An empirical analysis on fiscal sustainability in France: implications and prospects

Alyssa Irakoze

Department of Economics
University of Oslo
May 2013

Preface

First and foremost I would like to thank my supervisor Ragnar Nymoen for his vital guidance, technical suggestions and thought provoking discussions. I am grateful of him showing interest in the topic of this study, making the writing process an unquestionably learning experience.

I would like to thank my father and my mother for instilling in me hard work, dedication and tenacity. I would also like to thank them for shielding our family from the horrors and chaos of war, making our everyday life as normal as possible, allowing us to pursue education and follow our dreams.

More notably I would like to thank my fiancé Thierry for his requisite moral support and words of encouragement. I sure heard you when you said "As long as you do your best then there is nothing to worry about".

Last but not least I want to thank my friends Larissa, Valéry and Patrick for making my hectic days lighter and joyful.

Oslo, May 2013

Alyssa Irakoze

Table of Contents

Figures

Appendix

Abstract

For more than 30 years France has been facing high fiscal imbalances and rapidly growing debt ratios and the recent global financial crisis worsened French public finances. In the long term public debt levels are expected to increase mostly due to large future costs related to social security transfers; among others are the age related government outlays that are expected to grow. In this paper, we investigate the sustainability of the existing fiscal policy. We also examine what current fiscal policy implies for the debt to GDP ratios in the next 14 years. We make projections for future fiscal consolidation by simulating different scenarios involving reforms to the social security funds as well as financial and economic indicators, such as the long term interest rate on government bonds and the GDP growth rate. Our sustainability test show that the current fiscal policy ran by French authorities is not viable. Our projections of the primary surplus ratios and public debt to GDP ratios lead us to conclude that the path pursued by the French government is unsustainable. More specifically, we establish that the path of future debt to GDP ratios will show explosive characteristics unless the GDP growth rate surpasses the long term interest rate. In an attempt to stabilize for the explosive debt ratios we impose a value of 0.03 on the estimated response coefficient of the primary surplus towards foregoing debt to GDP ratio. This is evidence that radical measures are imperative to stabilize and hinder the rapid growth of the French public debt.

1. INTRODUCTION

Economic developments in the past decades have been characterized by large shifts in the distribution of debt and wealth. One of the most dramatic features of recent developments is the emergence of accumulated budgetary deficits and government overspending trends after the early 1970`s in almost all the major industrial economies, especially western Europe.

Most recently, the subject became more relevant because Eurozone governments are facing escalating fiscal pressures due to the recent financial and economic crisis that led to elevated public debt to GDP ratios. In the late 2000, the world economy fell into a major financial crisis. The rise of public debt appeared at first to be a normal cyclical reaction to the recession, but as the slowdown of economic growth continued, the increase in debt became amplified. In 2010 the European Union was officially hit by a "Debt Crisis". The crisis was brought to light by the Greek Debt Crisis. The Greek government was severely in debt by 2010 (148.3% of GDP) and its budget deficit had slightly exceeded 10% of GDP. The crisis was exacerbated by the lack of transparency shown by the country`s government in the presentation of its debt and deficit reports.

It soon became clear that several other European countries were faced with significant public debt ratios, which was related to structural problems due to their inability to raise taxes and control spending. Among the underlying causes of the debt crisis was a housing boom in countries like Spain that had led private agents to contract significant amounts of risky private debt. Speculative behavior by banks with regards to loans was also part of the problem. Consequently, many European countries experienced a macroeconomic job and income crisis which led to expectations of a long period of weak and negative growth projections. The combination of these events maintained and developed the crisis of government debt.

In an attempt to stabilize the financial system and stimulate economic activity, government spending increased. Tax revenues had started to fall during this process, and led to what seemed to be a self-enforcing debt spiral. The falling confidence of investors signalized skepticism to lending more capital in order to restore the growth needed by the struggling countries.

At the time of writing, many of the European countries exhibit high government debt and low economic growth. France, the fifth largest economy in the world and second most prominent within the European Union, exhibits an extended need for funding due to large structural fiscal deficits. Since the start of the global crisis, French public finances deteriorated significantly. The deterioration of French public finances over the past decade reflects the costs associated with the global recession as well as rising social security spending, including pension and health care. According to the National Institute for Statistics and Economic Studies (INSEE), France has a government debt which is estimated to 1688.9 billion Euros, equivalent to 85.8 percent of GDP. The French debt is considerably above the 60% ceiling set by the Maastricht criteria which may constitute a risk for the medium and long term. This has caused general expenditure overruns that have weakened the country`s fiscal position.

In the past three decades the French government debt mainly served to support continuous current public expenditures instead of being structurally reserved to finance investments that will increase the collective heritage of the French nation. Similarly, it was already emphasized in the 2005 Pébereau Report on Public Debt[1] that: *"the public deficit and the corresponding debt were not used to finance new assets but created other expenses"*.

In January 2012, along with other countries such as Portugal and Italy, Standard & Poor stripped France of its excellent credit rating, downgrading it from AAA to AA+. A situation that undoubtedly will set off immediate and serious consequences for France`s ability to borrow funding in the near future.

In this paper, we investigating whether public debt is sustainable given the country`s existing fiscal policy and public finance structure. We also examine what the current fiscal policy implies for the debt to GDP ratios in the next decade. Based on the fact that France faces large and rising costs related to an ageing population, we attempt to make projections for future fiscal consolidation, simulating different scenarios involving socio-economic reforms as well as financial and economic indicators, such as the long term interest rate on government bonds and the GDP growth rate.

[1] The "Pébereau Report on Public Debt" was a study made in 2005 regarding the evolution of the French Public Debt. Source: http://www.minefi.gouv.fr/notes_bleues/nbb/nbb301/pebereau.pdf

2 The impact of Government Debt

Government debt policy is an important part of fiscal policy and aggregate demand management in any economy. In this section, we explain the effects of government borrowing on the performance of the economy in an intergenerational framework based on two qualitative theories explained in Elmendorf and Mankiw (1998): a conventional theory and the Ricardian Equivalence.

The conventional theory is dubbed "conventional" because it is a view held by most economist and policymakers. According to this theory, the issuance of government debt stimulates aggregate demand and economic growth in the short run but crowds out capital and reduces national income in the long run. More specifically, the short term effects of debt accumulation include an increase in the current disposable income of households and firms and a raise in spending on consumption goods, thus increasing the aggregate demand for goods and services. Based on the Keynesian view, this view argues that shifts in the aggregate demand increases national income, through utilization of factors of production in the economy.

Theoretical evidence on the impact of public debt on economic growth in the long run point out a negative correlation between debt to GDP and economic growth in the long run. The main observation is that public debt tends to increase disposable income for the current generation while reducing that of the future generations. Modigliani (1961) argued that government debt contracted today to finance budget deficits has a negative impact on the next generation. It lowers private capital stocks which in turn produce low available income flow in the long run. Similarly, Diamond (1965) concludes that public debt accumulation reduces the available lifetime consumption, savings and capital stock of taxpayers. This occurs because state borrowing is equivalent to the present value of a future stream of additional annual taxes required to service the debt until it paid off.

Regarding this issue of negative intergenerational effects, there are theories that argue that public debt is acceptable if it facilitates the expansion of production capacity and if the return on the financed public financial intervention outweighs the cost of the debt. In other words, the only way to offset such a negative impact is that debt financed government expenditure

contributes to generating real income for future generations through productive public capital formation investments.

Numerous theoretical contributions have focused on the adverse impact of public debt on the economy and the channels through which such impacts arise. The first channel corresponds to the negative impact high public debt has on private savings and on government savings which leads to a reduction in the volume of net national savings. This situation tends to lead to an increase in the interest rate on the financial market.

The growth in interest rate halts investment and capital stock growth. The slow pace of capital accumulation often translates in reduced research and development innovation investments which in turn manifests in slow economic growth and lower labor productivity. It should be noted that the scale to which an increase in interest rate affects the economy depends on the size of the economy it affects. For instance, an upward pressure in the interest rate market in the Eurozone as a union will be significant.

This brings us to the second channel which captures the effect of high long term interest rates on public debt which is high interest charges. A highly indebt government will pay high interest payments receipts, taking the place for productive public investments in education, health and infrastructure or are offset by higher future taxes.

Finally, the third channel describes a situation where public debt growth can possibly reach heights that lead to development of sovereign risk, and drive up the risk premiums. Higher risk premiums will cause financing cost to increase and threaten the solvency of public finances. Moreover, this may lead the financial market to set higher interest rates on household and firm loans.

In a situation where significant public debt is combined with worsened budgetary conditions, the negative effect of a high debt level on the interest rate will amplify. In this context, attention must be drawn to the fact that contagion effects from financial markets will depend of the initial budgetary, structural and institutional conditions in the economy. Hence, factors such as low private savings, weak external capital inflow, fragile banking institutions, weak trade competiveness, inadequate institutions, high unemployment level will play an essential role in determining the type and the scale of the impact of public debt on interest rate.

The other view regarding the consequences of government debt in the academic debate is the Ricardian Equivalence approach. The Ricardian approach argues that a government`s decision to issue government debt in order to reduce the budget deficit by tax cut will result in an increase in private savings. The idea is that if households are forward looking economic agents, they know a tax cut today is equivalent to a tax increase tomorrow, therefore in order to meet tomorrow`s tax liability, private savings will increase in the same proportion as budget deficit (public savings) will increase. According to this approach, issuing debt to finance government expenditure using a tax relief policy is irrelevant.

Empirical evidence on the relationship between public debt and economic performance is scares. Ferreira (2009) analyzed the relationship between economic growth and public debt using a vector auto regression model and Granger causality test and confirmed the existence of a relationship between economic growth per capita and the ratio of public debt to GDP in OECD member countries over the period 1988–2001. Schclarek (2004) empirically investigated the relationship between economic growth and debt for a number of developing and developed countries and found out that high growth levels are related to lower levels of total external debt. In the case of industrialized countries, he does not found any significant link between economic growth and government debt.

Empirical literature on the optimal debt level is fairly limited due to methodological issues related to quantifying the return on public intervention financed by the debt. Earlier studies on the subject, including Aiyagari and McGrattan (1994), show that the optimal quantity of government debt is approximately -2.5 percent times the GDP for the US economy. In recent years, Reinhart and Rogoff (2010) [2]analyzed the relationship between central government debt and the long term growth rate. The results showed that for debt to GDP ratios below 90 percent of GDP, the correlation is weak and for ratios above 90 percent, the average growth rate falls by more than 1 percent.

Socio-political literature associates the connection between deficits and debt stocks to the lack of fiscal discipline. The lack of fiscal discipline is attributed to "deficit bias"[3] which states that democratic decision making encourages deviation from the fiscal policy optimum. Politicians tend to play on the fact that citizens don't always focus on the long term

[2] In April 2013 their work was challenged by three other economist researchers. They argue Rogoff and Reinhart made basic errors that undermine their results.
[3] Source: http://www.unc.edu/depts/europe/euroeconomics/Deficit%20Bias.php

repercussions of short term high spending and low tax legislation bills. Adam and Bevan (2004) examined the relationship between fiscal deficits and growth for a panel of 45 developing countries and found evidence of interaction effects between debt stocks and deficits, with high debt stocks aggravating the adverse consequences of high deficits.

3 Historical development of French Public Finance

Throughout the years, the French government always relied on debt to finance its high expenditures, whether it needed to fund wars during the Napoleon Era, Revolutions, industrialization or the world wars.

In the last three decades, French public finance has showed alarming patterns. Attempts to post war infrastructural reconstructions and reactions to turbulent international monetary policies were the backdrop of the French economic policy. Throughout the years, various governmental assistance programs were established, subsequently increasing the role of the government. Many of these programs are the reasons why public spending grew immensely, to some extent exceeding public revenues. To finance these expenditures, changes in tax structure were implemented. And whenever tax revenues were not enough to fund higher public expenses the government resorted to debt financing.

In present times, the economic crisis France is experiencing is indeed a global crisis and it affects its public finances more strongly due to the fact that they were already weakened. France registers three decades of unstable fiscal balance and public debt rising at a rate significantly higher than other countries in European Union.

This section presents public debt variations for the period 1978-2011 and the contributions of the different economic elements that explain this growth. In this analysis, public debt is defined according to the Maastricht Treaty. It is the debt level of the entire general government: the State, other government bodies, local governments and social security funds. The debt is consolidated meaning it excludes the elements of a government's debt held by another government. Moreover it is evaluated in nominal value, that is, at the repayment value of the principal.

During the period between the 1960`s and the early 1970`s, France experienced the strongest economic expansion in its history and one of the highest in the industrial world. The French economist, Jean Fourastie, gave this era the name "Thirty Glorious Years". In the agricultural sector for example, farms had expanded and modernized hence yields and productivity were

increased considerably. In the industrial sector, French companies had internationalized and modernized to cope with increased competition due to trade liberalization in Europe which eliminated tariffs in the Eurozone and in the world.

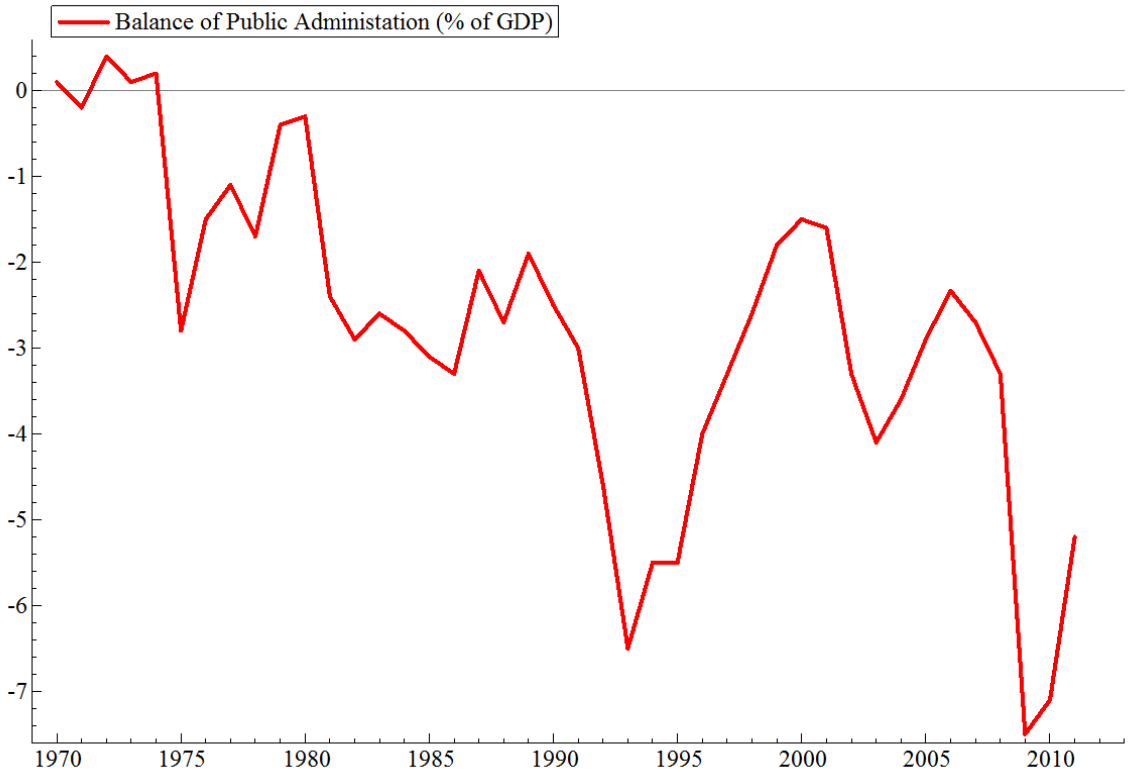
The French economy was prosperous due to a combination of high productivity, high wages and consumption, as well as a developed system of social benefits. Still running on deficits and having to resort to borrowing funds to meet its yearly budgeting, in 1973, the Minister of Economy at the time, in the attempt to create a real bond market in the short, medium and long term, passed a law that banned the Bank of France from lending the French Treasury without interest. From that time forward the government had to resort to private borrowing at rates higher than those offered by the Bank of France. Many critics name this law the main cause of the continually growing government debt as it is considered to have handed over the sovereign right of money creation of the state to the private banking system.

That same year, an oil crisis erupted due to an embargo proclaimed by the Organization of Arab Petroleum Exporting Countries (OAPEC)[4] on petroleum supply. A global economic crisis started and the economy showed signs of slow economic growth; growth decayed from 6.6% to -1.1% in 1975 due to the weakening in production investment, sharp oil prices and a decline in opportunities for self-financing business owing to high production costs. The unemployment levels rose from 394 000 to 840 000 in the period from 1973 to 1975 alone[5]. Inflation was linked to the rising in prices of imported energy and the indexing of the wage on prices. Rising unemployment was linked to slow economic growth, but also the modernization of factories; companies reducing their cost by automating their manufacturing processes and activities by relocating high cost of labor.

The year 1975 marked the first year of substantial fiscal deficit (that is -2.8%); it was related to the stimuli package to counter the recessionary effects of the first oil shock two years earlier. Since then, French public finance went through multiple recovery phases (1976-1980; 1994-2000; 2004-2006) that were repeatedly followed by relapses.

[4] In October of 1973, members of the OPEAC consisting of members of the Organization of the Petroleum Exporting Countries(OPEC) plus Egypt, Tunisia and Syria proclaimed an oil embargo
[5] Source: International Historical Statistics; Europe 1750-2000, Fifth Edition, B.R Mitchell, p 166.

Figure 1 Government Fiscal Balance (% of GDP) including interest payments



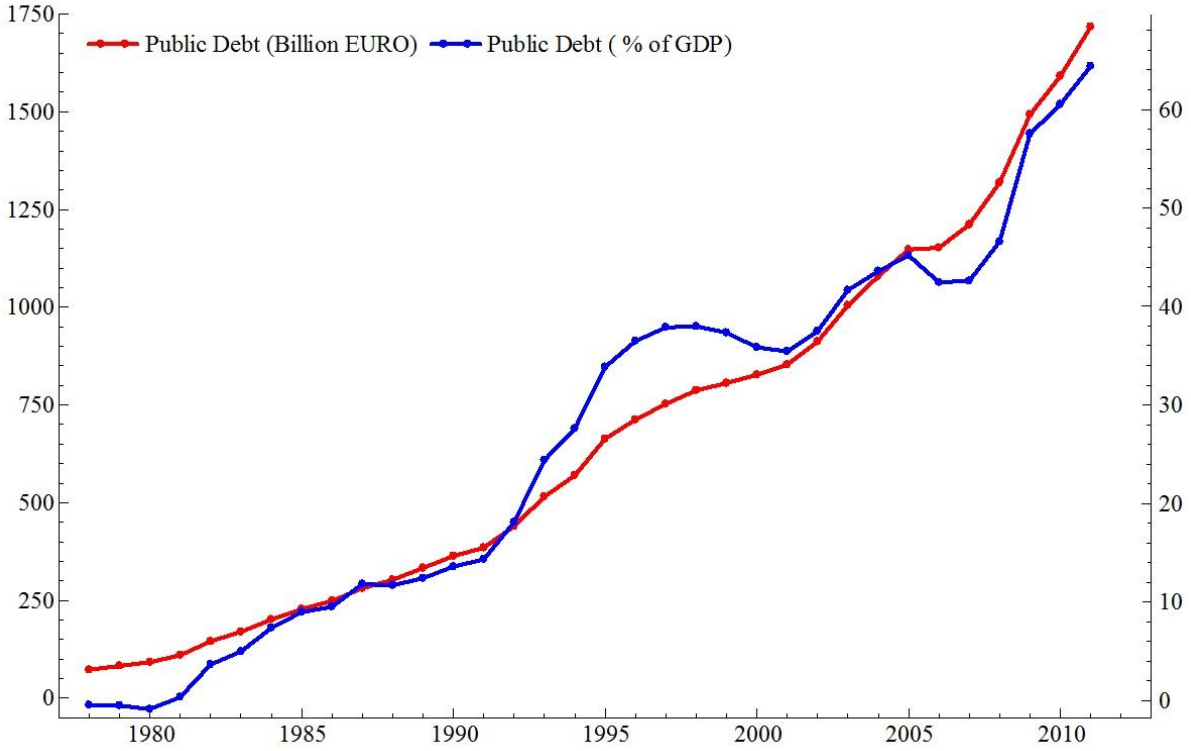
Source: Data Annex 1

As a result of these recurring deficits, public debt increased almost continuously. Between 1978 and 1986, the debt ratio of French general public administration increased by 3.7 percent per year on average. Over this period, high debt growth was consistent with strong public spending; it nearly doubled throughout that period (from 153.8 billion Euros to 410.7 billion Euros). The government was undertaking reforms programs regarding retirement schemes and nationalization resulting in a strong public spending growth. For instance in 1982, a number of private banks and firms were nationalized which led to a public debt increase larger than the public deficit[6].

[6] The 13th of February 1982, a nationalization law was passed by Francois Mitterrand. The companies concerned were compensated to the heights of 39 billion French Francs. The law covered a large part of the banking sector (for example the National Bank of Paris, Crédit Lyonnais, Société Général etc.) and strategic electronic and communication industries (Thomsom now Technicolor, Saint- Gobain, etc.)

The rise in public debt decelerated from 1987 to 1991. During this period, government debt only increased by 0.65 percent point of the GDP on average each year. This debt relief was

Figure 2 French Public Debt (in billion Euro and % of GDP)



Source: Data Annex 2

justified by strong economic growth between 1988 and 1989 (growth rate went from 2.4 % in 1987 to an average of 4 % those two consecutive years) initiating slower public spending growth compared to previous years.

Between 1992 and 1996, the economic climate was of slowing growth and recession. In 1993, France, like other European countries entered a recession. The causes of the recession were

two folded: The German reunification[7] and disequilibrium within the European Monetary System (EMS)[8]. The persistent economic situation triggered structural imbalances especially in the balance of the social security funds. In French economic history, the year 1993 was the first year of negative growth since 1975; GDP growth rate dropped 2.2% points from 1992 to 1993. In an attempt to revive the economy, the government increased public spending from 576.2 to 613.2 billion Euros, which consequently furthered the public deficit to -6.5%, hence a worsening of approximately one and a half times the deficit in the previous year. After eight years with stabilized debt ratios (since 1985 debt ratios were around 30% of GDP), public debt augmented by 6.3% points compared to the previous year. Higher long term interest rates on government bonds in the two years after the shock (going from 7.2% to 7.5%) contributed to accentuate the burden of the public debt.

In 1995, the French government launched a public deficit reduction program called the "Convergence Program" partly in an attempt to ease previous period`s macroeconomic shocks and most importantly to fulfill the participation requirements of the Economic and Monetary Union (EMU)[9]. Consequently, from 1997 to 2001, the government stabilized public debt growth; debt to GDP ratios was held below the 60 % threshold, hence satisfying the Stability Pact regarding government finance stipulated in the Treaty of Maastricht. The acceleration of economic growth (from 2.2 % in 1998 to 3.7 % at the end of the year 2000), lower inflation and low interest rates also contributed to the alleviation of the public debt. In the years leading up to the launch of the European common currency (Euro), the French debt only rose by 0.17 percent point of GDP on average, and still remained under 60% level.

Since 2003 the debt to GDP ratio augmented uninterruptedly. In present times, it has risen by 27 percent point since 2002 in other words growing by 3 percent points of GDP on average each year since. During that same period, in December of 2007, the world economy was affected by severe financial difficulties. In the United States, several financial institutions were making rash lending practice as well as increasing the trend of securitization of real estate mortgages. These practices implied risk taking and were hard to assess and regulate, but

[7] The German Unification was a process in 1990 that united the Federal Republic of Germany (West Germany) and the German Democratic Republic (East Germany) and reinstituted Berlin as a single city and capital of today`s Germany. For more information see A.J Hughes and Yue Ma (1993)

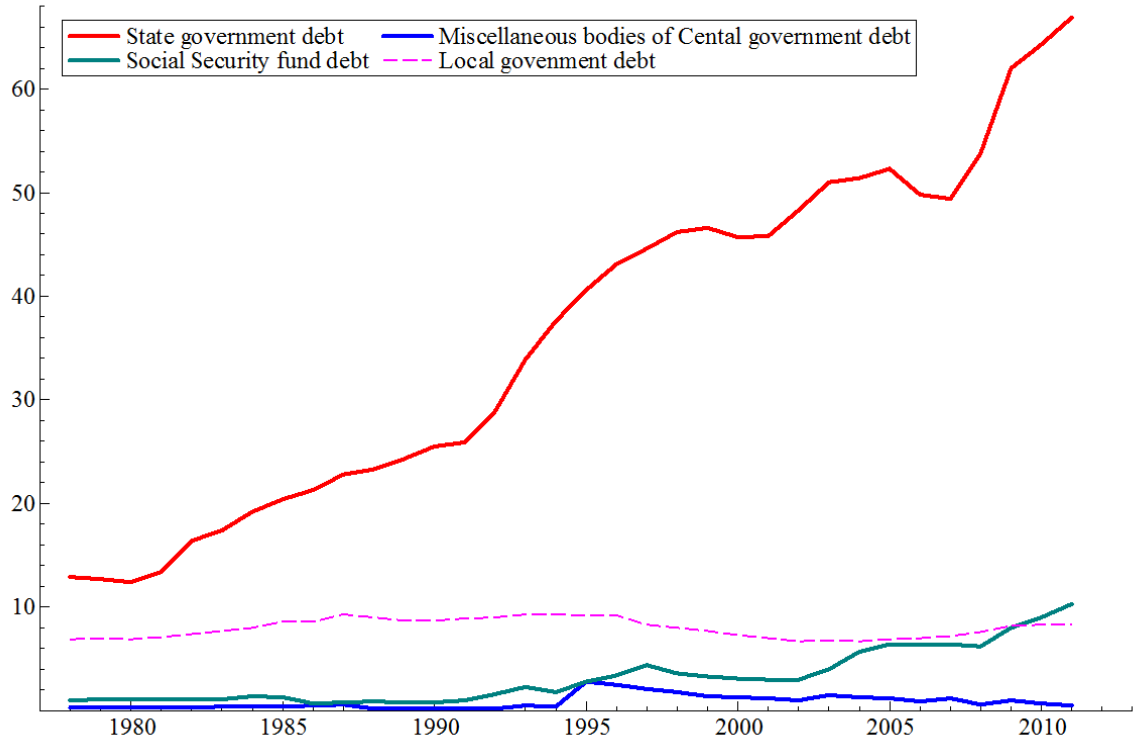
[8] European Monetary System (EMS) was an arrangement established in 1979 under the Jenkins European Committee where most nations of the European Economic Committee (EEC) linked their currencies to prevent large fluctuations relative to one another.

[9] The Economic and Monetary Union (EMU) is the combination of the European Union states into a joint economic system represented with the adoption of the euro as the national currency of participating members.

still were marketed widely around the world. These risky practices created an artificial credit boom that fed a global speculative bubble in equities and real estate.

By 2008, sub-prime loan losses started to emerge, enabling the crisis to surface, thereafter exposing other risky loans and assets that were overly priced. Global investment companies and commercial banks started to encounter considerable losses with a hand full of them even going bankrupt in the United States and Europe. By 2009, the crisis had well spread throughout Europe, and France the second largest economy within the European Union was considered to be in a recession. The recession was soon to be followed by a so called "Sovereign Debt Crisis". Large bailout packages were provided in attempts to stabilize the financial sector and stimulate the global economy that was in a tremendous slowdown. In December of 2009, the French government announced a recovery plan to kindle the employment market, a plan that cost around 26 billion Euros.

Figure 3 Central Government and sub-sectors debt (as defined in the Maastricht Treaty)



Source: Data Annex 3

As a consequence to the global financial crisis, debt to GDP in France was close to 80% and the fiscal deficit had doubled since 2008 (see **Figure 1**). Despite mainly low interest rates, the debt was growing as the government tried to cope with the global economic slowdown and since social spending was increasingly high, the debt level reached 1717.3 billion Euros, hence 86% of the GDP. At the time of writing, the risk that the fast tracking dynamics of debt turn out of control has become alarming.

The breakdown of the balance of public administrations into sub- sectors of the government shows that the State government debt is the highest contributor to the public debt burden. Data shows that this debt has been on the constant rise during the past three decades (see **Figure 3**). In 2011, debt held by the state government constituted 78% of the total public total debt.

The second largest component of the French public debt is the debt carried by the social security funds. These funds can be distributed into four categories: pensions, sickness, family and accidents. From 1978 to 2011, debt contracted by social security funds increased by 201.7 billion Euros, in other words increasing by 13.1% on average annually. From 1978 to 1985 the debt increased 15.5% on average every year. By 1986 social security funds were able to reimburse a minor portion of their debt, decreasing it by 3.6 billion Euros. This is due to slight surpluses registered in the social security accounts from 1983 to 1985 (+3.5, +2.5 and +1 billion Euros). From 1987 and throughout the 1990`s these accounts continued to exhibit deficits, displaying an average annual growth of 19.7%. In 2011 social security debt had increased by 30.2 billion Euros since the year before.

Another component of the French public debt is the debt held by local governments. This debt includes debt held by regions, departments and municipalities in France. The contribution of local administrations has been constantly increasing since 1978. From 1997 to 2005, the debt level was stabilized, only growing by 1.4% on average each year. However, from 2006 to 2011, the debt increased by 5.7% on average each year.

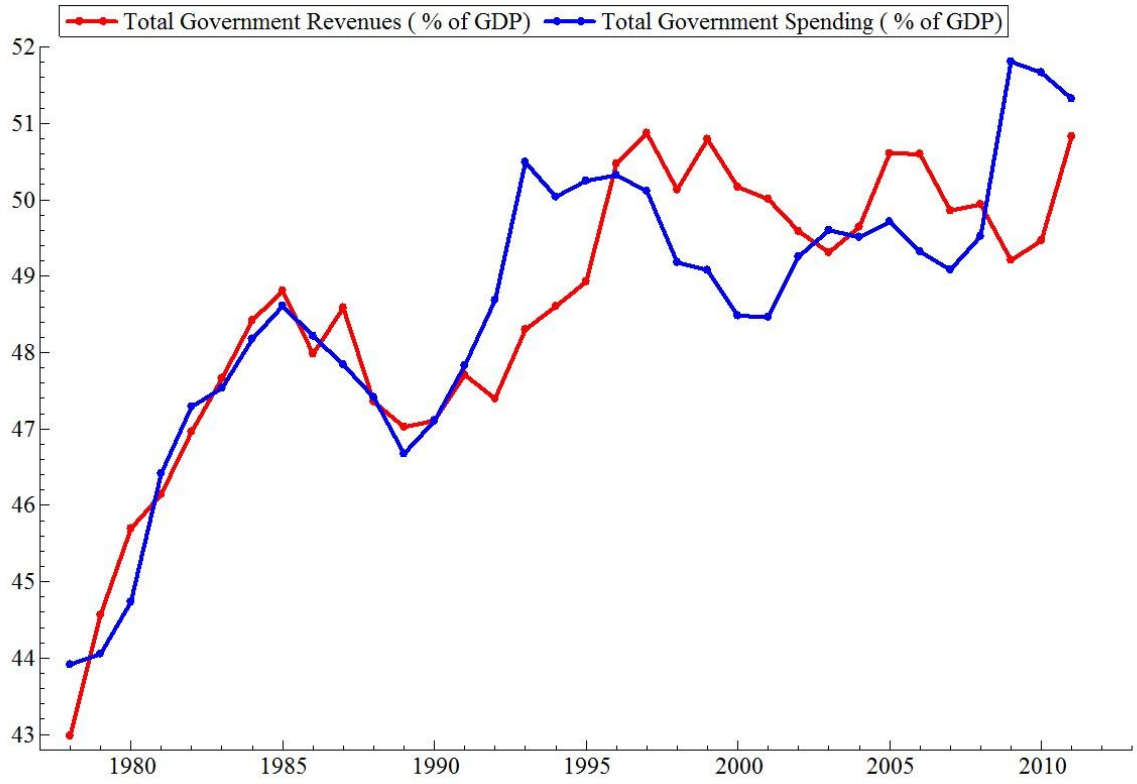
The high expenditures volumes exhibited by the central government are in contrast with the more restrictive rules that apply to the other public administration institutions. The insurance nature of the social security funds always leads public authorities to balance recurring deficits by increasing social contributions. Local authorities are prevented from excessive spending

schedules by a so called “golden rule” which ensure equilibrium in their operating division, any deficit will, in principle, originate from expenditures related to capital investment.

Over the last decades, French public finances exhibited a sharp increase in the weight of public expenditure and a small increase in the weight of the taxes, a pattern which comes to explain the growing trend of the French public debt.

Public expenditure can be broken down into five broad categories: interest payment expense, capital investment expenditures, operating costs, transfer expenses, and finally social benefits.

Figure 4 Total Government Revenues and Spending (% of GDP)



Source: Data Annex 4

Despite the sharp increase in public debt, interest payment outlays of the central government paradoxically slightly progressed in the last 33 years. These payments rose from 3.5 billion

Euros in 1978 to 52.6 billion Euro in 2008. It represents today 4.7% of the total expenditure against 2.28% in 1978. After a period of increase, these charges declined significantly between 1996 and 2006. This apparent paradox is related to the sharp decline in interest rates in the last 10 years; a relief that helped cushions the impact of rising debt. The decline in inflation from the early 1980s was indeed followed by a decline in global interest rates. This rate cut was amplified in the case of France, by the extinction of the risk premiums following the entry into the Economic and Monetary Union (EMU), enabling the State and local administrations to benefit from lower borrowing costs.

Public investments are mainly acquired by local authorities, but also the state and hospitals. A majority of these investments are buildings, land and investments related to public effort. The share of these investments has changed slight in past three decades: these expenses remained fairly stable since the early 1990`s. The rising deficits observed obviously did not originate an increase in investment effort.

Since the early 1980s, operating expenditures (that is intermediate consumption, employees compensation, taxes on production, income and wealth etc.) markedly grew, going from 63.2 billion Euros in 1978 to reaching 198.1 billion Euros by the 1990`s, the expenses had grown 6 times until present times. Benefits and other transfers meaning social benefits and other social transfers, subsidies and capital transfers rose almost always faster than GDP: longer life expectancy has pushed up spending pensions, while efforts to control health expenditure faced a strong dynamic; health care treatments costs have become very expensive.

On the subject of general government revenue, the trends observed are strongly differentiated from that exhibited by public spending in different levels of the government. Compulsory levies (taxes and social contributions) received in favor of central government went from 17.7% of GDP in 1978 to 14.6% in 2008 after experiencing considerable fluctuations due to economic cycles. Two aspects contributed to the intensification of this trend since the beginning of the decade: tax breaks on income tax, corporate income tax and the Value Added Tax (TVA) as well as the direct allocation of tax revenues to other public administrations.

The tax burden of the social security funds experienced a sustained growth reflecting the on growing trend of government expenditure. They went from 16% to 23% of GDP between 1978 and 2008. The gradual uncapping of social security contributions, the establishment of

the General Social Charges (CSG) in 1990 and its gradual increase, the implementation of new levies explain the current growth in the last thirty years.

The levies in favor of local authorities have also increased significantly, from 3.2% of GDP in 1978 to 5.9% in 2008. In this case, the increase in local tax rates and the transfers of fiscal resources to the state and revenues from the public social security funds explain the increase the last ten years.

With the crisis, the rise in public debt has grown rapidly in France. While France has failed in recent decades to master constant growth in public spending, the financial crisis may have helped to sustainably increase the government deficit of several percentage points of GDP. Moreover, the aging of the population has had an upward pressure on spending on pensions and health. Therefore, without a very important effort to control public finances, public debt will continue to grow substantially in the coming years.

4 Sustainability of Public Debt[10]

Broadly speaking, a chosen fiscal policy can be considered to be sustainable if it can be conducted for an unlimited time period without the building up of excessive government debt accumulation. This implies that the level of debt that is contracted must be coverable by future public primary surplus, thus ruling out risks of major fiscal changes (for instance budgetary cuts, tax increase), "Ponzi schemes" and the worst case scenario, risks of government default. Generally, sustainability analysis is considered as an instrument to test the quality of the observed fiscal stance for a given sovereign state.

The concept of sustainability should be distinguished from the notion of solvency. Sustainability concerns the consistency of a state`s financial policy. It primarily characterizes a given fiscal policy and the policy's future ramifications. Furthermore, the concept portrays a state which is solvent without requiring any fiscal adjustment. Whereas Solvency describes the financial health of the state and a state`s ability to meet its commitments, regardless of the way this is achieved.

Public finances that are not on a sustainable path do not necessarily lead to insolvency but rather indicate that fiscal reforms are necessary to ensure solvency. Concluding that a state is insolvent is interpreted as default on public debt. This situation could lead to a major financial crisis which in turn could lead to an economic recession.

In present times, many European countries have built up substantial amounts of public debt, often accompanied by mounting public sectors and short-term fiscal policies. Coordinated fiscal policies within the European Union (EU) are crucial given the understanding that today's overspending poses an actual threat for the wellbeing of future generations in the entire monetary union. Firm fiscal policies are imperative in order to prevent a destabilized European common currency and to have control over settlements of the aging population.

Throughout the years, debt financing for public investment was rationalized by the need of a growing public sector to maintain welfare states but this has led to large liabilities and a real

[10] All the numerical results have been produced by OxMetrics 6

danger of public debt finance instability. In the last decade, it has become clear that fiscal policies that will insure a manageable debt burden will have to be implemented.

4.1 Accounting for Fiscal Sustainability

Modern empirical research on sustainability of debt policies started with the contribution by Hamilton and Flavin (1986) whose tests on the United States deficits were consistent with the proposition that the government budget needs to be balanced in present value terms in order to emit interest bearing debt.

Another paper that received great attention in the economics literature on the subject is the one proposed by Bohn (2005). This paper studies the sustainability of U.S government fiscal policy from 1792-2003 and finds significant evidence of a positive effect of the primary surplus to fluctuations of debt to GDP ratio.

A paper by Fincke and Greiner (2009) showed that a rise in primary surplus as a response to higher government debt implied that the series of public debt relative to GDP should be a mean-reverting process. In other words, higher debt ratios should lead to an increase in the primary surplus relative to GDP, making the debt ratio decline and return to its mean. They specify that "mean-reversion" only holds in a relevant way if the reaction coefficient, determining how strongly the primary surplus reacts as public debt rises, is sufficiently large.

In the case of France, the growth of public debt is an aspect that has affected the government`s budget plan throughout the years. In the next section, the goal is to test whether the French government has been able to reach a sustainable response to the growing levels of debt during the period between 1978 and 2011.

4.2 Econometric Approach

The starting point for the analysis on the sustainability of public debt is the accounting identity describing the accumulation of public debt in continuous time described by the following differential equation:

$$\dot{B}_t = int_t B_t - S_t \qquad (1)$$

where B_t is the real public debt in period t and $\dot{B}_t$ is the derivative of B_t with respect to time. Denote int_t is the real interest rate and S_t is the government primary surplus (total budget surplus excluding the interest payments on public debt).

Our econometric analysis is based on the paper by Fincke and Greiner (2009) which examines the sustainability of public debt by investigating the correlation between Primary Surplus and Public Debt, both measured as ratios of the GDP. More specifically, the test for sustainability is based on an analysis on the correlation between the dynamics of public debt and primary surplus, all measured in ratios of GDP, assuming that the long term interest rate on government bonds exceeds the GDP growth rate. In the last three decades, the GDP growth rate has indeed been lower than the long term interest rate in France.

Furthermore, Fincke and Greiner assume a real economy and a government that cannot use a Ponzi scheme and seignorage or inflation to reduce its outstanding debt. The later assumption is a realistic assumption since France is part of a monetary union characterized by an independent central bank meaning the government cannot control the money supply. Thus, the government cannot rely on money creation to reduce outstanding public debt.

The dynamic relationship between Public debt and Primary surplus is described as follows:

$$s_t = \varphi_t b_t + \emptyset^T Z_t + \varepsilon_t \qquad (2)$$

where s_t is the primary surplus to GDP and b_t is the public debt to GDP at time t. Z_t is a vector of variables that is motivated by the tax smoothing hypothesis. According to Fincke and Greiner (2009), it is a hypothesis according to which public deficits should be used in order to keep tax rates constant, hence minimizing the excess burden of taxation. The vector is such that it includes 1 in its first element, representing the intercept, and additional variables, in its other elements, that influence the primary surplus ratio. Finally, ε_t is an error term and is assumed to be randomly and uniformly normally distributed.

In order to account for the tax smoothing hypotheses, a couple of variables are added to the original equation (2). The first is a variable describing government subsidies to the social security fund balance to GDP Soc_t. Due to business cycle fluctuations, periods of downturns are often distinguished by shortcomings in social security revenues, a situation that calls on government intervention.

Additionally the real long term interest rate int_t is included in order to account for the long term commitment to debt financing. The long term interest rate is observed to affect the Primary surplus ratio through the volume of government interest payments. However the type of impact the interest rate has on the primary surplus tends to be ambiguous. On one hand, high interest rate may characterize increase in tax revenues. On the other hand it might imply a high government debt, which tends to reduce the Primary surplus.

Finally a business cycle variable $YVar_t$ is incorporated to account for fluctuations in public revenues.

Thus, equation (2) can be rewritten as:

$$s_t = \emptyset_0 + \varphi_t b_{t-1} + \emptyset_1 Soc_t + \emptyset_2 int_t + \emptyset_3 YVar_t + \varepsilon_t \qquad (3)$$

In this study, the econometric analysis will mainly be based on the approach described above. A few modifications are implemented regarding the business cycle variable. The variable

YVar is replaced by a set of dummy variables that account for large shocks in the French economy. Therefore, equation (5) can be rewritten as follows:

$$s_t = \beta_0 + \beta_1 b_{t-1} + \beta_2 Soc_t + \beta_3 int_t + \alpha_1 Fin_{1993} + \alpha_2 Fin_{2009} + \alpha_3 Fin_{2010} + +\varepsilon_t \qquad (4)$$

where Fin_{1993} represents the economic downturn of 1993. It started in the second quarter of 1992, when France entered a recession due to the increase in oil prices that stemmed from the Gulf War and political unrest in neighboring Germany (the German reunification). By the fourth quarter the same year the unemployment level had reached a high peak, causing government social expenditures to increase. By 1993, the low levels of aggregate productivity indicated France had slid into a recession.

The dummy variables Fin_{2009} and Fin_{2010} represent the economic downturn caused by the financial crisis that hit the world economy in the autumn of 2008. A record large number of France`s financial institutions collapsed or were bailed out by governments during this period[11]. The failure of these institutions resulted in a drying out of global credit markets and required government interventions worldwide submerging the affected economies into a recession with low growth and high public spending. In 2010, the Greek debt was downgraded to "junk"[12] and in a move that signalized the start of a Eurozone Debt Crisis, Greece was bailed out with a loan worth 110 billion of euros. By the end of 2010, the Eurozone finance ministers had bailed out Ireland and were getting ready to bail out Portugal. The price the European Union has paid to avoid a financial crisis was in the form of recession and the unemployment level was around 10% including France; where the rate was at 9.6%.

[11] The list of financial institutions included Bear Stearns, Citigroup, Lehman Brothers, Merrill Lynch (in the U.S.), HBOS and RBS (in the U.K.), and Dexia, Fortis, Hypo Real Estate and UBS (in continental Europe).

[12] According to Investopedia a junk government bond is a risky investment. This type of bong is highly speculative because they offer higher yields than safe bonds.

4.3 Data Source and definitions

The data used in this study were acquired from the French National Institute of Statistics and Economic Studies (INSEE) and the Organization for Economic Co- operation and Development (OECD). Specific definitions and sources of data used in this study are the following:

GDP (expenditure approach): The data for the Gross Domestic Product was entirely acquired from the OECD`s Statistic data collection. According to the OECD`s glossary "*the Gross domestic product (GDP) is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units*." The unit of the data is Euros in constant value.

Primary Surplus (also Primary Deficit): According to the Organization for Economic Co-operation and Development (OECD) *"the primary balance is defined as a government`s net borrowing and net lending excluding interest payments on consolidated government liabilities"*. In other words, the Primary Balance is defined as the government's income from taxes and non- tax revenues (revenue from government owned corporations or sovereign wealth funds) net of public expenditures and investments. A Primary Balance is referred to as a Primary Deficit if government spending exceeds government tax revenues, excluding additional cost of debt interest payments on government bonds. And the balance is referred to as a Surplus if the government revenues are higher than government expenditures. The data on government revenue and government expenditures were collected from the National Institute of Statistics and Economic studies (INSEE). The unit of measurement is in Euro in constant value.

Public Debt: In this study, we use public debt as defined in the Treaty of Maastricht. According to the INSEE, *"debt in the sense of Maastricht covers all general governments in the sense of the national accounts: the State, other government bodies (ODAC), local*

governments and social security administrations. Debt in the sense of Maastricht is calculated in the framework of the national accounts but it is defined in a specific way. It does not include all financial liabilities but only cash and deposits, securities other than shares which are Treasury bonds (BTF and BTAN), fungible Treasury bonds (OAT), Euro medium term notes (EMTN), as well as loans; excluded are derivative products and other accounts payable and receivable.". The debt is consolidated meaning it excludes components of debt held by another government. Moreover the debt is a gross debt, meaning it does not include government assets. And finally the debt is expressed in nominal value that is at the repayment value of the principal.

The data for Public Debt is collected from the INSEE database whose original sources are the French National Accounts. The unit of measurement is in billions of Euros.

Interest Rate: It is the real long term government bond yield. According to the OECD," *long term (10 years) government bonds are the instrument whose yield is used as the representative 'interest rate'. Generally, the yield is calculated at the pre-tax level and before deductions for brokerage costs and commissions and is derived from the relationship between the present market value of the bond and that at maturity, taking into account also interest payments paid through to maturity".* The data source is the OECD database. In the case of France, the data refers to the yield on the secondary market of long term state bonds and are in expressed in term of percentage.

Social security funds Surplus/Deficit: This characterizes the difference between social security revenues and spending for the general government. This data represents the net lending/ net borrowing values of the social security funds. The data source is the French National Accounts published on by the INSEE. The unit data is expressed in billions of Euros.

All the data series for GDP, Public Debt, Interest Rate, Government expenditures and revenues are presented in the **Data Annex**.

4.4 Econometric Analysis

Many macroeconomic data series exhibit fluctuating trends, a characteristic for non-stationary time series. Therefore, before estimating the Primary Surplus to GDP regression equation, a Unit Root test for non- stationarity based on the Dickey- Fuller test is applied. Specifically, the times series of the Primary Surplus to GDP, Public Debt to GDP, Social security funds balance to GDP and the Interest Rate will be investigated. If the variables are shown to be integrated of order 1, noted I (1), a Cointegration Test will be conducted.

The test for cointegration is based on the Augmented Dickey- Fuller (ADF) test applied to the residuals from the regression equation for Primary Surplus to GDP. This test is useful in showcasing whether the variables in the regression have a long term relationship and also helps to avoid spurious regressions situations.

A Unit Root Test

A Unit Root Dickey- Fuller (DF) test is a test for stationarity that is widely popular. The starting point of the test is the so called unit root (stochastic) process:

$$Y_t = \gamma Y_{t-1} + u_t \qquad -1 \leq \gamma \leq 1 \ , \tag{5}$$

where u_t is the white noise error term.

Subtract both sides of equation (5) with Y_{t-1} to obtain:

$$Y_t - Y_{t-1} = \gamma Y_{t-1} - Y_{t-1} + u_t = (\gamma - 1)Y_{t-1} + u_t \tag{6}$$

Equation (6) can be rewritten as:

$$\Delta Y_t = \emptyset Y_{t-1} + u_t \tag{7}$$

where Δ is called the first difference operator and $\emptyset = (\gamma - 1)$.

The next step is to estimate equation (7) and test the null hypothesis that $\emptyset = 0$. If $\emptyset = 0$, then $\gamma = 1$, meaning that there is a unit root, hence the time series under consideration is non-stationary.

In this analysis, the white noise error u_t is assumed to be auto- correlated therefore the unit root hypothesis is tested using the Augmented Dickey-Fuller (ADF) test. The test is conducted by "augmenting" equation (7) that is by adding the lagged values of the dependent variable. Specifically, for each set of variables in equation (7) excluding the dummy variables, the ADF test consists into estimating the following regression:

$$\Delta Y_t = \alpha_1 + \emptyset Y_{t-1} + \delta t + \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \qquad (8)$$

Where ε_t is a white noise error term and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$,

$$\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3}), \ldots$$

In a similar way as for the Dickey-Fuller test, the null hypothesis for the ADF test is $H_0: \emptyset = 0$ meaning there is a unit root and the time series is non- stationary. The alternative hypothesis $H_1: \emptyset < 0$ means that the time series is stationary. Reject the null hypothesis if the absolute value of the computed tau $|\tau|$ exceeds the critical τ value from the Dickey-Fuller table, meaning the variable considered is stationary. On the other hand, do not reject the null hypothesis if the computed tau $|\tau|$ if the computed $|\tau|$ does not exceed the critical tau value, in this case the variable is non- stationary.

The ADF test on equation (4), based on the estimation procedure of equation (8), give the following computed results in **Table 4 A**:

Table 4 A Augmented Dickey- Fuller (ADF) Unit root results

Variables in level	Computed ADF at lag		Varables at first difference	Computed ADF at lag	
	0	1		0	1
S/GDP	-2,102	-2,878	ΔS/GDP	-4,474	-
B/GDP	-1,352	-2,748	ΔB/GDP	-3,293	-
Soc/GDP	-2,548	-	ΔSoc/GDP	-5,204	-
int	-3,07	-	Δint	-5,311	-

*** means stationarity at a 1% significance level*

Note that

- s_t and Soc_t are tested without a constant (2 variables, 33 observations) and the critical values in consideration are 5%= -1.95 and 1%=-2.64
- b_t and int_t are tested with a constant and a trend (2 variables, 33 observations) and the critical values are 5%=-3. 57 and 1%=-4.31

The test results show that *s*, *Soc* and *int* are non- stationary in levels and stationary at first difference form. Hence, the variables are said to be integrated of order 1 noted I (1) meaning they contain a Unit Root. Furthermore, the test indicates that b is non-stationary both in levels and in first difference form. In conclusion, the series for Primary surplus to GDP, Public debt to GDP, Social insurance surplus to GDP and Interest rate are non- stationary and the Unit Root hypothesis cannot be rejected at conventional significance levels. Based on this conclusion, the estimation of the primary surplus equation requires a cointegrated framework.

Cointegration Test

The test for non- stationarity showed that we were unable to reject the hypothesis that the variables contain a unit root. Time series analysis theory shows that unless taken care of, the regression of a non- stationary time series on another non-stationary time series will produce a spurious regression. In order to avoid results that may spuriously show a significant relationship when in fact the there is no relationship, I investigated whether the variables under consideration are cointegrated or not. In other words, two or more variables are said to be cointegrated if they have a long term relationship.

In this analysis, cointegration is tested by applying an Augmented Dickey- Fuller (ADF) unit root on the residuals estimated from the cointegrating regression:

$$\Delta\widehat{\varepsilon_t} = \gamma\varepsilon_{t-1} + \sum_{j=1}^{n} \widehat{\varepsilon_{t-1}} + \vartheta_t \qquad (14)$$

The null and alternative hypotheses for the cointegration test are:

H_0 : Residuals are non-stationary⇔the series are not cointegrated

H_1: Residuals are stationary⇔the series are cointegrated

We reject the null hypothesis of no cointegration if $\tau_c \geq \tau$, and we do not reject the null hypothesis that the time series are cointegrated if $\tau_c < \tau$. The tau (=τ) statistics in this analysis are reported in the following **Table 4 B**:

Table 4 B Eagle- Granger ADF test results for residuals (with no constant and no trend)

ADF test t-values of lagged differences		
0	**1**	**2**
-3.683**	-3.561**	-3.336**

***: stationary at 1% significance level*

Since the residuals are from the estimated cointegrating regression, the appropriate critical values are the Engle- Granger critical values[13]. Based on the results, the residuals of the Primary Surplus regression equation (6) are stationary at a 1% significance level. As a conclusion, we reject the null hypothesis that the least square residuals are non-stationary and accept the alternative hypothesis that the residuals are I (0), meaning they are stationary. Hence, equation (6) is cointegrated, the regression is not spurious, and therefore there exist a long term relationship between the Primary surplus, public debt, social security systems and the long term interest rate.

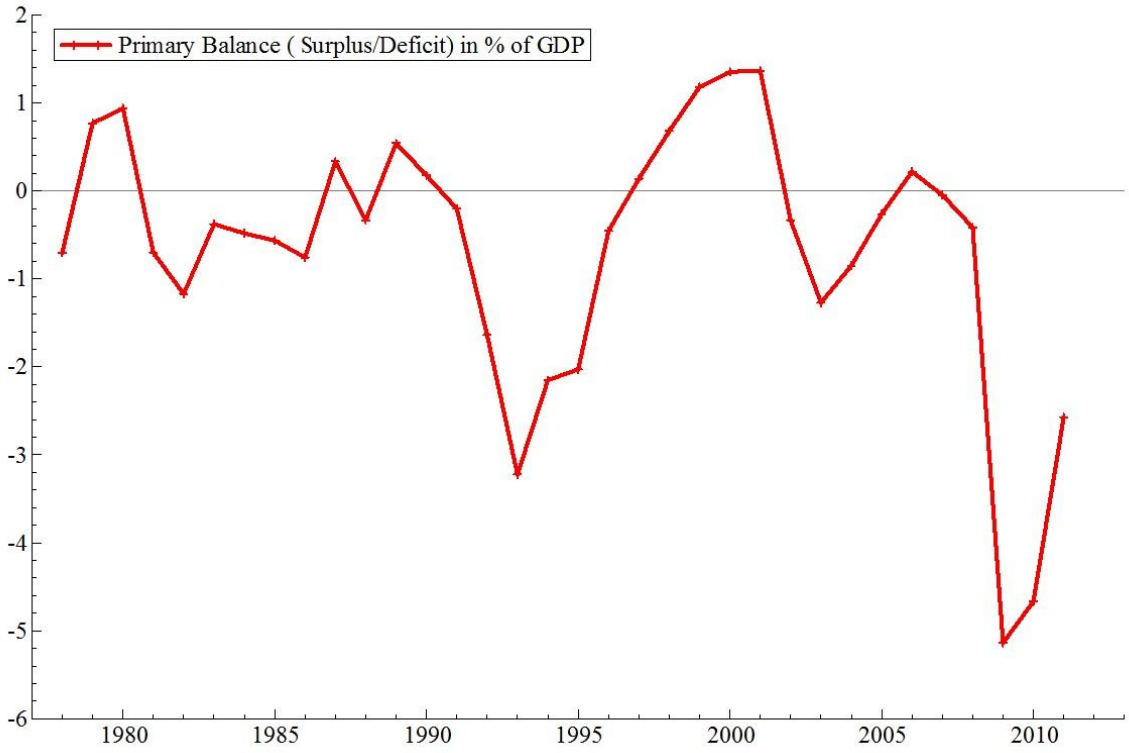
[13] Source: Engle R. F., W. J. Granger "Long Run Economic Relationships: Readings in Cointegration, Advanced Texts in Econometrics", Critical values for Cointegration Tests, Table 1. Response surface estimates of critical values, 275

Estimating for the Sustainability of Public Debt

Given the presence of cointegration between the dependent variable and the non-dummy explanatory variables, a credible estimation is run using OLS estimation. Equation (6) is estimated for the period from 1978 to 2011 with the presence of both a constant and a trend.

As mentioned in the previous section, dummy variables for the year 1993, 2009 and 2010 are introduced to capture the aftermath of financial crisis that have prevails during those years.

Figure 5 Primary Balance (% of GDP)



Source: Data Annex 6

The estimation results of equation (6) using OLS are assembled in **Table 4 C** and results of the mis- specification tests are collected in **Table 4 D**:

Table 4 C OLS regression results

	Coefficient	Standard Error	t- value	t- prob
Constant	0.0362	0.0145	2.5	0.0192
b	-0.0468	0.0181	-2.58	0.0158
soc	1.5949	0.2462	6.48	0.0000
int	-0.0023	0.0008	-2.79	0.0098
Fin1993	-0.0190	0.0071	-2.70	0.0121
Fin2009	-0.0347	0.0068	-5.14	0.0000
Fin2010	-0.0196	0.0075	-2.63	0.0143

R^2= 0.87089
Adj.R^2= 0.836417
F (6, 26) = 28.27 [0.000] **

The results show a negative average coefficient for public debt to GDP; that is -0.0468. Meaning the fiscal policy that has been run during the sample period by the French government is not sustainable. The coefficient is significant at a 5 percent level. Estimating the equation without the social security funds surplus, the long term interest rate and the dummy variables does not change the sign of the coefficient. The economic intuition is that despite a growing debt ratio, government expenditures remain higher than public revenues. The government is obviously not taking significant action to reduce an excessively growing debt ratio.

The coefficient for social security funds surplus is positive and highly significant, indicating that a surplus in the balance of the social security funds will result in an increase in the Primary surplus. The coefficient for the long term interest is negative and highly significant. This characterizes the adverse relationship between primary surplus and interest payments on the debt. The higher the interest rate on long term government bonds, the higher the interest payments, which then are reflected by higher government expenditures. Regarding the

goodness of fit of the model, expressed by adj.R^2 =0.8364, is considerably, indicating the model is a good fit.

Table 4 D Mis-specification Tests of the model in **Table 4 C**

Mis- spesification tests

F(2,24)	= 2.3128	[0.1206]
F(1,31)	= 0.058821	[0.8100]
Chi^2(2)	= 1.4264	[0.4901]
F(6,23)	= 0.61841	[0.7135]
F(9,20)	= 0.43604	[0.8994]
F(2,24)	= 0.92178	[0.4114]

In France, the GDP growth ratio is lower than the long term interest rate; consequently debt ratio is bound is to rise. The explanation is that with a long term interest rate above the growth rate, interest payments on the existing debt will rise faster than the GDP. Hence, servicing the debt interest will push the debt burden up.

In order to avoid this situation, the French government needs to run a primary budget surplus by adopting fiscal consolidation targets. However, such targets can create a number of difficulties for the economy for various reasons. Increasing the primary surplus either requires painful cuts in expenditures or politically unpopular increases in taxation. The supply-side effects imply a raise in the unemployment level making macroeconomic management more difficult. In the absence of fiscal consolidation policies, debt will rise without limit and it will trigger concerns that the government may default on its debt. In this case, the government will face a higher interest rate on its borrowing to incorporate the premium for default risk. A higher interest rate will in turn feedback to worsen the debt burden as well as the dampening of national investment. At some point, government credit offers may be cut off and in order to continue to finance its expenditure the government will have to resort to monetizing the debt.

In the next chapter, we examine the prospects of Public debt over the next decade given the current fiscal policy in France. First, we introduce the concept and the implications of fiscal consolidation.

5 Public Debt prospects[14]

5.1 Fiscal consolidation: route to a sustainable public debt policy

The global financial crisis has caused a fiscal deterioration that left the world economy with serious challenges. As the time of writing this thesis, France and a number of Eurozone countries are dealing with considerable fiscal consolidation challenges. Sustained high deficits and a tendency to pursue a pro- cyclical fiscal policy has left countries with high levels of public debt, a debt level which for most part has become unsustainable.

Historical peak in public debt levels has caused the financial markets to reevaluate sovereign risk especially of those countries with immense fiscal challenges (for example Greece, Spain, Portugal and Ireland). Weak revenues, economic slowdown and response policies to the crisis resulted in soared budget deficits. The severity of the crisis has put many of these countries in a poor position to face present adverse shocks. The automatic stabilizers that were put in place amplified government social spending and the tax revenue receipts. Spending rose due to growth in the number of support packages beneficiaries whereas government tax revenues were decayed due to fall in asset prices. Rising fiscal deficits combined with low GDP growth rates pressed debt ratios up in most countries in the Euro area, including France.

Although public debt can help overcome failures in financial market intermediation, if not contained, high level of public debt will hurt long term growth via an increase in long term interest rate that crowds out private investment and will damage the social welfare structures.

A the time of writing, reducing public debt is central because a high level of public debt will have a direct impact on fiscal sustainability especially since the long term interest rate is rising. In the case of France, our analysis shows that public debt ratios are not sustainable; a situation that plea for severe fiscal consolidation commitments.

In addition to an already damaged fiscal trend, France faces a large portion of future retirees whose pensions and health bill will have to be covered; another reason why fiscal

[14] All the numerical results in this chapter have been generated by Eviews

sustainability need to be reached. According to a survey on the topic by the INSEE, bringing back the French public debt to 60 percent of GDP by 2030 would require a fiscal effort of 4 to 5 percent points of GDP under the assumption of unchanged long term rates. Such consolidation effort will imply at least ten years of primary general government surpluses, a situation that is unheard in French fiscal history since 1970.

Most economists, policymakers and international financial institutions in the Eurozone are calling for expansionary fiscal policies to mitigate the adverse effects of the recent global crisis. As a consequence, the long term policy issue today consists on how to bring debt levels back to sustainable levels through fiscal consolidation while still promoting growth. Elevated debt levels offer a narrow fiscal action space to address on-going economic weakness; therefore longer term aim of fiscal consolidation should be to bring down debt to prudent levels.

Permanent and immediate adjustments to fiscal consolidation are unlikely to be met, except for small scaled adjustments. Assuming a slow introduction to fiscal consolidation is more likely to manifest results because needed adjustments are often of small proportions. Delaying fiscal tightening, rises in borrowing volumes and additional fiscal shocks would raise the degree of needed tightening in the future to bring debt down. It is therefore every government`s responsibility to set up a safety margin into the long run in order to stabilize debt accumulation. In the case of France, the government welcomed a multi- budget bill for 2011- 2014 according to which the budget deficit as a share of the GDP is to decrease to 3 percent in 2013 and 2 percent in 2014. France`s stability program includes reducing central and local government spending as well containing spending related to the social security system.

Given the current fragile state of the world economy, implementing large fiscal tightening could be costly in term of large reductions in GDP growth. Studies show that the largest consolidations could reduce GDP by around 6 percent relative to the baseline[15]. Nevertheless, not pursuing fiscal consolidation in some countries in Europe could lead to even gloomier consequences. A well designed fiscal consolidation scheme will anticipate and minimize adverse effects on equity and other policy goals.

[15] Source: OECD working paper No. 932

The countries most under pressure from the financial markets have no other option but to tighten their fiscal situation even though a credible consolidation strategy may offer significant transitory setbacks. Consequently, structuring consolidation packages with low multipliers initially may help minimize the trade-offs with growth in the short run. While higher growth and lower interest rate could help the consolidation process, the reality is most countries will need to rely principally on tightening the underlying primary balance.

In designing consolidation packages, fiscal policy makers face choices along a number of strategies, such as the trade off with short-term stabilization, long run growth, intergenerational balance and distributional aims. History shows that large consolidation policies have relied heavily on spending and revenue reforms. A mixture of both could bring upon an efficient alternative to current fiscal challenges.

Given the significant proportion of the aging population in France and other spending pressure related to an aging population like health care and pensions, reforms to entitlement programs may emerge as a main instrument in the process that can lead to the stabilization (and reduction of) public debt. Reforms to pension systems, which delay retirement and increase labor force participation, can significantly reduce long run budget pressures. Including cuts in health care spending could improve fiscal gaps to satisfactory levels. The distributional consequences of fiscal consolidation will improving the social security funds balance, which in turn will impact the primary balance positively, consequently diminishing public debt buildup.

In the next section, we will present the basic arithmetic of debt accounting, in order to be able to combine that accounting with the estimated equation for the primary surplus. Section 5.3 presents a brief description of the augmented model and the estimated results. I next use the model to analyze future scenarios for the public debt ratio in section 5.4.

5.2 Accounting for public debt dynamics

First, recall the basic concept of public debt arithmetic given by equation (1)

$$\dot{B}_t = int_t B_t - S_t \qquad (1)$$

where B_t is the real public debt, int_t is the real interest rate and S_t is the primary surplus defined as the government's income from taxes and non- tax revenues R_t (revenue from government owned corporations or sovereign wealth funds) net of public expenditures and investments G_t excluding interest payments on outstanding government debt., $S_t = R_t - G_t$. Hence, based on the arithmetic described in Boissinot and al. (2004), the equation identity of debt accumulation described in equation (1) can be rewritten as follows:

$$B_t = B_{t-1} + int_t B_{t-1} + R_t - G_t \qquad (9)$$

The above equation can be rewritten in terms of the GDP ratio in the following way:

$$\Delta b_t = (r_t - g_t) + \gamma_t b_{t-1} \qquad (10)$$

where the lower case letters represent the corresponding variable as a ratio to GDP and

$$\gamma_t = \frac{int_t - \rho_t}{1+\rho_t} \approx int_t - \rho_t \qquad (11)$$

where γ_t is interpreted as the accumulation to debt due to the excess of interest rate (int_t) and the GDP growth rate (ρ_t) responsible for the snowball effect describing public debt buildup.

According to equation (10), for a given $s_t = (r_t - g_t)$, a higher real GDP growth rate than that of the long term interest rate will reduce the debt growth dynamics. The opposite situation will increase public debt growth.

Equations (10) and (11) represent the two variables that matter in government debt dynamics and those are the primary surplus as a percentage of the GDP and the differential between the real long term interest rates and the GDP growth $\gamma_t = int_t - \rho_t$ that accounts for the snowball effect. The economic explanation is that in any given period, the debt stock increases by the existing debt stock b_{t-1} multiplied by $int_t - \rho_t$ less the primary surplus s_t. The assumption is that if γ_t is greater than zero, than the interest rate on government bonds is greater than economic growth, meaning that the debt stock increases over time.

An alternative dynamic model for public debt would be to include the nominal interest rate int_t^n in order to allow for inflation rate input. Inflation helps reduce the total debt stock over time by decreasing its real value.

Equation (10) can be rewritten to comprise the inflation rate denoted π_t:

$$\Delta b_t = (g_t - r_t) + (int_t^n - \pi_t - \rho_t)_t b_{t-1} \qquad (13)$$

Like in equation (12), public debt, the primary balance, the nominal interest rate and the inflation rate are variables that are strongly correlated in reality. However, debt dynamics in this analysis will take ground in equation (12).

Using data from the French economy, we estimate the debt dynamic equation of the form in equation (10) to account for the specific effect of the snowball effect denoted (γ_t):

$$b_t = \beta_4 + \beta_5 b_{t-1} + \beta_6 \gamma_t b_{t-1} - \beta_7 s_t + u_t \qquad (14)$$

and the variables are described as in previous section. Note that if the accounting equation held identically we would have $\beta_4 = 0$ and $\beta_6 = 1$. However, since the equation is not precise, we allow for a non- zero intercept and a scaling coefficient for the multiplicative term. We also assume $\beta_5 = 1$.

The estimation results are gathered in **Table 5 A** below.

Table 5 A Debt dynamic equation OLS regression results (for more detailed results see **Appendix A**)

	Coefficient	Standard Error	t- value	t- prob
Constant	-0,01	0,005667	-1,65	0,1092
s	-1,136158	0,155961	-7,284875	0,00
γb	0,010072	0,002615	3,851809	0,0006

R^2= 0.995902

Adj.R^2= 0.995629

The estimated value of β_6 describing the effect of snowball effect on the debt growth ratio is positive. This implies that debt is expected to increase if the long term interest rate stays

higher to GDP growth during the last three decades. Notice the coefficient is highly significant.

The expected estimate coefficient for the primary surplus describing the effect of fiscal consolidation on accumulated debt is negative and highly significant. The French fiscal authorities are currently running primary deficits; therefore higher deficits are met with higher debt. As to the goodness of fit of the entire model, the decision criterion $R^2(adj) = 0.9959$ attests of a good fit.

In the next section we simulate potential paths of debt to GDP ratio of the French government using a model including equation (4) that describes Primary surplus and equation (14) describing debt ratio dynamics. In our study, the simulation approach is a scenario based analysis where each scenario controls for fiscal consolidation targets, specifically the social security funds balance and different targets to the long term interest rate and GDP growth rate.

5.3 Debt dynamics scenario simulations

The sustainability results attained in the previous section confirm earlier conclusions that the debt policy ran by France in present times is not sustainable. Therefore, it is crucial for France to pursue consolidation measures if it wants to reduce the amount of debt that it has accumulated along the years; and ultimately reach the optimal 60% threshold objective recommended within the European Union.

In this section, we analyze possible patterns for the debt to GDP ratio in France from 2012 to 2025 by investigating the impact of a domestic variable instrument: the balance of social security funds Soc_t and the snowball effect indicator γ_t: the differential between the long term interest rate and the GDP growth rate.

The parameter demonstrating fiscal discipline is the social security fund surplus (soc_t) variable that reflects the net lending/net borrowing of those funds. The main assumption is that the balance of the social security funds is the main channel through which the

government is determined to improve its social security expense and achieve sustainable consolidation objectives. In this analysis, social reforms will constitute mainly of improvements to social health care schedules, social benefits and pensions systems.

In general macroeconomic theory, the GDP growth ratio and the interest rate are legitimate indicators of a country`s economic and financial health. In debt dynamics theory, these two parameters exert a significant justification to government debt accumulation; this is presented in equation (14). The difference between the GDP ratio and the interest rate, $\gamma_t = int_t - \rho_t$ quantifies the impact of the lack of GDP growth rate (ρ_t) and long term interest rate (int_t) called the snowball effect.

In the baseline scenario, we do not make any fundamental alterations to the current French economic situation. In other words, we expect France to have about an unchanged growth, an unchanged interest rate and to follow the same pattern of social spending schedule for next 14 years. This implies the simulation analysis assumes a deficit to the social security funds; a low and permanent GDP growth rate and relatively high and constant long term interest rate such that $int_t > \rho_t$.

The "positive/optimistic" scenario characterizes the commitment of the French government to a tight spending program. We assume the French government sets up and commits to a consolidation schedule which aims at reducing social expenditures through a series of reforms designed to ensure low social security transfers; hence the social security funds will display continuous surplus. Furthermore, this scenario outlines stronger economic growth; we assume the real GDP growth rate will increase with 1.8 % point compared to the rate described in the baseline scenario. We also assume that commitment to discretionary social reforms and positive growth will signal optimism in the financial markets regarding France`s ability to recover from its debt crunch. Therefore, the real interest rate is set to be lower than that described in the baseline scenario, at a level of 2%, such that $int_t < \rho_t$.

The "risky/pessimistic" scenario differs of that of the optimistic scenario in that the government fails to meet its fiscal policy consolidation targets. The lack of budget discipline will translate into high public social spending; implying the social security funds will display continuous deficit. We further assume no economic growth; the GDP growth rate remains the same as it is described in the baseline scenario. Given the lack of economic growth combined with insufficient consolidation efforts, we assume the financial market will respond by

increasing the real interest rate on government bonds; therefore we presume the interest rate will increase 0.5 percentage points higher than that of the basis case, such that $int_t > \rho_t$.

Below, we proceed to apply the details of the three scenarios described above on the equation system describing the primary surplus ratio and debt ratio dynamics equation:

$$s_t = \beta_0 + \beta_1 b_{t-1} + \beta_2 Soc_t + \beta_3 int_t + \alpha_1 Fin_{1993} + \alpha_2 Fin_{2009} + \alpha_3 Fin_{2010} + \varepsilon_t \qquad (4)$$

$$b_t = \beta_4 + \beta_5 b_{t-1} + \beta_6 \gamma_t b_{t-1} - \beta_7 s_t + u_t \qquad (15)$$

where the variables are described as in the previous sections.

The results are gathered in **Table 5 B** and are the estimated long term projections for debt ratios and primary surplus ratios under each scenario describes above for the sample period 2012 to 2025

Table 5 B Long term projections of public debt and Primary balance (% of GDP)[16]

France	Average RealGDP growth rate 2012-2025	Average interest rate 2012-2025	Average social security fund balance 2012-2025	Primary Balance as % of GDP 2012-2025		Det- to -GDP ratio	
				2020	2025	2020	2025
baseline scenario	1,7	3,32	-0,006	-0,03 %	-0,05 %	120,29 %	150,37 %
Risky/ pessimistic scenario	1,7	3,9	-0,01	-0,05 %	-0,07 %	137,89 %	185 %
Positive/optimistic scenario	3,5	2	0,01	0 %	0 %	54 %	30 %

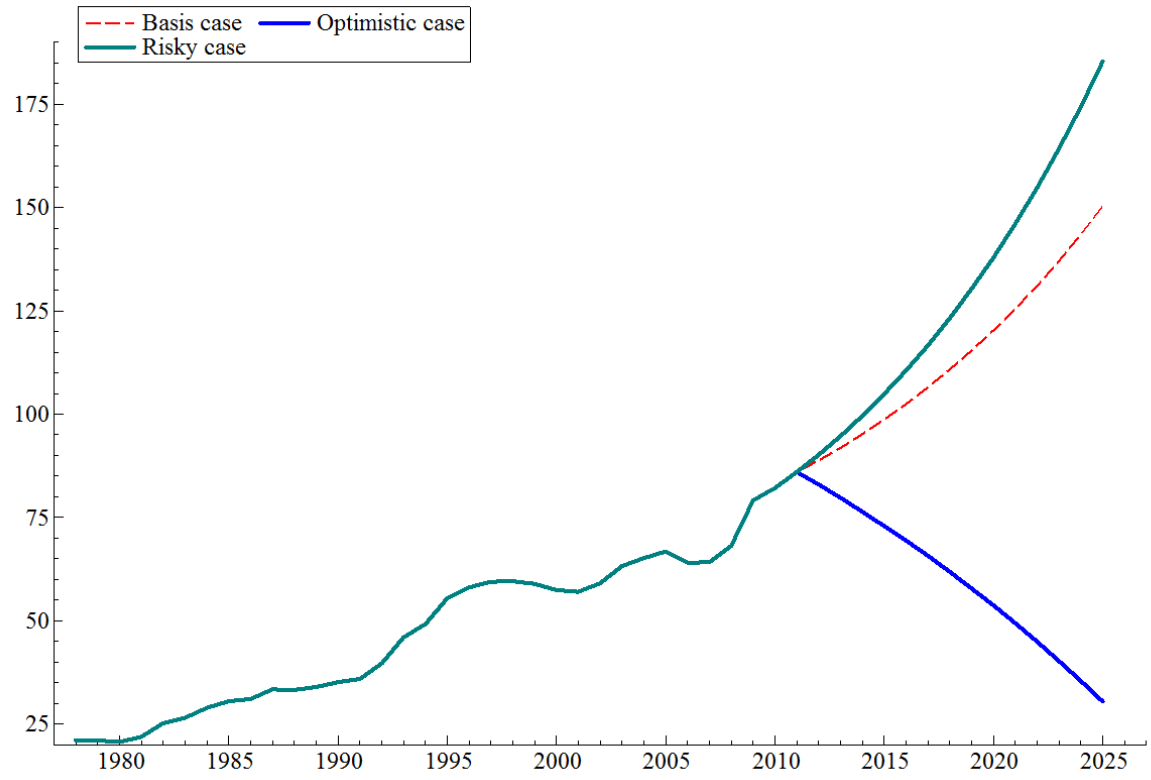
In our baseline scenario, which describes no fiscal interventions (social security funds exhibit a constant deficit), constant GDP rate (that is no economic growth) and invariable long term interest rates, France will not be able to reduce neither its primary deficit nor its debt ratio in the long run (see **Figure 6** and **Figure 7**). With a prevailing deficit combined with no growth

[16] The complete simulation results for debt to GDP and Primary surplus can be found in **Appendix A**

and a slightly high interest rate, France hits a debt ratio of over 100% of GDP as early as 2016; by 2025 the debt level will be around 150% of GDP. The primary surplus ratio will remain around -3% of GDP; the ratio will be close to -5% of GDP by 2025 (see **Appendix A** and **Figure 7**).

The results from the "risky/pessimistic" scenario describing failure to commit to fiscal discipline show that France`s primary deficit will get close to -5% of GDP by 2015 and reach -7% by 2025. The lack of the commitment to budgetary discipline will replicate into public debt reaching almost 140% of GDP by 2020, and reaching the ultimate heights of 185% of GDP by 2025.

Figure 6 Gross Public Debt as % of GDP (including projections)



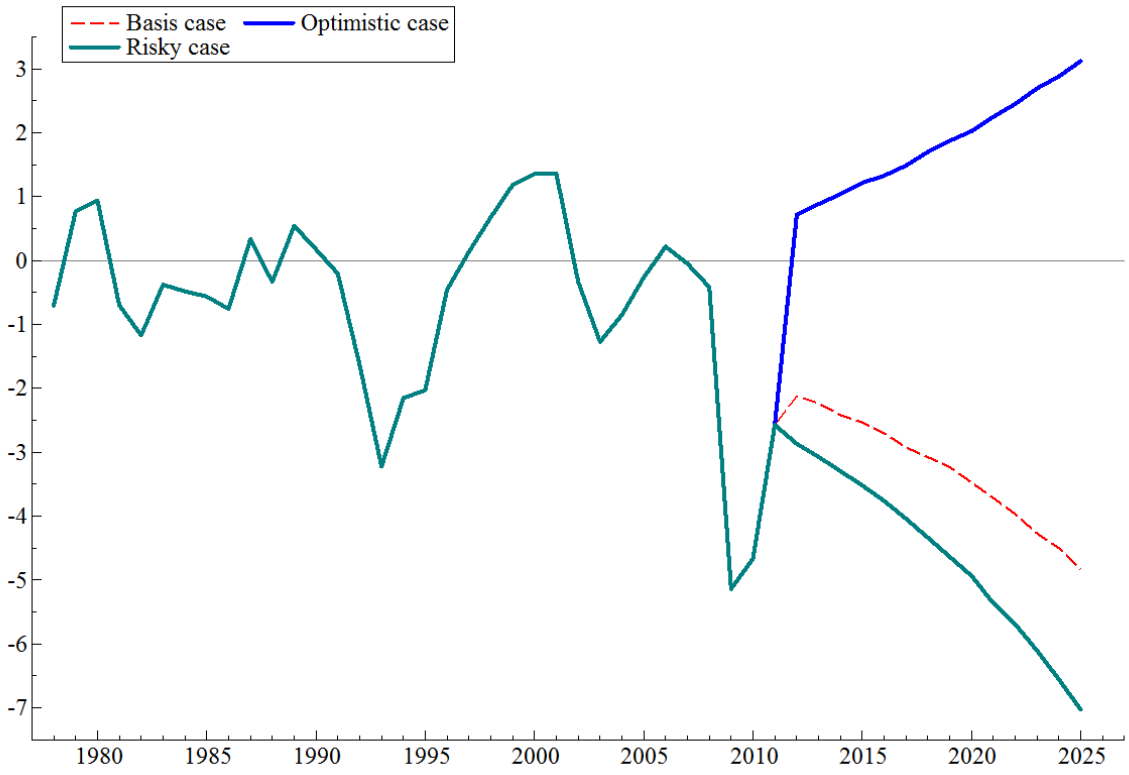
Source: Appendix B

The commitment to consolidation reforms described in the" positive/ optimistic" scenario will propel the French economy unto higher primary surplus ratios and subsequently into an

improved fiscal position. Already by 2012, the results show that the primary deficit will turn into a surplus, improving by 3.2% points compared to the year before; by 2025 the primary surplus would have reached 3% of GDP.

Regarding debt dynamics, the results are promising; by 2019 the debt ratio is below the 60 % debt ceiling Maastricht requirement, in 2025 the debt ratio will be as low as 30% of GDP. The assumed differential between the long term interest rate and GDP growth rate (γ_t) will be enough to stabilize the unsteady debt dynamics (see **Table 5 B**). Proving that improvements to economic growth compared to the prevailing interest rate will have a strong stabilizing effect in fiscal dynamics.

Figure 7 Primary Balance as % of GDP (including projections)



Source: Appendix B

The outcome in the "positive "scenarios shows that debt stability can be achieved if the differential between the long term interest rate and the GDP growth rate is low enough

($\gamma_t = int_t - \rho_t$). Theoretically, γ_t can be adjusted in a very optimistic way in order to ensure overall fiscal dynamics stability. However, in practice, business cycle hinders γ_t of being a controllable parameter. Additionally, the reality is that the French economy is stagnating; the alternative option for the French fiscal authorities will be to change the stance of the prevailing fiscal policy to incite debt balance.

Given the results found in the baseline and "risky" scenario, the evolution of public debt illustrates that reversing the debt momentum in France will be quite a challenging task. Existent deteriorated fiscal policies combined with high public debt and weak GDP growth compared to interest rate developments will lead to explosive debt dynamics. This will require France to determinedly pursue consolidation policies over long period of time. According to our analysis the effects of such developments on the economy and people's well-being could be worse if France is not able to summon up the needed budgetary discipline

5.4 Alternative Approach to Stabilizing debt dynamics

In the previous section, we estimated for future debt ratios in France using scenarios of fiscal consolidation and macroeconomic variable variations to generate future debt levels given a status quo of unsustainable fiscal policy. The results generated show that debt dynamics will stabilize only if the differential between the interest rate and the GDP growth (described by γ_t) is small enough to dominate the instability (see **Table 5 B**) .

In section we introduce an alternative stabilizing strategy towards debt dynamics. The underlying reasoning is to change the dynamics between the primary surplus ratio and the foregoing debt ratio in equation (4). More specifically, we impose a stabilizing value to the response coefficient β_1 of the primary balance ratio to past debt ratio; recall in our sustainability test, β_1 is an indicator of whether the prevailing fiscal policy is sustainable or not.

First, we revisit the dynamic equation for the primary surplus (4) described in section 5.3. The purpose is to show the origin of the explosive pattern exhibited by debt dynamics in order to then control for that pattern. Holding the remaining exogenous variables constant, we start by rewriting equation (4) in the intensive form (see **Table 4 C**):

$$s_t = -0.0468 b_{t-1} \qquad (4a)$$

Combining equation (4a) with the estimated regression equation for debt ratio forecasts generated in the scenario case (see **Table 5 A**), and holding the other exogenous variables constant we get:

$$b_t = b_{t-1} - 1.1362 s_t \qquad (15a)$$

By inserting (4a) into (15a), we get:

$$b_t = b_{t-1} - 1.1362[(-0.0468) b_{t-1}] \qquad (15b)$$

$$= (1 + 1.1362 * 0.0468)\ b_{t-1} \qquad (15c)$$

$$= 1.05 b_{t-1} \qquad (15d)$$

Hence, debt dynamics in the explosive cases is generated by the relationship described in (15d).

Next we proceed to control the unstable effect donned by the relationship described in (15d) in the baseline and pessimistic scenario. Let us start with the following equality; it is replicate of equation (4a), where X is the unknown estimate value:

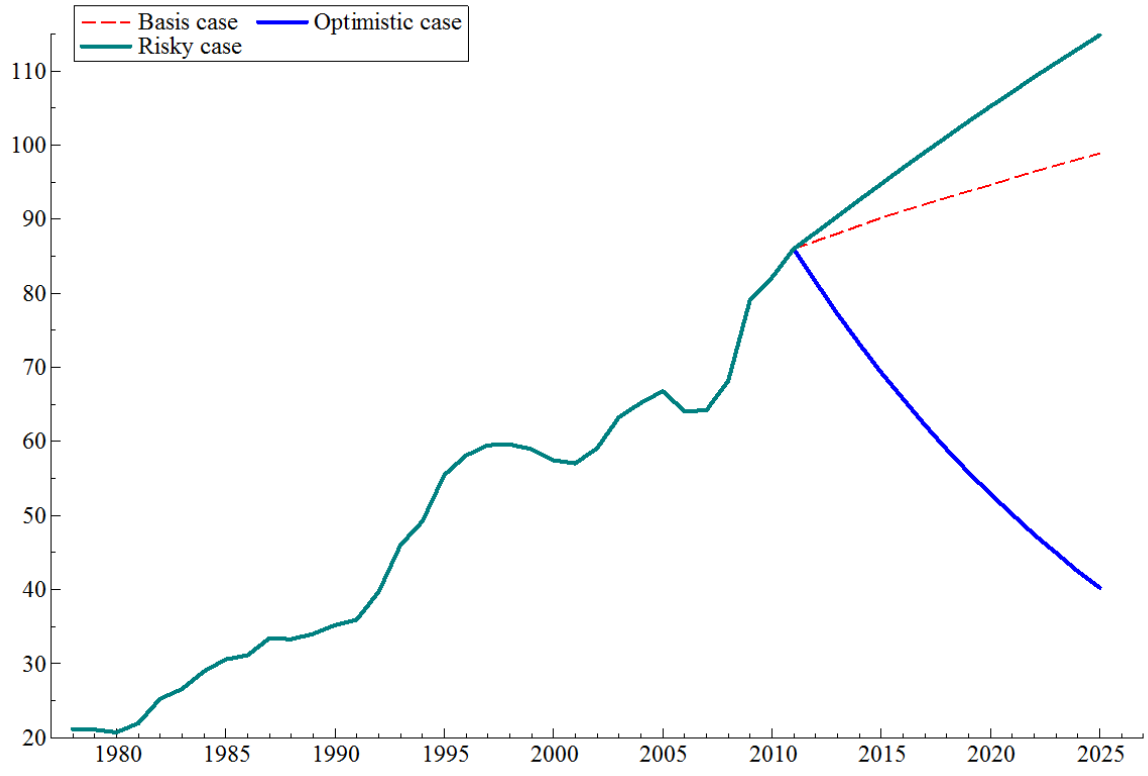
$$s_t = X b_{t-1}$$

The task is to impose an adequate response value describing the counter reaction of the French government to growing debt ratios. In this analysis, we opted for $X = 0.03$.The new simulations results are gathered in **Table 5 C** (and demonstrated **Figure 8)**.

Table 5 C Stabilized debt ratios (% of GDP)

France	Det- to -GDP ratio	
	2020	2025
baseline scenario	94,61 %	98,89 %
Risky/ pessimistic scenario	105,24 %	114,87 %
Positive/optimistic scenario	53 %	40 %

Figure 8 Stabilized debt dynamics



Source: Appendix B

In the baseline scenario, debt ratios will still amount to considerable heights. However, in this case, the growth path will noticeably be more contained and stable. There are no signs of default, if robust fiscal consolidation policies are to be implemented, debt will be reduced.

Under poor fiscal discipline, government debt will reach 115% of GDP in 2025. Although the country`s fiscal position ameliorates compared to that revealed in section 5.3, insufficient consolidation measures will still plunge France into a downward spiral.

The results in the positive scenario reinforce the principle that an adequate fiscal policy combined with high growth and low long term interest rates will bring debt ratios down to considerable levels in 2025. Economic stimulus and commitment to consolidation including adjustments to the social security funds will allow France to achieve sustainable debt reduction.

In this section, our examination shows that adding the element of stability through the process of imposing the reaction coefficient of fiscal policy to 0.03, government debt growth in France will be contained in both the baseline and risky scenarios; exhibiting a more balanced path (compare **Figure 9** to **Figure 8**). This is evidence that the key to achieving sustainable fiscal and debt policies are appropriate budgetary responses to government spending, public transfers, various taxes or like in our analysis adjustments to social spending

6 Conclusion and summary

This analysis undertakes an empirical examination of whether the French government is able to respond in a sustainable manner to the persistent tendency of considerable budget deficits and growing levels of debt. Based on the paper of Fincke and Greiner (2009), we test for fiscal sustainability by investigating the response of the primary surplus to GDP with respect to public debt to GDP covering a period from 1978 to 2011. In addition to the primary surplus ratio and debt to GDP ratio variables, our sustainability test equation includes a variable that characterize the French social security funds surplus and dummy variables that account for important financial shocks during these three last decades. The main assumption to our estimation model is the theory that the growth rate of GDP be inferior to the long term interest rate on government bonds. Moreover, we exclude the possibility of seignorage and "Ponzi Schemes". The OLS regression results show that the expected response of the primary surplus to GDP to a variation on debt to GDP is destructive, -0.0468; the coefficient is statistically significant and the negative effect describes that the prevailing fiscal policy fails to reduce growing debt ratios. In other words, fiscal policy in France is unsustainable, high debt is met with higher deficits, a situation that calls for fiscal consolidation measures.

Having found fiscal unsustainability for the period between 1978 and 2011, we simulated for future debt to GDP to investigate the characteristics of its path in the long run under three dissimilar scenarios of fiscal consolidation. To undertake this analysis, we add a debt to GDP dynamics equation that accounts for the debt accumulation. This regression equation features a primary surplus to GDP to account for the response of fiscal policy reforms on the debt ratio. We also add a variable that accounts for the differential between the long term interest rate and the GDP growth rate; the differential parameter denotes the snowball effect. This effect derives from the underlying assumption that as long as interest rate exceeds GDP growth rate, a government will accumulate debt. The forecasting results of the primary deficit to GDP and public debt to GDP are explosive in the baseline and "risky/pessimistic" scenarios; a clear indication that weak economic growth and high long term interest rates combined with a negative correlation between primary surplus and debt makes long term sustainability a challenging task.

The simulation results also reveal that, given an unsustainable fiscal policy, debt dynamics will stabilize only under the condition that the GDP growth rate is to grow significantly higher than the long term interest rate.

Given the explosive characteristics of debt growth in the baseline and risky scenarios, we attempt to stabilize the debt dynamics by imposing a value to the average estimated coefficient describing the response of the primary surplus given a marginal change in the debt ratio; the estimate is set the value of 0.03. The outcome in the baseline scenario shows that France will manage to reduce its debt ratio.

In the "risky/pessimistic" scenario, the imposed criterion of the fiscal policy is not enough to reverse debt ratios form their rising path. The snowball effect will prevail, although contained; France will not be able to achieve sustainable debt levels by 2025. Nevertheless, the scenario does not map out any indication of sovereign default risks beyond 2025. France will only be able to reverse the situation if the appropriate fiscal alterations are implemented.

References

Adam C. S., D. L. bevan (2004), "Fiscal Deficit and Growth in Developing Countries", Elsevier of Public Economics, Vol.89, No.4, 571-597

Aiyagari S. R., E. R McGrattan (1994), "The Optimal quantity of Debt", Federal Reserve Bank of Minneapolis Working Paper, No.538

Behaghel L., D. Blanchet, T. Debrand, M. Roger (2011), "Disability and Social Security Reforms: The French Case", Paris School of Economics Working Paper, No.2011-02

Blassone F., M. Francese, A. Pace (2011), "Public debt and Economic Debt in Italy", Banca D`Italia Economic History Working Paper

Barrell, R., D. Holland and I. Hurst (2012), "Fiscal Consolidation: Part 2. Fiscal Multipliers and Fiscal Consolidations", OECD Economics Department Working Papers, No.933, OECD Publishing

http://dx.doi.org/10.1787/5k9fdf6bs78r-en

Baumann A., C. Broyer, A-K Petersen., R. Schneider (2012) :" Scenarios fort he government debt in Europe" Economic Research and Corporate development Working Paper No.151

*https://www.allianz.com/v.../media/.../en/.../**debtscenarios**may12.pdf*

Boissinot J., C. L`Angevin, B. Monfort (2004) "Public Debt Sustainability: Some Results on the French Case", French National Institute of Statistics and Economic Studies (INSEE) Direction Des Etudes et Synthèses Économiques

Borre O., E. Scarbrough (1995), "The Scope of Government", Oxford University Press

Blöchliger, H., D. Song and D. Sutherland (2012), "Fiscal Consolidation: Part 4. Case Studies of Large Fiscal Consolidation Episodes", OECD Economics Department Working Papers, No. 935, OECD Publishing

http://dx.doi.org/10.1787/5k9fdf5xptlq-en

Cecchetti S. G., M. S. Mohanty and F. Zampolli (2010), "The future of public debt: prospects and implications", Bank of International Settlememts (BIS) Working Paper, No 300

http://dx.doi.org/10.2139/ssrn.1599421

Champar P., J. P Cotis (2010), "Rapport Sur La Situation Des Finances Publiques "

Checherita C., P. Rother (2010), "The impact of High and Growing Government Debt on Economic Growth: An empirical investigation for the Euro Area", European Central Bank Working Paper, No.1237

Chouraqui J. C., B. Jones, R. Montador (1986), "Public Debt in a Medium- Term Context and Its Implications for Fiscal Policy", OECD Economics Department Working Papers, No.30, OECD Publishing

http://dx.doi.org/10.1787/628367225815

Desbonnet A., T. Weitzenblum (2012), "Why Governments End Up With Debt? Short-Run Effects Matter", Economic Inquiry (ISSN 0095-2583), Vol.50, No 4, 905-919

Diamond, P. (1965), "National Debt in a Neoclassical Growth Model", The American Economic Review, Vol.55, No 5, 1126-1150

Égert B. (2011), "Bringing the French Public Debt Down: The Option for Fiscal Consolidation", OECD Economics Department Working Papers, No.858, OECD Publishing

http://dx.doi.org/10.1787/5kgdpn1hhc7k-en

Elmendorf D. W., N.G. Mankwi (1998), "Government Debt", National Bureau of Economic Research Working Paper No. 6470

Esposito P., A. paradise, B.B. Rao (2011), "The Debt Dynamics of Selected Euro Area Countries and Sustainable Paths of Fiscal Consolidation", University of Munich (Germany) MPRA Working Paper, No.32563

Greiner A., and B. Fincke (2009), "Public Debt and Economic Growth", Dynamic Modeling and Econometrics in Economics and Finance, Vol. 11, 5-69, Springer-Verlag Berlin Heidelberg

Irons J., J Bivens (2010), "Government Debt and Economic Growth", Economic Policy Institute, Report: Budget Taxes and Public Investment

Hagemann R. (2012), "Fiscal Consolidation: Part 6. What Are the Best Policy Instruments for Fiscal Consolidation?" OECD Economics Department Working Papers, No. 937, OECD Publishing

http://dx.doi.org/10.1787/5k9h28kd17xn-en

Holzmann R., R. Neck. (2001)" Public Debt: Causes, Effects and Prospects", Empirica, Vol. 28, No 1, 1-2

Kumar S.M., J. Whoo (2010), "Public Debt and Growth", IMF Fiscal Affairs Department Working Paper, Vol 10, No 174

Ley E. (2010), "Fiscal (and External) Sustainability", The world Bank Economic Policy and Debt Department

Martin E., I. Tyrell, I. Yakadina (2011), "France: Lessons from Past Fiscal Consolidation Plans", International Monetary Fund Working Paper, No.89

Merola R., D. Sutherland (2012) "Fiscal Consolidation: Part 3. Long –Run Projections and Fiscal Gap Calculations", OECD Economics Department Working Paper, No. 934, OECD Publishing.

http://dx.doi.org/10.1787/5k9h28p42pf1-en

Molnar, M. (2012), "Fiscal Consolidation: Part 5. What Factors Determine the Success of Consolidation Efforts?", OECD Economics Department Working Papers, No. 936,OECD Publishing.

http://dx.doi.org/10.1787/5k9h28mzp57h-en

Mondigliani, F (1961), "Long Run Implications of Alternative Fiscal Policies and the Burden of the National Debt", Economic Journal, Vol.71, No284, 730-755

Misztal P. (2010), "Public Debt and Economic Growth in the European Union", Spiru Haret University, Faculty of Financial Management and Accounting Craiova, Journal of Applied Economic Sciences, Vol 5, No.3 (13), 292-302

Nautet M., L. Van Meensel (2011), "Economic Impact of Public debt", Economic Review

Neck R., J.E. Sturm (2004), "Fiscal Sustainability: The unpleasant European Case", Money Macro and Finance (MMF) Research Group Conference 2004.

Panico C. (2010), "The Causes of the Debt Crisis in Europe and the role of Regional Integartion", University of Massachusetts Working Paper, No.234

Rao B. B. (2006),"Time Series Econometrics of Growth Models: A Guide for Applied Economists", University of South Pacific, Suva, Fiji.

Reinhart C. M., K. S Rogoff (2010), "Growth in time of Debt", National Bureau of Economic Research (NBER), No15639, National Bureau of Economic Research Inc

Schclarek A. (2004), "Debt and Economic Growth in Developing and Industrial Countries", Lund University, Department of Economics Working Paper, No 2005: 34

Sutherland, D., P. Hoeller and R. Merola (2012), "Fiscal Consolidation: Part 1. How Much is Needed and How to Reduce Debt to a Prudent Level?", OECD Economics Department Working Papers, No. 932, OECD Publishing.

http://dx.doi.org/10.1787/5k9h28rhqnxt-en

Tanzi V., L Schuknecht (2000), "Public Spending in the 20th Century", Cambridge University Press

Wright T. (2012) "What if Europe Fails?" Center of Strategic and International Studies, The Washington Quarterly, Vol 35, No 3, 23-41

http://dx.doi.org/10.1080/0163660X.2012.703584

Data Annex [17]

Data Annex 1 Fiscal surplus/Deficit

Year	Fiscal balance in (% of GDP)	Year	Fiscal balance in (% of GDP)
1978	-1,7	**1995**	-5,5
1979	-0,4	**1996**	-4,0
1980	-0,3	**1997**	-3,3
1981	-2,4	**1998**	-2,6
1982	-2,9	**1999**	-1,8
1983	-2,6	**2000**	-1,5
1984	-2,8	**2001**	-1,6
1985	-3,1	**2002**	-3,3
1986	-3,3	**2003**	-4,1
1987	-2,1	**2004**	-3,6
1988	-2,7	**2005**	-2,9
1989	-1,9	**2006**	-2,3
1990	-2,5	**2007**	-2,7
1991	-3,0	**2008**	-3,3
1992	-4,6	**2009**	-7,5
1993	-6,5	**2010**	-7,1
1994	-5,5	**2011**	-5,2

[17] All the data are from the French National Institute of Statistics and Economic Studies (INSEE) except for the data on the long term interest rate which was collected from OECD Statistics

Data Annex 2 Gross Public debt (billion Euro and % GDP)

Year	Gross public debt	
	in billion Euro	in % GDP
1978	72,8	0,211600227
1979	82,8	0,210999711
1980	92,2	0,207327941
1981	110,1	0,219574082
1982	145,5	0,252741902
1983	170	0,265855754
1984	201,4	0,289766495
1985	227,7	0,305857062
1986	249,3	0,311266887
1987	281,2	0,334336899
1988	302,8	0,333057582
1989	333,3	0,340304661
1990	363,6	0,352059626
1991	385,1	0,359512389
1992	440,1	0,397207687
1993	515,4	0,460247321
1994	570	0,49227844
1995	663,5	0,554682174
1996	712,7	0,581033602
1997	752,5	0,594935404
1998	787,4	0,59601689
1999	805,9	0,58953711
2000	827,3	0,574672163
2001	853,3	0,570557953
2002	912	0,59108385
2003	1004,9	0,63284738
2004	1079,5	0,652040661
2005	1147,6	0,667967679
2006	1152,2	0,640781964
2007	1211,6	0,642148127
2008	1318,6	0,682083287
2009	1492,7	0,791562885
2010	1591,2	0,821365836
2011	1717,3	0,860119467

Data Annex 3 Central Government and sub-sectors debt (as defined in the Maastricht Treaty)

Year	state		Various bodies of central government		Local government		Social security funds		General government	
	In billions of Euros	% of GDP	In billions of Euros	% of GDP	In billions of Euros	% of GDP	In billions of Euros	% of GDP	In billions of Euros	% of GDP
1978	44,4	**12,9**	1,0	**0,3**	23,9	**6,9**	3,5	**1,0**	72,8	**21,2**
1979	49,8	**12,7**	1,1	**0,3**	27,6	**7,0**	4,4	**1,1**	82,8	**21,1**
1980	55,1	**12,4**	1,2	**0,3**	30,9	**6,9**	5,0	**1,1**	92,2	**20,7**
1981	67,3	**13,4**	1,3	**0,3**	35,8	**7,1**	5,6	**1,1**	110,1	**22,0**
1982	94,7	**16,4**	2,0	**0,3**	42,5	**7,4**	6,3	**1,1**	145,5	**25,3**
1983	111,3	**17,4**	2,5	**0,4**	49,1	**7,7**	7,1	**1,1**	170,0	**26,6**
1984	133,5	**19,2**	2,7	**0,4**	55,8	**8,0**	9,5	**1,4**	201,4	**29,0**
1985	151,6	**20,4**	2,8	**0,4**	63,8	**8,6**	9,6	**1,3**	227,7	**30,6**
1986	170,4	**21,3**	4,1	**0,5**	68,7	**8,6**	6,0	**0,7**	249,3	**31,1**
1987	191,7	**22,8**	4,8	**0,6**	78,2	**9,3**	6,5	**0,8**	281,2	**33,4**
1988	211,8	**23,3**	1,6	**0,2**	81,6	**9,0**	7,8	**0,9**	302,8	**33,3**
1989	238,2	**24,3**	1,8	**0,2**	85,1	**8,7**	8,2	**0,8**	333,3	**34,0**
1990	263,1	**25,5**	2,2	**0,2**	90,0	**8,7**	8,3	**0,8**	363,6	**35,2**
1991	277,2	**25,9**	2,3	**0,2**	95,0	**8,9**	10,7	**1,0**	385,1	**36,0**
1992	320,3	**28,9**	2,4	**0,2**	99,5	**9,0**	17,9	**1,6**	440,1	**39,7**
1993	379,7	**33,9**	5,2	**0,5**	104,3	**9,3**	26,3	**2,3**	515,4	**46,0**
1994	435,4	**37,6**	5,2	**0,4**	108,2	**9,3**	21,2	**1,8**	570,0	**49,2**
1995	485,6	**40,6**	33,4	**2,8**	110,6	**9,2**	33,9	**2,8**	663,5	**55,5**
1996	528,5	**43,1**	30,3	**2,5**	112,4	**9,2**	41,4	**3,4**	712,7	**58,1**
1997	564,5	**44,6**	26,7	**2,1**	105,3	**8,3**	56,0	**4,4**	752,5	**59,5**
1998	610,8	**46,2**	23,8	**1,8**	105,7	**8,0**	47,0	**3,6**	787,4	**59,6**
1999	636,7	**46,6**	19,6	**1,4**	105,1	**7,7**	44,6	**3,3**	805,9	**59,0**
2000	657,7	**45,7**	19,2	**1,3**	105,2	**7,3**	45,3	**3,1**	827,3	**57,5**
2001	685,5	**45,8**	17,8	**1,2**	105,4	**7,0**	44,5	**3,0**	853,3	**57,1**
2002	746,0	**48,3**	15,4	**1,0**	104,1	**6,7**	46,6	**3,0**	912,0	**59,1**
2003	810,0	**51,0**	23,7	**1,5**	107,8	**6,8**	63,3	**4,0**	1 004,9	**63,3**
2004	851,2	**51,4**	21,9	**1,3**	111,5	**6,7**	94,8	**5,7**	1 079,5	**65,2**
2005	898,6	**52,3**	20,9	**1,2**	117,9	**6,9**	110,2	**6,4**	1 147,6	**66,8**
2006	896,2	**49,8**	15,3	**0,9**	125,6	**7,0**	115,0	**6,4**	1 152,2	**64,1**
2007	932,8	**49,4**	22,8	**1,2**	135,5	**7,2**	120,3	**6,4**	1 211,6	**64,2**
2008	1 040,9	**53,8**	11,6	**0,6**	146,3	**7,6**	119,9	**6,2**	1 318,6	**68,2**
2009	1 168,4	**62,0**	18,7	**1,0**	155,2	**8,2**	151,2	**8,0**	1 493,4	**79,2**
2010	1 244,8	**64,3**	14,1	**0,7**	161,1	**8,3**	175,0	**9,0**	1 595,0	**82,3**
2011	1 335,1	**66,9**	10,4	**0,5**	166,3	**8,3**	205,2	**10,3**	1 717,0	**86,0**

Data Annex 4 Total Government revenues and spending

Year	GDP	Revenue	Spending	Year	GDP	Revenue	Spending
1978	344	147,9	153,8	**1995**	1 196,20	585,3	650,6
1979	392,4	174,9	176,3	**1996**	1 226,60	619,1	668,5
1980	444,7	203,2	204,4	**1997**	1 264,80	643,5	685,3
1981	501,4	231,4	243,4	**1998**	1 321,10	662,3	697
1982	575,7	270,4	287,1	**1999**	1 367,00	694,3	719
1983	639,4	304,8	321,2	**2000**	1 439,60	722,2	744,1
1984	695	336,5	356	**2001**	1 495,60	747,9	772,6
1985	744,5	363,3	386,3	**2002**	1 542,90	765,1	815,8
1986	800,9	384,3	410,7	**2003**	1 587,90	783	848
1987	841,1	408,6	426,5	**2004**	1 655,60	821,9	881,8
1988	909,2	430,6	455,1	**2005**	1 718,00	869,4	920,4
1989	979,4	460,6	479,2	**2006**	1 798,10	909,8	952,6
1990	1 032,80	486,5	512,1	**2007**	1 886,80	940,7	992,6
1991	1 071,20	511	543	**2008**	1 933,20	965,4	1 030,00
1992	1 108,00	525,1	576,2	**2009**	1 885,80	928	1 070,60
1993	1 119,80	540,9	613,2	**2010**	1 937,30	958,3	1 095,60
1994	1 157,90	562,8	626,1	**2011**	1 996,60	1 014,80	1 118,70

Data Annex 5 Interest Payment and Primary Balance (in billion Euro and % GDP)

Year	Interest Payment	Primary surplus/ Primary deficit	Primary surplus/ Primary deficit in % of GDP
1978	3,5	-2,4	-0,70 %
1979	4,4	3	0,80 %
1980	5,4	4,2	0,90 %
1981	8,5	-3,5	-0,70 %
1982	10	-6,7	-1,20 %
1983	14,1	-2,4	-0,40 %
1984	16,1	-3,3	-0,50 %
1985	18,7	-4,2	-0,60 %
1986	20,4	-6	-0,80 %
1987	20,7	2,8	0,30 %
1988	21,5	-3	-0,30 %
1989	24	5,3	0,50 %
1990	27,4	1,8	0,20 %
1991	29,8	-2,2	-0,20 %
1992	32,9	-18,1	-1,60 %
1993	36,2	-36,1	-3,20 %
1994	38,4	-24,9	-2,20 %
1995	41,1	-24,2	-2,00 %
1996	43,8	-5,6	-0,50 %
1997	43,6	1,8	0,10 %
1998	43,7	9	0,70 %
1999	40,9	16,2	1,20 %
2000	41,5	19,5	1,40 %
2001	45,1	20,4	1,40 %
2002	45,6	-5,1	-0,30 %
2003	44,8	-20,2	-1,30 %
2004	45,8	-14,1	-0,80 %
2005	46,4	-4,5	-0,30 %
2006	46,7	3,9	0,20 %
2007	51	-0,9	0,00 %
2008	56,6	-8	-0,40 %
2009	45,8	-96,9	-5,10 %
2010	47	-90,4	-4,70 %
2011	52,6	-51,3	-2,60 %

Data Annex 6 GDP growth rate (in levels and % change of previous year)

GDP growth in France up to 2011		
year	**by value**	**by volume**
1978	13,5	3,9
1979	14,1	3,4
1980	13,3	1,6
1981	12,8	1,0
1982	14,8	2,4
1983	11,1	1,2
1984	8,7	1,5
1985	7,1	1,6
1986	7,6	2,3
1987	5,0	2,4
1988	8,1	4,7
1989	7,7	4,2
1990	5,4	2,6
1991	3,7	1,0
1992	3,4	1,5
1993	1,1	-0,7
1994	3,4	2,2
1995	3,3	2,0
1996	2,5	1,1
1997	3,1	2,2
1998	4,4	3,4
1999	3,5	3,3
2000	5,3	3,7
2001	3,9	1,8
2002	3,2	0,9
2003	2,9	0,9
2004	4,3	2,5
2005	3,8	1,8
2006	4,7	2,5
2007	4,9	2,3
2008	2,5	-0,1
2009 (r)	-2,5	-3,1
2010 (r)	2,7	1,7
2011 (p)	3,1	1,7

r: revised data
p: provisional data

Data Annex 7 Long term interest rate and the Balance of social security funds

Year	LT interest rate	Net lending/ Net borrowing of social security funds in % GDP
1978	10,612	-0,116263861
1979	10,848	0,789974762
1980	13,784	0,697089606
1981	16,292	-0,1595452
1982	15,998	-0,06948231
1983	14,368	0,547350083
1984	13,404	0,359690287
1985	11,867	0,134324577
1986	9,119	-0,574339223
1987	9,476	-0,035668944
1988	9,08	-0,098993337
1989	8,798	0,091891448
1990	9,933	-0,09682608
1991	9,037	-0,466777965
1992	8,588	-0,758133281
1993	6,775	-0,973359681
1994	7,216	-0,509551368
1995	7,535	-0,677155329
1996	6,311	-0,350560473
1997	5,582	-0,245089668
1998	4,64	-0,030277719
1999	4,609	0,431600564
2000	5,394	0,798831123
2001	4,939	0,708767643
2002	4,861	0,239803755
2003	4,13	-0,245607004
2004	4,099	-0,652342671
2005	3,41	0,017461686
2006	3,798	0,13347307
2007	4,304	0,243800048
2008	4,234	0,698325828
2009	3,648	-0,795433997
2010	3,118	-1,202729008
2011	3,32	-0,636086719

Appendix

Appendix A Regression results for the simulation model (equation (14))

	Coefficient	Std. Error	t-Statistic	Prob.
C(10)	-0.009355	0.005667	-1.650670	0.1092
C(14)	-1.136158	0.155961	-7.284875	0.0000
C(13)	0.010072	0.002615	3.851809	0.0006

R-squared	0.995902	Mean dependent var	0.490177
Adjusted R-squared	0.995629	S.D. dependent var	0.187711
S.E. of regression	0.012410	Akaike info criterion	-5.854050
Sum squared resid	0.004621	Schwarz criterion	-5.718004
Log likelihood	99.59182	Hannan-Quinn criter.	-5.808274
F-statistic	3645.371	Durbin-Watson stat	2.070865
Prob(F-statistic)	0.000000		

Appendix B Debt to GDP and Primary surplus forecasts (scenario analysis)

Year	Debt to GDP			Primary surplus to GDP		
	Baseline case	Posistive/ Optimistic case	Risky/ Pessimistic case	Baseline case	Posistive/ Optimistic case	Risky/ Pessimistic case
1978	0,211600227	0,211600227	0,211600227	-0,007017774	-0,007017774	-0,007017774
1979	0,210999711	0,210999711	0,210999711	0,007704802	0,007704802	0,007704802
1980	0,207327941	0,207327941	0,207327941	0,009421908	0,009421908	0,009421908
1981	0,219574082	0,219574082	0,219574082	-0,006990493	-0,006990493	-0,006990493
1982	0,252741902	0,252741902	0,252741902	-0,011698268	-0,011698268	-0,011698268
1983	0,265855754	0,265855754	0,265855754	-0,003767708	-0,003767708	-0,003767708
1984	0,289766495	0,289766495	0,289766495	-0,004810023	-0,004810023	-0,004810023
1985	0,305857062	0,305857062	0,305857062	-0,005625648	-0,005625648	-0,005625648
1986	0,311266887	0,311266887	0,311266887	-0,007552349	-0,007552349	-0,007552349
1987	0,334336899	0,334336899	0,334336899	0,003365995	0,003365995	0,003365995
1988	0,333057582	0,333057582	0,333057582	-0,003328343	-0,003328343	-0,003328343
1989	0,340304661	0,340304661	0,340304661	0,005434266	0,005434266	0,005434266
1990	0,352059626	0,352059626	0,352059626	0,001773147	0,001773147	0,001773147
1991	0,359512389	0,359512389	0,359512389	-0,002011748	-0,002011748	-0,002011748
1992	0,397207687	0,397207687	0,397207687	-0,016368134	-0,016368134	-0,016368134
1993	0,460247321	0,460247321	0,460247321	-0,032234235	-0,032234235	-0,032234235
1994	0,49227844	0,49227844	0,49227844	-0,021508612	-0,021508612	-0,021508612
1995	0,554682174	0,554682174	0,554682174	-0,020268847	-0,020268847	-0,020268847
1996	0,581033602	0,581033602	0,581033602	-0,004550275	-0,004550275	-0,004550275
1997	0,594935404	0,594935404	0,594935404	0,001384282	0,001384282	0,001384282
1998	0,59601689	0,59601689	0,59601689	0,006805069	0,006805069	0,006805069
1999	0,58953711	0,58953711	0,58953711	0,011819491	0,011819491	0,011819491
2000	0,574672163	0,574672163	0,574672163	0,01355665	0,01355665	0,01355665
2001	0,570557953	0,570557953	0,570557953	0,013637692	0,013637692	0,013637692
2002	0,59108385	0,59108385	0,59108385	-0,003329513	-0,003329513	-0,003329513
2003	0,63284738	0,63284738	0,63284738	-0,012698449	-0,012698449	-0,012698449
2004	0,652040661	0,652040661	0,652040661	-0,008487401	-0,008487401	-0,008487401
2005	0,667967679	0,667967679	0,667967679	-0,00264399	-0,00264399	-0,00264399
2006	0,640781964	0,640781964	0,640781964	0,002194425	0,002194425	0,002194425
2007	0,642148127	0,642148127	0,642148127	-0,000461068	-0,000461068	-0,000461068
2008	0,682083287	0,682083287	0,682083287	-0,004146504	-0,004146504	-0,004146504
2009	0,791562885	0,791562885	0,791562885	-0,051370718	-0,051370718	-0,051370718
2010	0,821365836	0,821365836	0,821365836	-0,046662272	-0,046662272	-0,046662272
2011	0,860119467	0,860119467	0,860119467	-0,025693897	-0,025693897	-0,025693897
2012	0,888269497	0,829906963	0,901853445	-0,021221141	0,007152037	-0,028673953
2013	0,918574427	0,797985044	0,947129847	-0,022313244	0,008848482	-0,030716261
2014	0,951925352	0,764132172	0,996189744	-0,024184321	0,010406569	-0,032932567
2015	0,98721361	0,729444337	1,048947769	-0,025324285	0,012169128	-0,035166069
2016	1,024628982	0,694384373	1,105911103	-0,027012064	0,013291567	-0,037605244
2017	1,065302266	0,657365269	1,166345503	-0,02923115	0,014879095	-0,040396925
2018	1,108435724	0,618762771	1,232339846	-0,030757305	0,017014055	-0,043348234
2019	1,154177823	0,578579202	1,303377156	-0,032303214	0,018751822	-0,046339284
2020	1,202884609	0,537805217	1,378870873	-0,034713529	0,020253525	-0,049327688
2021	1,255126875	0,494665145	1,460604941	-0,037144182	0,022501609	-0,053599413
2022	1,310548637	0,449577017	1,547987717	-0,039643784	0,024523009	-0,056905638
2023	1,371007043	0,402618772	1,642883609	-0,042686199	0,026974618	-0,061054866
2024	1,435097422	0,354805207	1,743791886	-0,044971362	0,028831434	-0,065531305
2025	1,503708143	0,304938796	1,853446614	-0,048291769	0,03123396	-0,070288848

Appendix C Debt to GDP forecast (stabilizing approach)

Year	Debt to GDP		
	Baseline case	Positive/Optimistic case	Risky/Pessimistic case
1978	0,211600227	0,211600227	0,211600227
1979	0,210999711	0,210999711	0,210999711
1980	0,207327941	0,207327941	0,207327941
1981	0,219574082	0,219574082	0,219574082
1982	0,252741902	0,252741902	0,252741902
1983	0,265855754	0,265855754	0,265855754
1984	0,289766495	0,289766495	0,289766495
1985	0,305857062	0,305857062	0,305857062
1986	0,311266887	0,311266887	0,311266887
1987	0,334336899	0,334336899	0,334336899
1988	0,333057582	0,333057582	0,333057582
1989	0,340304661	0,340304661	0,340304661
1990	0,352059626	0,352059626	0,352059626
1991	0,359512389	0,359512389	0,359512389
1992	0,397207687	0,397207687	0,397207687
1993	0,460247321	0,460247321	0,460247321
1994	0,49227844	0,49227844	0,49227844
1995	0,554682174	0,554682174	0,554682174
1996	0,581033602	0,581033602	0,581033602
1997	0,594935404	0,594935404	0,594935404
1998	0,59601689	0,59601689	0,59601689
1999	0,58953711	0,58953711	0,58953711
2000	0,574672163	0,574672163	0,574672163
2001	0,570557953	0,570557953	0,570557953
2002	0,59108385	0,59108385	0,59108385
2003	0,63284738	0,63284738	0,63284738
2004	0,652040661	0,652040661	0,652040661
2005	0,667967679	0,667967679	0,667967679
2006	0,640781964	0,640781964	0,640781964
2007	0,642148127	0,642148127	0,642148127
2008	0,682083287	0,682083287	0,682083287
2009	0,791562885	0,791562885	0,791562885
2010	0,821365836	0,821365836	0,821365836
2011	0,860119467	0,860119467	0,860119467
2012	0,87055218	0,815459423	0,882100538
2013	0,880786654	0,772165066	0,904111072
2014	0,891203092	0,731862371	0,926157938
2015	0,90185725	0,693018835	0,947665085
2016	0,911345973	0,657705662	0,969566458
2017	0,920275425	0,622109516	0,990658591
2018	0,929242611	0,589057534	1,011223821
2019	0,937958264	0,558021333	1,032245691
2020	0,946079338	0,529191231	1,052360711
2021	0,955459021	0,501619667	1,07186529
2022	0,964305756	0,4742868	1,092011716
2023	0,972636928	0,449781607	1,11101904
2024	0,980884121	0,424643119	1,129785885
2025	0,988869669	0,402554168	1,148677823