

The Sovereign Money Initiative in Switzerland: An Assessment¹

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Abstract

The Sovereign Money Initiative will be submitted to the Swiss people in 2018 or 2019. This paper reviews the arguments behind the initiative and discusses its potential impact. Using a simple model, the paper assesses quantitatively the impact of removing sight deposits from commercial banks balance sheets. Even though there is a gain for the state, the overall impact is negative, especially because depositors would face a lower return. Moreover, the initiative goes much beyond what would be the equivalent of full reserve requirement and would impose severe constraints on monetary policy; it would weaken financial stability rather than reinforce it; and it would threaten the trust in the Swiss monetary system. Finally, there is high uncertainty both on the details of the reform and on its impact. Reviewing the arguments behind the initiative, I argue that they ignore current knowledge in monetary economics and that many arguments are inconsistent with empirical evidence or with economic logic.

1 Introduction

The Swiss people should vote in 2018 or 2019 on an initiative for monetary reform. The proposal is to have *sovereign money*, where only the Swiss National Bank (SNB) can issue money and where money includes bank notes and scriptural money.¹ In principle scriptural money means sight deposits included in M1. The reform would imply that all sight deposits in Swiss francs would be transferred outside commercial banks' balance sheets and would be fully backed by reserves at the SNB. The SNB would control the quantity of these sight deposits. The initiative also proposes that the SNB distributes funds to the state or directly to households. These funds would come from new money creation and from selling SNB existing assets.

The objective of this paper is twofold. First, it reviews the main arguments behind the reform and, second, it discusses the potential impact of its implementation on the Swiss economy. Since there already exist several reviews of the initiative and of its potential implications (including the views of the Federal Council), this paper is brief on some aspects that are already covered in details elsewhere. The perspective taken in the paper is the one of an academic and of a macroeconomist. As a macroeconomist, I would like to put the reform in the perspective of current knowledge in the field. As an academic, I would like to examine the intellectual rigor of the arguments. From both perspectives, this review will be critical. First, even though it is a reform of macroeconomic nature, the motivation behind the initiative fundamentally ignores most of the existing literature in macroeconomics. Second, the arguments are often vague and incomplete and sometimes misleading or incorrect.

The sovereign money reform is obviously related to the proposals for full reserve banking and to the "Chicago plan", where commercial banks are imposed a 100 percent reserve requirement on deposits. Sovereign money also implies full reserve coverage, but it goes one step further as it gives full control of sight deposits by the central bank.² Moreover, the initiative goes much further than the concept of sovereign money. It would introduce constraints on monetary policy and might push the SNB to sell its existing

¹In Swiss national languages, sovereign money is called *Vollgeld*, *monnaie pleine* or *moneta intera*. It is useful to consider both the text of the initiative requiring a change in the Swiss constitution and its interpretation by the Swiss Federal Council. (see www.admin.ch/gov/en/start/documentation/media-releases.msg-id-64444.html)

²See Huber (2015, p. 15) for a discussion of the difference between full money and 100 percent reserves. He argues that "100% reserve would thus miss its main target of ruling out severe banking, financial and economic crises on the basis of the banking sector's excessive credit, debt and deposit creation."

assets. It would also impose restrictions on minimum holding periods for non-monetary financial assets such as savings deposits.

While the idea of full reserve requirements has received some attention in the literature³, it is difficult to find much literature on sovereign money. Instead, the idea of sovereign money is based on a manifesto written by Huber and Robertson (2000), henceforth HR. The two authors of the manifesto are not specialists in monetary economics and did not relate their arguments to the existing literature. Even though the motivation for monetary reform is not totally clear, they provide several arguments behind their proposal, some of which I will review in the next section.^{4,5} At this stage, it is interesting to notice that the original sovereign money proposal by HR preceded the global financial crisis, so that avoiding crises was not its main motivation.

Even though some of the arguments are not fully explicit, there are several hidden assumptions that run counter to our current knowledge in macroeconomics. For example, a major argument behind the sovereign money proposal is that controlling money allows the stabilization of credit.⁶ This in turn will help stabilize the business cycle. If this is left to commercial banks, HR write: *"They expand credit creation in upswings, and reduce it in downswings. The result is that bank-created money positively contributes to overheating and overcooling business cycles, amplifying their peaks and troughs,...(p. 37)"*. However, HR provide no evidence for their claim. While their first sentence is correct, there are two fundamental problems with their second sentence.

³For recent contributions, see Benes and Kumhof (2012), Baeriswyl (2014), Cochrane (2014) or Prescott and Wessel (2016). See Benes and Kumhof (2012, section III) for a review of the Chicago plan.

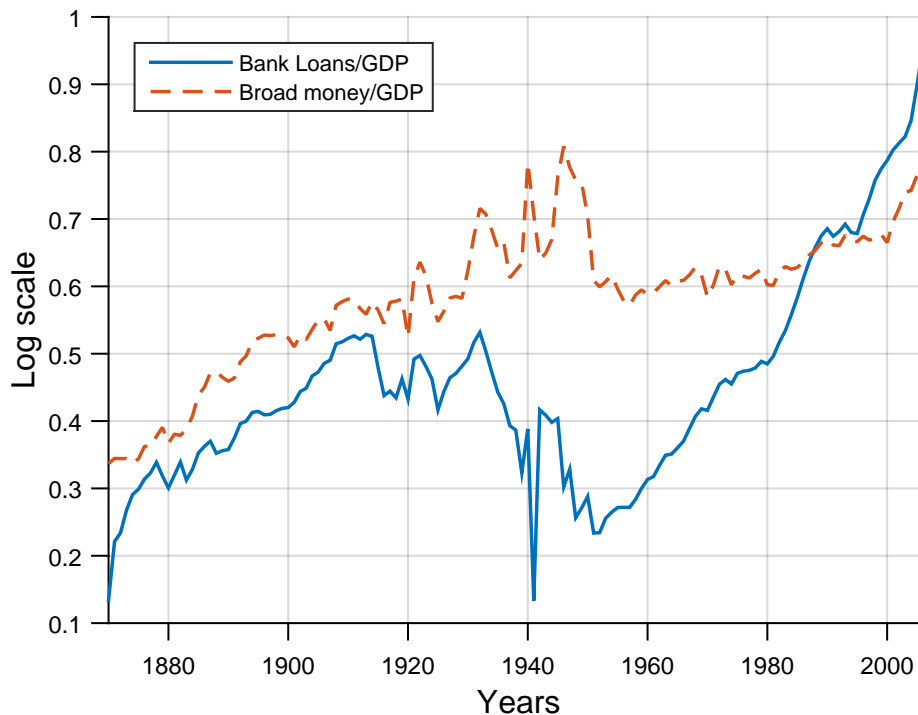
⁴See also Huber (2014).

⁵They also anticipate several counter arguments to the reform and potential negative effects. Interestingly, they also anticipate who might be opposed or in favor of the reform. Regarding academics, there seem to be two types. On the one hand, there might be opponents: *"Among ... academics with a stake in the present way the banking system works there will probably be some opponents. They will have built up an understanding of the details and complexities of a monetary and banking system founded on bank creation of credit. They will fear that their expertise may lose value and their prospects may suffer if the system is changed."* (p. 60-61). On the other hand, there will be beneficiaries: *"Although opposition may come from some of the older and more established monetary economists on the "can't-teach-old-dogs-new-tricks" principle, growing interest in seigniorage reform will open up a new range of questions and career opportunities for more innovative practitioners of the discipline. It will create new openings in the economics departments of universities and in research institutes in economic and political fields."* This cynical view assumes that academic economists would determine their opinion on the reform based on pure personal interest, rather than on the merits of the proposal.

⁶Notice that most of the literature does not make a distinction among different monetary aggregates. In the same spirit this introduction simply talks about money, but the rest of the paper will be more precise in focusing on M1.

First, there is little empirical evidence that money amplifies business cycles in modern economies. On the contrary, bank deposits tend to decline before financial crises (see Jordà et al., 2017). Second, the link between money and credit is weak. As I discuss below, there is no correlation between changes in money and changes in credit in Switzerland. Looking at developed economies, Schularick and Taylor (2012) show there was a close link between credit and broad money before World War II, but there has been a decoupling after World War II. This is illustrated in Figure 1. Schularick and Taylor also discuss the distinction between the "money view" and the "credit view" in macroeconomics. The defenders of sovereign money clearly worry about credit, but they want to control it by controlling money. This perspective is inconsistent with empirical evidence.

Figure 1: WORLD MONEY AND CREDIT (RELATIVE TO GDP)



Source: Schularick and Taylor (2012). Data covering 14 developed countries

The arguments in favor of the reform are also often backward looking, citing facts or reasonings in the nineteenth century or early twentieth century. But the role of money used for transactions has clearly changed in the last

decades. It is likely to keep changing in the near future and the liquidity services of demand deposits will most likely drop. Cochrane (2014, p. 199) puts it clearly: ” *With today’s technology, you could buy a cup of coffee by swiping a card or tapping a cell phone, selling two dollars and fifty cents of an S&P 500 fund, and crediting the coffee seller’s two dollars and fifty cents mortgage-backed security fund. If money (reserves) are involved at all—if the transaction is not simply netted among intermediaries—reserves are held for milliseconds. In the 1930s, this was not possible.*” With a decline in the demand for transaction money, the potential revenue for the central bank, one of the main argument for reform, would also shrink. The development of new forms of e-money will also require a different analysis. However, at this stage we ignore what form of e-money will be widely used. An important question is whether central banks will issue e-currency in the future. Here we need to distinguish between two different cases. First, central banks could offer e-currency directly to non-banks in addition to the existing system. This is the option currently considered by some central banks. It remains to be seen if there would be a demand for such a product.⁷ The second case is where e-currency would replace all sight deposits, i.e., it would be compulsory to use central bank e-money instead of sight deposits at commercial banks. The latter system would be similar to a sovereign money system.

A major feature of the sovereign money reform is that money would not bear any interest. This implies that there would never be interest on checking accounts, even in periods of high interest rates. This means that the reform would increase the cost of holding money. As pointed out by Friedman (1969), holding money is in general costly and this cost should be minimized. Instead, sovereign money increases this cost.

As I explain in more details in Section 2, given our current state of knowledge, it is difficult to see much benefit, if any, from the reform. The arguments behind the reform are inconsistent with much empirical evidence and find little theoretical support. It is typically argued that sovereign money could avoid standard bank runs. But this is not totally true as some type of bank runs could still occur. Moreover, runs on bank deposits are not the main source of recent financial crises. The defenders of the initiative often cite the paper of Benes and Kumhof (2012) as support, but the experiment studied by these authors is not the one proposed in the initiative. Section 2.4 explains why Benes and Kumhof’s results do not apply to the sovereign money initiative for Switzerland. The initiative is also based on the surprising idea that money is not a liability. I also discuss the issues with this idea

⁷An interesting case is the experience of Ecuador where e-money is issued by the central bank, but only receives limited public acceptance.

in Section 2. Finally, Section 2 discusses why bank credit is unlikely to be the source of money creation at the macroeconomic level.

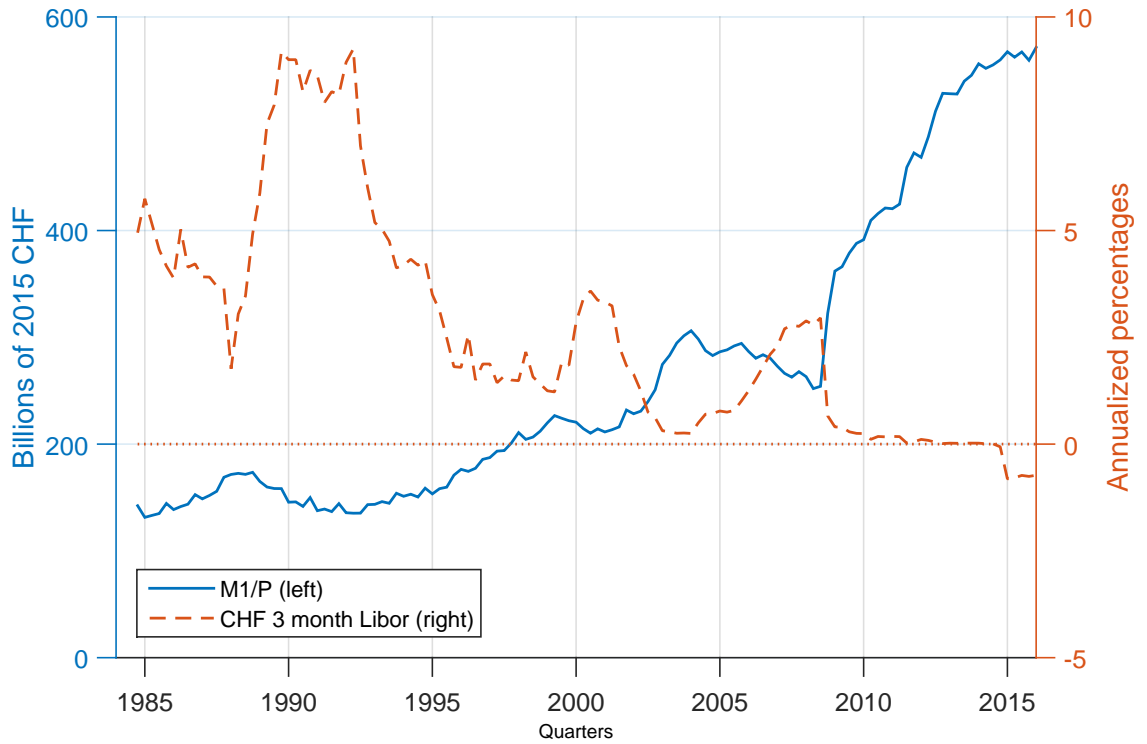
Independently of its motivation, the next question is to assess the potential impact of the reform for the Swiss economy. This is done in Sections 3 and 4. The reform is planned to be implemented in two stages. In the first stage, sight deposits, that are part of M1, disappear from bank liabilities and are fully backed by the central bank. But the overall banks balance sheets may not be affected as the central bank could lend its reserves back to banks. The first stage of the reform and its impact is examined in Section 3. In the second stage of the reform, the central bank no longer lends its reserves to banks. This means that banks need to find alternative sources of financing. It also means that the central bank could use its reserves in different ways. These aspects are reviewed in Section 4.

Section 3 examines quantitatively the impact of the reform's first stage on the state, on banks and on depositors, using a simple model of monopolistic competition in the banking sector. In the current situation of the Swiss economy, the aggregate impact of the first stage would be negligible because of very low, even negative, interest rates and of a massive level of reserves at the central bank: in early 2016, the proportion of central bank reserves to deposits in M1 is 100%. Figure 2 shows the evolution of real M1 and of the 3-month Swiss franc Libor rate in the last decades.

To have an assessment in a period of positive interest rates, I consider data for the 1984-2006 period. I find that the overall impact of the reform is negative and annually represents -0.8% of GDP. First, seigniorage of the central bank increases, while tax payments by banks decline. Consolidating the SNB and the government, the state gains by 0.5% of GDP. This would represent about CHF 3.5 billion. However, depositors would be the main losers (0.8 % of GDP) since they no longer receive a return on their sight deposits. Banks would naturally also lose (0.5% of GDP)

Results in Section 3 basically represent the impact of imposing full reserve requirement at zero interest rate. But they do not include the impact of the other dimensions of the sovereign money initiative, which are discussed in Section 4. Section 4 reviews the alternative sources of funding for banks in the second stage of the reform. It points to potential instability with some sources of funding. Then it reviews the implications of a decrease in SNB's assets. Finally, it discusses the constraints and the dangers for monetary policy.

Figure 2: LIQUIDITY TRAP



Source: SNB. M1 is deflated by CPI

2 The Arguments Behind the Initiative

2.1 Credit Creates Money

A major argument behind the idea of sovereign money is that money creation comes largely from the granting of credit by commercial banks. As a consequence, sovereign money could better control credit. However, the close relationship between money and credit is not verified at the macroeconomic level.

2.1.1 A simple example

Before turning to the macroeconomic perspective, let us start with a simple example. At a purely microeconomic, partial equilibrium, level it is true that a bank can increase the quantity of deposits when it provides a loan. But

this is only true at the initiation of the loan. Consider a simple example: I want to buy a house and I ask a mortgage loan from my bank. When my bank grants me the loan, the funds are available on my checking account. So that in this initial operation my bank indeed increases money. Then I transfer immediately the funds to the seller of the house, who will see an increase in her checking account. But the seller does not want to keep these funds in her checking account, as it bears a low interest, and transfers them to interest-bearing instruments of her bank (e.g., time deposits, bank bonds, savings account, etc.). Therefore, at the end of the day my mortgage loan has no impact on the quantity of checking accounts and on M1. At the aggregate level, my loan is matched by an increase in interest-yielding assets of the seller.

It is not clear how things would change under sovereign money. If my bank grants me a loan, the funds still end up in the seller's checking account and initially increase money. How could the central bank keep money constant if the seller decided to keep the funds on her checking account? The system would need to impose that the new credit is matched by a decline in deposits at the central bank. It is not clear how this constraint would be implemented, but it would most likely be costly and disrupt the efficient allocation of credit. If such constraints are not imposed, it is difficult to see how sovereign money affects the relationship between credit and money.

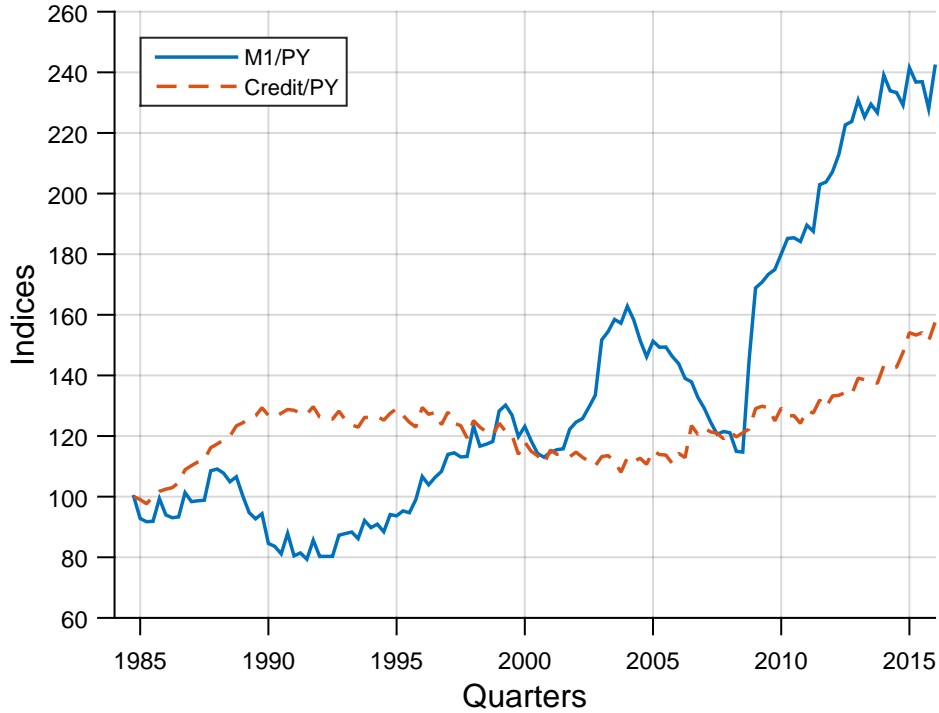
2.1.2 A decoupling between money and credit

As illustrated by the previous example, in general money is not generated by credit. This is confirmed by macroeconomic data. As mentioned in the Introduction, Schularick and Taylor (2012) document a decoupling between broad money and credit since World War II. This is also true for M1 and credit for Switzerland. Figure 3 shows the evolution of credit and M1 (divided by GDP and normalized to 100 in 1984q4) in Switzerland. It shows that movements in M1 are not tied to movements in bank credit. We see for example that in the credit boom in the early nineties, M1 actually decreased. Similarly, the large increases in M1 in the second half of the sample are not accompanied by large increases in credit. If we look at the correlation between the changes in money and in credit on a monthly basis from 1985 to 2015, we find a coefficient of -0.011.⁸

One should also notice that sight deposits represent a relatively small proportion of credit: about 25 percent in the last decades. In other terms, most of bank credit is not backed by sight deposits.

⁸The correlation is also insignificant if we consider M2 or M3.

Figure 3: M1 AND TOTAL CREDIT PER GDP



Data source: SNB. Data are from 1984q4 to 2016q1. Both variables are deflated by GDP before being transformed into indices; base 100 = 1984q4. Credits includes mortgages.

2.1.3 The constraint of money demand

Claiming that banks create money basically assumes that money demand is totally elastic. In that case it is the supply that determines the quantity. A standard money market equilibrium can be written as:

$$M^S = P \cdot L(Y, i - i^m, c) \quad (1)$$

where M^S is nominal money supply, P is the price level and L is a real money demand function from the private sector. It typically depends positively on a measure of economic activity Y and negatively on the opportunity cost of holding money $i - i^m$, where i^m is the interest on money and i is the alternative interest rate, typically government bonds. The variable c represents other factors like financial technology. If we assume that prices are rigid in the short run, an increase in M^S is only possible if Y increases or if i decreases. Since banks cannot directly influence Y and i , any increase in M^S in the

short run cannot be directly determined by banks.⁹ However, there is one case where money demand is elastic. This the case of a liquidity trap we are currently in. In that case equation (1) does not apply as the private sector is indifferent between money and alternative assets.

At the empirical level, there is a very long tradition of estimating money demand.¹⁰ Even though these estimations are faced with econometric problems, they tend to yield reasonable (and finite) income and interest elasticities. In the Swiss case, the focus has often been on M2 or on M3 as M1 appears less stable and less related to macroeconomic variables like inflation or output.¹¹ However, Section 3 will present a specific estimation for M1.

2.2 Money is not a Liability

A major assumption behind the benefits of sovereign money is that money would no longer be a liability of the central bank. And if it is no longer a liability, there is no need to match money with assets and money can then be spent. This view is puzzling, since both in accounting and in monetary economics, money at the central bank (i.e., the monetary base) is always considered as a liability and matched by assets. If money were not a liability and M1 represents for example 100% of GDP, it would mean that the central bank could potentially give away the equivalent of 100% of GDP on top of its usual profits from seigniorage. This would liberate a substantial amount of resources that could be used in many different ways (e.g., lowering taxes, increasing spending, lowering the debt, subsidizing credit, etc.).¹²

2.2.1 No reason to change fiscal policies

There are fundamental issues with using central bank assets for fiscal or credit policies. The first issue is that there is no reason why the state should change other aspects of its policies in the case of a monetary reform. This is because sovereign money differs very little from debt so that the policies considered are already possible by changing government debt. Changing other policies because of sovereign money would be suboptimal. For example, consider the current situation of a liquidity trap. In standard models, money and

⁹They could obviously have an indirect effect. For example, an increase in credit could boost economic activity, which stimulates money demand.

¹⁰There has been declining attention to money demand in the last two decades as central banks focused more on inflation targeting and decreased their focus on monetary aggregates.

¹¹E.g., see Kirchgässner and Wolters (2010).

¹²If this view were true, one could wonder why countries would not have already used the resources.

debt are actually equivalent in this situation. As a thought exercise, assume that nominal interest rates on government debt are zero for a very long period.¹³ In that case, money and bonds are very similar since no interest has to be paid on either bonds or money. Bonds mature, but they can be rolled over. Therefore, the consolidated state (government + central bank) can issue either bonds or money. This means that if the central bank buys government debt by issuing money, the consolidated state debt position is unaffected. Whatever can be done with money can be done with debt.

2.2.2 A central bank needs to hold assets

The second issue is that it is important for a central bank to hold assets. There are at least two main reasons for this. First, assets are useful to conduct monetary policy. The central bank may want to be more restrictive and sell its assets to reduce money supply. Or the central bank may want to change the currency or the maturity composition of its assets through foreign exchange interventions or different types of quantitative easing. Not having assets would therefore seriously handicap the central bank.

The second reason for the central bank to hold assets is to provide a guarantee for the currency. Currently, banks hold deposits at the central bank because they trust the central bank and because they know that they can withdraw their funds immediately. With sovereign money, deposits at the central bank are not determined by commercial banks and may be less fickle. But reductions in deposits may still occur and may be caused by a decline in trust in the system. If the central bank gets rid of its assets, it will clearly lose credibility and trust in the system may indeed decline (see more on this below).

2.3 Sovereign Money Avoids Financial Crises

In theory, a major advantage of a full reserve requirement system or of sovereign money is to avoid traditional bank runs, as modeled in Diamond and Dybvig (1983). This leads the defenders of the initiative to claim that a better control of money would i) eliminate financial crises; ii) avoid speculative bubbles; iii) avoid the need for a lender of last resort for banks. However, these claims have little basis and are inconsistent with empirical evidence.

¹³See Bacchetta et al. (2016) for a formal analysis of a persistent liquidity trap.

2.3.1 Bank runs may not be avoided

It is not the case that sovereign money can fully eliminate bank runs, for at least two reasons. First, a run may come from liabilities other than sight deposits. Second, there may be a run on the central bank.¹⁴ Regarding the first reason, bank runs may come from short-term liabilities other than demand deposits. Jordá et al. (2017) show that non-deposit bank liabilities, rather than deposits, tend to predict banking crises. Moreover, in the recent global financial crisis, demand deposits by non-financial agents only played a minor role. It is true that the crisis could be viewed in the perspective of runs, i.e., quick withdrawals of funds, as argued in particular by Gorton (2009). However, these runs were not on demand deposits. They started with the asset-backed commercial paper market and then spread to money market funds and other financial institutions.¹⁵ Commercial banks were not strongly affected by a run on their checking deposits. Even in the case of British bank Northern Rock in 2007, the run came from other financial institutions, i.e., from short-run liabilities that are not included in M1. Moreover, sovereign money may facilitate a bank run: since the central bank offers a safe asset, it becomes easier to move out of banking liabilities if there is a decline in confidence in the banking system. To avoid any bank run, the sovereign money reform should add severe restrictions on banks' other liabilities.

The second reason for bank runs is that an indirect run on the central bank may occur if the initiative implies that the central bank is running down its assets. In that case, there might be a lack of trust in the central bank and a run on sovereign money may occur. This would likely imply a currency crisis and the mechanism could be similar to Krugman (1979): a speculative attack on the currency occurs when the level of central bank foreign assets becomes low enough. This speculative attack implies a decline in the demand for domestic currency deposits and a capital outflow. If the central bank does not decrease its supply of deposits, this would lead to a large depreciation and large inflation. In other terms, selling central bank assets would move the risk of a bank run from commercial banks to the central bank.

¹⁴A third channel is a run on the asset side, as customers may run down their credit lines in times of crises. See Ippolito et al. (2016) for evidence.

¹⁵Gorton (2009) writes: *today's panic is not a banking panic in the sense that the traditional banking system was not initially at the forefront of the "bank" run as in 1907... In the current case, the run started on off-balance sheet vehicles and led to a general sudden drying up of liquidity in the repo market, and a scramble for cash...*

2.3.2 Iceland in 2008 as an example

An interesting case is the financial crisis in Iceland in 2008, which is one of the largest observed in history.¹⁶ The three large banks expanded extraordinarily their balance sheet and their credit in the years before the crisis. In the crisis, they all went bankrupt and were all subject to a run. The main source behind the credit surge and the subsequent withdrawal came from foreign short-term borrowing, as investors were exploiting the interest differential through carry-trade strategies. Controlling M1 in that context would clearly not help.¹⁷ It may even be counterproductive: restricting M1 would imply a more restrictive monetary policy, which could increase interest rates in Krona. This would make carry trade even more attractive and increase capital flows and credit growth.

It is interesting to notice that, in Switzerland, the only bank that activated the deposit insurance scheme for its depositors in the recent financial crisis was the subsidiary of one of the Iceland banks, Kaupthing.

2.3.3 Empirically money is not a good indicator of financial crises

As already mentioned, the stock of money in the economy does not have a significant macroeconomic impact. This is also true for its role in financial crises and bubbles. There is a huge empirical literature studying banking crises and trying to identify the determinants of crises. Different monetary aggregates and different measures of money have been considered (e.g., the level of real money or deviations from trend), but it has proven insignificant. What has proven significant in recent work, however, is credit (e.g., see Gourinchas and Obstfeld, 2012, or Schularick and Taylor, 2012). There has been much less empirical work on the causes of financial bubbles, but Jordá et al. (2016) show that credit-driven housing bubbles are particularly damaging for the economy.

More generally, periods of strong credit growth are often followed by lower economic activity. Therefore, controlling credit appears to be key for financial stability. This is by now well understood and has been motivating various aspects of financial regulation. But this is not true for money, since we have already seen that the correlation between money and credit is low: controlling money will not necessarily limit credit growth.

¹⁶See for example Benediktsdottir et al. (2011) for a description of the Iceland crisis.

¹⁷The proposal of sovereign money has also been suggested in a report by Sigurjónsson (2015), but the report does not explain how the financial crisis could have been avoided.

2.3.4 A lender of last resort is still needed

The recent crisis and other episodes clearly show that when banks run into trouble it is not due to traditional bank runs. Why would sovereign money affect the role of the state as lender of last resort? Banks may still be "too-big-to-fail": a bankruptcy may endanger the whole financial system and will affect employment. Other measures of financial regulation are clearly needed to limit the probability of bankruptcy and the need for state intervention.

2.4 The Benes-Kumhof Paper

The initiative committee cites the working paper by Benes and Kumhof (2012, henceforth BK) and claims that "the IMF confirms the positive impact of the sovereign money reform". This claim is abusive for three reasons. First, the working paper by BK is simply an academic investigation and is not the official IMF position.¹⁸ Second, the study is analyzing a reform that is quite different from the initiative submitted to the Swiss people. Some of the key differences between the initiative and the "Chicago plan" experiment in BK are the following: i) BK consider full reserve requirements and not sovereign money; ii) BK have only one type of deposits, so that reserve requirement applies to all deposits and not only to sight deposits as in the initiative; iii) in BK, central bank reserves, and therefore deposits, yield an interest, while there would be no interest on reserves in the initiative; iv) in the second stage of the reform, the central bank would use money to buy back government and mortgage debt in BK. In the initiative, the central bank would distribute the money to the government. Because of these key differences, the impact of the BK experiment are quite different from the initiative.

The third reason why the reference to BK is misleading is that the environment considered does not correspond to important features of the Swiss economy. One feature is that the Swiss economy is currently in a liquidity trap and the existing amount of central bank reserves is already very large. The monetary reform would therefore not increase substantially the reserves at the central bank. Another key feature is that Switzerland is an open economy. This has several implications. First, the real interest rate is strongly

¹⁸On the first page it is written: *This Working Paper should not be reported as representing the views of the IMF. The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.* Notice also that these two economists are not currently working at the IMF.

influenced by foreign interest rates. Second, banks can easily change their assets and liabilities by changing their positions with non residents. Third, there is currency substitution and alternative currencies, mainly euros and dollars, can be used for transaction purposes.

All these differences mean that the results from BK are not relevant for the sovereign money initiative. The Chicago plan experiment in BK increases the steady-state level of output by 10% through three channels.¹⁹ First, there is a large decline in the real interest rate that boosts investment. But the decline in interest rate comes mainly from the debt purchases by the central bank in the second stage of the reform. This aspect is not considered in the initiative. Moreover, the real interest can decline because the model is a closed economy. In an open economy model, this would typically not happen. The second channel is a decrease in distortionary taxes by a large increase in seigniorage (3.6% of GDP). I will explain below that the increase in seigniorage in Switzerland is much lower than that, so that the potential decrease in taxes is limited. On the other hand, by not paying interest on reserves in the sovereign money reform, seigniorage is also very distortionary. I show below that the loss for depositors is larger than the gain for the state. Therefore, the second channel does not appear relevant. The third channel reflects a decline in monitoring costs due to the reduction in credit. But the sovereign money initiative does not foresee a decline in credit. Moreover, the role of monitoring costs in the BK is somewhat odd: it implies by assumption that the smaller the banking sector the better.

The above discussion therefore shows that the three channels in BK would not apply to the proposed sovereign money reform in Switzerland.

3 The Impact of Sovereign Money in Switzerland: Stage 1

The reform implies that all sight deposits are no longer on the balance sheet of commercial banks. This may imply lower funding for banks. If this is the case, in the first stage of the reform, the SNB lends the funds to banks. More specifically, let H be the monetary base before the reform, which is made of bank notes and of banks' reserves at the central bank. With the reform, banks would deposit the additional quantity $M1 - H$ at the SNB. This is

¹⁹Another issue is that the BK model is not standard and incorporates several debatable assumptions. It is also difficult to see the role of each assumption on the results. A more detailed discussion of these issues would become quite technical for this survey. But it is fair to say that many economists (including all IMF economists I could talk to) are not convinced by the output increase generated by the experiment.

the quantity of funds that is no longer available to banks for their lending or investment activities. If the SNB lends this amount to banks their total resources are unchanged. This section considers the first stage of this reform and Section 4 will consider the second stage.

The objective is to analyze the revenue impact for the state, i.e., government and central bank, for banks and for depositors. Three key aspects will influence the analysis. First, an important aspect of the reform is that the SNB would not pay any interest on reserves so that sight deposits would no longer yield any interest, i.e., $i^m \leq 0$. This implies that the opportunity cost of holding money is higher, which has been shown to lower welfare.²⁰ Moreover, this will decrease money demand $M1$. Let $m1$ represent $M1$ in proportion of GDP: $m1 = M1/PY$; and let $m1^-$ and $m1^+$ be the levels of money before and after the reform. For the quantitative estimation, it is key to estimate $\Delta m1 = m1^- - m1^+$. For this purpose we need an estimate of the interest elasticity of money demand and this is discussed in the next subsection.

Second, it is important to distinguish between the current situation of a liquidity trap with interest rates close to zero from a more "normal" situation with positive interest rates. For the more normal period, the estimates will be based on the period 1984-2006 (the sample starts in 1984 due to data availability on interest rates). Figure 4 shows the evolution of interest rates during that period.

Third, the impact of the reform depends on the competitive structure of the banking industry. This is a complex issue, since banks offer multiple products. It is also possible that the competitive structure is affected by the reform. I will abstract from these complexities and follow the macroeconomic literature that assumes monopolistic competition in the loans and the deposit markets. Appendix B lays out the underlying model and derives the markups used in the numerical analysis.

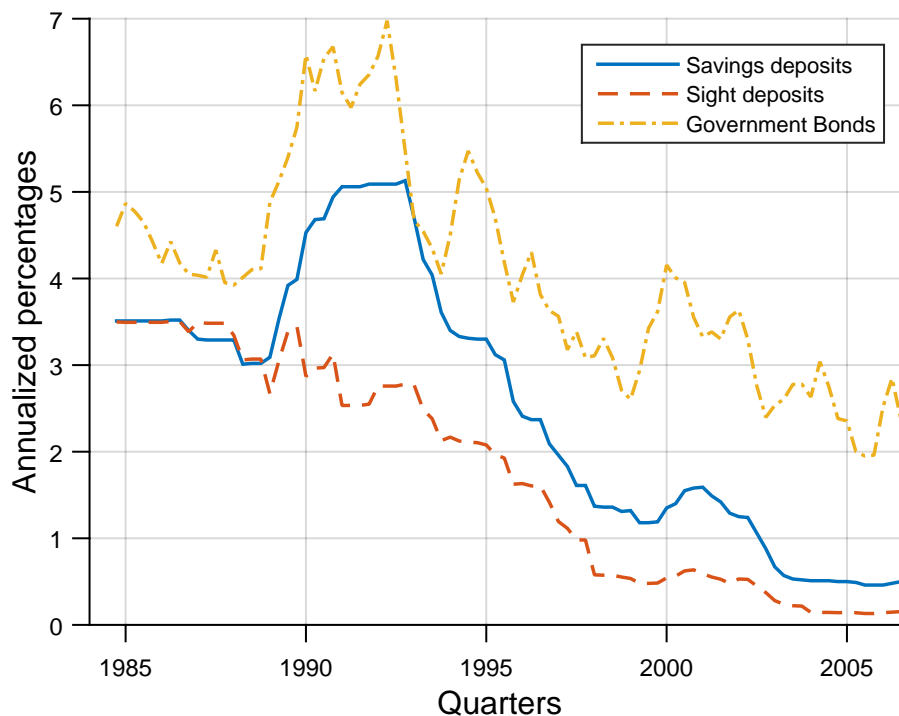
After describing the estimate of the interest elasticity of money demand, this section discusses the impact for the state, for depositors, and for banks.

3.1 Interest Elasticity of Money Demand

The objective is to determine how much the demand for sight deposits would decrease with a decline in its interest rate. This amounts to estimate a semi-

²⁰E.g., see Curdia and Woodford (2011). This point is related to the Friedman rule, a basic result in monetary economics. It says that the optimal level of nominal interest rates on bonds should be zero to eliminate the cost of holding money (when money yields zero interest). Since bonds rates are usually positive, it is optimal to pay a positive interest rate on money.

Figure 4: INTEREST RATES, 1984-2006



Data source: SNB. Interest rate on 10-year Government bonds.

elasticity of money demand: by how much, in percent, does money demand decrease if the interest rate increases by one percentage point? Estimates of this elasticity vary a lot, from as low as 6 in Ireland (2009) to as high as 60 in Bilson (1978).²¹ Here we estimate a simple long-run money demand for Switzerland, using quarterly data from 1984q4 to 2006q4. Our interval ends in 2006 to focus on a period where interest rates were distinctly higher than zero. As a dependent variable, we consider deposits in $M1$, so that we subtract banknotes from $M1$ and define this new variable as $\widetilde{M1}$. We estimate the following regression:

$$\ln \left(\widetilde{M1}_t / P_t \right) = \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 (i_t - i_t^m) + u_t \quad (2)$$

where P_t represents the consumer price index, Y_t is real GDP, i_t is the long-run interest rate (10-years Swiss bonds), and i_t^m is the interest rate on sight

²¹Lucas (2000) finds a value of 28 when translated to a quarterly frequency. Engel and West (2005) review many estimates that also fall in this range.

deposits. The results of the estimation can be found in the Appendix. The important result is the point estimate for α_2 , which is -0.13 . Even though the estimation is derived from a relatively short sample of 22 years, this estimate is in line with the recent estimations of Benati (2016) who considers a sample from 1948 to 2015. This implies that a one percentage point decrease in i^m decreases real money demand by 13 percent. I estimate the decline in the average return on sight deposits to be 2.73 (see below). This implies that the reduction in money demand is $\Delta m1 = -35.5\%$.

3.2 Additional Revenue for the State

3.2.1 Computing additional revenue

A major argument for sovereign money is the increase in revenue for the state. Commercial banks can make a profit by paying a low interest rate on sight deposits and lending the same amount at a higher rate. If instead the central bank controls sight deposits, it can reap these profits. The additional revenue is basically the increase in seigniorage minus two items that are otherwise paid by commercial banks. First, when banks make profits by issuing sight deposits, they pay taxes to the state. With sovereign money these taxes would disappear. Second, there is a cost to manage sight deposits and the liquidity and payment services they provide. At this stage, it is not clear who will pay these costs, but some of these costs may be paid by the central bank. To summarize, the additional revenue from sovereign money can be expressed as:²²

$$\Delta \text{Revenue} = i \cdot (m1^+ - h^-) - \text{Taxes}^- - \text{Costs}^+ \quad (3)$$

where $h^- = H^-/PY$. For convenience, in the numerical analysis I will abstract from Costs^+ , as they are difficult to estimate. Notice that under sovereign money the interest differential is simply i , because no interest is paid on money. Instead the interest rate differential for commercial banks is $i - i^m$ as they typically pay an interest on money. For an estimation of increased revenue, we should distinguish between the situation of a liquidity trap that we are in now and more normal times.

²²There are two ways to look at seigniorage. First, a central bank earns revenues by issuing money at a low or zero interest rate and lending it at a higher interest rate. In that case seigniorage is equal to the interest differential times the stock of money. In the second perspective seigniorage is simply the money created by the central bank. Although the two perspectives appear different, under some mild conditions they turn out to be equivalent in present value. We focus on the first approach.

3.2.2 No increase in revenue in the current liquidity trap

In the current situation, sovereign money would give no additional gain to the central bank. First, interest rates are about zero so that $i = 0$. Moreover the level of reserves already represents about 100% of demand deposits, i.e., $M1 \simeq H$. Therefore sovereign money would not increase the central bank balance sheet and would have no impact on its profits. If the state has to incur some additional costs from managing M1, the net impact could even be negative.

3.2.3 Increase in revenue in more normal times

Things will be different if we exit the liquidity trap, where interest rates would be positive, while money demand would be lower. The additional amount of seigniorage with sovereign money will obviously depend on how these variables change. It is natural to assume that the SNB lends its additional resources to commercial banks at rate i . If we compute $i \cdot (m1^+ - h^-)$ over the period 1984-2006, we find an annual rate of 0.80% of GDP.²³

To compute the net gain for the state, we need to have an estimate of taxes paid by banks on profits from sight deposit operations. In Appendix B, I compute the decline in bank profits to be 0.77% of GDP. If we assume a tax rate of 35%, lost taxes would represent 0.27% of GDP. This implies that the net gain for the state, abstracting from operational costs, would be 0.53% of GDP. Using 2015 GDP, this would make CHF 3.42 billions. This number is not insignificant, but it should be put in perspective by comparing it to recent SNB profits (CHF 24.5 billion in 2016) and to SNB profits that would occur in a period of high interest rates.

3.3 Implications for Depositors

In this part section, the sovereign money reform has the same implications as a 100% reserve requirement. There is an extensive literature on reserve requirements that shows that they act as a tax on deposits.²⁴ With 100% reserve requirement, the tax is simply equal to the reference interest rate i (the marginal interest rate a bank would get if it did not have to hold reserves at the SNB). With perfect competition in banking, this cost would be fully passed through to depositors. However, if we assume monopolistic

²³I used the average interest rate on federal government bonds (source: SNB). The average over the period is 4 percent. The average of $M1 - H$ is 34 percent of GDP.

²⁴Under some conditions, reserve requirements are equal to a tax on deposits combined with an open market operation. See Bacchetta and Caminal (1994).

competition (see Appendix B), depositors will only bear $(1 - \mu^d)i$, while banks profits in principle decline by $\mu^d i$. Under the assumptions of Appendix B we have $i^s = (1 - \mu^d)i$, where i^s is the interest rate on savings deposits. The additional tax from the reform can be simply computed as $i^s \cdot (m1^- - h^-)$.²⁵ For the period 1984-2006, this gives a loss of 0.82%.

It may be useful to clarify why i^s , and not i^m , is used to compute the loss. On top of a decline in interest rates i^m , depositors are likely to see an increase in service fees, as in the current situation of low interest rates. If sight deposits are still run by commercial banks, they would still have to incur operational costs. With competitive pressure, part of these costs are passed on to depositors. It is obviously difficult to estimate these costs, but an indirect way to estimate them is to consider the difference between the interest on savings deposits i^s and the interest on sight deposits i^m . Appendix B shows that the cost τ is proportional to the differential $(i^s - i^m)$: $\tau = (i^s - i^m)/(1 - \mu^d)$. Depositors bear a share $1 - \mu^d$ of this cost. In the 1984-2006 period, we find $\tau = 1.57$.

There is an additional cost that we cannot quantify, which is the increase in regulation including likely restrictions for savings deposits. Moreover, there is the uncertainty around these measures.

3.4 Implications for Banks Profits and Credit

In normal times, banks would definitely lose from the reform, as sight deposits with cost i^m are replaced by SNB loans with cost i . The loss for banks is the decline in interest rate margins, from which we can subtract taxes and operation costs if we assume that they are passed on to depositors.²⁶ The decrease in interest income is $(i - i^m) \cdot (m1^- - h^-)$. Over the 1984-2006 period, this is equal to 0.80% of GDP. Appendix B shows that the decline in bank profits per unit of deposits, $\mu^d(i - \tau)$, is equal to 0.77. If we assume a tax rate of 35% on these profits, the after tax loss in profit would be 0.50%.

Since banks' balance sheets are little affected by the first stage of the reform, the impact on total credit would in principle be small. However, banks face a loss $\mu^d \tau$ on sight deposits and may compensate it by increasing

²⁵It can be argued that the tax should be computed on the new money demand, i.e., $i^s \cdot (m1^+ - h^-)$. However, when $m1$ decreases depositors enjoy fewer services from sight deposits or have to incur higher costs. A simple approximation of these costs is $i^s \cdot \Delta m1$, and is captured by using $m1^-$ instead of $m1^+$. The precise measure of these costs actually depends on the motives for holding money. For an analysis of the welfare cost for depositors in a more structured analysis, see Bacchetta and Caminal (1992).

²⁶Notice, however, that reserves at the SNB would be less liquid under sovereign money: they would only be liquid for sight deposit withdrawals, but not with other liquidity needs.

Table 1: IMPACT OF SOVEREIGN MONEY - PHASE 1

Annualized percentage of GDP		
	Positive interest rates 1984-2006	Liquidity Trap Current period
SNB	0.80	0
Government	-0.27	0
State Total	0.53	0
Depositors	-0.82	0
Banks	-0.50	0
Total	-0.79	0

Notes : See text for a description. Does not include cost to borrowers, additional costs for the SNB, or regulation costs.

the cost of lending. Even if we assume that the whole loss is transferred to the cost of lending, the impact would not be large: 0.12 percentage points. The increase in the cost of credit should only have a small negative impact on the demand for credit.

3.5 Overall Impact

Table 1 summarizes the above analysis. It is obvious that the precise numbers should be taken with a grain of salt, but they help to provide an overall picture of the impact of the first stage. It is interesting to notice that when interest rates are positive, the sum of all the effects is negative. This is due to the decline in i^m with the reform, which implies a decrease in M1. This decrease means that the gain in SNB revenue is smaller than the loss in net interest revenue from banks. Moreover, the decline in the opportunity cost of holding money is an additional burden to depositors.

To summarize this section, we have found that in the current situation of a liquidity trap, there would be little aggregate impact of the first stage of the reform. If the Swiss economy returns to positive interest rates, the impact would be more significant. Using data for the period 1984-2006, we see an increase in state revenue, but also a loss for depositors. The loss to banks appears relatively small. Overall, this implies a net loss for the economy. This loss should be seen as a lower bound, as it excludes some of the costs that are more difficult to assess (regulation costs, implementation costs) and it assumes an orderly implementation of the reform.

4 The Impact of Sovereign Money in Switzerland: Stage 2

In the second stage of the reform, the SNB eliminates its lending to banks. This means that banks need to look for alternative sources of funds. On the other side, the SNB has more potential resources that could be used in several ways. This section will discuss the macroeconomic implications of this second phase under different scenarios. In such a survey, only the broad implications are considered. A more detailed analysis would require a full dynamic model.²⁷

4.1 Need for Alternative Funding by Banks

On average, sight deposits represent a relative small share of banks balance sheets. In the last thirty years, sight deposits minus reserves at the central bank represented about 25 percent of total credit and 15 percent of total banks balance sheets. In the second phase of sovereign money, banks would need to find alternative sources of funding. Given the attractiveness of the Swiss franc, there is no doubt that Swiss banks would be able to find funding. However, switching to alternative funding may create short-term costs. For example, consider the situation where banks want to rapidly increase their credit and need to issue new liabilities. Such a situation would occur if the Swiss economy exits the liquidity trap. In the transition, it might take some time to organize alternative funding, especially for smaller banks. This may slow down a potential credit recovery. Therefore, there might be short-run risks in the search for alternative financing.

In the medium run, the question is whether this funding would be much more expensive than sight deposits. This is a difficult question. Sight deposits obviously imply a lower interest payment for banks. But a large part of the lower interest rate is accounted for by the operating cost of sight deposits. Therefore, the difference may not be that large.

What type of alternative funding would be available? The basic idea behind the initiative is that, once sight deposits are outside of banks' balance sheets, the financing of banks should come from more "responsible" investment decisions. This is likely to be true for equity or long-term debt. But some alternative sources of financing may not be more "responsible" and some other may make banks more prone to crises. First, there might be an increase in savings deposits: since the opportunity cost of holding sight

²⁷Bacchetta and Perazzi (2017) provide such an analysis, examining in particular the welfare effect of the reform.

deposits increases, there would be a shift towards savings deposits. Second, there might be a shift towards sight deposits in euros. These deposits would not be part of sovereign money and would keep yielding a positive interest rate (once we exit the current liquidity trap). These accounts are already available in many Swiss banks, so that the switch would be easy. It may lead to an increase in euro transactions in Switzerland.²⁸ Third, banks may innovate to make alternative investments more liquid (e.g., the citation of Cochrane in the Introduction). Basically, they can reduce switching costs between invested funds and money needed for transactions. This could drastically reduce the demand for sight deposits without changing the behavior of depositors.

But alternative funding may attract more fickle funding. For example, banks may rely on short-term debt borrowing from other financial institutions. But these sources of funds are more volatile than sight deposits, as the recent financial crisis has illustrated (e.g., Bear Stearns, Lehman Brothers, or Northern Rock). There are many other examples of dramatic financial crises, where the source of the problem is the short-term international borrowing by banks and not in demand deposits (e.g., the Asian crisis or Iceland).²⁹ In particular, this could increase the exposure of Swiss banks to international contagion. In other terms, the Swiss banking system may replace funding from relatively stable funding deposits by funding from more volatile sources and be more prone to financial crises. Moreover, by offering a safe asset outside the banking sector, sovereign money makes it easier for these funds to leave banks.

4.2 Macroeconomic Implications

The macroeconomic impact of the reform depends on how the additional money at the SNB is used. For example, Benes and Kumhof (2012) assume that the state buys back mortgage and government debt, which leads to a decline in the interest rate and an increase in investment. Mortgage buybacks are not considered by the initiative and I will focus on more realistic scenarios.

²⁸Notice that almost half of Swiss banks liabilities are already in foreign currency. However, an increase in foreign currency liabilities could imply a currency mismatch for Swiss banks.

²⁹As already mentioned, Jordá et al., 2017, show that non-deposits sources of funding increase the probability of financial crises.

4.2.1 Status quo

The SNB invests its resources in Swiss and foreign assets. This could still be the case with sovereign money if additional money is simply matched by increases in SNB assets. SNB profits would come, as now, from the return differential between its assets and reserves. These profits would then be distributed over time to the state. The impact of sovereign money would not be large, besides the negative net effect mentioned in the previous section.

4.2.2 Increased transfers from the SNB

The initiative would insert in the Swiss constitution that the new money created by the SNB is directly transferred to the state (cantons and confederation). Moreover, the committee behind the initiative argues that the SNB could transfer an additional CHF 15 billion each year to the state. The only way to do that is to sell the assets of the central bank. However, selling SNB assets or automatically transferring new money does not have much impact on the present value of SNB transfers: SNB profits are anyway eventually distributed to the state. In other words, the initiative's committee is basically proposing to frontload the distribution of SNB profits at the cost of lower profits for future generations.

Nevertheless, policies affecting the timing of transfers may have distortionary effects. The actual impact of these transfers depends on what the state would do. If central bank transfers are exclusively used to reduce government debt, the impact is likely to be small. This would not affect government expenditures or revenues and would leave unchanged the consolidated position between the state and the central bank. However, it would also reduce the size of Swiss public debt, which may not be desirable.³⁰

If the SNB transfers the increase in money directly to the private sector, this would be equivalent to "helicopter money" (a policy where the central bank makes direct transfers to the private sector). Such a policy is currently discussed in the context of the liquidity trap, but is clearly not the right policy in normal times for reasons I will not discuss here.

A more likely scenario is that these transfers will allow to finance government deficits, i.e., to increase its expenditures or to decrease its revenues without a need to issue debt. This means that monetary policy would be tied to fiscal policy. It is well known that deficit financing by the central bank is extremely bad policy. All modern central banks are prevented from directly financing the government and the SNB has always been a leading example in terms of independence. It would also be important that central

³⁰See Bacchetta (2017) for a discussion.

bank transfers affect fiscal policy as little as possible. Putting the emphasis on a frontloaded distribution of central bank profits may help in "selling" the initiative to the voters, but is not key to a monetary reform. Moreover, it would clearly put political pressure on the SNB.

Section 3.2 already discussed the serious problems associated with the sale of these assets. In particular, having a central bank with assets much lower than the amount of currency in circulation strongly threatens the confidence in the system. Moreover, since the assets are currently in foreign exchange reserves, the SNB would need to sell foreign currency assets, which would put pressure on the Swiss franc.

4.3 Implications for Monetary Policy

Monetary policy would clearly be hampered by the sovereign money initiative. In the ideal world of a smoothly growing economy, the SNB could gradually increase its money supply through transfers (with all the problems this entails). But in the real world, the economy is bumpy and the SNB needs to react quickly to the changing economic environment. With the initiative, the SNB could no longer use its current instruments, that work in great part through a quick impact on the monetary base. The SNB would have to find other, less efficient, ways to influence monetary policy. In particular, it is not obvious to foresee how the SNB would operate when monetary policy has to become more restrictive for a sustained period. Following the logic of the initiative, the SNB should do reverse transfers to the government, i.e., tax the government. This appears unrealistic and extremely difficult to implement politically. An alternative could be to issue central bank bills to reduce money supply. But how safe would central bank debt be perceived if its assets do not match existing liabilities? Investors may require a high risk premium to hold these bills, which would make monetary policy very costly. Moreover, once there is central bank debt, could it be reduced to increase again money supply? This might contradict the law, as money supply increases are supposed to be transferred to the state or to the public.

Another issue for monetary policy is that the initiative implies that the SNB would return to monetary targeting, since it focuses on money supply. The SNB adopted such a strategy after the end of the Bretton Woods system until 2000 when it shifted to a policy focusing on inflation forecasts and on the control of short-term interest rates. There were good reasons (which I will not review here) to abandon such a system and going back to it would clearly lead to worse monetary policy. More generally, setting constraints in the Federal constitution on the way monetary policy can be implemented is undesirable and inconsistent with central bank independence.

5 Conclusions and summary

This survey has evaluated the arguments behind the sovereign money initiative and has examined some of its potential consequences. This has been done from a monetary and macroeconomic perspective and the survey abstracts from important aspects related to legal issues, practical implementation, or implications for specific institutions. One element that has been mentioned, but could not be evaluated, is uncertainty. There is high uncertainty at two levels. First, the text of the initiative is not precise and there is uncertainty about how it could be implemented. Second, since such a system has never been implemented anywhere, there is high uncertainty about the reaction of economic agents. For example, one scenario could be that the initiative would stimulate financial innovation and that financial technology would allow to make payments without any sight deposits in Swiss francs. Trying to guess which scenario is the most likely is difficult, but what is clear is that this high uncertainty would be an additional cost from this initiative.

This survey puts the initiative in a negative light, as its foundations are shaky, its benefits are questionable, and its drawbacks can be serious. Before starting working on the survey, I had a much more positive prior. However, the more I delved into the issue, the more disappointed I became because of the limited intellectual merit in the arguments behind the monetary reform proposal. First, it ignores and even despises current knowledge in monetary economics. Several of the arguments made are inconsistent with this knowledge and with basic economic logic. For example, claiming that bank credit creates money is inconsistent with empirical evidence and there is no convincing argument that sovereign money can avoid financial crises. Second, some of the claims are misleading or demagogic. For example, it is not true that the IMF supports the initiative or that there is academic support for it.

A major theme in this paper is that the role of sight deposits is overstated in the arguments behind the initiative. There is no evidence, at least in the last eighty years, that increases in sight deposits would lead to financial crises or to large credit increases. Therefore, giving control of these deposits to the SNB cannot provide any stabilizing benefit. On the other hand, the sovereign money reform will entail clear costs for the Swiss economy and will create potential risks and instability. The quantitative analysis shows that depositors and banks would clearly lose from the reform and that these losses are larger than the increase in state revenue. Pushing banks to look for alternatives to sight deposits is potentially destabilizing. There is a clear destabilizing impact of the reform, even though it is difficult to evaluate this quantitatively. Selling SNB assets and constraining monetary policy are threats to monetary stability and to the well functioning of the Swiss

economy. It is to be hoped that all these costs and potential risks will be all well understood by Swiss voters.

Appendix

Appendix A. Money Demand Estimation

Data

Data is quarterly for the period 1984q4-2006q4 and comes from the SNB data base. Monthly variables were converted to quarterly using the end of quarter value. Money aggregate M1, banknotes and nominal GDP are in billion CHF. The interest rate differential is calculated as the difference between the long-run interest rate on bonds (10-year Confederation) and the interest rate on sight deposits. Both rates are annualized and in percentage points. P_t is CPI based on all items (base 100, 2015m12).

Regression

The regression performed is as follows:

$$\ln\left(\frac{(\text{M1} - \text{banknotes})_t}{P_t}\right) = \alpha_0 + \alpha_1 \ln\left(\frac{\text{GDP}_t}{P_t}\right) + \alpha_2 (i_t - i_t^m) + u_t \quad (\text{A1})$$

Results are displayed in table 2.

Table 2: DEMAND FOR SIGHT DEPOSITS

Variables	Coefficient	Std errors	Robust std errors	T-test	P-value
Constant	-18.54	0.01	1.52	-12.23	0.00
ln(Real GDP)	3.72	0.00	0.22	16.98	0.00
$i - i^m$	-0.13	0.01	0.02	-8.19	0.00

Notes : Dependent variable is $\ln\left(\frac{(\text{M1} - \text{banknotes})}{\text{CPI}}\right)$. Adjusted $R^2 = 0.80062$. Durbin-Watson = 0.53708

Cointegration

The dependent variable and the exogenous variable $\ln\left(\frac{\text{GDP}_t}{P_t}\right)$ are both $I(1)$, so that we have to check for cointegration. Residuals of the regression are stationary according to the Augmented Dickey-Fuller test. Moreover, in an error correction model the error correction term is significant.

Appendix B. Interest Rates and the Banking Sector

This appendix describes the assumptions made behind the quantitative analysis of Section 4. The approach is in line with standard models of banking at the macroeconomic level. Although stylized, this approach allows to determine broadly the magnitude of the effect of the reform. In general, banks offer multiple products in imperfectly competitive markets. To simplify, I assume that there is monopolistic competition with constant markups, generated by Dixit-Stiglitz preferences for deposits and loans. Moreover, the analysis of loans and deposits can be separated as in the Monti-Klein model.³¹ However, I will assume that if a bank makes a loss in the sight deposit market, it will recoup the loss in the loans market (the alternatives would be that the bank charges fees to depositors or stops offering sight deposits).

There are four interest rates: i^m on sight deposits, i^s on savings deposit, i^l on loans, and i on safe bonds. The safe interest rate i is a "reference" rate that applies to government bonds and to the interbank market. I also assume it is the rate at which the SNB would lend to banks. The banks balance sheet can be written as:

$$\tilde{H} + B + L = \widetilde{M1} + S + E \quad (\text{B1})$$

where B are the net assets held by banks (B could be negative), L are loans, S are savings deposits and E is equity. \tilde{H} are reserves at the SNB and are equal to H minus bills and coins. They yield zero interest rate. $\widetilde{M1}$ represents sight deposits ($M1$ minus bills and coins).

The difference between the savings interest rate and the bonds interest rate is given by:

$$i^s = (1 - \mu^d)i \quad (\text{B2})$$

where μ^d is the markdown applying to both savings and sight deposits. This abstracts from any cost of managing savings deposits. In the Dixit-Stiglitz framework the markdown is given by the substitutability across bank deposits and is given by $1 - \mu^d = \varepsilon^d / (\varepsilon^d - 1)$, where ε^d is the elasticity across bank deposits.³² I also assume that there is a proportional cost τ for banks to run

³¹See, for example, Generali et al. (2010) for similar set of assumptions in a DSGE model.

³²Notice that this elasticity is different from α_2 , which represents the elasticity between sight deposits and other assets.

sight deposits.³³ In that case, the interest rate on sight deposits is given by:

$$i^m = (1 - \mu^d)(i - \tau) \quad (\text{B3})$$

Banks profits from sight deposits are simply given by:

$$\Pi = i - i^m - \tau = \mu^d(i - \tau) \quad (\text{B4})$$

With sovereign monetary reform, the reference interest rate for banks on sight deposits is zero. From (B3) this implies that the interest rate on sight deposits decreases by $(1 - \mu^d)i$, which turns out to be equal to i^s . The return on sight deposits is $i^m = -(1 - \mu^d)\tau$, which is negative. In practice, the interest rate on sight deposits might be equal to zero, but deposits would bear a cost (e.g. monthly charges) of $(1 - \mu^d)\tau$. To estimate the total cost for depositors, the decline in interest rate should be multiplied by the amount of sight deposits.

From (B4), bank profits would decline by $\mu^d i$ and would be negative at $-\mu^d \tau$. If sight deposits were the only product of banks, they would immediately stop offering them. However, with multiproducts, this loss can be compensated on loans.³⁴ I assume that the loan interest rate is increased such that:

$$\Delta i^l \cdot L = \mu^d \tau \cdot \widetilde{M1} \quad (\text{B5})$$

In such a case, the actual decline in bank profits is $\mu^d(i - \tau)$ per unit of sight deposits.

To quantify the analysis, I consider the 1984-2006 period. During this period, the average interest rates are $i = 4.00$, $i^s = 2.73$, $i^m = 1.66$. From (B2), this implies that $1 - \mu^d = 0.68$ or $\mu^d = 0.32$. This implies an elasticity of substitution $\varepsilon^d = -2.15$. From (B3), we have $\tau = 1.57$. Therefore, the sovereign money reform implies a decline in i^m of 2.73. The decline in bank profits per unit of deposits, $\mu^d(i - \tau)$, is equal to 0.77. Since $\widetilde{M1}/L = 0.25$, $\Delta i^l = 0.12$.

³³For simplicity, I assume that there are only variable costs, even though in reality fixed costs are significant.

³⁴This is consistent with recent evidence in Switzerland where an extremely low interest rate i has led to an increase in mortgage rates. The alternative scenario is that banks charge fees on sight deposits, so that depositors would suffer even more. It turns out, however, that this effect is small so that the precise assumption regarding the loss of sight deposits is not crucial.

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