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Proposals for monetary reform – a critical assessment using the general quantity equation by Wolfgang Stützel

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Abstract

Europe is still suffering from the turmoil created by the Great Financial Crisis. Finding solutions to the danger of new financial crises is an important criterion for a stable European Union. Proponents of the Sovereign Money System (SMS) identify the ability of private banks to create money as the main contributor to the outbreak of financial crisis. Hence, they want to put the control of the monetary base into the hands of a public institution. This paper will investigate whether the strategy of setting the monetary base – in a SMS – is grounded in realistic assumptions. They claim that the velocity for 'real' transactions is stable and therefore, a 'workable' link from money base to economic activity can be established. Yet, this claim stands on the shaky assumption that 'payment traditions' are unchanging and the dubious concept of 'velocity of circulation'. Post-Keynesians have criticised the latter, but have not contributed an alternative concept of the relationship between the level of economic activity and the means of payment necessary to achieve it. This, however, would help clarify the critique of a monetary policy strategy, which tries to set the monetary base in the SMS environment, as it would illuminate the specific assumptions that need to hold in order for a link between economic activity and the money supply to be stable. Already in 1957, Stützel tried to establish a relationship – based on balance mechanics – between economic activity and changes in means of payment that was free of the limitations of the equation of exchange.

The paper will reformulate Stützel's equation and clarify it with the help of stock-flow consistent T-accounts in order to apply it to the SMS. In doing so, it becomes obvious that the connection between economic activity and changes in means of payment is quite unpredictable. For a stable relationship, a lot of very specific, unrealistic assumptions need to hold. Therefore, the setting of an 'optimal' amount of the monetary base in the SMS is, apart from many other of the SMS' problems, not realistic. Stützel's 'general quantity equation' provides a clear relationship between money and economic activity that could help the existing endogenous money theory to be more precise in that regard.

Keywords: Sovereign Money, Balance mechanics, Stock-flow consistency, Demand for money, Money supply, Financial crises

JEL Codes: E41, E42, E51, E58, G01

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1 Introduction

Ideas and debates about monetary reform have frequently emerged throughout history. Over the last century, major events, such as the Great Depression in 1929 as well as the great financial crisis of 2008, have in many instances been catalysts for these discussions. Some proponents of monetary reform identify the ability of private banks to create money as the main contributing factor to the outbreak of financial crises. Commercial banks are seen by some as problematic since they tend to inflate bubbles in boom times by providing too much credit, and prolong economic downturn in times of crisis by providing too little credit. The idea of being able to control the money volume – and, therefore, the credit volume – in the economy in order to dampen both effects seems to be desirable for many economists. This has been the case after the Great Depression, with the '100% reserves banking approach' being advocated by Irving Fisher (1936) and later picked up by Milton Friedman (1948).

Contemporary proposals which are based on these earlier ideas have been put forward by many economists as well as NGOs. In Iceland, for example, there is, even discussion of implementing such proposals (Sigurjonsson, 2015). Proponents of monetary reform include the Chief Economics Commentator of the Financial Times, Martin Wolf (2014), researchers at the IMF (now partly Bank of England) (Benes & Kumhof, 2013), Joseph Huber (2016) and Positive Money, a UK-based NGO (Dyson & Jackson, 2012; Dyson, Greenham, Ryan-Collins, & Werner, 2011), among many others. As these proposals become more and more relevant, it makes sense to take a critical look at their logical coherence.

The basic proposition of all these approaches is to take away the banks' ability to create means of payment. By doing so, the reformers want to establish a system where banks that want to give out loans to households or firms need to have the means beforehand in the form of savings deposits. In this approach, the banks would become mere intermediators of loanable funds (as is already portrayed in many up-to-date economic textbooks). The money needed for an expansion of economic activities (ceteris paribus) would need to be supplied by savers. It would, however, originate from the central bank in the form of high-powered money. When transferred to the government, such money can be then reintroduced into the economy where it will eventually end up as savings, and in turn become investment. This assumes, however, that a centralised institution can set a more optimal money supply for the aggregate economy. While the reformers admit that the optimal amount is not possible to determine ex ante, they state that commercial banks are not able to determine it either. "The question therefore becomes one of who is most likely to supply the economy with the 'correct' amount of money: commercial banks in the current system, or an independent committee in the reformed system?" (Dyson & Jackson, 2012, p. 171). Huber suggests that monetary targeting by central banks is superior to interest rate targeting, while stating that it has never been possible to see the former in practice as the ability of banks to create means of payment, e.g. bank deposits, undermines any monetary targeting in the first place (Huber, 2016, p. 150; Benes & Kumhof, 2012, p. 38).

The reform proposals are essentially built on the assumption that a system with 'true' monetary targeting – when banks are prevented from creating money themselves – would be superior to current monetary systems. The indicator for that would be a dampening of credit booms and credit slumps. In order for the sovereign money system (SMS) to be viable, the fundamental assumption is that monetary policy works when the central bank can effectively set the desired amount of money in the system. Hence, the issue of whether such a system is more stable than the current arrangement depends a lot on the answer to this question: can a central bank determine the amount needed in an economy better than private banks?

The assumption that central banks possess a greater ability to set an appropriate amount of money for an economy will be the main focus of this paper. There will not be a general critique of the reform proposals from an endogenous money perspective, as that has already been done to a large extent (Schulmeister, 2016; Goodhart, 1989; Fontana & Sawyer, 2016; Dow, Johnsen, & Montagnoli, 2015; Fiebiger, 2014).

Instead, the focus of the paper will be on monetary policy in a reformed system, with a special interest in the assumption that a central bank has the ability to set an appropriate amount of money for an economic system. This assumption rests mainly on the equation of exchange ($M * V = P * T$), in that with a stable velocity of circulation one can influence P and T via setting the amount of means of payment M. This approach has been criticised for two reasons: first, the velocity of circulation is regarded as unstable; and second, the economic activity determines the money needed and not the other way around (Godley & Lavoie, 2007, p. 127). While the argument of reverse causality has been developed very well in a stock-flow consistent way, this is not the case with respect to the instability of velocity (ibid.). Interestingly, Wolfgang Stützel (1978) developed a stock-flow consistent equation of the relationship between money and economic activity already in the 1950s and therefore well before Godley and Lavoie (2007). Therefore, Stützel's approach can shed light on the relationship between the level of economic activity and changes in the money supply in a system where the money supply is purely supply side driven, i.e. central banks decide about and set the supply. It does not, however, make use of the concept of the velocity of circulation. Thereby, not reinforcing the image of a pool of a physical money supply, circulating round and round the economy, but, of a money being mostly electronic, getting as easily created out of thin air as destroyed and thus interrupting the circulations.

Following from this, the research questions pursued in this paper will be: what can Stützel's 'general quantity equation' tell us about the inherent assumptions in sovereign money concepts of monetary policy being able to control the money supply? Does this equation contribute to the critique of sovereign money reform (SMR)?

To answer these questions, the reform proposals (and especially their underlying theory of "how to determine an optimal amount of money for the economy") will be examined in Chapter 2. This way, their theory can be compared to the stock-flow consistent understanding provided by Stützel. Then, Stützel's general quantity equation will be explained by translating it into up-to-date stock-flow consistent balance sheets (Chapter 3). With the equation at hand, we can gain a better understanding of the assumptions of sovereign money proponents that are required for the velocity of circulation to be stable, and if these assumptions seem realistically or unrealistically restrictive (Chapter 4).

Although Stützel did not use his 'balance mechanics' framework to model the economy, he used it as an analytical tool in order to criticise the equation of exchange. His quantity equation's benefit is that it shows clearly what exactly needs to hold in order for the link between economic activity and money to remain stable. This will make it possible to evaluate how realistic it is that these assumptions actually hold in a sovereign money system. As it turns out, the need for means of payment in a certain period rests on a few factors, including: the quantity and direction of the transaction flows between bank debtors and bank creditors the change in the direct credit relations between these two groups, and, finally, the amount of demand deposits that are turned into long term savings deposits and vice versa. Additionally, it will become clear that a limitation of means of payment does not per se limit economic activity itself, but the possibility of the economy to move 'out of step' – meaning that less revenue or

expenditure surpluses can manifest themselves. And even this is only true as long as there are no other near-monies circumventing the limitations.

2 Proposals for Monetary Reform

Before going into the theories underlying the setting of an 'appropriate' amount of money for the economy, the proposals for monetary reform shall be presented more generally. The present discussion about monetary reform is in itself nothing new. At least parts of it can be traced back to Ricardo (1824) and the debate between the currency and the banking school. It was summarised by Lavoie (2014) as follows:

> Ricardo and the Currency School argued that only coins and Bank of England notes could be considered as money, that this stock of money determined aggregate demand, and that aggregate demand determined the price level, thus giving support to the quantity theory of money. The Banking School, with John Fullarton, Thomas Tooke and John Stuart Mill, argued instead that the definition of money was much more complicated, that aggregate demand determined the stock of money, and that if controls were needed to influence prices, these controls should be imposed on credit aggregates. The Banking School also put forth the 'reflux principle', arguing that if too many banknotes were created, its holders would bring them back to the issuer, and hence the excess would disappear. The Banking School thus supported endogenous money, reversed causality and the need to focus attention on credit instead of money aggregates, just as modern post-Keynesians do. (Lavoie, 2014, p. 184).

Several similar, though not altogether alike, reform proposals were put forward, including one called "full-reserve banking" or "100%-money", which aims to increase the reserve requirements of commercial banks to 100%. This plan is rooted in the Fisher proposal from 1934 (Fisher, 1936) and was most prominently reintroduced recently by Benes and Kumhof (2012; 2013).

The other proposals, which were put forward by Huber (2016), Frosti Sigurjonsson (2015), the UK Green Party (2015), as well as Ben Dyson and Andrew Jackson (2012), differ from the full-reserve banking proposal.[2] Their main distinction from the 100% reserve banking approach is that they only include a money circuit for central bank created money, whereas the former establishes money circuits for both central bank and bank created money. One could say that in this SMS, 'M1 becomes M0' (i.e. bank demand deposits become central bank money). While in today's financial system central bank money in the form of reserves is only used by commercial banks to settle their accounts in the books of the central bank, in the SMS model, the government, and other commercial banks, use it to settle all debts. We will focus on Huber's reform proposals, as they are the most elaborate and widely supported by prominent initiatives in Europe, like *Monetative* in Germany, *Vollgeld Initiative* in Switzerland, or *Positive Money* in the UK. Focusing on only these reforms could be criticised, as it results in an omission of the whole branch of contributions by Fisher and Friedman, among others. However, this will allow for a more precise analysis and, in the view of the author, will not water down the conclusions of the analysis, as the proposals and their basic assumptions are very similar.

[2] For a historical survey of the different monetary reform proposals in this vein and their different roots, see Lanià (2015).

2.1 The Sovereign Money Approach

The reform proposal that will be presented here is mainly built on Huber (2016), Dyson and Jackson (2012) and also Wolf (2014).

The core of the reform is that only central banks would be allowed to create electronic means of payment (Huber, 2016, p. 103). Commercial banks would therefore lose their ability to create means of payment 'out of thin air.' All money, in the sense of means of payment, would be central bank money, i.e. sovereign money. Hence, the central bank becomes the *issuer of first instance* and the only issuer of means of payment.

One benefit of this system, accordingly, would be more economic stability by a dampened business cycle. Additionally, it would lead to a smaller public deficit, as the government would have extra revenues resulting from the new money injected in the system. Moreover, the advocates of this approach suggest that it would be associated with more transparency, as there would be only one monetary circuit and not two different ones. Also, it would make the system more understandable to the population at large, as the new system would correspond better to everyday knowledge. What is put in the savings accounts can be used to invest, and banks do not just create money when they create credit (Dyson, Greenham, Ryan-Collins, & Werner, 2011, p. 5). In order to achieve these goals, the most relevant change in the financial system is the split into transaction and investment accounts.

2.1.1 Transaction and Investment Accounts

In an SMS, banks' customers will have two different kinds of accounts: a transaction account and an investment account (Dyson & Jackson, 2012, p. 178). The transaction account contains the electronic means of payment, the former bank-created demand deposits. It has the same properties as central bank reserves have in the current financial system. There have been several similar proposals put forward suggesting how exactly these accounts could be installed (Huber, 2016, pp. 106-115). The simplest approach would be for the bank accounts of the citizens and firms to be transformed into individual sovereign money accounts that could then be managed by the commercial banks as a service. However, the sovereign money accounts would not show up in the commercial banks' balance sheets, but would appear as off-balance fiduciary managed by the bank. If a bank goes bankrupt, the transaction account is only touched by this insofar as it would need to be put in the management of another bank. The balance would not be affected. On the transaction account is only M1 money, which then would be called M, as it encompasses paper money, coins, and the new electronic sovereign central bank money. There would not be any interest payed on this sovereign money, as it is deemed completely safe, as long as the central bank system is running (i.e. the central bank doesn't take any drastic measures like changing the currency, such as in Germany from Reichsmark to Deutsche Mark).

When people want to earn interest on their money they would need to put it in an investment account with a bank. The bank can now loan these funds to other customers, firms, or other banks. The bank may offer different types of investment categories, involving different levels of risk and interest rates. In order to lend out money, the banks need to have money beforehand, mostly in the form of savings. In addition, the funds invested here are not subject to insurance by the government. These funds are the corresponding amounts of financial assets that are subsumed under $M2 - M1$. Consequently, the banks can't increase 'M1' in their own accord anymore. This would make it possible for the Central bank to control the exact amount it sees fit, which is of major importance for the monetary reformers.

The SMS would become a system where the loanable funds theory would hold. The equilibrium interest rate would clear the loanable funds market, leading to higher interest rates when households provide only a small part of savings to investment accounts and with lower interest rates when people want to save more.

As a result, the interest on loans will reflect the real time preferences of society as a whole: if society wishes on aggregate to defer consumption to a future period (i.e. save), the rate of interest will be low, as individuals will place more of their money into Investment Accounts. Likewise, production should increase as more business investment takes place, ensuring that the economy as a whole can satisfy the demand for increased future consumption (Dyson & Jackson, 2012, p. 197).

2.1.2 The Monetary Creation Committee

Having introduced the key components of the SMR proposal, I now discuss how the economy can be steered by setting the amount of means of payment through this approach. This requires an institution that will decide on the right amount of money.

Similar to the current system, SMR proponents anticipate an increase in the demand for money beyond what banks can provide. In this context, there needs to be another player issuing new money. This role is fulfilled by the Monetary Creation Committee (MCC). Like the ECB, the MCC must act in accordance with its mandate, which is set by the government, most likely an inflation target, and maybe even an employment target. This would depend on democratic decision making processes. The MCC will then set the supply of money it deems necessary in order to fulfil policy goals, and will, in the normal case, credit the government with this amount. The government itself is free to do with the money as it pleases (ibid., p. 148). The MCC can also use the money to provide loans to banks for interest or buy financial assets, thereby emitting money. However, if it is deemed necessary, it can also credit the accounts of citizens. To reduce the amount of money in the system, the MCC can (with the agreement of the government) reduce the governments account at the central bank. Alternatively, it could discontinue the rolling over of credits that it has given to banks or sell securities which it already owns (Dyson & Jackson, 2012, p. 216). A final tool for reducing the amount of money in the system could be to prolong the holding requirements for investment deposits, which could impact the velocity of circulation (Huber, 2016, p. 151).

The more interesting question, though, is: how is the MCC going to know how much money is needed? In order to answer this question, we will need to understand how SMR proponents evaluate the effects of different MCC operations on output and inflation. This will be discussed in the following section.

2.1.3 Monetary Policy by Monetary Targeting

Central to the understanding of these monetary reforms is the idea of being able to control the quantity of money. Proponents of SMR suggest that monetary policy should be controlled by M1 (or M in the SMS terminology, as all M1 becomes central bank money) opposed to by the interest rate, as done in the current system (Huber, 2016, p. 150). In their view, this has never been attempted since all efforts to control the monetary supply were undermined by the ability of banks to create money (ibid.). Therefore, in an SMS, the setting of the monetary base (or high-powered money) would finally be possible. Following Huber, the central bank should then adjust the high-powered money according to the potential output of the economy (ibid., p. 149-150). This would imply that there is something like a potential output which is independent

from the money supply. The interest rate should then follow and be determined by the market. Dyson and Jackson are not using the concept of potential output explicitly. However, most of the SMR proponents base their idea of monetary policy on the equation of exchange by Fisher (Fisher & Brown, 1911, p. 26):

$$M * V = P * T \tag{1}$$

where M are means of payment in the economy; V is the velocity of circulation of this money and T is the number of transactions. As mentioned, we will now define M1 as M in the equation. This is because it is used in this scenario to settle transactions rather than less liquid financial assets, and is accepted by economic actors. Moreover, Stützel's general quantity equation will also work with M1, as it sees the other money aggregates rather as financial assets.

The equation of exchange builds a connection between the flow of transactions in a period and the corresponding stock of money. The equation is always true, as it is defined that way. Causalities are not inherent in the equation. To use it in terms of causality, one needs a theory or some assumptions.

SMR proponents see the velocity of money as relatively stable (not constant), meaning it does not fluctuate much in the short term and follows a long term stable average trend. Hence, an increase in economic activity will result in an increase of M1. Or, as Huber puts it, "Wirtschaftswachstum beinhaltet eine erhöhte Finanzierungsnachfrage, erhöhten Zahlungsverkehr, und somit einen erhöhten Geldbedarf" (Huber, 2016, p. 33).[3]

Based on the equation of exchange, Dyson and Jackson consider the effects of newly created money on inflation and output under different scenarios (2012, pp. 242-246). First, in the most relevant case (i.e. the 'normal case'), newly created money is established when it is granted to the government. In this context, the new money is associated with an expenditure of the central bank and a revenue of the treasury.[4] Depending how the government first spends this revenue – either on consumption and services or investment –the economy can be affected in different ways. If it spends it on productive investment, then the money supply and GDP are going to increase while prices stay constant, or even fall (e.g. due to lowered costs for companies thanks to better infrastructure). If, however, it is spent on consumption or services, the effect would depend on the capacity utilisation of the economy. If the economy is at full capacity utilisation, the increase in money will lead to inflation. Alternatively, if it were below full capacity, it would lead to more demand, resulting in more output, i.e. a higher GDP without inflation. Of course this is always just the immediate effect, as the money will be spent several times in the course of a year (if that is the period in question). If it is spent more in areas that are 'production-inducing', it will have less of an effect on inflation than on GDP. Different channels in this context include: new money given directly to citizens as kind of a "dividend", which would probably increase demand and be used to pay off debt or increase investments. Depending on the way in which the money is spent, the effect on the economy will be different. Consumption increases prices if the economy is already running at full output and increases

[3] "Economic growth implies a higher demand for finance, more monetary transactions and therefore a higher need for money" [authors' translation].

[4] They also have a long discussion about how to display this in the balance sheets as they do not see the central bank money as a liability. Again, as mentioned above, though this would be an interesting discussion to entertain, the system works the same way with normal double entry bookkeeping, with which we will work here.

output when it is running below. Additional investment, depending on its effectiveness, would increase output in the longer run. In general, the money entering the economy will be used several times, making the overall effect rather unforeseeable. Therefore, even with this simple equation, Dyson and Jackson conclude that not all money creates inflation, as it is more complicated and depends on what the money is spent on (2012, p. 250). In their analysis, however, these scholars fail to consider a change in the velocity of circulation. In contrast to Dyson and Jackson, Huber's view of the relationship between the money supply and economic output seems to be simpler. He states that in a modern economy, inflation would not stem from real economic activity, as the flexibility of the economy can accommodate almost any amount of demand. This makes, in his view, Friedman's famous statement "inflation is always and everywhere a monetary phenomenon" (Friedman, 1991, p. 16) true (Huber, 2016, p. 71).

By understanding the effects of changes in the amount of means of payment on the economy, what is the assessment of the SMR proponents on how the right amount of money is going to be determined? Unfortunately, both Huber and Dyson and Jackson do not provide much guidance here. Dyson and Jackson acknowledge that setting the right amount of money will be a difficult task that has to be carried out based on the theories above and the experiences of the past, i.e. an incremental approach. In Huber's opinion, the setting of the money base can target the interest rate in the economy much better than the interest rate could establish the money base (2016, p. 149). Therefore, in his analysis, output and inflation can be better targeted by setting the money supply.

What does this tell us about the underlying assumptions of the monetary targeting? On the one hand, it is interesting to note that there has not been a rule formulated yet regarding how to set the right amount of money, like Friedman's k-percent rule that proposed to increase the money supply every year by a certain percentage. This might be due to the fact that the authors realize that the MCC would not have real control over how newly created money would be used in the system. They rather opt for an incremental approach to monetary targeting. On the other hand, they see their approach as more promising to find an optimal amount of money for the economy than interest rate targeting in a system with money-creating banks. This could, in part, be due to the fact that they do not address their assumption of a stable velocity of circulation of money. The disaggregation of the equation of exchange seems to be enough for them to prove that for the real economy the velocity is stable.

3 A Balance Mechanics Perspective

Balance mechanics, developed by Stützel (1978; 1979) in Germany in the 1950s, are very similar to the stock-flow consistent framework used by post-Keynesian economists today (Godley & Lavoie, 2007). Also focusing on the importance of stock and flow analysis as a way of making sure 'nothing gets lost', Stützel conceptualized these relationships more as analytical tools rather than for model building.

3.1 Stocks

Stützel did often divide the economy into two groups, in order to think about it analytically. These can be any size as long as the sum of both groups makes up for the entire economic entity. The main group can be either a single economic unit or a group of units, while the complementary group is either the rest of the economy or the rest of the world. Like in the

stock-flow consistent framework, Stützel makes very clear distinctions between stocks and flows associated with economic transactions. Every unit's stocks can be recorded in a balance sheet. The accounting conventions used here are in accordance with ESA 2010 (European Union, 2013) and rely mainly on Lindner (2015) and Ellermann *et al.* (2017), which also contains a translation of parts of Stützel's texts. The total assets of an economic unit are made up of financial and tangible assets. Gross financial assets encompass all kinds of financial assets, which can be categorized either as a means of payment or other financial assets. Means of payment (*m*) – sometimes also called 'money' – include the most liquid financial assets that are accepted as means of payment. These differ substantially from the other financial assets (*ofa*), which are usually only associated with a promise to be exchanged for means of payment in the future, but are not in themselves used as a means of payment. In monetary economies, means of payment are usually cash – like coins and banknotes – as well as demand deposits held at banks. For banks, demand deposits do not have the quality of means of payment, as they themselves settle transactions only with central bank money (ibid., p. 6). What is regarded as money in this framework can, however, differ. In particular, as soon as any financial asset is used to settle debt, it can be regarded as means of payment (this, however, tends to differ between banks and non-banks). This is what happened with the shadow banking system before the crises, where shadow banks' liabilities became increasingly acceptable as money (Wray, 2012, p. 33). The difference between means of payment and other financial assets becomes increasingly important in times of financial crises when debtors fail to meet their obligations and creditors try to swap their other financial assets, which are losing value, for secure means of payment (Lindner, 2015, p. 6).

For a simple overview of the definitions used in the balance mechanics, Table 1 shows the balance sheet of an economic unit.

Table 1: Balance sheet (Lindner, 2015, p. 7)

Assets	**Liabilities and Net Worth**
Gross financial assets, *gfa*	Liabilities, *l*
Means of payment, *m*	Debts
Other financial assets, *ofa*	Stocks
Loans	
Bonds	
Stocks, etc.	
Tangible assets, *ta*	Net worth, *nw*
Machines	
Houses, etc.	

Based on the balance sheet, we can state the net worth of an economic unit as

$$nw = ta + gfa - l \tag{2}$$

The financial wealth of an economic unit can be derived from its gross financial assets minus its liabilities. This we call – in accordance with Lindner (2015) – the net financial assets (*nfa*) of an economic unit

$$nfa = gfa - l \tag{3}$$

with

$$gfa = m + ofa \quad (4)$$

$$nfa = m + ofa - l \quad (5)$$

With these relationships, we can understand what kind of flows affect which stocks.

3.2 Flows

We will distinguish between three important flows. The first are the income-consumption flows, which affect the net worth of a unit. While income (y) can stem from an increase in any asset on the asset side, consumption (c) is associated with a decrease of any asset on the asset side. Therefore

$$\Delta nw = y - c \quad (6)$$

The second relevant type of flow is the revenue-expenditure flow; when an economic unit realises more revenues (r) than expenditures (e), its net financial assets increase and vice versa. We can therefore write

$$\Delta nfa = r - e = \Delta m + \Delta ofa - \Delta l \quad (7)$$

The last flow to distinguish is the receipt-payment flow. This is only concerning the change in means of payment. In an equation, we write this as

$$\Delta m = receipts - payments \quad (12)$$

Treating these flows separately is very important when talking about monetary phenomena. There can, for example, be receipts without revenues if an economic unit is buying a financial asset, or revenues without a receipt when an economic unit is selling a car but does not get paid directly.

Stützel set up a quantity equation that would establish a connection between the trade turnover in a certain period with the change in the volume of means of payment (flow). This of course is different from the equation of exchange (1) that draws a connection between the money stock (stock) and the trade turnover, or alternatively, the GDP (flow). However, since the monetary reformers also claim they only want to adapt the changes in the amount of means of payment to the changes in the turnover, this will not diminish the applicability of the reform proposals (Dyson & Jackson, 2012, p. 170).

3.3 The General Quantity Equation

The relationship between economic transactions and the ensuing change in means of payment and credit in an economic system, which is similar to the balance mechanics approach, can already be found in Lautenbach (1952, p. 44 ff.). Stützel, a student of Lautenbach, expanded on his work in 1953 (Stützel, 1979) and later developed his systemic framework of balance mechanics in his habilitation in 1957 (Stützel, 1978). He derived an equation that tries to encompass all the economic phenomena that can theoretically change the means of payment needed for settling a certain ‘web’ of economic transactions. This section will present these

economic phenomena, which need to be considered in order to arrive at a general quantity equation (Stützel, 1978, pp. 208-229).

3.3.1 Trade Lockstep

In order to make the equation more accessible, we will rely on simple balance-sheet and transactions-flow matrices, as they are widely used in stock-flow consistent modelling (Godley & Lavoie, 2007). Thus, we will start with a small economy with two units and a universal bank where both units hold their accounts. Our economy is an overdraft economy, meaning the economic units have a credit line. To simplify, there are no banknotes in the system and all means of payment are held as deposits at the bank. The bank itself has no equity and all its assets are loans to economic units. At first, there is no money in the system. The financial balance sheets of all three parties are zero. Unit A and B have tangible assets (*ta*) worth 100 'money units' *m* each. While tangible assets do not have a counterpart in the balance sheets, all financial assets need to have a corresponding liability (Lavoie, 2014, p. 266). This means that the sum of all asset or all liability sides must add up to the amount of tangible assets. The transaction flows need to balance out, as every economic unit's expenditure is another unit's income. However, when units produce tangible assets (i.e. they invest) or consume them, the amount changes. Depreciation, which is also often called "consumption of fixed capital", does reduce the amount of tangible assets (Lindner, 2015, p. 8).

First and foremost, for any increase in the means of payment (*m*) to be required, units need to realise either expenditure or revenue surpluses. Otherwise, when every unit has the exact amount of revenue as expenditures, they move in step, or in "Gleichschritt" ("lockstep"), as Stützel called it (1979, p. 49). Moving in lockstep means that financial balances of the economic units do not change from the beginning to the end of a period. If all economic units increased their expenditures by the same absolute amount, it would not be enough to define a state of lockstep, as balances could still appear, depending on where the revenues accumulated themselves. Lockstep is only realised when every unit spends exactly what it earns in a certain period. The longer the respective period, however, the more likely it is that *intra*temporal surpluses and deficits will be realised. Therefore, means of payment could be needed in order to settle the economic transactions within a given period. These are the limitations of the period analysis, which we will discuss more in chapter 4. Table 3 shows this lockstep trading, where both economic units sell to one another their tangible assets of the same value. To illustrate this trade, we have a sequence of actions in our example, arising from when B first buys the assets from A. B takes out a loan from the bank (*bc*) in order to get *m* and uses these to buy the tangible assets from A. Since *m* is also a liability to the bank, it shows up as a liability in the banks' balance sheet as a demand deposit (*dd*). Subsequently, A increases it's expenditures by the same amount, buying the tangible assets from B. At the end of the period, the balance sheets look the same with no change in means of payment. The situation does not depict a "strict" revenue-expenditure lockstep, as one could easily divide the period into two or more periods, which would lead to the units realising expenditure or revenue surpluses. Hence, it is important to state that this happens within the relevant period and that possible intratemporal netting takes place (ibid., p. 209). In theory, an expansion in economic activity is possible to realise without any means of payment used, if everyone is moving in "strict" lockstep. This would mean that the in step movement is realised even in the smallest period possible – making it impossible to separate the single transactions.

Table 2: Two economic units, overdraft economy, one bank, trading in lockstep

Period/Transaction	Economic units					
	A		B		Bank	
	Assets	Liabilities	A	L	A	L
Beginning of period 1	100 ta		100 ta			
B takes out a loan from the bank to buy A's tangible assets.	*- 100 ta* *+ 100 m*		*+ 100 m* *+ 100 ta* *- 100 m*	*+ 100 bc*	*+ 100 bc*	*+ 100 dd*
B sells A it's tangible assets.	*+100 ta* *- 100 m*		*- 100 ta* *+ 100 m* *- 100 m*	*- 100 bc*	*- 100 bc*	*- 100 dd*
End of period 1	100 ta		100 ta			

As the length of the period approaches zero, the means of payment needed will also approach zero. This, of course, is a hypothetical and unrealistic case. However, it shows one extreme instance in which an SMR would not work at all, as the economy could expand or contract regardless of how the central bank sets the money base. Only when there is a deviation from lockstep, will a change in the amount and value of economic transactions have an influence on the change in means of payment. However, as one can already see, a change in the deviation from lockstep could counteract any restriction on the change of means of payment.

Stützel, in order to arrive at an equation linking economic activity and changes in the means of payment, established an indicator for how far an economic setting would deviate from revenue-expenditure lockstep. He defined this as the sum of all revenue surpluses in relation to the total amount of economic transactions (Stützel, 1978, p. 226). The more revenue (expenditure) surpluses are realised, the more the system deviates from lockstep and the more (less) (ceteris paribus) means of payment are needed to settle the transactions. The sum of the surpluses is put in relation to the total amount of transactions. If every transaction leads to a revenue surplus, then the deviation from lockstep is 1.

In order to calculate the total amount of revenue surpluses in relation to the overall transactions, we simply add the absolute value of all surpluses (i.e. revenues and expenditures) and divide by 2. This way we do not have to differentiate between the units with revenue or expenditure surpluses beforehand. As the absolute values of revenue and expenditure surpluses have to be the same size for the whole economy, the revenue surpluses are half the size of all surpluses[5].

$$\frac{1}{2}\sum_{i=0}^{n}\left(\frac{\left|r_{i,t}-e_{i,t}\right|}{T_t}\right)=\frac{1}{2}\sum_{i=0}^{n}\left(\frac{\left|\Delta nfa_{i,t}\right|}{T_t}\right)=deviation\ from\ trade\ lockstep \qquad (9)$$

The index of i stands for all the economic units of the aggregate economy, t for the time period in question and T_t for the economic transactions in that period. The latter could also be defined as transactions that generally change the net financial assets of the economic unit involved in the transaction, as opposed to financial transactions, which do not. However, this is

[5] Revenue (expenditure) surpluses always represent changes in nfa when changes in asset prices are omitted, as these can influence nfa without corresponding revenue (expenditure) surpluses.

only necessarily true if the single transaction is looked at individually and therefore lockstep is excluded[6]. This definition of transactions is different than the one used in the equation of exchange (1), as it includes the transactions of unfinished products, but excludes financial transactions. Therefore, it encompasses more than the GDP-relevant transactions (i.e. also unfinished products, reselling of products, etc.), but less than all transactions (i.e. no financial transactions). Financial transactions would not change the net financial asset position of the economic units involved, regardless of whether or not they are in a situation of lockstep, but only the composition of the financial assets held[7].

3.3.2 Straddle Effect

Assuming that deviation from trade lockstep $\neq 0$ (i.e. there is deviation), we can look at the effects that revenue and expenditure surpluses can have on the volume of means of payment. Therefore, we will look at our simple economy again (Table 3). We start with unit B taking out a loan from the bank in order to have the means of payment to buy 100 *ta* from A. Thus, we arrive in period 2 in a situation where unit A is a creditor to the bank, as it holds its means of payment as a demand deposit, i.e. the bank is indebted to A. Conversely, unit B is a bank debtor, as it owes the bank the loan it took out. This is the normal state in an economy; usually one can be either a bank creditor or bank debtor, even if one is only holding cash, which is a liability to the central bank (Lavoie, 2014, p. 206).

This is a fundamental distinction Stützel makes use of. He states that it makes all the difference if transaction flows go from bank debtors to bank creditors or vice versa. In period 2 of Table 3, the bank creditor A gives the bank debtor B money in exchange for tangible assets. In this case, the balance sheets also contract, as the economy is defined as an overdraft economy where revenues automatically pay down bank debt[8].

[6] To be precise about this is important as we just learned that transactions only change the net financial asset position, if they are not offset by other transactions. And the more a system is trading in lockstep, the more changes in net financial assets are set off.

[7] Interest payments would change the net financial asset position and are therefore categorised as expenditures and revenues for the banks.

[8] This is an important assumption that Stützel did not make explicit himself. Economic units will use all their revenues to pay down their bank debt immediately. This assumption ensures that bank creditors do not hold deposits and bank credit at the same time. Their *net* financial assets are their *gross* financial assets, as they do not have any liabilities. The reverse is true for the bank debtors, where all members only hold liabilities, but no deposits. The economic units always realize the minimum amount of liquidity. As soon as they can reduce their liquidity by paying back bank credits with liquid means of payment, they will do so. Stützel deals with liquidity concerns when he tries to make a connection between the *stock* of means of payment and the *flow* of economic transactions. He states that any liquidity concern is a behavioural assumption of economic agents deciding to hold liquidity. Therefore, he introduces them only after stating his general quantity equation, which is supposed to hold regardless of the behaviour of economic units. However, the assumption that economic units actively pay back their liabilities as soon as they have the means to do so could be regarded as a behavioural assumption as well. As he is working in an overdraft economy one could uphold this assumption more easily. Still, one would need to make also the assumption that there is only one bank account; one cannot have several accounts where some are credited and some debited. In this context, an inflow of means of payment could either reduce the volume of bank credit or leave it unchanged, depending on which account the money is debited. Further below, in footnote 12, we will expand his quantity equation in order to drop these assumptions.

Table 3: Two economic units, overdraft economy, one bank, negative straddle effect

Period/Transaction	Economic units					
	A		B		Bank	
	Assets	Liabilities	A	L	A	L
Beginning of period 1	100 ta		100 ta			
B takes out a bank loan in order to buy 100 *ta* from A.	*+ 100 m* *-100 ta*		*+ 100 m* *- 100 m* *+ 100 ta*	*+ 100 bc*	*+ 100 bc*	*+ 100 dd*
End of period 1/ Beginning of period 2	100 m		200 ta	100 bc	100 bc	100 dd
A buys 100 *ta* from B.	*- 100 m* *+ 100 ta*		*+ 100 m* *- 100 ta* *- 100 m*	*- 100 bc*	*- 100 bc*	*- 100 dd*
End of period 2	100 ta		100 ta			

Coming back to our small economy, B's inflow of means of payment will reduce its debt with the bank as it has a credit line. The reverse case can be seen in period 2 of Table 4. Here, as unit A does not have tangible assets, it will sell a service instead, which will not manifest as tangible assets in B's balance sheet. However, if A would use its labour to build B a tangible asset, it would newly appear in B's balance sheet.

Table 4: Two economic units, overdraft economy, one bank, positive straddle effect

Period/Transaction	Economic units					
	A		B		Bank	
	Assets	Liabilities	A	L	A	L
Beginning of period 2	100 m		200 ta	100 bc	100 bc	100 dd
B goes into bank debt in order to buy a service worth of 100 m from A	*+ 100 m*		*+ 100 m* *- 100 m*	*+ 100 bc*	*+ 100 bc*	*+ 100 dd*
End of period 2	200 m		200 ta	200 bc	200 bc	200 dd

The balance sheet of the bank, alongside the corresponding means of payment, expands. From these simple stock-flow consistent balance sheets, it is evident that, with respect to the relationship between changes of means of payment and economic transactions, it is important to take into account whether bank debtors or bank creditors realise revenue surpluses. Stützel tries to quantify this "straddle effect" of the transactions on the overall bank balance sheet by giving it a value between $+1$ and -1. A straddle effect of $+1$ means that every bank creditor realises a revenue surplus, while every bank debtor an expenditure surplus. Therefore, the transactions lead to increases in the banks' balance sheet by 100 % of the total amount of all revenue surpluses. Conversely, a straddle effect of -1 signifies that every bank creditor realises an expenditure surplus while every bank debtor realises a revenue surplus. Consequently, the transactions lead to a decrease in the banks' balance sheet of the total sum of all revenue surpluses. When bank creditors or bank debtors trade within their respective 'group' of bank creditors or debtors, the balance sheets do not change – given that the bank accounts have credit lines. This can be seen in Table 5 and Table 6. Table 5 shows an economic transaction

between unit A and C, who are both bank creditors. While means of payment are transferred from A to C, the length of the banks' balance sheet is unchanged. Only the composition of the demand deposits changes from being in the possession of A and C to being only in the possession of C.

Table 5: Economic transactions within the group of bank creditors

Period/Transaction	Economic units							
	A		B		C		Bank	
	Assets	Liabilities	A	L	A	L	A	L
Beginning of period 1	100 m			200 bc	100 m		200 bc	200 dd
A buys a service from C	*- 100 m*				*+ 100 m*			
End of period 1				200 bc	200 m		200 bc	200 dd

Table 6 shows the opposite case where A and C are bank debtors and make the same transaction. Again, the length of the banks' balance sheet stays the same size, while the composition changes. C does not owe anything to the bank anymore, while A's indebtedness to the bank is double what it was before.

Table 6: Economic transactions within the group of bank debtors

Period/Transaction	Economic units							
	A		B		C		Bank	
	Assets	Liabilities	A	L	A	L	A	L
Beginning of period 1		100 bc	200 m			100 bc	200 bc	200 dd
A buys a service from C. both have a credit line at the bank	*- 100 m*	*+ 100 bc*			*+ 100 m*	*- 100 bc*		
End of period 1		200 bc	200 m				200 bc	200 dd

The straddle effect can be described as the revenue surpluses (or the negative value of the expenditure surpluses) of the group of bank creditors in relation to the overall revenue surpluses (Stützel, 1978, p. 211). Usually, the amount of all revenue surpluses is bigger than that of the group of bank creditors or debtors alone. If they are the same size, then all bank creditors must have revenue surpluses and all bank debtors will have expenditure surpluses. The balance sheets will expand by the full amount of revenue surpluses. Therefore, the straddle effect is $+1$.

$$straddle\ effect_{nfa,t} = \frac{r_{bc,t} - e_{bc,t}}{1/2\sum_{i=0}^{n}|r_{i,t} - e_{i,t}|} = \frac{\Delta nfa_{\mathrm{bc,t}}}{1/2\sum_{i=0}^{n}|r_{i,t} - e_{i,t}|} \qquad (10)$$

The revenue surplus of the group of bank creditors is equal to the change in net financial assets[9]. Units in the groups can have expenditure or revenue surpluses also vis-à-vis their group members, as they can have transactions within their group as well. These, however, will net out

[9] This only holds with asset price changes staying constant. Otherwise, *nfa* could increase without any corresponding revenue surplus.

as soon as the aggregate of the change in net financial assets is calculated, since one units' income is offset by the other units' expenditure. The total revenue surplus does not contain any intragroup netting, as it is the sum of all the individual values. However, there is intra*temporal* netting taking place as the surpluses are always calculated at the end of the respective period. A unit that has a revenue surplus early on in the period can, for instance, have an expenditure surplus at the end of it. Longer time periods are generally associated with relatively more intratemporal netting. Even for the shortest periods possible, it is only in very special cases, where there is strict revenue-expenditure lockstep, that the netting would be zero.

3.3.3 Direct Credit Relations between Non-Banks

Until now we have solely dealt with real transactions causing changes in the net financial assets of the trading partners (i.e. decreases in financial assets and increases in tangible assets). Now we will look at financial transactions that do not change the value of net financial assets, but rather their composition. Direct credit relations between non-banks are, for instance, issuances of company bonds, direct credits or trade credits. With respect to the equation of exchange (1), these relations are not included in a meaningful way, or rather, are assumed to stay constant. To illustrate this, Stützel put forward the thought experiment that the economy would go on for a few days, making all the transactions it did before, with one important difference: No money would change hands, except for small things, such as buying tickets for the public transport. For all other transactions the economic actors would give each other credit (Stützel, 1979, p. 179). Therefore, they would have multiple expenditures without payments and revenues without receipts. Consequently, their balance sheets would grow with increasing direct credit relations. The equation of exchange (1), does not really give a satisfying relation between real transactions and the velocity of money. While some of the money used would be circulated many times, the rest of the money base would not circulate at all. As total transactions go down, the velocity of money would also decrease. If one were to include the real transactions in the $P * T$ part of the equation, the tautology would not work anymore, as no means of payment would have been used for these transactions (at least in the period in question). For the equation of exchange to hold, the direct-credit relations between non-banks would need to stay the same for each economic unit at the beginning and the end of the observed period (ibid.). What it shows is that the velocity of circulation is in the end a rather empty concept that offers a narrative – how often does one unit of money change hands – which it actually does not live up to. In the end it is a rather arbitrary gap filler for the equation of exchange. This does not change in the least when the equation of exchange is disaggregated, such as in equation 2.

Obviously, if one wants to draw conclusions about the change in means of payment needed in a certain period, the direct credit relations between non-banks must be taken into consideration. Therefore, we will look at the example above in a more systematic way, relying on the balance sheets we used before. Table 7 depicts the situation above. Without any means of payment, transactions can be made if the seller is willing to give the buyer a credit (*dc*). In this instance, the equation of exchange would just record no transactions, no money stock and no movement.

Table 7: Two economic units, one bank, overdraft economy, direct credit and transaction between non-banks

Period/Transaction	Economic units					
	A		B		Bank	
	Assets	Liabilities	A	L	A	L
Beginning of period 1	100 ta					
B buys 100 ta from A, A gives B a direct credit	*- 100 ta* *+ 100 dc*		*+ 100 ta*	*+ 100 dc*		
End of period 1	100 dc		100 ta	100 dc		

These kinds of direct credit relations are important, i.e. for all supply chains where the wholesalers often give direct credits to the retailers. Usually, when no direct transaction between the credit partners is involved, there will be a flow of means of payment in exchange for credit. This would then result in a change in the composition of the financial assets of the units. This can be seen in Table 8, where Direct credit relations between bank debtors and bank creditors affect the volume of bank credit in a similar way as the revenue and expenses surpluses. When bank debtors or bank creditors give out loans within their respective group, it does not affect the volume of bank credit.

Table 9 shows the simple credit relations between a bank creditor and a bank debtor and their effect on the banks' balance sheet. As can be seen when bank creditor (A) gives a direct credit to bank debtor (B), provided bank debtors pay back their debt or have a credit line, the means of payment in the system decreases. This is – at least potentially – without any 'real' transaction necessarily taking place. In Table 8, we see a restructuring of the net financial assets of both A and B. A is changing its liquid means of payment for a promissory note from B, while B is apparently rather owing money to A than to the bank. The second case, when a bank debtor (B) increases its bank debt and changes this for a promissory note of the bank creditor (A), is the opposite. In reality this can for instance happen when B is more credit worthy than A and can therefore get better conditions on the credit. It then passed the means of payment on to A, which, in this example, might be a partner company in its supply chain.

Table 8: Two economic units, one bank, overdraft economy, direct credit from bank creditor to bank debtor

Period/Transaction	Economic units					
	A		B		Bank	
	Assets	Liabilities	A	L	A	L
Beginning of period 1	100 m			100 bc	100 bc	100 dd
B borrows m from A.	*- 100 m* *+ 100 dc*		*+100 m* *- 100 m*	*+ 100 dc* *- 100 bc*	*- 100 bc*	*- 100 dd*
End of period 1	100 dc			100 dc		

Direct credit relations between bank debtors and bank creditors affect the volume of bank credit in a similar way as the revenue and expenses surpluses. When bank debtors or bank

creditors give out loans within their respective group, it does not affect the volume of bank credit.

Table 9: Two economic units, one bank, overdraft economy, direct credit from bank debtor to bank creditor

Period/Transaction	Economic units					
	A		B		Bank	
	Assets	Liabilities	A	L	A	L
Beginning of period 1	100 m			100 bc	100 bc	100 dd
B takes out a bank loan. A borrows m from B.	*+ 100 m*	*+ 100 dc*	*+100 m* *- 100 m* *+ 100 dc*	*+ 100 bc*	*+ 100 bc*	*+ 100 dd*
End of period 1	200 m	100 dc	100 dc	200 bc	200 bc	200 dd

Therefore, it makes sense to have a measure that describes the effect of direct credit relations between non-banks based on the amount of needs of payment. This can be, again, described by a straddle effect with bank creditors giving more loans to bank debtors or the other way around. The straddle effect of these direct credit relations, or, to stick more with Stützel's vocabulary, of the shifting of means of payment that are connected to the direct credit relations, can be described as follows: it is the change in means of payment held by the group of bank creditors in relation to the sum of the absolute changes in the means of payment of every single unit.

$$\text{straddle effect}_{m,t} = \frac{\Delta \text{m}_{\text{bc,t}}}{1/2 \sum_{i=0}^{n} |\Delta m_{i,t}|} \tag{11}$$

For Table 8, $\Delta m_{g,t}$ would be -100, as A is reducing its holdings of means of payment by 100; the sum of the absolute changes in means of payment would be $1/2\,(|-100| + |+100|) = 100$. Here, we take only the direct credit effect on B into account, which is an increase of means of payment by 100. Therefore, the straddle effect would be -1, signifying that the full amount of direct credit volume reduces the amount of means of payment. This, of course, is only true when B has a credit line or the behavioural assumption holds that it pays back any outstanding bank credit.

To sum up, we can already draw some conclusions about the changes in bank credit volume. The bank credit volume increases when the revenue surplus from bank creditors vis-à-vis bank debtors is higher than the direct credit flow from bank creditors to bank debtors. Conversely, the bank credit volume decreases when the revenue surplus from bank creditors vis-à-vis bank debtors is smaller than the direct credit flow from bank creditors to bank debtors.

However, it is important to also take into consideration the possibility that bank creditors change their demand deposits in longer term bank deposits. In this case, a simple reclassification of the bank money into savings account money would occur. This, however, cannot be accessed immediately. It switches from M1 to – depending on the modalities – M2 or M3. If a bank creditor changes its means of payment at the bank into a long term savings account, the means of payment by non-banks decreases. Therefore, these changes have to be included into a quantity equation.

3.3.4 The General Quantity Equation

Finally, bringing all the definitions above together, the balance mechanics relationship between economic activity and the changes in the volume of means of payment held by non-banks – the general quantity equation – can be stated (Stützel, 1978, p. 227).

$$\begin{aligned}&\left(\text{trade turnover} * \text{deviation from trade lockstep} * \text{straddle effect}_{nfa,t}\right)\\&+\left(\text{purely finance induced means of payment shifting} * \text{straddle effect}_{m,t}\right)\\&-\text{increase in long term bank deposits}\\&=\text{increase in the volume of means of payment held by non-banks}\end{aligned} \tag{12}$$

The first part of the equation deals with the revenue and expenditure surpluses that are realised and how they are distributed between bank creditors and bank debtors. The second part includes the direct credit relations between bank creditors and bank debtors and how they affect the change in means of payment. The last part, which was briefly mentioned, accounts for the possibility of bank money changing into illiquid financial assets. Here one could also include the emission of bank shares. More technically, we can also write the following with the help of equations 9-11 and what was discussed above.

$$\begin{aligned}&\mathrm{T}_t * \frac{1}{2}\sum_{i=0}^{n}\left(\frac{\left|r_{i,t}-e_{i,t}\right|}{T_t}\right) * \frac{r_{bc,t}-e_{bc,t}}{1/2\sum_{i=0}^{n}\left|r_{i,t}-e_{i,t}\right|}\\&+\frac{1}{2}\sum_{i=0}^{n}\left|direct\ credit\ granting_{i,t}-direct\ borrowing_{i,t}\right| * \frac{\Delta \mathrm{m}_{bc,\mathrm{t}}}{1/2\sum_{i=0}^{n}\left|\Delta m_{i,t}\right|}\\&-\Delta LBD_t\\&=\Delta \mathrm{M}_{NB,t}\end{aligned} \tag{12'}$$

If one is to abandon the assumption of minimal liquidity (see footnote 10), one could simply expand the equation by a term that includes the amount of money held liquid – instead of being used to pay down *bank* credit. As one can easily see, as soon as the minimal liquidity assumption is abandoned, the amount of means of payment in the system will increase.

$$\begin{aligned}&\mathrm{T}_t * \frac{1}{2}\sum_{i=0}^{n}\left(\frac{\left|r_{i,t}-e_{i,t}\right|}{T_t}\right) * \frac{r_{bc,t}-e_{bc,t}}{1/2\sum_{i=0}^{n}\left|r_{i,t}-e_{i,t}\right|}\\&+\frac{1}{2}\sum_{i=0}^{n}\left|direct\ credit\ granting_{i,t}-direct\ borrowing_{i,t}\right| * \frac{\Delta \mathrm{m}_{bc,\mathrm{t}}}{1/2\sum_{i=0}^{n}\left|\Delta m_{i,t}\right|}\\&-\Delta LBD_t\\&+\Delta m_{NB,t}\ \text{which could have been used to pay down bank debt}\\&=\Delta \mathrm{M}_{NB,t}\end{aligned} \tag{13}$$

The equation therefore states the direct relation between the trade turnover and the change in means of payment held by non-banks. If the trade turnover T_t were to increase, the change for the need for means of payment would depend entirely on the behaviour of the rest of the

equation. How can an economic system react to a limitation in the means of payment? This is a very relevant question for any monetary policy proposals trying to restrict the amount of means of payment, such as the SMR proponents which we will investigate in the next chapter.

4 Implications for Monetary Policy in a Sovereign Money System

How could an economic system react when the change in means of payment is zero, which would reflect the MCC's intention to dampen the credit cycle? First, we will look at the current system and then see if this is also applicable in an SMS framework.

The economy could of course keep the transactions constant, therefore establishing a link between means of payment and economic activity, which would be in the interest of the MCC. However, economic activity could also increase as long as one of the other parts of the equation counterbalances this effect. In this context, there would be: a) a decrease in the deviation from trade lockstep, b) a higher transaction volume going from bank creditors to bank debtors or going on within these groups, c) more direct credits being borrowed (if they are in total going more from bank creditors to bank debtors), d) a higher proportion of direct credits going from bank creditors to bank debtors, or e) an increase in economic activity without the need for more means of payment due to an increase in long term bank bonds.

These are not statements about causalities, but rather mere balance mechanical relationships. They show the ways in which a system can react, facing a restriction of means of payment. By doing so, they also show the implicit assumptions that would need to hold, in order for a link between a change in the means of payment and the economic activity to be stable. If the SMR proponents expect this link to be stable, they would need to support this claim by going through the components of Stützel's equation of exchange and explaining the causations behind them. This has not been done so far, as the disaggregation of the equation of exchange provides no further insight into these factors. It keeps the velocity of circulation for 'real' transactions stable, does not look into direct credit relations between non-banks and does not incorporate trade lockstep or straddle effects.

In an SMS, the relationships are of course a little different, as non-banks and banks share the same means of payment and banks can no longer create money. In this context – as far as the equation is concerned – the banks considered to be normal economic units. Therefore, a limitation on the means of payment could restrict deviation from trade lockstep, or transactions going from overall creditors to overall debtors. Furthermore, it could restrict overall debtors from granting direct credit to overall creditors, which would increase the means of payment as well as the possibility to liquidate long term loans.

However, it does not restrict economic activity in itself. For this to hold true, several assumptions have to be made. The first one is that economic units do not deviate less from trade lockstep in total. Additionally, they should not be allowed to shift the economic transactions in a way which would lead to more revenue surpluses for debtors. Furthermore, the direct credit relations cannot change in a way that creditors give more loans to debtors (the combination of the total volume with the straddle effect is important). Finally, it must also be assumed that the volume of long term bank credit will not increase. These assumptions do not have to be as strict because it is the overall effect of all these phenomena that counts. For example, the liquidation of long term bank loans could increase if it is counterbalanced by a smaller deviation from trade lockstep or another effect.

Regardless of possible circumventions of the means of payment by the emergence of new, unregulated kinds (as put forward by post-Keynesians), restrictions could always be circumvented by synchronising payments and transaction flows. This could be especially important within supply chains. Private clearing houses could emerge, synchronising the in- and outgoing payments, as suggested by Kaldor (1970, p. 7). This topic has been only briefly touched upon yet by the SMR proponent Gudehus (2015, p. 441) but in no sufficient depth to realise its possible impact.

What Stützel's quantity equation and the equation of exchange both fail to incorporate is consideration of different intratemporal phenomena. The equations only look at the beginning and at the end of each period and do not observe what is happening within it. However, as Stützel elaborates, the need for means of payment can hugely differ between two periods, even if the values in each period look quite similar (1978, pp. 229-235). The longer the period concerned, the higher intratemporal netting becomes and the less one can say about the amount of means of payment needed at a certain moment in time. It could be important to know if a unit's expenditures were happening all at once in a period or in small more frequent instalments. If the revenue stream is equal in both cases, then the unit would need more means of payment, as if it were to handle its' expenditures in one big payment. If this is a pattern for the whole economy – one might think of the day when wages are usually paid – then this can have a huge impact on the means of payment needed. If they would be restricted to an average value, such as in an SMR system, these different short term patterns could become very important for the system's stability. Therefore, it would be very important to consider if one is to set a fixed amount of means of payment for a certain period. This is another complication that the SMR proponents have to keep in mind.

Stützel's general quantity equation shows that the amount of means of payment required in an economy is very hard to determine beforehand. Moreover, simple aggregation over a longer period of time would probably not be able to deal with large short term deviations on the individual level. The assumptions that have to be made are very restrictive and have so far been made only implicitly. Therefore, an explication and elaboration of these assumptions is needed to be provided by SMR proponents. Their very basic model of monetary policy should also incorporate the possible reactions of the economic system, like, among others, a change in trade lock-step, straddle effects or direct credit relations. Furthermore, they should elaborate on how they would go about measuring these quite specific effects. This, of course, raises the question of whether or not this is even possible to achieve and manage.

Post-Keynesians read the quantity equation 'from right to left', meaning that the economic activity causes the changes in the money supply and the velocity of circulation. As a consequence, they never bothered to consider how the connections really work, seeing them as practically irrelevant. At least, I could not yet find any post-Keynesian literature dealing with the connections of economic activity and the money stock (or the change thereof) in stock-flow consistent terms. One could say that Stützel answered a question which was never posed by post-Keynesians themselves. His approach, however, gives additional value to the post-Keynesian critique. Dow, for instance, regards fundamental uncertainty as the central problem which makes it impossible for central banks to estimate the right amount of money in the economy (2015, p. 11). This is especially the case with a change in liquidity preference, which the central bank can hardly anticipate. Stützel considers this phenomenon through a different lens, taking into consideration more technical detail. Looking at the general quantity equation in equation 13 we can see that an increase in the preference for liquidity could lead to a) a

reduction in long term bank debt, b) an increase in the money holdings which could have been used to pay down bank debt, or c) a reduction in direct credit granting from non-banks.

A change in liquidity preference, however, does not affect the trade lockstep in combination with the straddle effect, the real side of the economy or its direct effect on the money base. This puts further uncertainty onto the central banks' forecasts.

Additionally, Stützel dissects the concept of the velocity of money and makes it easier for post-Keynesians to talk about a sovereign money system in which the money supply is purely supply determined. Here, Stützel's approach could especially help in the discussion with those who read the quantity equation 'from left to right', as it clearly shows on what assumptions this reading is based. One does not need to make use of the very flimsy concept of velocity of circulation in order to make the relationship between economic activity and change in means of payment clear. This way there might be a way out of reinforcing the very visual idea of money being a circulating entity; an image not apt for describing a monetary production economy, but which is, however, often incorporated by post-Keynesian economists.

On another note, the concept of financialisation – see for instance Hein et al. (2016) – researched by many economists, is easily compatible with the general quantity equation. The part of purely finance induced means of payment shifting has become more and more important in recent decades. The effect of these direct credit relations between bank creditors and bank debtors on the money supply can be easily understood through Stützel's work.

5 Conclusion

The SMR proponents base much of their ideas on the assumption that controlling the monetary base would lead to more nominal as well as real stability. This claim has been contested by many post-Keynesians, arguing that there is no model which could suggest how much money would be needed in a certain period. The SMR proponents base much of their analysis on the equation of exchange, which had been criticised by Stützel in a stock-flow consistent way already in the 1950s. Therefore, by reintroducing Stützel's critique, a clearer understanding of the needs for means of payment could be established, adding value and clarity to criticisms related to the setting of the money base.

Stützel sheds light on, and more so than the post-Keynesian critique so far, what really influences the change in means of payment in a certain period. These are a) the value of transactions, b) the deviation from trade lockstep, c) the straddle effect of transactions, with payment rather going from bank creditors to bank debtors or vice versa, d) the changes in direct credit between non-banks, e) the pattern of these direct credits, going more from bank debtors to bank creditors or the other way around and f) the changes in long term bank bonds. Furthermore, regarding the stability of a system, the intraperiod patterns of transactions and payments influence the need for means of payment at certain points in time. These patterns have been overlooked in a period analysis, but matter greatly. Stützel clarifies the argument of unstable velocity, which has been put forward by post-Keynesian authors. For SMR proponents to move forward, they would have to elaborate why they think Stützel's general quantity equation would behave in a stable way, which they have not done so far.

Until then, it seems quite impossible that the setting of the 'high-powered money' would work in a stable manner. It is more likely that the reactions are unpredictable and any re-steering by the MCC would lead to unforeseeable consequences. Interest rates would significantly fluctuate, leading to more uncertainty and slower growth. Moreover, a limitation on the amount

of money does not necessarily restrict the direct credit relations between the economic units, as already suggested by Wicksell.

In further research, the simple accounting relationships could be supported with empirical research on the relevance of each part of the equation in relation to different economic settings.

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