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Quantitative easing, negative interest rates and money creation. What central banks can and cannot do?

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**Quantitative easing, negative interest rates
and money creation.
What central banks can and cannot do?**

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Quantitative easing, negative interest rates and money creation. What central banks can and cannot do?

JEL Classification: *E51; E52; E58*

Keywords: *quantitative easing; negative interest rates; money creation; monetary transmission*

Abstract: Since the Great Recession some central banks have introduced measures such as quantitative easing (QE) and negative interest rates which seem unconventional in terms of the pre-crisis monetary policy consensus. Some economists and policymakers expect these actions to affect the money supply, both directly and indirectly. The paper confronts these statements with some institutional constraints on money creation to examine whether the claimed influence on money supply is possible. Some types of QE could affect the money supply, however it should not be perceived as an incentive for commercial banks to increase lending. When it comes to the negative policy rates, the effect on banks' lending might actually be quite the opposite to the expected growth. These discrepancies result from certain inaccurate beliefs about money creation. Some adjustments provide a more realistic view of possible consequences of unconventional monetary policies and may contribute to the better implementation of monetary policy at the zero-lower bound.

Introduction

Since the Great Recession (2007-2009) some central banks have introduced measures which seem unconventional in terms of the pre-crisis monetary policy consensus. When faced with the zero-lower bound it was decided to implement quantitative easing (QE), negative interest rates and forward guidance in order to provide a further monetary stimulus.

* The views expressed in this paper are those of the authors and do not necessarily represent those of Narodowy Bank Polski.

On the one hand, it is well documented that these measures have been effective (see, for example, Bernanke, 2012; Woodford, 2012; Hutt, 2014). On the other hand, they have not triggered a sudden increase in bank lending, money supply, and GDP and/or inflation, as some have expected.

We argue that any kind of disappointment concerning the hitherto effects of the unconventional monetary policies results from misunderstanding these mechanisms and expecting consequences that simply cannot happen because of institutional constraints on money creation which are sometimes overlooked.

For example, there are three claims made by some economists and policymakers on quantitative easing and negative interest rates which concern the expected effects on money supply. It is said that under quantitative easing central banks create money, quantitative easing increases lending capacity of commercial banks, and negative interest rates encourage commercial banks to lend.

These three popular statements are based on financial intermediation theory of banking and fractional reserve theory of banking. However, as recently noted by McLeay et al. (2014), Jakab and Kumhof (2015), and Werner (2014, 2015) the credit creation theory of banking is the most accurate description of monetary creation in the modern economy.

Respecting the fact that banks create money making loans “out of nothing” proves that some types of QE could affect the money supply, however it should not be perceived as an incentive for commercial banks to increase lending. Moreover, when it comes to the negative policy rates, the effect on banks’ lending might actually be quite the opposite to the expected growth.

In other words, we expect too much from the current policies. And if the aim were to increase money for GDP transactions, it would be much more efficient to implement “helicopter money” (Buiter, 2014).

1. Unconventional monetary policies since the Great Recession

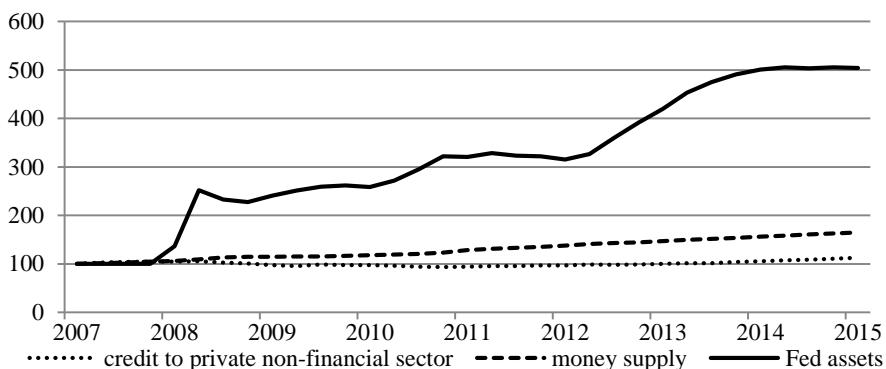
Since the Great Recession (2007-2009) some central banks have introduced measures which seem unconventional in terms of the pre-crisis monetary policy consensus. Faced with turbulences on financial markets, economic downturn and soon after interest rates close to zero (traditionally seen as a limit for monetary policy easing) it was decided to take on further steps such as quantitative easing (QE), negative interest rates and forward guidance to stimulate real growth and prevent disinflation.

By the end of 2015 five central banks, namely Federal Reserve (Fed), Bank of England (BOE), Bank of Japan (BOJ), European Central Bank (ECB) and Sveriges Riksbank (SR), have conducted quantitative easing programs, which have varied across economies in order to comply with their structural features and motivations behind particular actions (Fawley, Neely, 2013).

Fed pursued three asset purchase programs between November 2008 and October 2014. Bank of England started QE in March 2009 but it has not been expanded since July 2012. However, both in US and UK any funds associated with purchased bonds maturing have been reinvested, so the total stock of QE remains the same. As banks play more important role than bond markets outside the Anglo-American financial system, Bank of Japan focused firstly on credit easing, although it already had some precursor experience with QE from early 2000s. Nevertheless, its asset purchase program was initiated in July 2010 and is continually increasing. For similar structural reasons, in January 2008 European Central Bank began pursuing additional lending programs (for example LTROs). With sovereign debt crisis in between, the QE started in the Eurozone in January 2015 and further asset purchases are still conducted. In February 2015 Sveriges Riksbank began QE as a response to the ECB action (which caused the appreciation of krona) and it is also continued.

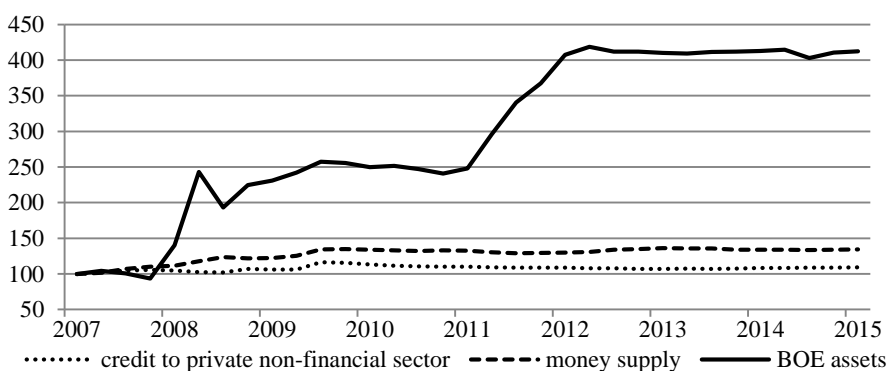
Although all of the above described policies resulted in expansion of central bank's balance sheet due to extraordinary increase of reserves, they did not lead to any comparable increase of money supply or bank credit to the private non-financial sector (figures 1-5), which would be expected according to the fractional reserve theory of banking. There was even a slight decrease in credit in the United States in 2009-2013 (figure 1) and in Japan in 2010-2012 (figure 3).

Figure 1. Credit, money supply (M2) and central bank's assets in the United States between 2007Q3 and 2015Q3 (index 2007Q3=100)



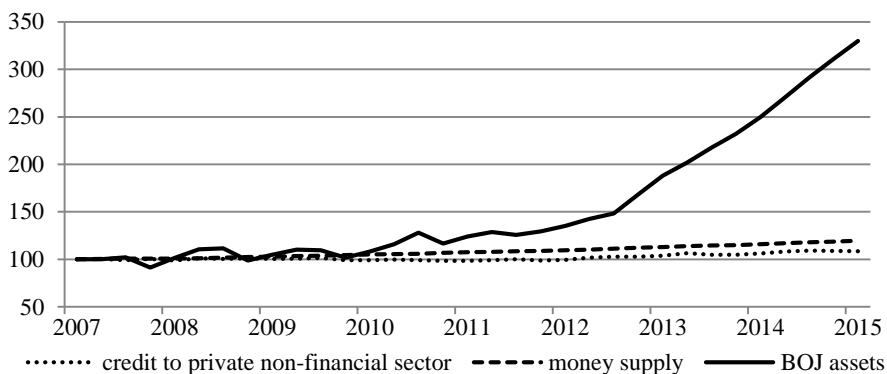
Source: own elaboration based on (BIS, 2016; OECD, 2016; FRED Economic Data, 2016).

Figure 2. Credit, money supply (M3) and central bank's assets in the United Kingdom between 2007Q3 and 2015Q3 (index 2007Q3=100)



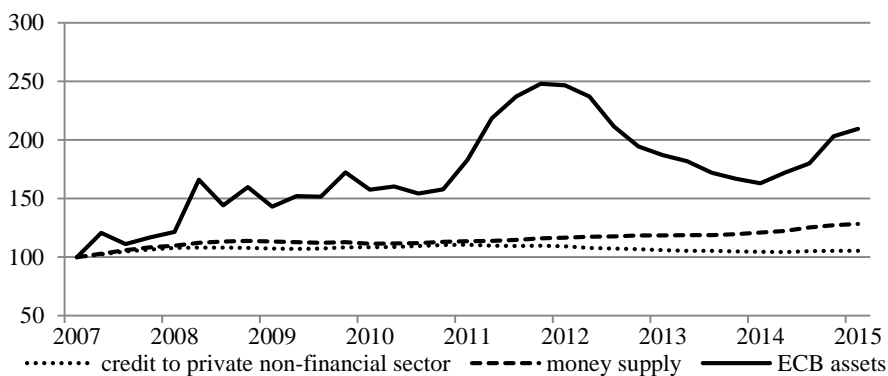
Source: own elaboration based on (BIS, 2016; OECD, 2016; Bank of England, 2016).

Figure 3. Credit, money supply (M3) and central bank's assets in Japan between 2007Q3 and 2015Q3 (index 2007Q3=100)



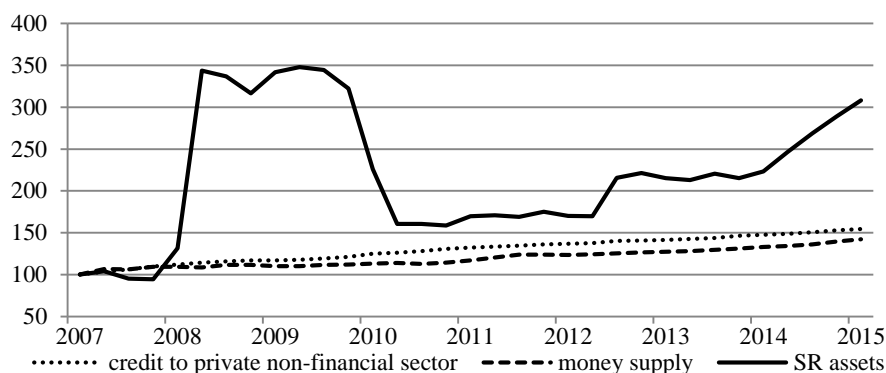
Source: own elaboration based on (BIS, 2016; OECD, 2016; Bank of Japan, 2016).

Figure 4. Credit, money supply (M3) and central bank's assets in the Eurozone between 2007Q3 and 2015Q3 (index 2007Q3=100)



Source: own elaboration based on (BIS, 2016; OECD, 2016; ECB, 2016a).

Figure 5. Credit, money supply (M3) and central bank's assets in Sweden between 2007Q3 and 2015Q3 (index 2007Q3=100)



Source: own elaboration based on (BIS, 2016; OECD, 2016; SR, 2016).

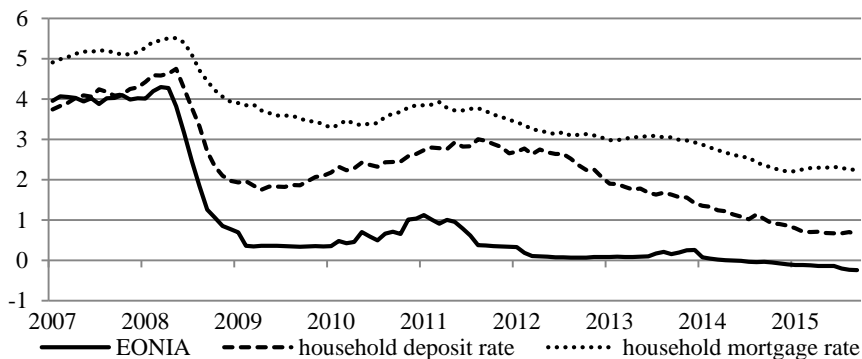
Another unconventional measure of conducting monetary policy are negative interest rates. By the end of March 2016 six central banks have set their interest rates below zero. The latest decisions were made by Bank of Japan and National Bank of Hungary in January and March 2016, respectively. However, our analysis is focused on the European Central Bank, Danmarks Nationalbank, the Swiss National Bank and Sveriges Riksbank due to the availability of data over a longer time span.

The European Central Bank lowered the deposit rate to below zero in June 2014, after having signalled the possibility for more than a year. Danmarks Nationalbank made its move into negative territory in September 2014 as a response to the appreciation of krona caused by a further ECB rate cut. Riksbank's decision to lower the repo rate to below zero in February 2015 was similarly motivated. The Swiss National Bank introduced negative interest on sight deposits exceeding a certain threshold in January 2015.

All of those above mentioned and also further cuts of the key policy rates have been transmitted quite accurately to the interbank rates and up to some point also to the market deposit and lending rates (figures 6-9). However, commercial banks seem rather reluctant to pass negative rates through to retail depositors, probably because negative deposit rates might lead to a significant deposit withdrawals. Apart from negative interest rates on some corporate deposits in Denmark, they have generally stabilized on a certain, close to zero, but positive level. In overall, retail lending rates have remained mostly unchanged despite introducing negative policy rates. Therefore, the decrease of lending margins caused the decline in banks' net interest income (ECB, 2016b) and some lending rates were even increased (especially

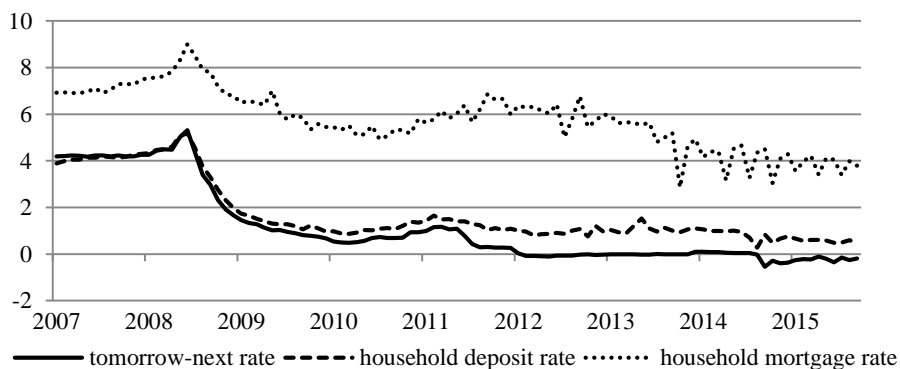
mortgage) in order to compensate lower mark-ups in other business lines of lending.

Figure 6. Interest rates in the Eurozone between 2007M06 and 2016M02



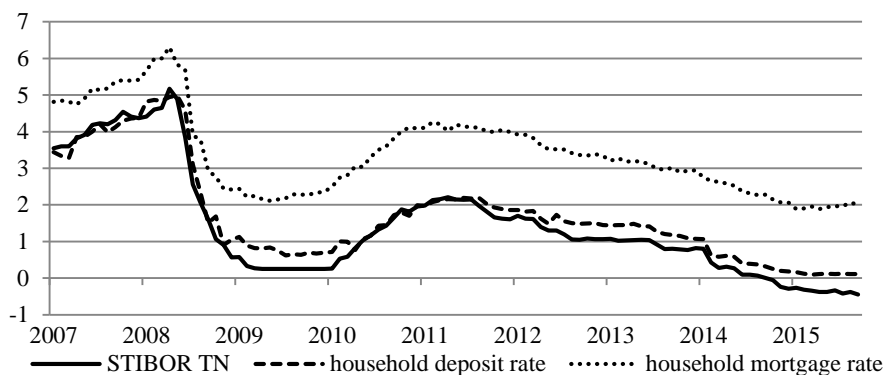
Source: own elaboration based on Datastream and (ECB, 2016a).

Figure 7. Interest rates in Denmark between 2007M06 and 2016M02



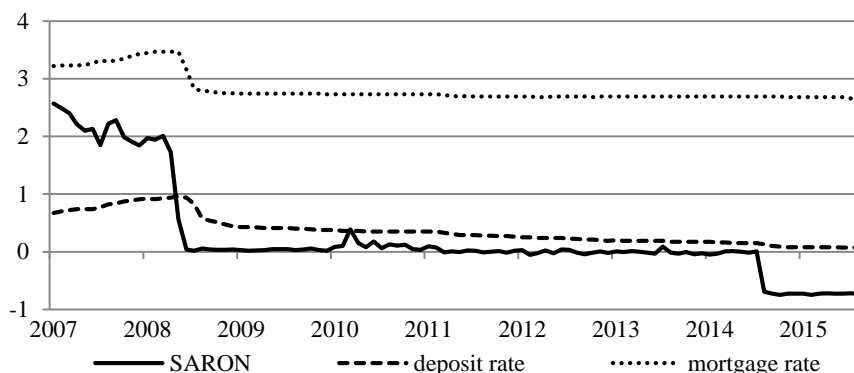
Source: own elaboration based on Datastream and (Danmarks Nationalbank, 2016).

Figure 8. Interest rates in Sweden between 2007M06 and 2016M02



Source: own elaboration based on Datastream and (SCB, 2016).

Figure 9. Interest rates in Switzerland between 2007M06 and 2016M01



Source: own elaboration based on Datastream and (SNB, 2016).

2. A review of illustrative comments

There are basically three claims made by some economists and policymakers on quantitative easing and negative interest rates, which refer both to the mechanism of these unconventional monetary measures and to the expected effects on money supply. It is said that:

- under quantitative easing central banks create money,
- quantitative easing increases lending capacity of commercial banks,
- negative interest rates encourage commercial banks to lend.

First of the above mentioned statement is especially popular in the media, when it comes to explaining QE in a simple way:

“But when interest rates are almost at zero, central banks need to adopt different tactics – such as pumping money directly into the financial system. This process is known as quantitative easing or QE. How does it work? The central bank buys assets, usually government bonds, with money it has “printed” - or, more accurately, created electronically”.

(BBC News, 2015)

Moreover, some economists and policymakers argue that QE will inevitably lead to a high inflation (or even hyperinflation) as during the process the money is created:

“The longer QE goes on and the more people keep talking about increasing it, the more one might start to worry about diminishing value of money and demanding more of it for the same work rate. As central banks print more and more money, all else being equal, its real value must decline”.

(Choudhry, 2012)

“So Bernanke doubled the money supply in the past eight or nine months. (...) One of the consequences of that will be rising prices and everybody knows about it. But he believes that he knows how to remove all this excess credits when the time comes”.

(Paul, 2009)

The second statement concerns the increase of commercial banks’ lending capacity due to QE and is shared by many prominent economists:

“The idea behind quantitative easing is to provide banks with substantial excess liquidity in the hope that they will choose to use some part of that liquidity to make loans or buy other assets”.

(Bernanke, 2009)

“As a result, excess reserves held at the Fed soared, from an average of \$200 billion during 2000-2008 to \$1.6 trillion during 2009-2015. Financial institutions chose to keep their money with the Fed instead of lending to the real economy, earning nearly \$30 billion – completely risk-free – during the last five years”.

(Stiglitz, Rashid, 2016)

“A further motive of the ECB’s bond purchases has been to increase the cash that Eurozone banks have available to lend to businesses and households”.

(Feldstein, 2016)

It is also used to explain why no significant change in price dynamics has occurred as a result of QE:

“(...) inflation – which rapid money-supply expansion inevitably fuels – has so far remained subdued, at roughly 2%, because banks are not using their swelling reserves to expand credit and increase liquidity”.

(Meltzer, 2013)

“One reason the hawks have been wrong about inflation is that the money the Fed has pumped into the financial system has tended to sit at banks without being lent to customers”.

(Hilsenrath, Peterson, 2013)

Therefore, the third opinion regards negative interest rates as an incentive for commercial banks to increase lending:

“If the Fed reduces the reward for holding excess reserves, banks will hold less of them--which means they will have to find something else to do with the money, such as lending it out or putting it in the capital markets”.

(Blinder, 2012)

“Instead of effectively encouraging banks not to lend, the Fed should have been penalizing banks for holding excess reserves”.

(Stiglitz, Rashid, 2016)

“But now, by imposing penalties on excess reserves left on deposit with central banks, negative interest rates drive stimulus through the supply side of the credit equation – in effect, urging banks to make new loans regardless of the demand for such funds”.

(Roach, 2016)

3. Rediscovering money creation

The key for verifying whether QE and negative interest rates can do what was claimed in comments from the previous section is to establish what is the role of commercial banks in money creation. There are basically three approaches: financial intermediation theory of banking, fractional reserve theory of banking and credit creation theory of banking. According to the first one, banks are intermediaries and lend out deposits that savers make (without the ability to create money). In the second approach, they “multiply up” monetary base to create loans and deposits (with being able to create money only collectively). The third theory claims that banks individually create money making loans, “out of nothing”.

Recently McLeay et al. (2014), Jakab and Kumhof (2015), and Werner (2014, 2015) noted that the credit creation theory of banking is the most

accurate description of monetary creation in the modern economy. On the other hand, the financial intermediation theory of banking describes what non-bank financial intermediaries (like corporations specialised in making payday loans), but not what banks do. The fractional reserve theory of banking makes a reverse causation – central banks accommodate demand for monetary base after lending, rather than providing reserves/cash to “multiply it up”.

Now we describe money creation. There are three main types of money: cash, reserves and deposits. Below we focus on three types of agents: a central bank, commercial banks and non-banks (covering households, non-financial corporations and non-bank financial corporations). Without loss of generality, we abstract from a government. As an analytical tool we use balance sheets.

Table 1 places different types of money in stylised balance sheets of the groups of agents of interest. Cash is a liability of the central bank and an asset of commercial banks and non-banks. Reserves, similarly as cash, are a liability of the central bank. But they are an asset of commercial banks only. Deposits are held by non-banks (being their asset) in commercial banks (their liability).

But how is money created? In table 2 there are again balance sheets of the central bank, commercial banks and non-banks. Deposit money is created mainly when commercial banks make loans (panel a). In this case, commercial banks expand both sides of their balance sheets – assets by loans and liabilities by deposits. At the same time, assets and liabilities of non-banks are increased, in a mirror way¹. Non-banks can exchange deposits for cash in commercial banks (panel b). Here, balance sheets of commercial banks shrink (cash is removed from their assets and deposits from liabilities) and assets of non-banks change their structure. Commercial banks can exchange reserves for cash in the central bank (panel c). In that case, there is a change in structure of balance sheets of both commercial banks and the central bank. Finally, reserve money is created mainly when central banks do repo with commercial banks (panel d). This is nothing else than a collateralised loan from the first institution to the second one. In its essence, it looks like deposit money creation (and it should not be surprising, as reserves are being deposits of commercial banks at the central bank).

A few issues emerge. Firstly, commercial banks do not need deposits or reserves to lend out in order to make loans, by doing it they create new deposits. Crucially, they even cannot lend out deposits, as they are not their assets (as in the case of non-bank financial intermediaries) and cannot lend

¹ Deposit money is created also when the central bank/commercial banks buy assets from non-banks.

out reserves, because they cannot be held by non-banks. Secondly, commercial banks need reserves mainly to settle transfers of deposits between banks and to fulfil the reserve requirement. The latter is related to a lagged level of deposits and, as mentioned above, the central bank accommodates demand for reserves (and cash). If it did not do so, it would not achieve the operating target, usually an interbank interest rate (see Disyatat, 2008). Thirdly, that commercial banks create money “out of thin air” does not mean that they are willing to do so in an unlimited quantity. They need to take into account the impact of new loans on their profitability and solvency (Jakab, Kumhof, 2015). When loans are made to low-quality borrowers and are not paid down, they subtract from bank capital and can make banks not fulfilling the capital requirement or bankrupt. For more details on money creation see Ryan-Collins et al. (2015). The next section uses these facts to verify the validity of comments from section 2.

Table 1. Money in stylized balance sheets

Central bank		Commercial banks		Non-banks	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	Cash	Cash	Deposits	Cash	
	Reserves	Reserves		Deposits	

Source: own elaboration.

Table 2. Creating/exchanging money

Central bank		Commercial banks		Non-banks	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
		a) Deposit creation			
		+ Loans	+ Deposits	+ Deposits	+ Loans
		b) Exchanging deposits for cash			
		- Cash	- Deposits	- Deposits	
				+ Cash	
		c) Exchanging reserves for cash			
	- Reserves	- Reserves			
	+ Cash	+ Cash			
		d) Reserve creation			
+ Repo	+ Reserves	+ Reserves	+ Repo		

Source: own elaboration.

4. Implications for the effects of quantitative easing and negative interest rates on money

According to comment 1, “under QE central banks create money”. Table 3 shows how do two types of QE look like in balance sheets of the central bank, commercial bank and investment/pension funds (a part of non-bank sector). In the first type, the central bank purchases government bonds (or other financial assets) paying with newly created reserves (panel a). Balance sheet of the central bank expands, while assets of commercial banks change their structure. Here, only reserve money is created. In the second type of QE the central bank buys bonds from funds, this time paying with newly created deposits (panel b). These are kept in commercial banks, so their liabilities expand. To make it accurate in terms of accounting principles, assets of commercial banks have to increase as well. And they do, as in this case the central bank creates reserve money as well. In sum, two types of money are created – deposits and reserves.

However, it should be noted that in neither case newly created money can be used (directly) for GDP transactions. Commercial banks can use reserves only for settlements with other banks. Funds hold deposits in the name of their customers and can use them only to buy other assets. However, an increased turnover on financial assets can increase their prices and lower long-term interest rates (for bonds, rates move inversely with prices). The wealth effect may encourage households to cash in their investment fund units and the lower cost of capital may make non-financial corporations issue more bonds to investment funds (and funds may be willing to buy them to rebalance their portfolios). Both cases are shown in table 4 in panels a and b, respectively. Here, households/non-financial corporations indeed end up with money created through QE and can use them for GDP transactions. But it should be noted that is not “free money” in any case. For empirical evidence on these effects see Joyce et al. (2014) and Cloyne et al. (2015). In general, the first comment from section 2 is at least in some sense true, but what kind of money is created depends on whether assets are bought from commercial banks or funds (there is no deposit money creation in the first case), and there may be no effect on the ability to make GDP transactions by economic agents (except via some indirect channels).

Comment 2 suggests that QE encourages commercial banks to lend. To verify it, table 5 compares lending with (panel a) and without QE (panel b). Until now we abstracted from reserves, as their role in deposit money creation is secondary. Now we divide them into required and excess reserves. The first case (lending with QE) starts with the central bank purchasing bonds from funds. We chose this variant as here commercial banks end up

with both new reserves and deposits. But they are not used in an way in subsequent lending. By granting loans, commercial banks create deposits. These newly created deposits increase the reserve requirement with some (usually 1-month) lag. Commercial banks fulfil it with transferring funds between excess and required reserve accounts.

It may look like the increase in excess reserves expands the capacity of commercial banks to lend. But how differently would the process look like without QE? In the case of structural lack of liquidity in the banking sector, the central bank would create reserves for commercial banks doing repo with them. And the central bank has to conduct these operations in order to achieve its operating target (an interbank interest rate). In the opposite case (structural liquidity surplus) the scale of operations absorbing liquidity (reverse repo, for example) would decrease. It means that the reserve requirement is effectively not a constraint in lending. And, with QE or without it, while granting loans commercial banks have to take into account their effects on profitability and solvency. It should be noted that comment 2 is consistent with financial intermediation and fractional reserve theories of banking. But these are misleading in the context of current institutional arrangements. And both the analysis above and empirical research (Butt et al., 2015) show that the claim that QE encourages commercial banks to lend is doubtful.

Finally, according to comment 3 “negative interest rates encourage commercial banks to lend”. It is based on assumption that commercial banks get rid of reserves while lending. But it was already mentioned that banks do not lend out reserves. It is likely that a given bank will get rid of reserves if it first grants loans, and then sets a deposits rate below the market rate, as it should cause a net outflow of deposits. Such a situations is shown in table 6. But it does not have an aggregate effect, as these deposits simply flow to another bank (it means that such an argument is based on fallacy of composition). An aggregate decrease can happen only in very specific circumstances. First, when loans are being paid down. Second, when non-banks buy assets from banks. Third, when non-banks exchange deposits for cash.

The last case is shown in table 7. Here, commercial banks grant loans. Then, non-banks decide to pay out cash. We assume that commercial banks do not have enough cash in their vaults so they exchange reserves for cash at the central bank. Finally, commercial banks provide non-banks with cash. But such a scenario on a large scale is extremely unlikely. While in 1867 the share of cash in money supply was 45% (Friedman, Schwartz, 1963), in 2016 it was only 11%. In other words, that negative interest rates encourage

commercial banks to lend is doubtful (though consistent with the fractional reserve theory of banking).

Furthermore, a concern about the aim of the negative policy rates emerges. Apparently, they are passed through to the lending rates for the private non-financial sector without imposing negative rates on retail deposits, which has negative effects on bank profitability. In effect, negative rates can even discourage commercial banks from lending (Linnemann Bech, Malkhozov, 2016). On the other hand, the introduction of negative deposit rate might disturb the retail deposit base and is unlikely to encourage spending (Cliffe, 2016). But if the transmission to lending rates for households and companies does not occur at all, negative policy rates largely lose their rationale.

Table 3. Quantitative easing

Central bank		Commercial banks		Funds	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
a) Purchasing bonds from commercial banks					
+ Bonds	+ Reserves	- Bonds			
		+ Reserves			
b) Purchasing bonds from funds					
+ Bonds	+ Reserves	+ Reserves	+ Deposits	- Bonds	
				+ Deposits	

Source: own elaboration.

Table 4. Asset purchases from funds – potential continuation

Funds		Households		Non-financial corporations	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
a) Cashing in fund units					
- Deposits	- Fund units	- Fund units			
		+ Deposits			
b) Purchasing bonds from non-financial corporations					
- Deposits				+ Deposits	+ Bonds
+ Bonds					

Source: own elaboration.

Table 5. Granting loans – with and without QE

Central bank		Commercial banks		Non-financial entities	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
a) Granting loans with QE					
Stage 1. Purchasing bonds from fund (funds not shown)					
+ Bonds	+ Excess reserves	+ Excess reserves	+ Deposits		
Stage 2. Granting loans					
		+ Loans	+ Deposits	+ Deposits	+ Loans
Stage 3. Fulfilling reserve requirement					
	- Excess reserves	- Excess reserves			
	+ Required reserves	+ Required reserves			
b) Granting loans without QE					
Stage 1. Granting loans					
		+ Loans	+ Deposits	+ Deposits	+ Loans
Stage 2. Fulfilling reserve requirement					
+ Repo	+ Required reserves	+ Required reserves	+ Repo		

Source: own elaboration.

Table 6. Granting loans and deposit outflow from one bank

Commercial bank 1		Commercial bank 2		Non-banks	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Stage 1. Granting loans					
+ Loans	+ Deposits			+ Deposits at CB 1	+ Loans
Stage 2. Deposit outflow					
- Reserves	- Deposits	+ Reserves	+ Deposits	- Deposits at CB 1	
				+ Deposits at CB 2	

Source: own elaboration.

Table 7. Granting loans and aggregate deposit outflow

Central bank		Commercial banks		Non-banks	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
		Stage 1. Granting loans			
		+ Loans	+ Deposits	+ Deposits	+ Loans
		Stage 2a. Deposit outflow 1			
			- Deposits	- Deposits	
		Stage 2b. Exchanging reserves for cash			
	- Reserves	- Reserves			
	+ Cash	+ Cash			
		Stage 2c. Deposit outflow 2			
		- Cash		+ Cash	

Source: own elaboration.

Conclusion

Respecting the fact that money creation differs substantially from its textbook description we have shown, that unconventional monetary policies are unlikely to affect money supply in the way expected by some economists and policymakers.

Asset purchases from non-banks indeed increase deposit money, but then it is not necessarily available for GDP transactions. Purchases from banks increase reserve money only, but rather do not encourage banks to lend. Negative interest rates, as they impair net interest income and profitability, may even discourage banks from doing so.

The channels of influence of these measures are much more subtle. They are likely to affect the economy by increasing asset prices, lowering long-term interest rates, depreciating exchange rates and limiting debt servicing costs for governments.

However, if the aim of unconventional monetary policies were to increase money for GDP transactions, it would be much more efficient to implement “helicopter money” (Buiter, 2014), as advocated, among others, by Friedman (1948), Bernanke (2003) and Turner (2016). As money creation usually requires someone running into debts, such a policy, if allowed by law, could be a good alternative, especially in the environment of deleveraging.

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