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About Monetary- & Banking System Reforms

A Revision Of The Past To Conclude About The Future

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Abstract

The crises of the 1930s and of 2008 are clear evidence of the fragility of the Fractional Reserve Banking System. Both of these events resulted in a liquidity crisis that sent the afflicted economies spiralling into deep recession. Security measures and regulations have been enacted to hinder the contagious effects of a systemic run. Unfortunately these have proven to be inadequate.

Prominent economists have wrestled with possible solutions in order to obtain long-term stability. We hereby present a mere few of these theories; Ones that we think are plausible and should be taken into serious consideration by the controlling powers of society.

Content

I. Introduction

The two most severe financial shocks in the western world within the past 100 years are undoubtedly the Great Depression of the 1930s and the Crisis of 2008. Both of these showed key-characteristics of what is called a bank-run. In short, a run is when the demand for the holding of liquid assets (cash, or the equivalent to cash) greatly increases. This leads to a shortage in supply that eventually leads to real economic declines. The runs occur when financial intermediaries issue debt-contracts that features seniority-claim and promises payment at its face value. These two characteristics ensure that the belief of a run may well lead to a run, because when one investor withdraws, the incentive for the next investor to do the same increases. The reason for this being that the bank only holds a fraction of its liabilities as liquid reserves. A hard strain where many large investors were to claim their deposits in a very short amount of time would lead to an inability for the banks to honor their contracts (every withdrawal actually puts the bank closer to bankruptcy).

As of August 2008, the entire banking system held about $50 billion in actual cash reserves while clearing trades of $2,996 trillion per day[1]. All of these trades promised, without a doubt, hard cash payment on demand to one party or the other. The run-prone nature of this system is hard to miss!

What about the burst of the dot-com bubble in 2000? Surely that was also a recent financial setback of magnitude, although it did not result in a run. However, this is no coincidence. Shares funded the corporations, and a share does not have any of the run-prone attributes.

Since the 1930s the main legislative and regulatory focus has been on guarantees regarding the liabilities-side of the banks' balance sheet (often constituted ex post facto, e.g. TARP[2] and Deposits Insurance).

[1] According to Lucas and Stokey (2011)

[2] The Troubled Asset Relief Program, allowed the US-government to purchase up to $700 billion worth of troubled assets from financial institutions in order to warrant financial stability

The result of this is an implicit insurance for the financial institutions to take on more risk (moral hazard), thus a contra productive pattern that is maiming the system in the long run.

The solutions lies within reducing run-prone funding and instead fund debt with assets. Holding large cash reserves are no longer necessary. With today's technology of instant communications, equity-financed banks can access liquid assets within the hour.

The problem lies within the nature of instability associated with the fractional reserve banking system (FRBS). It therefore needs to be evaluated in order to remove all (or at least as many as possible) of the run-prone securities that make up for a substantial part of it. Would the alternative of mandatory 100% cash reserves against demand deposits be a practical and desired solution or is there any other, better alternative, to our current system?

II. The Framework: *Reviews & Solutions*

This paper is built upon a literature study and a critical review, evaluating five different, possible solutions to the shortcomings of the current, instable banking system. We start by reviewing a stricter form of the current system as proposed by Stokey and Lucas (2011) followed by the Chicago plan of Full Reserve Banking (Benes and Kumhof 2012) and a form of narrow banking proposed by Cochrane (2014). The proposal suggested by the positive money organization (Dyson et al 2014) and the joint-liability arrangement (Sanches 2013) is also reviewed. We evaluate the theories presented in search of a solution to reduce the probability of future bank runs. Meanwhile we weigh the societal costs of a possible bank run against the efficiency of keeping the fractional reserve banking system.

To get a background of the omnipresent financial challenges we mention two of the biggest economic crises that have occurred within the past 100 years. Concluding that both crises involved bank runs. The fact that the crisis of 2007-2008 originated within the shadow-banking sector is of importance because of their specific features.

We then show the necessity of banks by the use of a simple general equilibrium model, based on the famous *Arrow-Debreu Model,* although modified by Freixas and Rochet (2008). The model shows that banks are redundant if market conditions were perfect. To draw a parallel we discuss how intermediation works in today's society. We discuss the importance of having financial intermediation to make the economy run smoothly and to make up for market imperfections.

We will do a further comparison of different systems using models presented by Freixas and Rochet (2008) to illustrate the efficiency levels of capital allocation that banks will be able to obtain in different banking systems. To understand why reforms or regulations are needed to our current system, it is important to first comprehend how the current banking system works as well as its flaws. Initially we explain the key features of a fractional reserve banking system and later discuss its inherent instabilities.

a. The Five Ideas

The ideas presented by Lucas and Stokey (2011) are alterations of the current system. They claim that the key to reduce the risk of bank runs is in the hands of the central bank (Federal Reserve). The central bank should have a clear and credible policy, and should act as a lender of last resort when a liquidity crisis erupts to add liquidity into the system for the preservation of market liquidity (i.e. not as a savior of particular institutions).

The first real reform presented is the Chicago Plan. Economists from Chicago initially formed the Chicago Plan in the 1930s, after the great depression as a suggestion of a banking reform. Famous economists such as Frank H. Knight, Lloyd W. Mints, Henry Schultz, Henry C. Simons, Garfield V. Cox, Paul H. Douglas and Albert G. Hart supported the plan. Irving Fisher further supported the Chicago plan and he later summarized it in his work *100% Money and Public Debt* from 1936, but it was not until 2012 that Kumhof and Benes formed a more modern version of the Chicago Plan, showing that with the technology we

have today an implementation of the Chicago Plan would benefit and stabilize the global economy.

It is also essential to review milder versions of system-reforms. Cochrane (2014) claims that a remedy to the risky conduct of bank managers might be to institute a Pigouvian Tax on run-prone short-term debt. The tax would work like a sorter for "*Financial-Darwinism*" where, if the liabilities are economically sound, would continue to exist. Otherwise the tax would exterminate them and so equally, the risk they impose. The main goal is to prevent runs, thus identify the features of a run.

Ben Dyson and several other economists from the Positive Money Organization propose a complete reform of the current banking system. The proposal´s main goal is to create a stable society by eliminating bank runs and reducing the level of private debt. The benefits of this proposition are the ability to reach a sustainable economy and to lower the national debt in the long run.

An alternative to narrow banking and full-reserve banking is the Joint-Liability Arrangement between banks. This system is built upon the fractional reserve banking system although it offers a solution to the risks of bank insolvency. The principles are based on a system where banks voluntarily decide to become members of a coalition where liabilities are issued that are jointly obligated towards its members, the coalition would be supervised by a Clearinghouse.

III. Background

a. The great depression

Between 1929-1933 the financial crisis known as *The Great Depression* hit the USA. It was a bank run where the banks´ customers lost confidence in the bank deposits and wanted to change deposits into currency. It was publicly known that the banks could only redeem a fraction of their customers notes which literarily made people run to get hands on their money first.

A key characteristic of a run is; If one investor pulls out, the firm is closer to bankruptcy, giving the second investor greater incentive to pull out (Cochrane, 2014). Thus the currency-deposits ratio rose dramatically

and the banks faced a scarcity of the medium of redemption, which was central bank money (Singh 2012). Even a *flight of quality* (where customers takes its deposits from a less-reputed bank to a more-reputed bank) was a dead-end since there was a general shortage of currency in the whole economy. This led to a decrease in the money multiplier, leading to a fall in the quantity of money by well over one-third, which turned to deflation as well as a fall in price-levels by over one-third in the course of four years (Freidman and Schwartz, p.299-301, 1963) The shortage on currency came as a result of people hoarding cash, a typical behavior in times of recession. Consequently aggregated demand falls and so the possibility to cover transactions. Another consequence was that the shortage on the medium for transactions and cash was that currency was traded at a premium, which put the economic situation further off-balance.

Singh further discusses that remnants of *The Gold Standard* lingered and the commercial banks did not receive any *line of credit (LOC)* from the central banks. It is argued that the refusal to issue currency by the central banks further deepened the level of the crisis. In short, the gold under the gold standard had two uses. One was its monetary use (as in backing of currency value) and the second being its non-monetary purpose (in jewelry, industry etc.) Any switch between the two changed the amount of monetary gold, which in turn affected the prices. By this there is two types of base money under the gold standard, gold and currency as opposed to the current system of fiat money where there is only one form of base money. Since there is a natural scarcity of gold, any increase in demand for monetary gold resulted in fluctuations in price levels (societally costly). During the great depression there was no deposit insurance nor did the central bank intervene by open market operations in order to stabilize the economy. The then contemporary rigid central banks might have considered it too risky to offer credits to the commercial banks or they may have been hindered by old ideas.

b. The crisis of 2007-2008

The first thing that marks this recent crisis as different from earlier ones is that it was a panic on wholesale funds, not a panic on retail funds. Here financial firms (amongst others) ran on other financial firms, which forced massive deleveraging, resulting in an insolvent banking system. The commercial banks were *not* at the roots of the problem in this latest crisis, it erupted in the *Shadow-Banking sector*. The shadow banks (SB) worked on the same principles as the fractional reserve system and held almost no liquid reserves. They worked as a parallel system, outside the regulations of the ordinary banking-system. Cochrane (2014) describes how the giant financial firms Bear Sterns and Lehman Brothers were leveraged 30:1 on their overnight mortgage-backed securities (MBS) that they used as collateral for financing portfolios. This means that for every $30 of investment, they had to borrow, anew, $29 to pay back yesterdays debt. Thus the Shadow Banks backed their borrowing on asset-backed securities (ABS)[3] that were collateralized by unsecure, run-prone, underlying assets; Hence the similarities to FRBS. The actual run started when large firms and investors refused to renew their repos[4].

A dangerous characteristic of a panic is when bank debt is not longer considered informationally insensitive. This alters the preferences of agents whom now prefer cash, which is truly insensitive from private information; By this, the logic behind the deposit insurance holds, where private information about the bank does not substantiate a low risk preference (Gorton 2009). Information-asymmetries led to speculations regarding the collateral that backed the assets of the shadow banks, e.g. bonds made up by defaulted, securitized loans. A principle of "first come, first served" emerged and firms ran to withdraw their funds. In order to prevent another crisis of the sort of 2008 a regulatory system called *Basel III* was formed. It is a directing framework

[3] A Security whose value is base on a pool of underlying assets

[4] Repo: Repurchase Agreement – The sale of a security with the contracted agreement of repurchase (by the seller) at a higher price on a later date.

on the use of capital, risk and stress testing for banks. The system is designed to work along side the previous accords of *Basel I* and *Basel II*.

IV. Financial Intermediation

a. Intermediation under Perfect Markets

To examine why banks are needed in the first place we use a simple general equilibrium model that is presented by Freixas and Rochet (2008) based on the famous *Arrow-Debreu Model.* This model includes the banking sector. *Figure 1.1* shows the financial decision of the economic agents. The model is simplified and assumes perfect market conditions with profit maximization. To simplify the model further it does not include the government or the central bank, nor does it account for transaction costs.

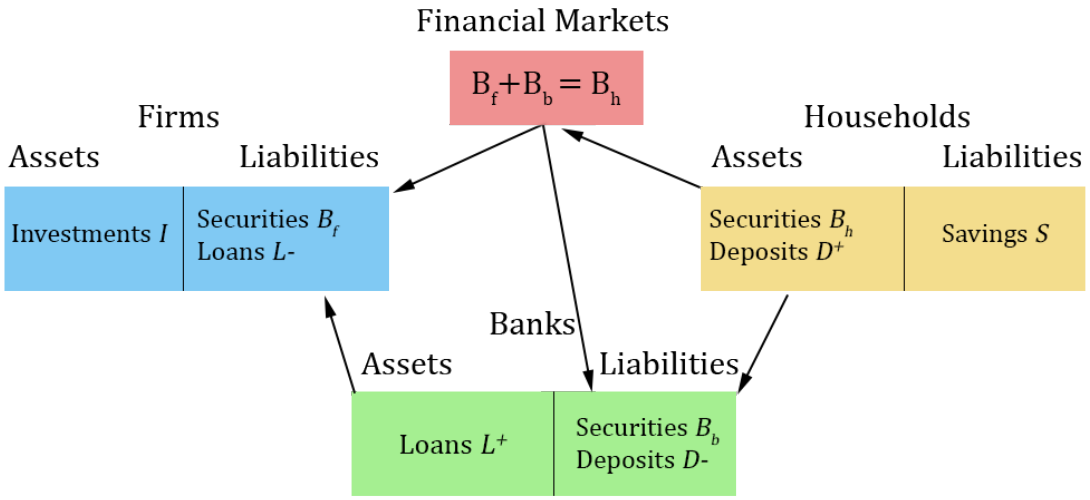

Figure 1.1, Financial decisions by economic agents

The model is a two-dates model (t = 1, 2), with a physical good owned by the consumers and used as a tool of measurement. The model consists of 3 representative agents: firms, consumers and a bank. We use subscriptions to distinguish the consumer (h), firm (f) and the bank (b). The physical good will be partially consumed at t = 1 and the rest will be invested by the firms to produce consumption at t = 2. All agents will act competitively.

The consumer receives ω_1 as endowment in the first period for consumption (C_1) and allocates the remaining resources between bonds issued by the bank or the firm (B_h) and bank deposits (D_h), to maximize the utility under the budget constraint. p denotes the price of C2, the consumption level in the second period which depends on the profits of the firm (Π_f) respectively the bank (Π_b) and the return from the bonds and the bank deposits, where r and rD are interest rates paid on bonds and bank deposits. The obvious solution is as in (1.3) due to oversimplification of the model where bonds and bank deposits are perfect substitutes. The interest rate will be equal.

P_h - max $u(C_1, C_2)$

$C_1 + B_h + D_h = \omega_1$, (1.1)

$pC_2 = \Pi_f + \Pi_b + (1 + r)B_h + (1 + rD)D_h$ (1.2)

$r = rD$ (1.3)

The firm finances its investment by issuing bonds (B_f) and by taking loans (L_f) from the bank in order to maximize its profit. The profit depends on how well the invested money is spent, where (f) is a production function. r and rL is interest rate that the firm will pay to the bondholders and to the bank. Because bank loans and bonds are perfect substitutes, the solution will be as in (1.6).

P_f – max Π_f

$\Pi_f = p_f(I) – (1 + r)B_f – (1 + rL)L_f$ (1.4)

$I = B_f + L_f$ (1.5)

$r = rL$ (1.6)

The bank gives loans to firms (L_b) that are financed from issuing bonds (B_b) and deposits from the consumers (D_b). Banks try to maximize their profit by issuing the right amount of bonds and get the right amount of deposits. The solution for the bank will be as (1.9).

P_b - max Π_b

$\Pi_b = rLL_b – rB_b – rDD_b$ (1.7)

$L_b = B_b + D_b$ (1.8)

$r = rL = rD$ (1.9)

In general equilibrium all three agents need to behave optimally and solve their maximization problem. Where in the good market investments will equal savings ($I = S$), deposit market ($D_b = D_h$), credit market ($L_f = L_b$) and bond market ($B_h = B_f + B_b$) all clears. If we combine the solutions for the consumer and the firm (1.3) and (1.6) it is clear that the only solution will be as (1.9), where all interest rate will be equal. Banks profit is shown in (1.7) and will be zero because all the interest rates will be the same and bonds and deposits are perfect substitutes meaning that the assets of the bank will be canceled out by the liabilities. If the bank is non-profitable and the consumer sees bonds as perfect substitute to depositing the money, as well as the firms sees that issuing bonds as perfect substitute as taking bank loans, banks would not be needed in our simplified example. But in reality, the markets are not perfect and this model is too incomplete and oversimplified to be able to reflect the reality. The market is not perfect where informational asymmetries exist (thus imperfect market conditions), a financial institute, such as a bank can mitigate this imperfection.

b. Financial Intermediation Under the Current System

The classic definition of a bank's intermediary service is that of *an economic agent who specializes in the activities of buying and selling (at the same time) financial claims* (Freixas and Rochet, 2008). The service provided greases economic development by the reallocation of capital and make up for market imperfections. Just as Schumpeter (1934) put it in his classic theories the scenario might be a researcher or entrepreneur who have a great idea but are lacking the funds needed to fulfill it. Schumpeter derives development from *innovations* and *entrepreneurs*. Innovations may consist of the introduction or improvement of a new product or a new production process, the opening up of a new market, the mining of new raw materials etc. For

these processes to be successful it is crucial that the innovator has access to credit lines.

At the same time as the entrepreneur needs funds there might be someone with a surplus of funds. The bank will buy this surplus at an interest rate (in the form of a deposits account) and then sell the funds as a loan to the researcher or entrepreneur by a higher interest rate. By such a setup *indirect financing* have been successfully obtained. *(Note that the interest rates for deposits today are close to none; thus theoretical justifications of the existence of the intermediary service based on this assumption fails)*.

As opposed to this there might also be a situation of *direct financing*. Then the part that is lacking funds will e.g. issue stocks and the part with a surplus will invest directly into the company in the exchange for a percentage of ownership.

The rationale behind *indirect financing* may be seen from three perspectives. *Convenience Denomination* makes it possible for the bank to cover a large indivisible loan from a large investor by collecting deposits from many small depositors (or vice versa). By *Quality Transformation* the bank may have better insight in a certain investment than a single investor, thus covering for information asymmetries. The bank may also have better possibilities to diversify all of its invested funds than that of a single investor, consequently converting risky investment into less risky. The third and final is *maturity transformation* (the general system under Fractional Reserve Banking) where the bank borrows money at a shorter term than they lend out money.

The market imperfections can be, inter alia, translated into information asymmetries that could be further derived to specific transaction costs.

As argued by Freixas and Rochet (2008) the classic forms of transaction costs are given endogenously whereby physical and technological costs usually are included. Since the emergence of more telecommunication- and computer-driven financial markets and with the development of more sophisticated financial instruments the need for the financial institutions (FI) persist. The three most crucial forms of

information asymmetries tackled by the FIs (and by what time they are addressed by the intermediation) are adverse selection (ex ante), moral hazard (interim) and costly state verification (ex post).

Adverse selection for banks is e.g. a problem faced when borrowers of a loan-agreement have more information about its own situation than the lenders. It is argued that the ones that have the least ability to repay their loans are the ones most likely to get a loan. This is based on assumption that the clientele that are most actively looking for the opportunity to get a loan are also the ones accepting it on (almost) any terms. Alas the loan will be "bad" as it is unfavorably affected by the events of the selection before the issuance. When the loan is finally in place the risk of moral hazard arises. If the borrower lacks real incentives to repay the loan and feels that it is not "their money", there is a higher probability of engaging in a risky and morally hazardous conduct. Outside this agreement, as a collateral for the lender, one can construct the contract for the loan in such a way that it lies in the borrowers interest to display truthfully about his performance regarding the usage of the loan. The costs associated with this "extended" monitoring falls on the lender. The scenario can be realized by conditional repayment structure where an audit process is in place. The information disclosed in the audit may then result in a penalty (or reward) specified between the lender and the borrower.

V. Basic Principles of Fractional Reserve Banking

A large part of the banks´ activities revolves around lending and borrowing. The former makes up a big part of the assets side of the banks balance sheet. Lending are commonly long-term credits that would be financed by short-term borrowing, foremost by demand deposits that are making up for a large post on the liabilities side. These are short-term in the sense that they may be withdrawn at anytime. It is unlikely that all deposits would be withdrawn at the same time. Accordingly, current deposits held by the bank cover all "day-to-day" transactions within themselves.

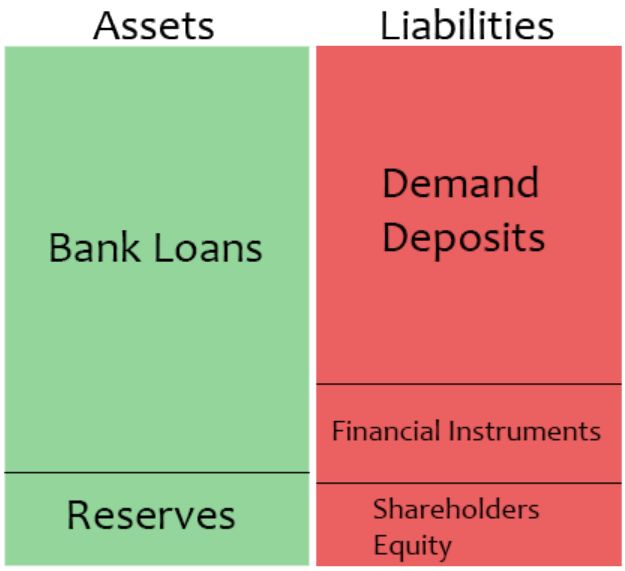

Figure 1.2. Bank Balance Sheet

Figure 1.2 shows a rough sketch (not according to scale) of the proportions of the biggest posts on the banks balance sheet.

The characteristics of demand deposits are: **(1)** demand deposits have no fixed maturity; they can be exchanged for cash at par on demand; **(2)** they are senior claims; **(3)** they are claims on a portfolio; **(4)** they can be used in transactions. This form of debt is created by depository institutions and by money market mutual funds that offer checking. (Gorton 2009) These are covered, in the regulated banking sector, by deposits insurance.

The more unusual large deposits and uncommonly hard strains on the short-term liabilities are covered by the banks´ reserves. The *fractional-reserve banking system* is built on the principles that only a fraction of the liabilities of the banks balance needs to be covered by its reserves. This rests on the assumption mentioned above, that not all deposits would be withdrawn at any one time. Herein lies the *inherent instability* (elaborated further on) of the fractional-reserve banking system. During normal market behavior the financial circulation behaves as anticipated. The bank reserves, interbank lending or small adjustments from the central bank may cover small volatilities, albeit systemic shocks immediately puts the structure off-balance.

The need for financial intermediaries (please read the section *Intermediation under Perfect Markets*) would not exist if real markets were to function perfectly.

a. The Inherent Instability Under The FRBS

In the banks balance sheet, a major part of the liabilities is made up by short-term debt.

On the assets side the major part consists of assets written on longer terms. This practice is known as *Maturity Transformation,* i.e. a system where borrowing is made on a shorter timeframe than that of the lending. The longer-term resources are more prone to fluctuations, which means higher volatility of the banks' net worth (its assets minus its liabilities). Common long-term assets would be e.g. company- or private loans, both generally illiquid. This means that they cannot back-up for any sudden large withdrawals from the deposits accounts.

On the one side are the illiquid assets and on the other side are liabilities that can be acquired on instant demand. Hereby a problem may arise because of the mismatching nature when the banks liabilities are more liquid than its assets. The banks are thereby vulnerable to crises since they are subordinate to the confidence of its holder (or even the general market). The bank would fail to meet the demand of all depositors if they all should choose to withdraw at a short period of time. Banks are thus vulnerable to self-fulfilling panics in which depositors withdraw their funds simply because they believe other depositors will do so (Chari and Phelan 2012). By this, the self-fulfilling nature of a crisis leading to a bank run is that "the belief of a run, leads to a run" because the rational thing to do for all depositors is to withdraw their funds as soon as possible before others can do so. This holds since the common knowledge that banks cannot cover all deposits in case of a mass-withdrawal, consequently the rationale of "the earlier one retrieves ones funds, the higher is the chance of success in doing so" applies.

The government has strong incentives to bail out debt holders if a panic is due to occur. Because of the toxic nature of negative financial

shocks if such an incident were to be neglected it may well lead to a *systemic bank run*. The paradox is that parties involved will have incentives for higher preferences of risk. As put by Chari and Phelan (2012), Bank managers have increased incentives to take on risk, knowing that their failures are implicitly insured. The taxpayers would be the ones to bear the consequence of a crash. Furthermore, the depositors are less motivated to monitor the bank managers since their accounts are covered. This postpones action, leading to a deeper crisis if a systemic failure would befall.

Lucas and Stokey (2011) lists some points that should be taken as lessons from the panic of 2008. **(1)** *Regulating banks may reduce the likelihood of a liquidity crisis although it cannot entirely eliminate it.* The Dodd-Frank Act [5] suggests that the Federal Reserve (Fed) should predict and prevent future crises, a task that is impossible to follow. **(2)** *The Fed should act as a lender of last resort during liquidity crisis.* If beneficial, the Fed should help by adding liquidity to the system to ease economic decline. **(3)** *The message from the Fed should be clear and well understood regarding its policy for liquidity crises.* During 2008 the general opinion were under the impression that the Fed would ensure the life of the too-big-to-fail firms and the decision to *not* save Lehman Brothers came as a shock. If the actual policies of the Fed are well communicated the risk for unfavorable beliefs is severely mitigated.

(4) *Deposit insurance is a partial solution.* Initially it was seen as a consumer protection rather than a run-prevention-mechanism. It did prevent runs on commercial banks during 2008 although the regulations on how to back deposits with assets need to be redefined.

(5) *Deposit insurance has only a limited role.* Many of today´s financial institutions stand outside the protection (and regulation) of the insured system and the crisis of 2008 involved a considerable part of these. Although the markets outside the insured system offer higher returns and will therefore always be an attractive playground. **(6)** The Fed's goal should be to maintain market liquidity, not in the preservation of

[5] The Dodd-Frank Act: Regulatory reform of financial regulations in the USA.

particular institutions. The focus should be (and by such understood by all) to have a credible policy on liquidity injections in the economy during crises and to *not* distort the incentives of the banks. The definition on what terms the Fed will lend on and in what situations need to be *very* clear. They should also carefully describe on what indicators they will portray as a crisis and when action will be sparked. And more importantly, what type of collateral will be accepted when covering a distressed bank's deposits.

VI. Proof of FRBS Efficiency

The following model is presented to grant a better understanding of the efficiency of capital allocation between different banking systems.
The model is a three-dates model (t = 0, 1, 2) with a good that is endowed to agents who are ex ante identical, which means that they all are identical in period 0. This good can be consumed at date t = 1 or t = 2. C_1, C_2 denotes when the good is consumed. The consumers will either consume the good early t =1, or consume it late t =2. We will distinguish these types of consumers as impatient consumer (consuming at t= 1) and patient consumer (consume at t = 2). This is a simple way to illustrate whether the consumer is facing liquidity
shock and have to consume the good early. π_1 is the probability of consuming early and π_2 is the probability of consuming
it late. $\pi_1 + \pi_2 = 1$.
The good can be stored from one period to the next period or be invested in a long term technology (I) at t = 0 and the invested amount gives R > 1 in return at t = 2, if the consumer do not consume the good before, but if the consumer need to consume the good at t = 1, the invested amount needs to be liquidated at a value of (Z < 1).
So the utility will either be $u(C_1)$ or $u(C_2)$. In t = 0 the expected utility of a depositor will be as follow:

$$U = \pi_1 u(C_1) + \pi_2 u(C_2) \quad (2.1)$$

We start by examine a model where agents cannot trade with each other (no financial market).

Agents cannot trade so when they face a liquidity shock they need to liquidate their investment. The consumption level will be:

$C_1 = ZI + 1 - I$ (2.2)

And if the agent does not need to liquidate the investment, the consumption level will be:

$C_2 = RI + 1 - I$ (2.3)

It is obvious that $C_1 \leq 1$ and $C_2 \leq R$ due to the fact that $Z < 1$ and $R > 1$. So the best-case scenario if the agent must liquidate at $t = 1$ is if the invested amount is $I = 0$ and if the agent can evade the liquidation the best outcome is to have the full amount invested ($I = 1$). The main problem here is that the decision will always be inefficient due to the fact that the agents do not know if they will face a liquidity shock at $t = 1$.

$\pi_1 C_1 + \pi_2 C_2/R < 1$ (2.4)

2.4 shows that efficiency is not reached and this problem can be mitigated by opening a financial market.

In this financial market (bond market) p units of good is exchanged at $t = 1$ promising one unit of good at $t = 2$. The consumption level for the dates will be:

$C_1 = pRI + 1 - I$ (2.5)

$C_2 = RI + 1 - I/p$ (2.6)

In 2.5 the impatient agent has sold RI bonds instead of liquidating the invested amount and in 2.6, the patient agent has bought $((I - 1)/p)$ bonds instead of storing the money. If $pR > 1$ it is more efficient to invest more, $I = 1$, while $pR < 1$ the most efficient decision will be to invest less, $I = 0$.

Observe that $C_1 = pC_2$ and the investment decision is at $t = 0$, the only solution will be $pR = 1$. Giving the price of bonds to $p = 1/R$.

The allocation will be $C_1 = 1$, $C_2 = R$, which dominates the model where no financial market is available. Giving the answer that a financial market contributes positively in the aspect of efficient investment

decision. Welfare increases when agents are allowed to trade, thus showing that this model pareto-dominates (all situations improves for all parties involved) the previous model where no financial market exists. Notice that the optimal I will be, $I = \pi_2$

A market including a financial market still does not achieve pareto-optimal allocation, which is the most efficient allocation of resources. This is achieved by maximizing (2.1) under the constraints of:

$\pi_1 C_1 = 1 - I$ and $\pi_2 C_2 = RI$

P1 max $\pi_1 u(C_1) + \pi_2 u(C_2)$ (2.7)

By eliminating I we can make it to a single constraint by substituting:

$I = \pi_2 C_2 / R$ ---> $\pi_1 C_1 + \pi_2 C_2 / R = 1$ (2.8)

Leading to the optimal allocation that satisfies the first-order condition.

$u'(C_1^*) = Ru'(C_2^*)$ ---> $u'(C_1^*)/u'(C_2^*) = R$

This expresses that when optimal allocation is achieved, the quota of the marginal utility of consumption in t = 1 and t = 2, will equal the return of the long-term technology.

As seen above no financial market is included in this model.

This pareto-optimal state can be achieved by implementing a financial intermediary who offers deposit contracts. The agents will deposit at t = 0 and will be able to get C_1^* at t =1 or C_2^* at t = 2. This FI (Bank) will only be able to pay back the promised amount if they invest $I = 1 - \pi_1 C_1^*$ in a long-term technology. These will consist of loans given to individuals and will be illiquid. The $\pi_1 C_1^*$ will be the amount that in this case, the bank will have as reserve to be able to hand out the promised amount to the agents who face a liquidity shock and will withdraw that specific amount from the bank. This bank will have the features of a fractional reserve bank.

We have now established that a bank under a fractional reserve banking system will be able to offer optimal deposit contracts, however the main question here is if this system is safe. Do the patient consumers remain patient in every scenario? Consumers will be maximizing their utility and thus will not withdraw early because $C_1^* < C_2^*$ if

the consumers believe that the bank will be able to fulfill their obligations at t = 2.

In this case the sole withdrawers will be those who face a liquidity shock and will be equal to the reserve amount of the bank, which is $\pi_1 C_1^*$. In this case the bank will run smoothly and no premature liquidation of long-term technology is needed. Another equilibrium might be taken into consideration, using game theory. The *Nash Equilibrium* where the "players" need to consider how the other "players" will act. In this case the consumers need to consider how the other consumers think. If the patient consumer believes that other patient consumers will withdraw early, the patient consumer will withdraw early, leading to a mass withdrawal exceeding $\pi_1 C_1^*$. All assets of the bank needs to be liquidated at a value of $\pi_1 C_1^*$+ Z(1-$\pi_1 C_1^*$) < 1. Considering this the patient consumer will withdraw early because nothing will be left at t = 2. This is called an inefficient bank run, however, it can be severely mitigated by implementing deposit insurance thus securing the invested amount for the patient consumer, giving them less of an incentive to withdraw early.

Now when we have confirmed the fact that a bank under a fractional reserve banking system can achieve optimal allocation of resources. However, it is important to find alternatives because of the inherent instability of the FRBS. The origin of the instability is due to the paradox of two Nash equilibria, where one is inefficient.

The alternative would be to have a 100% backing of deposits. This proposal is called full-reserve banking and we will show that this form is not desirable because of its nature of inefficiency. The mildest version of this narrow bank will be the most interesting version, when comparing to the fractional reserve banking system. We start off by making a short presentation of the most strict form of narrow banking, which is a 100% backing of deposits.

P2 max $\pi_1 u(C_1) + \pi_2 u(C_2)$ (2.9)

$C_1 \leq 1 - I$ and $C_2 \leq RI$

By looking at the constraint it is clear that the solution will be dominated by P1. In fact it will be dominated by a system where no banks exists and agents are not able to trade with each other, which is shown in (2.4). In a milder version, banks will be able to liquidate their long-term investments so depositors can withdraw at t = 1. In reality loans cannot be liquidated due to the fact that they are illiquid. In this case the loans will be sold to another institute yielding (Z < 1). The utility will be the same as in (2.4), where no financial market exists.

The next step would be to analyze a weaker form of a narrow bank, this bank will be able to reinvest their deposits in long term riskless financial assets instead of making loans; this type of bank will function as a money market fund. This Bank will be more efficient than the previous ones and be as efficient as if a financial market is opened, as discussed earlier in this paper. Still being less efficient than a fractional reserve banking system that achieves pareto-optimal allocation. Nevertheless, it is efficient enough to consider a narrow bank that acts in the same fashion as a money market fund, to be a somewhat desirable solution to a the fractional reserve banking system. Bank runs will not occur if the bank is a narrow bank, so in the end, the question is if this increase in stability is worth the decrease in efficiency. Thus mitigating the societal costs associated with bank runs.

VII. About Shadow Banking

The definitions of *Shadow Banking* (SB) *Activities* have differed widely. Especially after the latest financial shock (2007-2008) and with the common acceptance that this indeed erupted within the Shadow Banking Sector it becomes important to have an unambiguous description on the shadow banks. A good point of departure would be in the description stated by the US Financial Stability Board (2012):

"Credit intermediation involving entities and activities (fully or partially) outside the regular banking system."

FSB (2012)

Although this definition excludes important details it does set a reasonable framework. Entities operating in the financial market that need to be added to the category of SBs is credit-oriented hedge funds, leasing and financing companies corporate tax vehicles and short repos (often written on a one day maturity) etc. Also practices operated by banks include that of the shadow banking activity. Examples are Structured Investment Vehicles (SIV), Liquidity Puts on securitizations etc. These activities of intermediation can be derived from an actual demand where the possibilities of regulatory arbitrage exist and where the normal supervision attached to commercial banks fail; Hence the ever altering nature of SB, making juridical classification difficult. By this it is crucial to foresee where the shadow banks will operate in the future. An attempt to summarize the characteristics of an SB has been made by *Claessens and Ratnovski* (2014) in their IMF Working Paper. The model by *Claessens and Ratnovski* (2014) (figure 1.3) gives a good illustration on the classifications that distinguishes a traditional bank and a traditional intermediation entity towards a shadow bank. The SB needs a *Backstop* to operate which might be explained as a last-resort support security. If e.g. an investment would fail to reach its full pledge, the provider of a backstop would purchase the remainder of the amount. By the definition on shadow banking mentioned above one would cover the eventual services undertaken by a shadow banking entity in the future as well as in the current manner of operations and by emphasizing on the usage of *backstops* which is the fundament of risk-coverage for alternative banking. Since the margins of a shadow bank are too low to be self-supportive of a backstop it needs external access to capital to cover for its risk absorption (read further on the topic in the article by *Claessens and Ratnovski* (2014)). Here a parallel arises to the commercial banks, demand deposits in the sense that deposits are usually short term (one day repos) and may be withdrawn at maturity. The SB can use the deposits for further investments (rehypothecation) (in the same way a commercial bank uses demand deposits as liquid currency).

"Traditional " intermediation by institutions	**Activities commonly referred to as forms of "shadow banking"**	**"Traditional " intermediation by market entities**
Traditional banking (deposit taking and lending) Traditional insurance	***Securitization***, including: tranching of claims, maturity transformation, liquidity "puts" from banks to SIVs, support to par value money funds. ***Collateral services***, primarily through dealer banks, including: supporting the efficient re-use of collateral in repo transactions, for OTC derivatives and in prime brokerage; securities lending. ***Bank wholesale funding arrangement,*** including the use of collateral in repos and the operations of the tri-party repo market ***Deposit-taking and/or lending by non-banks***, including that by insurance companies (e.g., France) and bank-affiliated companies (e.g., India and China).	***In capital markets:*** Hedge funds Investment companies Underwriters Market-makers Custodians Brokers ***In non-bank sector:*** Leasing and finance companies Corporate tax vehicles

Figure 1.3 Spectrums of Financial Activities (Claessens and Ratnovski (2014))

The authors conclude to the definition of shadow banking in the following manner:

"*All financial activities, except traditional banking, which require a private or public backstop to operate.*"

Claessens and Ratnovski (2014)

One form of securitized asset used as collateral is the technique of turning assets that are non-marketable into a financial instrument (as combining several bank loans into a bond). In this process a degree of diversification is obtained. Further risk control is achieved by tranching (dividing the bond into portions with different attributes of maturity, risk and returns). If a number of depositors choose to not roll over their repos the SB would quickly face a *liquidity crisis*.

In reference to the latest crisis the SBs overleveraged and could not honor their commitments and therefore became insolvent. Consequently there was a "wholesale-panic" where large financial firms negated the renewal of their sales and repos, or made an increase of the repo-margins ("haircut") which forced a massive deleveraging, resulting in insolvency, Gorton (2009). The crisis can accordingly be addressed as a bank run. In such a fashion the shadow banking systems have similarities to the banking system before the introduction of deposit insurance. An important note is that in our current system, *boom-and-bust* cycles are inevitable, causing uncertainty to the value of collaterals when prices on assets fall (near bust).

A large part of the shadow banks' funding originated from the selling of repos. The repo market is a place where mainly large institutional investors such as pension funds and large companies lend large amounts of money for a short period of time. The main reason why they lend at the repo market is because they want to obtain higher yields than normal deposit interest rates. These large companies want to ensure that the loan is safe by receiving collaterals with low fluctuations in value. This is important because if the underlying value does not change the loans are considered risk-free. Although the amount lent can still be used by the lender (on a daily basis) and thus a parallel to a bank can be made. Where depositing money at the bank can be used on demand. At first, the shadow banks used treasury credits as collaterals. These collaterals were completely risk-free, but due to the scarcity of treasury credit all repo loans could not be backed with treasury credit. Later, collaterals that did not consist of treasury credit

could consist of a pool of mortgages that were diversified and tranched to lower the risk-levels and later securitized. The main problem with this securitized pool of mortgages, which is mortgage-backed securities (MBS), is that the value of these securities fluctuates depending on how the house market behaves (as in the case of 2008). As an example, MBS were used as collateral when taking loans. When the house market started to decline, investors were starting to believe that the default rate of any given pool of mortgages would rise. Repo lenders would then naturally ask for more collateral due to the uncertainty of the underlying value of the collateral. Eventually repo lenders stopped the renewal of the repos and potential borrowers with good MBS would not be able to renew the repo. The sudden stop of the renewals of the repos caused a systemic run (bank run) which sparked the beginning of the financial crisis (Sanches 2014). This is a good example showing that a run is more likely to occur if the assets are hard to value. Cochrane (2014) refers to an example, where "Eight bottles of Tylenol laced with cyanide, sold in a Chicago drugstore, instantly transformed 31 million bottles of Tylenol located in stores all over the globe into toxic assets that could find no buyers." It is not worth examining every single bottle for the harmful substance and no one wants to be held accountable in case of a miss. In the same sense, it is not worth investigating every MBS, it is instead easier and cheaper to not renew any of the repos.

One of the best examples to illuminate the interconnectedness of the whole financial market (SBs, investment banks and ordinary commercial banks) is in the burst of the MBSs. The commercial banks issued a massive amount of lending to households, both good and bad, and the investment banks backed housing construction equally. In order "clean up" their balance sheets the banks packaged the loans into MBS. The MBS where then bought by a Shadow Bank, who uses it as collateral to show when asking for funds through repos (agreements with large investors and firms). By now a large part of the economy is intertwined with each other. When the MBSs finally went under the microscope it was realized that it consisted of highly

correlated (and some bad) loans. All of a sudden all similar securities were seen as contagious and the systemic panic was a fact.

VIII. Risks And Liquidity In Banking

"*A bank is solvent so long as the total value of its assets exceeds the total value of its liabilities. A bank can remain solvent if it can take care of the risks it faces. These are of two types: diversifiable risks and non-diversifiable risks*"

Singh (2012)

The former type of risk is reduced by, as the name suggests, diversification. By making sure that the returns of the assets in the banks´ asset portfolio are not correlated would eliminate the probability of *diversifiable risk*.

Holding capital for a bank comes with costs. Depositors are free to withdraw whenever they choose. This keeps the management at bay and serves as a stipulation for moral hazard. Another cost that would be associated with the depositors is that the interest rates on a deposits account are usually smaller than the expected returns for a shareholder. Thereby the cost is "income forgone".

A solvent bank can face liquidity problems. If depositors have the perception of weakness in the bank holding their deposits the rational thing to do would be a full withdrawal thus resulting in a bank run. In accordance to Diamond and Dybvig (1983) a bank with fractional reserves works fine under *Nash Equilibrium* during *Pareto Efficiency*.

The Nash Equilibrium might be concluded to a state where everyone has full information on each other; one can anticipate the actions of others. Thereby ones own choices will be made in consideration to the rest of the market-participants.

Furthermore, the Pareto Efficiency (a situation of optimal resource allocation, where any one part can not get better off without making the situation worse for at least one other part) for banks occurs when any changes to make an individual bank (institution, intermediaries etc.) better would put one, or more, in a worse position.

Conclusions of observations by Singh (2012) tell that a near-systemic bank run can be avoided without the intervention of the government. If one bank in an economy would suffer from a run, it would surely affect other banks in the same economy. The bank in distress could be offered a Pigouvian subsidy on a Line-Of-Credit (LOC) from another bank. I.e. the bank offering the LOC would have an excess of capital at this given time. By transferring this capital to the bank in distress it may mitigate the incentives for a run thus aiding the economy as a whole. Herein lies a trade-off between competition and stability. The point of a near-systemic bank run is that there is a shift of deposits between less reputed banks towards more reputed banks.

A Systemic bank run is a run towards the whole sector, where the general public wants to make a shift from deposits to currency. Measures can be taken by the central bank to calm these runs (e.g. by offering deposit insurance) or to cover the actual amount of deposits by offering an individual LOC towards the affected banks. The LOC would be of an exact match of the total amount of the deposits for each of the respective banks. In a near-systemic bank run the LOC would be between the more reputed banks and the less reputed banks, in which the trust of the public lies with the more reputed banks. In the case of a systemic bank run the trust lies in currency, thus in the central bank. The principles are very similar though the notation differs.

Selling off liquid assets can also cover a bank run, although market activity usually falls drastically during times of a bank run, making assets that are liquid during normal times illiquid in times of a negative shock.

There are some crucial differences in the central bank acting as a lender of last resort and in the offering a LOC to banks that face liquidity problems. As a lender of last resort, the central bank acts ex-post. By such it would not have the possibility to fully monitor whether or not the receiver of the loan is facing liquidity- or solvency problems (elaborated later) hence the greater risk for moral hazard. By selling a LOC to a bank would be an action ex-ante. The monitoring process could then be more thorough thus better justifying the final verdict. A potential buyer of a LOC would be put under the microscope in

supervision of the issuing institution consequently lessening the probability of morally hazardous conduct.

a. Differences between Illiquidity and Insolvency

A bank can be solvent but still face liquidity problems. This might be due to the cause of a liquidity shock. In normal times (during generally normal market conditions) a solvent bank should not face problems with liquidity although if some sort of market failure is present the solvent bank might be in a position of illiquidity. These would be stated as abnormal time, or abnormal market behavior. History has shown that during a crisis or some kind of market shock, liquid assets might be hard to liquidate. Therefor a "clean" balance sheet is not enough in such a scenario. When facing problems with liquidity the buying of a LOC can be beneficial.

A solvency problem is when liabilities outweigh the assets of the balance sheet. Even if all assets were liquidated the bank would still be in debt.

IX. The Chicago Plan Reviewed

Banks after the Chicago Plan reform will have a system where money will be issued by the government as debt-free money as opposed to the current system where money is privately-issued and debt-based. Thus banks deposits will be fully backed with reserves.

Benes et al. (2012) claims, by reference to Fisher (1936), that at least four advantages will arise when converting to the system in accordance to the Chicago Plan reform; **(1)** Inter Alia, claims are made that business cycles will not fluctuate as much because, under the new system, banks will be pure intermediaries, banks cannot lend money unless they obtain funding to finance the loans. Banks would not be able to create money as before, ex nihilo, which will change the banks´ attitude towards credit risk, consequently reducing the banks' ability to heavily influence the volatility of the business cycles.

(2) As mentioned earlier, banks deposits will be fully backed by reserves, meaning that bank runs will be non-existent. This will increase

the financial stability and banks will be able to focus on their core lending functions. Banks do not have to worry about instabilities originating from the liability side of the balance sheet, which will now consist of run-proof non-monetary liabilities.

(3) The liability side off the balance sheet will consist out of a combination of equity and loans from the government treasury.

A heavy reduction of [net] government debt can be a possible outcome. Because the government would be able to issue money at zero interest, instead of borrowing it from banks at an interest, this would lead to a lower interest burden for the government when financing projects and would reduce the government [net] debt. Banks would need to fully back their deposits. That will be achieved by borrowing reserves from the treasury. The government could buy back government bonds from the banks by cancelling out the treasury credit. **(4)** There will also be the potential of a great reduction of private debt, as a result of the buyback of large amounts of private debts from banks against cancellation of treasury credit. This is possible because the government will have a negative net debt position.

Kumhof and Benes could verify the four advantages that Irving Fisher claims, by careful analytical work and simulations (Not presented in this paper, see Benes et al. (2012)) and they further claim that the economy will have a large steady state output gains due to the fact that several distortions will be gone or reduced when converting to a system under the Chicago plan. The distortions would be interest rate risk spreads, distortionary taxes and costly monitoring of macro economically unnecessary credit risks.

X. Private and Government Money Issuance

This aspect is important to consider because private money issuance is associated with fractional reserve banking, while government issued money is associated with full-reserve banking (Narrow banking), so called safe banks as previously mentioned. Graeber (2011) has shown that private issuance of money has several times led to major societal

problems. This has been the case because it is often combined with private debts.

According to Zarlenga (2002) private creators of money manipulate the money supply and choose to create more at times of economic expansion and to create less at times of economic contraction, leading to business fluctuations. It can be compared with the harvest cycle in ancient farming societies. Within these societies the lenders gave excessive amounts of loans in prosperous years thus raising the general levels of debt. Although in harsh years they constricted the amounts. This repeatedly led to systemic borrower defaults and loss of collateral, resulting in a concentration of wealth in the hands of the lenders. In other words, banks lend a lot when the economy is expanding, but this expansion will sooner or later halt and when it does, banks will lend less. This increases the levels of economic volatility and will be even bigger when the money is privately issued, which Benes et al. (2012) also debates. Huge Business fluctuation causes deeper recessions and recessions cause unemployment. Deep recessions are costly for the government, because unemployment equals loss in tax revenue and increased spending in unemployment benefits etc. according to Dyson (2014).

History is full of examples where privately issued money has caused problems with high inflation. While money issued by the government have caused high inflation at some rare occasions, association between inflation and specific actions of government money issuing have been questioned in recent times. According to Benes et al. (2012) correlation between the two is a common misconception. When government funding is available, banks can borrow any amount of required reserves from the government. By having full government funding of credit, this will give the government the opportunity to reduce tax distortions, which stimulates the economy.

XI. About Narrow banking

One of the characteristics of a narrow bank is safe banking without the necessity of 100% cash reserves. As stated by Cochrane (2014), a Pigouvian Tax on run-prone short-term debt would lessen risk-taking behavior for financial institutions. For example, say that the bank (or an other intermediary) needs to pay a 5% tax for every run-prone short-term dollar of debt issued (the same methods that are applied for polluting industries, it would only make sense for an equal application on financial pollution). The main problem lies within run-prone contracts, which suggests towards the regulation of such. A Pigouvian tax rather than a subsidy (which for instance is present in the form of tax deductibility for debt). This form of tax could then be used as an instrument for cyclical policies by the government. The Pigouvian tax would be the price of run-prone contracts and it would be up to the individual intermediary to decide if it is a worthy sacrifice.

Furthermore, the bank should keep equity in proportion to (although the more the better) their debt; the equity could be made up by e.g. issued stocks. By lowering the debt/equity ratio the risk of the operation is equally dropped. The increased costs for the banks might be reflected by higher prices for their services but free-market conditions would eventually push these fees down in an orderly fashion to a level of equilibrium.

However, there are different proposals of narrow banking. By definition a narrow bank is a safe bank that is immune to runs. One proposal suggests that demand deposit and lending should not be combined and should not be undertaken by a single institution. Demand deposit would be a service that a financial institute could offer by the charge of a fee.

A different financial institute would offer lending and specialize in that.

The proposal by Pierce (1991) suggests that narrow banks can only invest in short-term safe assets such as treasury bills and not long-term safe assets. The main reason being that banks can suffer from liquidity shortage due to costly liquidation of the long-term assets. However, this

is rather rare and can only occur if all depositors want to withdraw all of their savings at the same time.

To mitigate this risk, investment should consist only of short-term safe assets. While being inefficient compared to an institution with lending and demand deposit accounts, it will eliminate the problem of moral hazard. It is shown however (both empirically and theoretically) that a single institution with both a lending function and a demand deposit function is far more efficient due to synergy-effects (Kobayakawa et al 2000).

In this case we only consider the liquidity risk and not the credit risk (although, the credit risk can be lowered by implementing restrictions and giving banks the incentives to work harder in the screening process, thus not giving bad loans that will surely default).

In accordance to the statements above, our main focus will be on an institution that handles both lending and demand deposit accounts. The main issue by not separating the two, it is that we still have the problem of moral hazard. Consequently we need to find another way to mitigate that problem. A way that does not include the separation of the functions of lending and the issuance of demand deposits (due to the loss of efficiency)

XII. The Proposal By The Positive Money Organization

The sovereign money system is a system proposed by Dyson and several other economists from the Positive Money Organization. The starting point will be to take away the money-creation power from the banks and transfer this power to the central bank; The amounts that will be created will be decided by a committee (something similar to Monetary Policy Committee) who will think about the economy as a whole and create the "*right*" amount of money to run the economy smoothly and meet the inflation targets (not to create the amount that is needed by banks, politicians or the government). This committee needs to be uninfluenced by strong groups in the society to maintain an unbiased role. In short, the decision on how much money that will be created and how this money is going to be set into circulation must

be separated to avoid a conflict of interest. The money that will be created will be non-repayable debt free money that can be spent freely within the economy. The Monetary Policy committee will not set the interest rates anymore; instead the market will set the interest rates.
How should this money be spent into the system? In general there are four different ways to stimulate the economy. By reducing the overall tax burden or direct payment to the citizens, people will be able to spend more money. People will have more money and this might be used to repay debts and loans. In the long run, it is important to lower the national and private debt levels. Tax reductions on businesses can lead to increased levels of employment. The money can be spent into the system by the government, whom may start major projects, resulting in job opportunities. It is important to reduce high levels of government debt. The money gained can be spent to partially reduce the national debt (Dyson et al 2014).
The main reason why banks should not be able to create money in the first place is that they behave pro cyclically to gain more profit, meaning that banks overheat the economy in economic expansion and over cool the economy in economic contraction. This contributes to instability of prices in general and of interest rates in particular (Huber and Robertson 2000). As mentioned earlier in this paper, which is also argued by the Chicago plan, banks would not likely suffer cash-flow shortage in the same extent as in today's system, implicitly reducing the systemic risk levels. With less boom-and-busts cycles, recessions would be less frequent, leading to lower levels of unemployment. Less people would have financial difficulties and more would be able to repay their loans as planned, leading to a lower default rate. Banks will have limited funds for making loans. Instead of lending as much as possible (as in today's system) banks would instead need to find good quality borrowers to lend to.
Dyson et al (2014) argues that in the current system too much lending is projected towards the house market and the financial sector, leading to massive inflation in the house market as well as extreme fluctuations

in the financial market. It is argued that this is a major problem and a partial cause to the recent financial crisis.

a. Banking Under The Proposal By The Positive Money Organization

According to the proposal the new banks will need to split deposits into two different accounts. These two accounts will be transaction accounts and investment accounts (currently savings account). It is only the transaction account that will be fully backed and thus being safe towards runs. Money in transaction accounts would not be a part of banks liabilities; in other words, it will be excluded from the banks' balance sheets. The money will be held in an account at the central bank. Meaning that if a particular bank fails no money will be lost; instead this money will be transferred and administered by a different bank.

In this system the deposit guarantee will not cost taxpayers any money and the money cannot be lost in the first place. The amount that is guaranteed in this system has no upper bound, compared to 250 thousand dollars in today's USA, 85 thousand pounds in the UK or 100 thousand Euros in within the EU. Deposit insurance in the current banking system is extremely costly for the taxpayers if a run occurs. Thus money in the investment accounts would not be insured and will be classified as an investment, which per se is risky. The customer should be aware of the risk and the exclusion of deposit insurance since money in investment accounts is not classified as deposits.

Transaction accounts will be used for day-to-day transactions, such as paying ones rent or buying groceries, while the investment accounts will be the primary tool for the banks under this system to fund their investments (which is lending activities).

There will be no interest rate on transaction accounts, as in today's system. The question is; is the loss that big? People that have money in demand deposit accounts in banks today do not use it mainly to gain interest on the money, but instead use it as a means of payment (de facto the deposits interest today is only figurative). People invest in funds, indices or stocks to prevent suffrage from inflation, not by having

idle money stored at the bank. The banks under the FRBS will not be able to use the money in the transaction accounts to finance their loans, which means that they need to charge an extra fee when providing this service to the customers. This fee will probably be lowered as time passes due to market competition. The quality of the service will improve, as for the system renewal. All transaction accounts will be directly linked to one another ensuing enhanced transaction speed. The main reason for this is that there will be no "clearing system". Without it, the banks can run the new system much cheaper; hence the banks do not have to demand high fees to the customers. In the current system it might take some time to do the transactions, (maybe hours or even up to days in extreme cases) but with the new system the transactions can possibly be made instantly, resulting in a more efficient economy. Both individuals and companies will benefit greatly from this.

The investment accounts will resemble an index fund portfolio, meaning the investment account would no longer be safe and backed by reserves. This form of saving will be risky but much less riskier compared to other form of savings. And as long as the bank is doing a good job, this form of saving will be considered risk-free. Investment accounts will function in line with today's general belief, as a pure intermediary. These investment accounts can have different levels of risk, yielding returns in accordance to the investors' risk-preference.

The risk can be transferred to the bank, but not entirely. As an example, the bank could offer a minimum percentage of the original investment (when failing to profit from the investment) and by this giving a return in relation to the level of risk. This will lower the risk for the investor but will also lower the return. So possibly there will be different plans, considering risk-reward and how long time the investor can be without the money. This means that the risk will not fall on a third party, which in today's case is the taxpayers. This system will encourage banks to act more cautious when investing and more likely not to fail because of the higher incentive to succeed. These investment accounts are still prone to runs, as investors can withdraw the money when the

investment period is over. A run is plausible but rather unlikely because the economy as a whole is more stable after the reform.

In cases when banks do not have enough money to pay back maturing investment accounts, the Central bank will make an emergency loan to that bank, only if the bank have a short-term liquidity problems. The bank will repay the loan to the central bank using future income. However it is important to distinguish between bad banks and profiting banks with temporary cash-flow problems and accordingly only offering help to prudent banks. The process will transpire in similarity to the current system, money creation when lending followed by money destruction when repaying the debt.

The current banking system has a flaw where banks will seek more profit while taking on more risk although the banks do not pay the monetary cost in occurrence of a failure. Instead the cost eventually falls on the taxpayers via the government. This creates the problem of moral hazard. In accordance to Dyson et al (2014) this means that the bank will benefit when the investment is successful but if the bank is unsuccessful, taxpayers will only lose and has nothing to gain. This problem will be nonexistent, due to no bailouts and no deposit insurance.

Deposit insurance has affected banks behavior towards risk. Banks take on more risk because they know that the government will pay out deposit insurance to the owners of the deposits in the event of a failure. According to Dell´Ariccia et al (2012) bailouts of banks has a positive effect towards banks risk taking, lowering the moral hazard effect with a substantial amount. When a bank's success depends on the idiosyncratic risk and the overall stability of the banking system, shielding banks from systemic risk and the risk of contagion might give banks the incentive to invest prudently. Considering that the new system in this proposal will be more stable, the effect caused by moral hazard might outweigh the positive effects of bailouts. As mentioned before bailouts are also expensive for the society. The contagious nature in this case is when a run on institution A can cause a run on institution B solely because of the fact that the investors will now also

be questioning the finances of institution B. A sudden shock triggers to a second mechanism of contagion. Suppose that Bank B is holding a lot of Bank A securities. When those securities become illiquid, Bank B cannot count on selling those securities to raise cash to pay creditors in case of a run. Therefore bank A's problems can cause a run on bank B.

XIII. Joint-Liability Arrangement

Sanches (2013) presents the idea of a system with shared liabilities among banks, overseen by a clearinghouse. The idea of building a common supervisory system is also supported by Werner Sinn (2010), where he talks about stretching this notion further and create an international super-ordinate regulatory organ. The banking-world would then work under a hierarchy where e.g. a central bank would be a subordinate supervisory agency to work on national level.

The joint-liability arrangement sprung from the questioning of the inefficiency of having high levels of reserves. The reserves are inefficient in the sense that they may not be invested in interest bearing assets. If the banks within an economy would agree to form a bank coalition (a joint-liability arrangement) were they would ensure the solvency of each individual bank.

As opposed to markets, this bank coalition involves the monitoring and supervision of the activities of member banks; A resemblance to the clearinghouse associations that developed in the U.S. during the 19th century (Sanches 2013). The system would further warrant the transferring of reserves from liquid banks to illiquid banks to ensure solvency when the interbank markets fails. The assembly of this kind of coalition would further benefit the banks because of the risk-sharing possibilities. The joint-liability arrangement would induce societal benefits by a more effective way of allocating resources, achieved by the introduction of an incentive-feasible scheme among members of the banking-sector (Sanches 2013).

a. The Model of Joint-Liability[6]

As developed by Sanches (2013) the parameters setup and scenario is as follows:

The agents of the economy meet in a centralized place and are randomly matched into pairs. The trade is based on bank liabilities that might be redeemed to claim their face value. Buyers buy their goods from sellers using bank notes and the key problem is the incentives of hidden actions from the bankers. The system of joint-liability is presented to induce bankers to voluntarily report the amount of bank notes (liabilities) issued to the clearinghouse and also hold the suitable amount of reserves. The clearinghouse would be a safekeeping and recordkeeping institution. It would also supervise and monitor transactions and settlement/clearing of the liabilities at each period.

Time is discrete and the horizon is infinite. Each period is divided into three subperiods or stages. There are two physical commodities, referred to as good *x* and good *y* that are perfectly divisible. There are three types of agents, indexed by 1, 2, 3, who are infinitely lived. There is a [0, 1] continuum of each type.

Types 2 and 3 wants to consume good *x*, whereas type 1 wants to consume good *y*. Good *x* needs to be stored properly in the subperiod in which it is produced or it will depreciate completely. Good *y* must be consumed in the subperiod in which it is produced or it will perish. Type 1 is able to produce good *x* only in the first subperiod. Type 2 is able to produce good *y* only in the second subperiod. Type 3 is unable to produce either good but has access to the technology to perfectly store good *x* at any moment. In the first subperiod each type 3 also has access to a divisible investment technology that requires good *x* as an input and yields a fixed return (in terms of good *x*) only at the beginning of the following date. Finally, each type 3 has access to a technology that allows her to create, at zero cost, an indivisible and durable object, referred to as a bank note, which perfectly identifies her. This means that notes issued by each type 3 are perfectly distinguishable

[6] The models are derived from Sanches (2013) and the section is built on his work

from those issued by other people so that counterfeiting will not be a problem.

We assume the production technology of good x allows type 1 to produce either zero or one unit of good x at each date, even though good x is perfectly divisible.

Type 2 may produce of good *y* and consume good x.

In the first subperiod, each type 1 is randomly matched with a type 2 with probability $\lambda \epsilon (0,1)$ (where ϵ denotes an arbitrarily small positive number). In the third subperiod, all type 2 and all type 3 meet in a centralized location. Make the assumption that, after meeting with a type 1 bilaterally in the first subperiod, all type 3 immediately moves to the centralized location only in the third subperiod.

b. Exchange Mechanism[7]

A convenient description of the process of exchange would be to refer to type 1 as a buyer, to type 2 as a seller and to type 3 as a banker.

In the first stage, each buyer will be randomly matched with a banker and will be able to receive a bank note by trading their produced good x.

In the second stage, a random match will occur between the buyer and the seller with the probability λ. The buyer requests good *y* but is unable to produce good *x* at that time, hence a trade will only be made possible in the presence of an intermediary service. This service will become available through personal liabilities, redeemable on demand, offered by the bankers, type 3 (bank notes). Accordingly, the objects traded between the buyer and seller is good *y* and bank notes.

In the third and final stage all sellers and bankers interact in a centralized location. Here every trader may convert any privately issued liability into good *x* (that he would have acquired in the previous stage). The third stage may be called the settlement stage.

[7] The models are derived from Sanches (2013) and the section is built on his work

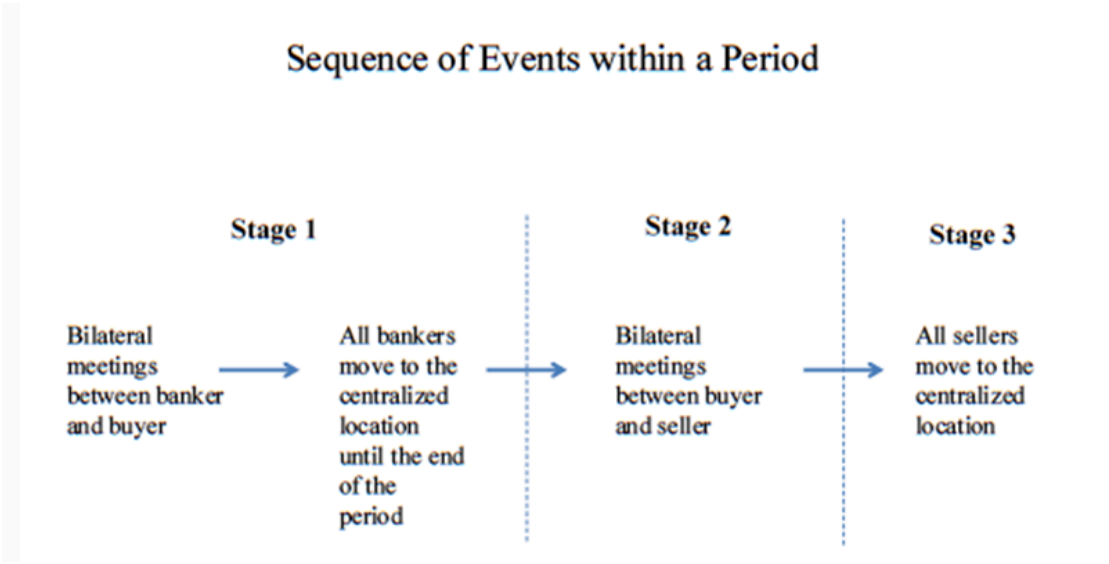

Figure 1.4 Sequence of Events within a Period (Sanches, 2013)

No production takes place in this stage and the objects traded are good x and bank notes, se *Figure 1.4* as a reference to the sequence.
The arrangement works as long as each banker is willing to set aside (i.e. invest in the storage technology) the appropriate amount of good x to have enough reserves to honour any note put up for redemption in the final stage. The arrangements are aggravated by the fact that they are not all perfectly observable.
The information structure of this economy is as follows. Each banker may observe the actions of any other banker within the centralized location. All bilateral trades within the first and second stage are private (only the participating agents have information about their trade). By this assumption the information regarding the creation of bank notes is also private. Each individual banker may then have her own incentives regarding the issuance of private liabilities without securing them with the storage technology (the only available safe, short-term asset).
An important thing to take into consideration is that each banker may want to opportunistically access previously accumulated reserves. This means that the possibility of a banker having many unresolved notes because of a history of successful trading and only a few redemptions creates a problem. This is particularly true for a banker who has held reserves as to secure issued notes that remain in circulation (whereas

the buyer have not had the opportunity to trade with a seller). If these reserves become very large the incentives may increase to opportunistically consume them, thus defaulting on the initial promise.
The establishing of a clearinghouse association in time t=0 may mitigate the difficulties mentioned above. Its role would be that of a safekeeping and recordkeeping institution. Any banker may be a member of the association, at no cost, with the condition to follow its rules. The clearinghouse demands that all issuances of bank notes in the first stage are to be reported. The bankers are required to store a fraction of the face value of each bank note they issue within the clearinghouse as a reserve.

As earlier mentioned, the bankers would head to the centralized location directly after the meetings with the buyers in the first period. There they will make any reports to the clearinghouse and make any required deposits. The bankers may also make investments in the productive technology.
Any failure to comply with the rules of the association will lead to an immediate and permanent exclusion. The divergence from the rules will however not be confirmed until an unreported bank note is presented at a future settlement stage. An important note is that the seller will base its decision regarding the exchange of a bank note for his good y on current available information on the banker.
The theoretical framework mentioned above (developed by Sanches, 2013) will provide each seller with information from the clearinghouse. The membership of the clearinghouse association will act as a confirmation of security and assure compliance to the rules.
This certification will make the members more attractive to the sellers when it comes to trade in the final stage since all clearinghouse information is public.
To conclude the exchange mechanisms a final assumption is made. The allowed number of held notes of an agent at any one moment is restricted to $\{0,1\}$ (for further references, please read Sanches, 2013, pp.11 §2nd). There are *no* restrictions on the number of notes that an

individual banker is allowed to issue at any moment except for that imposed by the matching technology and the other agents' willingness to trade. Thus, they may issue bank notes in accordance to$\{0,1,2 \dots\}$. *Figure 1.5* illustrates the cycle of bank notes.

A further assumption (for the interested reader, it is formally derived in Sanches, 2013) is that a truthful reporting of every individual bankers note issuance gives a profitable discounted utility. It is further argued that untruthful reporting gives a disadvantage that is increasing over time. The probability for the banker to stay undetected in her deviation from reporting will be with the probability of $(1-\lambda)^n$; where *n* denotes the current number of period since the issuance of the unreported note. *n* will be equal to *1* in the first period, *2* in the second period and so on.

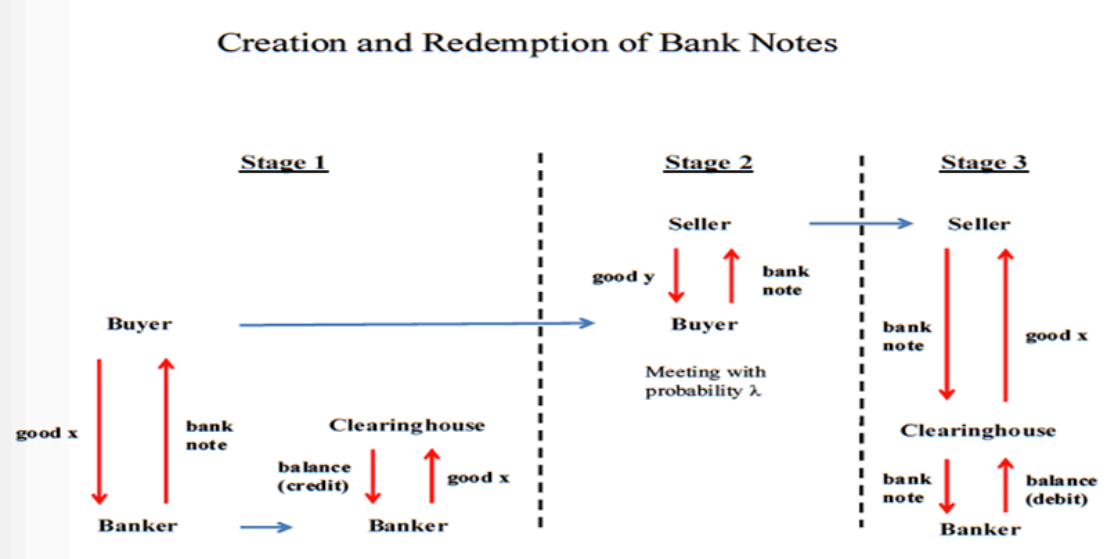

Figure 1.5 Creation and Redemption of Bank Notes (Sanches, 2013)

c. Joint-Liability Arrangement Under FRBS

Suppose that the bankers initially agree to the terms of the clearinghouse. All bank note issuance will be in the form of effectively joint obligations between the members. The individual bankers will sign as a debtor towards her own bank notes although in the event of a default the clearinghouse will assure that the other members will honour their obligations as creditors. This message is publicly announced. Thus, this mutual understanding entitles any individual

banker to use the other bankers' reserves in the case of redemption but also requires her to offer the same in return if tables are turned.

The clearinghouse will invest some of the amounts given as reserves into the productive technology. The specific volumes are judged by the clearinghouse and will then form the portfolio of the association. The reserve amounts given by each individual banker is equal to the amount that satisfies a specified utility-constraint. Thereby the solvency of the individual banks that is called for redemption is given by the ratio of *the total amount of reserves at the clearinghouse to the total value of all notes that are put up for redemption at that time.* The system builds on the notion that not all notes will be redeemed at the same time and that profit is to be made by the investment of fractions of the reserves in interest bearing assets. The multiparty arrangement offers a total of higher rate of return for its members when all members contribute.

This joint-liability arrangement initiates a mechanism for pooling reserves as a security for insolvency and also increases the number of interest-bearing assets within the coalition (and reducing the number of non-interest-bearing assets) thus obtaining a situation of pareto-efficient dominance which also grants welfare-gains by the improved allocation of resources.

XIV. Conclusion

We have concluded that an actor of financial intermediation is beneficial for development reasons as well as a helpful tool that is desired by investors of different preferences and make up for inevitable market imperfections.

The banking system embraces the whole world and by that, regulations are required. It is almost as the banking and monetary systems are seen as natural parts of the planet, at least to today's modern societies. A big blunder was once again realized when the lack of regulations of the bank-like entities sparked the latest global financial shock a couple of years back and the fragility of the system was exposed. This only further stresses the fact that the current system

needs to be revised. The proposals cited and presented in this paper are good starts on viable systems that could lessen the power-concentration experienced today and would also offer longer-term stability. Calculations and estimates of the time and costs for implementations are beyond the coverage of this paper although the importance lies within the rising of the discussion. We see it as important to broaden the framework regarding the definition of banks to cover-up loopholes that may be exploited by dubious actors such as the ones that sprouted the highly leveraged bad financing that trended in [especially] the USA before 2007.

Through our studies we have realized that the 100% cash reserves against demand deposits does not seem like a practical solution. The economical costs for implementation as well as the loss of efficiency are too great. However, we do think that a reform into a form of narrow banking is possible and would be beneficial for society.

The Pigouvian Tax ought to be instated and regulations would harvest better results if they focused on equity demands. Both these measures would lessen the run-prone exposure of banks.

As mentioned in the proposal made by The Positive Money Organization the society would benefit if the trade-off between stability and efficiency would over-weight towards the former.

The allocation-efficiency of capital will be somewhat lower than in the current system although the hypothetical transaction accounts would be run-proof, thus offering a higher grade of stability. In addition to this, transactions will run more smoothly where money will be transferred almost instantly and accordingly the receiving part of a transaction will be able to utilize the acquired funds immediately.

It is understood that a radical alteration of the entire system would be both costly and time consuming and with that in mind, the answer to the question about which of the systems presented that is henceforth recommended would land on a modified version of the current system. The joint-liability arrangement offers sound ideas for stabilization as well as welfare gains through higher rate of return on held capital. The implementation of a supervisory organ formed through a coalition of

the banks seems like a highly viable and desired option and the short presentation made by Werner Sinn (2010) is a good start. The work-ways of this arrangement should then follow in the manner of Sanches (2013) ideas. Regulations need to be redefined. The lending function of banks is a great lubricant for development however, by the enacting of policies, societal risk might be decreased. Among the advantageous points of the fractional reserve banking system is the fact that it speeds the issuance of loans by the maturity transformation of asset and liabilities. The ideas presented by Lucas Stokey (2011) are great compliments to the Joint-Liability Arrangement. It is also the most reasonable proposal to approve within the short-term (as well as the Pigouvian tax on run-prone, short-term debt). The six points stated above should be legislated immediately. The sores of the crisis are still fresh and it is never to soon to start building preventative measures.

An insinuation towards caution regarding the fractional reserve banking system is advisable in the absence of the complete reform of the system. Until then one can only take appraisal in what has transpired and try to cover for eventual weaknesses in the future.

XV. Food For Thought: *Responsibility*

Admati and Hellwig (2013) makes a valid point by making head to head comparison between banks and companies working in the industrial sector. On the latter, huge demands and regulations are put by the government on the way they operate. An industrial plant cannot freely pollute the environment. Demands on the level of cleansing for the companies waste material are governed. This might result in expensive (economically) changes in the manufacturing process for the individual company compared to the effects on the environment and further impacts the sums may be quite small in the long run. The company will probably raise the cost of their product and in the end it might even result in a zero-sum scenario.

A common argument for not putting equal regulations on the practices of banks is that it would be too expensive. A reasonable question to follow would be:

- "Expensive for whom?"

The activities of the bank would probably be slowed down which would result in the loss of income and also (as an example) a more in-depth screening process (in order to lessen the level of risk) would entail further expenses. But these costs would probably be a great deal less than the costs and losses followed by a global financial crisis.

" The point of public intervention is precisely to induce banks, or industries, to take account of costs they impose on others "(Admati and Hellwig 2013)

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