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Introduction

One of the fastest growing areas in the economic sciences is broadly defined area of finance, with particular emphasis on the financial markets, financial institutions and risk management. Real world challenges stimulate the development of new theories and methods. A large part of the theoretical research concerns the analysis of the risk of not only economic entities, but also households.

The first Wrocław Conference in Finance WROFIN was held in Wrocław between 22nd and 24th of September 2015. The participants of the conference were the leading representatives of academia, practitioners at corporate finance, financial and insurance markets. The conference is a continuation of the two long-standing conferences: INVEST (Financial Investments and Insurance) and ZAFIN (Financial Management – Theory and Practice).

The Conference constitutes a vibrant forum for presenting scientific ideas and results of new research in the areas of investment theory, financial markets, banking, corporate finance, insurance and risk management. Much emphasis is put on practical issues within the fields of finance and insurance. The conference was organized by Finance Management Institute of the Wrocław University of Economics. Scientific Committee of the conference consisted of prof. Diarmuid Bradley, prof. dr hab. Jan Czekaj, prof. dr hab. Andrzej Gospodarowicz, prof. dr hab. Krzysztof Jajuga, prof. dr hab. Adam Kopiński, prof. dr. Hermann Locarek-Junge, prof. dr hab. Monika Marcinkowska, prof. dr hab. Paweł Miłobędzki, prof. dr hab. Jan Monkiewicz, prof. dr Lucjan T. Orłowski, prof. dr hab. Stanisław Owsiak, prof. dr hab. Wanda Ronka-Chmielowiec, prof. dr hab. Jerzy Różański, prof. dr hab. Andrzej Sławiński, dr hab. Tomasz Słoński, prof. Karsten Staehr, prof. dr hab. Jerzy Węcławski, prof. dr hab. Małgorzata Zaleska and prof. dr hab. Dariusz Zarzecki. The Committee on Financial Sciences of Polish Academy of Sciences held the patronage of content and the Rector of the University of Economics in Wroclaw, Prof. Andrzej Gospodarowicz, held the honorary patronage.

The conference was attended by about 120 persons representing the academic, financial and insurance sector, including several people from abroad. During the conference 45 papers on finance and insurance, all in English, were presented. There were also 26 posters.

This publication contains 27 articles. They are listed in alphabetical order. The editors of the book on behalf of the authors and themselves express their deep gratitude to the reviewers of articles – Professors: Jacek Batóg, Joanna Bruzda, Katarzyna Byrka-Kita, Jerzy Dzieża, Teresa Famulska, Piotr Fiszeder, Jerzy Gajdka, Marek Gruszczyński, Magdalena Jerzemowska, Jarosław Kubiak, Tadeusz Kufel, Jacek Li-

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Wanda Ronka-Chmielowiec, Krzysztof Jajuga

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THE ROLE OF THE ECB'S QE IN ALLEVIATING THE EUROZONE DEBT CRISIS

ROLA QE EBC W ŁAGODZENIU KRYZYSU ZADŁUŻENIOWEGO W STREFIE EURO

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Abstract: In the wake of the Great Recession that begun in 2007, several central banks became trapped in the zero lower bound. The Federal Reserve Bank, the Bank of England, and the European Central Bank were unable to reinvigorate bank lending despite slashing their interest rates to a zero level. The Federal Reserve Bank and the Bank of England adopted their QE programs just after the collapse of Lehman Brothers to alleviate balance sheet recessions by facilitating economic recovery which in turn gradually unlocked credit and money creation. The decision to launch the ECB's QE was significantly delayed which pushed the Eurozone into a double-dip recession. Despite being long overdue the ECB's QE led to a number of favourable outcomes. One of these was a reduction in public debt service as QE programs are tools which facilitate government debt restructuring through *de facto* conversion of the treasuries purchased by the central bank into zero-coupon perpetuities.

Keywords: Eurozone crisis, quantitative easing, public debt restructuring.

Streszczenie: W czasie Wielkiej Recesji, która zaczęła się w 2007 r., Bank Rezerwy Federalnej, Bank Anglii i Europejski Bank Centralny napotkały barierę niemożności ożywienia koniunktury pomimo obniżenia stóp procentowych do zera. Rezerwa Federalna i Bank Anglii zdecydowały się rozpocząć programy ilościowego łagodzenia polityki pieniężnej od razu po upadku banku Lehman Brothers, by wywołać dzięki temu ożywienie gospodarcze, które odblokowuje popyt na kredyt i umożliwia wzrost podaży pieniądza. Decyzja o rozpoczęciu programu QE przez EBC została podjęta z dużym opóźnieniem, co spowodowało w strefie euro powrót recesji. Mimo to rozpoczęcie przez ECB programu QE przyniosło szereg korzyści. Najważniejszą była możliwość efektywnej redukcji długu publicznego, ponieważ QE prowadzi *de facto* do zamiany kupionych przez bank centralny obligacji skarbowych na zerokuponowe konsole.

Słowa kluczowe: kryzys w strefie euro, ilościowe łagodzenie polityki pieniężnej, restrukturyzacja długu publicznego.

[1] The author would like to thank Patrycja Beniak, Marta Korczak, Juliusz Jabłecki, Tomasz Jędrzejowicz and Hubert Karbowy for helpful comments and suggestions. The views expressed herein are those of the author and do not necessarily reflect the views of Narodowy Bank Polski.

1. Introduction

The source of the recent Eurozone crisis was the global banking crisis which produced credit deadlocks leading to balance-sheet recessions in several member economies. The most devastating outcome was halting credit and money creation, which led in turn to a protracted weakness of demand. This paper highlights the role of QE as a policy instrument enabling to alleviate balance sheet recessions. By clearing up certain misconceptions about QE, the paper will furthermore attempt to dispel the popular myth that equals QE with central bank's massive money printing operation.

QE programs constitute central bank large scale interventions on (predominantly) government paper markets. The central bank pays for treasury bonds it buys from commercial banks by crediting their current accounts. Thus the by-product of QE programs is an increase not in money supply but in banks' liquid reserves. However, as a result of a credit deadlock, commercial banks are not in a position to use these increased liquid reserves to expand lending [Viral et al. 2013].

Even so, QE programs may indirectly lead to a slow revival of credit and money creation, because they may facilitate recovery. This can be attained by shielding the economy from a sharp rise in long-term interest rates linked to a fiscal deterioration caused by a severe banking crisis and a subsequent persistent recession. Canonical examples include QE programs in the US and the UK, when interest rates remained low despite abrupt widening of budget deficits. This allowed both countries to avoid shocks associated with radical fiscal tightening and adopt more moderate fiscal policy instead. The other reason why QE programs tend to contribute to economic recovery is through the wealth effect, as well as domestic currency depreciation.

A much less frequently discussed benefit of QE programs is that they may also serve as a vehicle for reducing public debt. In the Eurozone sharp increases in debt-to-GDP ratios of several member countries forced ECB to initiate its QE program despite strong objections voiced by creditor countries.

There are two goals of this paper. The first is to analyse the reasons behind ECB's long delay in QE implementation and highlight the benefits it eventually brought for public debt management and stabilization policy. The second goal is to highlight a rarely realized fact that QE programs enable a *de facto* reduction in the public debt, which creates a fiscal space for stimulating the economy.

The remainder of the paper is organized as follows. Section 2 presents QE programs as an instrument for alleviating balance-sheet recessions. Section 3 recapitulates ECB actions between the outbreak of the Eurozone fiscal crisis and the outset of QE's implementation. Section 4 considers QE as a vehicle of restructuring public debt. Section 5 concludes.

2. QE programs as instruments alleviating balance-sheet recessions

In the wake of the Great Recession, triggered by the global banking crisis that begun in 2007, several central banks became trapped in the zero lower bound. Due to the credit deadlocks, caused by the global banking crisis, the Federal Reserve Bank, Bank of England and European Central Bank were unable to reinvigorate bank lending despite slashing their interest rates to a zero level, similarly as it had been the case with the Bank of Japan since 1990.

The principal cause of these credit deadlocks were abrupt falls in property prices leaving homeowners with negative net wealth, i.e. without collateral for refinancing their mortgage loans. Unexpectedly[2] households were made to finance their net debt repayments from their current incomes. Under such circumstances, even zero level interest rate could not induce households to take more debt and the deleveraging process became a long-term drag on growth [Keen 2015; Koo 2013].

The most destructive consequence of a credit deadlock and the ensuing balance sheet recession is a halt in money creation, as money is created not by central banks but by commercial banks [McLeay et al. 2014; Sławiński 2015]. Furthermore, deleveraging may even shrink money supply and this increases the risk of the economy sliding into a deep and prolonged recession. In an extreme case, the destabilizing dynamic of debt deflation derails economy from its equilibrium growth path [Fisher 1933].

The Japanese experience illustrates that deleveraging (net debt repayments) leads to accumulation of excessive savings within the banking system. In order to protect economy from sliding into a protracted recession, there need to be an economic agent willing to borrow and spend this excess of savings. Under a balance sheet recession, the only candidates are governments and enterprises in export oriented sectors. In Japan trade surpluses constitute relatively small percentage of the GDP. Hence, since the early 1990s, subsequent Japanese governments have been running sizable budget deficits to maintain the volume of money and spending in the economy[3]. The strategy has proven effective in the sense that it did prevent Japan from falling into a long recession. However, this did not come without cost, which was unsustainable public debt enforcing Bank of Japan to use QE as a tool to reduce the net volume of public debt[4].

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[2] Price crushes in assets markets are impossible to forecast [Shiller 2015].

[3] The three sources enabling households and firms to restock or increase their money balance are current incomes (including net exports and net foreign transfers), loans taken from the banking system and current transfers from the budget Budget deficits are source of money creation even if they are fully financed with savings.

[4] Since 2013 Bank of Japan had started to purchase much more treasury bonds than the volumes of their issuance by the government [McKinsey 2015].

The extraordinary length of the Japanese economic stagnation illustrates that there is no easy escape from a balance-sheet recession. This is particularly true when there are additional structural headwinds to economic growth, as for example aging society and chronic excess of domestic savings [Teulings, Baldwin 2014; Summers 2015, 2014]. Nonetheless, QE programs may alleviate balance sheet recessions by facilitating economic recovery which in turn unlocks credit and money creation.

Apart from shielding the economy from an excessive rise in long-term interest rates, QE programs also assist economic growth by inducing wealth effect and engineering domestic currency depreciation. The former (a rise in asset prices which makes households more optimistic and increases their propensity to spend) is observed as banks lend their inflated liquid reserves to institutions which invest in capital markets (e.g. hedge funds and other leveraged investment funds) thereby engineering an increase in stock indices. A weaker currency results from banks using their expanded liquid reserves to finance carry trades; i.e. purchases of foreign assets which increase the supply of the domestic currency on the global foreign exchange markets.

An underappreciated benefit of QE programs is that they enable commercial banks to exchange their risky assets (e.g. structured bonds) into safe liquid reserves. Such operations hedge banks against incurring large balance sheet losses, improve their soundness and above all enable them to restart their lending.

Another important and much less discussed benefit conveyed by the QE programs is their potential as an effective instrument for public debt reduction. When the central bank purchases treasury bonds in order to hold them permanently (through constantly reinvesting government principal payments)[5], it effectively converts these bonds into zero-coupon perpetuities, as not only principal is (effectively) returned, but also interest payments which are transferred to the government as central bank profits (seigniorage). This share of public debt is merely an accounting record without any burden on the government budget [McKinsey 2015]. Therefore, in practice QE programs amount to an ex-post monetization of the public debt [Turner 2013]. No inflationary pressure is added, as QE constitutes (to a large degree) a virtual cancellation of bonds whose issuance enabled channelling excess savings to the economy.

The unchanging stock of treasury bonds in the Federal Reserve Bank's balance sheet (depicted in Figure 1) illustrates that even after phasing out QE programs, central banks keep reinvesting principal payments obtained from the government. The reason is obvious. Had the Federal Reserve sold out treasuries from its portfolio, it might have caused a fall in their prices and hence a rise in long-term interest rates

[5] In practice central banks intend to resell their treasury bond portfolios, but after very long period of time. Thus their intention is to use QE not only to stabilize long-term interest rates, but also to reduce the net volume of their countries' public debt, which is illustrated also by the fact that currently central banks reinvest government principal payments.

to the potential effect of harming still fragile economic recovery. As the probability of the advanced economies entering secular stagnation is relatively high [Summers 2014, 2013; Gordon 2014], the ECB is even less likely to sell the treasuries purchased under its QE program in a foreseeable future.

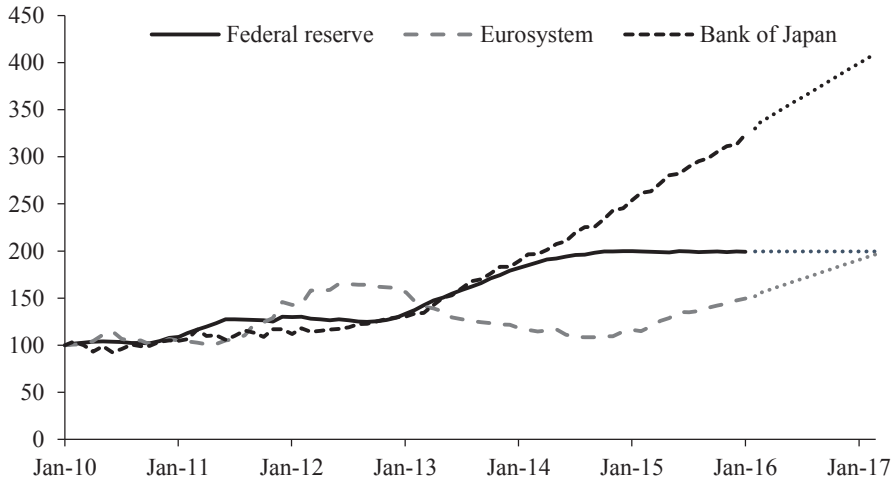

Figure 1. The stock of treasury paper in central banks' balance sheets

Source: NBP calculations.

3. ECB's long road to QE program

The positive outcomes of QE programs were evident in the UK and the US, where they did facilitate economic recovery and let both governments to adopt moderate and gradual fiscal measures. By moving in early, the US and the UK could reduce the burden of servicing their public debt.

In contrast to the Federal Reserve and the Bank of England, the ECB refrained from launching QE for several years. The consequences were very costly as the absence of ECB's large scale interventions in the treasury bonds markets paved the way for destabilizing speculation, which produced a sharp fall in sovereign paper prices and capital flight from Eurozone debtor countries. Its culmination came in 2010, when Greece, Ireland and Portugal lost their ability to borrow in international financial markets. In 2011-2012, returning waves of destabilizing speculation also brought Spain and Italy to the verge of being cut off from to capital markets.

The risk of turbulence provoked by the ECB's inaction was particularly high in the Eurozone, whose member countries lacked a political union. This fact helps to explain why investors could assume a reasonable degree of certainty that, unlike other central banks, the ECB would refrain from acting as the lender of last resort to

governments. Consequently, the absence of ECB's effective interventions[6] did prompt market turbulence on a vast scale which only augmented the feedback loop between Eurozone's fiscal and banking crises. Its core manifestation was the precipitous fall in treasury bond prices which inflated Eurozone banks' balance sheet losses. Risk premiums were further driven up in the interbank markets amid investors' worries that rapidly increasing costs of servicing the public debt would make governments unable to bail out banks [Fratzscher, Rieth 2015][7].

Launching ECB's QE could have broken this feedback loop as it would simultaneously have shielded governments from the sharp increases in long-term interest rates and the banks from capital losses. However, instead of launching QE, the Eurozone authorities opted to help governments and banks by means of separate programs. Governments of the stressed countries obtained bilateral loans from other member states *via* the newly created European Financial Stability Facility (EFSF) and from the IMF. Banks in turn obtained loans from the ECB under the Long-Term Refinancing Operation (LTRO) These two separate programs failed to break the destructive feedback loop between the fiscal and banking crises, because without QE ECB's large scale interventions, the destabilizing speculation continued to sink bond prices and lift interest rates on OTC markets despite banks' inflated liquid reserves[8].

Behind the decision not to initiate a QE program was the Eurozone creditor countries doctrinal stance and their reluctance to allow debt reductions [De Grauwe 2013]. They firmly asserted that the crisis was principally caused by irresponsible fiscal policies of several member countries. This was true for Greece but not for other member states as their debt-to-GDP ratios had been either stable or falling from Eurozone creation until the crisis broke out. The actual cause of the fiscal breakdown was the unexpected global banking crisis and the resulting Great Recession, in response to which the governments fell under pressure to sharply increase their budget expenditures which was augmented by the necessity to cover banks' large balance-sheet losses [Schoenmaker 2015]. The Eurozone creditor countries' reluctance to contemplate the public debt reduction was dictated by domestic policy considerations to show their taxpayers that no fiscal transfers to other countries were to take place.

The long delay in launching the ECB's QE was a grave policy mistake. Had QE been implemented as latest in 2010, it would have shielded the Eurozone from severe fiscal crises followed by the double-dip recession [Rannenberg et al. 2015]. Portugal and Ireland would not have lost the confidence of the capital markets. Eurozone

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[6] In 2010, the ECB initiated interventions on treasury bond markets; Securities Market Program but the scale of these interventions was far too small to contain speculation.

[7] The long-term solution to neutralize the feedback loop between fiscal deterioration and banking crisis is expected to be the European Banking Union, however there is uncertainty when and if it is to be completed.

[8] Under the balance-sheet recession banks were using the liquid reserves borrowed from the ECB not for extending loans, but mainly for financing carry trade [Viral et al. 2013].

countries would have been able to tighten their fiscal policies more gradually so as to facilitate the economic recovery as in the US and the UK [Wren-Lewis 2013].

Among the creditor countries, an argument against QE was their belief (based on a literal interpretation of the efficient market hypothesis) that under any circumstances sovereign bond yields accurately reflect the fiscal position of a given country [Dullien, Guérot 2012]. This led to the conclusion that the sharp rise in yields was the right incentive for debtor countries to embrace a necessary discipline on their fiscal policies [Sinn 2014]. For this reason, loans extended by the EFSF were initially offered at punitive interest rates [Dullien, Guérot 2012].

The creditor countries' uncritical belief that bond prices reflect nothing but fundamental (economic) factors, was disconnected from a large body of academic research proving that price volatility in financial markets reflects, not only changing fundamentals, but primarily the investors' shifting sentiment [Shiller 1981]. Moreover, markets usually do not respond to systemic risk, slowly building up over long periods, only to overreact grossly when a crisis breaks out. This is because severe financial crises occur very rarely and do not share enough common characteristics to design systemic risk indicators with any predictive power [Lo 2009; Shin 2013].

Investors' perspective cannot be relied on as a factor that enforces sound fiscal policy for yet another reason. In the run-up to a crisis, the risk perceived by investors is falling, because a strong demand for appreciating assets ensures high market liquidity. This makes investors relax their vigilance exactly at the time when the actual risk is growing, because massively overvalued assets are bound to eventually plummet [Danielsson 2013]. Hence, unsuspecting investors are invariably surprised by outbreak of a crisis what triggers massive overreaction augmented by institutional feedback loops (e.g. between mark-to-market accounting and capital requirements) potentially producing fire sales [Danielsson, Shin 2002].

Yields on the Eurozone sovereign paper markets followed exactly such pattern. For many years the spreads between member countries' bonds remained very small and stable, only to widen abruptly when the Eurozone fiscal crisis broke out [Favero, Missale 2011]. Empirical research confirms that this principal factor behind the sharp widening of yield spreads was the sudden reversal of investors sentiment, even though there was no abrupt acceleration in these countries' debt-to-GDP ratios [De Grauwe, Ji 2014; Saka et al. 2014].

Relaying on the financial markets as force that helps to impose sound fiscal policy may seem well founded under normal conditions, but leaving markets without central bank interventions in the midst of a severe crisis exposes them to unconstrained destabilizing speculation that instigates self-fulfilling panic. This was the case in several Eurozone countries between 2010-2012, when speculation – and the panic it instigated – made Eurozone authorities impose austere fiscal adjustment programs, especially in the crisis-stricken countries [De Grauwe, Ji 2013]. As a consequence, the Eurozone saw the return of recession as governments cut their spending sharply at the time when households were forced to do the same due to deleveraging in the

private sector [Cuerpo et al. 2013]. Hence, the consequences of delaying ECB's QE and imposing fiscal austerity were counterproductive and debt-to-GDP ratios increased instead of shrinking, even in surplus countries [Mazzolini, Mody 2014; Corsetti et al. 2013].

Figure 2 illustrates that in 2010-2012 the risk premium for government insolvency widened sharply. Usually central banks shield economies against such developments on treasury bond markets, because they act as lenders of last resort, not only to banks, but also to their governments. However, national central banks in the Eurozone are in fact only operational branches of the ECB and they are not able to issue liquid reserves themselves to intervene in the treasury bond markets. Such powers are reserved by law exclusively to the ECB. Without its intervention, the Eurozone treasury bond markets were exposed to the destabilizing speculation.

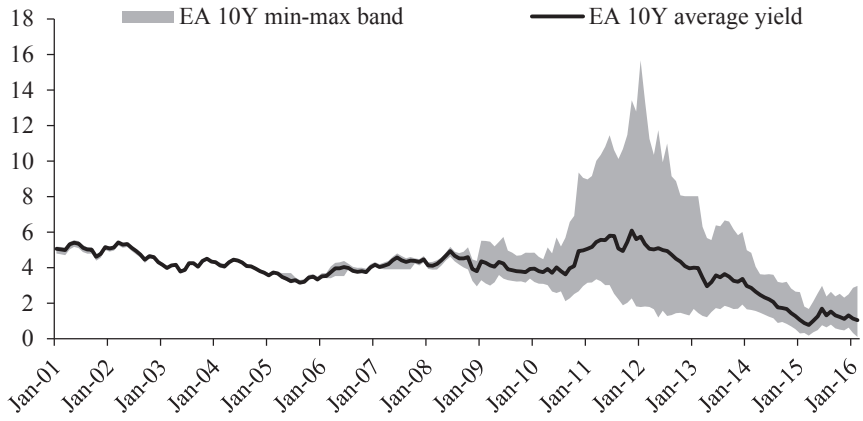

Figure 2. Treasury bond yields spreads in Eurozone

Source: NBP calculations.

Such intervention came in summer 2012, when the continuing recession and market turmoil persuaded Mario Draghi to step in and signal ECB's intention to engage in the massive interventions on treasury paper markets. It was sufficient to announce the program known as the Outright Monetary Transactions (OMT) to produce a sharp fall in long-term interest rates in the Eurozone debtor countries [Altavilla et al. 2014][9]. The reason why the mere announcement of the OMT stabilized markets was investors' awareness that there were no limits to the issuance of banks' liquid reserves by central banks and to the scale of their interventions in the treasury bond markets[10].

[9] Author's professional experience (in capacity of a former chief of ACI Poland training commission) is that in times of turbulence markets wait for central bank intervention to prevent the panic.

[10] In contrast to interventions in foreign exchange markets whose scale is constrained by the amount of foreign exchange reserves.

Despite its success, the OMT was heavily criticized by creditor countries. For example, the Federal Constitutional Court of Germany requested the European Court of Justice (ECJ) to rule on whether OMT could be classified as a regular central bank instrument used by ECB to eliminate distortions in the monetary policy transmission mechanism or rather a form of indirect fiscal subsidy awarded to debtor countries through "artificially" reducing the burden of their debt service [Bundesbank 2012]. The ECJ's verdict declaring OMT a regular monetary policy instrument gave ECB the green light to announce Eurozone's QE in January 2015 [European Court of Justice 2015].

4. QE as a vehicle for restructuring public debts

When the fiscal austerity made the Eurozone plunge into a new recession and debt-to-GDP ratio kept growing, it became apparent that debtor countries might not be able to proceed with their debt repayment in a conventional way. Doing so would entail permanently maintaining primary surpluses of economically and politically infeasible scale [McKinsey 2015; Eichengreen, Panizza 2014; Panizza 2014]. For this reason, creditor countries began to change their attitude towards QE and went from staunch opposition to cautious recognition of its potential as a vehicle of public debt restructuring. By its nature, QE lends itself that goal, because buying government papers by a central bank and holding them permanently amounts to converting them into zero-coupon perpetuities. Any interest paid on treasury bonds to the central bank is then returned to the government in the form of central bank profit (seigniorage).

An important breakthrough, which persuaded the surplus countries to approve ECB's large scale interventions, was the publication of the PADRE plan, which addressed the major objections raised by Germany and other Eurozone countries QE [Paris, Wyplosz 2014]. The fundamental grievance was that if QE involved only Eurozone debtor countries, it would lead to income transfers between member states. Therefore, to make it a politically acceptable instrument of public debt reduction, Charles Wyplosz and Pierre Paris postulated that the ECB should purchase treasury bonds of *all* Eurozone member countries in proportion to their shares in ECB's capital. Such an arrangement was rather unusual from an economic point of view, as it aimed to reduce public debt not only in debtor countries (which needed it) but also in creditor countries (which needed it far less, Nevertheless, this format was necessary to get the approval of the creditor countries and indeed it constituted QE's backbone[11].

To prevent the moral hazard (inclination to repeat debt reduction in the future), the PADRE plan stipulated that if a member country should again accumulate unsustainable public debt, a substantial share of its zero-coupon perpetuities (held by the ECB) would be almost automatically converted back into interest bearing

[11] The official name of the ECB's QE is the Public Sector Purchase Programme (PSPP)

government papers. This mechanism was conceived to dissuade governments from pursuing irresponsible policies through increasing again the burden of public debt repayments. However, such an arrangement was not eventually incorporated into ECB' QE due to a gradual tightening rules in Eurozone's fiscal policy [Andrle et al. 2015; European Central Bank 2012].

In order to address the worries concerning the inflationary pressures potentially arising from massive purchases of treasury papers, the PADRE plan proposed to charge the ECB with raising the funds necessary to buy government papers on the interbank market Furthermore, any interest payments would be made from ECB's non-inflationary seigniorage income[12], so as not to inflate banks' liquid reserves. It should be pointed out that the actual ECB's QE does not envisage taking such precautions and the treasury bonds purchases are not sterilized. This needs not to be a flaw, as QE in Japan, the UK and the US illustrated that during balance-sheet recessions swollen bank reserves were unlikely to pose an imminent inflationary threat. Moreover, the Eurozone's private sector has only seen the beginning of the deflationary deleveraging process [Buttiglione et al. 2014] with most of its economies exposed to secular stagnation due to their structural features [Summers 2015, 2014; Aizenman 2014].

Even though the PADRE plan offered the politically acceptable solution which enabled QE, the latter was no less politicized than the former. Among the major objections raised against QE was the concern that taxpayers in the Eurozone creditor countries would supposedly have to cover losses incurred by ECB following a potential Eurozone country default [Sinn 2014]. This objection was addressed by directing national central banks (NCBs) to purchase 80% of their own governments' bonds. Under these arrangement, the balance-sheet losses would be incurred not by the ECB, but by the NCB's in countries whose governments would default. It must be said with regret that European solidarity has been put to test to reassure taxpayers in creditor countries that their money would not be involved in covering ECB's losses. The political motives behind such a scheme are clearly illustrated by the fact that in the Eurozone liquid reserves may be created by NCBs only within limits and rules set by the ECB. In practice their role in the Eurozone is reduced to being ECB's operational branches.

The creditor countries argued, that if the ECB itself took large losses and sought for financing from taxpayers (governments), then its independence could be at risk. This argument, however, was misguided, because central banks' capital (in contrast to commercial banks) does not constrain the scale of their operations, as they possess unlimited power to create liquid reserves which by law are accepted as means of

[12] Just before the launching of the ECB's QE another plan of restructuring Eurozone countries public debt was published, which proposed to create a stability fund which would use, not only non-inflationary seigniorage, but also specified tax revenues and revenues from issuance of the so-called stability bills, as sources to finance purchases of the government papers [Corsetti et al. 2015].

payments [De Grauwe 2015]. For this reason, it is not uncommon for central banks to operate for extended periods of time with negative capital [Buiter 2015]. A case in point is the Czech National Bank (CNB) whose large balance sheet losses (caused by the Koruna's long-term appreciation) did not impact its operations and did not prevent yield on the Czech treasury bonds from falling below those of Germany. The CNB's example illustrates that a central bank can operate with negative capital for a long time (until seigniorage incomes cover its balance-sheet losses) without putting its credibility at stake.

Despite an untypical purpose (to allow the public debt reduction of both debtor and creditor countries) and misleading solutions (suggesting that Eurozone's NCBs are independent central banks), the ECB's QE undoubtedly contributed to economic recovery in the Eurozone in 2015. The program's main deficiency lies in its structural inadequacy for the purpose of solving the debt problem. While the PADRE plan argued for 50% reduction in Eurozone member countries' public debts [Paris, Wyplosz 2014], the actual scale of cuts enjoyed by debtor countries after QE's recent phase has been disappointingly moderate (significantly smaller than in the UK, the US and in Japan). This only shows that public debt will continue to be an important headwind to their economic growth (see Table 1).

Table 1. Debt-to-GDP ratios and the impact of QE programs[13]

	Debt-to-GDP ratios (percent, 2015)	Debt-to-GDP ratios adjusted for QE	The net impact of ECB's QE
Eurozone members			
Austria	85.9	78.8	7.1
Belgium	105.3	98.2	7.1
Finland	64.8	57.5	7.3
France	95.3	87.7	7.6
Germany	66.6	59.7	6.9
Ireland	120.5	112.4	8.1
Italy	130.8	121.8	9.0
Netherlands	68.2	61.1	7.1
Portugal	124.9	113.0	11.9
Spain	101.5	91.8	9.7
Other countries			
The UK	92.0	72.2	19.8
The US	104.9	91.9	13.0
Japan	247.0	185.1	61.9

Source: NBP estimations.

[13] Greece and Cyprus do not participate in the PSPP.

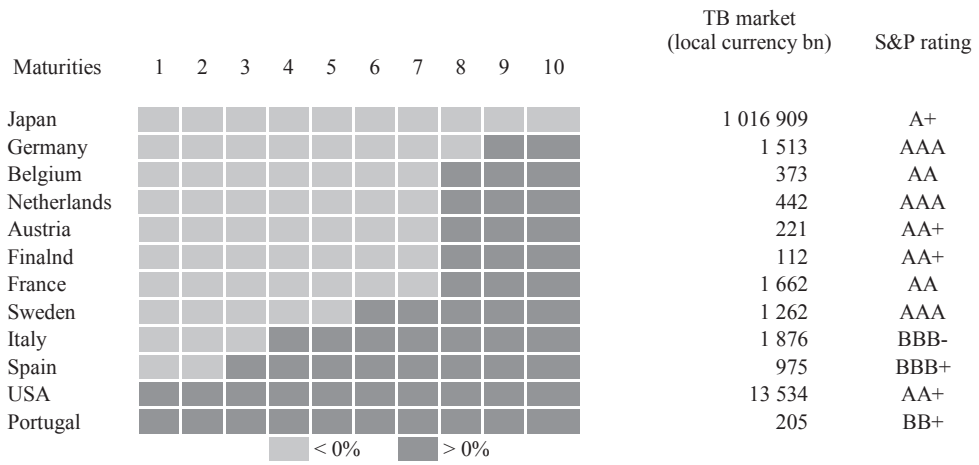

Figure 3. Treasury bond yields in 2015

Source: NBP calculations.

Despite the favourable outcomes of ECB's QE, it may face important technical obstacles. Due to the new banking regulations and narrowing budget deficits in Eurozone member countries, the ECB may encounter a shortage of treasury paper that banks would be ready to sell. As illustrated by Figure 3, the problematic side-effect of ECB' QE is that, by adding to the downward pressure on treasury yields, it contributed to their fall into a negative territory, which created obvious problems for insurance companies and pension funds.

5. Concluding remarks

QE programs are massive central bank interventions on treasury bond markets aiming to alleviate balance-sheet recessions which result from the uncontrolled boom-bust cycles on the mortgage markets. They did not directly fix the consequences of the credit crunch and halted money creation (both of which crippled domestic demand for an extended period of time) as contrary to the popular view no alleged direct money creation was involved. Nonetheless, QE programs tend to facilitate economic recovery and the following revival of credit and money creation by way of reducing fiscal adjustment costs, engineering the wealth effect and causing domestic currency depreciation.

The Federal Reserve and the Bank of England adopted their QE programs just after the collapse of Lehman Brothers and their prompt action facilitated economic recovery in both countries. In contrast, the ECB' QE was only started after the return of the recession and a surge in member countries' debt-to-GDP ratios. This delay resulted in the development of the negative feedback loop between the fiscal and

banking crises, which was augmented by destabilizing speculation on Eurozone debtor countries treasury bond markets.

Behind the Eurozone creditor countries' initial rejection to initiate QE was the mixture of doctrinal stance and opposition to any form of debt reduction [De Grauwe 2013]. The creditor countries insisted that the main factor behind the Eurozone crisis was irresponsible fiscal policy (while this was true for Greece, the same cannot be said for other member countries. It was also believed that (despite exacerbating fiscal crisis) punitive interest rates were necessary cure and the only way to incentivize the debtor countries to repair their public finance [Dullien, Guérot 2012].

The underlying cause of the costly delay in launching ECB's QE was an insufficient degree of political integration, which makes the Eurozone more similar to system of currency boards than a genuine monetary union [Buiter 2015]. The final form of ECB's QE is, therefore, a reflection of conflicting interests between creditor and debtor countries. The political compromise to use it as a vehicle of public debt reduction for creditor and debtor countries alike, regrettably, limited the scale of a decrease in debt-to-GDP ratios in the latter.

The initial phase of the ECB's QE was an insufficient tool to solve the Eurozone debt problem. Moreover, it is highly probable (given intensifying symptoms of secular stagnation) that the rates of economic growth and inflation are not high enough to ensure a substantial reduction in debt-to-GDP ratios of the debtor member countries. Hence, the Eurozone will have to choose between QE's extension and return to the concept of public debt mutualisation. As the latter option had been consistently rejected by the creditor countries, the more probable scenario is extending the QE program (as was the case in Japan) for a much longer period of time than initially assumed.

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