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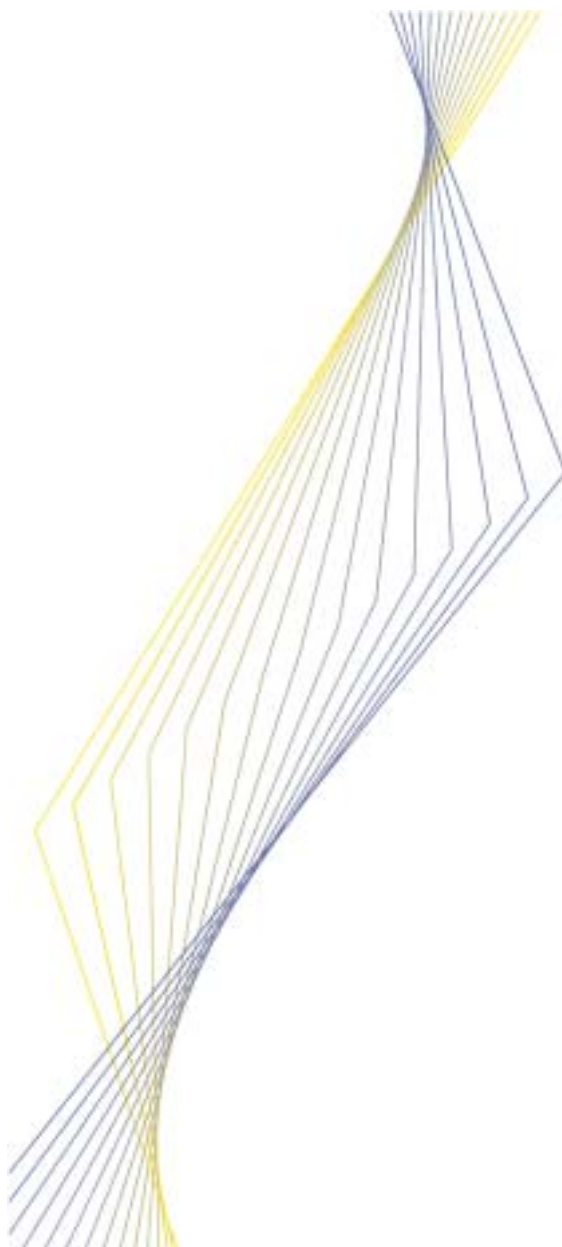
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A MODERN PERSPECTIVE¹**

**BY CORNELIA HOLTHAUSEN²
AND CYRIL MONNET²**

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Contents

Abstract	4
Non-technical summary	5
I Introduction	7
2 Public versus private money: a recapitulation	7
2.1 Competition and price stability: early arguments	8
2.2 Limits to competition	9
2.2.1 Network externality	9
2.2.2 Natural monopoly	11
2.2.3 Public good	12
2.3 Conclusion	13
3 Conceptual considerations in models of money	13
3.1 Definitions	14
3.2 Frictions	15
3.2.1 Limited enforcement	16
3.2.2 Informational frictions	19
3.3 Conclusion	22
4 Historical experiences	23
4.1 Scottish free banking	24
4.2 The Suffolk banking system	26
4.3 New York Clearing House Association (NYCHA)	27
4.4 Limitations of free banking	29
4.4.1 Instability of the free banking system	29
4.4.2 Portfolio mismanagement	30
4.4.3 Costs of information dissemination	31
5 Competition today	32
5.1 International currency competition	33
5.2 Electronic money	35
5.3 Large value payment and settlement systems	38
5.4 Ensuring competition	41
6 Conclusion	42
References	43
European Central Bank working paper series	53

Abstract

The role of money in society has been a controversial topic in economic theory over many years. Particular attention has been devoted to the analysis whether there should be competition in the supply of money, or whether this is best left to a governmental agency. This paper reviews the theoretical literature on these issues. It also gives an overview over some episodes of free banking where banks could issue currency themselves. Finally, we highlight several aspects in which today we have competition between issuers of money, namely in the international context, with electronic money, and in large value payments systems.

Keywords: money, private money, free banking, electronic money, payment systems

JEL Codes: E40, E41, N10

Non-technical summary

This paper reviews recent literature on the provision of public and private money. First, the paper sets the stage by recapitulating past views on the topic. Within this context, the desirability of having single or multiple issuers of currency as well as the role of the central bank in the provision of money are addressed. Since Hayek's radical proposal to eliminate the public provision of money, several other authors have supported the idea of having competition between issuers of money. However, more recently doubts have been raised to the desirability of free competition. One argument states that money is a typical good featuring network externalities. Because these lead to multiple equilibria, this suggests a role for the central bank in co-ordination. Also, the provision of money may be a natural monopoly industry. If this is the case, and the market is not contestable, public regulation might be called for.

However this strand of literature takes as granted that private money is accepted in trade activities. But the most recent literature argues that certain frictions are necessary for publicly or privately issued money to have a role in the economy. Several papers analyse the effects of these frictions – namely limited enforcement and imperfect information – on the acceptability of private money, from a theoretical perspective. It is found that these frictions limit the use of private monies, since in the absence of enforcement or information, the building blocks of acceptability that are reputation and trust cannot be maintained. It is therefore argued that this could point to an advantage for the use of public money.

The theoretical arguments we review are highly abstract, and need to be confronted with the facts. Hence, in the third part of the paper, we consider some historical evidence on private money provision and review several episodes of free banking in Scotland, New England ('Suffolk Banking System'), and New York ('New York Clearinghouse Association'). All three systems were able to achieve an environment with stable currencies for some time. One important factor was the efficiency of note-clearing systems that were established. Others were internal control mechanisms such as the option clause (Scotland), or monitoring of clearinghouse members through the clearinghouse (Suffolk). However, some doubts have been raised to the overall efficiency

of these systems. These include the suspicion that the clearinghouses may have enjoyed monopoly rents, or the high costs of information processing in the presence of many competing currencies. Moreover, the large number of bank failures during the free banking periods led to a high degree of instability of the systems.

Finally, the fourth part of the paper analyses several aspects in which we still have competition between monies. These include international currency competition, newer payment technologies such as electronic money, and large value payment systems in which some settlements take place in the books of private service providers.

1 Introduction

In most areas of economic activity, competition is seen as the best mechanism to achieve an efficient allocation of goods. Money, on the other hand, seems to be one of the lasting exceptions. Few economists have questioned the legitimacy of a government monopoly in the provision of money as long as price stability was maintained. However, recurrent episodes of inflation have also fuelled debates on the ability of governments to commit to price stability. The desirability of competition in the provision of money remains an open issue.

Recently, this question has received renewed attention. Due to technological developments, the structure of the payments industry is rapidly changing. On the one hand, new payment devices such as electronic money are starting to spread and might become an important substitute to banknotes and coins. On the other hand, in large value payment and settlement systems market participants are developing private solutions to reduce costs and to cope with the increasing demand for payment services. At the same time, public regulators are concerned about the stability implications of these developments. One issue is the safety of the emerging payment methods, especially regarding systemic risk in large value payments. Another issue is the question to what extent the new payment technologies, which can constitute a sort of private money, will lead to a reduced demand for central bank money in the future, and whether this, in the extreme, might make central banking, as we know it today, obsolete.

This survey will review the literature on the debate on public and private money. Section 2 briefly covers some well-known arguments. Section 3 is devoted to theoretical arguments on the desirability and the possibility of having competition in the supply of money. To give support or disavow theoretical findings, we review in Section 4 some historical experiences of free banking in the 19th century (in Scotland, New England, and New York). Section 5 discusses implications for the present environment, and section 6 concludes.

2 Public versus Private Money: A Recapitulation

The central banks' control over the supply of money has for many economists undisputable merits. Still, ever since central banks were created, some have questioned the central bank's

monopoly position in the issuance of money. In this section, we quickly review well-known arguments in favor and against some degree of competition between public and private money.

2.1 Competition and price stability: Early arguments

Much of the earlier debate on the public monopoly in the provision of money centered around the question whether private competition would lead to price stability, or, on the contrary, to hyperinflation.

Surely, the wish to maintain a stable financial environment was one aim of the establishment of central banks with a monopoly in note issuance. However, this was not the only reason. Already **Bagehot** (1873) argued that the Bank of England's special status was imposed by the government mainly to create an effective way of financing government expenditure. In a historical review of the origins of central banking, **Smith** (1936) comes to the same conclusion also for other central banks across Europe and America.¹ Indeed, later critics of the central bank's monopoly claim that governments are abusing their monopoly position by over-issuing money with the aim of maximizing their seignorage income. This has led to repeated periods of high inflation.

In his "Denationalization of Money", **Hayek** (1976) claims that "history is largely a history of inflation ... usually engineered by governments" (p. 34). He argues that the government monopoly created a situation in which there was no discipline for the monetary authorities to maintain a stable value of their currencies.² He, and also **Klein** (1974) in a concurrent paper, proposed to solve this incentive problem by allowing competition for the provision of outside money. With several competing currencies circulating, the public would quickly replace any unstable currencies. Knowing this, monetary authorities would refrain from the over-issuance of notes.

Hayek, perhaps the strongest advocate of free currency competition, goes beyond the proposals made by other economists by demanding the abolishment of any special status of central bank money. The period of currency competition immediately following this step would be marked by the co-existence of several currencies. The public would over time

¹See Goodhart (1988, p 304f) for a review of the evolution of central banking in several other countries.

²For a summary of Hayek's argument we refer the reader to Issing (1999).

learn which monies are stable, and choose to accept only those with a good reputation of no-overissue (or accept worse ones only at a discount). Thus, he envisaged a world where exchange rates between currencies would adjust to reflect the underlying risks. He predicted that after the initial learning phase, only good monies would be kept by the public, while other currencies would be driven out of circulation under flexible exchange rates. As a result, a concentrated market would emerge where only stable currencies circulate.

A radically different prediction was made by **Friedman** (1960), who argued that free currency competition would lead to an infinite price level and advocated a 100% reserve requirement in order to limit excessive volatility. Klein (1974) notes that in contrast to the other views, Friedman implicitly assumes that banks would issue indistinguishable bank notes. Exchange rates between the different currencies would by nature remain constant, and Gresham's Law would apply in that "bad money drives out good money". Klein, on the other hand, models competition between currency issuers when notes are distinguishable according to the issuer. An inflationary bank could only keep its notes in circulation if it paid higher interest rates on its liabilities, so that consumers are "indifferent between monies of varying anticipated rates of price change and interest yield" as long as they imply the same "rental price of monetary services" (p. 427). He shows the existence of an equilibrium with finite prices.

2.2 Limits to competition

The proposals for the abandonment of the central bank's monopoly on the issuance of money have triggered a wide debate among economists. Still, the proposals have been criticized on several grounds. These include the presence of network externalities and the fact that the production of money is a natural monopoly. These issues will be addressed in the remainder of this section.

2.2.1 Network Externality

The usefulness of holding a certain type of money for any agent depends on how many other agents are willing to accept this piece of money for payment. The more widely it is accepted,

the higher is the value of accepting and holding it. In economic terms, money creates a positive *network externality*³. Indeed, as far as commodity money is concerned, already **Menger** (1892) argues that “When the relatively most saleable commodities have become ‘money’ the event has in the first place the effect of substantially increasing their originally high saleableness. Every economic subject bringing less saleable wares to market (...) has thenceforth a stronger interest in converting what he has in the first instance into wares which have become money” (p. 250).

Brunner and **Meltzer** (1971) also link this notion of network externality to the existence of economies of scale. They assume that “The marginal cost of acquiring information about the properties of any asset (...) declines as the frequency with which the group uses a particular asset increases” (p.786). A similar argument related to network externalities can also be found in **Jones** (1976) and more recently in **Kiyotaki** and **Wright** (1989, 1991, 1993). There, a single good will be a medium of exchange whenever the beliefs about which good is mostly traded are the same across agents. All agents are willing to accept this good instead of the good they really are looking for because this minimizes the time of finding the desired trader.

In the presence of network externalities, public intervention could be justified on two grounds. First, a common feature of environments with network externalities is that multiple equilibria usually exist. This causes equilibrium indeterminacy, so that it may well be that the most expensive or less efficient instrument is used as money in an unregulated environment. This situation could be the outcome of certain beliefs, or because the switch to a new, better type of money proves difficult because of the externalities. Consequently, there is a potential role for the government in coordinating actions toward the use of the best means of payment.

Second, in an industry featuring network externalities, the most efficient production can be through a monopoly as this industry likely constitutes a *natural monopoly*. We now turn to this issue.

³For definitions of network externality and related concepts, see Liebowitz and Margolis, 1998.

2.2.2 Natural Monopoly

It is tempting to conclude that money is a natural monopoly industry because over most periods of time, we have observed government monopolies in most industrialized countries. However, **Vaubel (1990)** rightly argues that this conclusion cannot be drawn because entry by competitors was restricted.

In fact, it may not be easy to determine whether money indeed is a natural monopoly. As defined in **Sharkey (1982)**, a case for natural monopoly in a given industry exists if the cost function of the industry display strict subadditivity at any demanded level of output. In other words, it is cheaper to produce the output in one single plant than spreading the production over several places. For a single product industry, economies of scale are sufficient for this. However, central bank activity can be considered a multi-product industry, because it is involved in delivering money, payment and settlement system, supervision of banks as well as, in some countries, check clearing at the same time. To establish whether a multi-product industry is a natural monopoly is more complicated, as additional criteria have to be taken into account (Sharkey p. 83). In fact, in a multi-product industry such as the one in which central banks are involved, it is challenging to test for cost subadditivity. To our knowledge, this remains to be done.

Also, it needs to be determined whether the monopoly is *sustainable*, i.e. that no firm finds it profitable to enter the industry at any level of output given certain conditions (Sharkey p. 89). Economies of scale at *all* output levels are necessary and sufficient for the sustainability of a natural monopoly in the single product case. This caveat should shade suspicion on the likely sustainability of a natural monopoly in the multi-product case. Indeed, in this framework things are rendered more complex by the fact that potential entrants can enter in the market for a single output only.⁴

⁴Also demand cross-elasticities play a fundamental role in determining whether a natural monopoly is sustainable or not. This is especially relevant for the provision of settlement systems, which can be operated under gross or net settlement arrangements. A condition for the sustainability of a multi-product natural monopoly, when demand for all outputs are independent, is the existence of cost complementarity plus other technical conditions.

If money is found to be a natural monopoly good, does this imply a need for regulation? We will concentrate on the first reason given by Sharkey (p. 147) which is “Society may wish to protect buyers from a price that is too high and to recapture the loss in consumer surplus associated with monopoly pricing.” If entry into the market is free and the market is contestable, then regulation is not needed. The reason is simple. Given firms have the same technology and if the incumbent firm were making a profit, then potential entrants would be able to charge a lower price and take the whole market from the incumbent. Hence, for the incumbent to keep its position it must be that its monopoly pricing is not taking surplus away from buyers.

However, both sunk costs and economies of scale can discourage potential entrants and make the market not contestable. Since economics of scale are likely to be the reason of having a natural monopoly in the first place, regulation might therefore indeed be desirable.

In sum, we are still lacking a comprehensive test as to whether money is indeed a natural monopoly. If it is, then regulation of its supply can be justified if the market is found to be not contestable. Still, this does not imply that the supplier must necessarily be a public firm

2.2.3 Public Good

Some have argued that the provision of money should be a government monopoly because it is a public good whose production is best left to the government. **Tobin** (1980) claims that “Social institutions like money are a public good”. Drawing the analogy to language, he argues that increasing the number of people using one same money, the potential benefits from using this money rise; hence the public good character.⁵ **Kindleberger** (1972) as well as Tobin (1980) among others, consider that the public good character of money stems from its use as a unit of account. However, Vaubel rightly argues that while a unit of account might be a public good, this does not imply that money is one. At best “this would imply that governments should suggest a unit of account, and publish a price index for it, but not that it should supply money, let alone the only (base) money or monetary unit” (p. 272). In

⁵We find this analogy to be short lived. While the use of words satisfies the non-exclusivity criterium for public goods, this is not the case for the use of notes.

other words, there is no necessary link between the means of exchange role of money and its role as a unit of account.⁶ Hence, it is an open question whether central banks should provide the unit(s) of account, or why people use central bank money as a unit of account.

2.3 Conclusion

It appears to us that most of the arguments put forward lack a consistent basis for comparison. For instance there is no consistent definition for the important concepts used, like money. This has the unfortunate consequence that, with the notable exception of Klein, the arguments brought forward by the proponents of free competition are not very precise. Hayek's proposal is deemed by **Fisher** (1986) to be "remarkably vague" (p.433) and "silent on the essential issues: the unit of account, the costs of having multiple currencies, the issue of convertibility of currency into a dominant money or good (...) and the question of whether currency suppliers would be able to issue fiduciary money." (p.434). In particular, as it is alluded by Fisher, allowing for entry does not mean that private money will be valued.

The more recent theoretical literature on money tries to be more precise than the above, and to provide models that are able to tackle the essential questions. These will be reviewed in the following section.

3 Conceptual Considerations in Models of Money

We start by providing some useful conceptual material: we will propose a definition of money that relies on recent advances in the field of monetary theory and clarify the notion of competition among means of payment.

⁶A practical example of this statement can be taken from France: by some, the old French Franc unit is still used in current transactions, despite the fact that the currency change to the new franc took place in 1960 and that the euro is now in circulation.

3.1 Definitions

Money Most commonly, money is defined as any object that serves as a store of value, a medium of exchange and a unit of account. However, this descriptive definition is not helpful for our purpose, as it is concentrated on what money is used for rather than on what it is. In particular, as opposed to the definition we adopt below, it does not relate to characteristics of environments in which money is useful.

Instead, we will call a device *money* if, in the absence of such a device, some socially beneficial trades are not happening. In such environments, money will be considered as *essential*. The essentiality of money is due to frictions that prevent a number of trades from taking place. Uncovering these frictions is key in order to understand what money is and why it is used. There are three important frictions that explain why money is essential: the absence of double coincidence of wants, the lack of commitment and some degree of information asymmetry. As shown in **Kocherlakota** (1998a,b), in environments where these frictions are present, money is essential and acts as a record keeping device. That is, holdings of money are a statistics that summarizes, although imperfectly, the past transactions of all agents. If transactions were recorded in a book that would be freely and publicly accessible, then the information problem would be solved. In turn the commitment problem could also be solved, e.g. having recourse to reputation. Was a record keeping device available, Kocherlakota (1998a) shows that money would not be needed in implementing trades. Hence, *money is memory*.

We will also require a more practical characteristic for these objects, namely the property that they are used for the final settlements of debts, private or public. This rules out for instance checks, as private means of payment as their mere transfer does not represent a final settlement of debts. Also, when the object cannot be converted into specie of equivalent value we will call this object fiat money. Pieces of paper that treasuries or central banks produce are fiat money because these institutions always have the possibility to redeem one of these pieces of paper for another totally similar piece of paper.

Competition We will consider that competition prevails between private and public monies if, in an environment where money is essential 1) private and public monies are used as an

instrument for the *final* settlement of debts and 2) the supply of private monies is at least as elastic as the supply of public money, i.e. there is no restriction on the production of private money, but technological constraints. We will also consider that there is competition if the market is *contestable*. In this sense we will not require that private money be used in fact, but rather that the threat of using it is enough to induce the issuer of the public money to behave competitively.

Using the definition of money highlighted above, we will pose the question of whether competition between public and private money is necessary to implement more outcomes - i.e. achieve a larger number of trades - in all environments where money is essential. As we will see, a theoretical answer is to a large extent still to be found.

3.2 Frictions

As mentioned in the definition of money, there are three frictions that together can give rise to the essentiality of money. The absence of double coincidence of want, the lack of commitment and some asymmetry of information. The absence of double coincidence of wants is when A desires the good of B but B does not care for A's good. However, in itself, the lack of double coincidence of wants does not justify the essentiality of money. It suffices to consider environments where agents would be severely punished if they do not subscribe to the proper social behavior. Therefore, in addition to the lack of double coincidence of wants, the lack of commitment and a certain degree of asymmetry of information explain why money is essential. In this section, taking each friction in turn, we argue that in their presence, it is problematic to construct equilibria where inside money - that is money created by agents in the economy- is used as money. As a consequence, it is yet still difficult to tackle issues dealing with currency competition.

In order to understand what the consequences of the frictions are, we have to consider models that seriously take them into account. Hence, we are naturally restricted to the recent literature on the fundamental use of money. There, environments where neither enforcement, nor perfect information is available are explicitly used to analyze the consequences of the need for money.

3.2.1 Limited Enforcement

Definition Enforcement is limited whenever agents can default on their obligations at little or no cost. There is full enforcement whenever they cannot default without incurring a detrimental penalty, say death. The lack of, or inefficiencies in, the legal framework can easily explain limited enforcement. Somehow loosely, we will employ limited enforcement also as a synonym for limited commitment. This will not matter for our purpose, but these two concepts should normally be clearly distinguished.⁷

Implications The lack of enforcement matters for the existence of inside money as it can be seen as a contract between the issuer and whoever possesses it, which specifies certain obligations from the issuer when it is redeemed. When enforcement is lacking, terms of contracts cannot be put in place. Therefore obligations entailed by redemption can be defaulted upon.

In a world where contracts cannot be enforced by an authority, contracts have to be self-enforceable. This means contracts must be constructed such that, given the environment, the actions specified by the terms of the contract are compatible with incentives of the parties to the contract; i.e. the contract is incentive-compatible.

Suppose the redemption of a claim by its issuer requires he delivers an object he values. Then the redemption process is incentive-compatible only if he obtains something in return whose expected value is higher than the value of the relinquished object. If perfect information was available, reputation effects could matter so as to taper off the effect of limited enforcement. We will return to these types of arguments in the next section. The bottom line is that, without perfect information, the fulfillment of the obligations must insure future gains to the debtor; i.e. it must increase his continuation payoff. This is only possible if buyer and seller have some type of contact in the future.

We therefore have to consider two possible cases, one in which buyer and seller have no future transactions, neither directly nor via third parties (open loop), and one in which they do (closed loop).

⁷See **Koepl** (2002).

Search models (Open loop) We will say that a chain of buyer-seller forms an “open loop” whenever feedback effects are impossible. In other words, an agent x buying goods from an agent y will not be affected by the subsequent behavior of y . An example of open loop structure is the overlapping generation model. In an open loop, continuation payoff can increase with the acceptance of a claim to settle a transaction as long as the seller can use the claim to settle his own purchase of goods. Also, in open loops economy, the transfers of goods and claims generally occur simultaneously. Whenever the transfer of goods and settlement claims occur *simultaneously*, the payoff of accepting the claim is generally at least equal to the utility of consuming goods that can be bought with the claim. This is the basic idea behind all search models of money, initiated by **Jones** (1976) and followed up by **Kiyotaki** and **Wright** (1989, 1991 and 1993). However these models only consider outside money. By definition of outside money, a seller will never be the issuer of the claim he receives.

In open loop models, in the absence of commitment and with informational frictions, private money is valueless in equilibrium, as all agents have the incentive to issue as much of these claims as possible. One way to limit the over-issuance of these claims is to have them being redeemed. In the absence of any redemption institutions, this is possible only if the chain is in closed loop.

“Closed loop” models Contrary to open loops, feedback effects between buyers and sellers are possible in “closed loop” structures. In this case, if an inside claim is issued, there is the possibility that it will be redeemed, i.e. “returned” to his issuer. When considering a closed loop where private money is used, settlement can be of two types. Simultaneous settlement generally occurs between agents who have not issued the claim that is used, or when the claim is redeemed. Delayed settlement occurs in transactions where claims are issued. Enforcement problems, as highlighted above, occur when the claim is redeemed. There are few ways to solve enforcement problems.

If the mere issuance of the claim is costly, **Monnet** (2002) finds that private claims can serve as money in a closed loop structure. The idea is that in order to be able to participate in the next trading round, the issuer of a claim has to hold a number of them. This number is such that it will be beneficial to accept (or redeem) old claims rather than producing them.

Interestingly the equilibrium resembles situations where there is an over-issuance of private claims. But Monnet shows that this condition is necessary for their usefulness.

Kiyotaki and **Moore** (2001) have inside money circulating in closed loop among agents that cannot commit to their promises, but the final agent who issued the debt. Using their own words, the debt of the agent who has the ability to commit is used by other agents as a substitute for their inability to commit. However the paper does not shade light on the reasons why some people are more able to commit than others. In parallel, Monnet (2002) argues that enforcement problems can be circumvented as long as the issuer of inside money does not participate in the loop. He claims this is the main reason why money produced by a State institution is optimally used, as these institutions should ideally only be involved in fulfilling the core responsibilities of the State and, in this sense, not be active participants in the economic system.

Many recent models consider private debts circulating as money in closed loop. In these papers inside money is essential due to the insufficient amount of outside money. *Whenever the initial distribution and the pattern of circulation of outside money is such that some trade cannot take place, then inside money has a role.* Of course, as enforcement is an issue, this does not mean that inside money will be used. To get around this problem, the existence of an enforcement mechanism that allows agents to commit to pay back their debt is usually assumed. Under this assumption, private money is used, as in **Townsend** and **Wallace** (1987), **Freeman** (1996a,b), **Williamson** (1999) or **Azariadis, Bullard and Smith** (2001). In these models, when a claim is presented for repayment, the payment follows. Hence, for these models, the commitment problem is implicitly assumed away. Although we believe the general conclusion on the need for private claims is correct, we have concerns as to the way they will be valued in equilibrium.⁸

Other models, for instance **Cavalcanti, Erosa and Temzelides** (1999), use an explicit reserve-management technology, an example of which is a clearing-house. As will be shown in the later sections, this has clear historical motivations. In their framework, private money is valued because this social arrangement controls for the over-production of private money, by taking any misbehaving partners off the economy. This institutional device is then necessary,

⁸See Mills (2002) for an analysis of this slight inconsistency within models developed by Freeman (1996a).

however there are no answers as to the cost of setting it up and the circumstances under which it is worth undertaking.

Interestingly, **Kahn** and **Roberds** (2002) have recently presented a framework with three agents (A, B and C) where the presence of inside money can alleviate incentive problems rather than increasing them. In their model, C consumes the good produced by B but cannot pay on the spot. B needs the input provided by A in its production, but needs to wait for C's payment in order to pay back A. One type of contract *reduces incentive problems* due to the absence of enforcement. This is when C contracts a debt toward B for the delivery of the consumption good, but B uses part of C's - non denominative debt - to pay his purchase of A's input to its production. Then once C has enough of the good required to settle its debt with B, he transfers the required amount claimed by A and B. Incentive problems are reduced since whenever B would default on A, by not transferring C's claim, then B, by assumption, would be unable to obtain C's payment. C does not default as the existence of a default penalty makes this choice unprofitable. Therefore, while Kahn and Roberds argument is, to some extent, still subject to the criticism made earlier on the existence of an enforcement technology, it shows that inside money can alleviate incentive problems, instead of increasing them.⁹

The upshot of this section is that, although private money can be essential, limited enforcement will bind the amount of private money that can be placed in the market.¹⁰ Institutions that monitor actions of market participants are a solution to consequences of limited enforcement.

3.2.2 Informational frictions

Definition The *lack of recall* (see **Temzelides and Yu**, 2001) and the *lack of a public record device* are informational frictions that matter for the essentiality of money. By the lack of a public record device, we mean a situation where some agents have no or limited

⁹This result depends crucially on the assumption that one gives up the right to his entitlements if one defaults. However, while the authors give interesting historical examples, the presence of financial heavens and the intricacy of some judicial systems are potential back doors through which repudiators can escape.

¹⁰See Kiyotaki and Moore (2001) for an analysis of economic implications of such bounds on the amount of private money.

means of knowing the history of actions previously taken by other agents they are currently trading with. Kocherlakota (1998a,b) refers to these environments as being memory-less. Together with limited enforcement, this creates the essentiality of money. In an environment with no memory, reputation cannot be built so that many actions will be incompatible with private incentives.

As is usual in the literature, we use the term *asymmetry of information* to characterize situations in which one party knows more than another, e.g. on the characteristics of a good. This asymmetry of information will matter in the case where the settlement is delayed and depends on the transfer of an object, whose quality is unknown, in environments where reputation is impossible to obtain and quality is unverifiable. However, asymmetry of information does not matter for the essentiality of money, although it matters for the equilibrium value of private money.

Memory With no memory and the absence of enforcement, inside money, which is costless to issue, cannot be used to implement some trades. However, if some agents have access to a technology which makes their actions publicly known, these agents can build up reputation and issue claims that other agents will trade. This is the case in **Cavalcanti and Wallace** (1999). They assume the existence of a record-keeping device that keeps track of all actions taken by a type of agents, named banks. These banks can then produce private money that will be useful to implement trades. So perfect public knowledge of a certain type of actions allows the possibility for social punishments that will give banks the right incentives.¹¹ Under this assumption, the authors show that the set of implementable outcomes in an economy with only outside money is a strict subset of the analogous set in an economy that uses only private money.¹² The assumption is however subject to criticism. As public knowledge of an agent precedes the issuance of claims by this agent, it is difficult to understand why some agent would be restricted to access this technology. In case this technology is readily available, why then no other people use it?

¹¹A recent paper by Martin and Schreft (2003) uses a similar argument. Instead, they assume the existence of a technology that renders public information the amount of notes that a bank produces.

¹²Outside or fiat money is defined as an unbacked, almost costless to produce, intrinsically useless object that is used as money.

Furthermore, Cavalcanti and Wallace's result might not be robust to the degree of memory available. **Kocherlakota** and **Wallace** (1998) study the interaction between an imperfect public record of actions, which is only stochastically updated with a lag, and outside money. They find that it is optimal for outside money and credit to coexist in most, non degenerate cases.¹³

Nonetheless, Cavalcanti and Wallace's argument points toward a property of issuers of money that might be crucial, namely their average scale of operations with respect to other agents. Prices are publicly observed. Hence they represent a mechanism through which actions can be inferred, if an agent is able to modify prices. Unfortunately, models of money are not yet sufficiently developed in order to seriously think about equilibrium prices.¹⁴

Information Asymmetry In a world with asymmetric information, agents are unable to fully control for the quality of the goods they have been promised. Private providers of money can either hold fewer assets for backing, or hold assets of a lower quality than expected from creditors (more risky or not liquid). Because these assets are less expensive to hold than proper backing assets, and because of information asymmetry, all private producers of money have incentives to do so (see **Schreft**, 1997). Under the assumption of asymmetric information, **Williamson** (1999) shows the existence of an equilibrium where private money circulates but with only poor quality backing. Also he shows that with asymmetry of information, there might not exist any equilibrium with valued private money. This result is not related to limited enforcement, as Williamson (1999) assumed the existence of some degree of enforcement.

Reputation If information frictions are not too severe, reputation can be built. Reputation is the basis for the belief that, in a world with no enforcement, promises will be fulfilled. This belief is enough for inside claims to circulate, even if there are no other elements to guarantee the fulfillment of promises.

One essential feature for a certain money to be accepted as means of payment is that holders find it trustworthy. Holders of money must believe that people will agree to exchange goods of at least identical value for them as what they lost in acquiring it. In "Lombard

¹³That is whenever the lag with which the record is updated is neither zero nor infinite.

¹⁴However some recent advances, see Green and Zhou (2002), raise some hope.

Street”, Bagehot (1873) already acknowledges the importance of reputation. In spite of his criticism towards the Bank of England’s monopoly in note issuing, he states that the abolishment of the Bank of England money in favor of other currencies would be foolish, because people trust the currency they are used to. Any new forms of money would need a long time to build up the confidence in it that is necessary for universal acceptance.

Other economists also consider that reputation is best guaranteed when government institutions provide money. For instance, **Ritter** (1996) considers the transition between an equilibrium where commodity money is used as a medium of exchange and paper money. He finds that a sufficient condition for paper money to be valued in equilibrium and supplant commodity money is the credibility of the money producer. He shows that a coalition of agents - that he calls government - can provide a uniform means of payment that will be valued by other agents. Such money is valued because the government “has the ability to limit the production of money by individual members”.

Hence, in Ritter’s analysis government money is valued because the government can credibly signal that it will keep the money stock below the level at which agents refuse to accept it for payments. In short, Ritter (1996) claims that because government institutions are social agreements, they represent the most credible way of providing money. In fact, often central banks are independent of any political authority in order to circumvent these credibility issues. In the absence of any such independence, it is well known that commitment can be a problem (see among others **Kydland** and **Prescott** 1977, **Barro** and **Gordon** 1983 or **Chari** and **Kehoe** 1999).

3.3 Conclusion

The frictions that are necessary for the essentiality of money happen to be also detrimental for the use of private, inside, money. From the literature cited above, we can conclude that, although private money is useful, it is not clear that its use can be incentive compatible given the mentioned frictions. Also, even if its use meets incentive requirements, the latter will impose conditions that might well not be consistent with the optimal level of inside money. For instance, limited enforcement and informational frictions might bind the level of private money that can be issued by a single agent. Several ways have been proposed to explain

how private money could be valued in equilibrium. This undoubtedly shades lights on the mechanisms underlying the existence of money. However, most of the workable assumptions appear inconsistent with the essentiality of money. Hence, further work is much warranted on this issue. We can conclude from the theoretical literature that competition per-se is not the imperative issue. Rather, it is the mere possibility for private money to serve as a final means to settle debt *when other means of settling debts are lacking*. In other terms, there is somehow strong theoretical evidence that there should not be impediment to create close cash substitutes. The main issues are then 1) how to improve the access to outside money, and/or 2) how to insure the confidence necessary for economic agents to hold private money at the lowest cost.

Given the lack of clear cut theoretical results, we review in the next section three experiences where private money has been used. We concentrate our analysis on the social and institutional devices that insured private money could be used. We also highlight the main advantages and drawbacks of these systems of exchange with private money.

4 Historical Experiences

Throughout history, government supplied or certified money has had a special status. Still, in several countries there were episodes of "free banking" in which several private monies circulated on equal terms. In this section we will briefly review three different experiences related to free banking. The term *free banking* originally referred to an era in the US, in the period between 1837 and the founding of the Federal Reserve Bank in 1913. During this period, the banking system was not unregulated, as the term misleadingly seems to suggest, but entry was possible without the need to require a legislative charter. Free banking experiences are interesting because during these periods, banks could issue notes. Therefore they are good instances of competition in the provision of inside money.

The term 'free banking' is nowadays used for unregulated competitive banking, often associated with a system operating without a central bank (see Laidler, 1992). In the sequel, we will refer to the historical interpretation, but extended to several countries in which such a relatively free banking environment existed.

The first experience covered in this chapter is the Scottish free banking era from 1716 to 1844. The second is the Suffolk Banking System (1825-58) that prevailed in New England, USA. The third experience relates to the role of the New York Clearing House Association (NYCHA) during the banking panics in the second half on the 19th and in the early 20th century. This review generally highlights the benefits of the different systems: No monopoly emerged in the Scottish system and it was apparently very stable. Also, the Suffolk system is well known for maintaining a uniform and stable currency stock. Finally, the NYCHA is a very clean example of an efficient clearing system providing private money.

This historical review is structured around three main questions. How was trust in the means of payment maintained? How were information problems limited? and Were economies of scale present? We close this section with a review of the critiques addressed toward Free Banking. We concentrate on the claim that free banking is unstable and costly to manage.

4.1 Scottish Free Banking

From **White** (1995) and **Kroszner** (1995) we can characterize the Scottish free banking experience by the following elements: financial innovations, unlimited liability and branch banking.

The Scottish Free Banking Era started with the non-renewal of a 21 year long monopoly on banking and note issue that was granted to the Bank of Scotland in 1695. The Royal Bank of Scotland entered the market in 1728 and the British Linen Bank in 1746. All three banks were chartered banks - granted by an act of the Parliament or directly from the Crown - with limited liability. All other banks had unlimited liability. Banks could freely compete in note issuance. Notes were denominated in pounds, defined as a certain amount of specie. Profits were made with the holdings of interest bearing assets obtained with notes. Hence, the longer the notes were in circulation, the more profits were made. According to White (1995), the banks tried to undermine the credibility of the other banks so that a type of notes would be preferred by agents and so held for a longer period. This gave rise to two important financial innovations: in order to maintain trust in their currency, banks introduced the option clause and a system of note clearing.

Maintaining Trust Through Financial Innovations

The *option clause* was giving the right to a bank to suspend payment for a given period, with the understanding that interest would be paid on the standing notes at the end of this period. This enhanced confidence in holding notes but also favored entrance by small banks. This clause increased competition and the three limited liability banks lobbied against its use. The use of the option clause was outlawed by the Act of 1765.

The *private clearing house system* was also set up in order to maximize the circulation of notes. Some banks bilaterally agreed not to seek redemption of the notes of their partner. Eventually, the three big banks brought smaller, provincial banks into their note clearing systems. This was beneficial for both type of banks: it increased the acceptability of the small banks' notes and increased the scope for circulation of the big banks' notes.

Limiting Moral Hazard using Unlimited Liability

The private clearing-house system had some unfortunate consequence. The Ayr Bank went bust in 1772 after a period of mismanagement, issuing notes for financing bad projects. Within the clearing-house arrangements, banks were settling their balance using bills or drafts negotiable at correspondent London banks, or specie. This allowed the Ayr Bank to borrow from its London correspondent, until its correspondent failed. Ayr Bank's bills was then refused by other brokers and it had to liquidate. The effects of such a liquidation on the Scottish system were minimal due to the unlimited liability status of the Ayr Bank: the three big banks agreed to redeem its notes and Ayr Bank's shareholders had to bear the entire cost of the liquidation.

The unlimited liability status of a bank was shifting its inherent risk to its owner. Therefore, it might be argued that moral hazard was limited by the use of unlimited liability. However, it might also be argued that unlimited liability was restraining free entry.

Branch Banking: Presence of Economies of Scale?

Since the aim was to maximize note circulation, branching was the normal evolution of the system. Economies of scale could be exploited through branch banking: the spreading of risk among various locations and easy redeemability of notes enhanced public confidence.

As reported by Kroszner (1995), branch banking acted as a substitute for deposit insurance through regional diversification. Big banks had up to 15 branches within the country, while smaller banks had an average of 3 branches. However, White (1995) concludes that “Scottish experience offers no reason to suppose that there exists a ‘natural monopoly’ in the production of redeemable currency” (p. 34).

The Scottish free banking system ended in 1844 with the promulgation of Peel’s Act, which formally brought the Scottish banks under the control of the Bank of England.

4.2 The Suffolk Banking System (1825-58)

Trust and Uniform Currency Stock

The Suffolk Banking System originated from the Suffolk Bank of Boston as an attempt to eliminate the circulation of country bank notes¹⁵ in Boston. According to **Rolnick, Smith** and **Weber** (1998), the idea was to “allow [other] banks to deposit all their country banknotes with Suffolk, which would establish a system of net-clearing the banknotes it received. (...) Suffolk would accept and clear at par all country banknotes that participating banks chose to deposit.” (p. 13). The participation in this system involved a cost to country bank members. They had to hold permanent and non-interest bearing deposit of \$2,000 for every \$100,000 of capital with one of the system’s member. Also they had to maintain a certain amount of non-interest bearing deposit for the notes redeemed within the Suffolk system.

The most prominent feature of the Suffolk experience is that it was very successful in achieving a uniform currency throughout New England. This means that all notes were trading at par, with no discount related to the lieu of issue or distance from the lieu of issue. This can be interpreted as evidence that people were trusting notes of member banks because the clearing house could closely monitor their activities.

Information: The Advantage of a Centralized System

As recorded by **Calomiris** and **Kahn** (1996) this centralized system had the advantage of superior information about note-issuing behavior. The Suffolk bank could also monitor the

¹⁵The term “country banks” refers to banks established in New England but outside the Boston area.

portfolio management of member banks more efficiently than government regulations would have, thus preventing any failure like the one of Ayr Bank in Scotland. It also had a role in limiting counterfeiting. As a consequence, the banking environment was safer and more stable than in other states.

The Suffolk Banking System: A Monopoly?

There is not much debate on the benefits of the Suffolk Banking System. However, there is still disagreement on whether the Suffolk Banking System was a profit maximizing monopoly seeking rent extraction or an efficient system open to competition. Calomiris and Kahn (1996) argue in favor of the efficient competitive system: they consider the Suffolk System as the result of a *joint agreement among Boston banks*. Analyzing the balance sheets of *all* Boston banks from state banking reports, they do not find any profit that would accrue to a monopolistic behavior. However using similar data sources, Rolnick, Smith and Weber (1998) favor the view of the note clearing business being a *monopoly of the Suffolk Bank alone*. Analyzing the Suffolk Bank's balance sheet and shareholders dividends, they find evidence of unusual profits.¹⁶ Also, they record several instances of monopolistic behavior. Nonetheless, this monopoly is not deemed by Rolnick, Smith and Weber (1998) to be a bad outcome: it seems to have been a natural monopoly, with the exploitation of "economies of scale and scope".¹⁷

4.3 New York Clearing House Association (NYCHA)

The two experiences related above both dealt with the use of private money in payment systems. The experience of the NYCHA is somewhat different because it concerned the issuance of private money in a large value settlement system.

Initially, the NYCHA was not different from any other clearing houses. As stated in **Timberlake** (1984) "In the United States, clearing houses banks adopted the practice of

¹⁶The difference comes from the facts that Calomiris and Kahn "assume that the average dividend paid by the System was the average paid by large Boston banks". (Rolnick and Weber 1998, p. 8).

¹⁷Vaubel (1990) doubts that the money industry is a natural monopoly. He claims that during the historical episodes of "free banking", in no case did a monopoly note issuer emerge. This now is a contestable view as the Suffolk Banking System highlights the possibility of a natural monopoly in a very related service.

keeping deposits of specie and other lawful money with the clearing house, which in turn issued clearing house certificates of an equivalent amount that the bank could use in the settlement of daily balances. (...) In England and Scotland, clearing houses operated similarly, but participating banks did not usually keep reserves in the clearing houses.” (p. 364).

The interesting property of the NYCHA as summarized in Timberlake (1984) is that it was the first clearinghouse to provide liquidity, and this during several crises. This liquidity took the form of Clearing House Loan Certificates (CHLC) first issued in 1857. As expressed by **Cannon** (1901, p.80)

Clearing-house loan certificates may be defined as temporary loans made by the banks associated together as a clearing-house association, to the members thereof, for the purpose of settling clearing-house balances. Such certificates are negotiable, as a rule, only among the members of the association, and are not in any sense to be regarded as currency.

This private money was issued against the deposit of collateral securities (e.g. bank notes) and in some occasions in very small denomination. It circulated generally for a short period, until the liquidity problems were resolved. Although illegal - because the issue was not required to be backed with Government bonds or specie - this activity was so efficient in providing liquidity that the Federal Government did not prosecute the Association.¹⁸

The sequence of events that lead the NYCHA to issue CHLC usually started with deposit withdrawals in such an amount that liquidity was lacking. The need for liquidity was so important that some banks were not able to settle their balance at the clearing-house without having to liquidate. In order to prevent such an event, the bank asked the NYCHA for a loan at 6 to 9 percent per year. If the Association agreed, it extended CHLC that the bank could use as settlement assets. The CHLC were bearer securities, in the sense that the bearer benefited from the interests when they were due. The CHLC could circulate until retirement by the NYCHA. In order to retire the CHLC, the Association just announced a date after which the interest on certificates would not be paid. Hence, the interests paid

¹⁸Its illegality and therefore the possible prohibition of CHLC may be one reason for which Cannon - who recognised its usefulness as Vice-President of the Fourth National Bank of the City of New York - was stressing the fact that CHLC are not “in any sense to be regarded as currency”.

were the instrument used in order to control the supply of certificates as well as enhance the acceptability of the certificates by other banks. Trust in these certificates was maintained through the threat of eviction of the system of any member recalcitrant to pay the interests due. The use of CHLC was soon extended to other States of the Federation with higher degree of circulation. For instance, as reported by Cannon (1901) p.117, “it is noted on the [Atlanta] certificates that they ‘will be received on deposit or in payment of debts due any bank in said clearing-house’ - an implication that they were used for general circulation, which indeed, is true.”

The CHLC is an excellent example of how the use of private money allows for circumventing shocks and frictions present in the market. The Scottish and Suffolk experiences are also nice instances of private money system that were functioning smoothly in order to maintain stability. As mentioned above, it is not clear that these systems allowed for competition. Free banking is also subject to other criticisms that we review in the next section.

4.4 Limitations of Free Banking

In this section we review historical facts on the limitations of Free Banking. In particular, free banking systems are deemed unstable by many scholars (Section 4.4.1). This instability is usually blamed on portfolio mismanagement (Section 4.4.2). Also, monitoring was costly. To illustrate these costs, we review the dissemination process of notes quotation in Section 4.4.3.

4.4.1 Instability of the Free Banking System

In Scotland, **Car** and **Mathewson** (1988) record around thirty closures or failures of unlimited liability banks prior to 1845.¹⁹ Also, some observers are doubting the ‘Free’ spirit of the Scottish experience. For instance **Cowen** and **Kroszner** (1989) argue that Scotland had a three-tiered system: “The smaller Scottish banks relied on the public banks as lenders of last resort in problem times and, in addition to their London correspondents, sources of specie in normal times. The public [chartered] banks depended upon the Bank of England directly

¹⁹A bank is said to have failed if it closed and failed to pay all bearer of its notes.

in crisis times and upon their London correspondents, who had account with the BOE, for specie and discounting in normal times.” (p.228)

In the United States, runs and panics are legendary (e.g. **Dwyer**, 1996). Examples of banks whose redemption offices were located in remote and sometimes dangerous locations, the so-called “wildcat banks”, abound. See for instance, **Rockoff** (1975). Also, closures and failures of banks in the Free Banking era in the United States are well documented. See **Hammond** (1957).

Can one conclude that free banking a chaotic period? **Rolnick** and **Weber** (1983) study this claim for the United States. They find this conventional view to be over-exaggerated. However, their study of four States (New York, Wisconsin, Indiana and Minnesota) led to the conclusion that closures were numerous (48% of banks closed) and failures were a problem: 15% of banks failed. Moreover, although banks were staying in business on average for 6 years, according to their calculation at most 25% of all banks closed after one year or less of existence.²⁰

4.4.2 Portfolio Mismanagement

Although we cannot conclude from the above facts that free banking is *inherently* unstable, they point to problems with free banking. **Rolnick** and **Weber** (1983,84) explain these problems in the United States using the “falling asset price explanation”. Their explanation, which is also confirmed by the analysis in **Economopoulos** (1988) goes along the following line.

Free banking meant that the issuance of bank notes had to be backed by state bonds. Real shocks to the economy were fed into the financial sector through the value of the bonds held by banks: as these diminished in value, banks were more and more fragile thus creating massive withdrawals and sometimes runs. An example of such real shocks is the spring of the American Civil War.

Economopoulos (1990) reconsiders Rolnick’s and Weber’s falling asset price explanation of free bank failures. Examining New York and Wisconsin free banks portfolios, he finds that

²⁰This number represents an upper bound. This is due to Rolnick’s and Weber’s method of recording banks in existence.

failed banks held significantly different types of portfolio from solvent banks. Neither New York nor Wisconsin imposed a specie requirement. Therefore banks were flexible in asset selections. The liquidity problems facing free bank managers was simple. They had to match the average circulation period of their notes with the average maturity of the loan portfolio, thereby minimizing specie reserves and so minimizing costs.

Economopoulos (1990) finds three distinguishing features of solvent banks portfolios. (1) Solvent banks had higher proportion of loans and specie, and fewer bonds relative to total assets than closed banks. (2) They had higher loans and discounts to bonds ratios than closed banks. Finally, (3) solvent banks held more deposits than failed banks.

We can conclude from this analysis that the failed banks had portfolio management problems. Basically, their portfolios were too illiquid: they could not efficiently respond to large withdrawals by informed note-holders. This analysis hinges on the *lack of portfolio monitoring* as a main problem of a free banking system. Also, we can infer that requiring bond holdings as a security is not the appropriate regulation to adopt because of the associated liquidity problems.

4.4.3 Costs of Information Dissemination

In the United States, the transaction and monitoring costs resulting from the free banking activities were important. Compared to a system with a single producer of money, considerable amounts of resources were devoted to the well functioning of the system.

According to **Gorton** (1999), there were several hundred issuing banks in the United States during the free banking era. Each of these banks could issue a type of note. All these type of notes could be used as a settlement asset. In order to maintain a proper working environment, “note brokers gathered information on banks, quoted bid and ask prices (...) Note reporters, small newspaper, reported the prices at which notes traded in the secondary markets” (Gorton 1999, p.39). To a lesser extent, this also insured a safe and secure payment system. When a bank closed, its entry had to be updated appropriately. Since the value of a note was not fixed, but rather market determined, these reporters were typically updated on a monthly basis.

To be useful, this record had to be distributed to - or at least its entry had to be brought to the knowledge of - any interested person at least as regularly as it was updated. Gorton (1999) finds that “Such bank note reporters were obtained like other newspaper, by subscription or from a newsstand”. We did not find any approximation for the cost of using such a record, but it is easy to figure out that the update, printing and circulation process of this record involved non-negligible costs. For illustration, we include two selected pages of the “Thompson’s Bank note and commercial reporter” kindly provided to us by Warren E. Weber in the Appendix.

In this section we reviewed three free banking systems. We found that stability of the currency stock was more or less ensured. This was mainly due to financial innovations, rapid adaptation to adverse events and efficient clearing systems. However, despite these successes, free banking was criticized on three grounds. 1) Periods of free banking were seemingly subject to more instability than one can infer from the experiences we mention. 2) As a result of free competition and lack of monitoring, there were cases of portfolio mismanagement. They are the main reasons for the instability. 3) The monitoring costs required for a safe system are heavy.

5 Competition Today

Even though nowadays a government monopoly in the provision of money is standard, there are still several levels of which there is competition. First, central bank money (public currencies) compete against each other internationally. Second, central bank money has to compete at a national level with private money. Technological advances have over the last decades changed the payments industry dramatically. Changes have taken place both on the level of retail payments as well as in large value interbank payments. We will discuss these developments and their implications separately. We first turn to competition among (international) public currencies.

5.1 International Currency Competition

Even though competition between national monies is limited, there is potential competition between currencies of different countries. Relevant questions in this context are what determines the international demand for a currency, under what circumstances does a vehicle currency emerge, and finally, whether currency competition has any impact on price stability. Several papers study the demand for national currencies in an international environment. **Matsuyama, Kiyotaki and Matsui** (1993) extend the framework of Kiyotaki and Wright (1989) to a two-country context in which two national currencies exist. They show the existence of three different types of equilibria: in the first type of equilibrium, both countries remain in autarky, using their national currencies only, while in the second type, one currency is the only medium of exchange circulating in both countries. Finally, in a third equilibrium, currencies are perfect substitutes to each other, i.e. a uniform currency exists. The existence of these equilibria depends on the integration of the two economies, formalized as the probability to meet one trader from the other country. Not surprisingly, these types of equilibrium are non-exclusive, thus yielding to situations with multiple equilibria.

A shortcoming of Matsuyama, Kiyotaki and Matsui is that there is no room for a very common phenomenon, namely the predominant usage of domestic currencies for domestic good trades in an environment with active foreign exchange markets. **Zhou** (1997) is able to rationalize this behavior. In a model where consumers have a need to consume both foreign and domestic goods, she shows that this combination may emerge as equilibrium behavior. The result is driven by self-fulfilling beliefs about the future usage of currencies: if agents expect that a certain type of currency will be the one predominantly used in goods markets, it is in the agent's interest to use this currency. The usage of domestic currencies can therefore arise when a sufficiently large fraction of goods trades are expected to be performed in the local currency.

Rey (2001) links the usage of currency to the underlying pattern of international trades. Similar to the above papers, she shows that there may exist multiple equilibria. The multiplicity is caused by *thick-market externalities*. These externalities are characterized by a situation in which market participants profit from an increasing market size.²¹ The presence

²¹The term *thick market externalities* is closely related to *network externalities*, but more commonly used

of thick market externalities in the foreign exchange market has been tested in **Hartmann** (1998).²² In Rey (2001), they result from a transaction technology exhibiting increasing returns to scale. Rey is able to show the emergence of a *vehicle currency*, that is, a currency that is used in transactions between two countries even though it is the currency of a third country.

To summarize, the above papers show that there can exist equilibria in which several fiat currencies are valued, but also those in which there is only one, dominant medium of exchange circulating. A shortcoming of these models is, however, that they remain silent on some essential issues such as the endogenous determination of the price level and exchange rates. Therefore, they are unable to conclude on the effects that the competition has on the provision of money and the inflation rate. In fact, exchange rates constitute another source of indeterminacy.

What distinguishes fiat money markets from goods markets is that fiat monies are intrinsically useless. Fiat monies can only be valued to the extent that they ease the trade of goods. Whether these pieces of papers are red or blue should not make any difference as to their intrinsic ability to serve as means of exchange. Hence, if several types of pieces of paper are provided, this gives more opportunities for choosing the means of payment, but does not affect the very existence of a means of payment. Therefore, the price (exchange rate) at which these useless piece of papers are swapped does not matter either for the existence of a means of exchange. Hence for any exchange rate between fiat monies, there is a means of exchange and therefore there is an equilibrium in the real sector.

This is the well known indeterminacy result of **Kareken** and **Wallace** (1981): given a set of fundamentals, if several fiat monies are used there is a continuum of equilibria that are not welfare equivalent. In fact, different exchange rates yield to different distributions of wealth

in the context of industrial organization.

²²The foreign exchange market exhibits network effects if an increased trading volume is reflected in lower transaction costs. Hartmann (1998) uses bid-ask spreads as a proxy for transaction costs and finds a negative relationship between predictable volumes and bid-ask spreads, both in the short run (using daily time series estimations) and long run (using panel data random-effects estimation). In the short run, however, he finds unpredictable volumes to be highly and positively related with bid-ask spreads. The effects of unpredictable volumes vanishes over time and Hartmann concludes that the long-run effect of volume on bid-ask spread is unambiguously negative, thus confirming the presence of economies of scale in the foreign exchange market.

and to different price structures.²³

The reason for this indeterminacy is that the value of a currency does not rely on the fundamentals of the economy in which it is used. Instead, in the absence of any government intervention, **Wallace** (1979) argues that the demand for each currency is driven solely by speculation. There is then a role for the government in implementing a policy that will select the best equilibrium. Interventions can be a fixed exchange rate policy or a minimum holding requirement of a currency.

There are two important lessons from the literature on international currencies competition. First, most equilibria are characterized by a double indeterminacy: The price between each currency is indeterminate and the use of the currencies themselves is indeterminate. Second, history matters.²⁴ Despite the introduction of a new currency, old currencies might still be used because of institutionalized habits. A switch to an equilibrium in which a new currency assumes a more prominent position may happen only if there are substantial gains from using it, or if there is proper coordination from participants of the system.

5.2 Electronic Money

Electronic payment media such as credit and debit cards have already for some time been used extensively for conducting retail payments, and have to some extent replaced the traditional payment media cash and checks. Recently, also electronic money has started to circulate in many countries (for an overview of the usage of electronic money around the world, see BIS 2000).

The term *electronic money* is used for any monetary value that is stored on an electronic device and that is accepted as a means of payment not only by the issuer but also by other agents, and for the purchase of more than one good (see for instance **Issing** 2000). As such, it includes pre-paid (stored-value) cards as well as network money which is stored in computer memory and can be used to purchase goods over electronic networks such as the Internet.

To the user, payment with electronic money appears not to be too different from payment

²³Note that this is a different type of indeterminacy than that discussed in section 2.2.1: there, the payment medium itself was indeterminate, while here it is the *price* of the medium.

²⁴On this point also see Krugman (1980).

with a credit or debit card. The main difference is the timing of settlement: When a credit or debit card is used, the debiting of the payor's account occurs only after the purchase is made. A payment with electronic money, on the other hand, must be funded beforehand. **Shreft** (1997) points out that electronic money is in fact not very different from cash. It is simply the electronic equivalent of bills and coins. Indeed, at this point in time, both electronic money and paper money are usually drawn from the payor's current account in advance of the time the payment is made. Shreft argues that the novelty about electronic money is that unlike bills and coins, it is issued by private firms. These firms are mostly banks, but depending on the respective national regulations, also non-banking firms may be allowed to issue electronic money. Therefore, electronic money is essentially a form of a private money.

Hence, technological developments such as electronic money do not change the focus of the debate, on the contrary. Indeed, today most private monies are intangible and computerized. Therefore, issues are now the nature of the entity who should control the entries, and whether different types of computerized systems should be used. But the question of competition still remains.

One might also wonder whether electronic means of payment will replace cash or compete with it in the near future. Among others, **Drehman et. al.** (2002) claim that the obsolete features of cash will actually keep it alive, despite the technological advances used by other means of payment. Because cash is not easily traceable, agents might prefer to use it in order to remain anonymous in their undertaking of some not-so-legal activities.

Indeed, one main difference between now and then is the speed at which information circulates. The higher speed of information dissemination implies that mistakes or misbehavior are recorded by all agents more quickly. Hence coordinated punitive actions can be taken sooner. In turn this lowers the incentives for misbehavior.

Despite the preference that might have for cash, it seems difficult to dispute the fact that new payment technologies are potential competitors of government money. For instance, **Kroszner** (2000) claims that advances made in the payments technologies have already eroded the government monopoly on the issuance of money. He attributes the relative long periods of price stability observed in many countries partially to the presence of competition

from private payment media, and partially to international currency competition. Agents being better informed about the stability of other currencies can easily switch from one to the other. Furthermore, the cost of reshuffling a currency portfolio has been tremendously reduced by technological advances. He concludes that Hayek's vision that competition by private money issuers may discipline government has, at least to some degree, come true.

However, faster information dissemination does not mean the disappearance of information asymmetries. While information might circulate rapidly, it might well be more difficult to gather. This is even more so given the increasing complexity of the financial world.

Today, payments made with electronic money are usually accompanied by a movement in the users' bank accounts and therefore, also by central bank reserves. Indeed, the European Central Bank and Eurosystem's policy on electronic money is that issuers of electronic money must be legally obliged to redeem it at par value (Monthly Bulletin November 2000, p. 57). However, in the absence of such requirements, it may become the case that receivers of electronic money may not redeem its monetary value on their bank accounts, but instead use it to make new payments. Payments would then be conducted without regular recourse to central bank money. In this case, the link between economic activity and the amount of central bank money would become much weaker. **Friedman** (1999) predicts that this trend can lead to a complete erosion of the demand for central bank money. However, his conclusions that the central bank's ability to conduct monetary policy will vanish is disputed by several authors, such as **Freedman** (2000) and **Woodford** (2000).

In particular, despite all predictions, a widespread use of electronic money has not (yet) taken place. The analysis of section 2.2.1 provides an explanation for this: network externalities seem to be so strong that the technology is effectively prevented from taking-off. As long as the number of users is small, it is not worth to undertake the investments necessary to enable customer payments to be made in electronic money. Still, some exogenous shock may trigger the switch to another equilibrium in which electronic money is both widely used and accepted.

In this discussion, we have focussed on the effects of competitive electronic devices in retail payments. However, the demand for central bank money is not only affected by the

demand for cash, but also, and perhaps more importantly, by banks' demand for central bank reserves. We will turn to this question in the following.

5.3 Large value payment and settlement systems

Freeman (1996a) exposed the importance of a well functioning payment system for the economy in an environment where debt is settled using fiat money. It is the very fact that debt is settled using fiat money that creates inefficiencies. The environment is an overlapping generation model that involves both creditors and debtors that are risk averse. Preferences and endowments are such that debtors have to issue debt in order to consume creditors' goods. Debts can only be redeemed with fiat currency at a central clearing area. However, agents are displaced in such a way that an amount of debt has to be sold before it is settled. Because Freeman allows for the possibility of a liquidity shortage, the debt can be sold at a discount rather than at par thus generating a market inefficiency. Indeed, taking the likelihood of a liquidity shortage into consideration, risk averse creditors will not find debt as attractive as fiat money. They then reduce the quantity of good sold for each unit of debt. Debtors are then worse off while the likelihood of a liquidity shortage reduces the expected payoff of creditors. Freeman considers central bank discount window policy to buy debt at par as a remedy for the shortage of liquidity. Alternatively, **Freeman** (1996b) proposes private money as means to settle debt and circumvent a liquidity shortage. He shows then that regulations are needed in order to prevent bank-note over-issue. Despite the limitations of Freeman's approach already mentioned in Section 4, this last conclusion is interesting in the light of the recent developments we will cover here.

In the area of interbank payments, both private and public payment media are used widely. This includes settlement systems related to the transfer of securities as well as foreign exchange transactions. Public large-value payments systems settle in the books of a central bank, and also a few private systems provide settlement in central bank money. Private bank money, on the other hand, is often used in international settlement systems. Even though the turnover in these interbank payment systems is very large, and they constitute an important part of the payments infrastructure, the role of central bank and private money in this field

has only recently been explored in the literature.

Kahn and Roberds (2002) argue that one specificity of public, i.e. central bank provided settlement systems is that central banks have a strong interest and responsibility in maintaining financial stability. As such, they cannot commit not to provide liquidity to system participants in times of distress, even if no sufficient good collateral is available to cover the central bank's credit exposure. Because of this "credit insurance" extended by the central bank, collateral postings by participants are lower (or of lower quality) than they would have been in a private system, thus enhancing efficiency. On the other hand, an advantage of private systems is that they provide efficiency gains from private monitoring of counterparties.

The article also investigates the hierarchical structure that is typical in payments systems whereby only some banks are able to settle their transactions directly, while others have to settle through a settlement agent. It is efficient that riskier agents, the argument goes, are monitored by more reliable agents who act as their settlement banks. This again economizes on the need for collateral.²⁵

A different view is taken in **Freixas et al.** (2002) who consider systemic consequences of a settlement bank failure in the context of securities settlement. The paper argues that settlement of securities transactions often requires participants to pre-deposit funds at the settlement bank, on whose accounts the cash-leg of the transaction will be settled²⁶. So, if the settlement takes place at the central bank (which is the case in domestic settlement systems), payments are done in central bank money. However, some important international settlement systems currently settle in the accounts of private settlement banks. If the settlement bank undertakes any risky activities such as investments in risky or illiquid assets, its failure is a possibility. This creates credit and liquidity risk for the participants. Moreover, by its nature the settlement bank has obligations towards many participants at the same time. Thus, settlement in the money of a private settlement bank not only involves credit risk, but the consequences of its failure might easily be systemic. One possibility to eliminate credit risk

²⁵This argument could also be expanded to explain why at the retail level mostly commercial bank money is used, while central bank money is more common in large value systems ("pyramid structure").

²⁶Alternatively, settlement occurs on the basis of credit from the settlement bank.

of the settlement bank is obviously a strict regulation and close monitoring of its activities. Freixas et al. argue that in order to limit the systemic exposure of the financial system, a combination of collateral requirements and debit caps on participants' exposures would be optimal. Still, such a regulation might be difficult to enforce.²⁷

The settlement of foreign exchange transactions operates in a very similar way to the one of securities. Of course, different currencies are involved in the transaction, consequently settlement in public money is more complex than in the cases discussed above, and private settlement arrangements may evolve more naturally. Indeed, the only settlement system for multicurrency transactions operating on a large scale is the CLS (Continuous Linked Settlement) system which started operating in 2002. **Kahn and Roberds** (2001) describe and evaluate the operational structure of CLS. The system requires that participants make "pay-ins" in certain currencies (that is, in central bank money) in the beginning, but only receive "pay-outs" later in the settlement day. During this time, all settlement takes place in private money. Therefore, participants are in principle vulnerable to the failure of the CLS Bank, just as in the case of securities settlement. However, CLS Bank is designed to be a single-purpose bank that does not engage in any activities involving credit risk. All obligations of CLS Bank towards participants should therefore always be backed by liquid assets. Kahn and Roberds acknowledge that indeed, CLS basically eliminates credit risk in foreign exchange transactions. However, the authors point out that via CLS, financial contagion can spread across currencies. They also discuss possible co-ordination failures in cases where more than two trading parties are involved, which imply a rationale for central bank intervention. In particular the introduction of CLS might have swapped credit risk for liquidity risk. But overall, they conclude that CLS is able to significantly reduce risk in foreign exchange markets.

To summarize, in the area of large value payments, central bank money and private money exist side-by-side. Strong network externalities give rise to a tendency for concentration of the settlement industry. The high potential for systemic risk that arises from a very concentrated structure creates concerns about the unrestricted use of private settlement media. Thus, even

²⁷More generally, risk mitigation measures such as those suggested in the new Basel Capital Accord (BIS, 2001) could be employed. These include taking collateral and obtaining credit derivatives and guarantees.

though the use of private monies is efficient in large value payments, there is a need to regulate the settlement business in order to limit systemic risk.

5.4 Ensuring competition

If the provision of a means of payment is an activity which is characterized by economies of scale, then the central bank has a role to play in order to ensure competition. Concerning retail payments, it is clear that economies of scale are present: The costs of ensuring that economic agents use a means of payment are certainly considerable. However, once it is valued, producing a single unit of it is generally rather cheap. The same is true for large value payment systems: once in place, it does not cost much to allow a new party to become member of the system.

However, patents on new technology in electronic payment devices have the potential to make a market non-contestable. That is, if the cost of entry - for instance due to necessary investments in research and development - is high enough to deter any new entrants, monopoly behavior will prevail. As highlighted in our short overview of the literature on natural monopoly, a market that has a single producer can still be contestable if the cost of entry is low enough or if a firm is ready to enter and propose a service at a competitive price, thus forcing the present producer to maintain prices at marginal cost.

Hence, it is important that the central banks support measures that will render markets contestable. This has been recently advocated by **Green** and **Todd** (2001) for the specific case of the Federal Reserve Bank:

The Federal Reserve's policy on its role in the payments system should explicitly recognize promotion of contestable payment markets as a key tactic in the Fed's pursuits of its payments system goal. At the same time, pursuit of electronic payment technologies should be considered primarily as a means for promoting contestability, rather than as an end in itself or as a direct means of pursuing the Fed's goal. [p.19, italic in the text]

Payment and settlement systems are very costly to set up under present technological conditions. Therefore, markets for these systems exhibit large scale economies, and the con-

testability issue may be and certainly was problematic. There is some basis for the argument that central banks should stand ready to provide some type of financial services that are potentially subject to a monopoly at a marginal cost pricing policy.

6 Conclusion

Competition is generally seen as the best mechanism to achieve an efficient allocation of resources. Concerning the provision of means of payment and settlement services, however, in this survey we highlighted elements suggesting that unsupervised competition could be detrimental to efficiency or stability. On the one hand, network externalities and economies of scale could lead to a monopoly situation with the associated efficiency losses. On the other hand, asymmetric information could be detrimental to the value of privately supplied means of payment, thereby increasing the instability of the whole payment system.

A brief overview of the free banking episodes in Scotland and the United States illustrated the benefits of a system allowing competition. At the same time, the experiences point toward moral hazard problems. In particular, the lack of portfolio monitoring can explain why some free banks failed. Furthermore, some examples of monopolistic behavior are recorded.

Finally, the literature on competition among currencies as it is prevailing today was reviewed. Competition is taking place among international currencies but there are still no models predicting a clear outcome from such a competition. Similarly, there is no consensus on the impact of new retail payment media such as electronic money on economic efficiency and stability. In the area of large value payments, it was argued that economies of scale foster concentration, thus augmenting the risk of a systemic event. This creates concerns about the unrestricted use of private settlement media.

In short, the money industry seems to be characterized by network externalities. In the presence of such externalities, unregulated competition would lead to a high market concentration. This could make the market vulnerable to monopolistic behavior and systemic risk. Competition, or competition-like behavior can be guaranteed if a market is contestable. By actively participating in the settlement industry, and by supplying a means of payment, the central bank can contribute to the contestability of a market.

This participation of the central bank alone, however, does not eliminate systemic risk. In order to reduce the likelihood of a systemic event, and to limit the financial system's exposure to the failure of a market participant, supervision and regulation of large financial institutions and payment systems is needed.

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THOMPSON'S BANK NOTE AND COMMERCIAL REPORTER

EDITED BY J. THOMPSON; CORRECTED BY THOMPSON, MORSE & CO., No 2 WALL-ST.

PLATT ADAMS,
Publisher and Proprietor.

NEW YORK, DECEMBER 19, 1857.

[We have no Traveling Agent.]

THE REPORTER.

To Correspondents.—ALL LETTERS AND COMMUNICATIONS intended for the "BANK NOTE AND COMMERCIAL REPORTER," must be addressed to the subscriber, or JOHN THOMPSON, Editor; and Correspondents are particularly requested to name the State, as well as the Town or City.

Bank Officers are requested to inform us of all New Organizations, Changes of Officers, New Counterfeits, &c.

PLATT ADAMS, No. 64 Duane street, N. Y.

We expect to see a new issue of Treasury notes next week. The Treasury Department has a stock of old blank notes ready for use. It is only six months since the tariff was reduced to avoid a dangerous accumulation of specie in the Treasury. The turn in government finances shows that our statesmen did not see into the future any further than bankers and merchants. These Treasury notes will help bring back prosperity to the country. They are nothing more or less than a mammoth issue of paper money.

The New York and New England Banks (except Rhode Island), have gone through with the farce of proclaiming specie payments. We say farce, because none of them ever dared to refuse specie when demanded. The panic—the suspension, and the resumption are three notable farces, enacted by a few bank officers, better qualified for other work than the parts they play.

We are often asked—How the money market is shaping? What of the future, &c.? Our answer is—This revolution will die out and be forgotten almost as speedily as it was foolishly brought on. This revolution is no more like that of 1837, than pink is like black. That was painfully real;—this will pass off like a dream. That did not.

There is such a diversity of rates of discount, and such a quantity of bogus banks, that it would be prudent, at least, to refer to the quotations on taking money. Our quotations can be consulted with confidence.

The Country Banks are again moving the question of establishing a redemption agency in this city. This subject has heretofore been referred to us, and by this time has unquestionably been only considered by the banks of the interior. It is the only course for these banks to protect themselves at trifling expense, and ensure a prompt and efficient redemption of their circulating notes. This can be effectually accomplished by all uniting upon some system of protecting each other's notes, and thus do away with the "throwing-out" movement of our city institutions.

TREASURY NOTES.

Thompson, Morse & Co., No. 2 Wall-street, will buy and sell Treasury Notes, as soon as issued. For temporary investments, these notes will be the most desirable of any of the "promises to pay."

The Union Bank pays a semi-annual dividend of 4 per cent, on the 2d of January.

LATEST COUNTERFEITS.

5s. on the Union Bank, Dover, N. J.—Wid horses on upper left corner—arms of State, and scenery, &c. on right end.

10s. on the Bank of Pike County, Ills., altered from 1s.—On a careful inspection the word ONE is discernible under the word TEN.

20s. on the Mercantile Bank, Providence, R. I. from smaller denomination—Vig train of cars—male and female on right end—man, hammer, &c. on left end.

1s. on the Mechanics' and Traders' Bank, N. Y. City—Vig. female and eagle—child's head on right end—General Taylor on left end.

2s. on the Exchange Bank, Salem, Mass.—Vig. train of cars—female, shield, &c. on right end—female with sickle and sheaf of grain on left.

5s. on the Essex Co. Bank, Keeseville, N. Y.—Vig. eagle and female—5 each side of vig—FIVE across either end.

1s. on the Farmers' Bank, Orwell, Vt.—Vig. farmer, sheaf of grain, &c. &c.—female, shield, and figure 1 on right end.

2s. on the Bank of Commerce, Carmel, N. Y.—Vig. two females—female in upper left corner—Washington on right end.

5s. on the Exchange Bank, Hartford, Ct.—Vig. cattle and railroad cars.



IOWA BANKING.

The new Constitution of Iowa authorizes a system of banking, but upon what basis, we are not informed, never having seen a copy. From some of our exchanges, we notice preparations are making for the organization of a number of banks. If the law under which they exercise the banking privilege, is as stringent and as well administered at that of Illinois and Wisconsin, the public need have no fear of loss on the circulation of the banks.

The Forest City Bank, Waukesha, Wis., is a new Bank, but just organized upon a capital of \$50,000. The officers are S. A. Bean, Pres., and G. E. Sickles, Cash.

The Auditor of the Bank Department of Indiana reports that only one bank, established under the free banking law, has suspended—the Tippecanoe Bank. There are ten banks now winding up and redeeming their circulation at par. The securities pledged for the redemption of the bank notes include—State of Indiana, \$1,221,529; State of Virginia, \$191,000; State of Missouri, \$420,000; miscellaneous, \$101,000; total, \$1,933,529.

The interest on the New York Central 7 per cent Bonds, due December 15, in this city, will be paid by Duncan, Sherman & Co.

Canal Navigation in the State of New York closed on the 15th inst. Nearly or quite all the boats have got through. The weather is so mild that lake navigation still continues.

The Fulton Bank has declared a semi-annual dividend of five per cent, payable on the 2d of January, in lieu of the usual November dividend, omitted at that time.

INDEX.

Alabama.....	Page 25	Arkansas.....	Page 28
Canada.....	29	New Brunswick.....	29
Connecticut.....	11	New Hampshire.....	5
Delaware.....	33	New Jersey.....	19
Dis. of Columbia.....	24	New York City.....	13
Georgia.....	25	New York State.....	14
Illinois.....	27	North Carolina.....	24
Indiana.....	26	Ohio.....	26
Kentucky.....	27	Pennsylvania.....	21
Louisiana.....	25	Rhode Island.....	9
Maine.....	8	South Carolina.....	26
Maryland.....	23	Tennessee.....	28
Massachusetts.....	7	Vermont.....	6
Michigan.....	28	Virginia.....	24
Mississippi, &c.....	29	Wisconsin.....	26

QUOTATIONS.

Gold.....	per 100	prem.
New York State.....	per 100	dis.
New England (except Rhode Island).....	per 100	dis.
East Jersey.....	per 100	dis.
West Jersey.....	per 100	dis.
Rhode Island.....	per 100	dis.
Illinois & Wisconsin.....	per 100	dis.
Philadelphia Banks.....	per 100	dis.
Baltimore Banks.....	per 100	dis.
Interior Pennsylvania.....	per 100	dis.
Maryland Banks.....	per 100	dis.
Delaware Banks.....	per 100	dis.
Ohio, Ky., Indiana and Missouri.....	per 100	dis.
New Orleans.....	per 100	dis.
North Carolina.....	per 100	dis.
South Carolina and Georgia.....	per 100	dis.
Virginia.....	per 100	dis.
Canada.....	per 100	dis.

RATES OF EXCHANGE ON NEW YORK

AT THE PLACES NAMED BELOW.

The parties whose names we give being the Drawers, and the currency of their locality as signified.

		DECEMBER 16.
CHICAGO.....	F. G. Adams	6 @ 26 1/2 ct. prem.
CINCINNATI.....	Geo. S. Wright & Co.	5 @ 24 1/2 ct. prem.
PHILADELPHIA.....	Croome & Co.	2 @ 22 1/2 ct. prem.
BOSTON.....	Clapp, Fuller & Browne	1 @ 21 1/2 ct. prem.
PROVIDENCE.....	D. W. Vaughan & Co.	3 @ 19 1/2 ct. prem.
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RALEIGH, N.C.....	J. G. Williams & Co.	7 @ 13 1/2 ct. prem.
ST. PAUL, MINN.....	J. Jay Knox & Co.	5 @ 12 1/2 ct. prem.

LAND WARRANTS.

We quote (Dec. 17) at the following rates—

Acres	Price	Acres	Price
40 acres.....	\$0.86	40 acres.....	\$0.95
80 acres.....	0.76	80 acres.....	0.81
120 acres.....	0.67	120 acres.....	0.71
160 acres.....	0.77	160 acres.....	0.81

Warrants sold at this office are guaranteed in every respect.

THOMPSON, MORSE & CO.

PRIVATE BANKERS.—Important.—The Publisher of the Bankers' Magazine will issue next month in his work, a revised and corrected LIST OF THE PRIVATE BANKERS IN EVERY TOWN AND CITY OF THE UNITED STATES, in Europe, South America, Canada, Australia, &c. Also, a List of Banks in the United States, name of President and Cashier of each. This late revision has been so disastrous to Private Bankers, that a reliable list at this time will be duly appreciated. Cards of responsible Private Bankers will be inserted one year for TWENTY DOLLARS, including subscription to the Bankers' Magazine. Cards for insertion must be received before 1st January.

New Editions of the "Manual for Notaries Public," \$2.—and "Bankers' Common Place Book," \$1. dec. 12-1m.

G. L. MAXWELL,
STOCK BROKER,
OFFICE OF THOMPSON, MORSE & CO
No. 2 Wall Street..... New York.

Discount

Pacific Fishes, cor. Broadway & Grand st.,..... pa.
 [B. M. Tilden, Pres. — Robert Buck, Cash.]
 6, *vir.*, sailer, bules, barrels, &c., ships in the distance
 — 7 and two small marine views on right end — 8 and controller's die on the left — limitation of revenue
 15, altered from 18 — poorly done — *vir.* female with right
 head on figure 1 — genuine 56 have a rather neat — beside
 bules, barrels, &c., with shipping in the distance.
 10, altered from 18 — *vir.* train or cars.
 10, *vir.* a female resting on a shield, with Neptune in
 a dragon boat.

Park Bank; — *Parkman-st.* per
[*Dr. A. Hoke, Pres.—Chas. A. Tracy, Cash.*]
10s, raised from 2s—*vig* Park mountain, child's head &
the right ind—and eagle on the lower left corner
2s, 10s & 20s, altered from 1s—*vig* Park and fountain
—looking on the right—tallor on the left.
5s, altered from 2s—*vig* view of City Hall

People's Bank, 173 Canal-st., 100
 10¹, has. F. under. Box - G W L, see, Cues]
 10¹, altered from broken People's Bank, Patterson, N. J.
 - vig. two female etc.
 5¹, altered from 2¹ - vig. of tree 5 is steamboat.
 10¹, vig. three mechanicals forming iron - two females
 grain, &c., on the right - brig under sail on the left.
 10¹, altered from small notes - vig. street scene - p r
 - vig. on the right - two X's and center letter eye or tail
 10¹, vig. locomotive, cars, &c. - portrait on right and

[illegible]

Seventh Ward Bank, 234 Pearl-st. por
[M. Halsey, Pres.—A. S. Fraser, Cash.]
24. vig. a female, enters the distance—single, under full sail on right end—imitation of genuine and well used.
25. altered from 1a—vig. female sitting by agricultural implements, grain, &c., ships in the distance—several on the left.
26. letter A, altered from 1a—the margin of the bill, with figure 1, torn off.
27. vig. Declaration of Independence.
28. altered from 1a and 25—vig. detected.
29. altered from broken Tenth Ward Bank.
30. altered—"Seventh Ward Bank" is in one line on the genuine it is divided by the vig.
31. altered from the word "Seventh Ward Bank" are printed over the vig.—on the genuine 30s, the vig. is on the top.

Shoe and Leather B'k., Broadway & Chambers-st par
 1. T. J. Smith, Pres.—W. A. Hanson, Cash.
 5, altered from 1st—vig. hunting scene—Washington
 on left corner.
 5a & 21c, altered from 1st—vig. hunting scene—female
 on the lower left corner—eagle at bottom.
 10, altered from 3rd—vig. hunting scene—female on
 the right corner—man on right upper corner.
 10a, altered from 1st—vig. hunting scene—on eagle
 at the bottom—two figures 10 and the word TEN on the
 left end.

St. Nicholas Bank, 6 Wall-st. par
(Cassius Burdette, Pres.—Arch'd Parkhurst Cash.)
106, altered from 1st-vig. a view of the St. Nicholas
Hotel.—Saints Claus on the right end.

Tradesmen's Bank, 177 C'tham-st. (S). per
[W. H. Falls, Pres.—Richard Berry, Cash]
Beware of checks on this bank, purporting to be
drawn by the Utica Insurance Co.
5s, vig. sailor, ships in the distance—letter V on right—
imitation of genuine.
5s, 10s & 20s, altered from 1s—vig. man shoeing a
horse—man, horse and dog on the left. ind.

5a. old plate—the word FIVE is stamped on in large red letters.

10, 11, at the end, supports to be secured by Du-
 dard, Perkins & Co., N. Y.
 20, allowed from 35- ing, three-stations-blacksmiths on
 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 84

Union Bank, 34 Wall-st. par
[F. Hump, Pres—E. H. Arthur, Cash.]
Five Centime 1c & 2c of this bank are made payable to
bearer—all higher denominations payable (in writing) to
depositor.

12. Name of Ebbe's, each, is split with two's.
13. Two wheels of the work in centre—Pierce on the left—head of female on the left.
14. Stated—viz. woodcut and dog.
15. Old plate—viz. a female ship to the distance.
16. Two wheels of lathe work in the centre—Pierce on right—female on the left.
17. Alter—don't, fernier meant in a V—portrait and two

120. altered from 1a—vig. female figure on the lower arm.

200: v.g. a female seated beside an anchor.
200: Edmunds, one of the engravers, is spelled "Ed-
munds," otherwise it is a good counterfeit—others spelled
"Edmunds," dated Sept. 1, 1841.
200s, altered from 200—it has the letter L each side of

100⁹, let. A—supposed to be altered from the Union Bank, Montreal—Dec. 16, 1846.
100⁹, altered from 1s. and read "the Union Bank will pay, &c." the genuine read "promise to pay, &c."
100⁹, counterfeited—viz. a railroad and cars—viz. of the genuine 100⁹ : a Goddess and eagle.

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