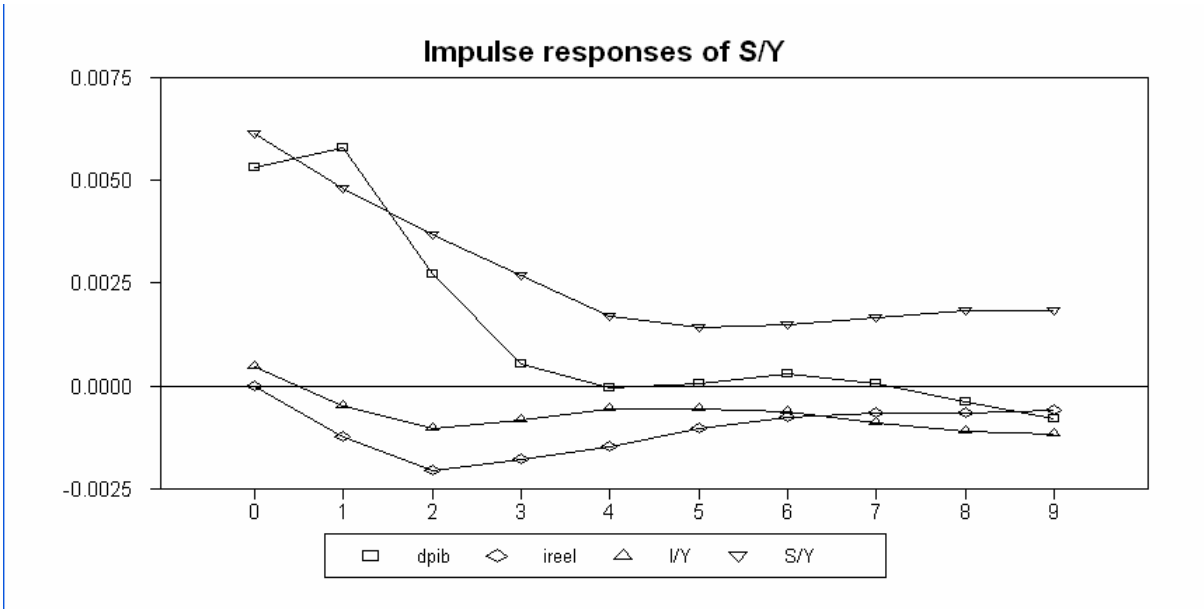
	Variance of S / Y					Variance of I / Y				
	S / Y (%)	I / Y (%)	r (%)	Δlogy (%)	σ*	S / Y (%)	I / Y (%)	r (%)	Δlogy (%)	σ
T = 0	47.7	7.9	5.5	38.7	0 .009	0.0	45.3	4.8	49.7	0.011
1	39 .5	8.4	8.1	43.8	0.013	2.4	31.0	7.3	59.1	0.017
2	36.6	8.8	11.9	42.5	0.016	4.8	25.3	10.0	59.7	0.020
3	34.1	9.0	16 .0	40.7	0.017	6.8	22.8	12.2	58.0	0.022

4	32.6	9.2	18.7	39.3	0.018	7.9	21.8	14.2	55.9	0.023
5	31.9	9.4	19.8	38.7	0.019	8.9	21.1	16.1	53.8	0.024
6	31.3	9.6	20.5	38.5	0.020	9.6	20.5	17.4	52.2	0.025
7	30.6	9.7	20.9	38.6	0.021	10.5	20.0	16.2	51.1	0.026
8	30.0	9.9	21.2	38.7	0.022	11.2	19.7	18.7	50.1	0.026
9	29.6	10.0	21.3	38.9	0.023	11.8	19.6	19.1	49.4	0.027

* standard error , ordering : Δlny, r, I/Y, S/Y

Table 6 confirms that national saving rate and investment rate in OECD countries are not correlated. Investment rate explain 8 to 10% of the forecast error variance of the national saving rate and national saving rate explains less than 10% of the 1 to 6 step ahead forecast error variance of the investment rate. These results tend then to corroborate the hypothesis of a high capital mobility in OECD countries, over the 1970 - 1998 period. The role of interest rate is noticeable, as its shocks explain around 20% of the forecast error variance of investment and saving rates. But the GDP growth rate plays a major role, since it explains 39% of the forecast error variance of saving rate and 49% of the forecast error variance of investment rate. This suggests that investment is mainly explained by an acceleration effect and that the capital cost exerts a minor influence.

The following figures give the impulse response[9] of saving rate and investment rate to shocks on**:** saving rate, investment rate, interest rate and GDP growth rate. We can see the predominance of GDP growth rate shocks on saving and investment rates. A GDP growth rate shock leads to a short term improvement in saving. Moreover, the improvement of investment rate is higher and more persistent.



[9] We pool the outcome of the impulse response across the countries

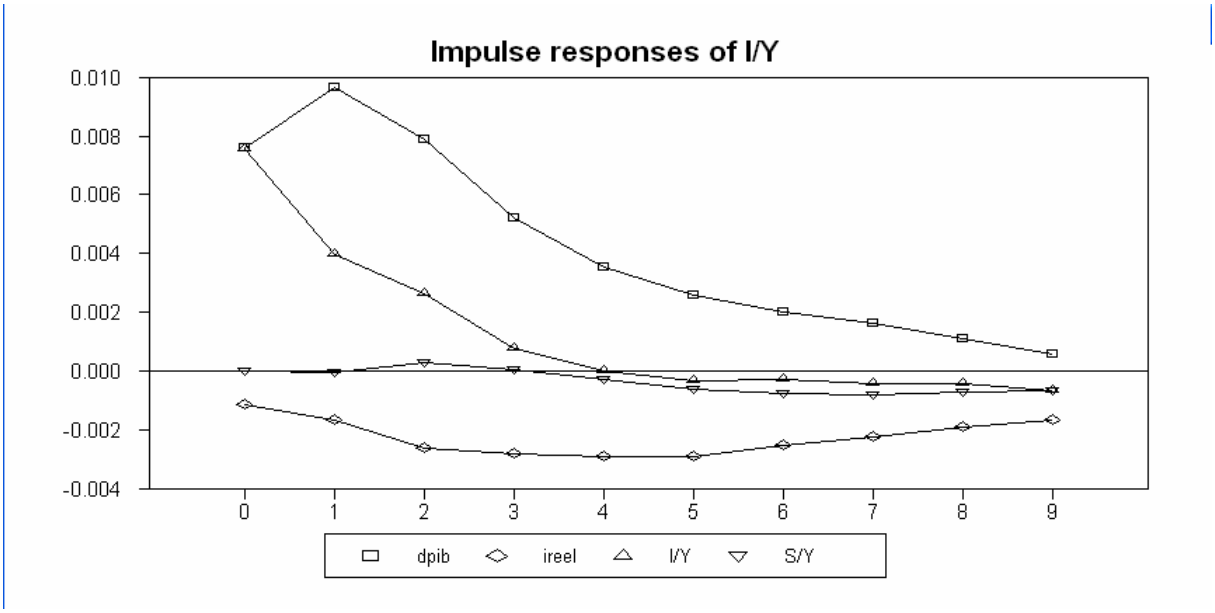


Table 7 conducts to similar conclusions. Both public and private saving rates explain around 10% of the investment rate forecast error variance. But interest rate and mostly GDP growth rate explain a larger share of it.

Impulse functions show a non significant effect of private and public saving shocks on investment rate, while real interest rate has a negative influence, and GDP growth rate a positive one. The fact that investment doesn't react to changes in public or private saving confirm the high capital mobility and the absence of a crowding out effect. Since investment is more sensitive to income growth than to interest rate, it confirms the already mentioned view of a stronger acceleration effect, in comparison with the cost of capital effect. This last point contributes to exclude the hypothesis of an internal crowding out effect, in case of a high but not perfect capital mobility.

Private saving rate doesn't react to shocks on public saving and investment. Once more, the forecast error variance share explained by real interest rate and GDP growth rate is relatively more important: respectively 16% and 28% at the end of the period.

Impulses functions illustrate the prominent influence of GDP growth rate on private saving rate. However, the fact that this one is first negatively, then positively influenced has to be explained. Other variables have no significant effects.

On the contrary, private saving rate contributes for 18% to 19% to the explanation of the public saving rate forecast error variance, at the end of the period. The real interest rate and the GDP growth rate explain also a large part of it (respectively 17% and 37% at the end of the period).

Public saving rate reacts mainly negatively to a shock on private saving, and positively to one on GDP growth. The effects of the other variables are not significant. The reaction of public saving to

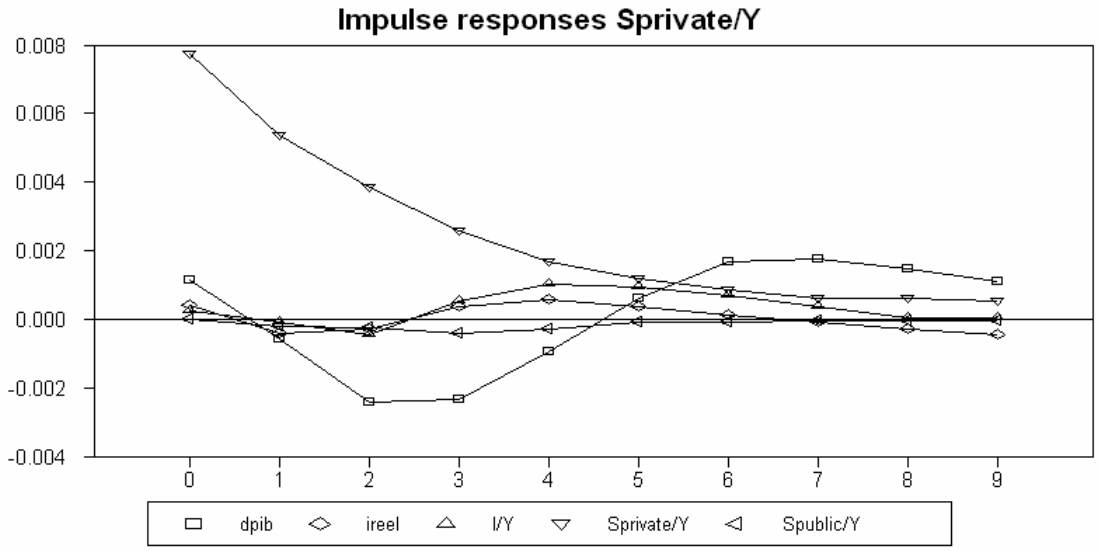
GDP growth rate changes are linked to: the action of automatic stabilisers and/or some discretionary fiscal measures of keynesian type. Effectively, a growth deceleration naturally deteriorates public finance, but it can also conduct fiscal authorities to engage some expansionary measures in addition to automatic stabilization, and inversely during an expansion period.

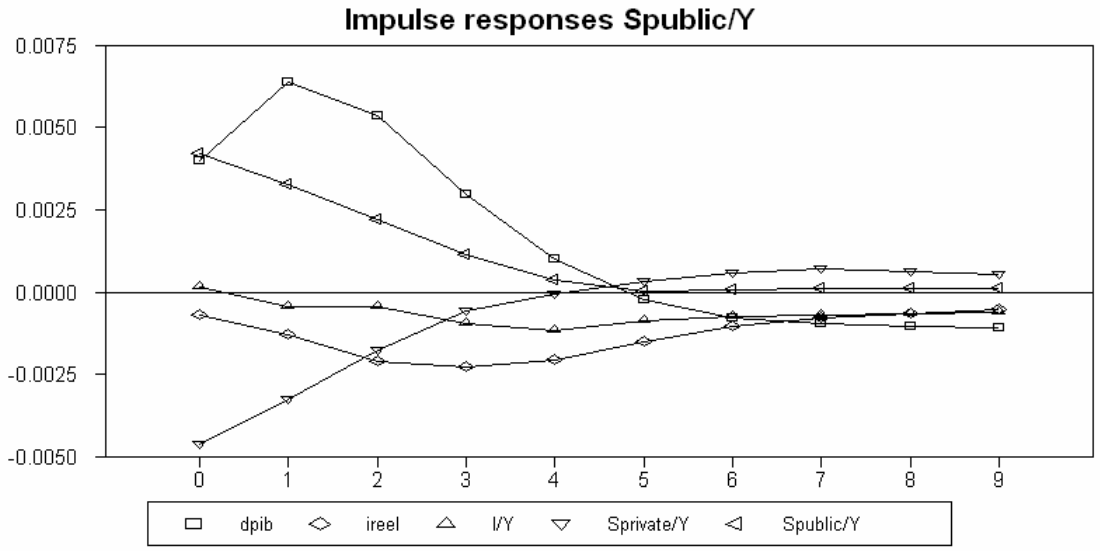
The appendix illustrates the rarely significant effects of the innovations shocks on saving and investment, in France and the USA.

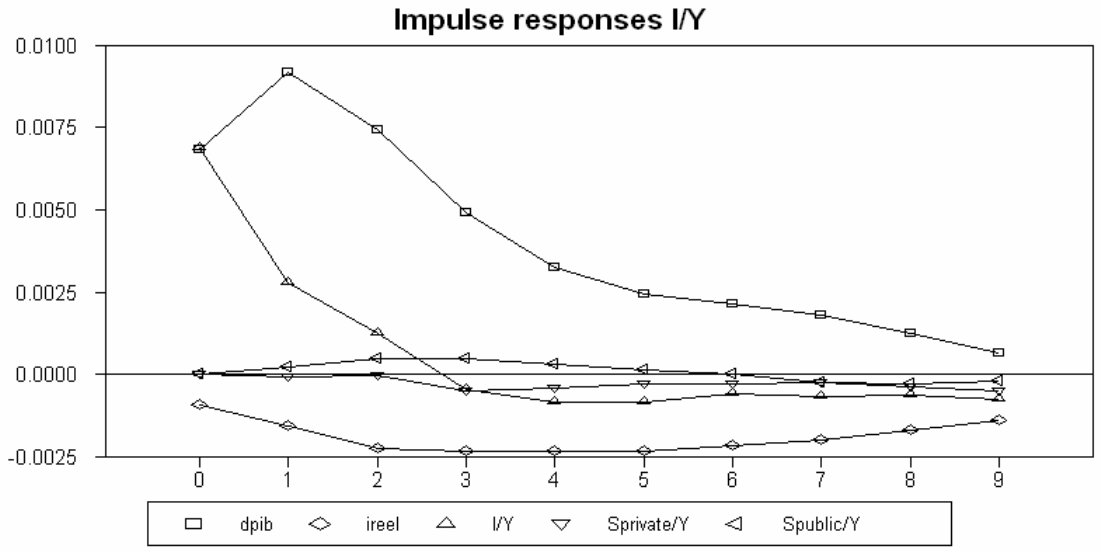
Table 7 : Variance decomposition in VAR distinguishing private and public saving rates

Variance of :	Variance of Sprivate / Y						Variance of Spublic / Y						Variance of I / Y					
Explained by :	Spr/ Y (%)*	Spu / Y (%)**	I / Y (%)	r (%)	Δlogy (%)	σ***	Spr/ Y (%)	Spu / Y (%)	I / Y (%)	r (%)	Δlogy (%)	σ	Spr/ Y (%)	Spu / Y (%)	I / Y (%)	r (%)	Δlogy (%)	σ
T = 0	71.5	0.0	7.7	7.9	12.7	0.010	27.6	27.1	10.1	10.2	24.7	0.009	0.0	0.0	47.0	5.3	47.6	0.010
1	62.0	3.0	8.3	8.8	17.7	0.012	21.5	21.1	9.9	11.4	35.8	0.013	2.7	2.0	29.2	7.6	58.3	0.015
2	56.0	4.0	8.3	8.7	22.3	0.014	18.7	19.4	8.7	14.4	38.5	0.012	5.3	3.5	22.1	10.4	58.4	0.019
3	51.7	4.7	8.3	10.0	25.0	0.016	17.6	18.5	8.7	17.0	38.0	0.014	7.2	5.1	19.3	12.0	56.1	0.021
4	48.0	5.0	9.1	12.0	25.6	0.017	17.4	17.4	9.3	18.5	37.1	0.016	8.8	5.9	18.5	13.6	53.1	0.022
5	45.3	5.2	9.6	13.3	26.2	0 .018	17.5	16.9	9.6	19.0	36.9	0.017	10.0	6.4	18.0	15.2	50.2	0.024
6	43.1	5.4	9.7	14.3	27.3	0.019	17.8	16.5	9.7	18.8	36.9	0.018	10.6	7.1	17.5	16.5	48.1	0.025
7	41.2	5.7	9.6	15.1	28.1	0 .019	18.3	16.4	9.7	18.3	37.1	0.019	10.7	7.8	17.2	17.2	46.9	0.026
8	39.8	6.0	9.6	15.7	28.6	0.020	18.7	16.2	9.6	18.0	37.2	0.020	10.9	8.4	16.8	17.5	46.2	0.026
9	38.7	6.2	9.6	16.4	28.8	0.020	19.1	16.1	9.6	17.8	37.2	0.020	11.2	8.0	16.4	17.7	45.7	0.027

*Sprivate/Y, **Spublic/Y, **** standard error


Impulse responses Sprivate/Y
0.008
0.006
0.004
0.002
0.000
-0.002
-0.004
0
1
2
3
4
5
6
7
8
9
dpib
ireel
I/Y
Sprivate/Y
Spublic/Y


Impulse responses Spublic/Y
0.0075
0.0050
0.0025
0.0000
-0.0025
-0.0050
0
1
2
3
4
5
6
7
8
9
dpib
ireel
I/Y
Sprivate/Y
Spublic/Y


Impulse responses I/Y
0.0100
0.0075
0.0050
0.0025
0.0000
-0.0025
0
1
2
3
4
5
6
7
8
9
dpib
ireel
I/Y
Sprivate/Y
Spublic/Y

Conclusion

A double question has been investigated in this study: 1) what is the degree of international capital mobility, which determines the precise nature of potential constraints on fiscal authorities? 2) Do these constraints significantly bind the government choices? In particular, are they sensitive to current balance equilibrium considerations and to long run solvency problems?

To answer these questions, the first part of our empirical analysis has been based on the famous FH approach, in order to assess the strength of the saving - investment correlation. Then, in a second step, we have completed this traditional approach by using panel and time series econometrics, so as to better catch the relationships between investment, private and public saving.

This analysis, realised for the major OECD countries, over the 1970 – 1998 period, has revealed four major conclusions:

1) Over the chosen period, which has been characterized by financial deregulation, capital is highly mobile in studied countries. However, it is not possible to conclude to a "perfect" capital mobility, since the results of cointegration tests between private saving and investment are still ambiguous.
2) A least in the short run, investment seems to be determinated essentially by an acceleration effect, which is stronger than the cost of capital effect;
3) At least in the short run, private saving seems also to react prominently to income changes;
4) No evidence of an intertemporal solvency constraint or a current account targeting has been found here. Public finance rather reflects automatic stabilisers and/or some discretionary measures.

Hence, the trends followed by fiscal policies in OECD countries don't seem favorable to a naturally consistent policy-mix. In the European case, this can justify the PSC rules, that substitute themselves to a discretionary coordination. In spite of their relative rigidity towards individual situations, which can legitimately be criticised, they appear, in the light of our results, to be quite useful to avoid fiscal policies following unsustainable paths.

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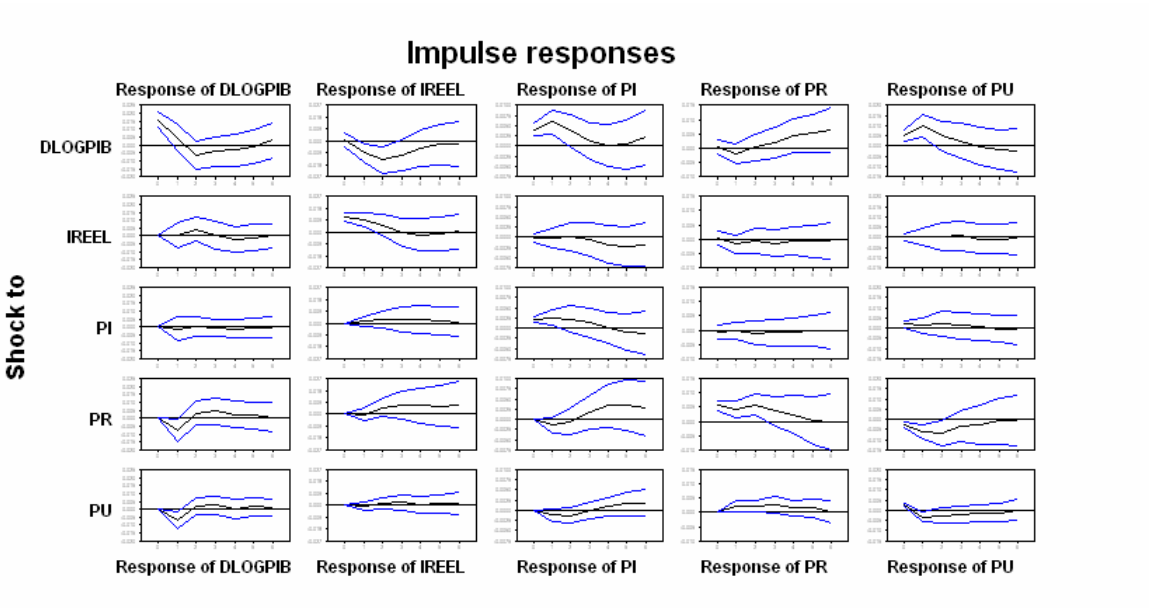
ANNEXE : USA and France Impulse responses graph

USA



France