Verein für Socialpolitik

Standing Committee on Macroeconomics

Discussion Paper Series

No.: 05/17

Author(s):

Josef Falkinger

Title:

Money and finance: Services for production or appropriation?

Money and finance: Services for production or appropriation?*

Josef Falkinger[†]

November 22, 2017

Abstract

This paper considers an economy in which the financial system provides services for founded and unfounded assets. Founded assets have real investments as underlying, the unfounded assets have not. Money is used for real and financial transactions. In particular, the money supplied to the financial system may be used to honor the payoff promises of unfounded assets rather than being transmitted to real investment activity. The paper analyzes the macroeconomic equilibrium of this economy. Two main policy conclusions are drawn: First, money policy faces a difficult choice between feeding unfounded financial investment at the cost of real capital formation or triggering a financial crisis. Second, the provision of unfounded financial investment opportunities by the financial and monetary system amplifies inequality.

Keywords: *Financial distortions, unfounded assets, transmission of money, financial and real investment, unemployment and deflation.*

JEL classification: *D53, E44, E50, G01*

*I wish to thank the colleagues, students and friends who have the patience to discuss basic ideas. My particular thanks go to Timo Boppart, Voker Grossmann, Mathias Hoffmann and Martin Summer as well as to the members of the Makroökonomische Ausschuss held at Luxemburg to whom the paper was presented in July 2017.

[†]University of Zurich, Department of Economics, Zürichbergstrasse 14, CH-8032 Zürich. E-mail: josef.falkinger@econ.uzh.ch

1 Introduction

The purpose of this paper is to show in a simple macroeconomic framework, how creation and distribution of money, in interaction with a financial system that offers founded and unfounded investment vehicles, leads to a fragile balance between depressed accumulation, redistribution and financial crisis. The paper is motivated by two observations: First, we see a lot of money creation but not so much real stimulus. Second, we see a large and complex financial system which can hardly be reconciled with the view that it serves the traditional purpose to transform – in a risky world – current saving into future production capacity. Often the real basis of financial investments is not easy to identify or may not exist at all. As a consequence, many people feel to be fooled by a financial and monetary system in which services related to the creation of real aggregate wealth are confounded with services for becoming rich at the cost of others. To sort out things in a simple and transparent way this paper takes the following perspective: Economic life is production and allocation of means for today and the future. How does this life look like in an economy of money, finance and goods?

Goods are objects that can be consumed or used as inputs for producing goods. Financial products are instruments to codify promises of monetary payoffs. Money is an object that is acknowledged as means of payment. Goods can be exchanged for money and money can be exchanged for goods. Money can be exchanged for financial products and financial products pay off money. In a modern economy, money and financial products are essential: Households and firms have to use money for exchanging goods and financial products and they have to rely on promises.

Real macroeconomics focuses on the goods side. From this perspective, economic life looks as follows: Current output can be consumed or saved. The saved part is accumulated and creates future production possibilities. In a money economy, however, economic life is different. Agents are endowed with some capacity which can be exchanged for money. The resulting budget can be spent on consumption or put in the financial system for future uses. The transformation of endowment into budget and back to consumption goods depends – apart from forces in the goods markets impacting on relative prices – on the supply and distribution of money. The transformation of the saved part of the budget into future possibilities is even more decoupled from the goods world. It depends on future money supply but also on the offered financial products. For saving part of the budget earned today an agent has to purchase a portfolio of papers which promise to generate future income. The actually available budget in the future depends on the extent to which the promised pay-offs are honored. Thus, economic life is not only a question of endowments, technologies and preferences but crucially determined by the interaction of supply and distribution of money with the financial sector.

The financial sector is viewed as system that provides financial instruments. There is no specific banking function of risk transformation, nor any distinction between liquidity or solvency risks of financial agents. As a consequence, there is no risk of instability in form of bank runs. Nonetheless, a lot can go wrong and fundamental crises may emerge. The main source of potential distortions on which the paper focuses comes from the fact that in a money economy with financial markets not all assets traded in the financial market are linked one to one to real transactions. Actually, with the complex set of financial instruments used in contemporary finance, the relationship between financial assets and real underlyings seems pretty loose. Given its complexity, a complete analysis of the imperfect reality seems so hopeless that economics tends to seek comfort in the perfect world – market- or plan-based, or focuses on partial analysis. This paper takes a bold step and reduces the complex world of finance to the following dichotomy, essential for the macroeconomic perspective: There are founded assets (with real endowments or production capacities as underlying) and unfounded assets, which have no real underlying. Although there is no real project to generate the pay-off promised by an unfounded asset, the belief that pay-offs will be paid can still be rational, that is, founded; namely if there is money to cover the promises. This money can come from additional money supply or from future savings in unfounded assets, or is diverted from investments in founded assets.[1] To work out the conditions under which a given mix of founded and unfounded assets is sustainable in equilibrium, is an important subject of the paper.

Thus, the extent to which current savings transmit into future production possibilities depends on the portfolio mix of founded and unfounded financial investments. And the extent to which pay-off promises on the investments will be honored depends on the details of future monetary policy – not only on the level of money supply but also on how the money is transmitted to the different agents in the economy. According to the familiar transmission mechanism in introductory textbooks, money supply affects financing costs and thereby consumption and investment. Non-orthodox monetary policy, which has become "normal" in the recent past, rests on more fragile transmission channels. Many people have got the impression that the created

[1] To my knowledge, a systematic analysis of this aspect is missing in the literature on money, banking and finance. Also in alternative approaches like the financing through money creation view promoted by Jakob and Kumhof (2015), for instance, the deposits created by banks are in the end invested in real capital.

liquidity is absorbed by a big hole in the financial market and somehow used for profitable business that does not transmit into real activity. My approach is ignorant of details of the transmission mechanism. Like rainfall takes winding paths through vast forests before eventually flowing away to the sea in big rivers, money flows in labyrinth-like ways through the financial system. What matters is who gets the money in the end. If the money ends up with real investors, we have positive growth effects; if it is used to honor pay-off promises of unfounded assets, sustained accumulation is low and redistribution promoted.

The analysis is carried out in a simple overlapping generations (OLG) framework, in which each generation lives two periods. In the basic model, the members of a generation are identical; in an extension, poor and rich agents are considered. Section 2 outlines the basic framework. Section 3 characterizes the macroeconomic aggregates and Section 4 analyzes the macroeconomics relationships that equilibria have to fulfill. Section 5 extends the basic model by accounting for risk and inequality. A short summary of the punchline of the paper and its most important results are presented in the concluding section.

2 Basic model

At the beginning of each perod t a mass N_t of agents is born, endowed with a certain capacity. Life has two life-cycles so that generation t dies at the end of period $t+1$. There is one type of goods that can be used for consumption and investment. The goods price is denoted by p_t.

2.1 Technology and financial markets

Investment goods can be employed in a linear technology. Accumulation of K_t units of capital by real investment in period $t-1$ generates

$$X_t = a_t \; K_t, \quad a_t > 0 \tag{1}$$

units of output in period t. After production, capital fully depreciates so that the stock of capital coincides with the flow of real investment.

Two products are traded in the financial market: bonds (b) and fake-bonds (f-asset)[2]. The bond has a real underlying. It is issued by firms to finance real investment into the technology specified in (1). For a unit of capital input, p_t units of a bond have to be issued. Thus, the issuers of a bond can promise to the buyers the following pay-off per unit of money spent on the bond:

$$r_{t+1} = \frac{p^e_{t+1} a_{t+1}}{p_t}, \tag{2}$$

where p^e_{t+1} denotes the expected goods price. In addition to the bond, the financial sector offers a financial product f that imitates the bond without having real investment as underlying. For one unit of money spent on the f-asset today the buyer is promised the pay-off φ_{t+1} tomorrow. Holding f-assets along with bonds is consistent with optimal portfolio choice if

$$\varphi_{t+1} = r_{t+1}. \tag{3}$$

[2] We could have technological uncertainty and securities instead, as shown in an earlier version of this paper (August 2016). Yet, adding risk-while raising complexity – does not change basic insights on the macroeconomic implications of unfounded assets.

2.2 Endowment and preferences

At the beginning of life, each agent i is endowed with the capacity to produce $\bar{x}_t^{0,i}$ units of goods. The nominal income generated by $\bar{x}_t^{0,i}$ depends on macroeconomic conditions. If capacity output can be sold at $p_t = p_t^e$, the nominal income is $p_t^e \bar{x}_t^{0,i}$. Actually, however, the nominal income depends on the supply and distribution of money in the economy (see section 3.2). Let $m_t^0 p_t^e$ be the amount of money earned by generation t per unit of endowment. Then, the nominal income is:

$$y_t^i = m_t^0 p_t^e \bar{x}_t^{0,i}. \tag{4}$$

The income can be spent on current consumption or saved for financing future consumption. For an agent i, born at the beginning of period t, who plans to consume $c_t^{1,i}$ units in the first period of life and saves s_t^i units of money for the second period, the intertemporal possibilities are given by the following budget constraints:

$$\begin{aligned} & c_t^{1,i} = \frac{y_t^i - s_t^i}{p_t^e}, \quad c_t^{2,i} = \frac{r_{t+1} b_t^i + \varphi_{t+1} f_t^i}{p_{t+1}^e} \\ & s_t^i = b_t^i + f_t^i, \end{aligned} \tag{5}$$

where $c_t^{2,i}$ denotes consumption in the agent's second life cycle. (Consumer plans are made before the market clearing prices are established. Therefore, plans are based on expected rather than actual prices.)

Agents are assumed to have additive logarithmic preferences so that optimal saving and consumption plans are given by the following program:

$$\max_{s_t^i, b_t^i, f_t^i} U = ln\left(c_t^{1,i}\right) + \delta ln\left(c_t^{2,i}\right)$$

subject to (5). Then, the optimal portfolio choice has the following properties:

$$s_t^i = \frac{\delta}{1+\delta} y_t^i \tag{6}$$

with $b_t^i = s_t^i$ for $r_{t+1} > \varphi_{t+1}$ and $f_t^i = s_t^i$ if $r_{t+1} < \varphi_{t+1}$. Under assumption (3), agents are indifferent with respect to the allocation of s_t on bonds on the one side and unfounded financial investment on the other side. Let χ^i denote the share of savings invested in the f-asset. That is,

$$b_t^i = \left(1 - \chi_t^i\right), \; f_t^i = \chi_t^i s_t^i. \tag{7}$$

Under this portfolio choice, the consumption levels planned by an agent born at the beginning of period t are in the first period of life:

$$c_t^{1,i} = \frac{1}{1+\delta} \frac{y_t^i}{p_t^e} \tag{8}$$

and in the second period of life:

$$c_t^{2,i} = \frac{r_{t+1}}{p_{t+1}^e} s_t^i, \tag{9}$$

respectively.

It is important noticing that portfolio choice and consumption levels planned for the second period of life are based on promised nominal payoffs $r_{t+1} = \frac{p_{t+1}^e a_{t+1}}{p_t}$. Actually, the plans may be deceived (see Section 3.3).

3 Macroeconomic aggregates

Aggregating (6) and (7), we obtain

$$S_t = \frac{\delta}{1+\delta} Y_t, \; B_t = (1 - \chi_t) S_t, \; F_t = \chi_t S_t \tag{10}$$

with capital letters denoting the aggregate values of the respective individual variables (denoted by small letters.) χ is the average propensity to put savings in unfounded financial assets.

3.1 Capacity output

At the beginning of period t, the new generation with aggregate endowment $\bar{X}_t^0$ is born. In addition to this capacity, the capacity $\bar{X}_t^1$ is available which was created by real accumulation of past saving

$$K_t = \frac{(1-\chi_{t-1})S_{t-1}}{p_{t-1}}. \tag{11}$$

In sum, total capacity output in period t is given by

$$\bar{X}_t = \bar{X}_t^0 + \bar{X}_t^1,\ \bar{X}_t^1 = a_t K_t. \tag{12}$$

3.2 Supply and use of money

Let

$$M_t^e = p_t^e \left(\bar{X}_t^0 + \bar{X}_t^1\right)$$

be the aggregate volume of money supporting price expectation p_t^e. That is, M_t^e is the money supply consistent with a monetary policy rule committed to a given inflation target p_t^e/p_{t-1}. I allow for deviations from this rule by assuming that actual money supply in period t is given by

$$M_t = m_t p_t^e \left(\bar{X}_t^0 + \bar{X}_t^1\right), \tag{13}$$

where $m_t > 0$ may be equal to one but also take values below and above one.

The money is distributed through the financial system. Let M_t^{young} and M_t^{old} denote the volume of money going to young and old households, respectively. The young spend only part of their money; the saved part may be used by the financial system for covering transaction requirements or funding the part of M_t^{old} which is not covered by the value of the real capital they accumulated $(m_t p_t^e \bar{X}_t^1)$. The remaining part of saved money goes to firms for financing the purchase of investment goods.

A fair distribution of money to young and old households would exactly match their shares in the real resources. To account for distortions in the transmission of money, I assume that the distribution of money may be biased. Young households get

$$M_t^{\text{young}} = m_t^0 p_t^e \bar{X}_t^0 \tag{14}$$

units of money.[3] Fair distribution would require $m_t^{\text{young}} = m_t$. Deviation from this benchmark means that the transmission of money is biased in favor of the young ($m_t^{\text{young}} > m_t$) or to their disadvantage ($m_t^{\text{young}} < m_t$). Young households spend their money income partly on consumption, partly they leave it in the banks as savings – in exchange for pay-off promises in the future. With nomal income $Y_t = M_t^{\text{young}}$ we have for aggregate savings

$$S_t = \frac{\delta}{1+\delta} M_t^{\text{young}}. \tag{15}$$

In an analogous way, old households receive in exchange for their assets

$$M_t^{\text{old}} = m_t^K r_t B_{t-1} + m_t^\chi r_t F_{t-1} = m_t^K p_t^e \bar{X}_t^1 + m_t^\chi r_t F_{t-1}. \tag{16}$$

[3] See the Appendix for a detailed flow diagram of money, goods, property rights and pay-off promises.

M_t^{old} is the total volume of money used to honor the pay-off promises to past savings. It may be selectively targeted according to the type of investment. The saving invested into founded assets (B) has production capacity $\bar{X}_t^1$ as underlying. The other part of saving, $F_{t-1} = \chi_{t-1}S_{t-1}$, was invested in unfounded financial papers. For $m_t^K = 1$, the pay-off promise $r_t = \frac{p_t^e a_t}{p_{t-1}}$ of founded bonds is fully honored. In an analogous way, the honoring of unfounded promises depends on m_t^χ. If $m_t^K = m_t^\chi = m_t^1$, there is no discrimination between assets; still there may be discrimination between earnings from new endowment and saving ($m_t^0 \neq m_t^1$).

Although the saving in unfounded financial assets has no counterpart in real investment, it can have resource effects on the cost side. To account for this, I assume that financial agents have transaction costs for managing $F_t = \chi_t S_t$ and retain

$$M_t^T = \tau\chi_t S_t,\ \tau \geq 0 \tag{17}$$

for covering the costs.[4]

In sum, the volume of money left for firms (after accounting for consumption spending and transaction costs) is given by

$$\begin{aligned} M_t^I &= M_t - M_t^{\text{young}} + S_t - M_t^{\text{old}} - M_t^T \\ &= M_t - \frac{M_t^{\text{young}}}{1+\delta} - M_t^{\text{old}} - \tau F_t \end{aligned} \tag{18}$$

In principle, all this money can be used for purchasing investment goods. In pessimistic times, however, some money may be held back as liquidity

[4] No transaction costs are assumed for the management of B. Apart from simplicity, the focus on transaction costs of managing purely financial assets expresses the view that those assets require more complex "efforts" to be placed in the market. After all, their pay-off promises are not founded by productive investment.

$L_t \geq 0$. In this case the aggregate level of spending on investment goods is

$$\tilde{M}_t^I = M_t - \frac{M_t^{\text{young}}}{1+\delta} - M_t^{\text{old}} - \tau F_t - L_t. \tag{19}$$

If total money supply is distributed in an unbiased way ($m_t^0 = m_t^K = m_t^\chi = m_t$) and no liquidity distortion occurs ($L_t = 0$), then

$$\begin{aligned} M_t^I &= S_t - [m_t r_t F_{t-1} + \tau F_t] \\ &= B_t + [(1-\tau)F_t - m_t r_t F_{t-1}], \end{aligned} \tag{20}$$

where (13) - (17) were used in (18) and $S_t = B_t + F_t$.

Hence, the funds available for real investment are equal to aggregate saving in founded assets if and only if the saving (net of transaction cost) in unfounded assets matches the pay-off promises to unfounded investments made in the past (so that the square-bracketed term vanishes). In this case, the unfounded saving of the young finances the promises to unfounded savings in the past. If additional money is needed for honoring past promises, then it must be diverted from the saving in founded assets. In that case, however, real capital formation falls short of the saving meant to be invested in founded assets so that χ cannot be sustained. A full analysis of the conditions that sustain an equilibrium between real investment funds (M_t^I) and founded saving (B_t) is presented in Section 4.

3.3 Planned *vs.* effective consumption

Aggregate consumption in period t comes from the young generation, born at the beginning of t, plus the old generation, born at the beginning of $t-1$. Plans are based on the expectation that the actual price, p_t, coincides with the expected one, p_t^e. This is supported by the expectation that M_t^e units of money are supplied in an unbiased way. Thus, $Y_t^{1,\text{plan}} = p_t^e \bar{X}_t^0$ and according to (8), aggregate planned consumption of the young generation is

$$C_t^{1\text{ plan}} = \frac{1}{1+\delta}\frac{Y_t^{1\text{ plan}}}{p_t^e} = \frac{\bar{X}_t^0}{1+\delta}. \tag{21}$$

Moreover, using $r_t = \frac{p_t^e a_{t-1}}{p_{t-1}}$ in (9), we have for the aggregate planned consumption of the old generation:

$$C_{t-1}^{2\text{ plan}} = \frac{r_t}{p_t^e} S_{t-1} = \frac{a_t}{p_{t-1}} S_{t-1}. \tag{22}$$

Actual consumption levels, however, are determined by actual prices and funds available to consumers in period t. According to (14) and (16), the sum of money income channeled to the young is $m_t^0 p_t^e \bar{X}_t^0$, whereas the old receive in the aggregate the amounts $m_t^K p_t^e \bar{X}_t^1$ and $m_t^\chi r_t F_{t-1}$ in return for their savings in founded and non-founded assets, respectively. Using $r_t = \frac{p_t^e a_t}{p_{t-1}}$, $\bar{X}_t^1 = \frac{a_t(1-\chi_{t-1})S_{t-1}}{p_{t-1}}$ and $F_{t-1} = \chi_{t-1} S_{t-1}$, we obtain for the implied real consumption levels (addressed by superscript "eff" like effective):

$$\begin{aligned} C_t^{1\text{ eff}} &= \frac{m_t^0 p_t^e}{p_t} \frac{\bar{X}_t^0}{1+\delta} \\ &= \frac{m_t p_t^e}{p_t} \frac{m_t^0}{m_t} C_t^{1,\text{plan}} \end{aligned} \tag{23}$$

and

$$\begin{aligned} C_{t-1}^{2\text{ eff}} &= \frac{p_t^e}{p_t} \left[m_t^K (1-\chi_{t-1}) + m_t^\chi \chi_{t-1} \right] a_t \frac{S_{t-1}}{p_{t-1}} \\ &= \frac{m_t p_t^e}{p_t} \left[\frac{m_t^K}{m_t}(1-\chi_{t-1}) + \frac{m_t^\chi}{m_t}\chi_{t-1} \right] C_t^{2,\text{ plan}} \end{aligned} \tag{24}$$

respectively, where p_t deviates from p_t^e if expectations are deceived.

Comparing effective with planned consumption levels, we see that there are two possible sources of deception: One would be an unexpected rise in the price level ($p_t > m_t p_t^e$); the other one is biased money distribution ($m_t^j \neq m_t$, $j \in \{0, K, \chi\}$). The first source hits all agents uniformly; the second one is selective and redistributes consumption possibilities between young and old (if $m_t^0 \neq m_t^1$) or, if $m_t^\chi \neq m_t$ or $m_t^K \neq m_t$, among the old between those with a high share in unfounded saving and the ones with a low share. Moreover, deviations from fair money distribution and baseline money supply affect capital accumulation.

3.4 Level of real investment

Using (14) - (17), we have

$$\frac{M_t^{\text{young}}}{1+\delta} + M_t^T = m_t^0 p_t^e \bar{X}_t^0 \frac{1+\tau\chi_t\delta}{1+\delta} \tag{25}$$

and

$$M_t^{\text{old}} = p_t^e a_t \frac{S_{t-1}}{p_{t-1}} \left[m_t^K (1-\chi_{t-1}) + m_t^\chi \chi_{t-1} \right] \tag{26}$$

where $M_t^{\text{old}} = p_t C_{t-1}^{2\ \text{eff}}$ and (24) were used for the second equation.

Combining this with (13), we conclude from (18):

$$\begin{aligned} M_t^I &= m_t p_t^e \left(\zeta_t^0 \bar{X}_t^0 - \zeta_t^1 \frac{a_t S_{t-1}}{p_{t-1}} \right) \\ \zeta_t^0 &\equiv 1 - \frac{m_t^0}{m_t} \frac{1+\tau\chi_t\delta}{1+\delta} \\ \zeta_t^1 &\equiv \left(\frac{m_t^K}{m_t} - 1 \right) (1-\chi_{t-1}) + \frac{m_t^\chi}{m_t} \chi_{t-1}, \end{aligned} \tag{27}$$

where $\bar{X}_t^1 = \frac{a_t S_{t-1}}{p_{t-1}}(1-\chi_{t-1})$ was used. ζ_t^0, ζ_t^1 describe the effective rates of real saving of the young and dissaving of the old (in excess of their founded saving), respectively.

$\bar{X}_t^0$ and $\frac{S_{t-1}}{p_{t-1}}$ are given at the beginning of period t. Thus, under fair distribution of money ($m_t^j = m_t,\ j \in \{0, K, \chi\}$), the funds for real investment are squeezed by the transaction cost for current unfounded saving ($\tau\chi_t$), but also by the shadow of past unfounded saving (χ_{t-1}) which led to diminished production possibilities. For a given χ-path, the squeeze can be loosened if some consumption plans are deceived – by biased distribution of money ($m_t^j < m_t$ for some $j \in \{0, K, \chi\}$).

In sum, if the financial system offers opportunities for unfounded financial investments, monetary policy faces a difficult choice between deceiving consumption plans or accepting poor real capital formations. The conflict persists for some time even when unfounded investment stops (that is, if $\chi_t = 0$).

4 Macroeconomic equilibrium

In a first step, equilibrium price level and unemployment rate are examined for a given period. Then, the conditions are presented which sustain unfounded financial investment as equilibrium.

4.1 Equilibrium locus of price level and degree of utilization

Aggregate demand is equal to the sum of consumption, investment in firms and resources absorbed by the financial industry. The effective nominal levels of these components are determined by the funds available to households (young ones and old ones), financial agents and firms. Young households spend a share $\frac{1}{1+\delta}$ of their funds on consumption, old households spend all the funds. Collecting the respective terms from Section 3.2, we have for the level of effective demand (in real terms):

$$\begin{aligned} X_t^D &= \frac{1}{p_t}\left\{\frac{1}{1+\delta}M_t^{\text{young}} + M_t^{\text{old}} + M_t^T + M_t^I\right\} \\ &= \frac{1}{p_t}\left[m_t p_t^e\left(\bar{X}_t^0 + \bar{X}_t^1\right) - L_t\right], \end{aligned}$$

where (19) was used for the last equation.

This is brought in line with the constraint imposed by the capacity output

$$\bar{X}^{\text{tot}} \equiv \bar{X}_t^0 + \bar{X}_t^1,$$

if price level p_t and rate of underutilisation of capacity, u_t, are such that $\bar{X}_t^{\text{tot}}(1-u_t) = X_t^D$ which reduces to

$$p_t(1-u_t) = m_t p_t^e - \frac{L_t}{\bar{X}_t^{\text{tot}}}. \tag{28}$$

Without liquidity holding, the baseline policy rule ($m_t = 1$) supports full employment ($u_t = 0$) and a price level that fulfills expectation ($p_t = p_t^e$). This corresponds to what was called classical regime in traditional macroeconomics. The so-called Keynesian regime would mean that $L_t > 0$ due to pessimistic investment behavior of firms or for speculative reasons. In this case, $m_t = 1$ and $p_t = p_t^e$ are no longer consistent with full employment ($u_t = 0$). Either unemployment rises or the price level falls or both unemployment and deflation are triggered if money supply sticks to its baseline rule. Expansionary policy ($m_t > 1$) could overcome the unpleasant trade-off.

Yet, this traditional wisdom fails if the financial sector holds liquidity as puffer proportional to unfounded financial investment. If $L_t = \lambda_t F_t$, $\lambda_t > 0$, then more aggressive monetary policy is required to fight unemployment and deflation. Since $F_t = \chi_t S_t = \chi_t \frac{\delta}{1+\delta} m_t^0 p_t^e \bar{X}_t^0$, any non-discriminating stimulus in money supply boosts unfounded investment too. Monetary expansion may even be self-defeating if lavish money supply raises the propensity to save in unfounded assets (that is, χ rises with m).

Only a biased distribution of money away from unfounded savings could make expansionary money supply more effective. Yet, such a biased distribution of money not only implies redistribution of income. It may also have severe implications for future production opportunities, because accumulation of real capital is dampened pari passu with unfounded investment as long as χ is not reduced. The next section looks at the χ-dynamics more closely.

4.2 Equilibrium development of unfounded financial investment in the short-run

If saving plans budget a share $(1 - \chi_t)$ of the saving for founded assets, firms must spend an equal amount on real investment. Otherwise saving plans are deceived. This gives us the following equilibrium condition for the χ-process:

$$(1 - \chi_t) S_t = M_t^I - L_t. \tag{29}$$

Liquidity holding crowds out founded investment in a straightforward way. So we ignore its effects in the following discussion by setting $L_t = 0$. Substituting (27) for M_t^I we can rewrite the condition in the form:[5]

[5] The equivalence of (30) and (29) is shown in the appendix. It was assumed that in $t-1$ the economy is in a full employment equilibrium ($u_{t-1} = 0$).

$$\chi_t(1-\tau) = \frac{m_t}{m_{t-1}} \frac{m^0_{t-1}}{m^0_t} \frac{a_t \bar{X}^0_{t-1}}{\bar{X}^0_t} \left[\xi_t \chi_{t-1} + \frac{m^K_t}{m_t} - 1 \right] + \left(1 - \frac{m_t}{m^0_t}\right) \frac{1+\delta}{\delta} \quad (30)$$

with $\xi_t \equiv 1 + \frac{m^\chi_t}{m_t} - \frac{m^K_t}{m_t}$.

Examining the condition, we see first that (like liquidity holding) transaction costs compete with unfounded investment for the same funds. So I set $\tau = 0$ in the further analysis and focus on the question: What are the effects of money distribution and growth on the equilibrium dynamics of unfounded financial investment?

Under neutral distribution of money ($m^j = m, \ j \in \{0, K, \chi\}$), condition (30) reduces to:

$$\chi_t = \frac{a_t}{1+g_t} \chi_{t-1}, \quad (31)$$

where $g_t \equiv \frac{\bar{X}^0_t - \bar{X}^0_{t-1}}{\bar{X}^0_{t-1}}$ is the growth rate of new endowment.

Thus, high endowment growth (relative to capital productivity a_t) implies a shrinking equilibrium share of unfounded investment and low growth boosts the dynamics of unfounded investment.

The equilibrium dynamics of unfounded financial investment is dampened or amplified by a biased distribution of money through the financial system. Keeping the past money flows at baseline ($m^0_{t-1} = m_{t-1} = 1$), selective favorization of money flows towards new endowment owners (the young) – that is $\frac{m_t}{m^0_t}$ is depressed (to some value below one) – amplifies the unfounded investment dynamics if $\frac{\delta}{1+\delta}\chi_{t-1} a_t < 1 + g_t$. If however the forgone productivity from past unfounded saving ($\frac{\delta}{1+\delta}\chi_{t-1} a_t$) is not covered by endowment growth, then preferential money flows to the young dampen the χ-dynamics. In contrast, a biased distribution of money in favor of the income from saving

– raising m_t^K/m_t or m_t^χ/m_t above one – unambiguously, implies an increased level of unfounded financial investment. Also discrimination of money distribution in favor of the pay-offs on unfounded saving, $m_t^\chi > m_t^K$, boosts ξ_t^1 and thus unfounded investment in equilibrium.

In sum, the unambiguous sources of an expansive equilibrium development of unfounded financial investment are: low endowment growth and biased distribution of money in favor of the funds for financing the pay-offs on saving, in particular the pay-off on unfounded assets.

4.3 Sustainability of unfounded financial investment in the long-run

Can a stationary share of unfounded saving ($\chi_{t+1} = \chi_t = \chi$) be sustained in the long-run and what determines the real accumulation rate?[6]

With money supply at baseline level ($m_t = 1$) and neutral distribution of money ($m_t^j = m_t,\ j \in \{0, K, \chi\}$), the equilibrium dynamics are given by the equation

$$(1-\tau)\chi_t = \frac{a_t}{1+g_t}\chi_{t-1} \tag{32}$$

Thus, any $\chi \in [0,1]$ can be sustained as stationary equilibrium if growth of endowment (net of transaction costs) equals capital productivity:

$$(1-\tau)(1+g) = a. \tag{33}$$

Condition (33) is a knife edge. If it is hurt, the only stationary solution of

[6] $u = 0,\ L = 0$ in the long-run analysis

(32) is $\chi = 0$. For $(1-\tau)(1+g) > a$, $\chi = 0$ is a stable equilibrium, otherwise it is unstable and the χ_t-process explodes.

In sum, unfounded financial business is no problem as long as growth of exogenous endowment is high. Even an incentivation of unfounded financial investment by a higher pay-off than promised, $m_t^\chi > m_t$, can be sustained. Suppose that money distribution is unbiased for all other uses, then condition (30) becomes $\chi_t(1-\tau) = \frac{a_t}{1+g_t}\frac{m_t^\chi}{m_t}\chi_{t-1}$ which results in a stable χ-path as long as $\frac{m^\chi}{m}$ does not exceed $\frac{(1-\tau)(1+g)}{a}$. This can explain why epochs of prosperous times may breed unfounded financial business.

Suppose that a stationary economy with unfounded financial investment, $\chi > 0$, is facing less prosperous times so that g declines and

$$1 + g < a. \tag{34}$$

(Keeping in mind that the growth factor has to be adjusted for transaction costs, we set again $\tau = 0$ in the further analysis.) According to (32), this would lead to an immediate upward jump of the equilibrium share of unfounded saving. As time goes by, the χ-path is diverging and eventually leads to a breakdown of real accumulation ($\chi \to 1$). Can non-orthodox supply and distribution of money help? According to (30), there must be some deviation from neutral distribution of money to counteract a fall of $1 + g$ below a.[7] We discuss the possible biases in the sequence of their occurrence. Distorting $\frac{m}{m^0}$, leaving everything else neutral, would mean for (30):

$$\chi_t = \frac{a}{1+g}\chi_{t-1} + \left(1 - \frac{m}{m^0}\right)\frac{1+\delta}{\delta}. \tag{35}$$

[7] Excluding the case of accelerating inflation, we have $\frac{m_t}{m_{t-1}} = 1$. Moreover, $\frac{m_{t-1}^0}{m_t^0} = 1$ in a stationary equilibrium.

Under (34), this process would still explode towards $\chi \to 1$. Thus, selective targeting of money in favor of the new endowment owners or away from them would not solve the problem arising from poor growth. As a next possibility, we consider selective distortion of $\frac{m^K}{m}$ so that condition (30) becomes:

$$\chi_t = \frac{a}{1+g}\left[\left(2 - \frac{m^K}{m}\right)\chi_{t-1} + \frac{m_K}{m} - 1\right]. \tag{36}$$

This process has the stationary solution:

$$\chi = \frac{\frac{a}{1+g}\left(1 - \frac{m^K}{m}\right)}{\frac{a}{1+g}\left(2 - \frac{m^K}{m}\right) - 1}, \tag{37}$$

which, for $1 + g < a$, is between zero and one if and only if $\frac{m_K}{m} < 1$. But this means deception of consumption plans, as shown in (24), and discrimination against saving in founded assets, which destroys the forces behind (36). So again this type of selective money targeting is no cure for an economy with unfounded financial investment facing weak (endowment) growth. What remains is distortion of $\frac{m^\chi}{m}$. In this case process (30) reduces to

$$\chi_t = \frac{a}{1+g}\frac{m^\chi}{m}\chi_{t-1}, \tag{38}$$

which supports any χ if $\frac{m^\chi}{m} = \frac{1+g}{a}(< 1)$ and converges towards $\chi = 0$ if $\frac{m^\chi}{m} < \frac{1+g}{a}$.

Thus, if an economy, facing a negative growth shock, risks explosive unfounded asset holding and breakdown of real accumulation, discriminative distribution of money against full satisfaction of pay-off promises of unfounded saving is indeed a counteracting force. In contrast to $\frac{m_t^K}{m_t} < 1$, the deception of consumption plans by $\frac{m_t^\chi}{m_t} < 1$ undermines the incentives for unfounded financial investment and enhances the forces behind (38).

In sum, $m_t^\chi < m_t$ is the only way to avoid explosion of unfounded financial investment in an economy that enters times of weak endowment growth.

5 Extensions: Risk and inequality

To show the macro mechanics of a money economy with unfounded assets in a clear and transparent way, complexity so far has been kept at a minimal level. In reality, offering an unfounded asset by just imitating a product as simple as bonds is no plausible way of doing financial business. After all, the trade mark of new finance is complex dealing with risks. In this section, I account for this fact – still in a minimal form – by assuming that the unfounded financial product is risky.

The second extension addresses the question who benefits from the unfounded business and who pays its costs. In the basic model extra business was generated for the financial sector (if and to the extent to which $\tau > 0$). Intragenerational heterogeneity, however, was ignored so that distributional tension could only take place between the young and the old.

This section adds distributional conflict between poor and rich agents.

Like in Section 2, bonds with pay-off r_{t+1}, given by (2), are used for real investment. But now the unfounded asset doesn't pay off with certainty. Let $\pi_t \in (0,1)$ be the belief held by generation t about the probability that the f-asset pays φ_{t+1} in the future. To compensate for the risk, the expected pay-off of the f-asset, $E\varphi_{t+1} = \pi_t \varphi_{t+1}$, must exceed the safe pay-off r_{t+1}.[8]

[8] In reality, there are of course also risky assets with underlying. Adding such assets to the analysis would not change the principal implications of unfounded assets shown in

We assume, for all t:

$$r_{t+1} = \rho\varphi_{t+1}, \quad \rho < \pi_t. \tag{39}$$

To account for the fact that richer agents tend to hold a larger fraction of their wealth in risky assets than poor agents do, we modify household preferences to a Stone-Geary form, accounting for subistence requirements in young and old age ($\bar{c}^1, \bar{c}^2$ respectively).[9] Thus, saving and consumption plans are now given by the program:

$$\max_{s_t^i, b_t^i, f_t^i} EU = ln(c_t^{1,i} - \bar{c}^1) + \delta\left[\pi_t ln(c_{t,1}^{2,i} - \bar{c}^2) + (1-\pi_t) ln(c_{t,0}^{2,i} - \bar{c}^2)\right]$$

subject to

$$\begin{aligned} c_t^{1,i} &= \frac{y_t^i - s_t^i}{p_t^e}, \ s_t^i = b_t^i + f_t^i \\ c_{t,1}^{2,i} &= \frac{r_{t+1}b_t^i + \varphi_{t+1}f_t^i}{p_{t+1}^e}, \ c_{t,0}^{2,i} = \frac{r_{t+1}b_t^i}{p_{t+1}^e}. \end{aligned} \tag{40}$$

5.1 The optimal portfolio mix

Before free choice begins the necessary means for subsistence have to be put aside. At the beginning of period t, the expected expenditure for subsistence consumption in the first live-cycle is $p_t^e\bar{c}^1$. Moreover, for covering expected future subsistence expenditure $p_{t+1}^e\bar{c}^2$, any agent – poor or rich – must save

this paper. For instance, like in the basic model, unfounded risky assets could be copies of founded assets. Studer (2016) shows how profitable financial markets can be created by imitating existing securities, as long as investors are not fully aware of the true correlation of imitations and originals. In contrast to here, however, in Studer's work the copies also have underlyings.

[9] See Falkinger, Studer and Zhao (2015) for a general analysis of the implications of Stone Geary preferences in a real economy with financial markets.

an amount $\frac{p^e_{t+1}\bar{c}^2}{r_{t+1}}$ in bonds. In sum, the income required for present and future subsistence is

$$\bar{y}_t = p^e_t \bar{c}^1 + \frac{p^e_{t+1}\bar{c}^2}{r_{t+1}}. \tag{41}$$

Any remaining funds (the so-called supernumerary income) are saved with propensity $\frac{\delta}{1+\delta}$ like in the basic model. As shown in the Appendix, we have

$$s^i_t = \frac{\delta}{1+\delta}(y^i_t - \bar{y}_t) + \frac{p_{t+1}\bar{c}^2}{r_{t+1}} \tag{42}$$

and

$$\begin{aligned} b^i_t &= s^b_t \frac{\delta}{1+\delta}(y^i_t - \bar{y}_t) + \frac{p_{t+1}\bar{c}^2}{r_{t+1}} \\ f^i_t &= s^f_t \frac{\delta}{1+\delta}(y^i_t - \bar{y}_t) \end{aligned} \tag{43}$$

where $s^b_t = \frac{1-\pi_t}{1-\rho}$ and $s^f_t = \frac{\pi_t - \rho}{1-\rho}$.

According to (43), b^i/f^i declines if y^i rises. Rich agents can take more risk than poor ones and invest more heavily in the f-asset. Thus, it is the rich who are particularly interested that the pay-off promises of unfounded financial investments are served by the creation and distribution of money.

Keeping the use of money for founded business neutral ($m^0_t = m^K_t = m_t$), we have with probability π_{t-1}:[10]

$$\begin{aligned} c^{2\ \mathrm{eff},i}_{t-1} &= \frac{m_t r_t b^i_{t-1} + m^\chi_t \varphi_t f^i_{t-1}}{p_t} \\ &= \frac{m_t p^e_t}{p_t} \bar{x}^{1,i}_t \left[1 + \frac{m^\chi_t}{m_t} \frac{f^i_{t-1}}{\rho b^i_{t-1}} \right] \end{aligned} \tag{44}$$

[10] $\varphi_t = 0$ with probability $1 - \pi_{t-1}$. Then, $c^{2\ \mathrm{eff},i}_{t-1} = \frac{m_t r_t b^i_{t-1}}{p_t} = \bar{x}^{1,i}_t = c^{2\ \mathrm{plan},i}_{t-1}$.

as opposed to

$$
\begin{aligned}
c_{t-1}^{2\text{ plan},i} &= \frac{r_t b_{t-1}^i + \varphi_t f_{t-1}^i}{p_t^e} \\
&= \bar{x}_t^{1,i}\left[1 + \frac{f_{t-1}^i}{\rho b_{t-1}^i}\right],
\end{aligned}
\tag{45}
$$

where $r_t = \frac{p_t^e a_t}{p_{t-1}}$, $\bar{x}_t^1 = \frac{a_t b_{t-1}}{p_{t-1}}$ and (39) have been used. (Plans are based on p_t^e.)

Since $\frac{m_t p_t^e}{p_t}$ equals one in an equilibrium with full capacity utilization and no liquidity holding (as shown by (28)), the deviation of effective consumption from the plans for the second life cycle is given by:

$$
\frac{c_{t-1}^{2\text{ eff},i}}{c_{t-1}^{2,\text{ plan},i}} = \frac{1 + \frac{m_t^\chi}{m_t}\frac{f_{t-1}^i}{\rho b_{t-1}^i}}{1 + \frac{f_{t-1}^i}{b_{t-1}^i}}. \tag{46}
$$

We have $\frac{\partial^2 (c^{2\text{ eff}}/c^{2\text{ plan}})}{\partial (m^\chi/m)\partial y} > 0$, because $\frac{\partial f_{t-1}/b_{t-1}}{\partial y} > 0$. Hence, the rich are more sensitive to the use of money for honoring pay-off promises of unfounded assets. At the same time, however, that use of money is an important determinant for the dynamics of unfounded financial investment.

5.2 The dynamics of unfounded financial investment: Between Skylla and Charybdis

The equilibrium development of investment is given by the condition $M_t^I = B_t$, where $M_t^I = M_t - M_t^{\text{young}} + S_t - M_t^{\text{old}}$. Thus, $M_t^I = B_t$ is equivalent to the condition $M_t + F_t = M_t^{\text{young}} + M_t^{\text{old}}$. For $m_t^0 = m_t^K = m_t$, the condition reduces to:[11]

$$F_t = m_t^\chi \varphi_t F_{t-1}. \tag{47}$$

The right-hand side of the equation represents the aggregate payments to the holders of unfounded assets. Under neutral distribution of money to founded business, they must be covered by new unfounded financial investment (F_t). For the potential mechanisms behind the dynamics of unfounded investment we have to look into the determinants of the F-process. Aggregating (43), we obtain $F_t = s_t^f \frac{\delta}{1+\delta}(Y_t - \bar{Y}_t)$, where $Y_t = M_t^{\text{young}}(= m_t p_t^e \bar{X}_t^0)$ and $\bar{Y}_t = N\bar{y}_t$. Applying this for t and $t-1$ in (47) and assuming baseline money supply ($m_t = m_{t-1} = 1$ and $p_{t-1} = p_{t-1}^e,\ p_t = p_t^e$), we can rewrite the equilibrium condition in the form:[12]

$$\rho \frac{\pi_t - \rho}{\pi_{t-1} - \rho} = m_t^\chi \, \frac{a_t}{1+g_t} \eta_t, \tag{48}$$

where $\eta_t \equiv \frac{1 - \frac{\bar{c}^1 + \bar{c}^2/a_t}{\bar{X}_{t-1}^0/N}}{1 - \frac{\bar{c}^1 + \bar{c}^2/a_{t+1}}{\bar{X}_t^0/N}}$ describes the share of supernumerary endowment in total endowment of generation t compared to generation $t-1$. If that share remains constant over time, we have $\eta = 1$; if it rises then $\eta < 1$.

Condition (48) shows that – given the fundamental development of the economy – the two channels through which the saving in founded assets is brought in line with the level of real investment funds ($B_t = M_t^I$) are: the flow of money to the holders of unfounded assets (m_t^χ) and the development of belief π about the likeliness that unfounded investments pay-off. The fundamen-

[11] For $m_t^0 = m_t^K = m_t$, we have $M_t^{\text{young}} + M_t^{\text{old}} - M_t = m_t p_t^e \bar{X}_t^0 + m_t r_t B_{t-1} + m_t^\chi \varphi_t F_{t-1} - m_t p_t^e(\bar{X}_t^0 + \bar{X}_t^1)$. Substitution of $r_t = \frac{p_t^e a_t}{p_{t-1}}$ and $\bar{X}_t^1 = \frac{a_t B_{t-1}}{p_{t-1}}$ gives (47).

[12] With $\varphi_{t+1} = \frac{r_{t+1}}{\rho}$, $r_{t+1} = \frac{p_{t+1}^e a_{t+1}}{p_t}$ and $r_t = \frac{p_t^e a_t}{p_{t-1}}$, condition (47) becomes $s_t^f p_t \left[\bar{X}_t^0 - N\left(\bar{c}^1 + \frac{\bar{c}^2}{a_{t+1}}\right)\right] = \frac{s_{t-1}^f}{\rho} \frac{p_t^e a_t}{p_{t-1}} \left[p_{t-1}\bar{X}_{t-1}^0 - \left(p_{t-1}\bar{c}^1 + \frac{p_{t-1}\bar{c}^2}{a_t}\right)\right]$, which for $p_t = p_t^e$ is equivalent to (48).

tal development is given by the ratio of capital productivity to endowment growth potentially modified by a change in the relative burden of subsistence requirements. For $a_t = 1 + g_t$ and $\eta_t = 1$, $m_t^\chi = m_t (= 1)$ supports a long-run equilibrium with a stationary propensity to save in unfounded assets as discussed in Section 4.[13] If endowment growth is insufficient to support such stationary development $(1 + g_t < a_t \eta_t)$, then either the distribution of money is discriminatory against unfounded assets $(m_t^\chi < m_t = 1)$ or the propensity to save in unfounded assets rises. The latter requires that investors' belief in full honoring of the pay-offs promised for unfounded asset holding is becoming more optimistic $(\pi_t > \pi_{t-1})$. In sum, if economic fundamentals worsen due to poor growth then the monetary system faces an Ulyssean choice: Either to generously feed the beast of unfounded financial investment by strengthening the commitment to fund the promised pay-offs. Or to trigger a financial crisis by not providing enough funds for honoring the promises.

5.3 Unfounded financial investment: An amplifier of inequality

For examining the distributional consequences of unfounded financial investment opportunities, we consider two types of agents: a poor and a rich one. Endowment at birth is $\bar{x}^{0,L}$ for the first and $\bar{x}_t^{0,H} > \bar{x}_t^{0,L}$ for the second. How large is the life time wealth they can achieve under optimal consumption and saving plans?

[13] Note that $\frac{\pi_t - \rho}{\pi_{t-1} - \rho} = \frac{s_t^f}{s_{t-1}^f}$. In the basic model, the propensity to save in unfounded assets was χ_t. For $m_t^0 = m_t^K = m_t$, $\tau = 0$ and $L_t = 0$, condition (30) boils down to $\frac{\chi_t}{\chi_{t-1}} = \frac{m_t^\chi}{m_t} \frac{a_t}{1+g_t}$, which is the analogous condition to (48).

Without bequests life-time wealth of an individual born at the beginning of period t is the present value

$$z_t^i \equiv c_t^{1,i} + \frac{Ec_t^{2,i}}{a_{t+1}} \tag{49}$$

of current and expected future consumption (discounted by the real interest rate a_{t+1}).

Keeping money supply at baseline ($m_t = 1,\ p_t = p_t^e$) and assuming neutral distribution of money ($m_t^0 = m_t^K = m_t^\chi = m_t$), we have $y_t^i/p_t^e = \bar{x}_t^{0,i}$ and $\frac{r_{t+1}}{p_{t+1}^e} = \frac{a_{t+1}}{p_t}$. With this we obtain from (40)-(43)

$$c_t^{1,i} = \frac{1}{1+\delta}\bar{x}_t^{0,i} + \frac{\delta}{1+\delta}\bar{c}^1 - \frac{1}{1+\delta}\frac{\bar{c}^2}{a_{t+1}} \tag{50}$$

and

$$\begin{aligned} Ec_t^{2,i} &= \frac{a_{t+1}}{p_t}\left(b_t^i + \frac{\pi_t}{\rho}f_t^i\right) \\ &= a_{t+1}\left[\frac{\delta}{1+\delta}\left(\bar{x}_t^{0,i} - \left[\bar{c}^1 + \frac{\bar{c}^2}{a_{t+1}}\right]\right)\left(s_t^b + \frac{\pi_t}{\rho}s_t^f\right) + \frac{\bar{c}^2}{a_{t+1}}\right], \end{aligned} \tag{51}$$

where $E\varphi_{t+1} = \pi_t\frac{r_{t+1}}{\rho}$ was used from (39). Thus,

$$z_t^i = \bar{x}_t^{0,i}\frac{1+\delta\left(s_t^b + \frac{\pi_t}{\rho}s_t^f\right)}{1+\delta} - \left(\bar{c}^1 + \frac{\bar{c}^2}{a_{t+1}}\right)\frac{\delta}{1+\delta}\left(s_t^b + \frac{\pi_t}{\rho}s_t^f - 1\right). \tag{52}$$

The first component of z describes the extra return that can be extracted from taking the risk of unfounded investment (by assumption (39): $\pi_t/\rho > 1$). This amplifies the worth of endowment $\bar{x}^{0,i}$. The second term describes the forgone opportunity to earn the extra-return on the resources required for subsistence. (For $\pi_t = \rho$, z_t^i would coincide with $\bar{x}_t^{0,i}$.)

As a consequence

$$\frac{z_t^H}{z_t^L} > \frac{\bar{x}_t^{0,H}}{\bar{x}^{0,L}}. \tag{53}$$

Unfounded financial investment enhances inequality. The rich, being able to take more risk, can exploit the margin between unfounded and founded investment better than the poor.

6 Conclusion

Saving is equal to investment and investment creates production capacity. This is the wisdom of real macroeconomics. In the more modern jargon, inspired by finance, saving means financial investment, that is, buying an asset that promises future pay-offs. The skilled economist sees here two sides of the same coin. After all, no real pay-off can be generated without real underlying. Even though this is true from the aggregate perspective on a closed system, for single agents or groups the link between pay-off and production can be suspended.

In the complex world of modern finance it is no easy task to trace out the relationship between financial products and their underlyings. Some products may have no real underlying at all. This paper examined if and how a mix of founded and unfounded assets can be sustained as equilibrium in a monetary economy with financial markets. Apart from the confusing complexity of the financial system an important fact is that pay-off promises for financial investments are honored in terms of money rather than goods. Thus the creation and distribution of money plays a key role for sustaining or destroying unfounded financial investment.

The analysis showed three main consequences of unfounded financial investment. First, the formation of production capacity is depressed since part of the saved resources is used as pay-off to past unfounded investment rather than for new real investment. Second, if endowment growth falls short of the level needed to support a stationary mix of founded and unfounded investment, then monetary policy faces an awkward choice: Either to raise the propensity to invest in unfounded assets by strengthening the commitment to inject money into the financial system for honoring promised pay-offs that are not covered by the revenue of a real underlying project; or to trigger a financial crisis by not providing the funds for honoring the promises. Third, the provision of unfounded investment opportunities by the financial system and its support by monetary policy amplify inequality.

A Appendix

Derivation of (30)

With $S_t = \frac{\delta}{1+\delta} m_t^0 p_t^e \bar{X}_t^0$ and $\frac{S_{t-1}}{p_{t-1}} = \frac{\delta}{1+\delta} \frac{m_{t-1}^0 p_{t-1}^e}{p_{t-1}} \bar{X}_{t-1}^0$, the expression for M_t^I in (27) can be written as

$$S_t \frac{m_t}{m_t^0} \left\{ \frac{1+\delta}{\delta} \left(1 - \frac{m_t^0}{m_t} \frac{1+\tau\chi_t\delta}{1+\delta} \right) - \frac{m_{t-1}^0}{m_{t-1}} \frac{a_t \bar{X}_{t-1}^0}{\bar{X}_t^0} \zeta_t^1 \right\},$$

where equilibrium condition (28) was used for $\frac{m_{t-1}^0 p_{t-1}^e}{p_{t-1}} = \frac{m_{t-1}^0}{m_{t-1}}$.

Thus, the condition $(1-\chi_t)S_t = M_t^I$ reduces to

$$1 - \chi_t = \frac{m_t}{m_t^0} \frac{1+\delta}{\delta} - \frac{1}{\delta} - \tau\chi_t - \frac{m_t}{m_{t-1}} \frac{m_{t-1}^0}{m_t^0} \frac{a_t \bar{X}_{t-1}^0}{\bar{X}_t^0} \zeta_t^1$$

which gives (30).

Derivation of optimal saving plans ((42) and (43))

The first order conditions for the program $\max\limits_{s_t, b_t, f_t} EU \;\; s.t$ (40) are:

$$\begin{aligned}
&(s) \quad \frac{1}{c_t^1 - \bar{c}^1} \frac{1}{p_t^e} = \lambda \\
&(b) \quad \frac{\delta r_{t-1}}{p_{t+1}^e} \left(\frac{\pi}{c_{t,1}^2 - \bar{c}^2} + \frac{1-\pi}{c_{t,0}^2 - \bar{c}^2} \right) = \lambda \\
&(f) \quad \frac{\delta}{\rho} \frac{r_{t+1}}{p_{t+1}^e} \frac{\pi}{c_{t,1}^2 - \bar{c}^2} = \lambda
\end{aligned}$$

where (39) was used for (f) and super- or subscripts are omitted when it produces no misunderstanding. Eliminating λ (the Lagrange multiplier for $b + f \le s$) from (b) and (f), we get

$$c_{t,1}^2 = \frac{\pi(1-\rho)}{(1-\pi)\rho} c_{t,0}^2 - \bar{c}^2 \frac{\pi - \rho}{(1-\pi)\rho}.$$

Using (40) we can rewrite the equation in the form $\frac{r_{t+1}}{p^e_{t+1}}\left(b+\frac{s-b}{\rho}\right)=\frac{\pi(1-\rho)}{(1-\pi_t)\rho}\frac{r_{t+1}}{p^e_{t+1}}b-\bar{c}^2\frac{\pi-\rho}{(1-\pi_t)\rho}$. Solving for b, we have:

$$b=\frac{1-\pi}{1-\rho}s+\frac{\pi-\rho}{1-\rho}\frac{p^e_{t+1}}{r_{t+1}}\bar{c}^2$$

and

$$f=\frac{\pi-\rho}{1-\rho}\left(s-\frac{p^e_{t+1}}{r_{t+1}}\bar{c}^2\right).$$

Substituting the two terms for b and f in the term for $c^2_{t,1}$ in (40), we get

$$c^2_{t,1}=\frac{r_{t+1}}{p^e_{t+1}}\frac{\pi}{\rho}s-\bar{c}^2\frac{\pi-\rho}{\rho}$$

and thus from (f):

$$\frac{1}{\lambda}=\frac{1}{\delta}\left(s-\frac{p^e_{t+1}}{r_{t+1}}\bar{c}^2\right).$$

Using this and (40) in condition (s), we have $\frac{1}{\delta}\left(s-\frac{p^e_{t+1}}{r_{t+1}}\bar{c}^2\right)=y-s-p^e_t\bar{c}^1$ which gives us:

$$s=\frac{\delta}{1+\delta}(y-\bar{y})+\frac{p^e_{t+1}}{r_{t+1}}\bar{c}^2.$$

This proves (42) and, substituting the term for s in the expressions for b and f above, we have (43).

References

Falkinger, J., S. Studer and Y. Zhao (2015), "Explaining structural change towards and within the financial sector", *University of Zurich, Department of Economics, Working Paper No. 206*

Jakob, Z. and M. Kumhof (2015), "Banks are not intermediaries of loanable funds – and why this matters." *Bank of England Working Paper No. 259.*

Studer, S. (2016), "An equilibrium model with diversification seeking households, competing banks and (non-)correlated financial innovations" in *Essays on the real economy and the financial sector*, PhD thesis, University of Zurich, Department of Economics. (www.zora.uzh.ch).

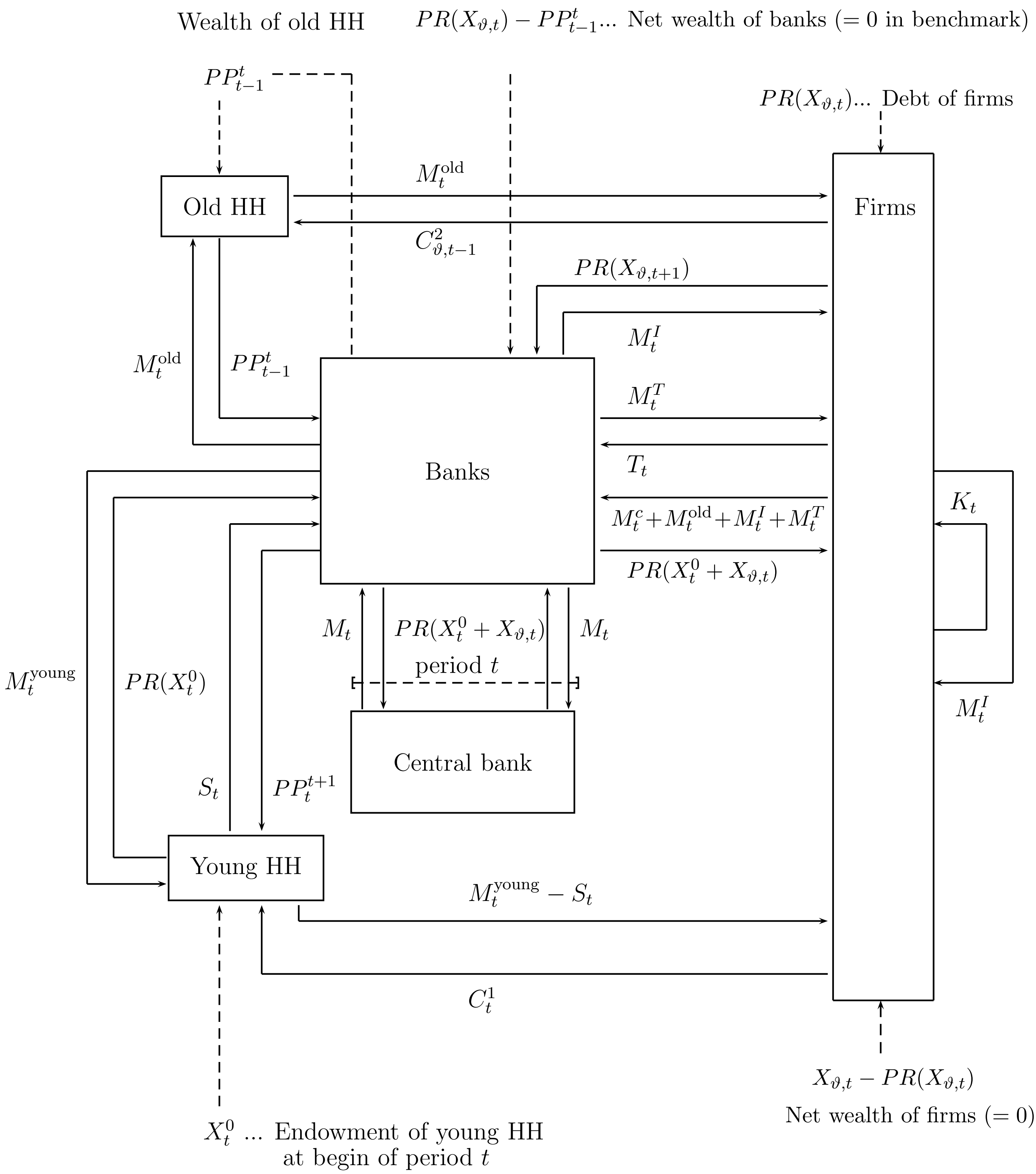

Figure 1: The distribution of money in exchange for property rights, payoff promises and the exchange of goods for money. PP_{t-1}^{t} denotes payoff promise for period t made in period $t-1$. $PR(X)$ means property right in X and M are money flaws. Dotted lines indicate positions “inherited” from past.