

Finance and Capital Markets

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From the turn of the eighteenth century to the middle of the nineteenth century, Britain created a new system of financial technology to supply liquidity for the British economy. Liquidity is the actual means of payment such as coin, and liquidity is also the process of converting other things into means of payment such as selling a stock or a bond. Liquidity is an ubiquitous component of a market-based economy because it solves the constraints that barter places on trade and on investment. Liquidity, however, has never been costless, so the less time, effort and risk expended on it the more specialization in trade and investment an economy can engage in. Over the century and a half following the Glorious Revolution of 1688, Britain introduced bank notes, joint-stock banking, the Bank of England, the three percent consol, clearinghouses, stock exchanges, savings banks, token coins and discount houses; Britain spread these advances throughout the nation; and Britain melded them into a system that eased the movement of liquidity between any combination of person, place, and time.

In 1700, Britain was just catching up to the Continent's best-practice financial technology. While bills of exchange were commonly used in commercial circles, milled coins finally replaced hammered coins in 1696, and, in 1700, only London and Edinburgh had deposit banks. Yet a novel combination of innovations was revolutionizing banking and public finance. In 1694, the Bank of England combined bank notes, a corporate structure and long-run government debt. The re-organization of the financial system reached a crescendo with the South Sea Bubble in 1720, and stabilized with the advent of the Three Percent Consol in 1752, so by mid-century government debt, in the form of Consol., was highly liquid.

In the second half of the seventeenth century, banking financed by note-issue spread to the industrial and agricultural countryside. Eighteenth century industrialization demanded means of local

payments and short-run lending, and country banks supplied these services. Every part of the kingdom also wanted access to London, so country banks arranged correspondent relationships with London banks. Although the Bank of England's monopoly on corporate banking limited the size of English and Welsh banks, the hub (London) and spoke (countryside) system moved liquidity between the countryside and the City and then between the City and the London securities market or overseas markets. The Revolutionary and Napoleonic Wars (1793-1815) swelled the volume of funds flowing through the hub-and-spoke system because the Bank of England liberally supplied liquidity during the wars. After Waterloo, the Bank of England contracted the supply of bank notes and the system shrank. Weak banks failed during the cycle of war finance, but the system performed well.

After the wars, the dominant problem of the system was liquidity panics. In particular, the Panic of 1825 taught banks that they could not count on emergency liquidity from the Bank of England. One consequence of 1825 was that bankers turned to bill brokers to hold bankers' deposits on call which transformed bill brokers into dealers called discount houses. The large discount houses pooled the liquidity needs of bankers and acted as intermediaries between banks and the Bank of England. Another attempt to increase the stability of the system was to end the Bank of England's monopoly on joint-stock banking. The idea was that larger banks, like those in Scotland, were more resistant to panics; however, the English joint-stock banks remained local until restrictive regulations were repealed in 1857. Yet another attempt to stabilize the system was to constrain the Bank of England's freedom to issue bank notes in 1844, but this did not commit the Bank of England to supply emergency liquidity during panics. Only in the 1870s did the Bank of England accept the role of lender of last resort to the system and larger-sized banks finally put an end to domestic liquidity panics. The mitigation of shocks

was the last element to be combined with local banking connected to the London center that housed markets in government debt, bills of exchange and increasingly in the nineteenth century the stocks and bonds of foreign nations and domestic industries.

I. Early Modern Payments System

Aristotle offered the logical premise that money's fundamental purpose is to act as a medium of exchange. A medium of exchange connects what is sold to one person to what is bought from another person, and exchange benefits from a medium because barter (the absence of such a medium) requires both parties to have what the other wants. Economists have called this constraint on barter the double coincidence of wants. Separating the double coincidence of wants into two single coincidences expands commerce by allowing a person to trade for money with one person and then trade the money to a different person. The coincidence of wants separated by a medium of exchange involves more than goods or services. A medium of exchange also separates timing. The period between accepting the medium and spending it is saving – defined as delayed consumption. While some people might want to minimize the time between selling what one has and buying what one wants, others may prefer to wait, so a medium of exchange connects a buyer who wants consumption now with a seller who wants consumption later. A medium of exchange contributes to economic growth and development by expanding the range of mutually beneficial trades and promotes specialization in comparative advantages.

The effectiveness of a medium of exchange depends on how well it connects trades, which is to

say how well it flows from person to person. Indeed, the term ‘liquid’ is used to describe money-ness, and Rondo Cameron used the metaphorical term ‘lubricant’ (Cameron 1967: 2), yet, if a medium of exchange is a lubricant, then a variety of frictions can increase its viscosity. A medium can have transaction costs such as the expense of transporting and protecting precious metals. A medium can lack finality, which means that a payment is unresolved for a while; for example, payment by check is not final until the check clears the bank. Also, a medium can have expectation problems. Current acceptance derives from the expectation of future acceptance, so fears of a devaluation, bank run, or other crisis can slow the flow of a medium of exchange.

Moreover, reducing one friction often requires increasing another. Checks have lower transaction costs compared to coin; however, checks are riskier. One can reduce the risk associated with checks by requiring check cards or other verification, but these measures increase transaction costs. Consequently, an economy uses a combination of media of exchange with varying combinations of risk and cost (Berger, Hancock and Marquardt 1996). The combination of media, along with the supporting institutions, is called the payments system, and each media has a different strength desired by part of the transacting public. In 1700, the combination of coin, deposit banking, and bills of exchange formed the payment system of Western Europe’s advanced commercial centers. In simplest form, one can arrange these three means of payment based on their tradeoff between cost (time and money expended acquiring, protecting, transferring, litigating, etc.) and risk of the payment not flowing (becoming illiquid). Figure 1 presents this relationship as a trade-off between costs on the vertical axis and risk on the horizontal axis.

[Chart 1. Payments System circa 1688]

Viewing the payments system this way allows us to see the development of the payment system as innovation that moves the frontier closer to the origin by reducing cost or risk. Development of the payments system is also moving exchange located behind the frontier up to best practice. As with many technologies, diffusion of best practice determines how much an economy benefits from innovation. For example, coinage was the anchor of the payments system, and the Royal mint produced coins of reliable quality. The metallic content of silver coin was sterling (92.5 percent pure silver) while gold guineas were produced with 22 carat gold (Feavearyear 1963: 346-9). British coin technology underwent an innovation when the production of coins by hammer was replaced by the mill press during the Restoration Era. Milled edges can include texture and engraving, like a modern pound coin, which easily shows if someone has clipped or shaved metal from the coin decreasing its value, so the cost of using milled coins is less than using hammered coins. However, the existing stock of British silver coin was not converted to milled edges until 1696, so for thirty years the new coins were hoarded because they were not clipped while the old coins circulated because they were clipped (Li 1963).

Even with milled edges, coin was heavy (a 100 pound bag of silver coin weighed £32), suffered counterfeits, and needed protection. The greatest eighteenth century complaint about coin, however, was its scarcity. At the most aggregate level, the supply of new coins came from bullion brought to the mint, and the supply of new coins did not keep up with the growing economy of early modern Britain. A general deflation could have addressed this. Instead, the supply of other media of exchange expanded, so coin was scarce compared to means of payment based on paper.

The other scarcity was of silver coins relative to gold coins. Silver coins were far more useful for small, everyday transactions than gold coins, yet silver was disappearing from the British monetary

stock. The decline of silver was a result of Britain making gold more valuable than silver compared to the Continent. Until 1696, England was on a silver standard with a troy ounce of sterling silver worth 62 pence (Feavearyear 1963: 346), and the price of a gold guinea set by the market. As part of the Great Recoinage of 1696, the price of a guinea was fixed at 22 shillings, so British gold and silver now had a fixed exchange rate which created a bimetallic system. Because gold bought more silver in Britain than on the Continent, whenever bullion flowed into Britain, gold was preferred to silver. In contrast, when bullion left Britain, silver was preferred to gold. The East India Company was a particularly large drainer of silver. Over time, the composition of the British stock of coinage became dominated by gold. The problem was realized early on by Sir Isaac Newton, Master of the Mint from 1699 to 1727. Newton lowered the price of a guinea by 6 pence in 1699 and still concluded in 1702 that, "Gold is therefore at too high a rate in England by about 10 [pence] or 12 [pence] in the Guinea (Newton 1702: 137)." In 1717, the value of a guinea was reduced for the last time by only 6 pence to 21 shillings, so over-valuation of gold and the drain of silver from Britain continued for another century.

To avoid using coins for local payments, Renaissance moneychangers developed deposit banking in Italy which spread to Barcelona and Bruges. In Renaissance deposit banking, two merchants would go to a banker and transfer funds from one account to another. Neither merchant had to worry about coin and the entry of the transfer into the banker's ledger made it final. However, deposit banks were not cost free or risk free. A cost was having to walk to the bank, and a solution was writing an order to the banker to transfer funds – which is the essence of a modern check. Checks spared both parties walking to the bank but created the risk that the check's drawer might have insufficient funds.

The other risk was that the bank might fail because banks lent out deposited money. The profit from lending deposits paid for the bank, so the risk was ever present. If depositors became fearful and withdrew deposits, then the bank suffered a run. Runs are a natural way to monitor and discipline banks because depositors had no good knowledge of what the banker was doing with their money. A run was a rough test of the bank's solvency. If the run demanded more coin than the bank had on hand, then the bank failed, so runs forced banks to keep coin reserves. Runs also create a shock to the payments system. Suddenly a medium of exchange becomes illiquid and merchants scramble for alternatives. Municipal authorities responded to systemic shock in different ways. Barcelona and Venice responded by creating municipal banks that were not to engage in lending (Usher 1943 and Mueller 1997). The concept spread to Amsterdam, but eventually these public banks ran into trouble when the cities, who were the owners, borrowed from the banks.

Other areas responded to instability by outlawing deposit banking. In England, the royal monopoly on money changing prevented banking until the mid-seventeenth century (Munro 2000). In Antwerp, banking was outlawed beginning in 1489 (van der Wee 1977). Without deposit banks, people wanting to avoid coin are reduced to personal promises in the form of written notes or entries in merchant ledgers (Kerridge 1988). Unlike bank transfer, payments using these methods are limited to circles of personal familiarity and are not final until the promise is paid. The situation could be improved by transferring existing debt. Imagine Alice has drawn a note promising to pay Bob £100 in exchange for Bob's cloth. If Bob then buys beer from Charles, then Bob would rather give Alice's note to Charles rather than write a new note. Transferring the note spares Bob the cost of creating a new note, but, more importantly, transfer makes the earlier transaction with Alice final for Bob. After the transfer,

Alice owes Charles instead of Alice owing Bob, and Bob owing Charles. A London Law Merchant court recognized the legality of transfer among merchants as early as *Burton v Davy* in 1436 (Munro 2000).

Even with legal transfer, the flow was still restricted to the circle of people who trusted the original drawer. If Charles does not trust Alice, then the transfer will not work. Worse, Bob has an incentive to misrepresent the creditworthiness of Alice to Charles, so moral hazard occurred whenever Bob had better information about Alice than Charles did. In 1507, Antwerp solved the moral hazard problem created by asymmetric information by declaring that every party in the chain of transfer was liable for the debt, so if Alice failed to pay the note, then Bob had to pay Charles. With contingent liability, Charles could trust Bob's faith in Alice because Bob was fully liable. With one piece of paper, Charles had enforceable promises from Alice and Bob. The most convenient way to record the chain of transfers was to have people sign the back of the note, so indorsement became the standard way to record contingent liability.

As an innovation, transfer by indorsement diffused across mercantile Europe and jumped to the medium of exchange used for international payments called the bill of exchange. A bill of exchange orders someone in a distant location to pay a specified sum in the local currency. For example, a merchant might pay sterling in London to buy a bill that orders repayment in Dutch guilders in Amsterdam in a month's time. Again, Italians first developed bills of exchange, but British merchants began adopting bills of exchange in the 1300s for international remittances, especially in the wool trade (Munro 2000). Bills of exchange allowed merchants to avoid shipping bullion and so became the dominant means of international payment. As commerce developed within nations, bills of exchange

were also drawn solely in domestic money and were called inland bills of exchange.

For bills of exchange to work, the person who wrote the bill (the drawer) had to arrange for someone to pay the bill at the other end (the acceptor). The risk in using a bill of exchange was that the acceptor would fail to accept the bill, so innovation focused on ensuring the credibility of acceptance. Credibility means that the drawer and the acceptor have incentives to honor the bill after the original payment has been collected. Legal penalties were one approach, but because bills were used for international payments, local legal systems were insufficient, so Medieval merchants created an international set of rules and private courts called the Law Merchant. The Law Merchant penalized offenders with ostracism from the community of merchants using bills of exchange. English Common Law absorbed the Law Merchant, so England was integrated with the Europe's system of international payments (Rogers 1995).

Legal threats only worked for merchants with sufficient wealth and reputation at stake, so information about drawers was essential. One solution to the information problem was to use prominent bankers with networks of acceptors. Italian bankers built the first network for bills of exchange by placing family members in various cities and fairs. Transfer by indorsement was another contribution to solving the information problem. Merchants who knew the drawer could insure the bill's acceptance. Indorsement especially complemented bills of exchange because bills were written to be payable after a set period called 'usance'. Usance had developed because the earliest bills of exchange were written at one Medieval fair to be paid at the next fair. Transfer allowed the bill of exchange to change hands multiple times before the bill became due. Transfer by indorsement meant that bills drawn in a far away port could circulate so long as at least one of the signatures was trusted. A

merchant in the cloth trade could purchase a bill of exchange in London, carry it to the Low Countries, and then indorse the bill to his trading partners. If the merchant was of good reputation, then knowledge of the drawer in London was not essential. The more signatures a bill had the more secure the bill was, so bills of exchange with multiple signatures were a low risk, but the contingent liability indorsement created was a cost. Also, once written, the bill's promised repayment could not be adjusted. Transactions paid for by bill of exchange were not final until the bill was accepted, so a multi-signature bill of exchange falls between coin and a bank deposit on the frontier of the payment system.

Transfer also changed how bills of exchange were used as means of saving. A merchant could write a bill of exchange and sell it to a banker for coin or a demand deposit. Instead of using the bill as a medium of exchange, the banker could send the bill off to be paid when the bill came due. The banker made a profit because the merchant was paid less today for the bill than the bill would pay when it was due. The difference between the future value and the present value is called the discount, and the rate of return implied by the discount is called the discount rate.¹ To actually collect the return, the banker had to arrange for the value of the paid bill to be sent back to the banker, usually in the form of a new bill of exchange. If bills between London and the Low Countries each lasted one month, then the banker had to wait two months for the investment to pay off.

While the exchange and re-exchange of bills may seem a cumbersome form of saving, transfer allows the banker to easily sell the bill before it comes due. The ability to convert financial assets into a medium of exchange separates a double coincidence of wants regarding investment duration. In the case of bills, a borrower agrees to pay the bill on a fixed day in the future, but liquidity means that the lender can hold the debt for a less than the full duration. Disconnecting a borrower's and a lender's

view of a loan's duration promotes lending by allowing more combinations of people to find beneficial exchange – now financial instead of commercial where this section began. Increasing financial liquidity means making it easier to sell an asset, and transfer by indorsement made selling a bill easier because the banker assumed contingent liability. Transfer of financial assets was difficult throughout Early Modern Europe, so discounting of bills of exchange became the principal means of commercial credit (van der Wee 1977).

By the end of the seventeenth century, Britain had adopted these elements of European payment system. While coin and bills of exchange were well established, deposit banking had only begun in Britain during Cromwell's Protectorate (1649-60). Cromwell relaxed economic regulation in general, and banking by goldsmiths likely built on the existing businesses of pawn brokering and retail credit, but no evidence has yet explained the particular catalyst behind how London's goldsmiths became bankers in the 1650s. Half a century later, London and Edinburgh had banks and were on the frontier of the payments system.

II. The Financial Revolution 1688-1750

Latecomers to a technology are not so bound by history (path dependency) as forerunners. In banking, Britain was a latecomer, and Britain did create a new system of banking that transformed the payment system, revolutionized public finance and resulted in the first central bank. The beginning, however, was a small innovation with tremendous potential system called the bank note. The European payments system based on deposit banks and bills of exchange worked well for those people with means and reputation, but many people were lacking in one or both accounts. People who just fell

short of participation – the marginally excluded – might be a good risk but not well enough known to participate. For example, a foreign merchant might only be able to discount a bill of exchange with a banker whose advantage in information and risk management allows him to serve this margin, but gaining a deposit with the banker would not conveniently solve the foreign merchant’s problem because a check still relied on trusting the merchant’s signature. The solution was for the banker to issue to the merchant a bank note – the banker’s promise to pay.

Bank notes worked (were accepted, were liquid) if the banker was well known and trusted. Of course anyone could write a note, but only where banks were permitted could someone develop the reputation necessary to issue notes that would be widely accepted at face value. Cities like Amsterdam, Rotterdam, and Hamburg had outlawed private banking and established municipal exchange banks based on bills of exchange. In contrast, when banks did appear in Britain, they were unregulated, so the opportunity to innovate was there.

Another innovation was to transfer banknotes without the contingent liability created by indorsement. Since the value of the note depended on the reputation of a well known banker, the perceived cost of the contingent liability to the person indorsing the note was the same as the perceived benefit of the indorsement to the person accepting the note because both people had the same information about the banker. Indorsement added no net value but did leave the transaction unsettled until final payment dissolved the contingent liability. In contrast, transfer without liability, ‘by bearer’, created finality for someone at the time the banknote was used. By reducing cost without increasing risk, the banknote payable to bearer moved the payments system frontier inwards towards the origin.

The far reaching consequence of the banknote was to reorganize how banks were financed and

how the payments system worked. Instead of attracting deposits, a bank could issue notes, but finance by note issue required that notes stay in circulation in the same way that finance by deposit required people not to withdraw all their funds. Perhaps a large demand for banknotes existed in London that was waiting for someone to offer enough supply; however, the willingness to hold and reuse bank notes (instead of present them for redemption) likely increased as more people held and used bank notes. Such a network effect on demand would require a supply of bank notes well in excess of bills offered for discount by marginal customers. If so, then starting a system of finance by bank note would require aggressively purchasing financial assets with bank notes.

The Bank of England, founded in 1694, did exactly that. The Glorious Revolution of 1688 brought William III to the throne of England and soon dragged England into Holland's war against France called the Nine Years War (1688-1697). The expensive war produced large quantities of government debt and encouraged experimentation in public finance. The Bank of England scheme had the public subscribe £1.5 million to create a corporate bank that would purchase a £1.2 million annuity from the government and keep £300,000 as working capital for the bank. Although investors subscribed to the full amount within a fortnight, the actual money was collected from investors in stages running for months, so the Bank of England paid the government with bank notes. Thereafter, the Bank of England purchased more government debt from the public with bank notes. By March 1696, the Bank of England had two million pounds worth of banknotes in circulation, and about half of those notes offered no interest – their only value was as a means of payment (Horsefield 1983: 264).

The Bank of England also increased the liquidity of government debt. Because government debt formed over ninety percent of the Bank of England's revenue-producing assets, the Bank's stock

was founded on government debt -- effectively a mutual fund. Stock was much easier to transfer than government debt, so Bank of England stock was a more liquid form of government debt (Neal 1990: 15). After the success of the Bank of England, annuities were sold to other joint-stock companies: the Million Bank in 1695, the New East India Company in 1698 (2 million), and the South Sea Company in 1711 (9 million). Also, to secure a monopoly, the Bank of England expanded its holding of government debt in 1697 and 1709 in exchange for extensions of the charter and Parliamentary prohibitions of additional corporate banks and any company of more than six members from issuing banknotes payable on demand (Acres 1931: 101). In all these cases, Parliament traded support for a company in exchange for corporate borrowing and the public supported the scheme by either buying stock, swapping government debt for stock or accepting banknotes. Chart 2 presents a schematic of the system.

The new stock deepened the secondary (resale) market for securities in London. Even companies that did not absorb government debt, like the Royal Africa Company and the Hudson's Bay Company, experienced an increase in trade activity (Carlos, Key and Dupree 1998). Deepening the market meant that buyers and sellers had increasing confidence that a trading partner could be found. The key intermediaries in deepening the market were brokers and jobbers. Brokers specialized in matching buyers with sellers while jobbers actually bought and sold their own positions. Although maligned in their day, jobbers created liquidity for sellers and a constant market for buyers (Michie 1999: 23-4). Most long run investors rarely bought or sold, but the volume of business generated by short run holders (especially merchants) kept intermediaries in business so long run investors enjoyed low cost liquidity (Michie 1999: 26).

The Bank of England and the other new quasi-government corporations were one of the changes in public finance that occurred at the turn of the eighteenth century collectively called the 'financial revolution' (Dickson 1967). The other changes were the development of the National Debt, the introduction of the Land Tax and the adoption of annuity finance, but all of these sprang from ascendancy of Parliament. The Glorious Revolution of 1688 and Britain's victory in the Nine Year's War in 1697 secured Parliament's fiscal preeminence (North and Weingast 1989). Parliament's authority brought enough public support to introduce a new major tax called the Land Tax that lasted for a century. The new constitution also transformed royal debt into the National debt and so made government debt far more secure. With increased trust, the government was able to adopt the Dutch practice of borrowing long run in the form of annuities (Dickson 1967). Government borrowing by annuity was introduced in the 1690s, but annuities came to dominate government borrowing during the War of Spanish Succession (1701-13) (Dickson 1967: 358-60). By the coronation of George I in 1714, interest charges were consuming one-half of the government's yearly revenue (Roseveare 1991: 53). The worst part of the problem was that roughly one-third (£15 million) of the debt was 'irredeemable' – meaning that the government could not force repayment of annuities paying seven to nine percent interest (Dickson 1967: 92-3).

The solution to the government's debt problem was to extend the new mechanisms of public finance to their logical extreme through the conversion of the 'irredeemables' and other annuities into stock. In 1720, the South Sea Company outbid the Bank of England for the right to swap South Sea Company stock for most of the outstanding government debt. At the time, a similar scheme under the direction of the Scotsman John Law seemed to be succeeding in Paris (Neal 1990). By mid-1720,

over eighty percent of privately held annuities (£26 million) were voluntarily exchanged for South Sea stock (Dickson 1967, 522-3). The windfall for the government was that annuities costing the government six to nine percent were transformed into debt owed to the South Sea Company paying five percent and could be redeemed if the government wanted.

For the South Sea Company, tremendous potential profits were to be had by driving up the price of the stock. A high price meant each share would swap for more annuities, and, even more profitable, high priced stock could be sold for cash. To drive up the price of the stock, the company limited supply, so initial offerings were only in spurts beginning in April 1720. To promote demand, subscribers only had to put down ten to twenty percent in cash, and the remaining payments were spread out up to 54 months. The subscribers were given subscription receipts (called scrip) that they could sell on the secondary market where demand from foreign investors pushed prices up even more. The network of brokers, jobbers and futures contracts facilitated speculation of future price increases. Once the process had pushed share prices up to near quadruple par in late April, the first round of investors were allowed to swap annuities for stock. The enthusiastic response by annuity holders established a fundamental asset for the company and the favorable terms (relative to the market price) encouraged speculation in anticipation of very large cash and annuity subscriptions scheduled for June and August (Neal 1990 109).

To further fuel speculation in mid-1720, the company flooded the market with credit. To circumvent Parliament's prohibition on corporate banking other than the Bank of England, the company used a partnership called the Sword Blade Company that shared many of the same directors as the South Sea Company. The Sword Blade Company issued banknotes, but the notes were used to

finance more purchases of the South Sea stock. While Sword Blade notes only functioned as a medium of exchange in Exchange Alley where the securities market operated, that circulation was sufficient to support a price increase that reached ten times par in the summer, at which price and time the company successfully conducted the remaining subscriptions. By the end of August 1720, the company's assets were 75 million in subscribed cash, 26 million in swapped annuities and 11 million in loans, while the liabilities were only 8 million owed to the government in various pledges and 5 million in bonds (Dickson 1967: 125, 134, 160-1). Also, the company had 17.5 million in unissued stock that could potentially be turned into working capital if opportunities presented themselves (Murphy 1986: 161-2).

The problem for the company was that most of the 75 million in cash was pledged rather than in hand, and collecting the down payment on the new cash subscriptions and the deferred calls on the April cash subscriptions strained the available supply of liquidity (Neal 1990: 109). Collection of the cash began to look very unlikely when stock prices plummeted in September 1720. Investors desperately sought liquidity to pay the now choking debts created during the bubble's rise. Liquidation spread to East India Company stock and Bank of England stock and their prices fell. London banks suffered runs, and the crisis worsened when the Sword Blade Company failed on 24 September 1720 (Dickson 1967: 158, Neal 1990: 106). As the liquidity crisis deepened towards the end of 1720, investors clamored for legislative relief, and Parliament ruled that the South Sea company would not collect the remaining cash due and that unissued stock was to be portioned out to current stock holders. However, those who had swapped annuities for stock were stuck with the situation. In effect, the company was stripped of its potential profits and left with the 5 percent return on the 26 million in

annuities collected through the equity swaps.

Unwinding the South Sea Bubble also brought a political shakeup through which conservative fiscal policy took control of the Treasury in the form of Lord Treasurer Robert Walpole (1721-43) and then Lord Treasurer Henry Pelham (1743-54). In this period, the remains of the South Sea company was restructured into a perpetual government annuity until the capital was finally paid in 1850 (Roseveare 1991: 59). Perpetual, redeemable annuities were also issued through the Bank of England eight times from 1727 through 1751 with each issue to be repaid out of a different fund, so these securities collectively became 'the funds.' Instead of having to purchase annuities, transfer annuities or collect interest at the Treasury, investors could conduct the business related to the funds much more conveniently in the City at the Bank of England. Also, tax revenues flowing into the government began to be channeled through the bank. Through this process, the Bank of England truly became the banker for the government and the center of the London securities market because government debt and stocks backed by government debt dominated the secondary market (Michie 1999: 18-9). From 1749-52, Pelham directed the consolidation of 'the funds' into one perpetual annuity called the Three Percent Consol because it was 'consolidated' and paid 3 percent interest per year (Dickson 1967: 228-41). The financial system now had a long run investment instrument that was simple and secure with a deep secondary market staffed by brokers and jobbers who could convert consol. into Bank of England notes, bills of exchange, private bank balances, or gold guineas

III. Diffusion 1750-1793

The technology of the financial revolution spread slowly beyond London to the English and

Welsh countryside. In 1750, perhaps a dozen country banks operated, but their numbers grew in waves of expansion (1765-6, 1770-1 and 1789-93) to 280 banks in 1793 (Pressnell 1956: 4-11). Country banks were created by industrialists needing local means of payment, by scriveners brokering loans, by wholesalers advancing credit to customers and by merchants and tax collectors remitting funds to and from London (Pressnell 1956:13, Price 1980: 142-3). Once begun, a bank usually expanded its scope to offer the set of liquidity enhancing services: local media of exchange, London-based media of exchange, brokerage and discounting of bills of exchange. For example, a merchant turned to finance by lending his own money as trade credit, but expanded by taking deposits or issuing notes. The merchant's earliest notes would often be payable with interest after a certain date, but the 'evolution to full banking' (to borrow a phrase from Pressnell 1956: 139) brought the use of notes payable on demand because customers valued the liquidity (Thornton 170).

The expansion of country bank notes in England, however, was constrained by Parliament. Notes less than one pound were prohibited in 1775, and the minimum amount was raised to five pounds in 1777, so bank notes were only suitable for larger transactions (Pressnell 1956: 140). Also, the individual country bank did not expand greatly in scale. The Bank of England retained its kingdom-wide monopoly on joint stock banking until 1826, and country banks were prohibited from issuing banknotes in London, so country banks remained focused on local needs.

To connect localities to opportunities in London, country banks established correspondent relationships with London banks. The relationships usually followed from the regular flow of bills of exchange between country and City deriving from an economic specialty, like hops (Pressnell 1956: 84). In return for a balance in London, the London bank would pay notes and bills of exchange of his

country bank, execute stock or annuity orders, assist in times of tight money and whatever else needed doing (Pressnell 1956: 80, 88). The correspondent system created a hub-and-spoke structure permitting people to move purchasing power between places (London, countryside and overseas) and to change the form of their savings from demand (notes and deposits) to securities via the London stock market or international bills of exchange via the London nexus of markets. Figure 3 presents a schematic of the integrated system with distance from London measured on the horizontal axis and the duration of the financial instrument measured on the vertical axis. The nexus of intermediaries represented by the dark triangle created the ability to move between spheres.

[Chart 3. System of English Liquidity, circa 1780.]

Part of London's growth as a financial hub was increased specialization in the supply of liquidity. The foremost example was the maturation of the Bank of England's monopoly over note issue as London bankers largely abandoned note issue in favor of deposit banking (Clapham 1944a: 162). The effect was limited to London because the Bank of England viewed itself as a London concern and would not extend itself around the kingdom. As a consequence, Bank of England notes supplanted gold for high-valued settlement, and London banks came to use Bank of England notes as reserves instead of specie. The Bank of England became the depository for roughly one-third of the kingdom's gold as country banks put extra gold into their London correspondents who put the gold into the Bank of England (Clapham 1944a). The Bank of England note became backed by two substantial assets: government debt and gold.

Although London's banking system became based on Bank of England notes, the Bank of

England avoided lending to banks, especially the rediscount of bills of exchange that a private bank had already discounted. Most of the Bank of England's revenue still derived from government debt, but the bank did lend to a circle of London merchants and tradesmen – mostly by discounting bills of exchange, so the supply of new Bank of England notes became a function of the Bank of England purchasing government debt and discounting commercial bills of exchange. Also, the Bank of England refused to discount bills longer than 65 days which eliminated many bills created by country banks for industrial finance.

Within this system, the number of London banks doubled from 1760 to 1800, and many were country bankers moving to the capital (Clapham 1944a: 165). West End banks focused on aristocratic clientele desiring consumption smoothing and brokerage services. City banks focused on the bill of exchange market and commercial payments. The move by private banks to check-based deposit banking caused thirty-one City banks to create a clearinghouse in 1773 (Joslin 1954). The clearinghouse reduced the cost of clearing by minimizing the actual transfer of Bank of England notes between member banks by processing off-setting balances by ledger. Members of the London Bankers Clearing House did not share their books with each other, so the clearinghouse did not perform the same level of monitoring and co-insurance that nineteenth century clearinghouses did in the United States (Holland 1910, Gorton 1985). The clearinghouse protected its advantage as deposit banking expanded in the nineteenth century by excluding joint-stock banks until 1854 and private country banks until 1858 (Kindleberger 1993: 80, Pressnell 1956: 130).

The stock market also introduced new institutions to facilitate market clearing. In 1773, a syndicate built a stock exchange in Sweetings Alley and charged for people to trade there (Michie

1999: 31). The benefit for traders was a common set of rules and regulations; however, the exchange was not a closed system, and the exchange's Committee for General Purposes lacked the power to exclude defaulters or adjudicate disputes (Michie 1999: 34). Trading occurred in other parts of the City, and the Rotunda of the Bank of England, opened in 1765, was popular trading place since consol and Bank of England stock transfer were registered there (Michie 1999: 32).

Innovation and diffusion of financial technology occurred even more rapidly in Scotland. In 1695 the Bank of Scotland was founded in Edinburgh by act of the Scottish Parliament. Like the Bank of England, the Bank of Scotland was a joint-stock bank with limited liability for its shareholders, but the new bank was not built on government debt. Instead, it was prohibited from lending to the Scottish government. In 1727, the Royal Bank of Scotland became the second Scottish joint-stock bank. A note duel soon followed as the two banks competed for a share of the demand for bank notes. The competition caused the Bank of Scotland to suspend convertibility for eight months in 1728 until legal pressure forced the bank to resume payment. The Bank of Scotland then adjusted its notes by inserting a clause allowing the bank's directors to suspend payments, but they had to pay interest on notes they suspended. The Royal Bank of Scotland did not incorporate the clause until 1762 but was ready to make the adoption if needed (Checkland 1975: 68). The suspension clause was rarely resorted to, and the option to suspend may have prevented runs in the Scottish system, but the clause was outlawed by Parliament in 1765 (White 1995: 26).

In 1747, a third Scottish joint-stock bank was granted a charter; however, the British Linen Company was also a trading company designed to use banking to facilitate the development of Scotland's linen industry. While an innovative departure for British banking, the British Linen Company

did not fare well as an industrial concern and instead came to focus on banking (Checkland 1975: 97). Private banking also spread to Glasgow, the heart of the tobacco trade, when, in 1749, the Bank of Scotland sponsored allies to form the Ship Bank with the idea that the Ship Bank would discount bills but circulate Bank of Scotland notes. The next year the Royal Bank of Scotland supported a similar arrangement with the Glasgow Arms Bank creating a joint-stock but unlimited liability bank. To the chagrin of the sponsoring banks, the Glasgow banks began to issue their own notes creating direct competition. A 'bank war' broke out between Glasgow and Edinburgh, but the new Glasgow banks could not be crushed, and private banking spread to Aberdeen, Ayr, Dumfries, Dundee and Perth (Checkland 1975: 91-138). In 1771, the Bank of Scotland and the Royal Bank of Scotland began par acceptance and regular weekly clearing of the provincial banks which integrated the Scottish note market. Edinburgh acted as the hub for the Scottish system and connected Scotland to London via bills of exchange. In May 1772, Scotland had 31 banks of which 21 were in Edinburgh including the three limited-liability joint-stock banks (Checkland 1975: 135).

The stability of the Scottish system was tested when the Ayr Bank went on a three year bill-discounting, note-issuing spree. The Ayr Bank was backed by landed nobility but was operated with little oversight by the principals. The failure of an London-Edinburgh banking house allied with the Ayr Bank in June 1772 touched off a panic that ruined thirteen private Edinburgh banks and along with the Ayr Bank (Checkland 1975: 134). The liquidity crises was mitigated when the Bank of Scotland and the Royal Bank of Scotland accepted Ayr Bank notes based on the properties of the Ayr Bank's principals. The par acceptance of provincial notes was restarted in 1774, and the Bank of Scotland began to establish branches around Scotland. In contrast, the Royal Bank of Scotland developed

correspondent relationships with provincial banks except for one branch in Glasgow. Private banking again began expanding both in and out of Edinburgh.

IV. Industrial Finance

The London and Edinburgh based network of liquidity was well suited for the needs of new sectors like cotton, iron and steam power. Firms needed to pay workers and suppliers while being paid by customers, so the diverse payments system helped create the confidence needed for investment. The payments system also facilitated access to larger markets since a market is defined as much by getting money home as getting output shipped. With the connections to London, payments could be made or received from most of the trading world.

Liquidity also indirectly financed industrial growth. Although fixed physical assets were essential for industrial expansion, fixed assets were a relatively small part of an early industrial firm (Pollard 1964). In contrast, workers, supplies and inventories were the dominant part of a firm, so a difference between the outflow of expenses (accounts payable) and the inflow of revenues from sales (accounts receivable) was a recurring financial problem. The availability of short run lending supplied by the system freed internal funds to finance long run growth. To see how, consider both the supply and demand of funds for a firm (Neal 1994). The supply schedule was a combination of cash, borrowing and equity. A firm's cash reserve was from the retained earnings of earlier profits, and the opportunity cost of retaining profits was at least the risk-free rate offered on Consol. in the London money market. A firm could also borrow short-run funds, for example by discounting bills of exchange at a local bank. Although usury laws limited the discount rate to 5 percent, the rate needed to be higher

than the consol rate because no firm was viewed as a safer risk than the British government. Finally, a firm could issue new stock or accept new partners to gain funds, but the opportunity cost of equity was considered greater than borrowing. The composite supply schedule is presented in Figure 4.

[Figure 4 here]

A firm's demand schedule for funds would begin with any fiscal shortfall that must be paid. Such demand would be willing to pay a high rate of return because the opportunity cost of not meeting these obligations was ruin. After a 'bankruptcy' zone would be the entrepreneur's opportunity for long run investments in the company. The remainder of the demand curve was short run opportunities such as lending to customers or increasing production. The composite demand schedule is also presented in Figure 4. While internal profits and equity can be used for long run investment, borrowing was limited to the short run. Because immediate obligations must be addressed first, a firm could lack the internal funds to supply long run growth. Although the short run debt may be used to finance short run obligations, the effect is to make internal profits available for long run investment.

Also, shifts in the components of supply and demand demonstrate the power of shocks to ruin firms. For example, trade cycles were a common feature of the era. In a trade boom, revenue would easily flow in, internal profits would grow providing room for expansion of long-run investment and opportunistic short-run borrowing. A downturn, however, reduced revenues, so firms had less internal profits exactly when the demand from immediate obligations increased. Chart 5 shows this combination and highlights the importance of the discount market during a crisis. Indeed, a liquidity crisis on top of the trade crises was devastating (Pressnell 1956, 468). The supply schedule would shift up and the right tail of the middle (short run lending) component of the supply curve would truncate as banks

rationed credit. Studies have been found that bankruptcy correlated with trade and liquidity crises (Duffy 1985, Hoppit 1987, Neal 1994).

[Figure 5 here]

V. Suspension 1797-1823

The choke-point of England's system of liquidity in the eighteenth century was the Bank of England. The domestic system of payments had become built on Bank of England notes and deposits. However, the Bank of England would only discount the short-term bills of a circle of London merchants and tradesmen, and even then the Bank of England limited total discounting. For example, when many country banks faced panics in 1793, the Bank of England would not expand its discounting. While the Bank of England would not act as the lender of last resort, it had become the keeper of pound sterling. When gold flowed in, the Bank of England's note issue expanded, as when capital fled France and the Continent after 1789. However, when France stabilized its monetary system in 1795 and invasion scares mounted, gold flowed out of Britain the Bank of England contracted note issue primarily by reducing discounting (Clapham 1944a: 267-72).

The major change to the system in the Napoleonic Era was the decoupling Bank of England notes from gold. The drain of gold out of the Bank of England became precipitous in early 1797, and on February 26 the King ordered the Bank of England to suspend convertibility (Clapham 1944a: 272). Suspension drove the coinage remaining in Britain out of circulation, so, to better supply means for small payments, Parliament also lifted restrictions on small denomination bank notes in March 1797. In London, the Bank of England began to aggressively discount bills of exchange and opened the service

to London bankers. Liberal discounting supported the government's war finance effort because London banks could invest heavily in high-return government debt and easily borrow from the Bank of England at a fixed rate of five percent should the banks require momentary liquidity. Liberal discounting was also very profitable for the Bank of England since notes could be issued without any gold backing.

The expansion of credit in London and the issue of small denomination notes also promoted the expansion of country banking, but another factor at work was an increased demand for banking by industry. The success of Napoleon's Continental Blockade and the need to arm Wellington's Peninsular Campaign shifted resources within Britain towards heavy industry such as metallurgy (Neal 1990: 205). From 1797 to 1810, the number of country banks in England and Wales almost tripled from 230 to 783 (Pressnell 1956: 11), and the growth of private bank notes was especially demanded by industry (Pressnell 1956: 148). Industrial growth also increased demand for country bank discounting on London, but that met with resistance (King 1936: 6). With war-time Consol. offering rates fluctuating at or near the five percent ceiling on discount rates, London bankers favored the more secure Consol (Neal 1990: 217). Also, the Bank of England would not discount directly with country banks. Even the secondary market was problematic because, again, the Bank of England would only discount bills of less than 65 days which excluded two-thirds of bills sent to London by country banks (Pressnell 1956).

To improve the liquidity of bills, bill brokers emerged who charged a fee to connect buyers and sellers. The brokers', "primary function then quickly came to be that of receiving bills from the 'industrialist' banker and arranging for the discount either in London or by the 'agriculturalist' country bankers" (King 1936: 6). Bill brokers originally took no position on the bill itself; however, brokers

claimed that they did screen borrowers on behalf of investors so that country banks using brokers suffered fewer losses (King 1936: 16). Bill brokerage was given another boost when the Bank of England began to reduce its levels of discounting after 1810 because the demand for discounting that the Bank of England had supplied moved to brokers. With peace and the subsequent fall in rates, brokers gained further business when private bankers were slow to reduce rates below 5 percent and the Bank of England refused to at all (King 1936: 27-8). Bill brokering rapidly increased the liquidity of the secondary market for bills and bolstered the eighteenth century system of localized banking. Returning to Figure 3, bill brokerage improved the ability of bills to move between the countryside and the City.

During the Napoleonic Wars, the stock market also saw new market organization to improve liquidity. War increased the volume and volatility of government securities while refugees from Paris and Amsterdam brought experienced traders who were new to the London market (Michie 1999: 33-4). Problems of traders defaulting and their inability to monitor each other caused the exchange on Sweetings Street to limit access to the market. In March 1801, the stock exchange changed itself into a subscription room with rules of behavior, controlled admission, administration paid by subscriptions, monitoring, and enforcement by the threat of expulsion (Michie 1999: 35). Early discrimination refused admittance to members whose 'principal business' was not brokering or jobbing to avoid linkages between external business failure and members going bankrupt (Michie 1999: 38-9). Positions between members could be substantial, and the illiquidity of assets in bankruptcy threatened the system. The institutional 'firewall' was made formal in 1812 when the exchange ruled that all members had to be solely stock brokers or jobbers (King 1936: 39).

Yet another innovation during the Suspension Era were savings banks. Begun in Ruthwell Scotland in 1810 as a charity, savings banks allowed the working class to earn interest on small value deposits (Horne 1947: 43). Deposits were invested with British Linen Company (a Scottish corporate bank) at 5%, and penalties on depositors allowed a small surplus for the savings bank (Horne 1947: 45). The concept was wildly popular with members of the upperclass who desired to promote thrift among the working poor, so, by the end of 1815, all of Scotland except the far North had access to a savings bank (Horne 1947: 50). The concept soon moved south; however, private banks in England would not pay savings banks for deposits. English savings banks could invest in government securities, but the rate of return was falling with the return to peace. A solution was proposed for the government to offer savings banks a guaranteed, above-market rate of return for money invested through the Bank of England into a special account of the National Debt (Horne 1947: 77-8). The bill became law in 1817, and about 150 new savings banks formed within 12 months after passage. The total amount that savings banks held in their special fund at the Bank of England increased by an average of one million pounds per year over the next thirty years (Horne 1947: 116) and provided a way for working class Britains to gain access to reasonable rates of return on their savings yet still have the ability to liquidate those savings if needed.

Peace increased political pressure to re-establish a metallic monetary system. One lingering problem from the eighteenth century was how to maintain the circulation of silver coins in a bimetallic system, and the solution adopted was to abandon bimetallism and instead mint silver coins with less metal content than their stamped value. Profiteers would not be tempted to export the coin since its value as a token coin was greater than value of the silver in it. Such token coins, however, also create

large profits called seigniorage for the government since a fraction of a shilling in silver produced a coin worth a full shilling. Unfortunately, counterfeiters could also earn the same high profits, so successful token coins required a hard-to-counterfeit technology. The technical breakthrough came from Matthew Boulton (of Boulton and Watt fame) who showed how to use a steam engine along with steel collars to create perfectly round and polished coins – a level of exactness unattainable by human powered presses. In 1816, Parliament adopted the technology, created token silver coinage and formally put Britain on the gold standard (Redish 1990: 802).

However, the banking system was still disconnected from gold, and not until 1819 did the Resumption Act order the Bank of England to restore convertibility by 1823. The Bank of England responded by building up its stock of gold, reducing the amount of notes in circulation, and keeping the discount rate at 5 percent (Neal 1998: 55). The resulting deflation allowed the Bank of England to restore convertibility in 1821 and brought the era of *fiat* legal tender to a close. Except for inflation and some bank failures, the era was remarkably successful: the wars were financed, domestic industry was financed, permanent financial innovation abounded and the system was unwound once the national emergency had ended.

VI. Panic and Reform 1821-1850

While the British payments system worked well day-to-day, liquidity crises routinely shocked the system. Liquidity crises are so disruptive because banks supply media of exchange but also supply loans. When the public fears that a bank's loans will fail because of a poor harvest or a commercial downturn, then depositors or note-holders run on the bank demanding gold or Bank of England notes.

If the public does not know which banks are at risk, then a run becomes a panic, so a business crisis becomes a lending crisis which becomes a liquidity crisis. The stress is compounded because banks fearing a panic seek to liquidate the loans they hold to get cash to satisfy depositors. In 1793 the end of a trade boom and speculation in canals had forced many country banks to suspend payments. As mentioned above, in 1797, the Bank of England was granted the suspension of convertibility to forestall a crisis. Even during the Suspension Era, private banks failed in waves of runs in from 1810-13 caused by bad turns in harvests and in foreign trade (Pressnell 1956: 466-70). It was the Panic of 1825, however, that stimulated a string of legislative changes designed to reduce the vulnerability of the payments system to shocks, but the reforms did not achieve full success until the Bank of England accepted the role of lender of last resort in the 1870s.

Curing banking panics was not a simple thing because vulnerability to runs is tied to what makes banks valuable. Banks supply both loans and media of exchange because the two functions are highly complementary. Borrowers want means of payment from a bank as do note-holders and depositors. The reason banks do not charge for these payment services is because the bank earn returns lending out the funds. The more money earned through this delegated lending, the more profit a bank makes and the more depositors can be paid – or not charged. The value of delegated lending increases as depositors have less of an idea what the bank is doing with their money because the bank is using its knowledge of the local business environment to make profitable loans while sparing the depositor the effort of having to acquire this information himself. The asymmetric information between depositor and banker creates value but also creates a moral hazard problem. How does a depositor know what a banker is using the money well? Finding out exactly how the banker is lending the money destroys the

value of the delegated lending, so a better means of disciplining the bank is to threaten a run. The deal is that the banker will invest the money wisely, but must be prepared to repay depositors on demand. Hence, a banker joins the of suppling media of exchange payable on demand and an lending portfolio of short-run or highly liquid assets (Calomiris and Kahn 1991).

The policy challenge becomes to improve a bank's ability to withstand runs without destroying the disciplinary effects created by the threat of a run. One way to supply liquidity during a crisis was for the Bank of England to aid private banks in need by rediscounting bills from bankers during a crisis. The Bank of England enjoyed privileges which implied commensurate obligations which the Bank of England did satisfy with regards to government finance and defending the foreign exchange value of the pound. The Bank of England, however, was a for-profit operation and resisted offering assistance to competitors at the Bank of England's expense (Goodhart 1988). After the suspension, the Bank of England was slow to offer rediscounting to banks during crises. For example, during liquidity crisis of 1825 the Bank of England's first instinct was to build reserves and restrict lending (Clapham 1944b: 98).

While the Bank of England resisted committing to becoming the lender of last resort, the government did push the Bank of England to establish branches so local money markets could be stabilized through the direct supply of Bank of England notes and discounting (Kindleberger 1993: 86). The Bank of England did not want to expand, but the government threatened to revoke the Bank of England's monopoly, so, from 1826 through 1829, the Bank of England established eleven branches in Manchester, Gloucester, Swansea, Birmingham, Liverpool, Bristol, Leeds, Exeter, Newcastle, Hull and Norwich (Neal 1998: 72). To discourage local note issue, the Bank of England branches offered

favorable terms to banks that did not issue notes (Pressnell 1956: 152). Also, the branches supplied coinage that was particularly useful to industrialist for paying wages. To secure this advantage, in 1829 Parliament banned notes below L5 in England and Wales.

While England and Wales saw about fifty banks go bankrupt and more suspend payments in 1825-6, Scotland seemed, “almost immune to the virus” (Clapham 1944b: 102). The stability of the Scottish system became a template for reforms to make English and Welsh banks more resistant to runs by making them larger and more diverse. In 1826, Parliament allowed banks beyond 65 miles of London to become joint-stock banks of more than six members, and 117 were created from 1826 to 1844, and only 19 failed or closed (Cottrell and Newton 1999: 84). The new joint-stock banks displaced over half the traditional country banks by 1844, but most joint-stock remained local in lending and ownership with one-fifth having been converted private banks (Cottrell and Newton 1999: 90-2, 103). In 1833, Parliament expanded joint-stock banking to London; however, joint-stock banks operating in London were not allowed to issue notes so as to avoid direct competition with the Bank of England. By 1844, London had five joint-stock banks that averaged three times the deposits per bank of private London banks, but private banks were still 12 times more numerous (Cottrell and Newton 1999: 103).

What did not happen until the 1860s was extensive bank amalgamation or bank branching. Many banks found the benefits of diversification outweighed by the challenges of managing branches (Cottrell and Newton 1998: 121-2). Also, joint-stock bank development was stymied from 1844 to 1857 by legal restrictions such a minimum capital requirement of L100,000 and a minimum share value denomination of L100, and only six new joint-stock banks were formed from 1844 to 1857 (Collins

1988: 74). A key element of the Scottish model of joint-stock banking; however, was not introduced to England until 1858 and 1862 when limited liability for share holders was finally made legal, and a rapid expansion of joint-stock banking and bank branching followed (Cottrell and Newton 1998: 127).

The combination of the note-issue ban in London and the presence of Bank of England branches outside of London meant that most joint-stock banks chose not to finance by note issue but instead sought deposits. As a result, country bank note issue (private and joint-stock) peaked in 1836 (Cottrell and Newton 1998: 126). Instead of issuing more notes, joint-stock banks competed for deposits by offering high interest rates, and profit margins were maintained by keeping low cash reserves and re-discounting bills to provide liquidity when needed (King 1936: 39-40). London's bill brokers became the key intermediaries as joint-stock banks rediscounted on a daily basis and favored bills of exchange to other investments such as government securities because bills were so liquid, so joint-stock banks increased the volume of bill business buying bills with deposited funds and selling bills to cover withdrawals (King 1936: 40).

The pressure on joint-stock banks to usefully employ funds fostered a new demand by banks for a saving opportunity that paid interest but could be liquidated on demand (King 1936: 42). London's private banks also sought such an opportunity for call loans. In 1825, London bankers were caught between their country bank correspondent's demand for discounts and the Bank of England's refusal to supply rediscounts. London bankers learned that in a liquidity crisis that they could not count on rediscounting a bill. This painful experience caused London private bankers to develop greater cash reserves and demand interest-paying call deposits (King 1936: 62-3). With banks willing to take a rate of return on call deposits less than what bills of exchange offered, the largest bill brokerages began to

supply the service to private and joint-stock banks. In doing so, the brokerages moved beyond brokerage. The broker became a dealer, a discount house, who took demand deposits and invested the money in bills of exchange.

The transformation from bill brokerage to discount house was encouraged in 1830 when the Bank of England began permitting discount houses to rediscount with the bank (King 1936: 89). As the demand by banks for the rediscounts and the call loans of discount houses increased, this seemingly innocuous policy change by the Bank of England rerouted the flow of emergency funds from the Bank of England through discount houses instead of directly to banks (King 1936: 89). The mediation of discount houses between banks and the Bank of England caused the Bank of England's rediscount policies to focus on systemic needs rather than on whether particular banks deserved assistance (Capie 1999). Bill dealing and rediscounting was further changed by the 1833 repeal of the usury ceiling on bills of exchange of up to three months. For discount houses, the spread between the rates offered on call deposits and the rates available on bills was no longer limited. For the Bank of England, instead of having to restrict the quantity of discounting supplied at 5 percent, the Bank of England could instead raise rates to reduce the quantity demanded. The flexibility allowed the Bank of England's discount rate to become the primary policy instrument calibrating the Bank of England's relationship with the discount houses of bill dealers.

As with earlier new financial technologies, the new discount market was pushed to an unsupportable extreme. The ease of rediscounting caused banks to discount more bills and bills of less quality, yet the security of a bank's indorsement lulled discount houses into ignoring the volume and quality of liabilities banks were creating (King 1936: 94). Those pushing the limits of the system

included joint-stock banks that discounted the bills of merchant houses specializing in Anglo-American trade. When the scale of the American-based liabilities became clearer in 1836, the Bank of England refused to discount the bills, so a panic began based on the weakness of the effected merchant houses and their banks. The Bank of England then chose to reverse policy, and the panic subsided, but the Bank of England was locked into a generous rediscount policy for three years. The moral hazard created by the Bank of England's easy liquidity caused banks and discount houses to not restrain themselves. The increasing supply of Bank of England notes, however, scared Continental markets into a run on the currency side of the Bank of England in 1839 out of fear that the Bank of England would not be able to maintain convertibility (King 1936: 97). In response, the Bank of England increased the discount rate to 6 percent, limited rediscounts, and pushed London into a severe liquidity crises (King 1936: 82).

The failure of the Bank of England in the 1830s to balance its role as defender of the pound and rediscounter of last resort fueled a reformatory agenda that became law in 1844. Members of the currency school of thought believed that the freedom to issue notes caused swings in the overall price level and created instability. The Bank of England and other members of the banking school of thought felt that so long as notes were issued with reasonable gold backing – thought to be 33 percent gold backing by the Bank of England's Governor – that note issue did not threaten price stability (Kindleberger 1993: 91). The Bank of England's failure during panics in 1836 and 1839 gave the currency school the upper hand in government, and in 1844, the Bank of England was split into an Issue Department and a Banking Department with the goal of limiting note issue (Kindleberger 1993: 91). The Issue Department was given the monopoly on the issue of Bank of England notes while the

Banking Department was given all the remaining business of the Bank of England. The Issue Department was allowed 14 million in fiduciary notes after which every additional Bank of England note issued had to be fully backed by gold. To further limit the supply of bank notes, existing English banks could not expand their note issue while existing Scottish and Irish banks could only expand issue with full gold backing like the Bank of England now had to have (Collins 1988: 72). Finally, no new note issuing banks were allowed anywhere in Britain.

While the Bank Act of 1844 created strict currency controls, the discount policy of the Bank of England remained largely unrestricted because rediscounts could be created by deposit liabilities instead of notes. The exception was when withdrawals from the Bank of England demanded more notes than could be supplied, but here an *ad hoc* solution was found. During panics in 1847, 1857 and 1866 the Treasury waived the penalties for violating the constraint, so the Bank of England was free to supply emergency liquidity (Kindleberger 1993: 94).

The era of domestic panics ended when the Bank of England committed to emergency rediscounting but not to create moral hazard problems. The solution adopted by the Bank of England was to commit to offering easy access to rediscounting during panics but to charge a high rate of interest to penalize those who most exposed themselves to the threat of a liquidity crisis. The balance was most forcefully communicated in the 1860s and 1870s by Walter Bagehot, editor of *The Economist* and author of *Lombard Street*. The adoption of Bagehot's policy by the Bank of England in the 1870s along with the growth of bank branches and the amalgamation of banks created a very crisis-resistant payments system (Ogden 1991). In the following decades, individual banks failed and international exchange-rate crises threatened the pound, but domestic panics on banking system ceased

(Capie 1999, 125-6).

VII. Conclusion

From 1688 to 1860, the British financial system increased the supply of liquidity to the rest of economy through innovation and diffusion. As a conceptual story, the frontier of the payments system shifted in because of innovations like token money, bank notes, discount houses and joint-stock banking. Chart 6 presents this reduction in the viscosity of British liquidity. These advances were spread throughout Britain by a network of country banks, correspondent relationships and bank branches. The network allowed members of the economy to reliably move assets over distances large and small and between a variety of forms: local payments, bills of exchange, deposits and securities. The system supplied long run financing of the government and short run financing of commerce and industry.

[Chart 6 here]

Government policy had a substantial role to play. The Glorious Revolution and the Three Per Cent Consol made government debt safe and convenient, and government debt, whether in the form of company stock or annuities, formed the bulk of London's securities market. However, the government allowed the South Sea Company to create the first stock bubble. Parliamentary charters created the Bank of England, the Bank of Scotland, the Royal Bank of Scotland, and the British Linen Company; however, Parliament limited the number of partners of English and Welsh banks could have and the smallest bank note they could issue. Many authors then and now have commented that England suffered from the greater banking regulation relative to Scotland (Cameron 1967: 98-9; Checkland

1975; White 1995). In the nineteenth century, Parliament shackled all British note issue and returned joint-stock banks, discount houses and even the Banking Department of the Bank of England to deposit finance.

Parliament's constraints, however, never halted the diffusion of financial technology and even spurred innovation (Cameron 1967: 58-9). For example, the deepening of the secondary market for bills of exchange, especially the development of discount houses, created a resilient source of liquidity that supported bills of exchange as a means of payment, bills of exchange as a means of lending, and a banking system that relied on both functions of the versatile bill of exchange. The Bank of England also used the bill market to conduct her discount policy -- when she had a discount policy. Compared to Britain's European and American counterparts, British finance was unfettered and innovative. Britain pioneered bank note finance, highly liquid government debt, nationwide diffusion of the banking habit, discount houses and central banking.

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Chart 1. Payments System circa 1688.

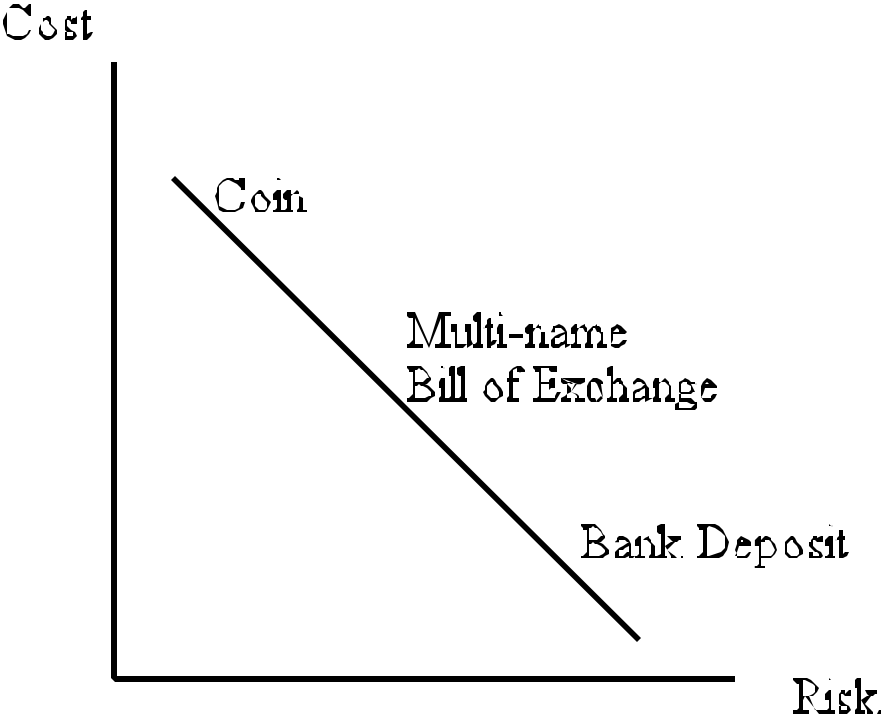


Chart 2. Debt/Equity Swap During, 1694-1720.

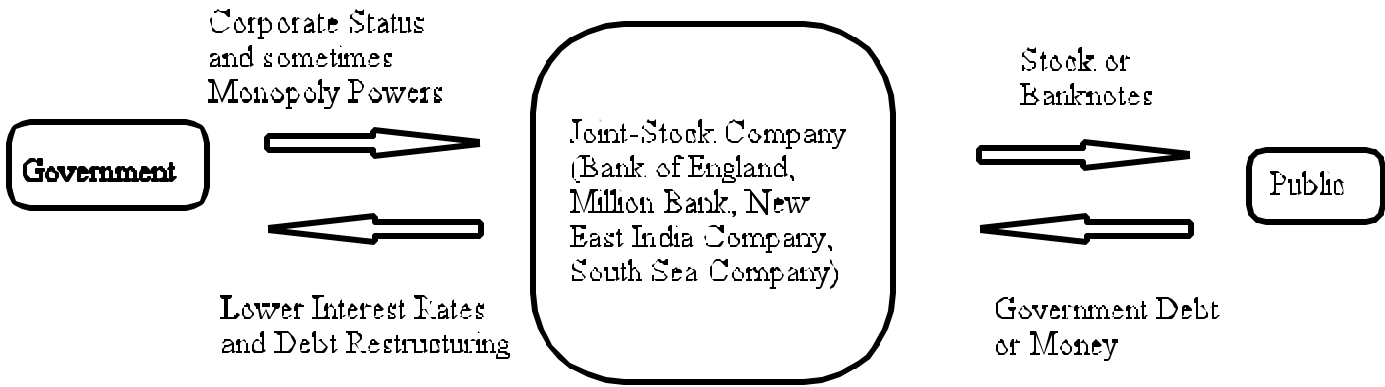


Chart 3. System of English Liquidity, circa 1780.

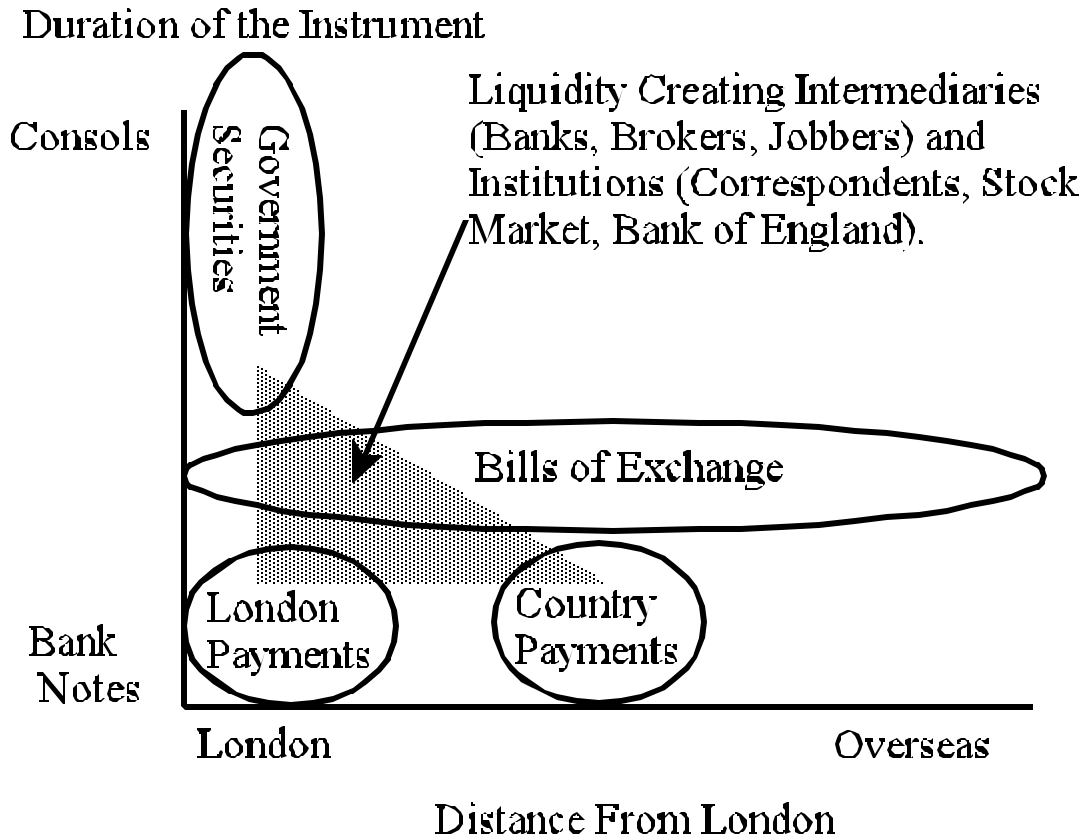


Chart 4. Supply and Demand for Industrial Finance circa 1790.

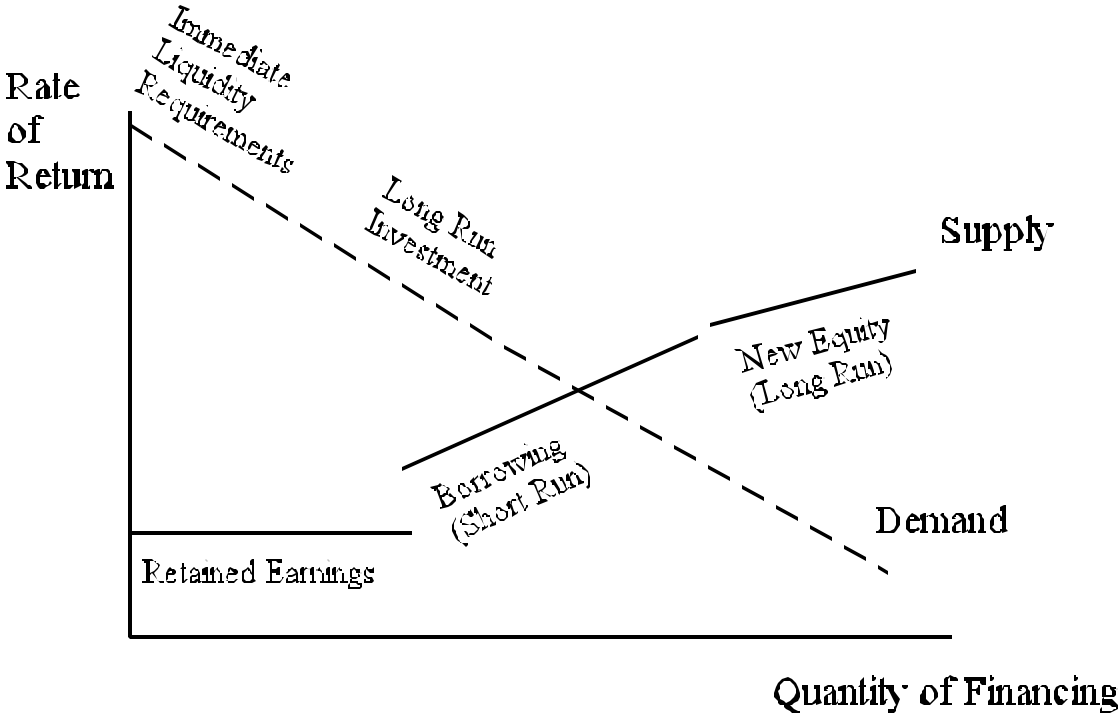


Chart 5. Supply and Demand for Industrial Finance During a Panic.

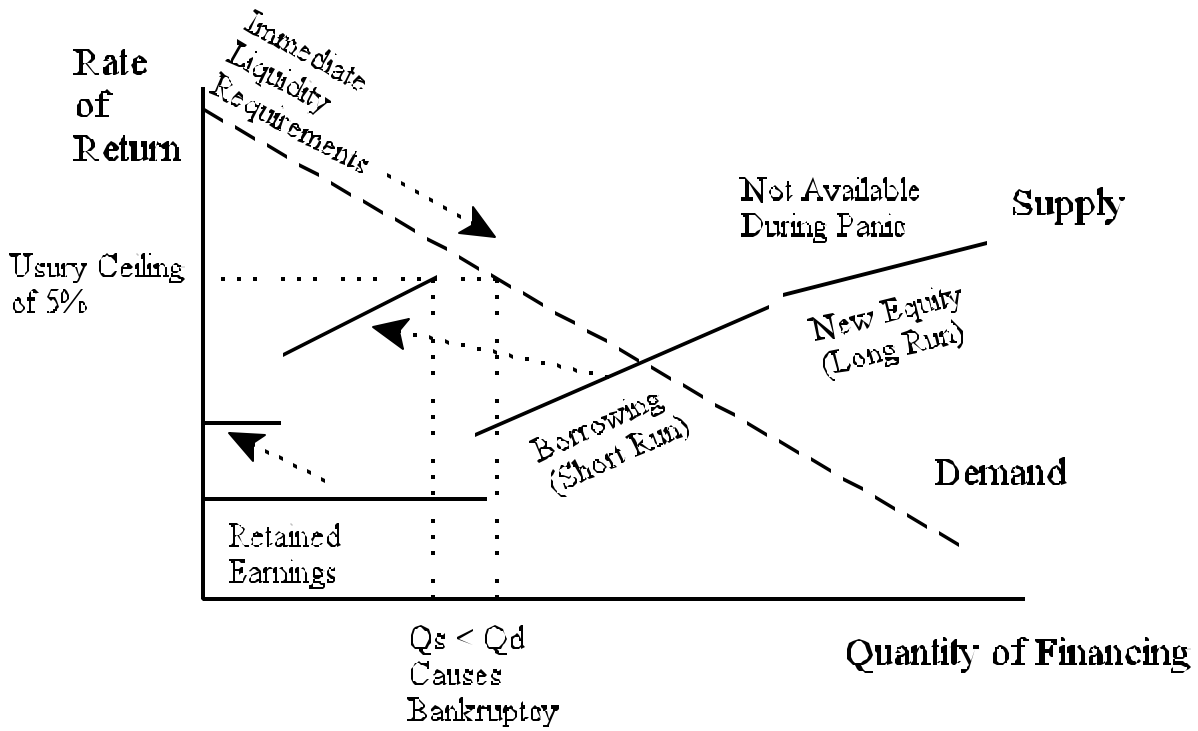
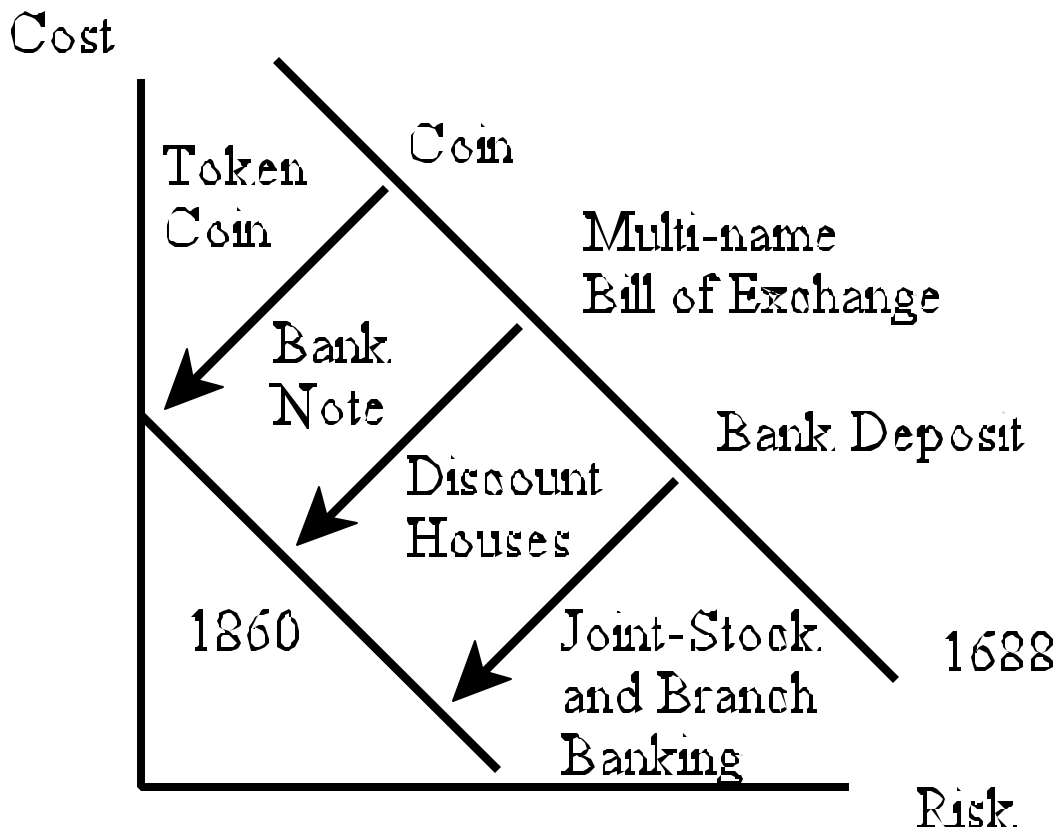


Chart 6. Development of the Payment System 1688 to 1860.



1. Mention that this skirted usury laws.