FISCAL IMPLICATIONS OF THE ECB'S BOND BUYING PROGRAM

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Abstract
The perception that the government bond buying program (OMT) announced by the ECB may lead to future tax burdens on countries, in particular on Germany, is based on an erroneous application of solvency principles that apply to private agents, but not to central banks. We argue that the creditor nations' taxpayers, in particular the German taxpayers, will receive tax revenue from the implementation of the OMT. We also measure the size of the bond-buying program that is compatible with price stability. It turns out that this estimate critically depends on whether the Eurozone stays in a liquidity trap situation or not. Today, as the Eurozone is still in a liquidity trap there is no limit to the amount of government bonds the ECB can buy without triggering inflation.

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1. Introduction

There is a lot of confusion about the fiscal implications of the government bond-buying program (OMT) that the ECB announced last year. This confusion arises mainly because the principles that guide the solvency of private companies (including banks) are applied to central banks. The confusion is so high that the President of the Bundesbank turned to the German Constitutional Court arguing that the OMT program of the ECB is illegal due to the fact that it would make German citizens liable for paying taxes to cover potential losses made by the ECB. In this paper we discuss the fiscal implications of the government bond-buying program of the ECB. We will argue that the fears that German taxpayers may have to cover losses made by the ECB are based on a misunderstanding of solvency issues that central banks face. We will also show that the German taxpayers are the main beneficiaries of such a bond-buying program.

2. Solvency of central banks is not the same as solvency of private agents

Private companies are said to be solvent when their equity is positive, i.e. when the value of their assets exceeds the value of their outstanding debt. The solvency of a private company can also be formulated in terms of the maximum amount of losses that a company can bear at any given time. Thus, a private company is said to be solvent when its losses do not exceed the value of its equity. Since in efficient markets the latter is equal to the present value of future profits, we arrive at the solvency constraint that says that the losses today cannot exceed the present value of expected future profits.

The problem arises when these solvency constraints are applied to central banks. This has led some to conclude that the loss the ECB (or any central bank) can bear should not exceed the present value of future expected seigniorage gains (see Corsetti and Delado (2013)). Similarly, it is sometimes concluded that a central bank needs a positive equity to remain solvent (Stella, (1997), Bindseil, et al. (2004)).

These solvency constraints should not be applied to the central bank. The reason is that the latter cannot default. A central bank can issue any amount of money that will allow it to "repay its creditors", i.e. the money holders[1]. Such a "repayment" would just amount in converting old money into new money. Contrary to private companies, the liabilities of the central bank do not constitute a claim on the assets of the central bank. The latter was the case during gold standard when the central bank promised to convert its liabilities into gold at a fixed price. Similarly in a fixed exchange rate system, the central banks promise to convert their liabilities into foreign exchange at a fixed price. The ECB and other modern central banks that are on a floating exchange rate system make no such promise. As a result, the value of the central bank's assets has no bearing for its solvency. The only promise made by the central bank in a floating exchange rate regime is that the money will be convertible into a basket of goods and services at a (more or less) fixed price. In other words the central bank makes a promise of price stability. That's all it does.

Thus it makes no sense to state that the limit to the losses a central bank can make at any point in time is given by the present value of future profits (seigniorage). There is no such limit. The central bank can make any loss provided the loss does not endanger its promise to maintain price stability.

Also it is not correct to claim that the central bank needs to hold positive equity "to remain solvent". A central bank needs no equity. As a result the claim that is sometimes made that a central bank with negative equity needs to be recapitalized by the Treasury is senseless. In other words the central bank (that cannot default) needs no fiscal backing from the government (who can default). The only backing the central bank needs from the government is that it can keep its monopoly power to issue money in the territory over which the sovereign has jurisdiction. With that power granted by the sovereign the central bank is freed from any solvency constraint.

[1] We assume here that the central bank does not hold foreign currency liabilities. In that case the central bank can be pushed into defaulting on these foreign currency liabilities because it can only issue domestic currency liabilities (Buiter(2008)).

Let us now apply these first principles to the issue of how a bond-buying program can have fiscal implications. We first discuss the situation of the central bank that faces only one sovereign. Then we discuss the problem of the central bank in a monetary union facing many sovereigns.

3. The case of a stand-alone country.

We will consider the case of a central bank that buys government bonds in the secondary market[2]. By buying government bonds the central bank transforms the nature of the public sector debt. From government debt that carries an interest rate and has default risk, the debt becomes a monetary liability of the central bank (money base) that is default free but that is subject to inflation risk.

In order to understand the fiscal implications of this transformation, it is important to consolidate the central bank and the government (after all they are separate branches of the public sector). After the swap (transformation) the government debt held by the central bank cancels out. It is an asset of one branch (the central bank) and a liability of another branch (the government). As a result, it disappears. The central bank may still keep it on its books, but it has no economic value anymore. In fact the central bank may do away with this fiction and eliminate it from its balance sheet and the government could then eliminate it from its debt figures. It has become worthless because it was replaced by a new type of debt (money). For some reason it is kept on the books of the central bank but this is a bookkeeping fiction. The central bank could as well put it equal to zero, without any loss of substance.

It therefore also makes no sense to state that the central bank makes a loss when the market price of the government bonds drops. If there were a loss for the central bank it would be matched by an equal gain of the government (whose market value of the debt has dropped in the same proportion). There is no loss for the public sector.

[2] Thus we do not discuss direct monetary financing of government budget deficits.

We arrive at an important conclusion: when the central bank has acquired government bonds, a decline in the market value of these bonds has no fiscal implications. The reason is that the loss in one branch of the public sector (the central bank) is offset by an equal gain in another part of the public sector (the government), leaving nothing to be paid by the taxpayer.

Another way to see this is to look at the interest rate flows underlying bond holdings. Let's take an example and suppose the central bank has bought €1 billion government bonds. These have a coupon of, say, 4%. Thus the central bank that keeps these bonds on its balance sheet receives €40 million from the government every year. The bookkeeping practice is to count this as profits of the central bank. At the end of the year the same central bank will have to hand over its profits to the government. Assuming that the marginal cost of managing this bond portfolio is zero, the central bank will hand over €40 million to the government.

This bookkeeping practice has led to the perception that the interest revenue is to be considered as seignorage. It is not. There is no profit for the public sector. The profit of the central bank is exactly offset by a loss of the government. Both could do away with this bookkeeping convention because there is no economic substance to these losses and profits.

It is therefore literally true that the central bank could put the government bonds "into the shredding machine". Nothing would be lost. The central bank would stop receiving €40 million a year, and would stop paying out €40 million to the government every year.

What happens if the government defaults on its outstanding bonds? This, of course, leads to losses for private holders of these bonds. But this default is immaterial for the bonds that are still on the books of the central bank. These are now valued at zero, but they were already worthless before the default also. In terms of the interest flows: after the default, the central bank stops receiving interest payments from the government; by the same token it stops paying these back to the government. Nothing has happened in the public sector. Thus the loss that the central bank is making as a result of the default has no fiscal implications.

From the previous analysis it also follows that it is absurd to say that when the central bank makes losses on its bond holdings it will need a fiscal backup of the government by a recapitalization. This does not make sense because these losses are pure bookkeeping losses and have not affected the substance of the public sector nor of the central bank.

It also follows that the solvency constraint that some economists have claimed should be imposed on the central bank, i.e. that these losses should not exceed the present value of future seigniorage gains is meaningless. In fact the central bank can bear a total loss on its bond holdings.

The only issue that arises is whether a default by the government will affect price stability. If the central bank keeps its liabilities (money base) under control the default by itself will not lead to more inflation. The latter will arise only if the government were to force the central bank to issue more of these monetary liabilities, e.g. to finance current budget deficits that after the default the government cannot finance by issuing bonds anymore.

It is sometimes argued that if the central bank has no assets (because of a default by the government) it has no instruments anymore to reduce the money stock. This may sometimes be necessary to reduce inflationary pressures. This argument does not hold water. There are two ways a central bank that lacks assets can reduce the money stock. First, the central bank can issue interest bearing bonds and sell them in the market. This has the effect of reducing liquidity (money base). Second, the central bank can raise minimum reserve requirements. As a result, the existing stock of liquidity is "de-activated", which has the same effect of a decline in the money base.

4. What about a monetary union?

In a monetary union the analysis of the fiscal implications of a bond buying program is more complicated than in the single country case because there is one central bank facing n different sovereigns; in the Eurozone n = 17 (and soon 18 when Latvia joins). If we could consolidate the ECB and the 17 sovereigns into one public sector

we would be back in the analysis of the previous section. But we cannot because the Eurozone is not a fiscal union. As a result a bond-buying program will lead to transfers among participating member countries.

Let us analyze this problem by assuming that the ECB buys Spanish bonds to the tune of €1 billion. Let us also assume that the coupon on these bonds is 4%. The fiscal implications are now as follows. The ECB receives €40 million interest from the Spanish Treasury. At the end of the year the ECB will return this €40 million to the national central banks (NCBs) which will transfer these to their national treasuries. The distribution of these interest payments occurs according to the equity shares of the participating NCBs (see table 1). Thus the ECB will transfer back 11.9% of the €40 million (€4.5 million) to the Banco de Espana. The rest (€35.5) goes to the other NCBs. The largest receiver is the German Bundesbank that with an equity share of 27.1% receives €10,8 million.

Thus in a monetary union (and in the absence of a fiscal union) a bond-buying program leads to fiscal transfers among countries. But note that in contrast with the usual perception, especially in Germany, a bond buying program leads to a yearly transfer from the country whose bonds are bought by the ECB to the countries whose bond are not bought.

It should be noted that the ECB could implement a bond-buying program that avoids fiscal transfers by buying national government bonds in the same proportions to the equity shares of table 1. This has in fact been proposed sometimes. But this would not eliminate all transfers because the interest rates on the outstanding government bonds are not the same. In fact the countries with the highest interest rates would in this weighted bond-buying program be net payers of interest to the countries with the lowest interest rates.

Thus one can conclude that a bond-buying program weighted by the equity shares would lead to a fiscal transfer from the weaker (debtor) countries to the stronger (creditor) countries in the Eurosystem.

One often hears in the creditor countries that these would be the losers if one of the governments whose bonds are on the balance sheet of the ECB were to default. This

is an erroneous conclusion. Let's go back to our example in which the ECB has bought €1 billion of Spanish government bonds. Suppose now that the Spanish government defaults on these bonds. The effect is that the Spanish government stops paying €40 million to the ECB. As a result, the ECB stops transferring this interest revenue back to the NCBs. Thus, the German taxpayer, for example, stops receiving the yearly windfall profit of €10,8 million that he used to receive prior to the Spanish default. In no way can one conclude that the German, and other taxpayers pay the bill of the Spanish default, except in the sense that they cannot count on the yearly interest revenues anymore.

Table 1: Equity shares of the NCBs in the ECB

	equity shares	interest receipts
Nationale Bank van België	3,5	1,4
Deutsche Bundesbank	27,1	10,8
Central Bank of Ireland	1,6	0,6
Bank of Greece	2,8	1,1
Banco de España	11,9	4,7
Banque de France	20,3	8,1
Banca d'Italia	17,9	7,1
De Nederlandsche Bank	5,7	2,3
Oesterreichische Nationalbank	2,8	1,1
Banco de Portugal	2,5	1,0
Suomen Pankki – Finlands Bank	1,8	0,7
Others	2,3	0,9
Total	100,0	40,0

Source: European Central Bank

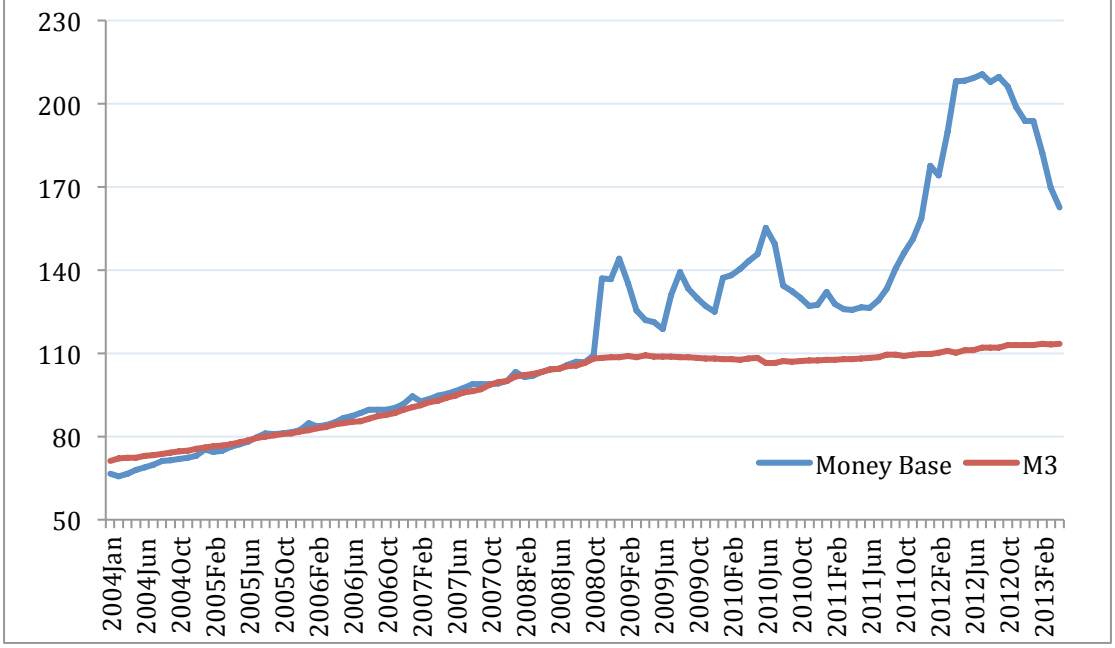
There is of course the possibility of an inflation tax. We have noted before that at the moment of the bond buying program interest bearing debt is transformed into monetary liabilities of the ECB (money base). This by itself could lead to inflation, and thus to an inflation tax that would be borne by all holders of euros. This leads to the issue of how large the ECB bond-buying program can be without generating additional inflation. We have argued earlier that the criterion that has been proposed in the literature (Corsetti and Dedola(2013)) is inappropriate. We discuss this issue in the following section.

5. From explicit taxation to inflation tax

Every open market operation involving the purchase of government bonds creates the potential of inflation because it increases money base. The key question we have to ask ourselves is how the increase in the money base is transmitted to the money stock. For it is the latter that determines inflation (and not the money base *per se*).

In Figure 1 we show the evolution of money base and money stock (M3) in the Eurozone since 2004. We find a striking difference between the period before and after the banking crisis of October 2008. Prior to that date the two monetary aggregates move in unison suggesting that the money multiplier (the ratio of money stock to money base) is constant. Put differently this is a period during which a 1% increase in the money stock leads to an increase of the money stock of approximately 1%.

Figure 1: Money Base, Money Stock (M3) in Eurozone (2007 December=100)

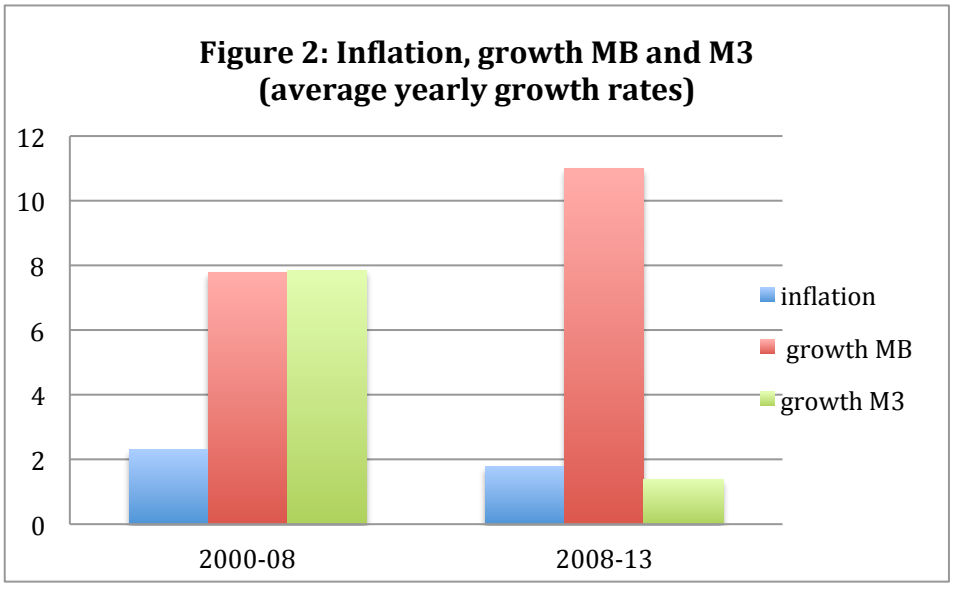


Source: European Central Bank, Statistical Warehouse

Things are very different during the crisis period. We observe that the relation between the money base and the money stock breaks down. Over the period 2008 (Oct) to 2013 (May) the money base increases by more than 50% while the money stock increases by only 7%. This suggests that the money multiplier has dropped

dramatically (see next section where we provide some econometric evidence). This dramatic decline in the money multiplier has everything to do with the liquidity trap (Krugman(2010)). Banks, which accumulate reserves as a result of the liquidity injections by the ECB, hoard these reserves. Their degree of risk aversion is such that they do not use their cash reserves to expand bank credit. As a result, the money stock (M3) does not increase.

Figure 2 is also instructive. It shows the average yearly inflation rate and the average yearly growth rates of money base and money stock before and after the banking crisis of 2008. Prior to 2008 both monetary aggregates increase at practically the same rates and the average yearly inflation amounts to 2.3%. Since 2008 the growth rate of the monetary aggregates diverge dramatically. The money base grows at a yearly rate of 11% while the growth rate of the money stock collapses to less that 2%. During the same period inflation drops below 2%. Thus, the massive expansion of the money base during the crisis period coincided with a significant decline in the growth rate of the money stock (M3) and with a decline in inflation. Our interpretation is that the strong increase in the money base helped to reduce the deflationary forces in the economy, rather than being a source of inflation[3].



Source: European Central Bank, Statistical Warehouse

[3] See Friedman and Schwartz(1961) for an analyis of the Great Depression in the US. These authors argued that the US Fed at the time failed to increase the money base sufficiently to counter the delflationary forces. As a result, the US money stock actually declined, reinforcing deflation.

The previous analysis suggests the following about the limits to a bond-buying program. This limit depends on the nature of the economic and financial situation, i.e. the existence of a liquidity trap. In normal times when an increase of the money base leads to proportional increases in the money stock the limit to a bond buying program is tight. If the target for the increase in the money stock is 4.5% (as is the case in the Eurozone where a 4.5% target is assumed to lead to at most 2% inflation) this also means that the money base should not increase by more than 4.5% per year. Given that prior to the crisis the balance sheet of the ECB amounted to about €1 trillion this implies that a bond buying program in normal times is limited to approximately €45 billion per year.

The situation has changed dramatically since the start of the banking crisis. During the crisis period characterized by a liquidity trap, the limits to the amount of money base that can be created without triggering inflationary pressures is much higher. How much higher depends on the money multiplier. We analyse the size of the multiplier in the next section.

6. Money multiplier: relationship between money base and money stock (M3)

In this section we analyze the relations between the money base and the money stock (M3) econometrically. We use data of these two monetary aggregates from 2004 March to 2013 April[4]. As was shown in the previous section, in the crisis period, the relationship between money base and money stock appears to be unusual. To check for a structural break, we perform a Chow test. This confirms there is a structural break between pre-crisis (before 2008) and crisis period.

We first performed unit root tests. Table 2 shows that the levels of the money base and money stock are non-stationary in both periods. The first differences of these variables, however, are stationary. We then tested for co-integration and found that in the pre-crisis period there exists a co-integrating relationship suggesting that

[4] Prior to 2004 the relationship between money base and M3 was not stable due to the introduction of euro banknotes and the replacement of national currencies. Therefore, we do not include these earlier data in the analysis.

there is a long term stable relation between the money base and the money stock. In contrast, we could not find a co-integrating relation during the post-crisis period, suggesting that there is no stable relation between money base and money stock. This confirms the visual impression one obtains from Figure 1.

Table 2: Augmented Dickey-Fuller unit root test (P-value)
Null Hypothesis: variable has a unit root

	Pre-crisis period		**Crisis period**	
	Ln(M3)	Ln (Money base)	Ln (M3)	Ln (Money base)
Level	0.9995 Cannot reject unit root	0.1811 Cannot reject unit root	0.9278 Cannot reject unit root	0.3595 Cannot reject unit root
First difference	0.0000 Reject unit root	0.0000 Reject unit root	0.0000 Reject unit root	0.0000 Reject unit root

As the money base and money stock are co-integrated during the pre-crisis period we estimated an error correction model for that period. The result is given in Table 3. The co-integrating relation allows us to recover the long-term money multiplier (in logs). This reveals that the money multiplier is about 0.85, i.e. a 1% increase in the money base is associated with 0.85% increase in M3.

As the money base and money stock are not integrated during the crisis period, we estimate the model in first differences. The results are shown in Table 4. The coefficient of the money base (changes) is not significantly different from zero. Thus there is not only an absence of long-term relation between money base and money stock during the crisis period; there is also no short-term effect of changes in the money base on the money stock. It implies a collapse of the money multiplier mechanism in the crisis period and the multiplier is practically zero.

Table 3. Relationship between ln (M3) and ln (Money base):

Pre-crisis period (2004M3-2008M8)

Long-term relationship: Dependent variable ln (M3)	
	Coefficient (std error)
Ln (Money base)	0.849800*** (0.020037)
Adjusted R-squared	0.971362
Cointegration test	Augmented Dickey-Fuller test: p-value=0.0090 Rejects unit root in the residual l→ cointegration
Short-term relationship: Dependent variable Δ ln (M3)	
	Coefficient (std error)
ΔLn (Money base)	0.066728 (0.044132)
Residual (-1)	-0.049591** (0.023346)
Adjusted R-squared	0.062780

Table 4. Relationship between ln (M3) and ln (Money base):

Crisis period (2008M9-2013M4)

Long-term relationship: Dependent variable ln (M3)	
	NA
Cointegration test	Augmented Dickey-Fuller test: p-value=0.6246 Cannot reject unit root in the residual→no cointegration
Short-term relationship: Dependent variable Δ ln (M3)	
	Coefficient (std error)
ΔLn (Money base)	-0.008986 (0.010786)
Adjusted R-squared	0.211235

From this econometric analysis one can derive some conclusions on the limits that have to be imposed on bond buying programs by the ECB. First, our econometric analysis confirms what we said in previous sections. This limit depends on the nature of the financial and economic regime. During normal times (the period before 2008) there is a tight link between money base and money stock. Our estimated money (log) multiplier of 0.85 suggesting that a 1% increase in the money stock leads to a 0.85% increase in M3. If in order to keep inflation below 2% the ECB wishes to keep the growth rate of M3 below 4.5% this implies that a bond buying program cannot exceed 5.3% of the money base on a yearly basis. But then during normal times there is little need for a bond-buying program.

Things are very different during the crisis period that the Eurozone experiences since 2008. We have shown that, as a result of the existence of a liquidity trap, during this

period the multiplier collapsed to zero. Thus, there is no limit to the size of the bond-buying program, i.e. the ECB can buy any amount of government bonds without endangering price stability as long as the crisis lasts. Neither will the taxpayers of the Eurozone bear any cost from the bond-buying program.

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