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Investigating shifts in public debt management behaviour in France

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Abstract

The aim of this paper is to identify some shifts in the behaviour of public debt managers in France. The behaviour is described using a reaction function and the documented impact of cost and risk considerations on the share of short-term debt. Using a Markov switching approach, distinguishing normal versus crisis episodes over the period of 1998-2015, endogenous shifts in public debt behaviour are identified. The results show non-monotonicity in French public debt management behaviour. In the crisis regime, findings show larger responses to changes in interest rates and in the liquidity of the long-term bond market.

1. Introduction

The onset of the financial crisis in developed countries has resulted in a sharp deterioration of fiscal positions. For example, the public deficit in the euro area increased from 0.6% in 2007 to 6.1% in 2010, and public debt increased from 65% in 2007 to 94.2% in 2014. At the same time, countries experienced very particular monetary conditions. Interest rates increased strongly during the period of 2005-2008 and then dropped to a very low – even negative – level in the recent period. The inflation rate followed the same pattern. In this context, the management of public debt has become a key initiative for macroeconomic policies. The way macroeconomic policies are conducted has an impact on public debt management. Several studies have shown interactions between public debt management and a macroeconomic framework (Blommenstein and Turner, 2012; Das et al., 2010; Hoodguin et al., 2011; Togo, 2007).

Public debt management refers to strategies employed by a country's national authority to handle the size and structure of its public debt. Two perspectives emerge from this definition. The first is the macroeconomic perspective, which focuses on all welfare implications of debt management decisions. A substantial strand of the literature of the macroeconomic perspective uses the optimal taxation paradigm to draw normative recommendations regarding the optimal portfolio structure of government debt. Under this approach, debt levels are permitted to vary over time to allow tax smoothing, which is welfare-improving, as it minimizes the distortionary costs of taxation (Angeletos, 2002; Buera and Nicolini, 2004; Nosbusch, 2008; Faraglia et al., 2010). The second perspective of public debt management is the micro portfolio optimization perspective, which focuses on debt servicing cost. This perspective examines public debt maturity and strategies related to the use of the yield curve or specific public debt instruments, such as inflation-indexed debt or the share of debt denominated in non-domestic currencies (Wolswijk and de Haan, 2005). Hoogduin et al. (2011) showed a change in debt management objectives, which transitioned from a macroeconomic perspective to a micro portfolio optimization perspective. Indeed, most worldwide debt management offices follow the revised guidelines for public debt management that were published by the IMF and the World Bank in 2014: "Public debt management is the process of establishing and executing a strategy for managing the government's debt to raise the required amount of funding at the lowest possible cost over the medium to long run, consistent with a prudent degree of risk". Due to the particular current macroeconomic context and stress on bond markets, strategies of debt management offices have evolved.

Using descriptive statistics, international institutions have described the change in the composition of public debt in developed countries following the crisis (e.g., Rawdanowicz and Wurzel, 2011). However, few academic studies have employed econometric methods to assess changes in public debt management during the crisis (De Broeck and Guscina, 2011; Hoogduin et al., 2011). These studies employ a panel analysis; thus, they do not take country characteristics into account. The effect of the crisis is assessed only through a dummy variable. Therefore, the studies are limited in their ability to reflect changes in the national behaviour of the public debt manager.

The aim of this study is to address those abovementioned gaps by empirically identifying several shifts in the behaviour of the public debt manager in France. The contribution of this study is twofold: first, by adding variables that better reflect country characteristics, it proposes an extended specification of public debt management behaviour for France; second, it uses a Markov switching approach to endogenously identify some shifts in behaviour over the period of January 1998 – June 2015. The behaviour is described through a reaction function, and the impacts of cost and risk considerations on the ratio of short-term

debt are captured. Two regimes are considered, reflecting both normal and crisis periods. Because estimated reactions are significantly different between the two regimes, the results show non-monotonicity in French public debt management behaviour.

This paper is organized as follows: Section 2 presents an overview of the public debt in France. Section 3 describes public debt management behaviour. Section 4 describes the methodology used. Section 5 presents and discusses the results obtained, and the final section provides a conclusion.

2. Overview of the public debt in France

Like most European countries, France managed a strong increase in net issuance from bn€ 101 in 2007 to bn€ 185 in 2011. Now, although the uptrend is over, the level of net issuance remains high. In this context, one may wonder whether the credibility of France were affected. Beyond managing the issuance amount, managing the public debt focuses on public debt composition. Active public debt management is reflected by changes in interest costs. While public debt has continuously increased from the end of the nineties, the share of the debt servicing into the GDP has experienced a downtrend. This could be explained by the downtrend in interest rates (i.e., the interest rates for 3-month bills and 10-year bonds fell respectively, from 3.4% and 5.1% to 0% and 0.6% between 1998 and 2015). The other explanation of the downtrend of debt servicing cost is changes in the public debt maturity: we note a significant increase from 5.7 years in 2004 to 7.1 years in 2007 but a sharp decrease during the crisis (Figure 1).

Because the government's debt maturity is a key parameter in debt management, the ratio of short-term debt to total debt is crucial. Usually, issuing short-term debt is cheaper than issuing long-term debt. However, refinancing risk is also higher for short-term debt as frequent refinancing implies a higher risk of having to refinance debt at higher interest rates. This risk rises with economic uncertainty. According to Holler (2013), if sovereign assets carry risk, the refinancing cost is determined not only by the cyclical behaviour of interest rates but also by the change in the country's risk premiums. In France, the share of short-term debt (i.e., debt with a maturity less than a year) more than doubled from 7.5% in 2006 to 19% in 2009 and then fell to 10% in 2015.

Figure 1. Public debt information in France
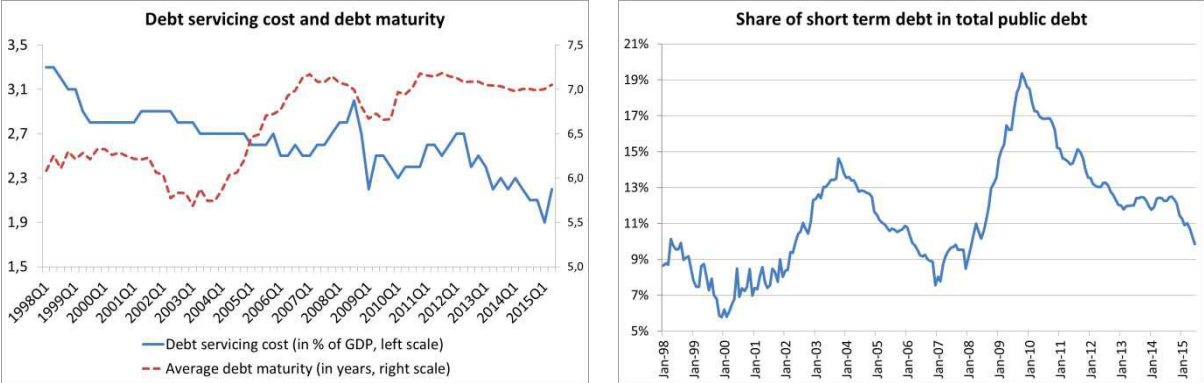
Source: Eurostat and French public debt management agency (AFT).

The composition of the French public debt is as follows:
- France is one of the few European countries that issues inflation-indexed bonds. The advantage stems from issuing the bonds at a lower interest rate because investors do not need compensation for inflationary uncertainty. When the monetary policy is credible, the main motive for inflation-indexed debt issuance is to diversify the portfolio to attract a

large investor base. Because debt servicing costs react to price fluctuations, the main disadvantage of issuing inflation-indexed debt is market risk. The share of inflation-indexed debt rose during the financial crisis and reached 14.9% in 2008.

- Debt ownership is also driven by the motivation to attract a large investor base. Foreign investors can reduce the cost of sovereign debt issuance; however, a high concentration of foreign investors implies a high sensibility to demand shocks. Public debt managers are competing for the desires of foreign investors. The foreign ownership ratio reached 67.9% in 2009.
- France has used interest rate swaps since 2002. The aim of interest rate swaps is to reduce the average debt maturity, and thereby the average cost of the debt. The advantage of swaps is that this reduction is not achieved by a change in the issuance policy. This allows the debt manager to maintain the liquidity of the bond market without increasing the duration of the portfolio or without running the risk of refinancing. The main disadvantage of interest rate swaps is counterparty risk, which means the other party of the contract may default on its obligations (Piga, 2001). With counterparty default, the debt manager may be forced to renew its debt at higher rates. In France, the amount of interest rate swaps is low (ranging from 0.4% to 8.7% of total public debt) and has sharply dropped since 2005, from bn € 61 in 2004 to bn € 7 in 2014.
- Note that the French debt includes no floating debt rate or foreign currency denominated debt.

3. Public debt management behaviour

As Hoogduin et al. (2011) described, the behaviour of a public debt manager is estimated using a debt management reaction function. Nevertheless, the chosen specification is expanded to best fit the French case. According to the IMF and World Bank guide definition, public debt management behaviour captures reactions to the proportion of short-term debt compared with the total debt, cost and risk considerations.

Cost considerations are reflected in the responses to interest rates. Two specifications are considered. The first is based on interest rates in nominal terms, as well as distinguished short- and long-term interest rates. According to the micro portfolio optimization perspective, debt management behaviour should minimize the debt serving cost. Consequently, higher short-term interest rates imply more expensive money market financing and may decrease the share of short-term debt. Similarly, higher long-term interest rates imply more expensive bond market financing and may increase the share of short-term debt. The second specification is based on real terms, including the yield curve and inflation rate. An increased difference between long- and short-term interest rates implies relatively more expansive bond market financing compared with money market financing, which subsequently may increase the share of short-term debt. The influence of the inflation rate on public debt management is mixed. On the one hand, the higher inflation rate may increase the share of short-term debt because it reflects a more uncertain environment, leading to an increase in the risk premium and thus, an increase in long-term interest rates. Moreover, a higher inflation rate, or expected inflation rate, implies additional costs related to the use of indexed bonds. On the other hand, a higher inflation rate may reduce the real pay out of public debt. Hall and Sargent (2010) estimated that inflation contributed to a 20% reduction of the U.S. debt ratio at the end of WWII. Aizenman and Marion (2011) showed that the current temptation to inflate away some U.S. debt is similar to that at the end of WWII. Nominal debt may also provide valuable insurance against the budgetary effects of economic fluctuations. Lustig et al. (2008) argue for the almost exclusive use of long-term nominal debt because such debt mitigates the distortions associated with hedging fiscal shocks by allowing the government to allocate them efficiently

across multiple states and periods. Even if the long-term nominal debt is more volatile than the short-term debt, this volatility could be used to hedge fiscal shocks. Higher risk premium on long-term debt are the analogues of insurance premium paid by the government.

Risk considerations are reflected by other variables. The first risk is related to the refinancing risk, which reflects changes in debt servicing costs due to changes in interest rates or unexpected changes in market conditions. This risk is captured using lagged values of the share of short-term debt. In the past, a high share of short-term debt implied high short-term refinancing. Debt management is also dependent on the government's record as a reliable debtor. In other words, debt management behaviour includes a reputational risk. This risk could be reflected by net issuance of public debt. In the case where the government is not considered to be a reliable debtor because of significantly higher credit risk, net issuance could lead to more difficulties in finding a viable counterparty in the long-term bond market. In the context of public debt management, bond market liquidity is a key variable. It refers to the extent to which the bond market allows assets to be bought and sold at stable prices. According to Holler (2013), the size of the debt market and the composition of the investor base are crucial elements in determining market liquidity. Trading volume of long-term debt in the secondary market is a standard measure of market liquidity. A high trading volume reflects a greater ease with exchanging bonds and thus reflects a low liquidity risk. This facilitates issuance of long-term debt. Higher trading volume may decrease the share of short-term debt. According to the abovementioned French debt presentation, because interest rate swaps and debt ownership reflect the investor base, they may influence the liquidity risk. An increase in counterparty risk leads to a decrease in interest rate swaps and may in turn increase the share of short-term debt. Similarly, a decrease in the foreign debt ownership ratio may reflect difficulties in attracting investors to the sovereign bond market, which may imply an increase in the share of short-term debt.

4. The Markov switching methodology

We use the Markov switching approach to model dependence of cost and risk considerations on the share of France's short-term debt. A Markov switching model allows the regression parameters to take different values depending on the regime that prevails at time t and is denoted by s_t. Because regime switches may occur through structural changes in the economy, two regimes are considered: one that signals a normal period and another that signals a crisis period. The transition from one regime to another is described by an unobservable first-order Markov chain. The probability of transition from regime i at time $t\text{-}1$ to regime j at time t is influenced only by the regime at time $t\text{-}1$ and is denoted p_{ij}.

Public debt management reaction functions in the Markov chain using the two specifications are as follows:

$$SD_t = \alpha_{s,1} + \sum_k \gamma_{s,k} SD_{t-k} + \beta_{s,1} SR_t + \beta_{s,2} LR_t + \delta_{s,1} NI_t + \omega_{s,1} VOL_t + \theta_{s,1} SWAP_t + \rho_{s,1} FO_t + \varepsilon_{s,t} \tag{1}$$

$$SD_t = \alpha_{s,2} + \sum_k \chi_{s,k} SD_{t-k} + \beta_{s,3} YIELD_t + \pi_s INF_t + \delta_{s,2} NI_t + \omega_{s,2} VOL_t + \theta_{s,2} SWAP_t + \rho_{s,2} FO_t + \mu_{s,t} \tag{2}$$

where SD_t is the share of short-term debt to the total public debt at time t, SR and LR are short- and long-term nominal interest rates, NI is the amount of net issuance of public debt, VOL is the trading volume of long-term debt, $SWAP$ is the amount of contracts of interest rate swaps, FO is the foreign ownership ratio, $YIELD$ is the yield curve, INF is the inflation rate, and ε and μ are error terms.

The set of optimal parameters can be obtained by maximizing the likelihood function under the restriction that the sum of the probabilities is equal to one and standard deviations are greater than zero. Because interest rate may be influenced by the maturity structure, the

behaviour may suffer from an endogeneity problem. This problem may be addressed by taking instrumental variables among the regressors. Since interest rates are persistent, we approximate the interest rates by a linear combination of their exogenous lags.

5. Data and estimation results

A database about public debt management in France is constructed. Relevant information was extracted from monthly reports on the French public debt agency (AFT), including details on variables of interest. In particular, the database contains the following data elements: the stock of short-term debt corresponding to the debt of original maturity of less than a year, stock of long-term debt corresponding to the debt of original maturity for more than a year, nominal interest rates for three-month Treasury bills corresponding to the short-term interest rate[1], nominal interest rates for ten-year bonds corresponding to the long-term interest rate, amount of net issuance of public debt, average daily trading volume of long-term debt in the secondary market, amount of the contracts for interest rate swaps since 2002, foreign ownership ratio, yield curve obtained by the difference between the 10-year rate and the 3-month rate, and the inflation rate obtained by the change in the monthly harmonised consumer price index. The database covers the period from January 1998 to June 2015 (210 observations). The seasonality of the series is adjusted using the X-12 ARIMA model.

Table 1 provides estimated results for the first specification, i.e., based on nominal short- and long-term interest rates, with Markov switching coefficients. The first column presents parameter values that prevail in the normal regime (regime 1), and the second presents parameter values that prevail in the crisis regime (regime 2).

Table 1. Markov switching regression results; Model 1 (Dependent variable: share of short-term debt, January 1998-June 2015).

	Regime 1	Regime 2
Constant	2.518***	5.505**
	(0.908)	(2.231)
Share of short-term debt (-3)	1.130***	1.055***
	(0.082)	(0.181)
Share of short-term debt (-6)	-0.271***	-0.421***
	(0.085)	(0.153)
Short-term interest rate	-0.159*	-0.551**
	(0.080)	(0.221)
Long-term interest rate	0.239**	1.478***
	(0.113)	(0.259)
Net issuance	0.494	3.009**
	(0.834)	(1.489)
Trading volume of bonds	-0.202	-1.064**
	(0.355)	(0.530)
Interest rate swaps	-0.021*	-0.047**
	(0.012)	(0.022)
Foreign ownership ratio	-0.012*	-0.049***
	(0.006)	(0.016)
Log likelihood	-134.116	

Notes: standard errors in parentheses; * significant at the 10 percent level, ** significant at the 5 percent level, *** significant at the 1 percent level.

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[1] The three-month T-bill is used to measure the short-term interest rate because the average maturity of short-term debt is approximately 90 days during the concerned period.

Because the intercept in the crisis regime is two times greater than in the normal regime, the crisis regime is characterized by a high share of short-term debt. Coefficients of autoregressive terms of the share of short-term debt are significantly high in both regimes, reflecting a strong inertia. This inertia could lead to a refinancing risk in the case of a sudden rise in the short-term interest rate. Nevertheless, this risk is less important in the crisis regime since the inertia is less strong. As expected, an increase in the short-term interest rate reduces the share of the short-term debt, whereas an increase in the long-term interest rate increases it. These effects are significantly higher in the crisis regime, in particular for the long-term interest rate. Notably, an increase of 1% in the short-term interest rate reduces the share of the short-term debt 0.551% in the crisis regime compared to 0.159% in the normal regime. Likewise, an increase of 1% in the long-term interest rate increases the share of the short-term debt 1.478% in the crisis regime compared to 0.239% in the normal regime. The results show that in crisis periods, the debt manager prefers to minimize debt servicing costs rather than lengthen the debt maturity.

Cost considerations are not the single factors which drive behaviour of the debt manager in France, especially in the crisis regime. Another determinant is related to the demand of public debt from financial markets through the ability to attract a large investor base. This capability is captured by two variables: foreign ownership ratio and interest rate swaps. These variables have a negative effect (at a 10% significance level) on the share of short-term debt in normal times. Because foreign investors can reduce the cost of public issuance, public debt managers are in competition to attract these investors, especially for long-term maturities. A decrease in the foreign ownership ratio could reflect a long-term public debt that is less attractive, leading to an increase of the share of short-term debt. Given that interest rate swaps are an alternative strategy of short-term debt issuance, an increase in the use of interest rate swaps may decrease the share of short-term debt. These negative effects of foreign ownership ratio and interest rate swaps on the share of short-term debt rise in the crisis regime (-0.049 compared with -0.012 for foreign ownership ratio, and -0.047 compared with -0.021 for interest rate swaps), reflecting a higher substitution effect. Swaps carry counterparty risk, which means that the other part of the contract may default on its obligations. The counterparty risk is higher during recessions and when the difference between long-term interest rates and swap rates becomes tiny. The results show that short-term debt is used often when a debt manager has difficulty attracting a large investor base.

Finally, the behaviour of the French public debt manager is strongly influenced by risk considerations in the crisis regime. The reputational risk is captured by effect of the net issuance and the liquidity risk is captured by the average daily trading volume of long-term debt in the secondary market. These variables have no significant effect on the share of the short-term debt in normal times, indicating that French debt has no reputational or liquidity issues. Note, however, that the French debt manager does not use this reliable picture to lengthen the debt maturity. In contrast, these variables have significant effect on the share of the short-term debt in the crisis regime. An increase of 1% in net issuance leads to an increase of 3% in the share of short-term debt, thereby reflecting a clear reputational risk. Because the credit risk related to long-term bonds is considered high, it is more difficult to find a feasible counterparty on the bond market for all the new issuances. This in turn implies that net issuance may increase the share of short-term debt. An increase of 1% in the average trading volume of bonds on the secondary market leads to a decrease of 1.064% in the share of short-term debt. This result reflects a liquidity issue because it reflects difficulties in exchanging bonds at stable prices. The results show that the relative weights on risk considerations are very high in the crisis regime since coefficients are more than one, reflecting more than proportional effects, whereas the relative weights in normal times are low since coefficients are not significant.

Table 2 provides the results for the second specification, based on the yield curve and the inflation rate. The results are consistent with the first specification based on the nominal terms. The crisis regime is characterized by a high share of short-term debt compared with the normal regime (intercept value of 8.152 compared with 4.663). There is an inertia effect in both regimes. The share of the short-term debt strongly reacts to the yield curve in the crisis regime. Accordingly, an increase of 1% in the yield curve leads to an increase of 0.819% in the share of short-term debt in the crisis regime compared with 0.206% in normal times. The debt manager has difficulty attracting a large investor base in the crisis regime since interest rate swaps and foreign ownership ratios have larger negative effects. Net issuance and trading volume of bonds have no significant effect in normal times but have significant and more than proportional effects in the crisis regime. The interesting point of this specification concerns the impact on the inflation rate. The inflation rate has no significant impact on the share of short-term debt in the normal regime. Investors do not request compensation for uncertainty or they consider they are able to hedge fiscal shocks. In this case, issuance of inflation indexed bonds is relevant and may reduce the real pay out. On the opposite, the inflation rate has a significant positive impact (+0.274) in the crisis regime. This finding reflects the rise of uncertainty and difficulties in attracting a large investor base, and then shows constraints in indexed debt issuance.

Table 2. Markov switching regression results, Model 2 (Dependent variable: share of short-term debt, January 1998-June 2015)

	Regime 1	Regime 2
Constant	4.663***	8.152***
	(0.998)	(2.127)
Share of short-term debt (-3)	1.055***	0.955***
	(0.845)	(0.120)
Share of short-term debt (-6)	-0.180**	-0.030
	(0.087)	(0.136)
Yield curve	0.206**	0.819***
	(0.101)	(0.154)
Inflation rate	0.002	0.274**
	(0.103)	(0.107)
Net issuance	0.278	1.794*
	(0.673)	(1.065)
Trading volume of bonds	-0.549	-1.901**
	(0.369)	(0.878)
Interest rate swaps	-0.040***	-0.076***
	(0.013)	(0.024)
Foreign ownership ratio	-0.016**	-0.086***
	(0.006)	(0.013)
Log likelihood	-130.386	

Notes: standard errors in parentheses; * significant at the 10 percent level, ** significant at the 5 percent level, *** significant at the 1 percent level.

Figure 2 represents the two specifications together, providing the smoothed probabilities of being in the crisis regime, along with each specification's share of the short-term debt. Two main periods of crisis exist: 1) June 2002 to March 2003 and 2) April 2007 to January 2010. It also should be pointed out that results show a small period of crisis between June 2011 and November 2011 with a probability of 68%. There are very few differences between the two specifications that could be explained by the influence of the inflation rate. It is worth mentioning that the Markov switching model distinguishes regimes that are highly persistent.

Figure 2. Smoothed probabilities
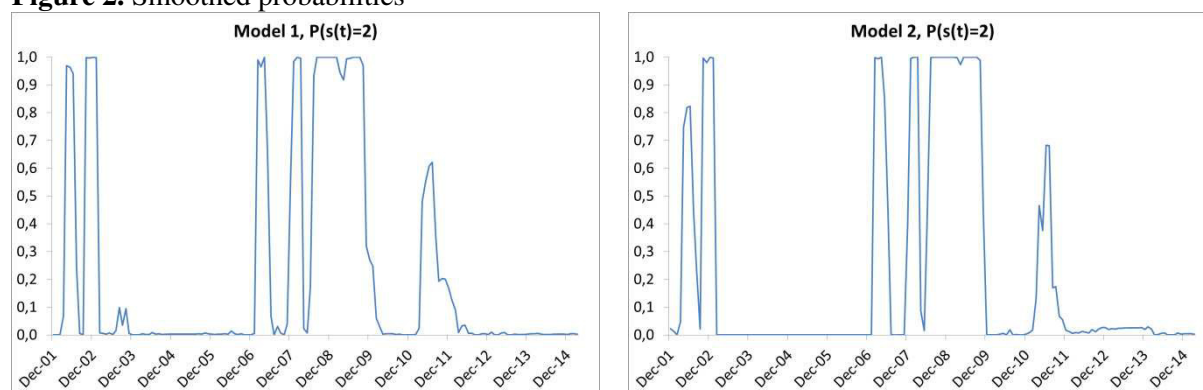
Note: smoothed probabilities of being in the crisis regime in the first specification (left subplot), and smoothed probabilities of being in the crisis regime in the second specification (right subplot).

Table 3 presents transition probabilities and expected durations for each regime in each specification. The probability of remaining in the normal regime is higher than 92%, and the probability of remaining in the crisis regime is higher than 79%. The persistence of the regime is also based on expected durations. The normal regime is persistent, with an expected duration of approximately 17 months, while the expected duration of the crisis regime is approximately 6 months.

Table 3. Regime transition results

	Model 1	Model 2
Transition probabilities		
P11	0.925	0.932
P22	0.794	0.827
Expected durations		
Regime 1	16.571	17.000
Regime 2	6.166	5.833

The crisis regimes can be characterized as follows: periods of sharp decline in short-term rates leading to an increase in yield curve, an increase in net issuance, and a sharp rise in foreign ownership ratio. In particular, the two main periods of crises (June 2002 - March 2003 and April 2007 - January 2010) correspond to cyclical reversals. Faced with this unexpected growth decline, the government implemented counter-cyclical fiscal policies, which led to a significant upward revision of financing requirements. At the same time, the public debt manager took advantage of the fall in short interest rates to reduce the average debt maturity (-0.3 year for the first period and -0.4 year for the second one).

The results of the study may have policy implications, both for monetary policy and for fiscal policy. A change in the yield curve that is induced by a central bank action may lead the debt manager to modify its issuance policy to take advantage of these new financing conditions. In this case, public debt management becomes endogenous to monetary developments (Blommestein and Turner, 2012). The macroeconomic consequences of limited changes in debt composition are small in normal times, but they can be significant in crisis periods. Therefore, to assure efficiency of the central bank action in public debt management, non-linearities may be taken into account in monetary policy decision-making. From this point of view, Goodhart (2010) argues that the central bank should be encouraged to revert to its role of managing the national debt. Without going so far, our findings raise the issue of the institutional framework. An explicit coordination between monetary policy (including a financial stability dimension) and public debt management is needed.

A better understanding of public debt management behaviour also helps to anticipate changes in the debt servicing cost, which is a major public expenditure in France (approximately 2% of the GDP). Policy makers can enable more robust fiscal forecasts when they take shift behaviour of the debt manager into consideration. More accurate fiscal forecasts lead to a rise in the fiscal authority's credibility, possibly leading to the country's reduced risk premium. Non-monotonicity in public debt management also has some implications in a tax smoothing approach. Empirical results of the study confirm theoretical results of Angeletos (2002) and Buera and Nicolini (2004), who showed that the government can stabilize the excess burden of taxation and therefore minimize the distortionary costs of taxation by exploiting variations in the yield curve across different maturities of risk-free securities.

6. Conclusion

The aim of this paper was to empirically identify some shifts in the behaviour of the public debt manager in France. The behaviour was described using a reaction function and the documented impact of cost and risk considerations on the share of short-term debt. Using a new monthly database from January 1998 and June 2015, as well as a Markov switching approach to distinguish normal and crisis periods, endogenous shifts in public debt behaviour were identified. Because estimated reactions were significantly different between the two regimes, the results showed shifts in French public debt management behaviour. Findings showed larger responses to the changes in interest rates and the liquidity of the long-term bond market in the crisis regime. This study also highlighted that short-term debt is employed as a backup plan when there are problems within the French bond market. The results have implications for monetary policy and fiscal policy. The findings presented here could be extended to different international settings to gain new intercultural insights.

References

Aizenman , J., Marion, N. (2011) "Using inflation to erode the U.S. public debt" *Journal of Macroeconomics* **33**, 524-541.

Angeletos, G. (2002) "Fiscal Policy with Non-contingent debt and the Optimal Maturity Structure" *Quarterly Journal of Economics* **117**, 1105-1131.

Blommenstein, H.J., and Turner, P. (2012) "Interactions between sovereign debt management and monetary policy under fiscal dominance and financial instability" OECD Working Papers on Sovereign Borrowing and Public Debt Management, No.3.

Buera, F., and Nicolini, J. (2004) "Optimal maturity of government debt without state contingent bonds" *Journal of Monetary Economics* **51**, 531-554.

Das, U.S., Papapioannou, M., Pedras, G., Ahmed, F., Surti, J. (2010) "Managing Public Debt and its Financial Stability Implications" in: Primo Braga, C. and Vincelette, G. (Eds.), *Sovereign Debt and the Financial Crisis*, World Bank Publishing, 357-381.

De Broeck, M., and Guscina, A. (2011) "Government debt Issuance in the Euro Area: The Impact of the Financial Crisis" IMF Working Paper, No 11/21.

Faraglia, E., Marcet, A., Scott, A. (2010) "In Search of a Theory of Debt Management" *Journal of Monetary Economics* **57**, 821-836.

Goodhart, C.A.E. (2010) "The Changing role of Central Banks" *Financial History Review* **18**, 135-154.

Holler, J. (2013) "Funding Strategies of Sovereign Debt Management: A Risk Focus" *Monetary Policy & The Economy* **Q2**, 51-74.

Hall, G.J., Sargent, T.J. (2010) "Interest rate risk and other determinants of post WWII U.S. government debt/GDP dynamics" *American Journal of Economics: Macroeconomics* **3**, 192-214.

Hoodguin, L., Ozturk, B., Wierts, P. (2011) "Public Debt Managers' Behaviour Interactions with Macro Policies", *Revue Economique* **62**, 1105-1122.

Lustig, H., Sleet, C., Yeltekin, S. (2008) "Fiscal Hedging with Nominal Assets" *Journal of Monetary Economics* **55**, 710-727.

Nosbusch, Y. (2008) "Interest Costs and the Optimal Maturity Structure of Debt" *Economic Journal* **118**, 477-498.

Piga, G. (2001) *Derivatives and Public Debt Management*, ISMA, Zurich.

Rawdanowicz, L., Wurzel, E., Ollivaud, P. (2011) "Current Issues in Managing Government Debt and Assets" OECD Working Papers, No. 923.

Togo, E. (2007) "Coordinating Public Debt Management with Fiscal and Monetary Policies: An Analytical Framework" World Bank Policy Research Working Paper, No.4369.

Wolswijk, G., and de Haan, J. (2005) "Government Debt Management in the Euro Area: Recent Theoretical Developments and Changes in Practices" ECB Working Paper, No.25.