

Fractional Reserve in Banking System

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<p>This thesis is aimed to provide understanding of the role of the fractional reserve in the modern banking system worldwide and particularly in Finland.</p> <p>The fractional reserve banking is used worldwide, but the benefits of this system are very disputable. On the one hand, experts say that the fractional reserve is a necessary instrument for the normal business and profit making. On the other hand, sceptics openly criticize the fractional reserve system and blame it for fiat money (money not backed by any physical commodities) creation. According to a third point of view, which is expressed by conspiracy theory followers, a the fractional reserve system primary targets to control the money supply in favor of famous rich families, such as the Rothschild family.</p> <p>Although the fractional reserve system is criticized for many reasons, such as causing a moral hazard, cheating and being not transparent, it still functions successfully all over the world. At least the banking system still exists and seems to exist further. How crucial are the deficiencies in the fractional reserve system for which it is criticized? Can they be improved? Or maybe the fractional reserve system is not that up to date anymore and should be replaced by something totally different?</p> <p>To find answers to these questions, I studied history books, up-to-date materials and legislation, especially acts published by the European Central Bank. In addition, I sent questionnaires to several banks in Finland and got examples from real bank practice, which in total helped me to form the final understanding of the role of the fractional reserve system in today's economy.</p>	
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1 Introduction

This thesis is aimed to investigate the role of the fractional reserve banking in the banking system, analyse its disadvantages and finally answer the question whether modern the fractional reserve banking system is beneficial for a particular bank and, as a consequence, for the whole state's financial system.

Each bank is an element of a state's financial system. There is the Central Bank on the top of this system. According to Investopedia, the Central Bank is "the entity responsible for overseeing the monetary system for a nation". In other words, this institution is responsible for managing state's currency, money policy and supply and interest rate. The Central Bank functions as the bank of the government. The Central bank in the US is known as the Federal Reserve System (the Fed), in Russia it is the Central Bank of Russia, in Finland it is the Bank of Finland (Suomen Pankki or Keskuspankki). The policy regarding bank reserves is managed by the Central Bank of a country.

Apart from maintenance of the state financial system functionality, banks also act as physical and legal persons' finances operations and secure institute. Millions of people make deposits, receive salaries through bank accounts, take credits for big and small purchases, transfer money and make other operations. Businesses are financed with bank loans and keep their money on bank accounts. Nation's money circulates via banks. If the bank system crashes, it will be a disaster. That's why banks need to secure their solvency.

A bank faces many risks: liquidity risk (ability to pay on demand), credit risk (occurs when a borrower cannot repay the debt), interest rate risk (when a bank has to pay more for its liabilities and therefore its profits reduce), trading risk (when bank operates with trading securities - debt securities and derivatives), foreign exchange risk (when the value of one currency falls in relation to another), sovereign risk (same as political risk), operational risk (arises from deficient business practice when property required to run a business (buildings, equipment etc) is damaged or fully destroyed) (Spaulding, W.C. Bank Risks). One of the most common risks is liquidity risk. In order to maintain their solvency and follow normal course of business modern commercial banks all over the world use the fractional-reserve banking.

Nowadays in the light of unstable financial situation in Europe due to political issues, economic sanctions and crisis in Greece, banks are staying alert. People and businesses are afraid of tomorrow, and it makes them to be prudent about their finances. Almost

everybody keep their money in banks and in case of loss of trust and/or bank panic regular people and stakeholders will rush to withdraw their deposits, which will lead to a bank run. That's why the question of making reserves in regards of going concern of a bank is extremely important for today.

The fractional reserve system is the only banking system which is applied nowadays all over the world. On the one hand, it seems to be reliable, because it is based on the worldwide bank practice and is being used for many tens of years. But on the other hand, there is enough criticism of the system. Modern financial experts figure out its deficiencies and claim, that this system obviously is not able to protect banks from liquidity risk. If so, why governments have not rejected the fractional reserve system as meaning of liquidity secure and therefore what is the actual target of this system?

In this thesis I am going to investigate, where the true answer is.

1.1 Research topic, investigative questions and research methods

The research topic can be worded as: does the fractional reserve system really act in a benefit of the state's financial system?

To set accents I figured out four investigative questions:

IQ 1. What is the fractional reserve, how is it calculated and monitored?

IQ 2. To what extent the liquidity risk can be mitigated by the fractional reserve system?

IQ 3. What are deficiencies in the fractional reserve system?

IQ 4. Can the system be improved?

To find the answer for these questions I am going to study theory concepts, examine related to the topic worldwide bank experience (news, articles) and particularly will refer to the Finnish banks practice. I sent interview forms to 51 banks in Finland (Nordea, OsuusPankki (OP), OmaSP, DanskeBank and Handelsbanken) in order to get opinions about advantages and disadvantages of existing fractional reserve system and to find out suggestions about its improvement.

I will conduct qualitative research, which will include desktop research of literature, articles and pieces of news, interviews of banks' management representatives and active research with the use of FRB simulator. FRB simulator (or fractional reserve banking simulator) allows to illustrate how the fractional reserve functions in a real time. This simulator allows to change parameters and see the impact on money supply straight away. This simulator is developed by TrueActivist web site creators in order to give

“accurate picture of a problem” (TrueActivist 2012). More details about FRB simulator will be given in chapter 2, subchapter 2.2.

Thus the structure of the thesis will be as follows: chapter 2 will include theory and will cover IQ1, IQ2 and IQ3 in terms of theory; chapter 3 will include practical materials (interviews with banks’ representatives) and will cover IQ3 and IQ4 in terms of Finnish banks practice; in chapter 4 I will summarise my findings and present results and chapter 5 will be dedicated to discussion.

1.2 The fractional reserve definition

Firstly, I would like to clarify some wording issues. Different sources use different wording for the topic: the fractional reserve banking, the fractional reserve system or sometimes even the fractional reserve banking system. In this thesis I will use *the fractional reserve system* wording.

What is the fractional reserve system? Obviously it is a banking system which functions with the use of the fractional reserve. Here comes next question: what is the fractional reserve?

In general reserve means some amount of funds that are retained in the business and are not distributed among owners and other stakeholders. Bank reserve is made with the same logic. Investopedia gives the following definition for bank reserve: “the currency deposits which are not lent out to the bank’s clients” (Investopedia. Bank Reserve). The only difference is that bank reserve is always made in cash, whereas accounting reserves in regular business can be made also as provisions (e.g. obsolete stock provision), allowances (e.g. bad debt allowance) and accruals (e.g. accrued liabilities), that do not have cash equivalent, but are made as double-entries in an accounting system.

According to BusinessDictionary, banks can make primary reserves (to meet the needs of day-to-day operations) and secondary reserves (to meet emergency liquidity requirements). Primary reserves represent funds required to support routine bank operations, uncollected cheques and to fulfil legal/mandatory reserve requirements. Primary reserves cannot be used (lent out or invested) but they may be used in case of liquidity crisis, when depositors start heavy cash withdrawals.

Secondary reserves are represented by bank investments into short-term marketable securities (e.g. treasury bills), that act as support for primary reserves, being a source of liquidity supplemental.

The fractional reserve belongs to primary bank reserves.

Investopedia defines the fractional reserve system in the following way: “A banking system in which only a fraction of bank deposits are backed by actual cash-on-hand and are available for withdrawal” (Investopedia. Definition of the fractional reserve banking).

Thus the fractional reserve means some percent (fraction) from each deposited amount, which is required to be kept on hand by a bank and cannot be lent to anyone. The size of the percent is set by the Central Bank.

1.3 Historical background

Banks appeared thousands years ago together with the people’s need to protect their values in a safe place. In early civilizations, such as ancient Egypt and Mesopotamia, best protected places were temples. They were able to protect themselves from thieves and enemies attacks. People kept their gold in temples, but the gold was idle there, while there were merchants, trading communities and governments, that might need it. First loans to these groups were made by the priests of the temples in the 18 century BC in Babylon (History of Banking). This is was how the basic concept of bank arrived.

There is also a version about how the fractional reserve banking occurred. The story usually tells about ancient goldsmiths, in whose vaults people stored their precious metals “on account” and received some warehouse receipt, which they could redeem later for their gold or silver. Over time the goldsmiths realized that it might be beneficial to lend some part of this gold to other people in the community (in other words to make investments), make a profit and return the gold to the vault before someone comes to take it back (Federal Reserve Bank of Atlanta).

Another version makes more exact, that the fractional reserve system was invented in Sweden by banker and former goldsmith Johan Palmstruch, who implemented the system in the bank Stockholms Banco (Takkirauta Blogspot 2014). The logic of the system was the same: Palmstruch kept people’s precious metals in a safe place for a small fee and gave in return a receipt, which was redeemable for gold or silver in future. He noticed that as a rule all the depositors never come to withdraw their funds at the same time, which meant that these funds could bring profits by being invested further. It is also interesting to mention, that Palmstruch was the first banker who went bankrupt because of the misuse of the system, when he started to lend more, that he could afford.

The main idea of the fractional reserve is that idle resources do not themselves bring any value before being invested for profit is transmitted very clearly.

Therefore the key idea of the fractional reserve is possibility to make profits by investing other people's funds having at the same time some "physical" amount (cash, gold) in case of withdrawals. Hardly all the depositors will come to withdraw their money at the same time, hence reserved amount should be enough to cover single withdrawals, while all the rest money circulate in a community production as investments. If speak broader, the fractional reserve gives banks opportunity to satisfy another need – need for investments. Therefore banks can solve two problems, which are relevant for every community: protect one's values and provide financial support (from a bank's perspective - to make investments) to the others.

For sure, financing can also be executed without bank intermediation. For example, direct financing can be made by individuals (when people buy shares of major corporation and therefore invest their own money for some return), but still significant investments in every country all over the world are funded by banks. Banks grant loans to big and small businesses and also to households. Why banks keep leading positions in investing – because banks, in contrast to individuals – can guarantee good investment opportunity. In other words a bank is a reliable source of finance, which will always follow its obligations and take care about funds for a certain fee.

In the light of aforesaid the question of trust becomes very important. Both physical and legal persons, when deal with a bank, expect from the latter stability and going concern in the long-term run, that's why banks have to protect themselves from crises. And here comes the fractional reserve system onto the scene as the only reserve system which is used by the banks worldwide.

2 Understanding of the fractional reserve system

Everybody knows what money is. We use money in our everyday life. For us money means banknotes in hand and cash on our bank accounts. Economists define money as an equivalent which is used as a measure of goods in nowadays world. In other words, money is a universal mean of exchange, which is understandable for everyone.

Do we know where money actually comes from? I think that most of us would give positive answer. We can earn money, we can inherit money, we can win money in lottery, we can get money as a birthday present and we can, for sure, borrow money from a bank. Thus for a physical person it is pretty clear where money comes from.

And what about state money supply, or where does the government get money from? Textbooks would say that currency is emitted by the Central Bank and then this currency is put into the financial system. This currency can be also called as “physical money” or “outside money”. This is cash. But there is also money created by commercial banks in the form of loans and credits. This money we cannot touch. This money is called “deposit money” or “inside money” and they are generated through the fractional reserve system. I took the names of “outside money” and “inside money” from the article about the fractional reserve banking published on the web site of Federal Reserve Bank of Atlanta, because in my opinion they clearly reflect the meaning of the subject (Federal Reserve Bank of Atlanta).

So how does a bank generate money? If shortly, a bank takes a deposit, which in turn will become a loan, which in turn will become another deposit and so on. This is how “inside money” is created, through the process of depositing-lending. But what role does the fractional reserve play here?

The amount of the fractional reserve is defined by the Central Bank. When the Central Bank wants commercial banks create more or less “inside money”, it will change the fractional reserve requirements to make banks hold more or less reserves and therefore create more or less “inside money”. If the Central Bank sets lower reserve requirements, banks will lend out more money, which in turn will become new deposits and therefore the increasing quantity money will be created through the fractional reserve system. And vice versa: bigger the fractional reserve requirements will lead to less money to lend out and money supply will decrease.

This money-making process through depositing-lending and changing reserve requirements form a basis for *Money multiplier concept*, which I will describe further.

If we turn back to money supply and currency emission, we should mention such fact as that banknotes and coins emitted by the Central Bank should be backed by some physical commodity, which is bank assets. But are the “inside money” – loans and credits - backed by any bank assets? Are they even backed by anything? Can we speak about *Fiat money* when speaking about the fractional reserve system? If shortly, fiat money means currency, which a government has declared but which is not backed by a physical commodity (Investopedia. Fiat money). But as we know the fractional reserve is only a certain percent from each deposited amount and this in turn means that bank reserve cannot back each loan given. So does the fractional reserve system encourage fiat money creation and what consequences can it have?

To find answers to these and other question, let's turn now to theory and browse mentioned above concepts and a couple more.

2.1 Theories and concepts

The starting point in understanding the role of the fractional reserve role in the financial system is Money supply concept.

2.1.1 Money supply

The money supply means the “entire stock of currency and other liquid instruments in a country's economy as of a particular time” (Investopedia. Money supply). The money supply includes cash, coins, checks and savings accounts. Different types of money in the money supply are usually classified as M0, M1, M2, M3, M4 and MB.

M0 includes currency in circulation (banknotes and coins) and banks reserves with the Central Bank. M1 includes currency in circulation, current (checking) accounts plus deposit accounts that can be transferred by checks.

M2 includes currency in circulation, saving accounts and non-interest bearing bank deposits. M3 includes M1 plus all non-government (or private sector) deposits and certificates of deposits. There is also M3C category, which includes M3 plus foreign exchange deposits.

M4 includes M1 plus private sector deposits and money market investments (which are highly liquid government or corporate short-term debt instruments traded in money market: promissory notes, treasury bills etc).

Some sources (e.g. mentioned above BusinessDictionary) also allocate M5 category, which includes M4 and building-society deposits (building-society is a type of financial institution which provides financial services to its members (Investopedia. Definition of Building Society)).

MB relates to the Central Bank money. All the rest Ms relate to the commercial banks' money.

Banks can expand the money supply by lending money which they actually do not possess, but are only authorised to create, lend and spend. Having, e.g. 10% in reserve, a bank can lend out other 90% of funds, that a bank does not possess (it simply means that from each 1 EUR of every deposit a bank can lend out 0,90 EUR). In other words, "the fractional reserve system allows banks to lend out many times the amount they have in reserve". (O'Leary 2010, 11). Banks create money by creating new debts and this money is not backed by any physical commodities. With the use of the fractional reserve system banks increase M2 and M3 money types depending on the type of loan.

The FeD (the Central Bank of the USA) gives the following definition for the money supply: "a group of safe assets that households and businesses can use to make payments or to hold as short-term investments" (Board of Governors of the Federal Reserve System 2014). Key term here is "safe". But are these assets really safe or they seem to be safe? In fact banks lend out money that they do not possess to people, who then spend or invest further the money that they do not possess. And in fact only a very small percent of these lending and deposits is really secured by physical commodity – cash.

Now let's move to the money multiplier concept in order to understand the nature of the fractional reserve role in depositing-lending chain.

2.1.2 Money multiplier: true of myth?

The money multiplier effect occurs when commercial banks make money by lending to each other. By Investopedia, "the size of the multiplier effect depends on the percentage of deposits that banks are required to hold as reserves. In other words, it is money used to

create more money and is calculated by dividing total bank deposits by the reserve requirement”.

If speak in numbers, the picture looks as follows: a person puts on the bank account, say, 100 000 EUR. Let’s imagine that a bank is obliged to 10% reserve requirement. Thus 10 000 EUR from the initial deposit will be kept in cash as reserve. All the rest amount – 90 000 EUR – a bank can lend out. In fact a bank took 100 000 EUR (actual cash) and by lending out 90 000 EUR turned it into 190 000 EUR. Can a bank grow the initial deposit further? Yes, it can. To demonstrate it, I made simple calculations in the table, taking as an example the figures above (the idea is taken from Learning Markets portal (Learning Markets 2011)).

Table 1. How a bank can grow money with the use of the fractional reserve

Deposited amount		Amount which is lent out after 10% reserve requirement	
Initial deposit	100 000 €	The bank can lend out	90 000 €
Further deposit	90 000 €	The bank can lend out	81 000 €
Further deposit	81 000 €	The bank can lend out	72 900 €
Further deposit	72 900 €	The bank can lend out	65 610 €
Further deposit	65 610 €	The bank can lend out	59 049 €
Further deposit	59 049 €	The bank can lend out	53 144 €
Further deposit	53 144 €	The bank can lend out	47 830 €
Further deposit	47 830 €	The bank can lend out	43 047 €
<...>			
Further deposit	0,02 €	The bank can lend out	0,01 €
Further deposit	0,01 €	The bank can lend out	0,01 €
Further deposit	0,01 €	The bank can lend out	0,01 €
Further deposit	0,01 €	The bank can lend out	0,01 €
Total	1 000 000 €	Total	900 000 €

I skipped a couple of tens rows (in Excel I got 152 rows in total) in order not to overload the page with huge calculations. The principle of my calculations is as follows: from each deposited amount 10% of reserve is deducted and further amount is then lent out. The formula of each further deposit looks as: deposit - (deposit * 10%).

To know how much money a bank can theoretically grow from the initial deposit, I can also simply use the money multiplier formula: **total money grown = initial deposit/reserve requirement** (Learning Markets 2011). In our case total money grown will equal to 100 000 EUR/0.10, which will give the same answer of 1 000 000 EUR as in the Table 1.

There is also quite sceptical opinion about money multiplier effect, expressed by John Tamny, economy editor of Forbes. He says, that money multiplier is a myth in that sense, that there would be no money multiplier effect without people. In other words, there are no sellers without buyers and there is no supply without demand. Banks could not lend out deposited money if there were no borrowers, and in real life initial deposit of 100 000 EUR will never multiply into 1 000 000 EUR without changing hands enough times. Bank will never have money to lend out, if no one makes deposits. Some sceptics blame the fractional reserve system and multiplier effect for giving opportunity to create money “from thin air”, which is kind of moral hazard (Tamny 2012). Tamny says that in fact banks just do their work: they lend out funds that were put in their care by one person to another, who wants to borrow, and here is nothing of “immoral”.

Banks, of course, could act under 100% reserve requirement, but in this case they would not be banks anymore, but “warehouses for money”, that would charge depositors a fee for the right to deposit their money (Tamny 2012). This system will not allow the money to “work”, the value of saved money will decline ever day, which eventually will result into devaluation of state’s currency. The fractional reserve allows banks to pay compensation (percent) for the money that people do not immediately need and compensate these expenses by making loans to others, who needs credit here and now. This is how the fractional reserve actually works, according to Tamny.

To sum up all the above, there are two views onto money multiplier effect: theoretical and practical. The first one gives pretty clear calculated example of how banks can grow money with the help of the fractional reserve, the second one claims that the money multiplier would never work without people, who make deposits and take credits.

Also in this subchapter we came across the opinion, that the fractional reserve is a normal instrument in terms of normal business run, nothing about making money “from air”. Business aims to make profits, and so the banks do.

Now let’s move to the further important and disputable point and already mentioned in the beginning of chapter 2 – to fiat money concept in the fractional reserve system.

2.1.3 Fiat money

In general, fiat money means currency, which is not backed by a physical commodity. What physical commodity does a bank have? For sure, it is cash. From the subchapter 2.1.2 we remember, how a bank can grow the hypothetical initial deposit of 100 000 EUR to 1 mln EUR, using 10% of reserve requirement. According to the Table 1, the hypothetical bank has only 100 000 EUR in cash, required by the fractional reserve system. All the rest amount - 900 000 EUR - is not backed by cash, because banks do not operate with 100% reserve requirement. So can we call these 900 000 EUR fiat money?

American Doctor of Jurisprudence, real estate and forensic appraiser, Paul O'Leary, explains on the example of the US dollar, what fiat money is. If we remember the historical background from subchapter 1.3, where we told about goldsmiths, who stored people's precious metals and issued some kind of receipts, so that people could redeem these receipts for their gold afterwards, we can say that those receipts were very close to the concept of modern paper money and they were backed by actual assets. What we can see nowadays? O'Leary explains, that although the US dollar banknote is printed in the US and is used as money, is not in fact a dollar, but a "substitute dollar", because it cannot be redeemed for any gold or silver (O'Leary 2010, 15). And this is how it works all over the worlds: paper banknotes are not secured by assets, that's why they are called "fiat money". These paper banknotes are printed by the National Central Banks of each country (in Eurozone there is also the European Central Bank, which also has a right to issue euro banknotes, but in practice banknotes are printed by the National Central Banks).

What do the banks do? The fractional reserve system allows banks to lend out many times the amount of money that they have in reserve. Banks create money (increase money supply) by giving credits, and these credits are not in fact backed by actual cash. O'Leary says, that "money is created by the creation of new debt" (O'Leary 2010, 11), and this debt is not supported by any asset. The trick is that only small percent of this money created is backed by actual cash (which is in reserve), whereas all the rest money is continuously being created and destroyed (money is created when a bank makes loan, and destroyed when this loan is repaid).

So can this "created" money be called fiat money? Yes, it can. Does it bring positive or negative influence on the state's economy? Well, it is a subject to think. Literally, the banks do not print their own money, but they increase money supply through constant depositing-lending process. Banks' actual monetary base is in their reserves. If we

remember M- types, banks particularly increase M2 and M3 money types (just to remind, M2 is currency in circulation, saving accounts and non-interest bearing bank deposits and M3 is private-sector deposits). Deposits are considered to be less liquid than the monetary base (in other words, lending can exceed depositing), and here is a potential risk of the situation, when the demand, or need for credits, becomes greater than the supply, or deposits. This situation is also called “demand-pull inflation” (Investopedia. Demand-Pull Inflation). If a bank cannot fulfil the demand, it can experience short-term liquidity shortfalls.

To handle liquidity shortfalls, banks have to ask for a help from lender of last resort. According to Investopedia, lender of last resort is “an institution, usually a country's Central Bank that offers loans to banks” (Investopedia. Lender of Last Resort). Lenders of resort are countries’ own central banks that are supposed to provide emergency liquidity assistance to the banks.

Here comes the question: does the fractional reserve system actually take account of the risks of the loans that banks make? Obviously, not. Surely, it can satisfy one-time need for cash on hand, which occurs during a day, but it cannot assist in greater liquidity problems, when a bank cannot satisfy depositors’ demand and the bank falls below its reserve requirements, experiencing liquidity squeeze.

If there was 100% reserve requirement, there would not be interest accumulated on deposits and there would be no loans generated. The fractional reserve system allows doing both of this. Thus we can say that primary purpose of the fractional reserve system is not to protect from risks, but to make banks be able to conduct their normal functioning.

2.1.4 Gold Standard conspiracy theory

The fact, that the fractional reserve system’s primary goal is not protection from liquidity risks, causes arguments about what the actual purpose of this system is. Is it just a base for normal bank’s activity or is it something more?

From this point of view the fractional reserve system is the subject for conspiracy theories’ followers.

There is a number of conspiracy theories and they are about the fact how world-famous rich Jewish bankers like Rothschild family control governments and the worlds. I decided to study the Gold Standard theory, which explains from the banking system point of view where the roots grow from.

Knight, P. says in his book "Conspiracy Theories in American History" that "at the most basic level conspiracy theory blames the current, undesirable state of affairs on a concerted conspiracy by a secret group. It is in effect of interpretation of history that claims that things are not always what they seem, and that things haven't just tumbled out by coincidence in the normal, more-or-less random fashion, but they have only got like this because someone with evil intentions planned it this way" (Knight 2003, 16).

According to the above, the fractional reserve system does not act just like a base for normal bank functioning, but has greater, not obvious for regular people, target. There are many conspiracy theories, and particularly the fractional reserve banking is a part of Gold Standard conspiracy theory as an instrument of controlling of the money supply. Under this theory, the fractional reserve is an instrument of controlling the money supply.

According to Knight, the basis for conspiracy theorists lies in history of banking. In the past gold acted as money because it possessed a number of important characteristics: it was easily divisible, it was portable, it had value itself, it was scarce (rare) and it was durable (Knight 2003, 285). But gold's scarcity became very unattractive as a characteristic of money in the age of growing capitalism in Europe and the US, when the economy demanded growing financing, exchange and easily circulated medium. By 1800 year it became pretty clear that gold coin cannot fulfil demands of growing capitalist system anymore. The system demanded significant increase in the money supply, which neither gold, nor silver were able to provide. The Bank of England was the first bank, who declared, that not only gold and silver had wealth. The Bank operated on a gold reserve and issued banknotes, that was possible to redeem in gold and silver. As these metals were scarce, it was pretty clear, that it was not enough metal to redeem every banknote in 100% (par) value. Therefore the idea of the fractional reserve banking was based on statistical probability (and likelihood based on common sense), that only a fraction of banknote holders would ever redeem their paper notes in gold or silver.

Conspiracy theorists suggest, that the Bank of England by this action deliberately cheated people by issuing banknotes that could not be redeemed in emergency. Conspiracy theorists say that the fractional reserve system was a kind of compromise, when the public accepted convenient paper money in exchange for a small amount of risk. But the degree of this risk, or under what conditions the paper money is not redeemable, was not stated.

At the same time Scottish banks did not use any specific reserve ratios, but allowed competition between banks to sort out “good” banks from “bad” ones. If “bad” banks failed, their management was subject to double liability for losses. Some experts named the Scottish approach (it also had a name of “free banking”) with its competitive money more stable and resilient in contrast to the Bank of England with the gold-convertible money (Knight 2003, 286).

The US legislation put a bridge between these two systems. States adopted a system of chartered banks, that had an authority to issue paper banknotes, backed by precious metals, and these banknotes were convertible at all times. During panics the banks could either “suspend” specie payments or refuse to convert paper notes for gold or silver. According to legislation, the bank, which was not able to convert paper money for specie, loosed its authority to do business. Therefore there was healthy competition among banknotes, which let people know banknotes of which bank were reliable. Before Civil War (i.e. before 1861 year) the US bank system was fully tied to a gold standard: banks issued competitive notes that were backed by gold.

During the Civil War Abraham Lincoln’s Union government needed additional revenue to finance the war and it suspended all gold redemption, but authorized to print 450 mln dollars in paper notes (Knight 2003, 286). These notes were not immediately redeemable in gold, but it has a “promise” to be redeemed at a future date. In addition to this the Union removed the competition with government money issued by national banks by putting a 10% tax on all non-national banknotes. Thus the link to gold was temporarily destroyed and competition between banks in banknotes issue ended.

After the Civil War the US suffered from the national deflation. At the same time there were the boom of new silver discoveries, and one silver ounce was exchanged for 17 gold ounces (Knight 2003, 287), and this gave a good ground for speculations. Domestic and foreign speculators poured silver into the US vault and took away gold. The government was very close to a bankruptcy, and a banker J.P.Morgan gave to the government a massive loan. It was a matter for conspiracy theorists to claim, that bankers such as Morgan, Carnegie and Rockefeller manipulated the state’s economy by controlling the gold standard.

The US banking system went off gold standard in 1920, straight after England, and started to act within international currency exchanges (Knight 2003, 288).

Thus conspiracy theorists state that the Rockefellers with the support of the Rothschilds from England and the Bank of England manipulate the state money supply, and the FeD, at a political direction, is just an instrument for this with the power to set the fractional reserve requirements for national banks.

During studying the materials, I started to think, who benefited from the conspiracy? Well, being an economist, I have only one financially justified answer: by blaming the fractional reserve system (and therefore government) for fraud, they try to undermine people's trust to banks and push them to deposit money into different "non-bank" pyramid schemes, created by the conspiracy theorists themselves or by their "sponsors". These pyramids perceive only one goal: to trick people by making them believe that they will make easy money. In fact pyramid schemes are nothing more but sort of financial scam, because the only ones, who benefit from them, are pyramid creators.

2.2 FRB simulator

Now let's turn from theory to some practice. The fractional reserve banking (FRB) simulator is freely available for download on the webpage www.trueactivist.com. This simulator illustrates, what effects the fractional reserve has on the money supply. This simulator is very simple in use. It lets to input parameters and see what happens in real time.

Fractional Reserve Banking Simulator (Frackin' Reserve!)

This is a simple calculator to let you play with initial input parameters for fractional reserve banking. You cannot change the "Results on the Money Supply" numbers as they are all computed.

For the accompanying tutorial and more information, visit <http://cynic.me/>.

Initial Parameters for Fractional Reserve Calculations

Initial deposit	0
Fractional reserve factor	0,00000001
Iterations	0

Fractional Reserve Results on the Money Supply

What customers think they have	0,00	} +=	0,00
What the bank has in reserve	0,00		
What the bank can loan out	0,00		
What the bank has loaned out (fake money)	0,00		
What the bank's next loan is	0,00		

Show me in a table

Interest Owed Parameters

Interest periods (in years)	1
Interest rate (x 100 = %)	0,0001
Compounded	Monthly

Interest Owed Results

Total interest on money lent out	0,00
Total interest and principal	0,00

The simulator with zero parameters is shown in the picture 1:

Picture 1. FRB simulator with zero parameters.

There are 4 blocks. The 1st one, Initial Parameters for The fractional reserve Calculation, contains boxes for initial deposit amount, the fractional reserve factor (the required percent of reserve) and iterations (this is the number of times that people deposit money into the system. The first iteration is initial deposit, all the further are loans lent out by the banks that bear interest). Initial parameters are changeable.

The 2d block shows the fractional reserve results on the money supply, which change when the 1st block parameters are changed.

The 3d block contains interest owed parameters or parameters for compound interest calculation: years, interest rate and how the user wants the interest to be compounded (annually, monthly, daily, hourly etc). These parameters also are changeable.

The 4th block shows the results from calculations made in the 3d block: total interest on all money lent out (without the principal) and total of all the interest and the principal (or total interest on money lent out plus the principal).

Now let's make some calculations. Let's take the hypothetical 100 000 EUR as initial deposit, hypothetical 10% (0,10) as reserve requirements and let's imagine that number of iterations equals to 10 times. I will input these parameters into the 1st section of the simulator.

Then I will fill in the 4th section, Interest Owed Parameters. Let's put 10 years as interest periods, 5% (0,05) as interest rate and let's compound interest monthly.

The 2d section, Fractional Reserve Results on the Money Supply, and the 4th one, Interest Owed Parameters, the simulator will calculate automatically.

The results of the calculations are shown in the picture 2:

Fractional Reserve Banking Simulator (Frackin' Reserve!)

This is a simple calculator to let you play with initial input parameters for fractional reserve banking. You cannot change the "Results on the Money Supply" numbers as they are all computed.

For the accompanying tutorial and more information, visit <http://cynic.me/>.

Initial Parameters for Fractional Reserve Calculations

Initial deposit	100 000
Fractional reserve factor	0,10000000
Iterations	10

Fractional Reserve Results on the Money Supply

What customers think they have	651 321,56	
What the bank has in reserve	65 132,16	} + =
What the bank can loan out	586 189,40	
What the bank has loaned out (fake money)	551 321,56	651 321,56
What the bank's next loan is	34 867,84	<input type="button" value="Show me in a table"/>

Interest Owed Parameters

Interest periods (in years)	10
Interest rate (x 100 = %)	0,0500
Compounded	Monthly

Interest Owed Results

Total interest on money lent out	356 710,29
Total interest and principal	908 031,85

Picture 2. FRB simulator with calculated results.

FRB simulator also can generate the report in a table format by pressing the "Show me in a table"-button. I generated report and put it into Excel in order to make it more readable. I added the second row to show the logic of calculations.

Table 2. FRB simulator results in a table format with formulae

Iteration #	Deposited by customer	Amount held in reserve from deposit	Amount currently available to lend out from deposit	Total amount that "can" be lent out	Total amount that has been lent out	Total amount held in reserve	Total amount that customers believe they have	Compound interest	Amount of interest for 10 year(s) @ 5% on loaned money [e]
	[a]=deposit-reserved amount in [b]	[b]=[a]*10%	[c]=[a]-[b]	[d]	[e]=[d]-[c]	[f]=initial reserved amount+reserved amount from the further deposit	[g]=[d]+[f]	[h]=[e]*(1+0,05/12)^12*10	[i]=[h]-[e]
1	100 000,00	10 000,00	90 000,00	90 000,00	0,00	10 000,00	100 000,00	0,00	0,00
2	90 000,00	9 000,00	81 000,00	171 000,00	90 000,00	19 000,00	190 000,00	148 230,85	58 230,85
3	81 000,00	8 100,00	72 900,00	243 900,00	171 000,00	27 100,00	271 000,00	281 638,62	110 638,62
4	72 900,00	7 290,00	65 610,00	309 510,00	243 900,00	34 390,00	343 900,00	401 705,62	157 805,62
5	65 610,00	6 561,00	59 049,00	368 559,00	309 510,00	40 951,00	409 510,00	509 765,91	200 255,91
6	59 049,00	5 904,90	53 144,10	421 703,10	368 559,00	46 855,90	468 559,00	607 020,17	238 461,17
7	53 144,10	5 314,41	47 829,69	469 532,79	421 703,10	52 170,31	521 703,10	694 549,01	272 845,91
8	47 829,69	4 782,97	43 046,72	512 579,51	469 532,79	56 953,28	569 532,79	773 324,96	303 792,17
9	43 046,72	4 304,67	38 742,05	551 321,56	512 579,51	61 257,95	612 579,51	844 223,32	331 643,81
10	38 742,05	3 874,20	34 867,84	586 189,40	551 321,56	65 132,16	651 321,56	908 031,85	356 710,29

I highlighted with grey colour the figures calculated in FRB simulator. The amount from the box named "What customers think they have" of 651 322 EUR (column [g]) is calculated as the sum of what the bank has in reserve (65 132 EUR from column [f]) and what the bank can loan out (586 189 EUR from column [d]).

The amount from the box named "What the bank has loaned out (fake money)" is calculated in column [e] and equals to 551 321 EUR after 10 years of iterations. E.g., the amount of 90 000 EUR at the year 2 was calculated as follows:

- Initial deposit of 100 000 EUR is made at the year 1.
- 10% reserve from the initial deposit equals to 10 000 EUR. It will be held in cash in bank's vaults.
- The rest sum of 90 000 EUR (100 000 EUR – 10 000 EUR) can be lent further. Let's imagine that someone took it as credit and then put it as deposit again at the year 2.
- 10% reserve from 90 000 EUR equals to 9 000 EUR. It will be held in cash.
- Amount available for further lending is therefore 81 000 EUR (90 000 EUR – 9 000 EUR).

- Therefore after year 1 and 2 total amount for further lending equals to 90 000 EUR from the 1st year deposit and 81 000 EUR from the 2^d deposit. Total equals to 171 000 EUR.
- From these 171 000 EUR at the year 2 in fact was lent only 90 000 EUR. The rest amount of 81 000 EUR will be lent further later, at the year 3.
- And so on.

As we can see, the amounts from column [e] are not backed by any asset. FRB simulator programmers call them “fake money”. Economists call them as “fiat money” (described in subchapter 2.1.3 Fiat money). By generating fiat money, a bank increases the money supply.

Bank’s point of view differs from customers’ point of view. Let’s take as an example the situation at the year 2. As we remember, a customer 1 made an initial deposit of 100 000 EUR (10 000 EUR are reserved and 90 000 EUR are available for further credit). At year 2 a customer 2 took a credit of 90 000 EUR and put them as a deposit as well (9 000 EUR are reserved and 81 000 EUR are available for further rent). How much cash does the bank actually have after these iterations? It put into reserve 19 000 EUR (10 000 EUR plus 9 000 EUR) and this is actual amount of cash which a bank possesses. How much a bank is allowed to lend out? Everything above the reserve or 171 000 EUR (90 000 EUR plus 81 000 EUR). This is how it looks from the bank’s perspective.

But what does a customer 1 see? He does not know about the fractional reserve system and he thinks, that the bank still has these 100 000 EUR deposited by him. A customer 2 thinks that the bank has these 90 000 EUR deposited by him as well. He does not know, that these 90 000 EUR were lent to him from the initial deposit of 100 000 EUR. Therefore both customer 1 and customer 2 think, that they deposited 190 000 EUR in total, whereas in fact a bank has only 19 000 EUR of cash in its vaults.

2.3 Criticism of the fractional reserve system

Although the fractional reserve system is the only current form of banking all over the world, there is a lot of criticism of it. In this chapter I summarized the most common sceptical opinions.

The fractional reserve does not prevent from a bank run. When someone makes a deposit, he or she believes that their money is safe and sound in the bank and they can come and withdraw their money at any point on time. But in fact only a small fraction of

their money is kept in cash, while all the rest money is lent out. If a bank turns to be in trouble (e.g. go bankrupt) and if there is no support from the Central Bank, depositors will never have their money back, because a bank has nothing to give them apart from that small fraction, which is kept in cash. And it is not a problem of some particular bank, it is the question of trust to the whole banking system and, as a consequence, to the whole economy of the country. If one bank becomes insolvent, depositors may rush to other banks to withdraw their money before these other banks are not insolvent, too, and the whole system will be in trouble (KHANAcademy 2012).

The fractional reserve system provides bad incentives. Normally when a bank gets in trouble, it is supported by finances from the Central Bank, which gives to depositors an opportunity not to care much about what a bank is going to do with their funds, because with the support of CB they will always have their money back (KHANAcademy 2012). With the lack of the control from the depositors banks can do with the investments whatever they want, because nobody is going to ask, where a banks intends to invest received funds further.

Influencing the money supply in “wrong” direction. During the recession the government needs more money and it may lower interest rates in order to motivate people to borrow and consume more and invest more. But in fact during the recession people tend to be cautious and borrow less money, than the government needs. Less borrowing cause less lending, and this leads to less money in circulation. During the boom in the economy happens the opposite situation: the government want to have less money in circulation, but people tend to borrow more and spend more. More borrowing cause more lending. The fractional reserve system might lead to money creation process which is quite opposite to what the economy needs at the moment (KHANAcademy 2012).

Lack of transparency. In the light of recent events, such as Greek default and sharpened situation in Eurozone financial sector, some economists started to blame the banking system for speculative investment behaviour and creation of financial instruments that does not improve current financial situation (King 19 October 2011). According to King, banks can no longer assume that the public in large will believe, that banks know what they are doing with the investments, rates and fees, but nowadays the banking system does not suppose any engagement with their clients in any useful way through the social media.

Creation of fiat money. This phenomenon is examined in details in subchapter 2.1.3. In short, banks increase money supply through constant depositing-lending process,

creating money that is backed by nothing, but debt. Taking into account the fact, that deposits are less liquid than lending (in other words, people more tend to borrow and consume, than to deposit, and lending can one day exceed depositing), there is a potential risk of “demand-pull inflation”, when the demand for credits exceeds the supply and therefore the money supply will decrease. And the decrease of money supply is a bad sign for the economy.

Bad effects on the economic health. According to Austrian economic blog, concentration of wealth in the hands of commercial banks makes the nation to live in debt. People take loans to buy houses, cars, to educate their children and so on. Some people take new loans to repay existing ones. The money is actually expanded through debt, especially through increase of personal debt. This process is unsustainable in the long run, because debt expansion leads to artificial growth of prices (when people have more money in hand, they tend to consume more, and this is a good ground for price speculation on the market) and debt saturation, after which further growth of debt is not possible and slows down. This triggers the liquidity (as we remember, lending can exceed depositing) and puts under the question solvency of the banks (Ludvig von Mises Institute 2015).

Ethical problem. In subchapter 2.1.2 we came across the opinion, that the fractional reserve banking by allowing to make money “from thin air” causes a kind of moral hazard. In other words, the money created by banks are not backed by physical assets and seem to be a legal way to cheat the people by telling them, that everything that they invest, can be fully redeemed at any point of time.

2.4 How it works in Finland

Finland is a member country of European Union and Euro area economy. Monetary policy of Euro area is defined by the European Central Bank (ECB). Primary target of the ECB is to maintain price stability in the Euro area over the medium term (European Central Bank 2015).

The ECB also sets the Monetary Financial Instructions (MFI) for the Eurozone’s banks. MFIs are the instruments of Eurosystem operational framework. MFIs set minimum reserve requirements for the banks of member countries.

Minimum reserves’ target is “to pursue the aims of stabilising money market interest rates and creating (or enlarging) a structural liquidity shortage” (European Central Bank 2015).

According to database published on the ECB official page, banks and money market funds of Finland are subjects to minimum reserve requirements (European Central Bank 2015). Reserve coefficients are set as in the picture 3.

Reserve coefficients

As from the maintenance period starting on	Overnight deposits, deposits with agreed maturity or period of notice up to 2 years, debt securities issued with maturity up to 2 years, money market paper	Deposits with agreed maturity or period of notice over 2 years, repos, debt securities issued with maturity over 2 years
1999 1 Jan.	2%	0%
2012 18 Jan.	1%	0%

Picture 3. Reserve coefficients set by the ECB for Eurozone's banks (European Central Bank 2015).

The ECB allows to apply standardised deductions for those credit institutions, that cannot provide evidence of its interbank liabilities in the form of debt securities with a maturity up to 2 years and money market paper. Deductions are presented in the picture 4

Standardised deductions

As from the maintenance period starting on	Debt securities issued with maturity up to 2 years	Money market paper
1999 1 Jan.	10%	10%
2000 24 Jan.	30%	30%

Picture 4. Standardised deductions set by the ECB for Eurozone's banks (European Central Bank 2015).

The ECB also sets an allowance of 100 000 EUR, which should be deducted by each credit institution from the amount of its reserve requirement (European Central Bank 2015).

As for legal framework, the Central Bank of Finland acts within the Recommendation of the ECB of 1 March 2001 for a Council regulation concerning an amendment to Council Regulation (EC) 2531/98 and Regulation (EC) on the application of minimum reserves

1745/2003. Finnish version is published on the Central Bank of Finland (Suomen Pankki) web page, English version can be found on the ECB web page (European Central Bank 2015).

According to Chapter 4 of Regulation on the application of minimum reserves (1745/2003), minimum reserve ratio is set at 1%.

According to Chapter 3 of Regulation on the application of minimum reserves (1745/2003), reserve base consists of short-term (up to 2 years) deposits and debt securities issued. From the reserve base should be excluded liabilities which are owed to the ECB and Central Bank of Finland and to any other institution not listed as being exempt from the ECB's minimum reserve system.

According to Chapter 4 of Regulation on the application of minimum reserves (1745/2003), for long-term deposits reserve ratio is set at 0%.

3 Finnish bank practice

In this chapter I am going to speak about such details of my thesis, as target of research and research methods, investigative questions and methods of data analysis. I am also going to introduce interviewed banks and share the details of the interviews. Finally, I am going to summarize and analyze the results of interviews and make conclusions.

3.1 Target of research and research methods

My thesis is research-oriented with qualitative methods. The target of my research is to answer the question whether the fractional reserve system really acts in a benefit of the state's financial system. I conducted qualitative research, which aims to describe, understand and interpret the role of the fractional reserve in the modern banking system and answer investigative questions, mentioned in chapter 1.1. Research topic, investigative questions and research methods. I will mention the investigative questions once more. They are:

IQ 1. What is the fractional reserve, how is it calculated and monitored?

IQ 2. To what extent the liquidity risk can be mitigated by the fractional reserve system?

IQ 3. What are deficiencies in the fractional reserve system?

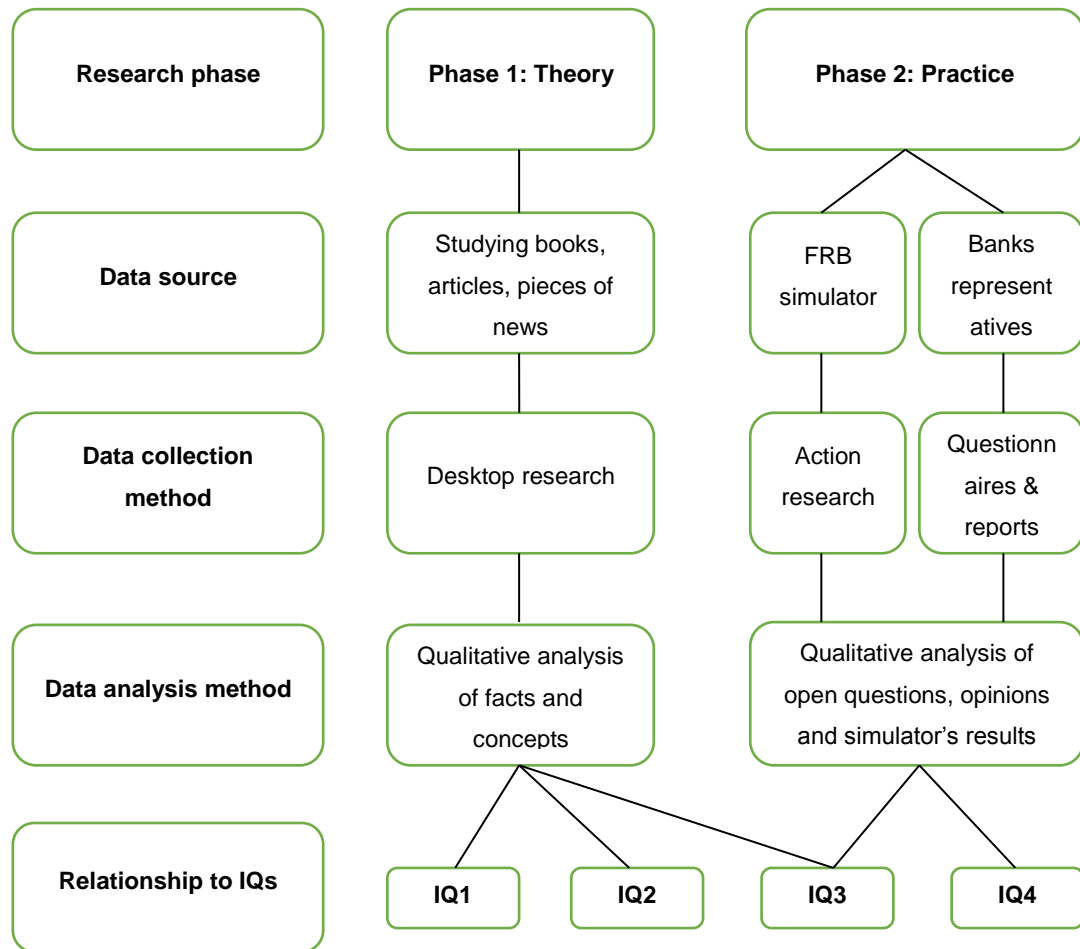
IQ 4. Can the system be improved?

My thesis consists of two parts: theoretical, where I studied related literature, concepts, theories and current legislation (chapters 1 and 2, except for subchapter 2.2 FRB simulator), and practical, where I used FRB simulator (subchapter 2.2) and studied bank working experience through interviewing bank representatives (chapter 3). The first part answered questions 1, 2 and partly 3 (to the extent of theory), and the second one – 3 (to the extent of practice) and 4.

For the first part I conducted desk-top research by studying books, articles and pieces of news related to the topic. For the second part I conducted action research with the use of FRB simulator and carried out interviews with the representatives of banks management. Thus my research can be classified as content analysis (HAAGA-HELIA 2014), because I classified, organised and analysed different pre-collected written materials, such as books, articles, pieces of news, and summarised and studied interview transcriptions.

The questionnaires were sent by me to the contact persons via e-mail. Questionnaires consist of 11 thematic questions aimed to get general understanding of how banks monitor liquidity risk and what role the fractional reserve plays in banks' functioning.

For better visibility I summarised the investigative questions, data collection methods, related research methods and data analysis methods in the picture 5.



Picture 5. Data collection methods, research methods and data analysis methods

3.2 Target banks introduction

I connected 5 banks in Finland: Nordea, OsuusPankki (OP), Oma Säästöpankki (OmaSP), DanskeBank and Handelsbanken. Not all banks were student-friendly. Representatives of Handelsbanken and DanskeBank straight ahead refused to take responsibility and didn't answer to any of questions. Representatives of Nordea in Sweden (I was not provided with contact persons of Nordea in Finland, because the representative of Nordea in Finland informed me, that only investor relations people could answer my questions and they all were located in Sweden) received questions but didn't provide any answer, although I kindly reminded them several times. Therefore I got 2 replies from 5 possible: from OP and OmaSP. Filled questionnaires in English can be found in appendixes 1 and 2 respectively. Original answer from OP (in Finnish) is attached in appendix 3.

To get bigger picture, I also analysed Nordea's annual report for the year 2015. I chose Nordea because I am its client and it interests me more than other banks that did not provide me with the answers.

OP introduction

OsuusPankki is a member of OP Financial Group, which history started from 1891 year, when the fire insurance company Palovakuutus-Osakeyhtiö Pohjola was founded and the first 45 insurance applications were signed at the very first day (History of OP Financial Group). Nowadays OP Financial Group is the Finland's largest financial service group. It is made up of 180 independent member cooperative banks, including its subsidiaries and closely related companies (OP 2015). Principles of Group's operations are: cooperation and a fair distribution of success among the stakeholders.

In 1996 OP Bank Group was the first in Europe and second in the world to provide on-line bank services

In 2007 there was an introduction of the financial services group's new name: OP-Pohjola Group.

Based on the financial reporting of 2015, the Group had 4.3 mln customers, 450 branches, 12 000 employees. Earnings before taxes (EBIT) comprised 1 101 mln eur, which means 20.4% increase in comparison to 2014 year (OP 2015).

Mission of OP-Pohjola Group is to create sustainable prosperity, security and wellbeing for its customers. OP's strategy is based on on the cooperative principle and a long-term business development in the best interests of its customers. OP positions itself as being owned by its customers and acts within people-first approach, strong community spirit, corporate responsibility and progressiveness.

In 2015 OP achieved all its key targets: growth rate was above the market average, market leadership in all business segments (banking, insurance, other financial services), market leadership in serving private customers and business – small, medium and large companies. OP's market share at the end of 2015 was 38.6% (38% in 2014).

OmaSP introduction

Oma Säästöpankki is the biggest bank of Finland. It was established in 2009 year, when when Kuortaneen Säästöpankki and Töysän Säästöpankki joined. In 2013 Parkanon Säästöpankki joined Oma Säästöpankki. In 2014 two more banks joined Oma Säästöpankki - The Hämeenlinna area based Kantasäästöpankki, Suodenniemen Säästöpankki and Etelä-Karjalan Säästöpankki.

Nowadays OmaSP serves 125 000 customers in 45 offices all over the country. The goal of the bank is to offer the best people-centric customer service in town (OmaSP 2015).

Based on the year-end report of 2015, Earnings before taxes (EBIT) comprised 19,6 mln eur, which means 3.8% increase in comparison to 2014 year (OmaSP 2015).

Mission of OmaSP is to seek long-term growth by getting to know our customers better and by adapting promptly to the changing customer needs (OmaSP 2015). OmaSP strategy is based on the clear focus on the key bank services that bring value to customers.

Nordea introduction

Nordea is the largest financial services group in the Northern Europe. It positions itself as “the most diversified bank in the Nordics with strong capital generation” (Nordea 2015). Nordea operates in Finland, Sweden, Norway and Denmark. It has the largest distribution network and customer base in the Nordic and Baltic Sea region. Total number of Nordea’s household clients equals to 10 mln and corporate clients number equals to 590 th. In Finland the bank has 2.9 mln of household clients and 159 th of corporate clients (Nordea 2015). Total number of branches is 650 and total number of employees equals to 29 815.

Based on the year-end report of 2015, Group earnings before taxes (EBIT) comprised 4 704 mln eur (1 027 mln eur for Finland branch), which means 8.4% increase in comparison to 2014 year (Nordea 2015).

Nordea’s mission is “to be a Great European bank, acknowledged for its people, creating superior value for customers and shareholders” (Nordea 2015). Nordea’s strategy is “to focus on a continued strive for efficiency and delivering the future relationship bank” (Nordea 2015).

3.3 Analysis of questionnaires and banks' year-end reports

In this chapter I will analyse questionnaires filled by OsuusPankki and OmaSP representatives and also will look through Nordea's year-end report.

OsuusPankki questionnaire analysis

OsuusPankki in their liquidity risk management use Liquidity Coverage Ratio, or LCR. General liquidity requirement was introduced by the Basel Committee on Bank Supervision (BCBS) in December, 2010 (Accenture 2015) and become applicable starting from 1 January, 2014, according to chapter 1, Section 1 of European Commission Liquidity Delegated Act (575/2013).

Finnish banks and particularly OsuusPankki act according to the European Commission Liquidity Delegated Act 575/2013. The Act specifies the detailed general liquidity coverage requirement (LCR) for credit institutions. According to Chapter 3 of European Commission Liquidity Delegated Act (575/2013), LCR for each 30 calendar days should exceed 100%. As for the long-term period, it should be at least 60% during the 4th quarter of 2015 and rise to at least 100% at the beginning of 2018, according to Chapter 1, Section 1 of European Commission Liquidity Delegated Act (575/2013).

According to Investopedia, LCR "is designed to ensure that financial institutions have the necessary assets on hand to ride out short-term liquidity disruptions". In other words, LCR defines, how much liquid assets (cash or treasury bonds) banks are required to hold in order to be able to meet short-term liquidity problems. The sum of these liquid assets should be equal or greater than banks' net cash outflow for the period of 30 days (with at least 100% coverage).

LCR formula looks like this:

$$LCR = \frac{\text{Stock of HQLA}}{\text{Total Net Cash Outflows}} \geq 100\%$$

where HQLA abbreviation stands for high-quality liquid assets (or liquidity buffer). Liquidity buffer includes notes and bonds issued by governments, municipalities, financial institutions, securitised assets and collateral (secured) loans. OP's liquidity value as at the

end of 2015 year comprises 24.2 mln EUR, which means 46% increase compared to 2014 year (OP 2015).

OP Financial Group's LCR was 116% at the end of December, 2015 (OP 2015), which means that OsuusPankki meets LCR requirements.

OsuusPankki also makes cash reserves according to ECB the fractional reserve requirements and monitors it on a daily basis. From the OsuusPankki representative's point of view, the fractional reserve system acts more as the technical instrument rather than as protection against any kind of liquidity risk, and there is no need either to change something in the fractional reserve system or to refuse from it at all.

According to OsuusPankki representative, the bank provides its depositors with the information about how their funds are used in the annual report. The bank does not provide each depositor with detailed information, where their particular loans are used.

OsuusPankki representative also says, that in terms of financial stability securing the fractional reserve requirements nowadays are replaced by LCR requirements. Being a technical instrument, the fractional reserve therefore does not bring any kind of moral hazard to clients of the bank.

Oma Säästöpankki questionnaire analysis

According to OmaSP representative, the bank monitors and reports on its short- and long-term liquidity. In case of short-term liquidity shortages, the bank uses different market operations like OTC (over-the-counter) repos (repurchase agreements), the Central Bank repos and also credit facilities and CD-programmes (Certificate of Deposits).

Investopedia gives the following definition for OTC: "Over-the-counter (OTC) is a security traded in some context other than on a formal exchange such as the NYSE, TSX, AMEX, etc. The phrase "over-the-counter" can be used to refer to stocks that trade via a dealer network as opposed to on a centralized exchange. It also refers to debt securities and other financial instruments such as derivatives, which are traded through a dealer network". In other words, OTC means unlisted securities of small companies that are traded not on exchanges, but by broker dealers who negotiate directly with one another over computer networks and by phone (Investopedia. What is Over-the-Counter).

Certificate of deposit means a promissory note issued by a bank. It is a saving certificate that restricts holders from withdrawing funds on demand and it entitles its bearer to receive interest (Investopedia. What is Certificate of Deposit).

OmaSP also follows the fractional reserve requirements and monitor its the fractional reserve on a daily basis, same as OsuusPankki does. According to OmaSP representative, the bank provides its depositors with the information about how their funds are used in the annual report. The bank does not provide each depositor with detailed information, where their loans are used.

In respect of the usefulness of the fractional reserve system OmaSP representative says, that “a low FR requirement gives banks the opportunity to make their business, especially when taking in to account all other regulation” (Appendix 2). In other words, the representative has the same opinion, as OsuusPankki’s representative: the fractional reserve acts nowadays as a tool for a normal bank functioning.

As for LCR ratio, OmaSP representative didn’t say, that the bank used it. I checked OmaSP year report and found out, that currently OmaSP does not use LCR ratio for its liquidity risk management due to the fact, that now the monitoring period for the LCR is not finished yet (target is set as 60% for the 4th quarter of 2014 and 100% for the beginning of 2018), therefore the LCR requirement is not binding yet (OmaSP 2015).

Nordea’s year-end report analysis

Nordea assesses its short-term liquidity risk in 2015 as moderate (Nordea 2015). In terms of liquidity risk analysis, Nordea is compliant with LCR requirement, introduced by the Swedish FSA (Financial Supervisory Authority). Nordea is LCS compliant in all currencies combined and separately in EUR and USD, introduced by the Swedish FSA (Financial Supervisory Authority). Nordea is LCR compliant in all currencies combined and separately in EUR and USD.

According to Swedish rules, LCR ratio for Nordea Group at the end of 2015 was 201% (compare to 149% at the end of 2014), average yearly rate was 134% (compare to 131% for 2014). Therefore Nordea met LCR requirements for both years.

In its year-end report Nordea does not mention anything about the fractional reserve requirements, and this fact gives me the basis for suggestion, that the bank also considers

it to be more a technical tool for normal bank routine, rather than a significant aid in liquidity risk management.

3.4 Summary

I conducted qualitative data analysis for the materials I that I collected during my research. For theoretical part of the thesis I collected and studied theoretical materials, which were books, blogs, pieces of news, historical articles. For practical part of the thesis I used The fractional reserve simulator and collected open opinions from Finnish banks.

Qualitative analysis of collected materials is introduced in each related chapter.

During the first – theoretical - part of the thesis I studied theories and concepts in order to build up general understanding of the fractional reserve phenomenon. The goal of theory study was to find answers to investigative questions 1 and 2 and partly 3. The goal of practical part was to answer to investigative questions 3 and 4. The practical part of the research is based on the answers to questionnaire received from OsuusPankki and Oma Säästöpankki and from Nordea's year-end report review in terms of liquidity risk management.

I summarised my findings and figured out answers for the investigative questions in the next chapter.

4 Results

In this chapter I will present the answers to investigative questions and final answer to the research question.

IQ 1. What is the fractional reserve, how is it calculated and monitored?

The fractional reserve refers to some percent (fraction) from each deposited amount, which is required to be kept on hand by a bank and cannot be lent to anyone. The size of the percent is set by the Central Bank. ECB's minimum reserve requirement is set at 1% for deposits and debts with agreed maturity up to 2 years.

The fractional reserve amount is monitored by a bank on a daily basis.

IQ 2. To what extent the liquidity risk can be mitigated by the fractional reserve system?

According to studied theory and bank practice, the answer to this question would be as follows: the fractional reserve nowadays does not play any significant role in liquidity risk management. Starting from 2013-2014, banks tend to apply LCR ratio requirements and, according to OsuusPankki and OmaSP representatives', LCR ratio is more useful tool for managing short-term liquidity falls.

IQ 3. What are deficiencies in the fractional reserve system?

After studying theory materials I figured out the following deficiencies:

1. The fractional reserve does not prevent from a bank run.
2. The fractional reserve system provides bad incentives for banks, because due to the lack of the control from the depositors banks can do with the investments whatever they want, and nobody is going to ask, where a banks intends to invest received funds further.
3. Through the fractional reserve it is possible to influence the money supply in "wrong" direction. The fractional reserve system might lead to money creation process which is quite opposite to what the economy needs at the moment.
4. There is a lack of transparency in terms of the use of invested funds. Banks do not provide their depositors with the detailed information about how their funds are used, and therefore are blamed by some economists for speculative investment behaviour.

5. The fractional reserve stimulates creation of fiat money by allowing banks to increase money supply through constant depositing-lending process, and this money is backed by nothing, but debt.
6. The fractional reserve has bad effects on economic health by pushing the nation to live in debt. People tend to borrow more than to deposit, and the modern banking system gives them this possibility.
7. The fractional reserve creates ethical problem by allowing banks to make money “from thin air”.

From the answers of the two banks’ representatives it follows pretty clear, that the fractional reserve system nowadays has lost its initial purpose of securing paying capacity and become a technical instrument, because of which modern banks can run their everyday activities.

IQ 4. Can the system be improved?

Based on the answers of banks’ representatives, there is no need for improvements, because the system works smoothly and its requirements are pretty easy to meet in practice.

The ultimate target of my research was to answer the question: does the fractional reserve system really act in a benefit of the state’s financial system?

The right answer to this question comes from the understanding of the basic principle of bank’s functioning, when in order to be able to lend money further a bank has to keep some amount of cash in reserve. This principle was illustrated in chapter 2.2 FRB simulator. Without the fractional reserve system bank’s activities would not be well-ordered and smoothly-going. Although modern the fractional reserve system is not aimed to protect banks from liquidity risks and banks use either LCR ratio or their own liquidity risk assessment, the fractional reserve system still exists and is considered as viable for further use. Taking into account the fact, that the bank system is a part of the state’s financial system and the fractional reserve requirements ensure this system’s routine functioning, the answer to the research question is therefore “yes”.

5 Discussion

From the theory and practice analysis conducted above it follows, that the fractional reserve in modern financial system has lost its initial purpose of solvency securing and become governmental tool for money supply regulation and for allowing banks to function smoothly. Many economists strongly criticize the the fractional reserve system for its negative influence on the society in terms of creation “fiat money” and stimulating people to live in debt. Moreover, some of them say, that banks can function normally without any reserve requirements, because the experienced banker will never allow the situation of a bank-run.

According to filled questionnaires, banks consider the fractional reserve system to be something necessary, but at the same time not deserving any significant attention, because it does not have any practical meaning in liquidity risk management. Sometimes it seems, that the fractional reserve has no use neither for economy, nor for banks. But at the same time this system is the only banking system, applied all over the world. Here comes the question: if it is so useless and causes so many moral and economical hazards, why it still exists? Would it be reasonable to refuse from the fractional reserve system and implement completely opposite system, in which banks, say, will set minimum reserve percent themselves?

Let's imagine two contrary situations. In the first situation a hypothetical bank ABC functions with 100% reserve requirement and in the second one the same bank functions with 0% reserve requirement. How would it look like and what effects would it have on money supply?

Let's start with the first situation. There is some ABC bank, that has, say, 100 customers, each of which deposited 1 000 eur. Total deposited amount therefore is $100 \cdot 1\,000 = 100\,000$ eur. ABC bank works with 100% reserve requirement, which means, that every deposited eurocent goes to reserve. For better visibility I used FRB simulator. Initial parameters are as follows: 100 000 eur as initial deposit, 100% the fractional reserve factor (or reserve requirement), iterations' number is 10 times (hypothetical number).

Fractional Reserve Banking Simulator (Frackin' Reserve!)

This is a simple calculator to let you play with initial input parameters for fractional reserve banking. You cannot change the "Results on the Money Supply" numbers as they are all computed.

For the accompanying tutorial and more information, visit <http://cynic.me/>.

Initial Parameters for Fractional Reserve Calculations

Initial deposit: 100 000

Fractional reserve factor: 1,00000000

Iterations: 10

Fractional Reserve Results on the Money Supply

What customers think they have: 100 000,00

What the bank has in reserve: 100 000,00 } + = 100 000,00

What the bank can loan out: 0,00

What the bank has loaned out (fake money): 0,00

What the bank's next loan is: 0,00

Show me in a table

Interest Owed Parameters

Interest periods (in years): 10

Interest rate (x 100 = %): 0,0500

Compounded: Monthly

Interest Owed Results

Total interest on money lent out: 0,00

Total interest and principal: 0,00

Picture 6. Results on money supply, when the bank operates with 100% reserve requirement.

Block 2 "The fractional reserve Results on Money Supply" shows, that everything that customers deposited is fully reserved by the bank (boxes "What customers think they have" and "What the bank has in reserve" both equals to 100 000 eur). If everything is in reserve, can the bank lend anything to the clients, who came to take a credit? Obviously not.

Working under 100% reserve requirement the ABC bank does not increase money supply in the economy (because it cannot lend any funds further and grow percent) and simply becomes a money store. Thus with 100% reserve requirement the whole idea of banking is lost and ABC bank will function only as a vault.

Now let's turn to the second situation, when ABC bank acts with 0% reserve requirement. I will again use FRB simulator with the same initial parameters as in the first situation, described above.

Fractional Reserve Banking Simulator (Frackin' Reserve!)

This is a simple calculator to let you play with initial input parameters for fractional reserve banking. You cannot change the "Results on the Money Supply" numbers as they are all computed.

For the accompanying tutorial and more information, visit <http://cynic.me/>.

Initial Parameters for Fractional Reserve Calculations

Initial deposit	100 000
Fractional reserve factor	0,000000
Iterations	10

Fractional Reserve Results on the Money Supply

What customers think they have	999 999,96	
What the bank has in reserve	0,00	} + =
What the bank can loan out	999 999,95	
What the bank has loaned out (fake money)	899 999,96	
What the bank's next loan is	99 999,99	

Interest Owed Parameters

Interest periods (in years)	10
Interest rate (x 100 = %)	0,0500
Compounded	Monthly

Interest Owed Results

Total interest on money lent out	582 308,52
Total interest and principal	1 482 308,47

Picture 7. Results on money supply, when the bank operates with 0% reserve requirement.

With 0% reserve requirement ABC bank is not obliged to make reserves and theoretically can lend further all the deposited money. The money supply will therefore increase after

10 iterations by 1 mln (here we should pay attention to the small issue, that FRB simulator does not calculate with bare 0% requirement but uses 0,00000001%, that's why in the Block 2 we can see the number of 999 999,96 instead of 1 000 000 (100 000 eur of initial deposit by 10 iterations)).

With no reserve requirement no one controls how much ABC bank lends further and to what extent ABC's actions will increase money supply. And non-controlled growth of money supply will eventually lead to high inflation. Thus, negative factor in 0% reserve requirement is the impossibility for the government to regulate money supply in the economy. Moreover, there is a risk of liquidity squeeze for ABC bank in the situation, when depositors come and ask their money back. It is very difficult to imagine situation, when bankers do not care about their bank's stability. Experienced bankers will design procedures for liquidity risk management and upon their professional experience will finally set their own minimum reserve requirement.

But what if every bank will set their own reserve requirement upon their professional judgement? ABC bank will act with 1% reserve requirement, DEF bank will act with, say, 5% requirement, GHI bank will act with 10% requirement. Is this system viable? To answer this question we have to obtain general understanding of how the whole system is regulated.

Money supply is normally regulated by government through the Central Banks. The Central Banks set restrictive requirements to regulate money supply on the one hand, and not to allow banks to generate too much money against too narrow money deposit base on the other hand. Apart from control function, the Central Bank also has supportive function, acting as lender for distressed banks. Thus, if every bank acts with its own reserve requirement, the Central Bank's control function will be lost, and it will be almost impossible to assess the extent of potential financial aid to banks in case of crisis.

Therefore the fractional reserve has two ultimate targets:

- it acts as restrictive requirement for preventing banks from non-controlled money creation and
- it ensures that banks have sufficient supply of cash, so that the system operates smoothly, providing confidence for the public.

0% reserve requirement along with the absence of centralised control looks more like utopia rather than rational scenario for successful functioning of state's financial system. The fractional reserve system is necessary instrument for normal function of financial

system, through which the Central Bank can influence money supply and control inflation, providing at the same time a cushion for distressed banks.

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Appendices

Appendix 1. Answers from OP, translated into English.

Question	Answer
1. How do you assess the threat of liquidity risk nowadays?	Banks prepare to liquid stress situations by liquid securities. Banks have to meet officially set Liquidity Coverage Ratio, LCR.
2. What measures would you put in place in case of liquidity shortages?	Banks use LCR-reserve, which is calculated in order to cover 30 days of stress situation.
3. How often does the bank monitor its FR? What does it do, if the FR falls below the limit?	Minimum cash reserve requirement has to be met within the timeframe set by the Central Bank. Cash reserve level is monitored on a daily basis. The sum of shortage automatically becomes a credit from the Central Bank at the end of the period.
4. Is it always possible to keep funds in reserve under the necessary limit?	At the moment minimum cash reserve requirement is set at reasonable level and banks do not have any problems with its fulfillment. Normally banks have to meet LCR-requirement. In stress situations it is possible to use LCR-reserve.
5. Do you provide your depositors upon request with transparent information about how their funds are used?	All the banks publish the information in their official year reports.
6. Could in your opinion the bank function better under 100% reserve requirement or without any reserve requirements?	At the moment the fractional reserve requirements, set by the Central Bank, act more as the technical instruments rather than as protection against risk of non-payment.
7. It is obvious that FR cannot protect banks from major liquidity risk, it can help only in case of a short-term shortage. In case of bigger threat the bank is supposed to borrow funds from the Central Bank. Thus in your opinion what is the actual target of FR system, if not protection?	See previous answer.
8. What are deficiencies of the FR system in your opinion?	In practice liquidity requirements have replaced the fractional reserve requirements for the purpose of financial stability securing.
9. How would you improve them, if necessary?	No need for improvements.
10. How do you think, is there any moral hazard in FR system?	No.
11. The European Central Bank (ECB) puts 1% requirement for FR, is in your opinion enough to meet liquidity shortages? Do you make more reserves?	At the moment the fractional reserve requirements set by the Central Bank act more as the technical instruments rather than as protection against risks of non-payment.

Appendix 2. Answers from OmaSP

Question	Answer
1. How do you assess the threat of liquidity risk nowadays?	The heavy regulation that banks face requires monitoring and reporting on banks' short- and long-term liquidity. This works as a good groundwork for assessing liquidity risk.
2. What measures would you put in place in case of liquidity shortages?	Different market operations like OTC repos and central bank repos. Also credit facilities and CD-programmes can be used to cover short-term liquidity shortages.
3. How often does the bank monitor its FR (fractional reserve)? What does it do, if the FR falls below the limit?	FR monitoring is a daily routine, many times an intraday routine.
4. Is it always possible to keep funds in reserve under the necessary limit?	Not necessarily but as the FR requirement is cumulative it gives banks' the ability to fulfill requirements within a certain period of time.
5. Do you provide your depositors upon request with transparent information about how their funds are used?	On a macro level the annual report shows the big picture if one is able to read it. Otherwise there isn't in place a system for such information. Also deposits aren't pinpointed to certain loans so it wouldn't be possible to give such information.
6. Could in your opinion the bank function better under 100% reserve requirement or without any reserve requirements?	A low FR requirement gives banks the opportunity to make their business, especially when taking in to account all other regulation.
7. It is obvious that FR cannot protect banks from major liquidity risk, it can help only in case of a short-term shortage. In case of bigger threat the bank is supposed to borrow funds from the Central Bank. Thus in your opinion what is the actual target of FR system, if not protection?	I guess the purpose is that banks wouldn't be able to endlessly "create" money by lending deposits.
8. What are deficiencies of the FR system in your opinion?	I think it has lost its meaning when regulation and other requirements have been growing rapidly.
9. How would you improve them, if necessary?	
10. How do you think, is there any moral hazard in FR system?	I don't see it.
11. The European Central Bank (ECB) puts 1% requirement for FR, is in your opinion enough to meet liquidity shortages? Do you make more reserves?	The 1% requirement was put in place 2011 during the aftermath of Lehman and the financial crisis. The "normal" requirement is 2%. Talking about more reserves you have to take into account also other regulation than just the FR. LCR-requirements became active in October 2015 and it has a far bigger effect on banks' ability to cope with liquidity shortages. Although the LCR could have its' handicaps in case of a large scale crisis when LCR-eligible funds lose their liquidity.

Appendix 3. Answers from OP, original.

Question	Answer
1. How do you assess the threat of liquidity risk nowadays?	Pankit varautuvat likviteetin stressitilanteisiin likvideillä arvopapareilla-. Pankkien on vminimissään täytettävä viranomaisen asettama maksuvalmiusvaatimu (LCR, liquidity coverage ratio)
2. What measures would you put in place in case of liquidity shortages?	Pankit käyttävät ensimmäisenä LCR-puskuria, joka on mitoitettu kattamaan 30 päivän pituinen stressitila.
3. How often does the bank monitor its FR? What does it do, if the FR falls below the limit?	Minimikassavarantovelvoite on talletettava Keksuspankkiin kassavarantojakson aikana. Kassavarantovelvoitteen täyttymistä seurataan päivittäin. Puuttuva osa varantoperiodin lopussa muuttuu automaattisesti luotoksi KEksuspankista.
4. Is it always possible to keep funds in reserve under the necessary limit?	Tällä hetkellä kassavarantovelvoite on kevyt ja pankeilla ei ole minkäänlaisia ongelmia sen täyttämässä. Normaalitilanteessa pankkien on täytettävä LCR-vaatimus. Stressitilanteessa LCR-puskureita voidaan käyttää.
5. Do you provide your depositors upon request with transparent information about how their funds are used?	Kaikki pankkien julkaisema tieto löytyy pankkien vuosikertomuksista.
6. Could in your opinion the bank function better under 100% reserve requirement or without any reserve requirements?	Tällä hetkellä Keksuspankin keräämät vähimmäisvarantotaletukset ovat pikemminkin rahoitusjärjestelmän teknisen toiminnan välineitä kuin maksuvalmiuden turvaamiseen tarkoitettu puskuri.
7. It is obvious that FR cannot protect banks from major liquidity risk, it can help only in case of a short-term shortage. In case of bigger threat the bank is supposed to borrow funds from the Central Bank. Thus in your opinion what is the actual target of FR system, if not protection?	Kts edellinen vastaus.
8. What are deficiencies of the FR system in your opinion?	Maksuvalmiusvaatimukset ovat käytännössä korvanneet vähimmäisvarantovelvoitteen rahoitusjärjestelmän vakauden turvaamisessa.
9. How would you improve them, if necessary?	Ei tarvetta muutoksiin.
10. How do you think, is there any moral hazard in FR system?	Ei ole.
11. The European Central Bank (ECB) puts 1% requirement for FR, is in your opinion enough to meet liquidity shortages? Do you make more reserves?	Tällä hetkellä Keksuspankin keräämät vähimmäisvarantotaletukset ovat pikemminkin rahoitusjärjestelmän teknisen toiminnan välineitä kuin maksuvalmiuden turvaamiseen tarkoitettu puskuri.