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The Structure of Production and Endogenous and Exogenous Liquidity of Financial Intermediaries

Abstract

Banks directly manage their own liquidity. Banks also indirectly manage the liquidity of the entire economic system. In this article we discuss the relationship between endogenous and exogenous bank liquidity, and their corresponding relationship to the structure of production. We explore these liquidity relationships in the context of both a decentralized and centralized system of free banking, comparing both with the monopoly regime of central banks, “convertible and inconvertible liabilities. We analyze the incentives that engender a liquid “system in the context of free banking as well as the perversion of those same incentives in the context of central banking, which leads to breakdowns in the system’s ability to maintain liquidity. Additionally, we touch upon the fact that the criteria for individual liquidity and systemic liquidity do not coincide. They differ, and we explain their difference in a more expansive treatment of the concept of exogenous liquidity. Regarding that concept, as of late, central banks have been employing increasingly lax criteria for what constitutes eligible collateral that might be monetized.

Keywords

liquidity, endogenous liquidity, exogenous liquidity, solvency, asset structure, capital structure, portfolio structure, monetary liabilities, central banks, free banking

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1. Liquidity and Solvency of an Individual Economic Agent

If an economic agent wants to endure the vagaries of the market process, then it will be concerned about its ability to fulfill its financial obligations incurred in the natural course of business. There are two aspects to the ability to fulfill financial commitments (Scherman, 1938). The first one is solvency, which refers to the ability of an economic agent to generate enough income to service external debt. The second is liquidity, which refers to the ability of an economic agent to generate enough income to service and pay off external debt in time (Minsky, 1992). Put differently, liquidity means the debt can be paid off within the period originally agreed upon by both parties. Solvency means the debt can be paid off, but not necessarily in the period originally agreed upon. Solvency is achieved by having a successful business model that can create economic value for consumers. Liquidity is achieved by delivering goods and services at the moment previously agreed upon. Liquidity can be achieved in a variety of ways, but not all of them are satisfactory.

These two concepts are intimately related. While it may be possible to separate them theoretically, in practice it becomes much more complicated and difficult. As a general principle, any economic agent must be both solvent and liquid to avoid default. The concept of solvency is related to the economic value added to the goods and services produced by the agent. The concept of liquidity is related to the timespan in which the goods and services produced are provided to third parties. From the concepts of solvency and liquidity, we can deduce a three-dimensional representation of the economic agent's economic reality (Lachmann L. M., 1956):

1. The asset structure, comprising all the assets the economic agent owns. The asset structure is part of a business plan that specifies how, by how much, and when those assets are able to generate a stream of income.

2. The liability structure, comprising the commitments to repay the external resources third parties provide to the economic agent. The liability structure is also part of a business plan that specifies the conditions under which the external resources are granted, such as when and at what price, and how the external resources are going to be returned.
3. The portfolio structure, comprising claims the economic agent has against third parties in exchange for the resources made available by them. It also specifies the conditions under which the resources are granted to third parties, such as when and at what price, and how the resources are going to be returned.

As we have argued, for an individual agent to be fully functional, it must not only be solvent but also liquid. This means the economic agent should not only own enough assets that can generate economic value but should also have those assets organized in such a way that the agent is able to deliver consumer goods at the moment when consumers demand them. Therefore, the concept of liquidity is closely tied to all three structures outlined above.

Thus, for an economic agent to preserve its own liquidity, its asset structure must be aligned with its liability structure and the portfolio structure of the ultimate providers of capital. In other words, the expectations expressed in the portfolio concerning the recovery of the resources of the capital providers must be aligned with the ability of the asset structure to produce income. In the case of an individual agent, the last two structures match out of logical necessity.

From the economic agent's perspective, its own liability structure and the portfolio structure of its capital providers match. In the case of direct financing, every liability of the economic agent finds its counterpart in an asset owned by a counterparty. However, when financial intermediaries and indirect financing enter the equation, the liability and portfolio structures do not necessarily match. Therefore, to the individual agent, the liability and

portfolio structures are nothing more than manifestations of the same economic activity from the perspective of different agents.

“Discrepancies between expectations as to when the ultimate providers of capital will withdraw resources and when the economic agents in question will be able to return those resources can arise if there is a maturity mismatch between the asset and liability structures of the economic agents. The asset and liability structures are matched when the economic agents’ own assets are producing enough cash inflows, by selling the produced goods and services, to cover all the cash outflows that arise from their liabilities—that is, their commitments to generate income for capital providers.” (Palyi, 1936).

Problems can arise if the economic agent creates value in the form of consumer goods at a slower pace than promised to and expected by the final providers of capital to the economic agent. In this case, the incoming cash flows generated by the assets do not suffice to meet all current cash commitments expressed in the agent’s liabilities.

If not appropriately addressed, such a misalignment between the asset and liability structures of an economic agent can lead to a suspension of payments. The agent can even find itself forced to sell some of its assets to pay off part of its outstanding obligations.

We will use the term “endogenous liquidity” to refer to the ability of an economic agent to cover its cash commitments with the cash flows its own assets generate. We will use the term “exogenous liquidity” to refer to an economic agent’s need for a third party’s liquidity to cover the agent’s cash commitments (Somary, 1915). An agent unable to cover its cash commitments with the cash flows coming from its own assets is forced to find new sources of funding, renew previous funding, or sell some of its assets. For each of the three solutions, the economic agent needs exogenous liquidity to survive—that is, it depends on a third party’s cash flows.

The appropriate arrangement of an agent's structure of assets and liabilities is a principle that might appear wholly unconnected with the concept of solvency. This is, however, not the case. An agent in possession of assets that are able to generate plenty of income could find itself in a situation in which, because of an ill-chosen liability structure, the income is not enough to cover short-term liabilities. In other words, it is possible that a company has a solid business model, with assets capable of generating plenty of wealth, and yet at the same time finds itself unable to make payments on short-term liabilities when they come due. In this case, if the assets of the agent are illiquid — and most assets that generate wealth over long periods certainly are — then the agent will not be able to sell these capital goods in the market without a significant discount. In the absence of a structure of production similar to the agent's current one, the assets on sale could suffer even bigger price cuts since they are not easily convertible into production goods that serve other economic purposes (Lachmann L. M., 1956). More specifically, the market will demand dramatic price cuts on the assets put up for sale because buyers will need to rearrange those assets into a different structure of production. If the price cut is great enough, the economic agent in question can go bankrupt. In this case, the need for exogenous liquidity through the fire sale of assets implies an insolvency that has nothing to do with the assets' ability to produce income and generate wealth. We could say, in other words, that illiquidity can easily lead to insolvency.

2. Liquidity and Solvency in the Entire Economic System

The case of the individual economic agent resembles the case of an entire economic system when it comes to solvency. The economic system performs a coordinating function if all the needs of consumers are satisfied by producers (Hayek F. A., 1931). The market process, a continuous and dynamic process of trial and error, is responsible for providing the environment in which changes in consumer desires result in corresponding changes in the

production structure and benefit those whose production structures best attend to the new desires (Huerta de Soto, 1992). Such benefits, usually expressed in terms of profit, provide the natural incentive to continue to engage in economic activity that serves to coordinate all economic agents. Put simply, systemic solvency occurs when there is a healthy structure of production with plenty of assets capable of producing goods and services in line with consumer needs and preferences.

Problems may arise when we begin to examine the liquidity of the system as a whole. At this point, we must relax what we said earlier in the case of the individual economic agent about the liability structure matching the portfolio structure of capital providers. When analyzing the entire system as a whole, these structures do not necessarily match.

Without financial intermediaries, the system would not differ at all from the individual agent. In the absence of financial intermediaries, producers sell their liabilities directly to savers, and therefore the liabilities of the former are per definition the assets of the latter¹. In contrast, financial intermediaries can have different types of claims in both their asset and liability structures.

The financial sector is in charge of coordinating producers and capital providers. It must ensure that the liabilities of businesses are appropriately matched with the portfolio structure of society. A healthy and functional financial sector will provide financing to the productive sector with the same maturity and risk profile that savers provide to financial intermediaries.

The financial sector's task is to align the commitments of producers to generate income and the commitments of the banking sector to distribute this income to its customers. By balancing its structure of assets and liabilities, the banking sector ensures that the producers' liabilities, which are largely the banks' assets, are consistent with the portfolio structure of society, which consists largely of the banks' liabilities.

Put differently, financial intermediaries serve as a bridge between savers (or consumers of future wealth) and producers (or creators of future wealth). Therefore, it is of utmost importance that the intermediaries adhere to the intentions of savers when investing and allocating the savers' funds.

If savers are future consumers², then intermediaries should channel funds into the creation of future wealth which will be available when savers expect to become consumers and to use their ability to withdraw goods and services from the market. This is the essential coordinating function to which we alluded earlier when referring to the financial system and how it aims to provide intermediaries with funding that matches the maturity and risk profiles of savers seeking to accumulate wealth for future consumption at a precise later date. Thus, the liability structure of the productive sector and the portfolio structure of savers (future consumers) will be perfectly coordinated if and when financial intermediaries are able to match their own structure of assets (composed of the producer liabilities they have claims to) and their own structure of liabilities (composed of the assets in the portfolios of future consumers).

By contrast, even in a healthy productive sector (with an appropriately balanced asset structure and liability structure), a dysfunctional financial sector could cause producers to fail to produce the wealth that consumers or capital providers demand at a given future moment. That is, even with a productive sector that appears to be solvent and liquid, if there is a general mismanagement of liquidity in the financial system and consequently a failure to produce wealth at the moment economic agents demand it, the system is illiquid.

In other words, when financial intermediaries engage in maturity mismatching (Fekete A. E., 1984), they are sending a false signal to producers that they can use the resources over a longer period than savers are actually willing to wait. Savers (future consumers) expect to exercise their right to consume the resources that were advanced to producers in a shorter timeframe than that over which the resources are invested³. Producers also receive distorted

information: their funds need to be available at shorter notice than the creation of future wealth truly requires. As soon as savers decide to exercise their claim on consumer goods, problems in the economic system arise⁴.

As we discussed in the previous section, the concept of exogenous liquidity makes sense for an individual company as a last resort to remain solvent, but when analyzing the system as a whole this concept becomes much narrower. Exogenous liquidity requires an external economic agent with endogenous liquidity. If this is not the case and endogenous liquidity in the entire system has disappeared because the financial system is dysfunctional, then there is no other way out than the default and restructuring of both capital providers and the productive sector, as well as the financial sector that functioned as an intermediary between both. This process is commonly called an economic crisis (Huerta de Soto, 1998).

The cause of the miscoordination between the asset structure of society and the liability structure of producers is to be found in the miscoordination between the asset and liability structures of financial intermediaries. The inevitable question is, given that the survival of a financial intermediary or the entire financial sector is based on both solvency and liquidity, what causes financial intermediaries to fall systematically prey to this type of miscoordination, losing their own liquidity and consequently the entire sector's liquidity? To answer this question, we will proceed by applying the concepts of endogenous and exogenous liquidity to the specific cases of different banking systems.

3. Endogenous Liquidity and Exogenous Liquidity of Financial Intermediaries

By endogenous liquidity we mean a bank's ability to meet its obligations with its own resources and without the help of other banks or the central bank. This entails either having

sufficiently ample reserves or the ability to access those reserves when necessary by calling in loans (Somary, 1915).

Financial intermediaries, just like any other economic agents, achieve endogenous liquidity when the cash flows from their producing assets are sufficient to cover all ongoing financial commitments (liabilities) they have made to others (Merhling, 1999). When this is not the case, the financial intermediaries must be considered illiquid.

Obtaining and maintaining sufficient liquidity is especially difficult in the banking sector. Indeed, it is the subject of much controversy. This is because many of the resources at the bank's disposal are determined by its creditors who prefer demand deposits over other types of credit. Therefore, the bank must match the creditors' credit with equally short-term investments if it wants to achieve endogenous liquidity (Agger, 1914).

Proper liquidity management enables both an individual's liquidity and the total liquidity in the system to be in perfect harmony. This implies that all payments and collections, or payables and receivables, end up coinciding⁵.

By exogenous, or derived, liquidity we mean a bank's ability to meet its financial obligations through the aid of external entities, be they temporary or permanent⁶. Through such external aid, the bank is able to meet its obligations by selling some of its assets on the market, thereby transferring its illiquid position to a third party that assumes the illiquid position.

By refinancing in the interbank, or repo, market, the bank can essentially meet its obligations by "renting" the liquidity of a third party on a short-term basis. The interbank market enables structurally liquid banks to resolve occasional illiquidity. That is, the interbank market enables the bank to meet its current obligations whenever the bank has greater outflows than inflows, if the bank in the very near future will receive greater inflows than outflows and will therefore be able to meet its obligations in the interbank market with its excess inflows. In other words, the interbank market can be, and is, a powerful refinancing tool for banks. But the

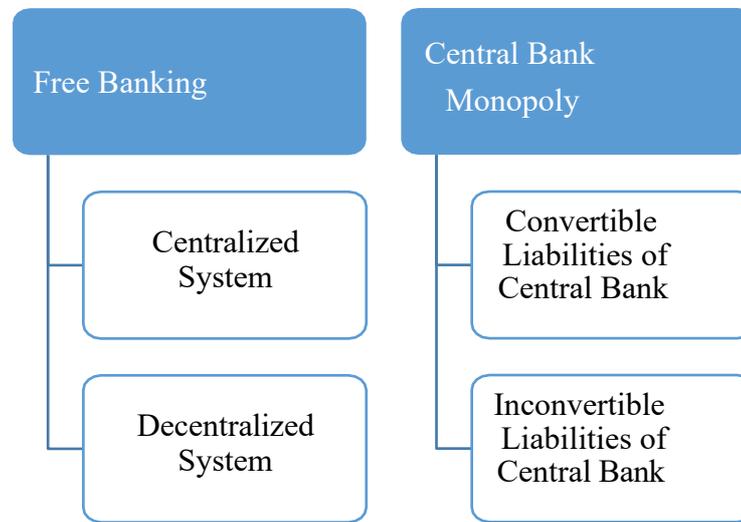
interbank market requires a structurally liquid underlying financial system, in which some banks can be temporarily illiquid because of isolated mismatch between inflows and outflows. The excess inflows from certain banks are temporarily put at the disposal of banks that find themselves short of bank reserves⁷. Thus the interbank market is a vehicle based on the concept of exogenous liquidity that enables some banks to obtain endogenous liquidity from other banks. The liquidity of the entire system is not necessarily compromised; some banks are able to satisfy the need for liquidity temporarily with the endogenous liquidity of other banks.

Exogenous liquidity can also be obtained by refinancing at the central bank. That is, banks can either resort to other banks to shore up their specific liquidity deficiencies or they may go to the central bank. The central bank, like any other bank, gradually loses endogenous liquidity when it provides exogenous liquidity to other banks in the financial sector. Here the collateral requirements of monetizable assets—i.e., the assets that might be used as a guarantee against a credit in order to obtain banking reserves (the exogenous liquidity) extended to the financial sector—come into play. The eligibility of collateral varies significantly depending on which monetary system is studied. Because central banks are at the center of the financial system⁸, the requirements for monetizable collateral in some way determine the asset structure of the financial system and, consequently, a large part of the liability structure of society⁹.

4. Endogenous Liquidity and Exogeneous Liquidity in Different Systems

We will distinguish two types of banking systems: the free-banking system and the central bank monopoly system. Within these two systems we will make two further divisions. Within the free-banking system, we will analyze a system of decentralized reserves and a system of centralized reserves. Within the central bank monopoly system, we will discuss a system of convertible central bank liabilities and a system of inconvertible central bank

liabilities. We will apply the concepts of exogenous liquidity and endogenous liquidity to all four systems, as illustrated below.



4.1. Decentralized Reserves in a Free-Banking System

The decentralized system of free banking is a system in which multiple banks coexist with no institutional barriers to entry¹⁰. No bankers' bank (i.e., central bank) has emerged or, if it has, it is at least very limited in its scope. There might exist various clearinghouses, but none of them serve the function of a centralized reserve manager for all participating banks in the system, which would be the case in the centralized system. In a decentralized system, it is highly unlikely that legal tender laws would arise from a central authority since no centralized authority exists that sets the rules for how payments are processed¹¹.

In this system, the monetary base tends to be currency¹². The role and definition of money in a modern economy is to be the last and final extinguisher of debt as well as the most commonly accepted medium of exchange (Fekete A. E., 1996). The different clearinghouses act as liquidators of the monetary liabilities issued by different banks, yet none of those liabilities is crowned as the main monetary liability. In this system, any attempt by the legislature to enact legal tender laws that force the acceptance of monetary liability from a

particular bank will tend to fail, since many of the economic agents will distrust monetary liabilities of banks they are not familiar with and will therefore continue to do business either in already-familiar monetary liabilities or directly in base money. The circulation of monetary liabilities would be significantly restricted, as is the case with other credit instruments, such as checks¹³. The restriction is both a great advantage and a great disadvantage at the same time. On the one hand, it tends to enable financial intermediaries to issue monetary liabilities backed by investments in the money market (i.e., they issue real bills of exchange, which are very liquid forms of savings backed by very liquid investments) (Fekete A. E., 1984). On the other hand, it tends to limit the amount of monetary circulation of each instrument, thereby incurring additional transaction costs when exchanging those monetary liabilities for others that are more trusted. In other words, currency, as a monetary liability, circulates only narrowly, which is an advantage from the point of view of the bank seeking liquidity but a disadvantage from the point of view of other economic agents as they have to bear additional transaction costs at the point of exchange¹⁴. In this system, capital markets and money are completely separate and isolated. There is little to no connection between them. Commercial banks tend to avoid using short-term funds put at their disposal for investments in assets with longer maturities (Palyi, 1936).

In the decentralized system of free banking, there is a propensity for each bank to maintain adequate endogenous liquidity and to rely very little on exogenous liquidity from other banks in the system. Within this system, private banks, just like any other economic agent in a given economy, are tempted to erode their liquidity. However, if they do so, they run the risk of becoming illiquid and could be forced to suspend payments. Banks that engage in such practices tend to disappear either if they go bankrupt or if the markets (consisting of the various clearinghouses, other banks, and depositors) reject their liabilities. It is evident that banks in such a system cannot rely on the exogenous liquidity of other banks indefinitely and must at

all times seek to maintain sufficient endogenous liquidity, especially in moments of financial stress, when exogenous liquidity dissipates. This incentive encourages banks to seek a balanced structure between their assets and liabilities, thereby leading to the balancing of the liability structure of the productive sector with the portfolio structure of society (assuming the productive sector adheres to the principles of liquidity in the balancing of its own assets and liabilities¹⁵). The strict observance of the principles of liquidity leads to the coordination of all three structures (asset, liability, and portfolio) through the financial system. Consequently, savers can smoothly transition into consumers and access goods and services according to their personal timeframe¹⁶.

A system of decentralized reserves, in which every bank holds a large amount of bank reserves, could reach a point of economic inefficiency since a system of decentralized reserves (lacking economies of scale) requires a greater outlay of resources to cover the logistical and operational costs of maintaining the reserves. In the same way that bank clients deposit their cash balances (either as demand deposits or callable loans) at the bank, banks can deposit their cash balances at a central reserve bank. Thus, central banks arise as bankers' banks allow for a cost saving on the use of the banking reserves.

4.2. Centralized Reserves in a Free-Banking System

A centralized system of free banking is one in which, again, multiple banks coexist without institutional barriers to entry or any type of restriction of competition. However, in this system the function of a bankers' bank plays an important role. Even though there are no barriers to entry for any bank, be it central or otherwise, the tendency is for only a very small number of bankers' banks to emerge: indeed, possibly only one.. One of the drivers behind this tendency toward the centralization of reserves, particularly in the case of commodity money, is that the necessary conditions exist for a natural monopoly to emerge. This is the case when

the premises of a high initial investment and low marginal costs are met. In other words, the centralization of reserves finds its roots in the premise of economic efficiency.

All natural monopolies have two limits. First, a natural monopoly has a maximum limit above which, under current conditions, its marginal costs begin to skyrocket. That is why in very large developed countries such as the United States we can very well imagine that two or more central banks would emerge, leading to some sort of natural oligopoly (Scott, 1902). The second limitation has to do with the development of new technologies that reduce or maintain the marginal cost and remove the need for large initial investments. This could disrupt the industry and very well lead to reserves becoming managed in a more decentralized manner. In any case, it is very likely that in a deregulated marketplace, competitive private central banks could emerge as a natural part of the market process.

Under this regime, financial intermediaries and especially commercial banks that operate in the money market deposit their excess reserves at the central bank. In so doing, these financial intermediaries rely on the exogenous liquidity of the central bank by placing their endogenous liquidity in the hands of that very same central bank.

Despite the fact that financial intermediaries systematically require access to exogenous liquidity, the system has a tendency to remain structurally liquid, because the central bank, by extending exogenous-liquidity lines, loses its endogenous liquidity and sees its reserves diminish. Since there is competition among central banks, central banks (potentially including new ones) can perfectly well drain the reserves of other central banks that are losing their own endogenous liquidity at a greater rate (White, 1995). Whenever central banks find themselves in a tight spot, they only accept real bills of exchange, which are backed by high-demand consumer goods, as monetizable collateral¹⁷. They have the incentive to put the funds they receive into the short-term money market to avoid losing endogenous liquidity. In addition, the central banks only accept real bills as collateral when they lend to the banking sector— that is,

when they provide the necessary exogenous liquidity to commercial banks. Real bills ensure that, in case of default on the principal, the proceeds of the sales of the liquid consumer goods used as collateral allow the central bank to preserve its liquidity.

Thus, there are natural brakes built into the centralized free-banking system that limit maturity mismatching if it were to occur. Financial intermediaries would tend not to engage in maturity mismatching, because the lender of last resort, in order to preserve its own liquidity and avoid being replaced by a more capable competitor, would only provide liquidity against certain highly liquid assets. The two brakes come from the possibility of losing reserves and having to suspend payments: the first brake is the very competition between (potential) central banks, while the second brake is the possibility of losing reserves either by a negative trade balance¹⁸ or by the depreciation of monetary liabilities against the central bank's own reserves, which induces users to convert liabilities into reserves (Somary, 1915).

Financial intermediaries have no incentive to mismatch cash flows arising from assets and liabilities, because the central bank only provides exogenous liquidity if it does not compromise its own endogenous liquidity. The central bank is able to achieve this by requiring liquid assets such as real bills of exchange as collateral in its discount policy. With a structurally liquid asset structure and with exogenous liquidity only provided by a central bank properly incentivized to not engage in maturity mismatching itself, the system as a whole tends to be liquid. When the banking system is liquid, the liability structure of the productive sector matches the maturity of the portfolio structure of society. In other words, the flow of goods and services in an economy is perfectly matched with present and future consumer demand.

4.3. Central Bank Monopoly System with Convertible Liabilities

Because of the central bank's pivotal position in the financial system, political leaders often look to influence its decisions for their own interests. The most common example of this

dangerous marriage between central banks and governments is the restriction of competition in the field of central banking (White, 1995). This monopoly goes hand in hand with the inclusion of government debt among the central bank's assets. The inclusion benefits the government because it artificially increases demand for its public debt, which causes an increase in the price of that debt and, consequently, a decline in interest rates.

In this system, despite the varying conditions and circumstances relative to each country or economic region, there is only one central bank responsible for managing the liquidity of the entire financial system for the country or monetary zone. From the very outset, several complications may arise. Financial intermediaries mostly pledge long-term government debt as collateral when accessing the credit facilities provided by the central bank; that means central bank assets are generally backed indirectly by long-term investments. In other words, the entity that lies at the very heart of the money market is, at least partially, engaged in maturity mismatching. This causes the central bank to lose endogenous liquidity right from the beginning by moving savings from short-term money markets to long-term capital markets.

Moreover, we know, from as far back as David Hume (Hume, 1752), that an increase in the supply of money has an expansionary impact on the economy, at least in the short term. Because the newly created money enters the economy through the credit market, the new claims available to the productive sector tend to create an illusion of wealth (Huerta de Soto, 1998). This is all the more true when maturity mismatching occurs, since long-term investment increases dramatically when it can be backed by highly elastic short-term savings¹⁹. In other words, investment is excessive since long-term investment exceeds long-term savings.

As the central bank is pressured into accepting collateral different from assets that are typically accepted in money markets, the use of such assets increases. The government hopes/tries/endeavours to use the central bank to stimulate economic growth. The range of eligible collateral is increasingly widened. Consequently, assets typically used in long-term

capital markets instead of short-term money markets begin to be accepted as collateral to access fresh reserves from the central bank. Because of this, financial intermediaries tend to increase their exposure to the same illiquid assets the central bank accepts as collateral. After all, these illiquid assets have become more profitable²⁰ and highly negotiable²¹ since the central bank is willing to discount them.

Because such illiquid investments are increasingly preferred, the financial system begins to suffer from a lack of endogenous liquidity precisely because of overconfidence in the exogenous liquidity provided by the central bank. However, the central bank is not able to provide the required liquidity if its own assets are illiquid. The inability of the central bank in this system to provide an unlimited amount of liquidity is partly due to the loss of its own endogenous liquidity when it monetized long-term public debt and partly due to its limited scope for action. Even if the central bank possessed a completely liquid asset structure, it could not guarantee the liquidity of a structurally illiquid financial system. The central bank would be overwhelmed by the total demand from the banking sector for liquidity. The root of the problem lies in the relaxed restrictions on which types of assets the central bank accepts as collateral. In other words, bad criteria for eligible collateral lead to a structure of financial assets and liabilities that is so illiquid that it cannot be supported by the endogenous liquidity of the central bank. Sooner or later, the central bank is forced to cut liquidity to the financial sector, which causes a banking crisis with possible insolvency due to a structural lack of liquidity.

The poor choice of collateral, with the political pressure of governments to obtain cheap financing and increase credit growth being its root cause, leads to a highly illiquid financial-asset structure. This illiquidity means the productive assets of society are unable to produce consumer goods and services when present and future consumers demand them. The claims on

wealth-creating productive assets come due before the wealth is created. The system becomes highly unstable because of the illiquid assets at the heart of the money market.

One of the factors—competition among central banks—that prevented a central bank from losing liquidity in the second system we analyzed is eliminated in this system. However, two other factors that prevented the central bank from losing liquidity in this system remain almost entirely intact: the external drain of reserves due to an unfavorable balance of trade, and the internal drain of reserves when inflation appears. Attempts have been made to eliminate these two factors as well, using various rules and regulations. Some of these attempts include enacting legal tender laws for central bank liabilities and making it increasingly difficult to convert monetary liabilities into base money (Palyi, 1972), to the point of ending up with a system of complete inconvertibility of monetary liabilities.

4.4. Central Bank Monopoly System with Inconvertible Liabilities

Continuing the logical line of our analysis of the previous system, several dynamics set in motion cause the central bank, and the system at large, to rely on a series of regulations to avoid a general loss of liquidity.

As competition among central banks, the first mechanism of market discipline to prevent a liquidity crisis, , is eliminated, attention turns to the earlier-mentioned second mechanism: the drain on reserves. Within this framework, measures are taken that are designed to prevent domestic economic agents from recovering liquidity and opting out from financing the central bank and the financial sector. Initially, these measures are aimed at restricting, but not completely abolishing, convertibility²². However, sooner rather than later, convertibility is completely abolished, and cash-transactions or hoarding base money might even be prohibited²³.

Under these conditions, the central bank's scope for action is considerably enlarged. In principle, the central bank would be able to extend liquidity without suffering any internal drain on reserves. The discretion of the central bank increases dramatically, and with it the possibility to create an increasingly illiquid productive structure—that is, a growing time-lapse between the creation of consumer goods by producers and savers' (future consumers) expectation of consuming those goods

Even though the central bank's discretion increases greatly under these circumstances, its powers are not without limits. If the inconvertible monetary liabilities begin to lose value as a consequence of the indiscriminate monetization of illiquid long-term assets, then economic agents will begin to flee from those liabilities until such a point that they are rejected altogether by the market²⁴. What remains is a minor limitation to the indiscriminate monetization of assets by the central bank: namely, these assets have no solvency issues in that there is no possibility that defaults could spill over from the central bank's or financial system's assets to their monetary liabilities, which could otherwise lead to a loss of purchasing power of these monetary liabilities and a massive flight from them (Kocherlakota, 1999).

However, this limit is much less effective than the strict limits in a centralized free-banking system—that is, competition among central banks with the risk of losing reserves. The ability of a system with a central bank monopoly with inconvertible liabilities to distort the coordination between economic agents is many times greater than that of other systems.

The very system of central bank monopoly leads endogenously to a suspension of convertibility once the monetary mechanism is used for ends other than solely providing derived liquidity to an inherently liquid system.

5. Conclusions

We have observed the following:

- Structurally liquid systems cause the flow of goods and services to match the consumption needs and preferences of consumers and savers alike.
- The financial system, in its role as an intermediary, manages a great amount of the production system's liabilities and of the assets of the portfolio structure of savers (future consumers).
- The interbank market is a means to obtain exogenous liquidity temporarily, never permanently. The interbank market cannot be of much help for long if the system is already suffering from widespread illiquidity.
- The two free-banking systems under discussion are characterized by two major principles that curb maturity mismatching: competition among central banks, and the potential drain on reserves.
- The central bank monopoly system engenders a large increase in individual exogenous liquidity (through the wide range of eligible collateral for refinancing or for sale), well above what would originally constitute the overall liquidity of the system.
- The central bank monopoly system leads endogenously to the inconvertibility of its monetary liabilities.

6. Endnotes

1 The majority of transactions take place through an intermediary. However, in a marginal number of cases in today's economy, no intermediary is involved. See Stigum and Crescenzi (2007).

2 We assume that practically no one saves just to save and never to consume. If this were otherwise, it would not be economical to produce wealth for others since no one would eventually consume some part of other people's wealth. The saver that never consumes could be seen as a true altruist since he or she produces wealth for society without asking for anything in return and without any further consideration. We can safely assume that this kind of behavior is marginal within the current economic system, and for that reason we will treat savers simply as future consumers.

3 It is possible that maturity mismatching does no harm if savers choose to constantly renew their liabilities until the productive processes come to fruition. This is probably true at the individual level. But it would be wrong to assume all savers act in this manner, given that by not doing so they are able to obtain a higher yield and therefore gain access to a greater number of future goods than in the case of continuous refinancing.

4 These problems differ depending on what kind of monetary system we are examining. It could be inflation if the banking system receives indiscriminate financing from the central bank in the form of unconvertible liabilities; or it could be deflation in the form of bank failures under a free-banking monetary regime.

5 This does not mean credit is always paid back. Rather it means that if the credit is of good quality (extended to a solvent borrower), then there will be neither any suspension of

payments nor defaults due to illiquidity. Respecting the principles of autonomous liquidity at the systemic level does not tell us anything about the perceived risk of any credit transaction.

6 In other words, this is the ability to temporarily meet all outstanding financial obligations thanks to the additional liquidity provided by a third party.

7 This mechanism is analogous to what emerged under the gold standard, which enabled banks to balance their accounts without the costly movements and transport of physical gold (base money) from place to place and avoiding costly surpluses or shortages in international trade and the balance of payments. See Sprague (1917). As we will show below, the current monetary system excludes any such evolutionary mechanisms.

8 Although central banks are at the center of this system, this does not necessarily mean they are quantitatively the most important actors. In fact, this is not often the case.

9 For that reason, the choice of what collateral will be accepted is of vital importance for the correct functioning of the entire economic system. Sound collateral requirements ensure that the three previously mentioned structures of society (the asset, liability, and portfolio structures) are in harmony with one another. The converse is true as well. Poor collateral requirements will necessarily correspond with discord and distortion in those same three structures.

10 This includes any type of anticompetitive restriction that is not strictly speaking economic in nature, such as obtaining the appropriate licenses. See White (1995).

11 Here we refer to the difficulty of enacting legal tender laws on monetary liabilities in a free-banking system with decentralized reserves.

12 Money can be a present good or a future good. When it is a present good, we denominate it currency- money, or more commonly commodity-money. When it refers to a future good (credit), we more commonly speak of it as credit-money. See Bondone (2012).

13 Normally, checks circulate very little. They promptly return to the clearinghouse, given that a check is a form of credit transfer that is verified by only a signature. That is, the bank does not put its acceptance on the check. See Dunbar (1891).

14 This is one of the essential reasons why circulating credit emerged to complement money as a substitute for payment and to lower the transaction costs associated with commodity-money payments. In other words, it helps money circulate without the money ever having to move. See Hicks (1989).

15 There is no reason to assume the productive sector would otherwise do so endogenously. The generalized losses of liquidity can only come from incentives created by external institutions, such as central banks, whose main task is assumed to be to provide liquidity to the financial sector. See Bagehot (1873).

16 A saver saves for a given timeframe. When the period comes to an end, he or she becomes a consumer. This is the case as long as his or her plan is not modified before the end of the period.

17 Historically, central banks tended to demand these types of assets as collateral for loans to the banking system. See Dunbar (1891).

18 Immobilizing funds in long-term assets financed by monetary liabilities creates a greater flow of monetary units toward consumer goods, which in turn provokes inflation throughout the zone under the central banks' influence. This inflation leads foreign goods and services to become marginally more attractive and produces a negative trade balance. Sooner or later, negative trade balances will be paid in international currency, and therefore the central bank will end up losing reserves to foreign entities to correct this imbalance. See Sprague (1917).

19 Conversely, the less elastic savings in longer-term maturities cause the interest rate to rise in response to an increase in the demand for credit.

20 Those assets are more profitable since the longer the term, the higher the interest rate. See Culbertson (1957).

21 Negotiability is not a synonym of liquidity. The liquidity of an asset is related to how far away the final payment is. The negotiability of an asset is related to the ability to be sold quickly. Every liquid asset is a negotiable one, but the converse is not necessarily true. See Palyi (1936).

22 For example, by limiting their ability to be exchanged in certain cities or in certain quantities. For more, see Dunbar (1891).

23 A good historic example is the enactment of Executive Order 6102 in the United States. To avoid the drain on reserves from external parties, other methods are introduced such as limiting the amount of foreign currency one can buy or introducing capital controls. See Palyi (1972). Although the importance of such methods is paramount in the economic system as a whole, they are beyond the scope of this article.

24 This describes the process of hyperinflation, a general flight from inconvertible money. See Bernholz (2003).

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