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How did the US Monetary System work under the National Banking System (1863-1913)?

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Abstract

In the midst of the US Civil War, in 1863, the Northern states of the federal Union established the *National Banking System*. It contributed to financing the war effort and to the circulation of banknotes. Following the civil war, this system was retained and extended across the reunified country, surviving 50 years, coming to an end with the establishment of the Federal Reserve System in 1913. The aim of this article is to analyze the features of this system; its weaknesses, brought into relief during the debates surrounding the US 1907 economic panic, and its strengths, such as the role it gave the federal government of guaranteeing the liquidity of national banknotes. We analyze in particular the types of banks and banknotes that existed at the time. We explain in detail what a "bond-backed currency system" means, as well as the meaning of the alternative proposals for an "asset-backed currency system". By pointing out the impact of seasonal variations in credit demand made on the US Money Market, and by presenting some accounting illustrations, we bring to light how the system worked and how it regularly incurred liquidity crises.

Keys words: Bond-backed currency, asset-backed currency, 1907 crisis, liquidity crisis, money market, Kemmerer, Warburg.
Classification J.E.L B1, E4, E5, N11.

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1. Introduction

In the midst of the US Civil War, in 1863, the Northern states of the federal Union established the National Banking System (NBS), which contributed to the financing of the war and to the circulation of banknotes. This system was retained and extended following the Civil War, surviving 50 years, finally coming to an end with the establishment of the Federal Reserve System in December 1913.

The problems characteristic of the NBS were analyzed both long before the 1907 crisis and in the years after. In a 1918 work, E. W. Kemmerer summarized the system's main shortcomings, which, in his view, fully justified the creation of the Federal Reserve. He charts four main problem categories: i) the decentralization and the rigidity of reserves, ii) the inelasticity of money and credit, iii) the absence of an organized system for international transfer, and iv) a dependency on the Federal Treasury due to the absence of a money market which would have allowed banks to borrow, or place funds, in the short term. There was broad consensus concerning these points among the early historians of the Fed, among them Warburg (1907, 1930), van Zeeland (1922), and Burgess (1928).

Nevertheless, for modern readers, accustomed to regard the NBS as merely the prior system in existence before the creation of the Fed, the functioning of this banking system and the way the banknotes were issued remains unclear. Among the copious literature on the history of the NBS, we find Timberlake (1978), West (1974), Selgin & White (1994), Wicker (2000), but the most complete discussion of the workings of the NBS can be found in Sprague (1910). The aim of our article is to analyze the features of this system; its weaknesses, brought into relief during the debates surrounding the US 1907 economic panic, and its strengths, such as the role it gave the federal government of guaranteeing the reimbursement of national banknotes, and therefore their liquidity.

In the second section, we will define the components of legal tender at the time, placing special emphasis on the types of banks and of banknotes that existed during this period. We will also introduce the inelasticity problem of current money. In the third section, we will explain in detail what a "bond-backed currency system" means, as well as the meaning of the alternative proposals for an "asset-backed currency system". We will show how the seasonal demands for current money were satisfied. In the fourth section, we will explain the links between the pyramidal structure of reserves, call loans, and interest rates. In the fifth section, we will analyze the nature of Clearing House Loan Certificates (CHLC) and how they solved the liquidity difficulties of banks, which could suffer losses, while remaining solvent. In the

sixth section, we will look at the US Treasury, US banking policies, and the potential relevance of the economic principles of Bagehot in the American debate of the period.

By presenting some accounting examples, we bring to light how, through its issuing of an endogenous money, the NBS worked, but also how it regularly incurred liquidity crises.

2. Legal tender, the banking system, and the elasticity of current money

Days priors to the creation of the Fed, Hawtrey wrote: "for historical reasons the United States currency system, like the banking system, is an accumulation of picturesque survivals unillumined by any intelligible theory" (1913, p. 172). This system had been created from the two general economic frameworks of the period that lasted from the Civil War (1861-1865), - when the bimetallism prevailing since 1792 had been suspended[3], until the finally adoption of the gold standard in 1900- first, the monetary system, second, the banking system.

The monetary system included many types of "current money", to use Warburg's term (1907). Four of these were considered "legal tender": gold coins, gold certificates (yellowbacks), United States notes (greenbacks), and the 1890 Treasury notes (coin notes), and four were not considered legal tender: national banknotes, silver dollars[4], silver certificates, and silver, nickel, and copper subsidiary coins. According to Kemmerer (1910), national banknotes, gold coins, and yellowbacks were "presumably elastic currency", while greenbacks, Treasury notes, silver dollars, silver certificates, and subsidiary coins were "presumably inelastic currency".

Curent money	*Legal tender*	*Not Legal tender*
Presumably elastic	Gold coin Gold certificates (yellowbacks)	National bank notes
Presumably inelastic	United states notes (greenbacks) Treasury notes of 1890 (coin notes)	Silver dollars Silver sertificates Subsidiary coins of silver, nickel and copper

Greenbacks and coin notes were issued by the Treasury as government debt and considered part of legal tender. This type of legal tender appeared in 1862 with two aims: first, to fill the space created by the suspension of the convertibility of bank debt in gold and

[3] Kemmerer (1944, p. 61-76).

[4] Silver dollars had a face value higher than their intrinsic value (the amount of silver contained in each coin); though they were not legal tender, they were convertible into gold.

silver in December 1861. Indeed, the absence of means of payment threatened the banking system. Second, to finance the war against the secessionist states[5]. All this debt issued by the Treasury during the civil war was paid back, with the exception of the greenbacks, of which the great majority was paid back at the beginning of the 20th century[6]. Coin notes had been issued in 1890 in order to stop and avoid a liquidity crisis. Once greenbacks and coin notes were no longer being issued, they became an inelastic component of legal tender.

Apart from issuing new kinds of legal tender, the second historical remnant of the civil war was the NBS, established in 1863 via the National Bank Act. This Act was a banking legislation on a federal scale, regulating the issuing of national banknotes as well as regulating the "deposit currency" of National Banks. It was in force concurrently with various forms of state legislation seeking to regulate the activity of banks not adhering to federal legislation, there existing as many different forms of state legislation as there were states, in other words there was legislation by state.

Since 1863, there were two types of bank, State Banks and National Banks. The State Banks issued notes, putting them into circulation according to the more or less flexible rules of their particular state[7]. The National Banks could issue national banknotes, which were put at the disposal of banks by the Comptroller of the Currency. The Comptroller of the Currency department was created to supervise National Banks. Only the Comptroller of the Currency was entitled to print and first sign national banknotes. This measure was designed to guarantee banknote uniformity and prevent forgery. The rule stated that these banks could receive national banknotes for an amount representing 90% of the amount of federal government bonds they had subscribed to, after depositing these bonds with the Comptroller's Office. This measure was designed to guarantee the final convertibility of national banknotes[8]. Additionally, these banks were required to maintain a minimum percentage of reserves (between 15 and 25%), so they could ensure the convertibility of banknotes and deposits upon demand, i.e. ensuring their liquidity, which seems *a priori* a good idea, but turns out to be a hindrance in reality, as we will see. One of the crucial points in the reform,

[5] For a contemporary analysis of the legal tender of the period, see Ch. F. Dunbar (1897a) and W.C. Mitchell (1903).

[6] The remaining greenbacks are still not demonetized.

[7] In 1860, there were more than 1500 *State Banks,* with over 900 different state banknotes. There were also other banks (Savings, Private, Trust, etc.).

[8] Note that this measure also facilitated the financing of the war. The obligation for National Banks to guarantee their banknotes to 105% with Treasury bonds expanded the market of public debt, increasing liquidity.

and one of the main advantages of the system, was an obligation of capital in order to guarantee a high degree of solvency (a required minimum of $50,000 or $100,000 depending on the size of the population a bank served). Finally, National Banks were required to subscribe to Federal bonds (a minimum of 30 thousands and 1/3 of the initial capital stock paid in) in order to obtain national banknotes, which they could then put into circulation[9].

The system had two main advantages. As stated above, the uniformity of banknotes made forgery particularly difficult (only the second signature of each bank was different). Furthermore, the issuing of banknotes was *bond-backed*, which means that U.S. Treasury bonds guaranteed them. Consequently, these banknotes were free from credit-risk. Nonetheless, the banking system established in 1863 faced two main problems. The first problem was monetary inelasticity (the quantity of banknotes depended on the bonds issued by the government for budget policy purposes), and the second was a limited distribution in bank reserves (bank reserves being scattered across Country Banks, Reserve City Banks, and Central Reserve City Banks), and the consequent inflexibility of these reserves in case of crisis. In 1911 Kemmerer wrote:

> "The most serious defects of our banking system are, broadly speaking, two in number. The first is lack of coordination and centralization… The second defect is lack of elasticity not only in bank-note circulation, but in bank credit in the broader sense of the term" (Kemmerer 1911a, p. 248).

Initially, the establishment of the NBS met a double aim. On one hand, it helped finance the war, and on the other, it provided a safe, convertible, uniform, and elastic money. When the war ended, the second aim remained in operation, to be continually achieved. This helps explain the system's survival, even if the first experiments of federal banking in the US, first from 1791 until 1811 (the First Bank of the United States), and then from 1816 until

[9] "Sec. 16. And be it further enacted, That every association, after having complied with the provisions of this act, preliminary to the commencement of banking business Under its provisions, and before it shall be authorized to commence business, shall transfer and deliver to the treasurer of the United States registered bonds bearing interest **to an amount not less than thirty thousands dollars nor less than one third of the capital stock paid in**, which bonds shall be deposited with the treasurer of the United States and by him safely kept in his office until the same shall be otherwise disposed of, in pursuance of the provisions of this act (. . .) so that every association shall at al times have on deposit with the treasurer registered United States bonds to the amount of at least one third of its capital stock actually paid in." National Currency Act, later called National Bank Act. Chap. CVI. June 3, 1864.

1836 (the Second Bank of the United States), were highly controversial and ultimately unsuccessful[10].

However, after a time, the NBS appeared to be failing concerning its aim of elasticity. This was the diagnosis established shortly after the crisis of 1890. Indeed, although *"(...) safety, convertibility, uniformity, and elasticity are the attributes of a perfect system of paper currency, the institution under discussion has given us a money in which only the first three requirements mentioned above have been met."* (Waldo, 1893[1900], p. 37).

In 1863, Salmon P. Chase, the Secretary of the Treasury, argued that such a *"national association ... (had to be) permanent in its very nature, and adequate to all demands of business"*[11]. According to T. M. Cooley, Chase introduced the aim of elasticity for the NBS during its very creation[12].

> "Mr. Chase wanted financial machinery under which the volume of currency would not be thus arbitrarily fixed by a legislative vote, but would be *elastic*, and increase or diminish in obedience of the laws of trade. (…) the banks would also give what the treasury issues could not – an *elastic currency* – their bills being issued and returned as they were required, and the calls from day to day determining the amount." T. M. Cooley (1893[1900], p. 43).

When, why, and how was the objective of elasticity for the NBS unfulfilled while those of safety, convertibility, and uniformity were? The answer to the question of when is whenever there were the recurrent economic panics of this period, i.e., 1873,1884,1890 and 1907, as well repeatedly each year at harvest periods, October in particular. To answer the questions of why and how, we will clarify how the NBS functioned, and draw out what distinguishes its "bond-backed currency system" from an "asset-based currency system".

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[10] These two banks were created primarily to finance debt, in the first case debt from the War of Independence (1775-1783), and in the second from the War of 1812 (1812-1815) during an attempt to stabilize the value of money under the Madison administration (1809-1817). These initial attempts failed despite the fact that their function, namely to manage government funds and regulate national credit, was generally accepted by the public. The banking system operated with very limited capital, granted risky credit, and maintained insufficient reserves for banknotes and demand deposits. Following these two failed efforts, after several years under a *free-banking* system (1836-1863), the National Banking Act was signed in 1863. This third attempt proved more successful and the NBS remained in force until 1913. For more details on problems that developed under the NBS, see Warburg (1930), West (1974), Timberlake (1978) and Selgin & White (1994).

[11] Report of the Secretary of the Treasury, for the year 1862, 38th Congress of Senate and Ho. Reps., 1st session, December 10, 1863.

[12] *" In his first annual report, Mr. Chase* [Report of the year 1862, published in 1863] *gave his views upon the machinery desired."* T. M. Cooley (1893[1900]), p. 42.

3. Endogenous issuing of bond-backed national banknotes

To explain the way what we call "the endogenous issuing of bond-backed national banknotes" functioned, let us start by analyzing a simplified example of one national bank operating under the NBS.

Before any banking activity, let's suppose a Denver National Bank with a capital, in thousands, of 80, 70 of which is already paid in, and 10 of which is to be provided later, leaving our bank with 70 in cash to begin with. A portion of this capital must be used to buy US Federal bonds. Instead of buying the minimum requirement, an equivalent of a third of the capital initially paid in, which would amount to 23, Denver National Bank buys not less than 30. Of the remaining capital, 20 is deposited in various reserve banks of New York, and 20 constitutes its cash reserves in legal tender. Our bank's accounts thus appear as follows:

Situation n° 1:

Denver National Bank

20	Legal tender		
20	Deposits in NY Banks		
10	Capital to be paid		
30	*US Bonds*	Capital Paid	70
		Capital unpaid	10
80			80

Under the NBS, our National Bank could grant credit, open and manage deposits, and put national banknotes into circulation. It will receive an amount of national banknotes representing 90% of the 30 of Federal bonds (i.e. 27) to which it subscribed[13].

The Federal bonds retained by the bank were deposited as a guarantee for the national banknotes it received. The national banknotes remain off the balance sheet as long as they remain in the bank, which means until the moment they are signed by the National Bank and put into circulation. In other words, they are off the balance sheet as long as they do not pass into the hands of bank customers. Once a bank signs national banknotes, they come to represent its debt, but a debt whose convertibility is backed and secured by the Federal bonds the bank retains. Through this mechanism the bank put national banknotes into circulation, i.e., it issues them through the grant of credit[14].

[13] All our quantities are in thousands of American dollars, a capital of 80 corresponding to $80,000. See Sprague (1910).

[14] The Comptroller of the Currency prints the notes.

For our example, we will use a balance sheet published by Sprague (1910) for the year 1873, and we will repeat the same habits of payment to establish the proportion of credit used in deposits (55%) versus in national banknotes (45%). To start we will assume that the bank decides to issue the maximum amount in national banknotes it can (27).

Let us now extend the example by having the bank make loans amounting to 65, 38 of which to be credited to the customers' deposit accounts, and 27 given in national banknotes. For the loans amounting to 65, the clients ask for 10% of it (6) in legal tender (20-6=14), they obtain 1 through redemption of national banknotes (27-1), and 5 through reimbursement of deposits (38-5). Finally, let us suppose that the bank receives a deposit of 1 national banknote signed and issued by another National Bank[15], which it adds to its assets by crediting its deposit account (38-5 +1). The reserve coefficient is 57% ((14+20)/(26+34)). The accounts then read as following:

Situation n° 2:

Denver National Bank

20 - 6 =	14	Legal tender	National Banknotes	27 - 1 =	26
	20	Deposits in NY Banks			
	1	NBN other banks	Deposit	38-5+1=	34
	65	Credit			
	10	Capital to be paid	Capital Paid		70
	30	*US Bonds*	Capital unpaid		10
	140				140

The security the Treasury bills lend to the national banknotes has two consequences: first, the quantity of Treasury bills in each bank's possession determines the quantity of national banknotes the bank receives and can issue, i.e. put into circulation. Second, the national banknotes appear on the liability side of the bank's balance sheet only when they are issued, and remain there as long as they do not return to the bank (through payment, deposit, or redemption in legal tender).

Now, suppose that the Denver National Bank, looking at its high level of liquidity, decides to buy more US bonds in order to be able to satisfy any additional demands for credit, that is to create more liquidity by issuing national banknotes. The bank decides to call on the

[15] National banks were required to accept banknotes from all other national banks in order to create a national currency. This helped reduce the risk of loss in case of bankruptcy.

unpaid capital (10) to buy more US bonds; and to buy another 10 of US bonds using 5 in legal tender and 5 in deposits in New York. Thus, the number of US bonds comes to 50. Doing this, the bank diminishes its liquidity so as to increase its capacity to issue national banknotes. With 50 in US bonds, the bank can issue maximum 45 in national banknotes (90% x 50), after previously being able to issue 26 (27-1), or 19 in addition, and respecting this proportion, increasing its deposits to 21. The new extra credit needed to issue these national banknotes and deposits are equal to 40 (19+21). Now suppose that at the same time the bank is reimbursed one unit of credit (65+40-1) with legal tender. The accounts then become, with a 25% (=(10+15)/(45+55)) reserve coefficient:

Situation n° 3:

Denver National Bank

			National Bank		
14 - 5 + 1 =	10	Legal tender	Notes	26 + 19 =	45
20 - 5 =	15	Deposits in NY Banks			
	1	NBN other banks	Deposits	34 + 21 =	55
65 + 40 - 1 =	104	Credit			
10 – 10 =	0	Capital to be paid	Capital paid	70 + 10 =	80
30+10+10 =	50	US Bonds			
	180				180

Here we see that to issue 19 national banknotes, and to increase the deposit by 21, banks have to grant a new credit of 40. Credit is at the origin of this new issue of national banknotes, backed as they are by the Treasury bills possessed in the bank vaults. This is what we call the *endogenous issuing process of national banknotes*, backed by bonds. The amount of available national banknotes depends on the quantity of bills, though their issuing fluctuates according to the demands for means of circulation, related to overall American economic activity.

Now a client asks for 5 units of legal tender (10-5), with 1 through redemption of national banknotes (45-1), and 4 through reimbursement of deposits (55-4). The bank asks the reserve bank in New York to send it 3 of its reserves to replenish its vaults. The reserve coefficient now falls to 21% (=(12+8)/(44+51)). This remains 6 points above the legal minimum (15%). Situation n°4 corresponds to a period of the year during which the money market is relaxed and the interest rate is generally low. The bank can answer without problem to liquidity demands.

Situation n° 4:

Denver National Bank					
			National Bank		
10-5+3 =	8	Legal tender	Notes	45–1 =	44
		Deposits in NY			
15 - 3 =	12	Banks			
	1	NBN other banks	Deposits	55 - 4 =	51
	104	Credit			
	50	US Bonds	Shareholders' funds		80
	175				175

Now a client asks for 7 banknotes, but the Bank only has 50 Treasury bills. It only can provide him 1 more of its own banknotes, and 1 in national banknotes from other banks (now 0), the other 5 notes will necessarily be greenbacks. The Denver National Bank has to request from reserve banks in New York to send 3 (12-3). Consequently, the legal tender falls to 6 (=8-5+3). The reserve coefficient is now 16% (=(6+9)/(45+49)), slightly above the minimum legal reserve coefficient. The bank respects the reserve coefficient, but cannot meet any kind of demand for credit or for legal tender.

Situation n° 5:

Denver National Bank					
			National Bank		
8+3-5=	6	Legal tender	Notes	44 + 1 =	45
		Deposits in NY			
12- 3 =	9	Banks			
1 - 1 =	0	NBN other banks	Deposits	51 - 2 =	49
104 + 5 =	109	Credit			
			Shareholders'		
	50	US Bonds	funds		80
	174				174

The bank has no room left to do anything, all the national banknotes at its disposal having been used, even though it has not granted any additional loans and its reserve coefficient has remained above the 15% requirement.

As we have seen, National Banks often had to ask for the deposits they possessed in the New York reserve banks in order to maintain their legal reserve coefficient. Moreover, although National Banks were protected from liquidity risk, rarely having a coefficient under 15%, even in crisis years, the New York reserve banks were the ones to respond to these demands, and consequently were the banks suffering liquidity crises.

In 1908, the National Monetary Commission (NMC) was created to address the issue of banking reform and to conduct a study of what changes were necessary for the US monetary and banking systems[16]. The NMC was headed by a Republican Senator from Rhode Island, Nelson W. Aldrich, a central figure in East Coast business and politics, working in close collaboration with many advisors and experts[17]. Among the members of the commission was a relatively unknown economist: Edwin Walter Kemmerer, who, along with other economists and bankers, represented the interests of the North, and who elaborated the necessity of the United States adopting an "asset-based currency".

> "The relation between our treasury department and the national banks encourage on the part of banks the practice of depending upon the government for aid in times of emergency, and tend to prevent the banks from making independently, in advance, proper provision for the regularly recurring heavy seasonal demands" (Kemmerer 1911a, p. 249).

The pursuit of American banking reform between 1894 and 1908 focused on finding an alternative model to a *bond-backed currency*. The new model, an *asset-based currency,* proposed a currency that would be guaranteed by private assets (the issuing system would be based on commercial papers), rather than by U.S. government bonds. The goals of this model were to reduce the inelasticity problem in the system, to diminish the negatives effect of seasonal demand fluctuations, and to avoid currency panics. Bankers and businessmen in the Midwest and the South generally favored an asset-based currency, since in their historical experience government-sponsored currencies clearly tended to be over-issued and inflationary. New York bankers, on the other hand, argued that rural banks could not avoid over-issuing (Wicker 2005, p. 22).

During this period of reform, there were many different proposals as to how to establish an asset-based currency that would ensure monetary elasticity and consequently

[16] The NMC began its work in the last year of Theodore Roosevelt's term and continued under fellow Republican William Howard Taft. However, the Democrats won both houses of Congress in the mid-term elections of 1910. Following, in 1912, the Democrats not only kept both houses of Congress, but also entered the White House with Woodrow Wilson. See Gomez Betancourt (2008).

[17] Aldrich's main advisor, Abram Piatt Andrew, organized and coordinated the work of the NMC in its debates concerning the Fed. Warren Samuels published newspaper articles on A. Piatt Andrew in the 70s. David Kinley, who wrote two monographs on the NMC, is also of great interest. See Andrew (1905) and (1906).

prevent panics and fluctuations in seasonal demand[18]. These asset-based currency proposals wanted to establish that it be only the banks, and not the federal government, who would be allowed to issue banknotes. In this way, an asset-based currency would come to replace the *bond-backed* currency created by the National Banking Act of 1863.

Before the 1907 crisis, the importance of establishing an elastic currency as soon as possible, and the necessity for a better distribution of, and access to, bank reserves, had been highlighted in the course of the various bank crises of 1873, 1884, 1890, 1893.

The other major problem that faced the NBS was the location of reserves distributed throughout the country, and their consequent unavailability when needed. Reserves being dispersed, they were difficult to move, and were not easily transferable to regions in which they were scarce[19]. Warburg was right in saying that the 1907 crisis was not caused by a shortage of gold in the United States, but by an over-extensive distribution of reserves to banks who, following their own interests, would hoard gold independently, which resulted in a shortage of gold in the market and fuelled the panic.

These two main problems—the inelasticity of the currency and the scattered dispersal of reserves—largely contributed to the US 1907 financial panic, and the resulting failure of many commercial American banks.

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[18] Among the numerous proposals for an *asset-base currency* we will mention: The Baltimore Plan (1894), inspired by Canadian banking practices of bank issuing of notes versus governmental issuing; the Carlisle-Eckels proposals (1894), which called for the abolition of a bond-secured currency; the Indianapolis Monetary Commission's Plan (1898) with the participation of J. Laurence Laughlin, Frank Taussig, and Arthur Hadley which called for the maintenance of the gold standard, the retirement of greenbacks, and furnishing credit facilities; the Pratt Bill (1903) seeking to incorporate clearinghouses' right to issue currency backed by general assets; and the ABA Currency Commission report (1906) calling for an asset-based currency issued by national banks. Other proposals such as those by the NY Chamber of Commerce, voiced by Conant and Vanderlip (1906), and those from the Columbia University Lectures (1907, 1908), were devoted to the establishment of an issuing central bank and only secondarily to proposing an asset-based currency. See Wicker (2005).

[19] According to Warburg, the 1907 crisis was not the result of a lack of gold in the United States, but the distribution of reserves to a very large number of banks that then hoarded gold independently and in self-interest during the crisis, thus provoking both a shortage of gold and an extended panic. As he said, the result of our system is that our immense quantities of gold and coins remain unused despite the fact that our gold reserve are four times greater than England's, and despite our massive monetary circulation per person of 35 dollars. Consequently every year, we suffer from severe currency shortages. See Warburg (1930, pp. 52-55) and Rist (1938, p. 437).

4. Reserves and the interest rate

Through the issuing of national banknotes, National Banks under the NBS created liquidity. However, the way in which national banknote convertibility was guaranteed, through the possession of US Treasury bills, which were remunerated though confined to this function of guarantee, introduced a quantitative limit to the issuing process. The NBS as a whole was constrained by the exogenous quantity of notes that it can issue, in an endogenous way, trough granting of credits.. This explains the potential seasonal illiquidity described in the preceding section, arising when the National Banks were unable to provide national banknotes, and were compelled to draw from their reserves. Thus, even if this endogenous mechanism of issuing national banknotes introduced an element of elasticity into the creation of liquidity, this mechanism created situations of illiquidity. Did the same situations arise in the money market, in which banks were usually provided the means of managing their liquidity? Warburg states that the money market is the second pillar in maintaining the elasticity of the US monetary system.

> "Our whole elasticity is built up on the bond and stock market. Banks can issue notes on government bonds, and call money is kept in stock-exchange loans". Warburg (January 6, 1907, [1930, II, p. 13]).

In reality, the functioning of the money market under some circumstances also created problems in liquidity. Understanding how this mechanism worked requires considering the structure of the NBS, in particular the relation between country banks, reserve city banks, and the New York banks. For this purpose, we will look at the data of 1873 found in Sprague that breaks down the then existing structure (1910, chapter 1).

Of a total of 1,976 National Banks, on September 12 of that year, with a total capital of 668 million dollars, there were:

- 1,747 country banks (88% of the total number of banks), with a capital adding up to 392 million (59% of the total). They issued 69% of the national banknotes in circulation and managed 43% of the deposits. They had a 21.6% reserve coefficient, or 5.6% above their lawful minimum, and held together 43% of the NBS's reserves, a figure requiring careful consideration.
- 181 reserve city banks (9% of the total number of banks), with a capital adding up to 172 million (26% of the total). They issued 23% of the national banknotes in circulation and managed 29% of the deposits. They had a 28.9% reserve coefficient, or 3.9% above their lawful minimum, and held together 31% of the NBS's reserves, a figure requiring careful consideration.

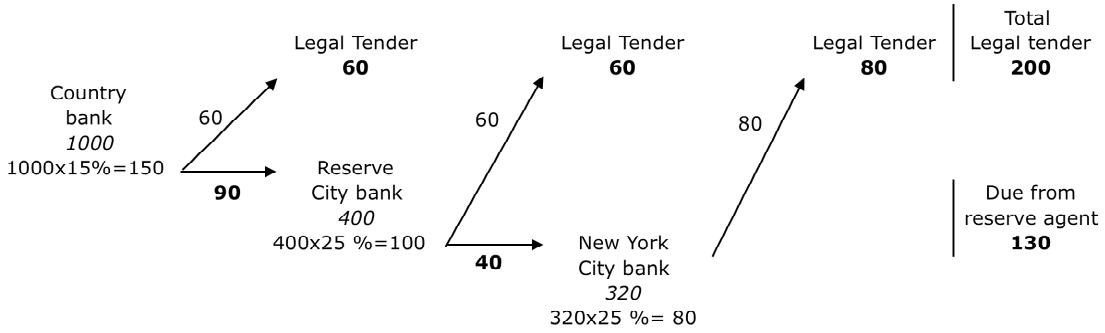
- 48 New York banks (2% of the total number of banks), with a capital adding up to 104 million (16% of the total). They issued 8% of the national banknotes in circulation and managed 27% of the deposits. They had a 24.2% reserve coefficient, or 0.6% under their lawful minimum, and held together 25% of the NBS's reserves, a figure requiring careful consideration. Let us note that three months previous, in June of that year, their reserve coefficient was 30%, or 5% above their lawful minimum.

Beyond these overall statistics of the various kinds of National Banks, the structural breakdown of their balance sheets distinguishes them further:

	Country	RC	NY	en %	Country	RC	NY
Legal Tender	5,0	8,2	12,1	National bank notes	24,6	15,9	7,1
Due from reserve agent	6,7	6,6	0,0	Deposits or all kinds	31,1	35,8	43,1
National bank notes	0,9	1,0	0,7	Due to all other banks	2,5	12,1	23,2
Due from all other banks	2,2	2,9	4,6				
Exchange for clearing house		4,3	17,4	Other	0,7	0,9	0,1
Other stocks, bonds & mortgages	1,5	1,0	1,2				
US bonds to secure circulation	27,8	18,3	8,7				
US bonds to secure deposits	1,2	0,6	0,2				
Other US bonds	0,4	0,3	0,8	Shareholder's fund	41,2	35,4	26,6
Total loans and discounts	50,6	53,8	51,1				
Other	3,6	3,0	3,2				
Total Assets	**100**	**100**	**100**	**Total Liabilities**	**100**	**100**	**100**

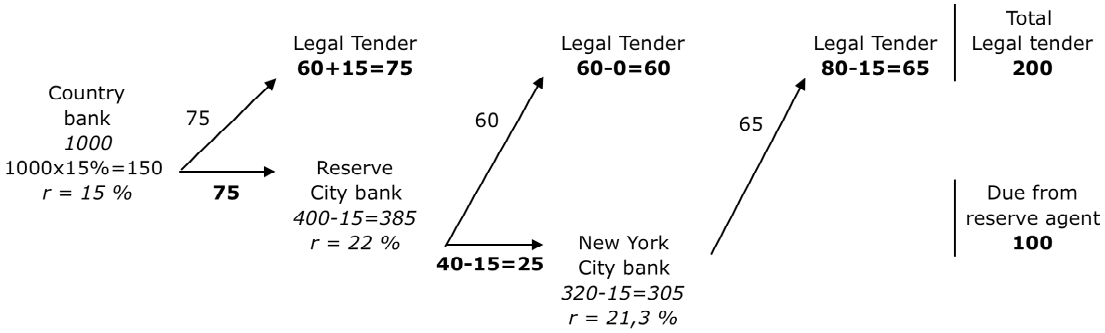
The greatest amount of capital in the NBS's overall balance sheet was located in the country banks (41.2%), with the lowest amount located in the New York banks (26.6%). The country banks had the lowest amount of legal tender reserves, and the greatest amount of banknote issuing, a correlation inversed for the New York banks. Interbank commitments are negligible for the country banks, but very important for the New York banks. The reserve city banks present an intermediate situation. Let us note that more than the half of the country banks' reserves, and a little less than half of that of the reserve city banks, were in the form of deposits in other banks.

The amounts of reserves must be carefully considered because the reserve system was pyramidal. The diagram below illustrates the composition of the reserves of the three types of banks. The country bank has 1,000 in banknotes and deposits, and must keep 150 in reserve (15%), 60 (2/5) of which it holds in legal tender, while 90 (3/5) in deposits in a reserve city bank. The latter has 400 in banknotes and deposits, and must keep 100 in reserve (25%), 60 (3/5) of which it holds in legal tender, while 40 (2/5) in deposits in a New York bank. The latter has 320 in banknotes and deposits, and must keep 80 in reserve (25%), of which it must hold completely in legal tender.



Our diagram illustrates two lessons:

- The aggregate coefficient of reserves, defined as the relationship between the total amount of reserves and the quantity of aggregate bank money, is 19.2% [= (200+130)/(1.000+400+320)], which rests almost exactly midway between the two respective lawful coefficients of 15% and 25%. However, if we define the aggregate as the relationship between the 200 in legal tender and the "consolidated" total of bank money (the sum of all banknotes and deposits minus the reserves deposited in the next bank), that is to say 1,590 [=1.000+ (400-90) + (320-40)], the reserve coefficient is now 12.6% [=200/1.590].
- If the country banks wish to hold half of their reserve in legal tender, that is to say 75 instead of 60, and that the additional 15 in legal tender are withdrawn from the reserves of the New York banks, then the country bank's reserve coefficient remains unchanged, while the coefficients of the two other types of bank fall to 22%[= 85/385] and 21,3% [= 65/305] respectively, instead of remaining at the former 25%.



The aggregate reserve coefficients move in different trajectories: the ratio of 19.2% falls to 15.8% in this instance, whereas the ratio of 12.6% remains unchanged.

This example demonstrates that the pyramidal structure of reserves induced a great sensitivity in the reserve banks to any changes in the amount of legal tender country banks requested, whatever the reasons for these changes.

Consequently, banks had to keep an excess in reserve in order to maintain the legal ratios in times of additional demands for legal tender. This is the reason why the banks had in June the high ratios mentioned above. The spirit of the law translated to the banks keeping a considerable amount of reserves for the purpose of use, but never to use it. Paul Van Zeeland's analogy of an army assembled but never to fight appears as early as 1873 in the Coe report (1873)[20].

> "The situation has been compared – not without humor – to that of a nation which would have taken care to form a territorial army in times of peace but would refrain from using it in times of war, lest all the reserves should be lost." (van Zeeland, 1922, p 12).

As seen in the previous section, as a consequence of the rigidities in the amount of national banknotes that may be issued, seasonal demands for current money by the agricultural sector was a recurrent cause, twice each year, of country banks changing their demands for legal tender. The NBS had two means for satisfying (responding to) these regular demands during the harvests. First, having an excess in reserve before the harvests. Second, the New York banks would regularly reduce the loans they were making to the money market. More precisely, as Wicker (2000, pp. 116-27) underlined, because the mandated legal ratio made it essentially impossible to maintain an effective one, the lending policy of the New York banks was in reality not particularly sensitive to the level of reserve, but to the excess of effective reserves above the legal level. Hence, the seasonal variations of the interest rate effect upon the money market, an effect brought to light in a study by Kemmerer (1910)[21].

As emphasized by Richard Timberlake (1978), a third mechanism that did not belong specifically to the NBS was at work in limiting the seasonal pressure on the money market. The US Treasury released cash either through the deposit of coins in the New York banks, or

[20] Cf. Sprague (1910, p. 95).

[21] To explain the volatility of interest rates, Selgin and White (1994) argue that the redemption of national banknotes was slightly at work. Hence these last circulated as if they were legal tender instead of being issued and redeemed according to the needs of trade. The analysis is close to Kemmerer's remark: *"The national bank-note circulation does not appear to exhibit any considerable seasonal elasticity, i.e., rise and fall according to the seasonal variations in the demand of trade; (...) There is no evidence of contraction when the crop-moving demand are over, the national bank-note elasticity being (to use a rather inelegant expression) of the chewing-gum variety."* Kemmerer (1910, pp. 152 and 228). Note that if the inelasticity of national banknotes is the primary cause of seasonal pressure on, or relaxation of, the money market, it is doubtful that the weak functioning of the redemption of banknotes, instead of the bank's reserve policy, is the casual mechanism that leads to fluctuating interest rates. See also Gomez Betancourt (2010a and 2008).

through the reimbursement and/or the purchase of its debt, or through the postponement of a new issuing of debt[22]. Through the supplying of gold, the Treasury was acting as a lender of last resort in accordance with the vision of Bagehot. Indeed, according to Bagehot (1873), the lender of last resort—i.e., the *Banking Department* of the Bank of England—has to lend its legal tender reserves, which are coins and banknotes that have not been issued by the Banking Department itself, but by the *Issuing Department* (in respect to the *currency principle*).[23]

A fourth mechanism for reducing pressure on the money market was the import of gold, which is borrowing by New York banks from London. However, as Sprague and Wicker rightly noticed, these imports were linked to the gold point mechanism, which means they occurred only when the dollar-sterling exchange rate reached the US gold entry point. However, the seasonal increase in interest rates alone was not sufficient to induce an increase in the exchange rate of the dollar. Moreover, even in cases when gold did manage to enter as a result of the gold point mechanism, these imports did not have substantial or lasting effects (Wicker, 2000, p. 134).

5. Losses and solvency of banks, and Clearing House Certificates

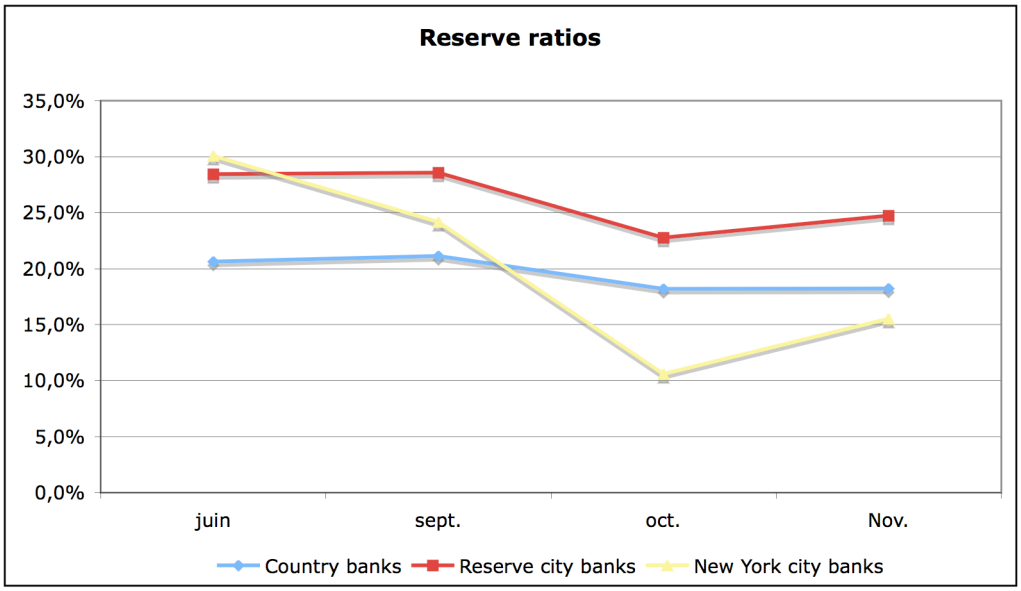
The failures of New York banks in debt, Wall Street crashes, banking panics—the general fears of New York bank illiquidity—were another cause for changes in the amount of legal tender country banks requested. This is at the root of the 1873, 1884, 1890, and 1907 crises[24]. Among the first crises, the one of 1873 is particularly significant. This crisis began between September 8th and 18th as several railroad companies and banks went bankrupt, causing a tightening of pressure on the money market and inducing banking panic. On September 20th, the stock market closed for 10 days and the New York Clearing House (NYCH) authorized their banks in the issuing of Clearing House Loan Certificates (CHLC), done previously in 1860 and 1861, as well decided to equalize their reserves, which meant pooling their banks' reserves in order to make it possible for the New York Banks send legal tender to country banks demanding the reimbursement of their deposits. On September 24th, the NYCH suspended cash payments until November 1st. During this panic, the New York bank never ceased sending cash to banks in the country's interior, to reserve city banks, and to country banks.

[22] Cf. Sprague (1910, p. 40-2, 230-2, 393-9), Timberlake (1978), Wicker (2000), White (1983, p. 78).

[23] Cf. de Boyer and Diatkine (2008) and de Boyer & Solis (2002).

[24] Sprague (1910) and Wicker (2000) are the main reference books. We have omitted the 1893 banking panic because its origin is not found in the New York money market.

Between June and November 1873, the reserve coefficient of the various types of banks followed different trajectories. Whereas for all three bank types a ratio from 4 to 5 points higher than the lawful requirement was held in June, the New York banks' ratio dips below the minimum in September, at the beginning of harvesting, then very clearly falls under the minimum with the stock exchange crisis at the end of September, and through October. This downward trajectory alters in November, but still remains far from the 25% lawful minimum. The reserve city banks see their ratio dropping appreciably in October, but find their lawful level again in November. At all times during this period, the ratio held by the country banks as a whole does not fall below the lawful minimum. However, this maintenance comes at the price of a consequent degradation of the reserve ratio of the New York banks.



At the beginning of September 1873, among their various "loans and discounts", the New York banks held an amount of "call loans", granted to the operators on the stock exchange, equivalent to their reserves in legal tender.

As every year, the New York banks hoped to obtain these refundable loans "at call" to meet any requests for liquidity. This source of liquidity, however, was drained with a fall in the stock exchange market. We propose to illustrate with an example, how a New York bank with a loss in its stock market call loans can lose liquidity, even if it remains solvent. The situation of illiquidity initiates the panic, while at the same time requiring the bank to pool reserves, and issue new debt in the form of Clearing House Loan Certificates (CHLC), which make possible a damming up of the money market's liquidity crisis.

Let's conjecture the Bronx-Brooklyn bank (the BB) with a balance sheet characteristic of New York banks: out of a total of 400, there are shareholder's funds (or capital) equal to 100; bank notes equal to 30; deposits equal to 170; legal tender equal to 50; call loans equal to 70. Its reserve ratio is 25 % (=50/200). Its balance at the Clearing House is zero. Suppose it has to reimburse 20 in deposits to country banks in order to send them a part of its legal tender. It settles 15 of its call loans, and maintains its reserve ratio at 25 % (= 45/180).

BB bank

Legal tender	50-20+15=	45	Bank notes		30
Interbank		20	Deposits	170-20=	150
Exchange for CH		75	Interbank		100
Call loans	70-15=	55	*. Due to CH*		*75*
Other loans		150	*. Other*		*15*
US bonds		35	Capital		100
Total		380	Total		380

Clearing House

Due from BB bank	75	Due to BB bank	75

Now suppose that the BB bank cannot settle 15 of its call loans due to the bankruptcy of the debtor. The BB bank incurs a loss. Instead of settling 15 of its call loans, the bank will build up its reserve again by incurring a balance debit at the Clearing House. In this case, the BB bank is confronted with a liquidity problem.

BB bank

Legal tender	50-20+15=	45	Bank notes		30
Interbank		20	Deposits	170-20=	150
Exchange for CH	75-15=	60	Interbank		100
Call loans		70	*. Due to CH*		*75*
Other loans		150	*. Other*		*15*
US bonds		35	Capital		100
Total		380	Total		380

Clearing House

Due from BB bank	75	Due to BB	75-15=	60
		Balance		15

Of course, if its illiquidity becomes known, a bank run may occur and aggravate its position. But neither the country banks' demands for legal tender, nor a bank run are the initial causes of its sudden illiquidity. The root cause is the loss of its call loans on Wall Street. The balance sheet above does not evidence the real situation; it is a false balance sheet. The loss must be recorded. When it appears, as below, BB bank faces liquidity difficulties as the funds of its shareholders are encroached upon: no longer 100, but 85.

BB bank

Legal tender	50-20+15=	45	Bank notes		30
Interbank		20	Deposits	170-20=	150
Exchange for CH	75-15=	60	Interbank		100
Call loans	70-15=	55	*. Due to CH*		*75*
Other loans		150	*. Other*		*15*
US bonds		35	Capital	100-15=	85
Total		365	Total		365

Clearing House

Due from BB	75	Due to BB	75-15=	60
		Balance		15

However, BB bank is at this point neither insolvent, nor facing illiquidity[25]. In the normal functioning of the money market, part of its 55 in call loans would be settled. But in circumstances where high pressure on the money and financial markets exist, and due to a consequent banking panic, BB bank cannot solve its liquidity difficulties alone. Hence the intervention at this point of the Clearing House.

The Clearing House first audits the balance sheet of BB bank. As soon as solvency is verified, it authorizes BB bank to issue a new kind of debt (15) known as Clearing House Loan Certificates (CHLC), and receives assets (25) which are deposited as collateral to back the certificates being issued[26]. To conclude, the Clearing House announces that all Clearing House banks will accept CHLC as means of payment. This issuing thereby allows BB bank to settle its position at the Clearing House. The balance sheet thus comes to the following:

BB bank

Legal tender	50-20+15=	45	Bank notes		30
Interbank		20	Deposits	170-20=	150
Exchange for CH	75-15=	60	Interbank	100-15=	85
Call loans	70-15=	55	*. Due to CH*	*75-15=*	*60*
Other loans		150	*. Other*		*15*
. Loan to secure CHLC		*25*	CHLC	15	15
. Other	*150-25=*	*125*			
US bonds		35	Capital	100-15=	85
Total		365	Total		365

Clearing House

Due from BB	75-15=	60	Due to BB	75-15=	60
			Balance		0

6. American banking debates and Bagehot

At this stage of our study, following a thought of Wicker, we will look into the potential relevance to refer to Bagehot for understand banking debates that arose in America during the existence of the NBS. The publication of Bagehot's *Lombard Street* coincided with the Coe report in 1873[27]. There are few similarities in idea between Bagehot's propositions for

[25] Note that the funds of shareholders (85) remains always above the outstanding amounts in US bonds (35) and banknotes (30).

[26] Note that the collateral was greater than the CHLCs.

[27] Note that Wicker wrongly indicates the year 1887 for the publication of Bagehot's book (p. 130 and p. 151).

England and the ones Coe puts forward for America, such as Coe's proposition in favor of the NYCH pooling banks reserves. However, there are many differences between the two contexts and the resulting analyses of each authors.

In answering, it is necessary to underline that it is not the Clearing House which issues the CHLCs, but the New York bank. There is no credit operation at work here, only a substitution of debts. This does not appear clearly in the literature concerning the NBS. For example, in the first chapter of Sprague's 1910 work in which he analyzes the 1873 crisis, the CHLCs appear on the asset side of the New York banks' aggregate balance sheets, but not on the liability side (cf. p. 88). Logically they are on the asset side since, as in our illustration, the 15 CHLCs, after payment by BB bank, belong to the banks to which they are paid. However, in Sprague's second chapter, which analyzes the 1884 crisis, CHLCs appear on both sides of the aggregate balance sheet of the New York banks (cf. p. 117). Moreover, a close reading of the Coe report integrally reproduced by Sprague (p. 91-103), and Sprague's notes E, H, J and K at the end of the book, indicate that it is indeed the banks who are the issuers of the CHLCs.

Consequently, it becomes clear that the function of the Clearing House in intervening is not to lend, but to coordinate. The aim of thins kind of intervention of the Clearing House is to solve the liquidity problems provoked by the bank losses and is completely different for the Treasury's intervention. The US Treasury cannot relieve the liquidity problem through the release of cash into the money market.

When the crisis ends, BB bank will settle its call loans in order to pay its CHCLs, leaving us with the following balance sheet that shows a diminution, from the initial situation, both in the total and in the funds of shareholders.

BB bank

Legal tender	50-20+15=	45	Bank notes		30
Interbank		20	Deposits	170-20=	150
Exchange for CH	75-15=	60	Interbank	100-15=	85
Call loans	70-15-15=	40	*. Due to CH*	*75-15=*	*60*
Other loans		150	*. Other*		*15*
. Loan to secure	*25-25=*	*0*	CHLC	15-15=	0
. Other	*150-25+25=*	*150*			
US bonds		35	Capital	100-15=	85
Total		350	Total		350

Clearing House

Due from BB	75-15=	60	Due to BB	75-15=	60
Balance					0

Thanks to the issuing of CHLCs, BB bank, which incurred losses via call loans on the money market, and which lost its liquidity but remained solvent, survived the liquidity crisis after reimbursing its CHLCs and recording its losses.

Is it indeed then curious that Sprague did not refer to Bagehot, as Wicker claimed? We say no, and for three main reasons.

First, the problem Bagehot analyzed was very different from the American one. Bagehot criticized the policy, concerning its reserves of legal tender, held by the Bank of England's Banking Department. According to Bagehot, the Banking Department has to lend "quickly, freely, and readily" in the case of a banking panic, in order to remove the fears of a credit crunch that initially caused the panic. Though the Banking Department must retain a large reserve to be able to carry out such a policy, the opposite was the case. A misinterpretation of the 1844 Bank Charter Act encouraged the Banking Department into managing its reserve like other banks, minimizing its quantity to maximize profits. The Banking Department then, just like other banks, felt obliged to cut down on loans when its reserve diminished. Due to this low level of its reserve, the Banking Department was the one who, instead of being able to lend freely to remove potential fears of a credit crunch, brought about such fears.

Bagehot did not consider the centralization of the gold reserve in the vault of the Bank of England as optimal. According to him, "a great collapse, except from rebellion or invasion, would probably not happen" (Bagehot, 1873, p. 103-4) in what he called a "natural system of banking" (ibid p. 101), that is in a system where banks with large capital and reserve competed between one another without a central bank[28]. Recognizing, however, that the elimination of the Bank of England was inconceivable, he proposed increasing its Banking Department's capital, meaning its reserves, in order to grant it the ability to lend freely. Such a release of cash would function by removing pressure on the money market. Bagehot's analysis is far removed from the banking situation and debates going on in America at the time.

Secondly, the competitive banking system advanced by Bagehot did not match the coordination of the New York Clearing House envisioned by Coe. Rather than Bagehot, in looking for a figure of reference, it would be more accurate to mention Thornton[29], who was in favor of a central bank and the centralization of reserves:

> " (…) if instead one national bank two or more should be instituted, each having a small capital (…) we should suppose such a good understanding to subsist between them as to make them act if they were one body, and resemble, in many respects, one single institution". Thornton (1802, p. 127)

[28] Chap. 4. See also chapter 11, p. 279.

[29] About the difference between Thornton and Bagehot, see Laidler (2003), de Boyer & Solis (2002) and de Boyer (2003).

Lastly, we will point out that Bagehot was against the lending of the gold reserves of the Bank of England's Issuing Department.

7. Conclusion

When looking at a National Bank balance sheet and referring to the American banking debates that opposed "asset-based notes" to "bond-backed notes," it is not obvious that national banknotes were asset issued. On the asset side, we find legal tender, US bonds, and credit assets, while on the liability side we find banknotes, deposits, and shareholders' funds. It is not clear, *a priori*, whether the banks were in fact purchasing Treasury debt by issuing national banknotes or not, as was the case for the Bank of England when it was established. However, the National Banks first paid capital, then bought bonds, then deposited them by the Comptroller of the Currency, then received the national banknotes signed by the Comptroller of the Currency, then signed them itself, then issued them by granting credit. This was the scheme for issuing a "national currency … adequate to all demands of business" (Chase, 1863). Of course, the amount of national banknotes that could be issued was quantitatively limited by their being bond-backed, even though the notes were asset-based issued. When the quantitative limit was reached, the banks granted credit by lending out their excess of legal tender reserves, which explains the seasonal pressures on the money market and the high volatility of interest rates. By underlining these last arguments, Kemmerer wanted to convince the agricultural lobbies of the advantages of a central bank that would permit the removal of a quantity limitation on asset-based issued banknotes. By underlining the security provided by backing national banknotes with US bonds, he argues for the necessity of the federal government in guaranteeing the future Federal banknotes[30].

Although the NBS was well capitalized, and reserves were at a high level, it failed to avoid the recurrence of liquidity crises during banking panics. These were not the consequence of seasonal demands, but of banks incurring losses in credit and financial investments. Due to the high levels of bank capital, bank losses did not result in insolvency. Due to the coordinating function of the Clearing Houses, the pooling of reserves, and the issuing of CHLCs, the crises could be contained and bank liquidity could be restored. In this way, our accounting depiction of the issuing mechanism completes Sprague's and Wicker's analyses. It was not the Clearing House that issued the CHLCs, but the banks that incurred credit and financial market losses without becoming insolvent.

[30] See Gomez Betancourt (2010a).

Finally, taking into account the role of the Treasury, who provided the banks with liquidity in times of crisis, our study also clarifies the absence of references to Bagehot in the American banking debates. The banking debates, like the monetary debates in America, are different than British monetary orthodoxy. Bagehot appears useless to us here. Every banking liquidity crisis cannot be explained and taken care of by the Bagehotian analysis.

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