DERIVATIVES, FISCAL POLICY AND FINANCIAL STABILITY

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Abstract

The massive use of derivatives and securitisation by sovereign States for public debt and deficit management is a growing phenomenon in financial markets. Financial innovation can alter the stability of the public sector finance, and modify risks effectively run. The experience of some developed and developing countries is surveyed to look at main instruments used and aims of public finance. Financial stability of the public sector is analysed considering financial innovation use. The case of Italy and its scarce disclosure of information is presented. An IS-LM model is used to capture the effect of financial innovation on fiscal policy for high indebted (European) industrialised countries, with deficit constraints, starting from Blanchard (1981). The use of financial innovation can have various effects over debt and deficit management, given binding external burden (like the European criteria) in the short run as far as risks are properly considered, expectations of fiscal policy are coherent with that of markets, and no exogenous shock occurs.

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Introduction

Derivatives are far the biggest financial innovation used on modern financial markets worldwide; their notional amount has reached the value of $220 trillion OTC at end June 2004 with an increase of 12% over the last semester. Exchange traded derivatives reached the value of $ 288 trillion, with a fall of 5% over the last semester. The fall of exchange-traded derivatives is due mainly to more homogeneous expectations over future path of economic growth (BIS, 2004).

Derivatives are widely used because of their high liquidity degree, low costs (if compared with the traditional equivalent investment) normal volatility level and leverage effects; market players are banks, non-financial firms and Sovereign States, according to the BIS survey; the disclosure about single investors' exposure is not deep enough to get a complete picture of the situation from the BIS survey, but from 2005 on this lack will be improved. Sovereign States have recently incurred in these financial instruments because of their ability to provide hedging against interest and exchange rates, manage debt and sometimes helping in raising funds, e.g. by anticipating future tax revenue. Securitisation is another way Sovereign State manage assets, debt and current deficit, and is technically different from a swap contract although the economic functions are similar (high liquidity, reasonable costs and normal volatility). Some countries face internal and external budget constraints; European countries have Maastricht criteria to satisfy, other than domestic policy. Some countries have also introduced an increasing fiscal federalism, like Italy, and others have to deal with competitive financial markets where issuing bonds is not a cost-less operation. Financial assistance in both cases is a strategic tool to achieve financial stability, which represents a necessary goal of economic policy, being it fiscal or monetary.

European countries characterised by high debt, like Italy, Belgium, and Greece, face two constraints: one over deficit level which should be no more than 3% of GDP and one over the path of debt, which should converge to 60%. Getting out of the European Monetary Union is too costly for these countries, for various country-specific reasons[1] and we will not get deeply into it, but we consider that domestic authorities do not consider it as possible.

Recent analysis of financial innovation has not yet considers explicitly their role in public debt management, considering effects over financial stability. Our aim is then to introduce derivatives (and other similar financial innovation instruments) into policy analysis as to get a clearer picture of possible effects, and considering risks.

Section 1 surveys some countries' experiences over financial innovation use; section 2 surveys in details the situation of Italy and public administration's use of derivatives and securitisation; section 3 looks at the implications of financial derivatives use by fiscal authorities; section 4 is devoted to the Blanchard

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[1] See P. De Grawe, 2003, where cost-benefit analysis is developed.

(1981) model description and main reasons driving the study; section 5 modifies it in order to consider explicitly derivatives in fiscal policy, equilibrium setting, and possible shocks. Finally concluding remarks summarise main findings and light the way over possible future research.

1. Financial Innovation and Fiscal Policy: Some Countries' Experience

Financial innovation influences modern fiscal policy in two different ways: first, it helps in tax saving by taxpayers; secondly, financial innovation can be used by the State itself (centrally or locally) to lower the cost of debt, to improve the cash and debt management, and reduce costs (OECD, 2002).

Instruments used by the taxpayers are derivatives, while the public sector can use derivatives and/or securitisation for debt management. Securitisation is a way to pool together credits and other financial assets (Assets Backed Security, ABS), sell them on the market to institutions, which utilise securitisation to finance their business. Assets are generally held by tax neutral vehicle (Special Purpose Vehicle, SPV), and it issues rated debt to fund the purchase of these assets. Derivatives used for public debt management are swaps, FRAs and many others, depending on needs, debt structure and characteristics.

Looking at taxpayers, derivatives' strategies are useful for tax timing option, i.e. postponing revenues and realising losses, as to lower the total amount of revenues, and then taxes to be paid; this has been shown for firms and households (see Zeng, 2004 and Salcedo, 2003 respectively) and then induce a loss in total revenues of the State.

By helping taxpayers to lower their burden, derivatives confirm their nature, i.e. are used to shift risks and satisfy needs of customers, being more efficient than traditional financial instruments. The tax saving has been demonstrated in the US tax system by many authors and will not be taken as given; the European tax system is highly fragmented, and recently the European Commission has asked for homogenous definitions of what to tax and by whom, but not yet on how much, leaving it to the freedom of countries. Each European country has a different tax system for financial revenues and it increases tax arbitraging, since it is theoretically possible to move from a country to another and save. This could be confirmed looking at firms, which prefer lower tax rate countries, like Ireland (Fondazione La Malfa, 2002).

Benefits of financial innovation's use by Sovereign State are that it is an off-balance sheet item and increases funds available to public sector, given budget criteria (e.g. Maastrict or IMF); increases international transparency, since capital markets are under intense international scrutiny; is alternative to privatisation, which is not always the sole solution to exploit public goods; diversifies investments and betters debt management. The clearness and disclosure of the strategy is very important for the market to believe in a sovereign State finance management.

Examples of countries actively using financial innovation to manage debt and deficit (locally and centrally) are known and we can briefly summarise them basing on a rough distinction: North America States, developed countries (Austria, Denmark, Greece, Italy) and developing ones (Brazil, Hungary, India, Israel).

Table 1 Derivatives used by North America States

STATE	YEAR	NOTIONAL AMOUNT	INSTRUMENT	PURPOSE
Massachussets	2001	1.3 bln $	IR swap	Interest rate hedging
New Jersey	2004-2006	3 bln $	Swap	Infrastructure financing
New York	2005-2006	2 bln $	IR swap	Interest rate hedging
New York	1999-2004	5 bln $	IR swap	Interest rate hedging
Texas-Houston	2004	200 mln $	Swap	Lowering costs of financing
Texas-Houston	2004	1.53 bln $	Securitisation	Future tax revenue
California	2004	600 mln $	IR swap	Debt management and infrastructure financing

Source: the Bond Buyer (various issues)

North American States enjoy a high degree of fiscal autonomy thus rendering necessary to finance current expenditure, infrastructures other than raising taxes in order not to incur in any deficit; some of these States are even bigger than some Europeans so that the dimension of financing operations is high, together with the frequency. Over the last years most operations are due to interest rate hedging, debt management and infrastructure financing; this last purpose is particularly difficult to evaluate over future budget years since changes in rates can affect the cost of these swaps thus rendering necessary other issues. Disclosure of information about these operations is quite good, since main specialised newspapers report them. Historical data about past activities in derivatives is not available, rendering a comprehensive stress analysis not possible.

Table 2 Derivatives Use by Sovereign States

COUNTRY	YEAR	NOTIONAL AMOUNT	DEBT/GDP %	PURPOSE
Brasil	2002	$170 bln	54.5	$ swap
Hungray	2001	$150 mln	53.4	securitisation
India	1999	$10 bln	63	IR swap
Israel	2000	$200 mln	91	IR and currency swap
Austria	2001-2002	€ 13 bln	66.56	IR swap
Austria	2001-2002	€ 15 bln	67.3	currency swap
Denmark	2001	120.5DKK bln	47.77	swap
Italy	1999-2001	€ 6.5 bln	110	securitisation
Europe	2002	€ 145 bln	62.9	securitisation
Greece	2002	€ 3.745 bln	104.73	securitisation

Source of data on Derivatives: OECD, 2002; on debt/GDP: Datastream.

Brazil has been hit by external shock over 2001 and effects last for 2002

and over. Currency depreciated by 40% in 9 months of 2001, FDI lowered and inflation increased; derivatives have been used to hedge against this adverse shock and instruments are dollar futures, interest rate futures, interest and exchange rates swaps, and forwards, for a total 170 billion dollars (December 30th 2001). Monetary policy intervened to enhance liquidity in the market and increase overnight target rate. Monetary and fiscal authority worked together to manage foreign exchange denominated debt and not boosting the exchange rate, issuing a dollar indexed bonds and supplying hedge to the market.

Hungary, as a country willing to access the European Union, has to control monetary and real variables under strict rules; public debt outstanding reached the value of 30 billion euro, which is small compared to other European countries, and securitisation has been chosen as a debt and risk management technique. A marginal role is given to these innovative instruments, since market risks can be influenced.

India has 63.7% debt over GDP ratio and uses extensively financial innovation to manage its costs. In March 2002 there were $10 billion of derivatives transactions outstanding. Derivatives allowed are swaps and FRAs, written on interest and exchange rates and in various forms (caps, collars). The massive use of these instruments has growth dramatically over the '90s and '00s because of increasing deficit and internationalisation of trading. Derivatives are used to manage risks, increase liquidity of markets, attracting investors, and providing shorter dates on markets.

Israel has debt over GDP ratio at 96% in 2001, 26% of which is foreign, and has introduced a single debt manager to enhance risk management, build an infrastructure for advanced pricing capability, and to find an optimal benchmark for liabilities portfolio. Derivatives are used "strategically in restructuring the liabilities portfolio vis-à-vis the benchmark". Instruments used are swaps, collars, swap-options; derivatives are chosen basically on risk-cost measures (efficient frontier) and to reshape the portfolio according to the benchmark.

Austria uses derivatives since 1981 such as swaps, for long-term management, and FRAs, for short term, on interest and exchange rates. The Austrian Federal Financing Agency is the external agency in charge to raise funds and restructure portfolio; particular attention is due to credit risk and liquidity management.

Denmark uses extensively derivatives for debt management and instruments are basically swaps: currency, interest rates, structured, liability, asset and portfolio. In 2001 the total principal amount outstanding was 121 billion Danish krona (16 billion euro). Aim of this extensive use is to lower "long-term borrowing costs, while taking into account risks associated with the debt"[2]. Strict rating requirements support derivatives purchases together with the tendency toward plain vanilla style contract.

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[2] Cf. "The role of derivatives in Danish debt policy", in OECD, 2002.

Greece has used securitisation as a debt management instrument and has securitised credits coming from lottery, air traffic, and revenue from the EU. The amount of securitised assets is however, much lower than other European countries, and reached 3,745 million euro.

Italy with its 106% debt over GDP ratio in 2003 is one of the most sensible country to debt management problems; securitisation is one of the instruments used to hedge public debt and it has been applied to the National Institute of Social Security (INPS), and to the Public Real Estate. Credits have been securitised and performances were different in the two cases, because of their different nature. Credits of National Security are financial assets which can be traded on the market, domestically and abroad, without much difficulty, while Italian public real estates have an incredible burden of rules, limits and privileges which let their trading more complicate and time consuming. However, both operations were successful and raise funds up to 9 billion euro[3]. The use of derivative instruments by the Italian public sector will be analysed in depth in the following paragraph.

In its reducing costs trough the use of innovation, especially interest rate and currency swaps, what need to be carefully considered are risks effectively taken by the State. Credit, liquidity and market risks are related to derivatives' use. Many crashes of firms and banks have been caused by some form of mismanagement (Barings, LTCM, and many others). Often only credit and market risks are considered, so that if a liquidity problem arises, it can have very bad effects. One example of public institution which did not considered liquidity risk in its derivatives investing strategy was the **Orange County** (California) which bankrupted in 1994, after having realised 1,6 billion losses. As explained by Marthinsen (2003), the loss was due to mismanagement of funds by the County, which was unable to consider risk effectively run. The poor control and monitoring systems were unable to look after what was happening to County's funds, which realised high revenues with very aggressive (and un-hedged) financial operations, managed by Mr Citron, a self-educated blue-collar of the County. Total portfolio of Orange County amounted to 7.6 billion dollars, all excess funds of the County and of 200 other municipal entities (schools, hospitals and so on). The Federal Reserve decided in February 1994 to rise interest rates to avoid the US economy overheating[4]; portfolio of Orange County was made mainly by structured notes, fixed-income securities and inverse floating-rates notes, all interest rate sensible assets. Leverage of portfolio was more than 2.5 (trough the use of reverse repurchase agreements). The fund manager, Mr Citron, has bet on falling interest rates in designing the portfolio structure, so that in front of an unexpected monetary and credit restriction, at the beginning, he believed in the goodness of the strategy and doubled all positions[5]. At the end of 1994 the return of investment was –

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[3] Cf. "The role of securitisation of public assets: the Italian experience", in OECD, 2002.
[4] Treasury Bill rate moved from 3.54 to 7.14% over 1994.
[5] This was the same mistake made by Mr. Leeson, which lead to the bankrupt of Barings Bank.

38.55%[6]. The news that the County had a bad structured portfolio induce all market players to ask back funds and close all positions with the County. Liquidity restrictions (and not credit or market risks) lead to the bankrupt of the County, which asked for Chapter 9 creditor protection.

The role of derivatives in the crash is limited to the reverse repurchase agreements (a type of forward contract). However, inverse floating-rates notes are considered as derivatives-type instruments, so that the total derivatives-related losses of the County was about 700 million dollars[7]. The general lesson to be learned by the Orange County crash is that safety, liquidity and high yield are not possible to reach together; an opaque and complicate investing strategy can create much risk than costs it saves (or profits it makes).

2. The Case of Italy: Public Debt and Derivatives

Local municipalities, thanks to increasing devolution of fiscal sovereignty, and of a fixed percentage of national income tax, must finance public services, like education or health care, and infrastructures, like roads, and transports. This has contributed to increase the fiscal pressure over taxpayers; Cities and Municipalities have introduced new taxes on real estate[8], and Regions have introduced a tax on firms' revenues[9]. On the other hand, they had to finance their deficit by issuing bonds. These bonds pay interest rate to holders, they have looked for hedging strategies against adverse interest rates' movements. Banks and financial advisors are the economic institutions, which develop new instruments to satisfy the needs of customers, gain a profit and move the frontier of market. Local municipalities gain in the short run from hedging strategies and succeed in reducing costs, but it is not clear which is the burden of costs that can potentially come out over a longer period of time.

The *Corte dei Conti*, the administrative controller of Italian public accounting and practises, has stated that swap can be used to manage the lower resources available from the centre to the periphery of the State; specifically, the interest rate swap is designed to exchange interest rates paid on bonds issued on domestic and international markets; this practice is allowed since 2001 by the State budget law. Tuscany Region, Sicily Region, Provinces of Varese and Pavia, Cities of La Spezia, Reggio Emilia, Udine and Venice have used swaps advised by J. P. Morgan Chase and other prestigious banks. The Lazio Region has opened an Office devoted to help municipalities in the Region to develop the best hedging strategy and saving costs. The public sector has to update its

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[6] See Marthinsen, (2003) cap. 6 for data and details.
[7] Marthinsen, by confronting different replication strategies of the portfolio, concludes that derivatives' role in the bankrupt can be considered as much smaller (about 330 million dollars over the total 1.6 billion) and poses some doubts about the effective liquidity crisis of the County.
[8] The *Imposta Comunale sugli Immobili* (ICI).
[9] The *Imposta sui Redditi delle Attività Produttive* (IRAP).

knowledge and exploit new financing means and instruments, and their well-known advantages.

In a speech at the Italian Senate of the Republic in March 2004, the General Director of the Finance Ministry, and actually deputy Minister, Domenico Siniscalco (2004a), had explained the way the public sector uses derivatives, and guarantees that risks are properly addressed. Some local municipalities have been a little bit too aggressive and maybe not much cautious, but sound monitoring and control are guaranteed.

Italian public debt is composed at 54% by long-term fixed rate bonds (*Buoni Poliennali del Tesoro*, BPT), and at 31% by short and long term floating rate bonds (*Buoni Ordinari del Tesoro*, BOT and *Certificati di Credito del Tesoro*, CCT). The share of floating rate bonds is around 25-30%, and the debt's costs have been lowered in the last 10 years, from 14.05% to 3.8%, thanks also to lowering European interest rates. Average life of debt has increased, together with the duration over the last decade, and reached 5.9 years. Issuance techniques of the Italian Governement are auctions, syndications, exchange offers and various combinations of the latter (Ministero dell'Economia, 2003). Using syndicated deals long-term bonds, foreign currency denominated bonds and innovative instruments are placed.

A bond exchange program has been allowed since 2002 to manage risks more efficiently, to obtain a smoother debt redemption profile, and to enhance the liquidity of the secondary market (Ministero dell'Economia, 2004a). Debt management policy in 2003 has been oriented to new benchmarks on the long part of the yield curve, has introduced new inflation-linked bonds, and has lowered the amount of floating rate bonds (Ministero dell'Economia, 2004b).

Debt management in 2004 will follow guidelines for 2003, and issue at least 8 billion US$ denominated bonds, and 2-2.5 billion in other markets for a total 10 billion euros (Ministero dell'Economia, 2004b).

Recently, the Ministry of Economy, Siniscalco (2004b), has given some numbers about the activity of local public authorities (Regions, Cities, Provinces, and Municipalities) on the use of derivatives and their purposes (table 3). The Italian Treasury admits the lack of data about this activity, which has reached 856 million euro notional amount total from February to July 2004 only, and the dynamic evolution of financial markets is an objective obstacle against a clear picture of instruments, counterparts and markets involved. 35% of Italian Regions, 31% of Municipalities and 28% of Provinces engage in swap activities, but many local authorities have not provided complete data. What is remarkable is that cost saving is not one of the main reasons for the Italian Governement to use derivatives, since it is less than 1% of notional value, compared to open market operation (table 4).

Table 3 Derivatives use by Italian local public administration Year 2003

Region	Overall debt*	Swap	Up front
Piemonte	331.715.222,50	152.632.379,45	223.291,00
Lombardia	458.371.923,21	97.278.045,99	1.195.416,43
Veneto	286.171.192,51	49.012.653,48	445.047,33
Friuli Venezia Giul	357.499.369,52	148.342.418,02	0
Liguria	173.803.197,25	81.450.799,54	0
Emilia Romagna	349.023.525,95	66.348.069,61	800.000,00
Nord	1.956.584.430,94	595.064.566,09	2.663.754,76
Toscana	742.289.308,12	229.292.745,33	153.000,00
Umbria	33.623.267,04	33.791.163,27	574.000,00
Marche	176.470.759,53	39.274.213,89	519.935,71
Lazio	177.307.230,68	176.836.220,70	1.971.496,56
Centro	1.129.690.565,37	479.194.543,19	3.218.132,27
Abruzzo	280.636.879,38	134.163.691,18	2.226.427,74
Molise	40.044.999,73	12.290.025,80	250.000,00
Campania	136.754.837,98	33.902.521,29	450.000,00
Puglia	253.410.884,65	174.558.260,08	5.217.431,26
Basilicata	42.219.276,64	21.511.065,98	300.000,00
Calabria	154.272.361,40	128.317.634,48	2.786.077,63
Sicilia	62.420.854,27	32.123.408,79	705.000,00
Sardegna	178.564.898,46	15.489.062,03	0
Sud-Isole	1.148.324.992,51	552.355.669,63	11.934.936,63
TOTAL	4.234.599.988,82	1.626.614.578,91	17.817.123,66

* net of long term financing and short term debt

Source: Corte dei Conti, Il Sole 24 Ore (2004).

The Ministry sets which types of derivatives can be traded by public authorities, and these are: plain vanilla interest rate swap, interest rate cap, interest rate collar, and forward rate agreements (FRAs). All derivatives should be "plain vanilla" style, i.e. no derivatives on derivatives, no exotic or structural instruments linked to any principal. In particular, knock-in swaps are forbidden (i.e. if the Euribor reaches a pre-defined - high - level, the authority pays twice the Euribor to the counterpart). Positions are limited too, in particular long and short position can be taken on swaps and FRAs, but only long positions on cap and collar are allowed. In Table 4 there are some qualitative information provided by the Ministry of Economy on request, where options are, however, still present.

The problem of restructuring existing derivatives liabilities, which are not allowed any more (like options), is solved by saying that the relative costs cannot be shifted to future budget years (when derivatives effectively expire).

Risks should be bear (and paid) by who raised them. The problem of the authority who should look after derivatives' trading has been solved, since the Treasury is the only able to allow for derivatives purchases by local authorities. Counterparty in derivatives contracts should have the same rating of the Italian republic.

The database of derivatives activity by local authorities is not accessible, and the Treasury admits having some troubles in collecting complete data about derivatives from Regions (Siniscalco, 2004, p. 9). No punishment or fine is ruled for those providing false (or even no) data.

The picture of derivatives' use by the Public sector is not complete at the moment, since public data are not provided. They should be given according also to European savings protection principles. Every financial operation has immediate effects but induces some forms of risk, which can show up in the future. This dilemma is as old as the State itself: the incentive to cheat, gain and be re-elected can overcome the potential costs of the worse scenario.

Many other countries, industrialised and developing, engage in derivatives activity to hedge on domestic and international markets[10]. Plain vanilla swaps and options are widely used and back office procedures and control are crucial not to raise other risks.

Denmark and Australia, for example, use interest rate and currency swaps to lower long-term borrowing costs. Only high rated counterpart (A3, AA) can be involved in such operations; preference toward plain vanilla type of contracts is given, together with and the inclusion of cross-default clauses, which help decreasing credit risks. Other developing countries, having high external debt like Brazil, use derivatives to hedge and lower the cost of debt. Monetary policy cooperation plays a central role in this last case, since monetary and economic conditions are much complicate, and the rating of these countries is not very high.

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[10] For details see OECD, 2002.

Tab. 4 The Italian Public Sector: Derivatives Activity

September 1th, 2004

Types of contracts

	YES	NO
Swap	X	
Option	X	
FRAs		X
Repurchase agreement		X
Forex agreement	X	
Future		X
Other	X	

Characteristics of Contracts

Underlying

	YES	NO
Interest Rate	X	
Exchange Rate	X	
Credit		
Commodity		
Other		

Market Structure

	YES	NO
Plain vanilla	X	
Structured	X	
Exotic		
Barrier		
knock in		
Other		

Time lenght

	YES	NO
Overnight		
One week		
One month	X	
Six Months	X	
Less than a year	X	
More than a year	X	
More than two years	X	
More than five years	X	
More than ten years	X	

Type of Counterparts

	YES	NO
Sovereign States		
Italian banks and financial intermediaries	X	
Foreign banks and intermediaries	X	
Italian firms		
Foreign firms		
Other		

Rating of counterparts

	YES	NO
High rated	X	
Low rated		
No rating		
Rating is not necessary		

Costs of operations: intermediation fee
(as a percentage of notional value)

	YES	NO
Less than1%	X	
Less than 5%		
More than 5% but less than 10%		
Less than 15%		
More than 15%		

Other costs
(as a percentage of notional value)

	YES	NO
Less than1%	X	
Less than 5%		
More than 5% but less than 10%		
Less than 15%		
More than 15%		

Costs saving with respect to open market operation
(as a percentage of notional value)

	YES	NO
Less than1%	X	
Less than 5%		
More than 5% but less than 10%		
Less than 15%		
More than 15%		

Source: Italian Treasury.

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3. Implications of Derivatives' Use by Fiscal Authorities

The use of financial innovation and derivatives by public sector has certain cost savings' effects, and brings benefits to national and international financial markets, increasing liquidity and efficiency of public debt and deficit management. The growth rate of these markets and contracts is justified by their efficiency in costs saving and pricing systems, and by their liquidity and flexibility; the public sector, as a player of financial markets, benefits from financial innovation improvements.

However, financial innovation directly increases existing risks (market, credit, liquidity and counterparty) over a pre-determined time length, and then could act in the opposite direction of financial stability. OTC derivatives can indirectly induce different forms of risk thanks to the opacity of trading, low transparency of settlements systems, and scarce accounting and registration principles; moreover, the interaction between central and local public authorities using financial innovation can alter financial equilibrium and modify the allocation process of resources from the centre to the periphery.

A public sector characterised by a heavy burden of debt outstanding should exhibit low risk loving behaviour, not to increase existing risks; using financial innovation for debt and cash management has positive effects, but in case of shocks can exacerbate risks, giving raise to a different cost-return of portfolio. A distinction between high and low indebted countries has to be done, before proceeding with the analysis; financial innovation is a powerful tool of debt management and creates positive savings, but **European high indebted countries** (i.e. with debt/GDP ratio more than 70%, like Italy, and Greece) have to manage the combination of risks-costs and returns-costs saving of financial innovation's use in order not to modify the dynamic of debt and let it become unstable. European countries have to exhibit a decreasing path of debt in order to reach the 60% target of debt over GDP (a Maastricht criteria), together with a decreasing deficit to sustain the debt reduction process. Financial innovation and its cost savings is then particularly attractive for these countries, with developed financial markets and international credibility, because it helps reaching policy goals, but on the other side should be balanced with the public moral hazard in using instruments which can bring future costs.

European countries have multiple limits on their balance sheet, since they have to reach a year budget deficit $(G_t - T_t)$ and contribute not to increase outstanding debt (B_{t-1}). More formally:

$$B_t = B_{t-1} + r_t B_{t-1} + (G_t - T_t) \qquad\qquad (3.1)$$

The dynamic behaviour of European countries debt and deficit should be such that:

$$\lim_{t \to n} \frac{B_t}{GDP_t} \le 60\% \qquad\qquad (3.2)$$

$$\frac{(G_t - T_t)}{Y_t} \leq 3\% \forall t \tag{3.3}$$

An active use of derivatives can be considered as a tool to control the cost of debt ($r_t B_{t-1}$), to hedge outstanding debt (B_{t-1}) and to manage deficit, i.e. increasing revenues and decreasing expenses (e.g. by means of privatisation).

An active use of derivatives for hedging and speculation can be an indirect source of financial instability and can influence the investment-saving relationship of the public sector. The I-S relationship is dependent on sensitivity to invest and save, measured by the slope of the IS curve (steeper or flatter); the sensitivity influences the elasticity of the curve with respect to income (Y), a part of which is made by investment, and the interest rate (r), the price of investment (and savings). Financial innovation, whose use is based on expectations, by influencing the ability of the State to borrow on market and inducing new risks, trough leverage effects, increases the instability of the I-S relationship (its slope can change if adverse shocks take place).

The indirect effects of derivatives are also to be linked with the tax timing options of tax-payers (firms and households), enhancing liquidity risks for the State. At a macroeconomic level the tax timing option can influence the relationship between investments and savings, since the private sector can have more resources at disposal and exhibit more risk loving behaviour, increasing the IS curve slope.

A very active use of derivatives by private and public sectors can be a source of "real" instability; derivatives affect financial markets, increasing instability in case a shock occurs, but a comprehensive analysis of monetary aspects is left to a separate research.

We can use these intuitions to modify existing macro model and look at the effects, positive or not, of the use of financial innovation (securitisation, derivatives) by the public sector and analyse policy behaviour, given previous country experience.

4. A Macro Model Considering Expectations

Blanchard (1981) extended the traditional IS-LM model to consider the role of expectations, of asset prices and their interaction with output. We will proceed with summarising Blanchard model in this paragraph, and in following sections proceed with extensions.

Main hypotheses are that "the economy is closed, the physical capital stock is constant, there are one good and four marketable assets, which are shares of physical capital, there are private short term and long term bonds, issued and held by individuals, and outside money"[11]. There are three main spending determinants: "shares of the stock market, which being short term, influences

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[11] See O. Blanchard (1981) p. 132.

consumption, and influences investments, by determining capital value, trough its replacement cost" (Tobin's Q). Output depends on stock market and fiscal policy.

Real spending (d) is composed by the stock market value (q), real income (y), and influenced by fiscal policy (g).

$$d = aq + \beta y + g;$$

$$a > 0; \tag{4.1}$$

$$0 < \beta \leq 1$$

An interesting consequence of the first equation of 4.1 is that, following an increase in aggregate demand, inventories are decumulated first, and then production is increased. Output adjusts to spending over time, so that its growth rate can be expressed as:

$$\dot{y} = \sigma(d - y) = \sigma(aq + g - by) \tag{4.2}$$

$$\sigma > 0 \qquad b \equiv 1 - \beta > 0$$

Spending equals production, but actual spending adjusts slowly to desired spending d.

The asset market is in equilibrium if there is no arbitrage on short term return of the three assets; the portfolio balance is characterised by LM curve:

$$i = cy - h(m - p)$$

$$c > 0; h > 0 \tag{4.3}$$

$$r^* \equiv i - \dot{p}^*$$

where i is short term nominal interest rate, y is real income, m is log of nominal money, p is log of price level, r is real short term rate, r* is the expected level of the rate, and $\dot{p}^*$ is expected rate of inflation. By imposing no arbitrage between long and short term bonds, and considering R as long term interest rate we get that:

$$r^* = R - \dot{R}^* / R \tag{4.4}$$

By considering the no arbitrage condition between short-term bonds and shares, if q is real value of stock market, the expected real rate of return on holding shares is:

$$\dot{q}^* / q + \pi / q, \tag{4.5}$$

where π is real profit, and

$$\pi = \alpha_0 + \alpha_1 y \qquad \alpha_1 \geq 0 \tag{4.6}$$

Following Tobin, the link between financial and real markets is the value of stock market, q. The no arbitrage condition between shares and bonds on long and short term leads to:

$$\frac{\dot{q}^*}{q} + \frac{\alpha_0 + \alpha_1 y}{q} = r^* \tag{4.7}$$

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To close the model let's suppose expectations are rational, so that we miss only the equation of price level behaviour.

First Blanchard simplifies the system by hypothesising fixed prices, so that actual and expected inflation is zero; nominal and real variables coincide. At the steady state, the system of equations simplifies to:

$$\dot{y} = \sigma(aq - by + g)$$

$$r = cy - h(m - p)$$

$$\frac{\dot{q}^*}{q} + \frac{\alpha_0 + \alpha_1 y}{q} = r \qquad (4.8)$$

$$r = R - \frac{\dot{R}}{R}$$

Expected rate of interest (r^*) has been replaced by r, and last equation is the term structure.

Blanchard (1981) looked at the effects of monetary and fiscal expansions under fixed price hypothesis and at monetary expansion under flexible price; the effects of a discrete change in current or anticipated policy is a discrete change in the stock market due to the change in the anticipated sequence of profits and interest rates. This, in turn, affects spending and output over time. Output and the stock market change because of a policy movement. The announcement effect plays a central role in the effectiveness of policy manoeuvre, since it can change anticipated profits and discount rate, leading to an effective change of the stock market[12]. The Author underlines a perverse effect of fiscal policy announcement, since it can decrease output, because of crowding out effect, before the policy is even implemented; this is mainly due to the rational expectations hypothesis.

Rational expectations hypothesis of the Blanchard model is coherent with financial innovations' use by authorities (as other investors) since is not in contrast with increasing perfectiveness of financial market following the decrease in inefficiencies due to derivatives introduction, as underlined by many authors (see for examples Savona, 2004, von Hagen and Fender, 1999). The complete information hypothesis and the perfect foresight would render the model, although elegant and stylish, useless for policy analysis, being it too far from real policy-making. Recent New Keynesian models (Woodford, 2003) are trying to fill this gap, but still stay with perfect (asset) market hypothesis, which render derivatives useless, or at least not a useful policy instruments; given that derivatives in complete and perfect markets are equivalent to the underlying asset, why should the central bank look at derivatives? Moreover, these models consider the Government as issuing risk-less bonds; this last hypothesis is the most difficult to modify since it introduces non-linear

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[12] See O. Blanchard (1981) page 141.

solution and infinite equilibria (a first attempt has been made by Benigno and Woodford, 2004), rendering the model less intelligible.

5. A Modified Model to Consider Financial Innovation's Use in Fiscal Policy

5.1 The model

In this sections we will try to modify Blanchard model to consider explicitly financial innovation as a tool of fiscal policy; Blanchard model is flexible enough to model a modern fiscal policy behaviour, considering monetary policy as given and not dependent from fiscal policy, and a portfolio approach. The Blanchard model is also free of the criticisms we explained in the previous paragraph. We consider as given the separation between the two policy authorities and do not alter any characteristic of monetary policy with respect to the Blanchard original model. We are conscious that financial innovation alters financial market's behaviour as well (i.e. LM curve), and this should be directly modelled. This issue has been addressed by Savona (2004) and will be further developed in a separate research project.

The introduction of financial innovation use into fiscal policy behaviour (*g*) changes slightly the specification of the model, and its main implications. The distinction between short and long-term adjustment will be given. An active use of financial innovation is particularly interesting for those countries characterised by high deficit and debt, either domestic or foreign currency denominated; financial innovation can be particularly useful for cash management and hedging, to lower costs and bettering portfolio balancing. Our analysis will be focused on heavily indebted countries, or running high deficit like Italy, the U.S., and Brazil.

The index of fiscal policy, *g*, contrary to Blanchard model, where it was considered as full employment deficit target, here has to be considered as the debt-deficit level targets. Decreasing debt and deficit targets are assimilated to a restrictive fiscal policy, and this comes with a lowering public expenditure, decreasing national spending (*d*). Fiscal policy uses financial innovation to hedge and, basing on some expectations on future interest rates level, fixes the amount of interest to be paid on bonds, in between a certain corridor of rates. To introduce financial innovation we need to consider expectations[13].

We can introduce expectations in the model, by assuming that the no arbitrage condition considers risk premium (χ).

$$R - \frac{\dot{R}}{R} = r + \chi = i - p^* + \chi \qquad (5.1.1)$$

Expectations are the most important ingredient in a portfolio composed of bonds, money and financial innovation; we have to clarify a bit more the dynamic evolution of debt and expenditure in order to consider the case of

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[13] See O. Blanchard and S. Fischer (1989), page 532.

European Highly Indebted Countries. These countries usually look for an investment strategy, having some pre-determined expectations over future interest rates, and choose a corridor of rates which is compatible with deficit and debt evolution ($r^* \leq r \leq r^{**}$). The dynamic of debt and deficit in each period of time is given by:

$$B_t = I_t + B_{t-1} + DEF_t; \quad DEF_t = G_t - T_t = G_t - tY_t; \quad I_t = rB_{t-1} \qquad (5.1.2)$$

This relationship simplifies to:

$$G_t = B_t - (1+r)B_{t-1} + tY_t \qquad (5.1.3)$$

where the public spending is dependent on debt (past and present) and a function of income; European countries have two binding conditions which states that deficit and debt should converge to pre-determined levels, in order not to introduce asymmetric shocks in the Union. The elasticity of spending to interest rate (ψ) for these countries is then higher than that to income (η), being the exit from the Union a non acceptable policy behaviour.

We can synthesise this relationship of fiscal policy over interest rate and income elasticities, depending on debt outstanding, as:

$$g = \eta r + \psi y$$
$$\eta > \psi \qquad (5.1.4)$$

We can hypothesis that the sensitivity of fiscal policy, represented by the IS curve, to income (ψ), in between the pre-determined interest rates, high (r^{**}) and low (r^*) compatible with the desired derivatives strategy, is very low or even constant, since the target of costs of debt (I_t) and deficit are given trough the use of financial innovation[14]. In this corridor the sensitivity of fiscal policy to interest rates (η) is greater that that to income (ψ) since the goal over debt is dominating over the output. Derivatives are used to lower (I_t) the cost of debt and control (G_t) over some expectations on rates, as shown in the previous survey of countries' experiences. In this corridor we can say that income is no longer a primary target of fiscal policy since the target of debt-deficit cannot be achieved if another is followed[15]. Financial innovation is used to settle the cost of debt (or deficit) g basing on some expectations over interest rates, whose level is settled by the market, and income (or unemployment if you prefer) becomes a secondary policy target. We have to underline that this trade-off between income and debt-deficit targets of fiscal policy is true in the short run, since long run equilibrium of the model cannot depend on financial innovation, which bets over short-term rates and is based on expectations.

If public debt outstanding (B) is not high, the two elasticities become relevant for fiscal policy, and income plays an explicit role for fiscal policy. The IS curve has still income in its specification, but fiscal policy spending, g, is

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[14] E.g. swaps or forward contracts with which a bet over interest rates is possible and contribute to save costs.

[15] This is the same idea of the unholy trinity for monetary policy and the exchange rate. Here the ingredients of the trinity are high debt-deficit outstanding, autonomous monetary policy and output target. The third target is not achievable by fiscal authority given the other two.

under control only in between a corridor of rates ($r* \leq r \leq r**$) where financial market and innovation contributes to control the dynamic evolution of debt and deficit.

Starting from public spending (d) we can state that it is a function of income (y) in the short run, of debt-deficit target (g), and of stock market value (q), where the debt is managed. We can rearrange the short-term model as:

$$d = aq + g + \beta y \qquad \text{IS curve}$$

$$a > 0 \quad \beta > 0$$

$$\text{Iff} \quad r* \leq r \leq r** \quad \text{Interest rate corridor}$$

$$r = cy - h(m - p) \quad \text{LM curve}$$

$$\frac{\dot{q}*}{q} + \frac{\alpha_0 + \alpha_1 y}{q} = r \quad \text{No - arbitrage condition}$$

$$r + \chi = R - \frac{\dot{R}}{R} \qquad \text{Term structure}$$

(5.1.5)

Fiscal policy index is very sensible to interest rates, so that if $r* \leq r \leq r**$ (expectations of the State over interest rates are satisfied) the dynamic of debt and deficit is under control, and financial innovation contributes to lower the cost of debt and public spending.

Short-term interest rates are settled through the interaction between the LM curve, the no arbitrage condition and the term structure, so that the market settles interest rates, and the fiscal authority has no power to influence them. Since interest rates represent the cost of debt, financial innovation is used to settle a pre-defined cost of debt over constant expectation on long-term rate (R), and certain risk premium (χ). Fiscal policy uses derivatives to control g in the spending function.

Into the corridor of rates, $r* \leq r \leq r**$, the equilibrium between the IS, the LM and market is such that all targets are satisfied: fiscal policy reaches the desired levels of debt and deficit, monetary policy controls money (or prices), the market settles the interest rate and income (y) is in equilibrium.
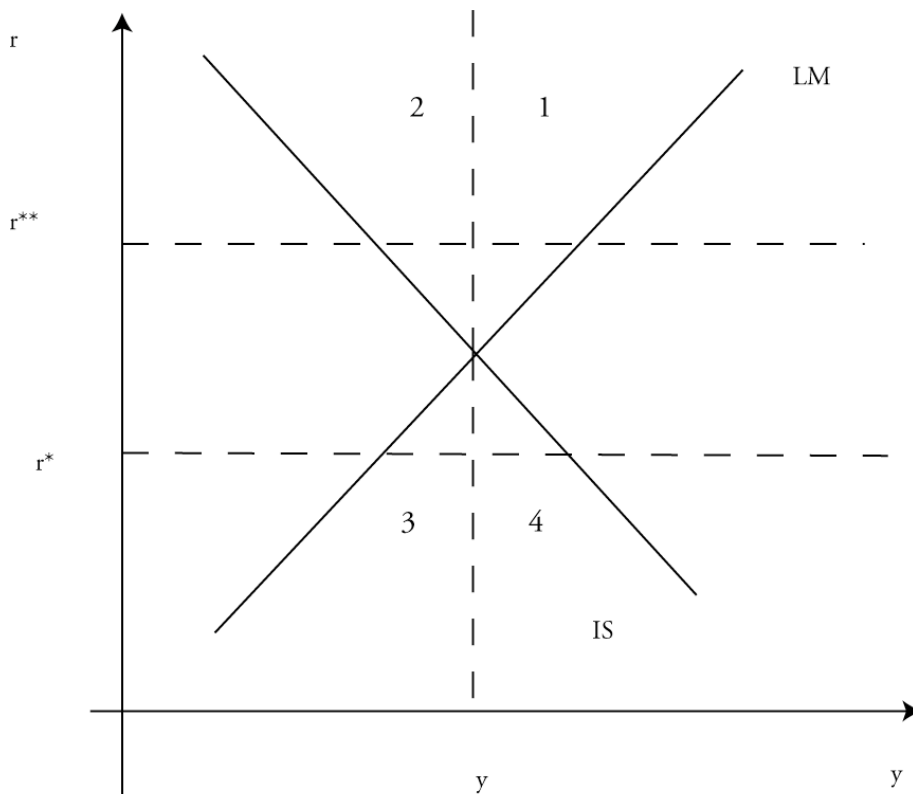
Graph. 1
The IS-LM for a country running high debt and deficit, and debt-deficit areas below the relevant interest rate corridor. Equilibrium income y is such that interest rates and debt-deficit are stable. The LM curve does not move.

Area 1 is characterised by high debt-deficit and high interest rates, so that fiscal policy is not under control and derivatives used to control debt and deficit are "out of the money".
Area 3 is low deficit-debt equilibrium with low income and low interest rates, so that derivatives are "out of the money".
In areas 2 and 4 monetary policy moves and can look for opposite goals of those of fiscal.

Outside the corridor of rates $(r \prec r^*; r \succ r^{**})$ the IS curve reaches an equilibrium which is associated with either higher or lower debt-deficit (area 1 or 3 in graph 1), if the LM curve is not moving[16].

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[16] A further development of the model would be to allow the LM curve to react and move; this will be done in a separate research project.

Financial innovation with constant risk aversion, χ, and no exogenous shock can be effective to control short-term costs of debt-deficit. Fixed price let the story to be the simplest, since the equilibrium is the desired.

If a shock occurs, changing expectations over long-term rates (R), and risk aversion (χ), given that the no arbitrage condition is binding, $\dfrac{\dot{q^*}}{q} + \dfrac{\alpha_0 + \alpha_1 y}{q} = r$, the relevant equilibrium can lie outside the corridor, and the system is that described by Blanchard, but with an uncontrolled debt-deficit dynamic.

Long run solution of the model[17] can be found by imposing that income equals spending ($y=d$), fiscal policy controls $\bar{g}$, the market expects r, and monetary policy controls $\bar{m}$; prices are fixed ($\bar{p}$) and we can compute risk aversion (χ). The system solves finally:

$$y = \frac{a}{b}q + \frac{1}{b}\bar{g}$$

$$q = \frac{\pi}{r} = \frac{\alpha_0 + \alpha_1 y}{cy - h(\bar{m} - \bar{p})} \qquad (5.1.6)$$

$$R - \chi = cy - h(\bar{m} - \bar{p})$$

The long run solution is such that output depends on fiscal policy and the stock market; the stock market is the ratio between steady state profit and interest rate[18]. The two curves have the traditional shapes but come from modified hypothesis and behaviour.

The target of debt and deficit can be reached in the short run by means of derivatives and securitisation; in the long run risk premium and exogenous shock let the game much difficult to play since the equilibrium is set by the interaction between market and policies.

Our first conclusion is to underline the very positive role of financial innovation in matching short-term targets of debt-deficit ($\bar{g}$), given autonomous monetary policy ($\bar{m}$), financial markets setting r, fixed prices ($\bar{p}$), but losing control over output target (y) by fiscal authority (i.e. sensitivity to income target is lower if debt outstanding is high).

This theoretic result seems to be confirmed by the behaviour of high indebted countries, which are involved in many OTC derivatives transactions and run high risk in exchange of lowering debt-deficit dynamic over the last decade.

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[17] Hp: $\dot{R} = \dot{p} = \dot{q} = \dot{q^*} = 0$ and solve for y, q and r, given exogenous variables.
[18] O. Blanchard (1981) page 134.

5.2 Shocks to the model and the effectiveness of policy

Considering fixed price level, if a shock occurs and changes risk aversion of the public sector, χ, the term structure and the equilibrium rate change, influencing the slope if the curves first, and the final equilibrium of the system after. If risk aversion increases, so that the public sector accepts less risk (and lower return) the short term rate r lowers, influencing capital market value. If the rate falls below the lower level accepted by the public sector ($r \leq r^*$), the IS becomes elastic with respect to market interest rates since derivatives become "out of the money". The Tobin's Q is the link between real and financial markets, and if market rates are lower, capital market value lowers and the equilibrium is at lower level of all variables. Fiscal policy could have not reached its target of debt-deficit, being at a lower level.

If a shock occurs and lowers expectations over capital market value (q^*) the final effect is the same as described above.

Another shock can be considered a change in g, for example in a climate of elections. If the target of fiscal policy, g, changes, e.g. increases, so that we aim at reaching a lower debt-deficit target, the effect is that of a restrictive fiscal policy, moving to the lower bound of rates ($r \rightarrow r^*$). This can be managed using more financial innovation thus decreasing risk aversion (χ) accepted by the public sector.

If a shock to financial market changes expected long-term rate (R) the term structure changes, and rational expectations incorporate this in short-term rates and the capital market value increases. If the interest rate falls above the highest accepted by fiscal authority, $r \succ r^{**}$, derivatives become "out of the money" and the final equilibrium is expansionary on output but "out of the money" for debt management (area 1 in graph 1).

Generally speaking, unless an un-anticipated shock occurs to the economy, derivatives are very good instruments to reach desired target levels of debt and deficit, lowering the sensitivity over income level; if a shock occurs, derivatives can exacerbate its effects, and alter financial stability of public sector, by changing its liquidity risk and lead to any equilibrium with high undesired deficit.

An expansionary monetary policy, moving the LM curve up to the right, can have different effects if the final equilibrium is inside or outside the corridor of rate ($r^* \leq r \leq r^{**}$); the better solution would be to get a level of rate inside the corridor, so that monetary and fiscal targets are reached at the same time. If the un-cooperative monetary policy manoeuvre leads to reach a rate outside the corridor, $r \succ r^{**}$, the fiscal is in contrast with monetary policy and market expectations over r influence the equilibrium.

Our second conclusion is that fiscal policy can be considered as completely effective over its target of debt and deficit, without disturbing real spending and income, if the interest rate settled by the interaction with the market is at the desired level; in this way expectations are satisfied and no contrast between monetary and fiscal policy, and the market arises. The focus then has to be put

over the correct level of the rate to be expected by fiscal policy, to be coherent with the market and monetary authority. The burden of risk implied in the use of financial innovation has to be properly considered, since can modify financial stability of the public sector.

In short survey of countries using derivatives to manage cash and debt, Brazil is one paying attention to this interaction, shows low risk loving behaviour, and monetary policy coordination, so that the market support the investment and hedging strategy. Italy has shown a fragmented behaviour, since, centrally and locally, a scarce flow of information and coordination is provided; risk loving should be low since the national burden of debt is very high, but provisional data about the use of financial innovation seems reveal an aggressive behaviour. We suppose that the Italian Government has some interest rates expectations, and up to now these have been coherent with markets rates. In official document we did not find any concern or explanation regarding liquidity risk of the State, which can be altered by financial innovation's use, or regarding adverse shock effects.

Concluding remarks

We have looked at the use of derivatives by fiscal authority and observed that the necessary attention has not yet been paid to the link between policy targets and financial innovation's use. Political debate and traditional economic analysis have not focused on the effects on financial stability of public sector using and facing innovations; the use of derivatives is mainly, but not only, devoted to cost saving and hedging debt. Financial stability of the public sector is strictly related to its liquidity risk, which needs a special attention.

A simple IS-LM model has been used to develop the analysis starting from Blanchard (1981), which introduced expectations and capital market value into the traditional IS-LM framework; the author analysed the effectiveness of anticipated and un-anticipated monetary and fiscal policy manoeuvres under rational expectations' hypothesis, fixed and flexible prices, and effects on capital market value.

Introducing derivatives into the IS curve as debt and deficit management tool, we reach the following conclusions; first is to underline the very positive role of financial innovation in matching short-term targets of debt-deficit $(\bar{g})$, given autonomous monetary policy $(\bar{m})$, financial markets setting r, fixed prices $(\bar{p})$, but losing control over output target (y) by fiscal authority (i.e. elasticity to income is lower that that to interest rate if debt outstanding is high).

Our second conclusion is that fiscal policy can be considered as completely effective over its target of debt and deficit, without disturbing real spending and income, if the interest rate settled by the interaction with the market is at the desired level; in this way expectations are satisfied and no contrast between monetary and fiscal policy, and the market arises. The focus then has to be put over the correct level of the rate to be expected by fiscal policy, to be coherent

with the market and monetary authority. The burden of risk implied in the use of financial innovation has to be properly considered, since can modify financial stability of the public sector; the burden of risks can exacerbate negative effects over interest rates rendering derivatives "out of the money", and modifying debt and deficit dynamic.

With that respect, the example of the Italian Government is remarkable, since the dynamic of debt and deficit is managed trough the use of financial innovation, centrally and locally, and is effective in the short run; on the long run the burden of risk is not known, and only recently the Ministry of Economy, Siniscalco, has asked not to increase future risks by means of innovation and asked for restructuring portfolio of local authorities. Data about the future burden are not known.

The cooperation between fiscal and monetary authority, like that developed by Brazil, can lead to a better equilibrium (inside the corridor of rates), but this is not new to economic theory.

Further study should consider the behaviour of monetary policy and the LM curve with respect to financial innovation use and financial stability, but a higher disclosure of data and risks effectively run is not to be any more delayed.

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