Liquidity and Contagion: The Crisis of 1763*

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Abstract

The financial crisis that swept across northern Europe in 1763 bears a strong resemblance to more recent episodes of financial distress. The combination of the specific contractual arrangements at the time, interlocking credit relationships and the high leverage of market participants triggered distress sales of assets, leading into a severe liquidity crisis. Hence, the crisis is an early instance of contagion on the asset side of the balance sheet. We highlight the salient features of the 1763 crisis and propose a stylized model of the events. Whilst the financial institutions have changed fundamentally in the intervening two hundred or so years, the underlying problems appear to be universal.

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1. Introduction

At the end of the Seven Years' War, the whole of northern Europe was gripped by a financial crisis that has been described by one commentator as "a pest epidemic, spreading with raving speed from house to house"[1]. Although the institutions governing financial markets looked very different in 1763 compared to those today, the crisis shows many features that would be familiar to an observer of recent financial crises. Indeed, many of the hotly debated topics of the last few years, such as the role of highly leveraged institutions, liquidity drains in times of crisis, and the intertwining of credit risk and market risk, are clearly evident in 1763. We see financial innovations that allowed nimble market players to increase leverage in a buoyant financial market and amass rapid gains at the expense of increased fragility of the system. We see these same players finally breaking down, inducing fire sales of assets and widespread failures, with severe repercussions for all market participants and the economy as a whole. In contrast to other historical episodes, the events of 1763 have received surprisingly little attention, even though they might be considered key to a better understanding of more recent events.

From a theoretical perspective, the crisis of 1763 poses a challenge to our current models of financial crises. Banks in the eighteenth century were underdeveloped by today's standards. It was uncommon for them to take retail deposits and extend cash loans to the private sector. Their primary role was in the payments system associated with the trade in goods. The most prominent bankers were also merchants, hence the origin of the term "merchant banker". Thus, the financial crisis of 1763 does not fall neatly into the textbook bank run model where the main issue is the vulnerability of a deposit-funded bank that has a maturity mismatch of liabilities and assets.

Agency-based theories that emphasize debtor moral hazard fare little better. Holland was the main creditor nation at the time, home to plentiful capital accumulated during its heyday as the pre-eminent trading nation of Europe. Meanwhile, Prussia would be familiar to many bankers today as a typical "emerging market" debtor country. Hamburg played an intermediary role between Amsterdam and Berlin, channeling funds and exploiting the interest rate differences that existed between Holland and Prussia. However, in contrast to the predictions of the agency-based theories, the first wave of failures occurred in Amsterdam, followed by failures in Hamburg some two weeks later. The financial crisis in Berlin was severe, but it arrived several weeks after the crises in Amsterdam and Hamburg. More significantly, most of the merchant bankers that failed in Amsterdam and Hamburg were able to re-open their doors within months,

[1] Skalweit (1937, p. 47).

suggesting that the crisis was one of liquidity rather than fundamental solvency. In any event, agency-based theories sit uncomfortably in an environment with unlimited liability, where the penalties for default (imprisonment and personal ruin) were harsh by modern standards. We need to search elsewhere for a satisfactory account of the events.

One striking feature of the crisis is the increased leverage in the balance sheets of market participants in the run-up to the crisis. Due to the offsetting nature of claims and liabilities, the increased size of balance sheets and the attendant increase in leverage were not viewed with alarm in 1763. In modern parlance, the balance sheets were "perfectly hedged" to the extent that each liability was exactly offset by an equal and opposite claim on another party.

The increase in leverage was made possible by financial innovations. Bills of exchange (as their name implies) first emerged as instruments in the payment system, facilitating trade in goods (Usher, 1914, Kohn, 1999). However, by the 18th century, they had evolved into a sophisticated instrument of credit–the "acceptance loan"–that allowed capital to be raised on the established financial centres of Amsterdam and Hamburg to finance trade and manufacturing in the newly emerging markets further east, such as Prussia (Mansvelt, 1922). Reputable bankers in the financial centres would make their own creditworthiness available by allowing other persons to draw bills on them, which could then be used for payments to third parties, or be sold on the bills market to raise capital. All the contracting parties' interests were tied together through rigorously enforced laws on the transferability and negotiability of bills, which meant that contracting parties were better able to commit to repay. In particular, all signatories of the bill remained *jointly* liable for the obligation from the bill contract after passing on the bill to other parties (this feature of the contract will be described in detail below).

The commitment power of the acceptance loan had the virtuous effect of expanding the universe of contracting possibilities between counterparties across large distances and across jurisdictions. However, there was also a dark side. The combination of highly leveraged balance sheets and interlocking claims and liabilities proved to be vulnerable to the downturn in economic activity at the end of war and induced a spread of bankruptcies in a contagious manner. We can distinguish three channels of contagion in the crisis of 1763.[2] First, the joint liability clause provided for contagion through the specific features of the bill contract. Second, the interlocking sets of claims and liabilities bound many market participants together in a credit-chain like fashion.[3] Third,

[2]We are grateful to a referee for suggesting the threefold taxonomy.

[3]See Kiyotaki and Moore (1998) for a theoretical development of credit chains.

and most importantly, contagion worked through the forced sales of assets to meet liabilities. Merchants suffered *direct* losses when their counterparties went bankrupt, but they were also affected *indirectly* through the price declines resulting from the fire sales. The actions of distressed parties attempting to reduce the size of their balance sheets had an impact on the value of others' assets. Weakened balance sheets generated further forced sales, feeding the vicious circle.

The third channel of contagion underscores an important distinction. The modern treatment of bank runs emphasizes the negative externalities on the *liabilities* side of the balance sheet–it is the run by depositors that precipitates the crisis. In contrast, the crisis of 1763 is an early instance of contagion on the *asset* side of the balance sheet. The negative externality that flows from one economic agent to another is through the impact on the prices of assets, magnified by the balance-sheet interlinkages between the agents. Liabilities side explanations for crises have received the bulk of the attention in the literature, reflecting the importance of banks in their modern role of intermediating between savers and borrowers. Explanations that focus on the asset side have been comparatively rare, although there are important recent contributions that have redressed the balance.[4] Our aim is to make a further contribution in this direction.

The features of the 1763 crisis are reminiscent of more recent episodes of financial distress. Complex balance-sheet interlinkages and the high implicit leverage inherent in such arrangements have figured prominently in the diagnosis of crises, and the propagation of financial distress through asset prices remains an important driving force of market dynamics to the present day.[5] Even for sophisticated financial institutions, changes in asset prices may interact with externally imposed solvency requirements or the internal risk controls to generate amplified endogenous responses to an initial shock. By reducing the market value of a firm's balance sheet, the shock will induce the disposal of assets or of trading positions. If the market's demand is less than perfectly elastic, such disposals will result in a short run change in market prices. When assets are marked to market at the new prices (or when creditors mark collateral assets to market), the externally imposed solvency constraints, or the internally imposed risk controls may dictate further disposals. In turn, such disposals will have a further impact on market prices. In this way, the initial shock has the potential to induce an endogenous response that far outweighs the initial shock.

Regulators are familiar with the potentially destabilizing effect of solvency con-

[4]Examples include Diamond and Rajan (2001), Allen and Gale (2003), and Gorton and Huang (2002). A more detailed discussion of these and other papers follows in section 3.

[5]The liquidity squeeze generated by such forced sales has received particular attention in the aftermath of the LTCM crisis (see, e.g., the 'Johnson report', BIS (1999)).

straints in distressed markets. To take a recent instance, in the days following the September 11th attacks on New York and Washington financial markets around the world were buffeted by unprecedented turbulence. In response to the short term disruption, the authorities suspended various solvency tests applied to large financial institutions such as life insurance firms.[6] Similarly, the feared meltdown in the financial system in 1998 prompted the intervention of the authorities (the New York Fed) who coordinated a buyout of LTCM by its main creditors. In 1763, there were no official lenders of last resort, nor official mediators who could coordinate rescues. Hence, the crisis presents a case study of how a liquidity crisis spreads in the absence of official intervention.

The outline of the paper is as follows. In the following section, we begin with a description of the financial institutions and macroeconomic backdrop to the 1763 crisis. In section 3, we present a stylized model of the crisis and develop a hypothesis about the origin and propagation of the crisis. In section 4, we confront this hypothesis with the evidence from price series and from the balance sheets of the major players in the market. We conclude in section 5, in which we develop further the general lessons to be learned from the 1763 crisis.

2. Background

2.1. Financial Market Institutions

The eighteenth century marked the slow, but steady decline of the Netherlands as Europe's dominant trading nation. Nevertheless Amsterdam remained the financial centre of northern Europe, followed by London and Hamburg. The accumulated wealth and a lack of domestic investment opportunities made Holland one of the major capital exporters of the time, both to foreign governments and to private firms.

Following the example of towns like Venice, Seville and Antwerp, Amsterdam had developed financial institutions that were crucial to the city's development as a global financial centre. The most important of these institutions was the *Exchange Bank of Amsterdam*, which was a publicly guaranteed deposit and giro bank (i.e., a payment bank). Adam Smith's *Wealth of Nations* has a celebrated description of the Bank of

[6] In the U.K., for instance, the usual 'resilience test' applied to life insurance companies in which the firm has to demonstrate solvency in the face of a further 25% market decline was suspended for several weeks. Also, following the decline in European stock markets in the summer of 2002, the Financial Services Authority — the U.K. regulator — diluted the resilience test so as to preempt the destabilizing forced sales of stocks by the major market players (FSA Guidance Note 4 (2002), "Resilience test for insurers". See also FSA Press Release, June 28th 2002, no FSA/PN/071/2002, "FSA introduces new element to life insurers' resilience tests").

Amsterdam[7], which remains a classic exposition of the functioning of a giro bank in the 18th century. Accounts were kept in a notional currency, called *bank money*, the largest part of which was backed with the holding of gold or silver. By law, bills of exchange had to be settled in bank money by a transfer from one account to another. Due to the impeccable reputation of Amsterdam bank money, it soon emerged as the key currency in international finance. The convenience and security afforded to account holders meant that bank money normally traded at a premium (or *agio*) to the circulating currency. Similar institutions were introduced in other countries, most notably in Hamburg whose financial institutions were almost one-to-one copies of the ones in Amsterdam.

At the time of the 1763 crisis, banking activities were much more restricted than they are today. It was still uncommon to take retail deposits and extend cash loans to the private sector. Besides the procurement of loans to sovereign debtors, banking activities served the purpose of facilitating payments in trade transactions, and hence the typical banker of the day operated his banking activities alongside his trading and (to a lesser extent) industrial activities. The financial markets in northern continental Europe were organized around the two financial centres, Amsterdam and Hamburg, while Berlin was still a provincial backwater in the 18th century, just beginning its integration into the world economy. Berlin's second rung status as a financial centre was also reflected in prevailing interest rates. Interest rates in Prussia were much higher than in Amsterdam and Hamburg.[8]

2.2. Impetus for Financial Innovation

The Seven Years' War (1756-1763) and the emergence of Prussia as a regional power were accompanied by a shift in the centre of gravity in the growth in trade and manufacturing activity away from the traditional centres of Amsterdam and Hamburg towards the interior.[9] In the absence of large financial intermediaries analogous to today's international banks, the main economic challenge in the mid 18th century was to find ways of channeling funds from established financial centres such as Amsterdam to the capital-hungry regions further east, especially Prussia. This challenge proved to be an important impetus for financial innovation.

[7]See his "Digression Concerning Banks of Deposit, Particularly that of Amsterdam", Book IV, Chapter III, Part I.

[8]Rachel, Papritz, and Wallich (1934, p. 510).

[9]The Seven Years' War refers to two separate conflicts - the colonial war between Britain and France, and the continental conflict between Prussia and her neighbours, especially Austria and Russia.

The problem could be posed starkly as follows. A Berlin merchant has a project–whether in manufacturing or in the trading of commodities–but has little capital of his own. He would like to borrow money from investors in rich countries such as the Netherlands where there is a ready stock of capital seeking investment opportunities. Borrowing directly from an Amsterdam bank is not feasible, since there are no banks that grant such loans. In any case, a direct loan contract between an Amsterdam investor and the Berlin merchant is not feasible due to the lack of enforcement powers across jurisdictions. Also, given the large distances involved, the use of collateral assets to secure the loan is ruled out. To the extent that the Berlin merchant lacks a commitment device to pay back the creditor in Amsterdam, the contractual possibilities are much reduced. For the cautious Amsterdam investor, lending money to an emerging market borrower in return for a promise of uncertain quality would be a risky undertaking. This is so even if the investment opportunities of the Berlin merchant is commonly recognized to be sound. This is a dilemma that would be familiar to investors in emerging markets in the 21st century.

A large part of the solution came from the financial institutions in established markets and the reservoir of relationship-specific capital that had been accumulated among their participants through day-to-day trade and commercial activity. For parties engaged in long-term commercial relationships, the surplus arising from continued collaboration meant that credible promises could be made, on pain of loss of a valuable long-term relationship. In addition, commodities and other goods involved in trade would offer opportunities to pledge collateral to back any obligation. Both the availabity of collateral and the relationship-specific capital provided an extensive network of commercial relationships that, if strung together, could bridge the gulf between Amsterdam and Berlin.

Bills of exchange had been in use in northern Europe since the end of the 16th century as an instrument of the payment system for the trade in goods. However, the 18th century saw a key financial innovation – the "acceptance loan" – that permitted the rapid expansion of credit, and the overcoming of information and enforcement problems between Amsterdam and Berlin. To understand the nature of the 1763 crisis and its propagation, it is important to understand the contractual underpinnings of credit through bills. We begin by describing the mechanics of acceptance loans.

2.3. Bills of Exchange and Acceptance Loans

Legally, a bill of exchange is an 'order to pay' (rather like a modern cheque) rather than a 'promise to pay' (such as a modern corporate bond). Thus, in contrast to a modern

creditor-debtor relationship, which involves a bilateral contract, there are typically at least *four* interested parties in a loan contract involving a bill of exchange:

- The *drawer* of the bill,
- the *drawee* of the bill,
- the *beneficiary* of the bill,
- and the *holder* of the bill.

Under the terms of the bill, the *drawer* requires the *drawee* to pay the *beneficiary* a sum of money at a given point in time. The bill carries the signatures of both the drawer and the drawee. By signing the bill, the drawee "accepts" the bill, thereby entering into the obligation to the beneficiary. Bills were negotiable instruments – they were freely transferable from one party to another–and their transfer was governed by rules for transfer and settlement that were rigorously enforced in all the major jurisdictions. We will describe these rules and their economic rationale in more detail below. Before doing so, we sketch a typical set of transactions.

In the run-up to the events of 1763, the cast of characters in a typical acceptance credit transaction would consist of the following parties:

Drawer of bill	Hamburg merchant banker
Drawee of bill	Amsterdam merchant banker
Beneficiary / endorser of bill	Berlin merchant
Purchaser / holder of bill	Amsterdam investor

The Hamburg merchant banker draws a bill on the Amsterdam merchant banker, with the Berlin merchant as the beneficiary. The beneficiary receives the accepted bill, endorses it, and then sells this bill to the ultimate creditor – the Amsterdam investor. In practice, the bill would in most cases pass through the Hamburg bill market, but would eventually end up in Amsterdam where most of the capital was. Bill traders could thus exploit the interest differences that existed between Amsterdam, Hamburg and Berlin.

The Amsterdam merchant banker accepts the bill on the understanding that the Hamburg banker will pay the sum of money necessary to redeem the bill before the redemption date. Typically, the Hamburg banker maintains a balance on his account at the Amsterdam banker, but this promise by the Hamburg merchant banker could

also be secured on collateral in the form of trading goods. The Amsterdam merchant banker receives a commission for its service in accepting the bill. This commission typically was very small (around 1/3 of a percent[10]), indicating that the incurred risks were judged to be negligible. For its part, the Berlin merchant promises to repay the Hamburg merchant banker before the redemption date of the bill so that this sum can be passed on to the Amsterdam merchant banker before redemption of the bill. This promise would also typically be secured on collateral, and the Hamburg merchant banker would receive commission from the Berlin merchant for its role in drawing up the bill. In addition, the Berlin merchant would have to pay interest when discounting the bill in the market. Since the bill was secured by the signatures of the Amsterdam and the Hamburg bankers, discount rates would be relatively low compared to the rates that the merchant would have to pay otherwise. Figure 2.1 displays the contractual relationships between the involved parties resulting from the described stylized transaction.

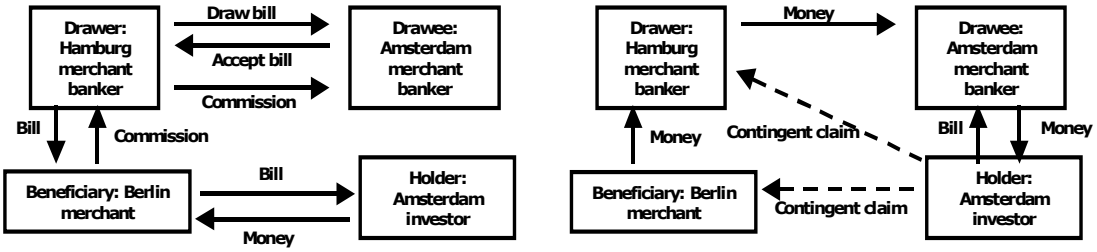

Figure 2.1: Contractual relationships in an acceptance loan at the inception of contract (left panel) and at maturity (right panel).

As a result of this sequence of transactions, credit has flowed from the investor in Amsterdam to the merchant in Berlin, and the intermediaries have balance sheets in which the liabilities are exactly matched by claims on other parties. The balance sheets of the four interested parties resulting from the transactions are as follows (the contingent claims and liabilities referred to will be explained shortly).

[10]Büsch (1797, p. 121), Rachel, Papritz, and Wallich (1934, p. 513).

Amsterdam merchant banker (drawee)

Assets	Liabilities
+ Acceptance loan to Hamburg banker	+ Acceptance liability toward bill holder

Hamburg merchant banker (drawer)

Assets	Liabilities
+ Claim on Berlin merchant	+ Liability toward Amsterdam banker
	+ *Contingent liability toward bill holder*

Berlin merchant (endorser, ultimate debtor)

Assets	Liabilities
+ Bill (as beneficiary) − Bill (from sale) + Cash (from sale)	+ Liability toward Hamburg merchant banker
	+ *Contingent liability toward bill holder*

Amsterdam investor (bill holder)

Assets	Liabilities
+ Bill = Claim on Amsterdam banker − Cash	
+ *Contingent claims on Hamburg banker and Berlin merchant*	

On the balance sheets of the intermediaries, there is an increase on both the assets and the liabilities side, reflecting the increase in leverage. The Amsterdam merchant banker owes money to the holder of the bill, but this liability is matched by his claim on the Hamburg merchant banker. The Hamburg merchant banker also has an extended

balance sheet in which the liability towards the Amsterdam banker is matched by a claim against the ultimate borrower–the Berlin merchant. The intermediaries are remunerated for their increased leverage and credit risk arising from this transaction by the commissions received for drawing up the bill.

Acceptance loans were *de jure* short-term contracts, just as the traditional loans based on bills of exchange. *De facto*, they were often used for long-term borrowing as the bills were "paid" by drawing another bill, much like the modern practice of rolling over short-term loans for the financing of long-term projects. In times of crisis, however, the short-term nature of the contract became apparent with the bill market drying up, wrong-footing the borrowers who had counted on being able to roll over their loans.

In reality, transactions were, of course, much more complicated and manifold than the stylized transaction described above. The chains of interlinking obligations typically were much longer, because bills were heavily traded at exchanges. However, the stylized transaction described above is designed to illustrate the overall direction of capital flows as well as the nature of the interlinking obligations.

Besides the claims and liabilities "above the line", the parties to the transaction were also subject to contingent liabilities and claims that are "below the line". These contingent claims and liabilities arose from the legal provisions for the transfer and negotiatiability of the bills, which had two key planks: *endorsement* and *Wechselstrenge*.

The first plank, the practice of *endorsement*, has survived to today in the regulations governing the settlement of cheques. The beneficiary of the bill can sell the accepted bill in the open market after adding his signature to the bill (by 'endorsing' the bill). Indeed, any subsequent owner can endorse the bill and sell it on the open market. However, such a transfer is not final. Even after the sale, the new holder of the bill has a contingent claim on the other signatories of the bill in the event that the original drawee is unable to pay. If the drawee is unable to honour the bill, then the drawer and all endorsers of the bill become *jointly* liable. That is, the holder of the bill has legal recourse to all of the signatories on the bill simultaneously, and may demand payment from any of them. In effect, when the beneficiary sells the bill by endorsing it, he is selling the claim on the drawee within a "credit insurance wrapper". The seller of the bill is promising to insure the buyer of the bill against default by the drawee.

The economic rationale for the institution of endorsement is clear. By maintaining a contingent liability, the practice of endorsement was designed to guard against the passing on of lower quality or fraudulent bills. Also, the fact that all signatories became jointly liable greatly reduces the informational costs related to seeking recourse against default. If, by contrast, there were a strict sequencing of liabilities, the bill would be

far less attractive, since the informational demands on demonstrating the insolvency of those higher up the list before claiming redress on one of the signatories would entail delays and open up further uncertainties. A signatory could turn away a claimant on the pretext that those that were more immediately liable had not been pursued first. There would also be the potential for collusion between sub-groups of the signatories with the drawee. The joint liability would eliminate such uncertainty, making the claim less informationally sensitive.

The practice of endorsement thus reduced the detrimental effects of asymmetric information by, first, removing the incentive to pass off fraudulent bills, and second, by making the claim more immediate. This latter aspect is closely related to the modern arguments for the benefits of demand deposit contracts as a way of overcoming the incentive problems arising from the informational advantage of modern banks (Gorton and Pennacchi, 1990, Diamond and Rajan, 2001).

In a recent theoretical treatment, Kahn and Roberds (2002) argue that the commitment power embedded in the practice of endorsement allows efficient contracting outcomes that could not have been achieved without it. The importance of such institutions in practice can be seen from the endogenous appearance of bill-like instruments in jurisdictions that have poor contract enforcement features. Ickes (1998) describes the workings of the *veksel* (a bill-like instrument) in Russia in the 1990s which emerged as a response to the poor contract enforcement environment at the time.

The second plank of the legal provisions for bills was *Wechselstrenge*, analogous to what is known today as the *holder in due course* provision in U.S. and U.K. law.[11] It stipulated the legal separation of the obligation related to the bill from any underlying commercial transaction between third parties. It thus ensured that claims from bills of exchange were enforced quickly and rigorously. It is best to illustrate this rule with a concrete example. Suppose that the Hamburg banker (the drawer of the bill) had repaid the Amsterdam banker (the drawee of the bill) prior to the maturity of the bill, but that the Amsterdam banker goes bust before the bill is redeemed. Then, the holder of the bill has the right to take the protested bill to the Hamburg banker and demand payment, since the legal claim of the bill is in force as long as the bill is outstanding. Thus, from the point of view of the Hamburg banker, he is being asked to "pay twice" for the same bill – once to the (now failed) Amsterdam banker, and once to the owner of the bill.[12]

[11]The evolution of Wechselstrenge has been described extensively by Sedatis (1967). See Kahn and Roberds (2002) for further discussion of the holder in due course provision.

[12]Interestingly, this risk does not seem to have been priced by the Hamburg bankers, attesting to the (perceived) impeccable credit of the Amsterdam bankers.

The economic rationale for the stringent implicit commitments embedded in bills of exchange are clear. They allow interested parties to make credible promises, and hence expand the contracting possibilities of diverse parties by stringing together long sequences of commitments. However, when the economic downturn came at the end of the Seven Years' War, the same stringent commitments became a source for contagion that destabilized the entire financial system.[13]

2.4. The Seven Years' War and the Rise of Gebroeders de Neufville

The Seven Years' War brought an economic boom not only to the neutral states, such as Holland and Hamburg, but also to antagonist states such as Prussia. This boom was accompanied by a strong expansion of credit through bills of exchange. At the same time inflation became a widespread phenomenon in northern Europe, as many German states and other countries like Sweden financed the war by debasing their currencies. Rapid price changes and price uncertainty formed the backdrop to speculative activities which were very often carried out on the basis of bills of exchange by people with little capital of their own. Not everybody profited from the war boom to the same extent: huge gains could be made in the money trade, which became more and more popular among merchant bankers, or in the trade of war goods and exotic goods from the West Indies. However, these profitable activities also were the most risky ones, as the price volatility of exotic and war goods was particularly high. In addition, trade in exotic goods necessitated expensive investment in shipping (much like the capital intensive high tech industries today), so that traders in these goods were particularly vulnerable to a fall in prices.

The key advantage enjoyed by de Neufville and other Amsterdam banks was their base in a mature financial market with a legal infrastructure which provided the commitment power to borrow. This was a feature that entrepreneurs operating in Berlin and other less well developed financial centres, or even the Hamburg merchant bankers did not have. Although the Hamburg bankers may have been wealthy enough to lend directly to the borrowers in Berlin and elsewhere, the range of services that de Neufville was able to offer–such as access to the Amsterdam bills market–was certainly very valuable to the Hamburg bankers. Indeed, market commentators observing the modern

[13]Deeper issues are raised by the relationship between contractual discipline that makes financial contracts possible, and the systemic risk that is engendered by that discipline. The current debate on credit risk transfer and the emergence of credit derivatives (see BIS (2003)) go to the heart of the issue of the limits to how much contingent liabilities can be insured away, and when the monitoring incentives of the lenders begin to be impaired. Contractual discipline and systemic risk are two sides of the same coin. We are grateful to a referee for pointing this out to us.

market in credit default swaps and other instruments observe how the larger international banks that can offer credit as well as investment banking services have a competitive advantage over the specialized investment banks (Rule, 2001). This explains why most financial transactions at some stage involved a banking house in Amsterdam and underlines the importance of the Amsterdam financial market for the neighbouring countries.

Jong-Keesing (1939) distinguishes three types of banking houses in Amsterdam at the time: the *traders*, the *bankers*, and the *speculators*. 'Traders' specialized in the trade of certain traditional goods that did not profit as much from the war conjuncture. For them, banking transactions were always closely related to their trading business and never became an independent branch of business. The 'bankers' consisted of the well-established old banking houses of Amsterdam who strongly extended their banking activities during the war. In contrast, 'speculators' were newcomers in the market who employed aggressive, highly leveraged transactions designed to capitalize on opportunities for making fast profits, whether it be in the trade of exotic goods or in the money market.

The most celebrated of this latter group was the banking house of de Neufville Brothers, whose name is inextricably linked with the crisis of 1763. This banking house was founded in 1751 by Leendert Pieter de Neufville, who was 21 years old at the time. It was no more than a medium-sized firm at the beginning the war. However, during the war they were catapulted into being one of the richest and most prestigious banking houses of Amsterdam by taking full advantage of the opportunities that the buoyant war economy provided. De Neufville's balance sheet reveals an extensive range of projects–in manufacturing, goods trading, shipping, in insurance and other financial activities. Thus, as well as being a banker who acts as the guarantor of a loan (i.e., being the drawee of bills), de Neufville was a debt-financed entrepreneur in its own right.

De Neufville's business practices were initially viewed with suspicion, but their apparent triumphs ensured their growing prominence in banking circles and gave rise to many imitators. Skalweit (1937, p. 41) notes how

> "They succeeded in outdoing their competitors by extending loans in a particularly broad-minded way ... Whoever wanted to keep up with them had to adjust to their terms, and so they became the engine of the increasing expansion of Amsterdam bill credit. Again and again ... [they] succeeded in maintaining their predominance by inventing methods that were at first considered revolutionary, but soon imitated by other merchants In the end, they even sold bills on credit for a time span of eight days or more, which

was unheard of in a time when discounting just started to be established and when prompt payment in bank money was common practice."

The glamour and fascination associated with such success would be familiar to contemporary observers of the excesses of the late 1990s bull market. Leendert Pieter's opulent lifestyle was the subject of much comment and gossip. The furnishings of his house were said to be of the finest quality, including chests of drawers made from walnut wood, a drawing room from yellow silk, and a fine collection of paintings. He owned several coaches, horses, a yacht, a manor, but (reputedly) not a single book.

De Neufville's commercial interests were wide, both in the range of goods he traded in, but also in the wide geographical spread of his business activities. One project in particular deserves special mention, both as an illustration of the geographical spread of de Neufville's interests, but also as a contributory factor in his downfall. After the conclusion of peace in February 1763 (the Peace of Hubertusburg), de Neufville was party to a major speculative deal with the Berlin merchant banker Gotzkowsky, who was the pivotal financier and entrepreneur in Berlin of the day.[14] The deal (which involved two other Berlin merchants Leveaux and Stein, both of whom went bust in the crisis) involved buying up a large quantity of grain from the granaries of the departing Russian army in Poland. The purchase price was one million Dutch guilders. To gain an idea of the sums involved, it should be borne in mind that any bank with capital of one million guilders was considered to be a large bank in Amsterdam at the time. The largest Amsterdam bank, Hope & Co. (which survived the crisis largely unscathed) had a total capital of 4.3 million guilders in 1762.[15] As we will see in more detail later in our paper, grain prices collapsed in Berlin, falling more than 75 percent between May and August. Of course, the merchants had known that the end of war would bring about a decrease in grain prices, but a drop of such magnitude could hardly have been expected (Skalweit, 1937, p. 95). Although de Neufville's equity stake in the project was small (only 6 percent), the fallout from the crash in grain prices may have been much larger. The details of the financing of the deal is not well documented, but if, as is likely, de Neufville had financed a substantial part of the deal for his partners by extending acceptance loans himself or by drawing bills on other Amsterdam bankers, the losses resulting from the Berlin grain price collapse would have been substantial.

[14]Skalweit (1937, pp. 94), Rachel, Papritz, and Wallich (1934, pp. 447).

[15]Buist (1974, p. 520).

2.5. Chronology of the Crisis

Speculative trading activities associated with the war boom began to come under strain after the conclusion of peace in February 1763. Jong-Keesing (1939, pp. 88) reports that

> "In March [1763] the merchant letters [in Amsterdam] were full of expectations that trade would thanks to the peace become more favourable. ... In May, people discovered that they depended on the economic recovery in Germany and that this took longer than one had thought in the beginning. In June, merchant letters are full of reports of falling prices, unmarketable goods, the generally weak situtation and the scarcity of money. ... In July it is realized that the peace has not brought what one had hoped."

These events affected market participants in two ways: First, falling prices depressed the values of their asset portfolios, and second, it became harder and harder to obtain new loans needed to roll over existing debt. The common practice of repaying obligations from bills of exchange by drawing another bill was no longer viable. The tightening of the credit market shows up clearly in the levels of discount rates. In past decades, discount rates in Amsterdam had been in the range of 2 to 3 percent in normal times.[16] Now they had risen to more than 4 percent, which was highly unusual for the Dutch market, and fluctuated wildly (see table 2.1). The strain on liquidity was most keenly felt by speculators like de Neufville and Aron Joseph, the two firms to fail first in 1763. Already at the beginning of the year, both firms had been forced to borrow at spreads as high as 1.5 to 3 percent.[17] These spreads were surely related to their difficult economic situations, but also to the huge size of these loans.

1763	March	May 31	June 7	July 8	July 16	July 29/30	August 9
Discount rate	4%	5%	4.25%	4%	3.5-4%	no trade	6%, little trade

Table 2.1: Evolution of interest rates in Amsterdam. Source: Jong-Keesing (1939, pp. 93, 166).

The Hamburg credit market showed similar signs of distress. Büsch (1797, p. 122) tells us that the liquidity situation tightened dramatically in the run-up to the crisis, raising discount rates to 12 percent at a place where normal rates were around 4 percent.

[16] Homer and Sylla (1991, pp. 175).

[17] Jong-Keesing (1939, pp. 93).

The tight credit markets forced merchants and merchant bankers to sell their assets such as grain and sugar, to obtain the liquidity needed for the repayment of maturing bills. Jong-Keesing (1939, p. 90) tells us that the merchants "were forced to sell their trading goods in public auctions, thus strongly depressing prices ... Since May complaints are heard concerning these auctions and hurried sales that damaged the market." The reinforcement of price decreases through fire sales will be one of the main ingredients in our stylized model of the crisis.

The crisis finally came to a head in Amsterdam on July 29th. The first to fail were the Amsterdam houses of Aron Joseph & Co. and, most spectacularly, de Neufville. Some bankers attempted to organize support for de Neufville, but this attempt met with strong opposition from some of the traditional banking houses. The two failures were immediately followed by other failures in Amsterdam, not only by other speculators, but also by some of the old-established banking houses who had been creditors of de Neufville. Two weeks later, on August 11, there was a first wave of bank failures in Hamburg. This was in spite of the frenetic activity on the part of Hamburg merchant bankers to organize an officially sanctioned bail-out of the failed bankers in Amsterdam. These failures in Hamburg were in turn followed by a second wave of failures in Amsterdam, which were attributable to the Hamburg failures (see Figure 2.2).[18]

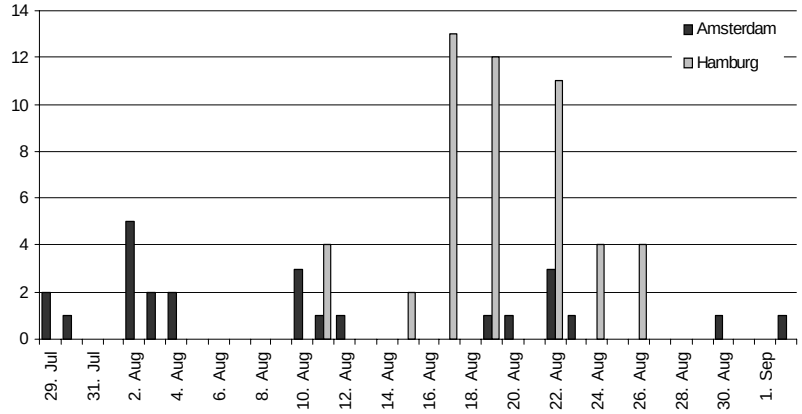

Figure 2.2: The number of failures in Amsterdam and Hamburg in July and August 1763. Source: Jong-Keesing (1939).

[18] Jong-Keesing (1939, p. 95).

The propagation of the crisis followed the links established by the tight web of bills of exchange. When de Neufville and other Amsterdam houses declared themselves bankrupt, the bills drawn on them were protested immediately and presented to the endorsers or drawers of the bills. Due to Wechselstrenge, the Hamburg bankers could not refuse payment even if they had sent remittances to the Amsterdam house to settle the obligations from an acceptance loan, with the implication that they had to pay their obligation "twice".[19] In this manner, Hamburg bankers received protested bills from Amsterdam, forcing many of them to close down. In turn, Berlin bankers received protested bills from Hamburg, and by this means, the wave of bankruptcies spread contagiously from Amsterdam to Hamburg and Berlin. In the end, more than one hundred banks succumbed to the crisis, most of which were located in Hamburg.

In Berlin, the number of initial failures was relatively low. This was due to the fact that Friedrich II–in violation of Wechselstrenge–imposed a payments standstill on outstanding bills and even organized outright bail-outs. However, many of the Berlin bankers who had just averted bankruptcy in 1763 collapsed in the following depression.[20] In Amsterdam and Hamburg, there was no direct public intervention, but the respective giro banks tried to fight the liquidity crisis through the extension of additional secured loans. However, the banks' hands were tied by the provision that the ratio of bank money to gold and silver holdings should be kept close to one, and their support was insufficient to stem the crisis. Nevertheless, it may have helped to interrupt the vicious circle of pending illiquidity and fire sales of goods.[21]

A natural place to search for the culprit for the 1763 crisis according to the current literature on financial crises would be the agency problems generated in the credit relationship, and the moral hazard on the part of the ultimate borrowers. However, a striking feature of the crisis of 1763 was the sequence in which the main protagonists encountered difficulties. The first to fail were the Amsterdam houses, followed by the Hamburg bankers some two weeks later, while the ultimate borrowers in Berlin were initially spared from widespread failures. This sequence of events suggests a more complex diagnosis of the crisis than the simple "emerging market debtor moral hazard" scenario.

[19] Skalweit (1937, p. 50), Rachel, Papritz, and Wallich (1938, p. 513).
[20] Skalweit (1937, pp. 109), Rachel, Papritz, and Wallich (1938, pp. 463).
[21] Soetbeer (1855, p. 54).

2.6. Aftermath of the crisis

The crisis was followed by a period of falling industrial production and a stagnation of credit in northern Europe (Skalweit, 1937, p. 104). The Amsterdam financial market was the first to recover from the crisis, such that confidence in existing credit practices was soon restored (Riley 1980, p. 30, Baasch, 1927, p. 239). Many banking houses that had been declared bankrupt were able to settle their outstanding liabilities in full once markets regained their composure and re-opened shortly after the crisis. Those houses that proved to be insolvent, such as de Neufville, were allowed to fail. In the end, a large part of the debts outstanding could be repaid notwithstanding the high number of initial failures. In spite of the abuse of the system by de Neufville and others, there do not appear to have been any modifications to the laws governing bills of exchange. Hence, it may not be surprising that already in 1772, Amsterdam experienced the next financial crisis, which this time was mainly related to the speculation in stocks.

In Hamburg, too, many banks that had closed during the crisis reopened for business later on. Büsch (1797, p. 125) reports that "the first shock was much larger than the evil itself" and that a large part of the debt could be paid in the end. Nevertheless, the period after the crisis [1763-1788] was "one of the most unfavourable periods ever experienced" (Wirth, 1890, p. 95). However, bankers and merchants had become much more cautious in their financial affairs, such that there were no serious financial disturbances until 1799.[22]

The biggest impact of the crisis was felt in Berlin. The bank failures in Amsterdam and Hamburg, and probably also the Prussian departure from Wechselstrenge, precipitated a severe credit crunch, provoking numerous bankruptcies in the corporate sector. The situation was exacerbated by the currency reform enacted at the end of the war, which produced a drastic tightening of the monetary base. Prussia plunged into a deep and long-lasting recession and deflation, which culminated in a second wave of bankruptcies in 1766. Many of the bankers who had just averted bankruptcy in 1763 finally collapsed.[23] It is easy to understand why Prussia was hit particularly hard. In the other countries, the crisis led to the temporary closure of many banks and to the disappearance of unviable financial institutions. In contrast, the breakdown of credit networks entailed severe effects for the real economy of Prussia because many projects could no longer be financed and had to be interrupted or even abandoned. In addition, the willingness to extend international loans receded after the crisis, such that the total impact on Prussia was much more severe than the immediate effect.

[22] Wirth (1890, p. 95).

[23] Skalweit (1937, pp. 104), Rachel, Papritz, and Wallich (1938, pp. 463).

The observation that many banks in Amsterdam and Hamburg re-opened after the crisis indicates that the underlying problem of the crisis of the banks was one of *illiquidity* and not of fundamental insolvency. This will be another important ingredient in our stylized model of the crisis. The model will illustrate how the decline of goods prices at the end of war and the overextended balance sheets of merchant bankers who engaged in acceptance loans but also held speculative positions in commodities, rendered the financial system very fragile. The institution of acceptance credit, and the chain of obligations induced are the decisive elements of the model.

3. A Stylized Model of the Crisis

3.1. Model Setup

Our stylized model emphasizes *asset side* externalities and the balance-sheet interlinkages of the interested parties as the sources of contagion. We should emphasize the word "stylized" in the section title. The intention is not to build a fully rigorous theoretical model, but rather to provide a thumbnail sketch of the possible ingredients of such a fully developed theory. The model rests on two features–the contingent obligations embedded in bills, and the externalities generated by liquidity risk in which sales by distressed parties lowers prices for others.

Keeping to the description of the institution of bills of exchange in section 2, there are three active players in our account–the Amsterdam merchant banker (AMB), the Hamburg merchant banker (HMB), and the Berlin merchant (BM). There are two commodities–*sugar* and *grain*. These goods form the main part of the asset side of the traders' balance sheets. Let us suppose that the only player trading in both commodities is the Amsterdam merchant banker who could be thought of as one of the 'speculators', such as de Neufville. *Sugar* represents the type of good which necessitates large capital outlays and hence is traded by only a small number of traders, while *grain* typifies those traditional goods that were traded more widely, and hence which appears on the balance sheets of many traders.

To emphasize the endogenous nature of contagion and systemic collapse, we will suppose that the fundamentals governing the returns of the two assets are independent. We denote by θ the revenue received by the Amsterdam merchant banker from the sale of sugar at the redemption date of the bill. We denote by x the "fundamental" value of grain and contrast it with the price at which grain can be disposed immediately to raise revenue. The interpretation is that potential purchasers of grain can be found, but only at the cost of lowering the price below the fundamental, long-term value. Potential

purchasers are willing to absorb the net supply, but only at an advantageous price. If L is the aggregate distress sale of grain, we assume that the price is driven down to

$$p = xe^{-\lambda L},$$

where $\lambda > 0$ is a constant.

In our discussion here, we will take the parameter λ as being exogenous. One way of rationalizing the residual demand curve above would be to postulate that some traders have short decision horizons induced by bankruptcy constraints, but that traders with somewhat longer horizons–those who absorb the increased supply–are risk averse. Then, the willingness on the part of long-horizon traders to absorb the increased supply would be limited by their risk-aversion. Alternatively, limits to arbitrage could arise from storage costs or borrowing constraints.

The idea that the residual demand curve facing active traders is not infinitely elastic also figures in modern securities markets. Grossman and Miller (1988) posit a role for risk-averse market makers who accommodate order flows and are compensated with higher expected return. Campbell, Grossman, and Wang (1993) find evidence consistent with this hypothesis by showing that returns accompanied by high volume tend to be reversed more strongly. Pastor and Stambaugh (2002) provide further evidence for this hypothesis by finding a role for a liquidity factor in an empirical asset pricing model, based on the idea that price reversals often follow liquidity shortages. Bernardo and Welch (2004), Brunnermeier and Pedersen (2002) and Morris and Shin (2004a) have used this device in modelling limited liquidity facing active traders.

More generally, the limited capacity of the market to absorb sales of assets has figured prominently in the literature on banking and financial crises (see Allen and Gale, 2003, and Gorton and Huang, 2002), where the price repercussions of asset sales have important adverse welfare consequences. Similarly, the inefficient liquidation of long assets in Diamond and Rajan (2001) has an analogous effect.

In addition to the externalities that flow from the price-depressing effect of the sale of goods, the interlocking web of obligations entailed by the contractual form of acceptance loans play a key role in our model. The distressed sales by an individual arise from the his need to meet obligations stemming from his part in the acceptance loan. The legal institutions of endorsement and Wechselstrenge that were so effective at allowing individuals to commit ex ante become the major engine for distressed selling in a crisis.

The constant $e^{-\lambda L} \leq 1$ could be called the *liquidity discount factor*. At a fundamental value x, the realized market price is a fraction of x given by this discount factor. The parameter λ represents the degree of illiquidity in the market for grain, reflecting

the degree of reluctance of deep-pocketed individuals to cushion the price fall. The larger is λ, the steeper is the aggregate demand curve, and hence the greater is the price impact of a non-zero net supply. Although the sale pushes down the price, we will suppose that the sellers extract the full surplus, so that total revenue from a sale of L is the area under the demand curve, namely

$$\begin{aligned} x\int_0^L e^{-\lambda z}dz &= x\left(\frac{1-e^{-\lambda L}}{\lambda}\right) \\ &\leq \frac{x}{\lambda}\,. \end{aligned}$$

Thus, total revenue from the sale is bounded by $\frac{x}{\lambda}$. We can interpret this upper bound as the aggregate amount of money that can be raised in the market through sales. In the 18th century, this could be thought of as the circulation of species money in the economy. The implication is that there is a limit to how much revenue can be generated by disposing of grain. The higher is the illiquidity parameter λ, the lower is the sum that can be raised for any given realization of the asset's fundamental value x and for any net supply L. Clearly, this revenue is always smaller than the revenue that could be raised in the absence of liquidity risk, which is xL.

In addition to the holding of commodities, the agents hold cash and debt. The three parties are linked by a chain of obligations arising from an acceptance loan as described before: HMB has drawn a bill of exchange on AMB in favour of BM who has endorsed the bill and sold it in the market. The face value of the bill is F. The interlocking obligations from this transaction can be represented by the following matrix, where the (i,j)-th entry represents the claim of i towards j:

	AMB	HMB	BM	AI	Total claim
Amsterdam merchant banker		F			F
Hamburg merchant banker			F		F
Berlin merchant					0
Amsterdam investor	F				F
Total debt	$-F$	$-F$	$-F$	0	
Net position	0	0	$-F$	F	

As can be seen from the matrix, the net positions of both AMB and HMB are balanced, while the Berlin merchant has incurred a net liability. The proceeds of the

sale of the bill show up as cash on BM's balance sheet. In addition, we assume that AMB has borrowed the sum F to finance his position in the two commodities, and must pay this sum back to some other agent. By assumption, the other agents have not borrowed otherwise. Then the holdings of the three players of the two commodities as well as cash and debt are as follows:

	AMB	HMB	BM
Sugar	1	0	0
Grain	L_A	L_H	L_B
Cash	0	0	F
Debt	$-F$	0	$-F$

In accordance with our discussion in section 2, HMB and BM pay their debts as scheduled shortly before the maturity date of the bill. However, instead of holding back this money in order to repay the acceptance liability, AMB has paid back his other debt. The holdings of the three agents after these payments, but immediately before the maturity of the bill are as follows:

	AMB	HMB	BM
Sugar	1	0	0
Grain	L_A	L_H	L_B
Cash	0	0	0
Debt	$-F$	0	0

The term $-F$ above represents the outstanding bill of exchange. Provided that the Amsterdam merchant banker can pay back the amount F from the proceeds of his holdings of grain and sugar, no further repercussions result. However, if the Amsterdam merchant banker is unable to meet his obligations, the bill will be unpaid, and the players further down the chain will become liable by the rules of Wechselstrenge. As was mentioned before, such instances of bankers "paying twice" for a bill are frequently cited by the commentators on this crisis.

If $\theta < F$, the proceeds from the sale of sugar alone are not sufficient to redeem the bill. Some disposal of grain is necessary. Denote by S the shortfall that must be financed by the sale of grain:

$$S = \max\{0, F - \theta\}$$

Then, the required liquidation L of grain to meet this shortfall is

$$S = x\left(\frac{1-e^{-\lambda L}}{\lambda}\right),$$

which gives

$$L = \frac{1}{\lambda}\log\left(\frac{x}{x-\lambda S}\right).$$

The price impact on grain arising from shortfall S can be obtained by substituting this expression into the demand curve. Thus the price of grain arising from the shortfall S is given by

$$\begin{aligned} p &= x\exp\left\{-\lambda\cdot\frac{1}{\lambda}\log\left(\frac{x}{x-\lambda S}\right)\right\} \\ &= x-\lambda S. \end{aligned}$$

Expressed in terms of θ and F, the price of grain is given by

$$p = \begin{cases} x & \text{if} \quad \theta \geq F \\ x-\lambda\left(F-\theta\right) & \text{if} \quad \theta < F \end{cases}.$$

Figure 3.1 plots p against θ. Even though the fundamentals determining the values of sugar and grain are independent, the liquidity risk injects positive correlation into the prices of the two assets when the outcome θ is bad. This feature is reminiscent of many studies that have documented changes in the correlation of returns across assets, and where the correlation increases when asset prices have fallen, and is a feature that appeared with a vengeance in recent liquidity crises, such as the LTCM crisis of 1998.

Note that the correlation between the prices of grain and sugar is likely to be high when the prices of both are low. The correlation is low (indeed, non-existent) when the prices of the two goods are high. Such asymmetric behaviour of correlations has been noted by many observers of financial markets. The recent literature on *copulas* has been an attempt to find a better statistical summary of such asymmetries of correlations (see, for instance, Embrechts, Höing, and Juri, 2001). We will see later in our paper that increased correlations of prices during the crisis period is a key piece of the evidence from 1763.

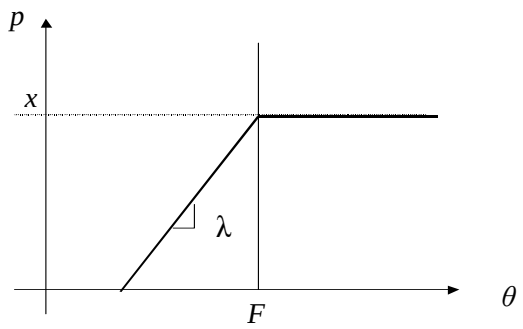

Figure 3.1: Correlation of asset prices induced by liquidity risk.

3.2. Sequence of Failures

The Amsterdam merchant banker is solvent if the shortfall S can be met by the disposal of grain. Since his holding of grain is given by L_A, he is solvent whenever the shortfall is not so large that it exceeds the amount that can be generated by selling grain. Thus, AMB is solvent if and only if

$$F - \theta \leq x \left(\frac{1 - e^{-\lambda L_A}}{\lambda} \right).$$

In (θ, x)-space, which represents the pairs of fundamental asset values, the solvency boundary for the Amsterdam merchant banker can be represented by the highest downward-sloping boundary in figure 3.2. The correlation of asset values generated for low outcomes of θ is reflected in the fact that the solvency boundary is steeper than it would be in the absence of liquidity risk. This means that there are combinations of θ and x where the Amsterdam merchant banker becomes insolvent only because grain is not valued at its fundamental value. One might say that in this case AMB is "intrinsically solvent", but illiquid.

If the Amsterdam merchant banker fails to honour the full amount F promised by the bill, the drawer and the endorser become jointly liable. We will assume that the Amsterdam bill holder will turn to the Hamburg merchant banker first, which is compatible with the observed behaviour in the crisis. This is, in fact, highly plausible because the Hamburg banker would have been closer at hand and because it would have been much more cumbersome and time-consuming to turn to the Berlin merchant.

So the Hamburg merchant banker (as the drawer of the bill) becomes liable to pay

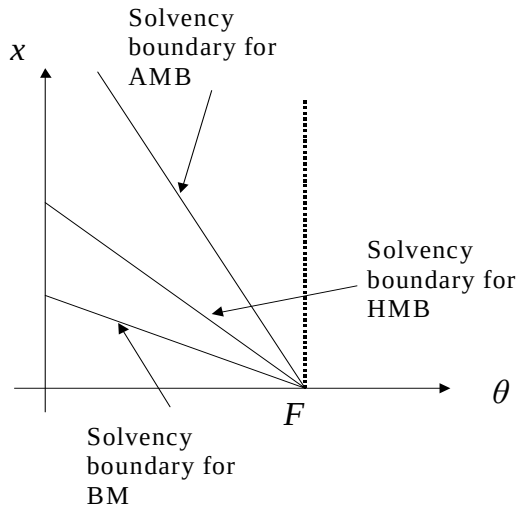

Figure 3.2: Solvency boundaries of the three agents.

the defaulted amount. The defaulted amount is

$$F - \theta - x\left(\frac{1 - e^{-\lambda L_A}}{\lambda}\right).$$

Since the Hamburg banker has no cash on hand, this sum must be met by disposal of grain at the new lower price. The amount of grain that must be sold to meet this obligation is the value of L that solves:

$$x\int_{L_A}^{L_A+L} e^{-\lambda z}dz = F - \theta - x\left(\frac{1 - e^{-\lambda L_A}}{\lambda}\right)$$

or

$$x\left(\frac{1 - e^{-\lambda(L_A+L)}}{\lambda}\right) = F - \theta. \tag{3.1}$$

If this L is larger than the Hamburg merchant banker's holding of grain, then HMB becomes insolvent. Substituting in L_H for L in equation (3.1) then defines the solvency boundary for the Hamburg merchant banker in the (θ, x)-space (see figure 3.2):

$$F - \theta \leq x\left(\frac{1 - e^{-\lambda(L_A+L_H)}}{\lambda}\right)$$

Similarly, the solvency constraint for the Berlin merchant can be derived by calculating the amount of grain that must be disposed to meet the unpaid obligations in the case HMB defaults. The Berlin merchant's solvency condition is given by

$$F - \theta \leq x \left(\frac{1 - e^{-\lambda(L_A + L_H + L_B)}}{\lambda} \right).$$

Note the positioning of the three solvency boundaries. The Berlin merchant fails only if both the Amsterdam and the Hamburg merchant banker fail. Similarly, the Hamburg merchant banker fails only if the Amsterdam merchant banker fails. Hence, our model is able to explain the observed sequence of failures, given that the initial shock hit the Amsterdam banker.[24] The ranking of the solvency conditions of the three players is a consequence of the way that the institution of bills of exchange generates the cascading sequence of obligations. Contagion works through the interaction of contractual arrangements and changes in market prices, which induces correlations of market, credit, and counterparty risks in the chain of claims. Note that there are parameter constellations for which all three agents would be solvent in the absence of liquidity risk, but are insolvent due to the discount in grain prices.[25]

At a more general level, we can identify the three channels of contagion mentioned in the introduction:[26] There is, first, the joint liability nature of the acceptance loan contract in which the Hamburg bankers must pay twice for the same bill. The second channel is the credit chain nature of the lending relationship. The third is the impact of falling prices on the asset values of all market players. Of the three, the first is arguably peculiar to the 1763 crisis. However, whilst the joint liability exacerbated the crisis by accelerating the failures of the Hamburg houses, the crisis could not be attributed exclusively to the contractual details ruling at the time. The second channel played an important role in the spread of failures from Hamburg back to Amsterdam, and it clearly has modern counterparts, such as the complex balance sheet interlinkages

[24] If instead the initial shock had hit the Berlin merchant, the chain might just as well have unraveled from the other side.

[25] Our theoretical thumbnail sketch does not do justice to the potential "rush for the exits" of individual traders in each location who may attempt to unwind their trades before others. Such liquidity runs would cause an additional element of viciousness to the selling. See Morris and Shin (2004b) for a quantification of the inefficiencies in a related context of a creditor run. We are grateful to a referee for pointing out the coordination element in the sales in each region.

[26] Note that the model captures mainly the interaction between the first and the third channel of contagion, while the second channel is not modelled explicitly. Also, the model could easily be extended to capture the spread of bankruptcies in the absence of the joint liability clause by adding other agents who are driven into insolvency by the drop in grain prices.

among modern financial institutions through over the counter derivative contracts. The third channel of contagion is also a very familiar theme in recent debates on financial stability. As the empirical analysis in the next section will show, this channel is crucial for the explanation of the 1763 crisis.

The main insight from our model can be summarized as follows: In a liquidity crisis, goods whose prices are uncorrelated in normal times become highly correlated due to forced distress sales of market participants. Contagion works through the combination of direct interlinkages between agents and generalized price declines induced by fire sales, which can cause the failure of agents that would be solvent in the absence of liquidity risk. In the following section, we will confront this "distressed sales hypothesis" with the empirical evidence.

4. Examining the Evidence

4.1. A Note on Sources

In piecing together the events of 1763, we have drawn on a number of commentaries of the events in Amsterdam, Hamburg and Berlin, and on commodity price and exchange rate data series for the period compiled by various authors. For Amsterdam, where the crisis originated, a detailed picture of the institutions and chronology is contained in Kluit (1865) and especially Jong-Keesing (1939), which also presents balance-sheet information on the major market participants. Early attempts of an interpretation of events can be found in van Dillen (1922) and Mansvelt (1922), and the broader perspective is set out by Baasch (1927). Büsch (1797) is an account by a contemporary observer who paints a vivid picture of events, especially in Hamburg, which has been summarized and supplemented by Wirth (1890). Further accounts on the Hamburg crisis include Soetbeer (1855). Skalweit (1937) presents an illuminating account of the events surrounding the crisis in Berlin, while Rachel, Papritz, and Wallich (1938) provide a broader picture of the emergence of Berlin as a major economic centre. There also exist a number of individual accounts of certain banking houses, such as Buist (1974) on Hope & Co. in Amsterdam, Schramm (1949) on Berenberg in Hamburg, and Lenz and Unholtz (1912) on Schickler in Berlin. These accounts proved to be very helpful in that they contain some interesting archival information on the scale and scope of the banks' businesses.

The quality of quantitative information varies widely between Amsterdam, Hamburg and Berlin. The most detailed information can be found on Amsterdam, which boasted a sophisticated financial system including organized exchanges for bills and

major commodities. Jong-Keesing's study contains an extensive collection of data on individual banks, drawn from the archives of the court of bankruptcy as well as other private archives. The picture in Hamburg is less clear, although Jong-Keesing also provides balance-sheet information on some of the Hamburg bankers who were counterparties to Amsterdam bankers. The financial system in Berlin was underdeveloped–it had no established public payment banks as in Amsterdam and Hamburg, nor major organized exchanges. Nevertheless, salient features of the crisis can be pieced together from the qualitative information contained in the above sources, especially for those players who were major counterparties to Amsterdam bankers such as de Neufville.

For commodity prices in Amsterdam, Posthumus (1946) is an excellent source. We collected the price series for Hamburg directly from the records of the Hamburg exchange. The data on Berlin is much less plentiful, but Skalweit (1931) has monthly price series for types of grain in Berlin that cover several years, including the crisis period. Exchange rates and the *agio* on Amsterdam and Hamburg bank money were obtained from von Schrötter (1910) and Schneider, Schwarzer, and Schnelzer (1993).

4.2. Evidence from Prices

In this section, we will confront the "distressed sales hypothesis" with the evidence from price data. First, we will show that there was a generalized price decline of goods widely traded by merchant bankers, and second, we will present some evidence on increasing correlations of goods prices in the crisis period.

As the buoyant war economy gave way to more subdued conditions, commodity prices came under downward pressure. Of particular interest are the prices in exotic goods, such as cocoa, tea, and sugar, which appear to have started falling well before the end of the war. Figure 4.1 plots monthly price indices for sugar in Amsterdam and Hamburg.[27]

Figure 4.1 reveals close co-movement of sugar prices in the two locations, suggesting a high degree of integration of the two sugar markets. The fall in sugar prices started well before the end of the war. From its peak in early 1762, the price of sugar declined by over 25 percent. Due to the capital intensive nature of trade in sugar (with heavy investment in shipping), we may conjecture that a price decline of this magnitude posed problems for speculators in sugar. It seems that the initial decrease in sugar prices was largely exogenous to the crisis and might actually have been its trigger. Yet, the end of war, the re-opening of transport routes, and the crisis itself probably exacerbated and prolonged the downward movement.

[27]Unfortunately, we have not been able to obtain sugar prices for Berlin.

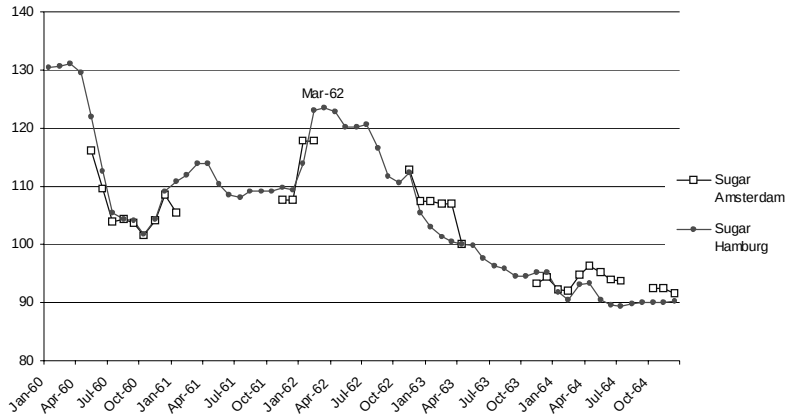

Figure 4.1: Sugar prices in Amsterdam and Hamburg, April 1763 = 100.

Grain prices showed a similar pattern to sugar prices, but the decrease started only towards the end of war.[28] Figure 4.2 shows how grain prices in Amsterdam and Hamburg seemed to stabilize around April, but then continued to decrease sharply at the onset of the crisis. In October, there was a pronounced rebound of prices.[29]

Most dramatic, however, is the rise and the subsequent collapse of the price of grain in Berlin after the conclusion of peace in February 1763. Figure 4.3 plots the monthly series of grain prices in Berlin, taken from Skalweit (1931).

The price series maps out a bubble-like path, with the price of grain rising rapidly starting in August 1761, and then falling by more than 75 percent between May and August 1763 (we will comment below on the price adjustment for the "cleaned" series). Such a dramatic fall in price would have caused acute distress for heavily leveraged speculators (such as de Neufville's partners in Berlin) who had stockpiles of grain. It should be stressed again that some price decrease was, of course, to be expected at the end of war. However, a price drop of this magnitude was unheard of, and is indeed far beyond the price movements of grain that have been observed in other times and places.[30] The reasons for the initial rise in the price of grain in 1761 are not well documented in the sources that we have managed to assemble, but the ebb and flow of the fortunes of the war for Prussia would have played its part. 1761 was the

[28]Note that the peace between England and France was concluded already in November 1762.

[29]In the graphs we used the prices of rye. Other types of grain show similar patterns.

[30]We thank Cormac Ó Gráda for bringing this point to our attention.

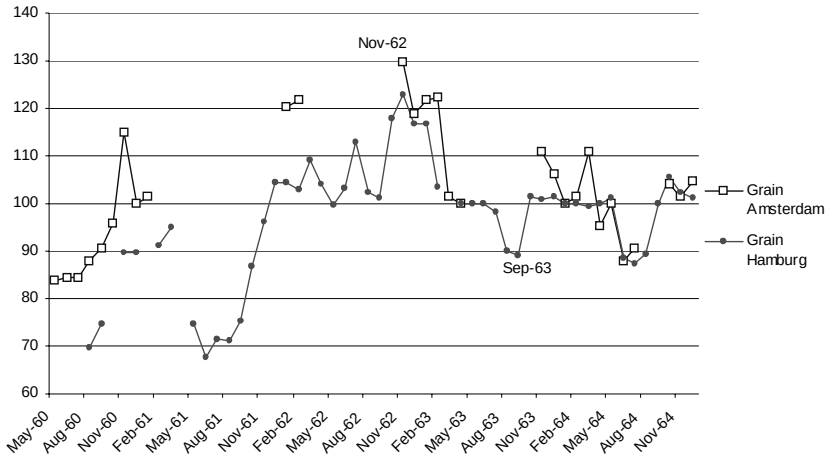

Figure 4.2: Grain prices in Amsterdam and Hamburg, April 1763 = 100.

bleakest time for Prussia in the war, battling its much larger neighbours Austria and Russia. It was only with the death of the Russian empress (the 'miracle of the House of Brandenburg'), and the making of peace by her successor Peter III (who happened to be an admirer of Friedrich) in May 1762 that Prussia's fortunes changed. The rise in the Berlin grain price coincides with the onset of the grimmest period for Prussia in the war.

Also, we should recognize the potential for arbitrage trading in grain, mostly likely using leveraged transactions. It would be reasonable to suppose that in a context of war, traders would be buying grain where it was cheap and selling it where it was expensive, financing this where credit was most available. Although Berlin grain prices had been historically low in absolute terms compared to Amsterdam and Hamburg, the rapid run-up in grain price toward the latter part of the war may have received some impetus from such trading activities. A more detailed archival investigation would be worthwhile.

As balance-sheet positions weakened and bank money holdings fell, it was necessary for the speculators to liquidate their holdings of grain and other trading goods, thereby flooding the already depressed market with additional supply. We have mentioned in the description of the crisis that these kinds of distress sales did, in fact, take place. As speculators were unwinding their grain positions, this also caused repercussions for other market participants dealing in grain. Even if market integration was

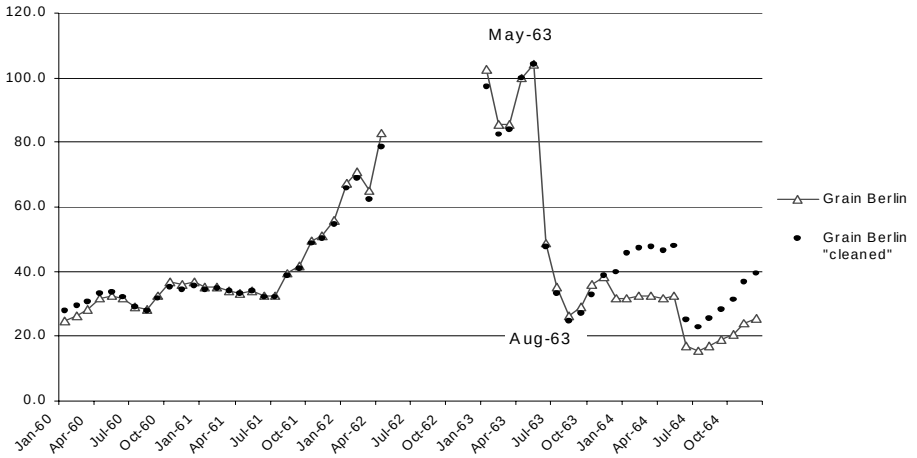

Figure 4.3: Berlin grain prices, April 1763 = 100. "Cleaned" prices are adjusted for exchange rate.

far from being perfect[31], there certainly also existed spill-overs into neighboring countries. Thus, the distressed sales by large players in Berlin inflicted unwelcome price shocks for players in Hamburg and Amsterdam. The more highly leveraged players had to liquidate their positions too, thereby exacerbating the price declines. The parallels with the LTCM crisis in 1998 are very clear. In the summer of 1998, the forced unwinding of large leveraged portfolios by LTCM and other copycat funds caused adverse price moves, which in turn forced further unwinding that amplified these adverse price moves. When traders have short horizons due to bankruptcy constraints, liquidity problems quickly translate into solvency problems. This is one of the major insights from our stylized model presented above.

We must exercise some caution in interpreting the price data from Berlin due to the fluctuations in the value of the currency that arose from debasement and major currency reforms that were introduced as a consequence. Figure 4.4 plots the Berlin exchange rate in terms of the number of "Reichsthaler preussisch Kurant" (i.e., the circulating Prussian Reichsthaler) per unit of circulating currency in Amsterdam and Hamburg– that is, Amsterdam and Hamburg "Kurant". Thus, higher numbers in figure 4.4 denote

[31] In absolute terms, the price of Berlin grain briefly exceeded the Amsterdam price at the peak of bubble in the spring of 1763, but in the pre-crisis period (1761-1762) it was much lower than in Amsterdam. Hamburg prices were generally closer to Berlin prices than to Amsterdam prices.

a weak Prussian currency, while low numbers denote a strong Prussian currency.

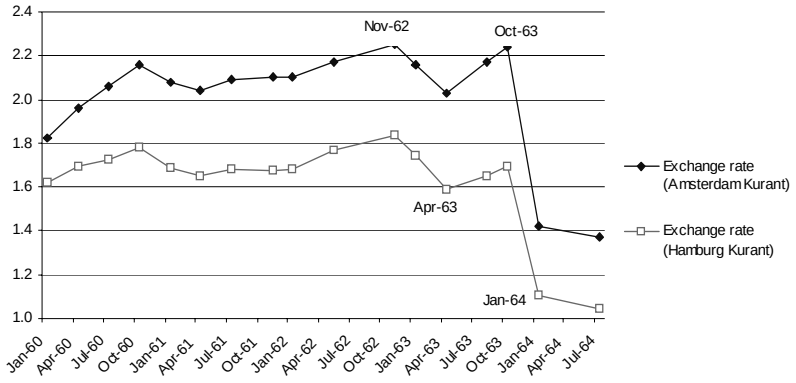

Figure 4.4: Berlin exchange rate (Prussian units per Amsterdam and Hamburg Kurant)

The Prussian currency depreciates until the end of 1762, but appreciates temporarily up to April 1763, reflecting the termination of war finance through the debasement of coins following the end of the war.[32] During the crisis period (summer of 1763), however, the Prussian currency depreciates once more. The fact that bills were required to be settled in Amsterdam bank money would have translated into higher flows into Amsterdam, putting renewed downward pressure on the Prussian currency. The subsequent dramatic appreciation in the Prussian currency (starting from October) must in large part be attributed to severe monetary contraction associated with the second currency reform when Prussia returned to the old silver standard of 1750 ("Graumannscher Münzfuß ") and when the official silver content of coins was increased by 41 percent.

On the basis of this evidence, it is clear that the collapse in Berlin grain prices observed in 1763 cannot be attributed to the Prussian coin reforms as the currency was actually depreciating in the critical period. Besides the nominal Berlin grain prices, figure 4.3 also depicts the respective "cleaned" price series for comparison. If anything, the adjustment of grain prices for the exchange rate accentuates the sharp fall and the subsequent "rebound" in prices that are characteristic of short-term speculative attacks.

The main conclusion thus stands. There was a dramatic collapse in the prices of commodities that were prime speculative instruments for the largest players in the

[32]The decision to return to the coin standard of 1758 was taken in December 1762, but the official decree was released no earlier than May 1763 (von Schrötter, 1910, pp. 155).

market at the time. Such dramatic declines are hard to attribute simply to the underlying macroeconomic fundamentals of the economy, albeit one that was entering a period of peace. It seems reasonable to attribute part of this price collapse to the unwinding of speculative positions, much of it under distressed circumstances.

In order to cast additional light on the "distressed sales hypothesis", it is instructive to examine the changes in correlations of prices across different goods during the crisis episodes (see tables 4.1–4.3). Unfortunately, we were unable to obtain data on prices in Amsterdam between May and October 1763, so that the calculated correlations understate actual correlations if Amsterdam experienced similar price declines as the other places during this period. Neverthless, the evidence is striking. Correlations of (monthly) prices generally increased across goods at all three places.[33] The increases in correlations are even more remarkable for Hamburg and Berlin for which the price data are more complete. One striking example is the correlation of wheat and sugar prices in Hamburg, which is negative during normal times (given by –0.44), but turns positive and rises to 0.83 during the crisis period. This is consistent with the hypothesis that the general scramble for liquidity led to distressed selling of merchandise.

	Barley	Oats	Rye	Wheat	Sugar
Barley	1.00				
Oats	*0.46* 0.82	1.00			
Rye	*0.50* 0.86	*0.94* 0.84	1.00		
Wheat	*0.77* 0.22	*0.47* 0.04	*0.70* 0.64	1.00	
Sugar	*0.81* 0.26	*0.78* 0.50	*0.79* 0.07	*0.75* –0.75	1.00

Table 4.1: Correlations of commodity prices in Amsterdam during the crisis (Nov 62–Sep 63, in italics) and at other times (1760–1764 excluding crisis period).

	Barley	Oats	Rye	Wheat	Sugar
Barley	1.00				
Oats	*0.85* 0.80	1.00			
Rye	*0.96* 0.59	*0.51* 0.21	1.00		
Wheat	*0.97* –0.23	*0.32* –0.31	*0.93* 0.43	1.00	
Sugar	*0.90* 0.79	*0.60* 0.39	*0.93* 0.05	*0.83* –0.44	1.00

Table 4.2: Correlations of commodity prices in Hamburg during the crisis (Nov 62–Sep 63, in italics) and at other times (1760–1764 excluding crisis period).

[33]There are two correlations in Amsterdam that actually decreased.

	Barley	Oats	Rye	Wheat
Barley	1.00			
Oats	*0.96* 0.90	1.00		
Rye	*0.97* 0.93	*0.99* 0.91	1.00	
Wheat	*0.95* 0.86	*0.97* 0.74	*0.96* 0.81	1.00

Table 4.3: Correlations of "cleaned" commodity prices in Berlin during the crisis (Nov 62–Sep 63, in italics) and at other times (1760–1764 excluding crisis period).

The differences in the correlation of commodity prices between the crisis period and the non-crisis period can be illustrated for a particular pair of commodities. In figure 4.5, we plot the co-movement of sugar and wheat prices in Hamburg from July 1762 to December 1964. The prices in the crisis period are indicated by the squares, and the prices in the non-crisis periods are indicated by the diamonds. With the onset of the crisis, both commodities fall in price, and they continue their falls in step as the crisis unfolds. Such a pattern of prices is quite different from the pattern shown during the non-crisis periods.

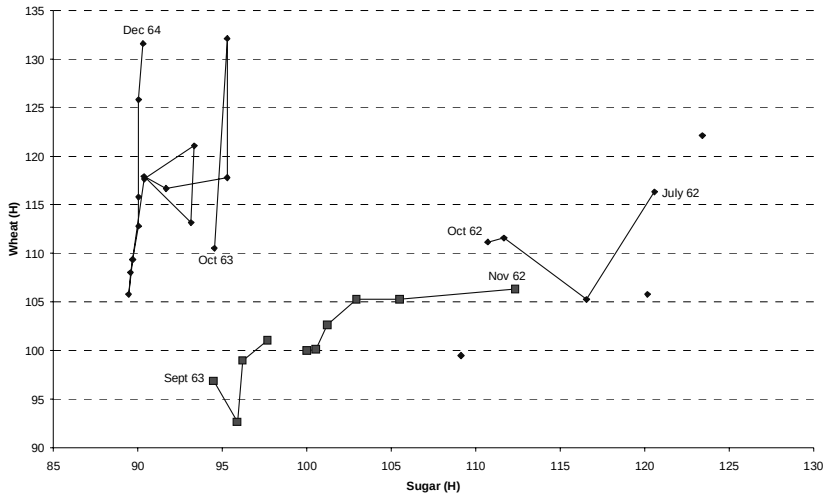

Figure 4.5: Co-movement of sugar and wheat prices in Hamburg: crisis period (squares), non-crisis period (diamonds).

The evidence presented above refers to the prices of a very limited number of goods, which are all foodstuffs and may hence have been particularly sensitive to the end of

war. We chose these goods because they were widely held and traded by merchant bankers. In addition, the availability of prices for other goods is even more restricted. However, there exists some data on other goods, albeit not for Berlin. A excerpt of this data can be found in table 4.4.

	Amsterdam			Hamburg		
Commodity	**Nov 62**	**Apr 63**	**Nov 63**	**Nov 62**	**Apr 63**	**Nov 63**
Cotton (Smirna)	100	95.9	87.8	100	91.7	85.4
Mocca	100	100	93.0	100	100	91.8
Cocoa (Caracas/Martinique)	100	74.7	67.4	100	88.9	66.7
Genoese oil	100	100	96.2	100	98.0	90.5
Gunpowder	100	92.6	85.2	100	n.a.	n.a.
Fine silver	100	100	99.4	100	99.6	98.2
Iron (Sweden)	100	100	102.0	100	100	100
Steel (Sweden)	100	93.2	93.2	100	102.0	110.2
Lead (England)	100	n.a.	102.6	100	99.3	100.7
Copper (Sweden)	100	102.0	102.0	n.a.	100	100.9
Wood (Pernambuco)	100	93.3	93.3	100	100	100

Table 4.4: Price indices for diverse goods in Amsterdam and Hamburg. Sources: Posthumus (1946), Hamburger Preiscourant.

The table contains two types of goods: those traded by merchant bankers and those not traded by merchant bankers. The first group includes mostly overseas goods, war goods, and silver, while the second group contains metals and wood.[34] The evidence is again striking: While all goods in the first group show a marked decline in prices, particularly after April 1763, the same is not true for the goods in the second group. In fact, in many cases the goods prices remain constant or even increase in the crisis period. This is consistent with the "distressed sales hypothesis", which predicts that the price decrease should be particularly strong for those goods that were heavily traded by merchant bankers.

We may conclude that the evidence from prices is consistent with the "distressed sales hypothesis" developed in our stylized model. It remains to show the impact of the evolution of prices on individual balance sheets.

[34]We have found no evidence that merchant bankers traded in these latter goods.

4.3. Balance-Sheet Information

We are fortunate in that Jong-Keesing provides a snapshot of de Neufville's balance sheet at the time of bankruptcy. We also have bank money holdings figures for June 30, 1763. This was a full month before the failure of de Neufville, but by this time, the full force of the price collapse in Berlin grain prices will have taken its toll. Table 4.5 gives some summary statistics for three banks in Amsterdam. We can compare de Neufville's balance sheet with two other banks–*Grill & Zonen* and *Hope & Co.* These two banks are representative of two classes–those that failed but re-opened their doors some months later, and those that did not fail. Additionally, we report the averages for the failed banks in Jong-Keesing's sample, distinguishing between those that re-opened and those that did not. In reading the following table, the reader should bear in mind that the denomination for a bill was typically around 2,000 guilders, and maturity was no more than 3 months.

The most striking feature of de Neufville's balance sheet was the low level of liquidity as measured by the ratio of bank money at the Bank of Amsterdam to the total liabilities. As compared to Grill & Zonen, de Neufville's liquidity was only 1/40 as large. As compared to the overall average of failing banks in Amsterdam, de Neufville's liquidity was 1/18. As another measure of liquidity we can examine the size of bank money holding as a proportion of the number of bill transactions. De Neufville's holding of bank money at the Bank of Amsterdam at the end of June 1763 had dwindled to about the same amount as it had in 1751. Meanwhile, the number of bill transactions had increased by a factor of 14. Hence, the ratio of bank money holdings to the number of bill transactions was below 6 at de Neufville, while at Hope & Co., this ratio was well above 300.[35] Note that bank money holdings at Hope & Co. were, in fact, higher than the total of all failing banks. It is clear that such a level of liquidity reserves could serve as a safe cushion in a liquidity crisis and reduced the need for fire sales. In fact, they may have been able to absorb some of the supply of trading goods that flooded the market. This may explain why Hope & Co. managed to increase their profits in the year 1763 in spite of the crisis. It is also interesting to compare the scales of the bankers' liabilities. De Neufville's liabilities were more than three times as large as those of Grill & Zonen who was one of the biggest Amsterdam banking houses, and more than ten times as large as those of the average failing bank. This gives an impression of the enormous expansion of de Neufville's balance sheet, and of the effects that the failure of this bank must have had. There is little information on banks' leverage, and the existing estimates differ widely according to the source. For de Neufville, estimates of

[35] Jong-Keesing (1939, pp. 70, 98).

the ratio of total liabilities to capital range from 8 to 23[36], while at Grill & Zonen, the leverage ratio was at most 3, given that their capital was above one million.

	Individual banks			Full sample of failures (average)	
	De Neufville	Grill & Zonen	Hope & Co.	21 failures	16 failures
Failure date	30th July	4th August, re-opened	Did not fail	various dates, re-opened	various dates, not re-opened
Bank money as at June 30th (thousand guilders)	8	120	793	15	3
Total liabilities at failure date (thousand guilders)	9,643	3,000	n.a.	669	802
Liquidity (= bank money/ total liabilities)	0.1%	4.0%	n.a.	2.1%	1.5%
# of bill transactions (first half of 1763)	1,395	777	2,151	241	255
Recovery rate (= accord at court of bankruptcy)	11%	70%	–	43%	10%

Table 4.5: Balance-sheet snapshot. Source: Jong-Keesing (1939).

The snapshot of de Neufville's balance sheet at the end of June betrays all the symptoms of a leveraged trader in distress. The wafer thin level of liquidity would have compelled the distressed sales of assets, especially the liquid assets such as grain, and thereby contributing to the sharp fall in the Berlin grain price documented above. This fits well with the evidence from Jong-Keesing (1939, p. 90) that many merchants were forced to sell their goods in public auctions at very low prices in order to stay liquid and supports our view that distressed selling by merchants exacerbated the downward movement of prices. Unfortunately, the available data does not allow us to directly establish the link between falling prices and the banks' balance sheets.

Jong-Keesing provides additional information on a total of 37 failing Amsterdam banks. Among these banks, there were many of the largest and most renowned Amsterdam houses. 24 banks had a capital of more than one million Dutch guilders. Our

[36]Rachel, Papritz, and Wallich (1938, p. 450), Jong-Keesing (1939, p. 121).

claim that the crisis was one of liquidity, rather than fundamental solvency, is supported by the observation that more than half of the failing banks in Jong-Keesing's sample continued their businesses later on. Recovery rates at surviving banks were much higher than at the banks closing down for good, sometimes as high as 100 percent. 31 of the 37 banks reported to have been directly affected by other failures, which underlines the importance of contagion through contractual relationships. However, the sums involved often were not large enough to explain the failure of banks. Grill & Zonen, for instance, failed relatively early on, and suffered comparatively high losses from the default of de Neufville. Still the loan sum to de Neufville amounted to less then 23 percent of the bank's capital and, thus, cannot by itself explain the bank's failure.[37] Therefore, a contagion story based on interbank liabilities alone is not able to explain the observed failures and has to be supplemented by another explanation, such as the one we provide in this paper.

5. Concluding Remarks

The crisis of 1763 cannot be explained by the traditional models of financial crises. It does not fall into the standard bank run model of Diamond and Dybvig (1983), nor does it seem to conform to agency models that emphasize debtor moral hazard. Therefore, we offer an alternative explanation.

Liquidity risk appears to be at the core of the crisis. We see a drying up of liquidity in the market, forcing distressed agents to sell their assets at prices below their fundamental values. Assets that used to be uncorrelated in normal times, suddenly showed a high degree of correlation as traders were forced into liquidating their portfolios. The fact that many merchants were holding similar assets meant that such liquidations had a detrimental feedback effect on other agents' portfolios.

The 1763 crisis demonstrates vividly the effects of a liquidity crisis in the absence of official intervention. We see a complete breakdown of the financial system, spreading internationally as far as Sweden and England. This shows that a systemic meltdown is, in fact, a real possibility in a situation where banks are connected through interlocking obligations and, in addition, have very similar trading positions. "Hedging" and collateral lose much of their reliability when market and credit risks are correlated, and this has to be taken into account in risk management.

An important lesson from the crisis is that aggregate risk inheres in the system as a

[37] The loan amounted to 229 thousand guilders, and capital was above – and possibly well above – one million guilders.

whole, no matter how ingenious individual market participants have been in attempting to hedge their individual exposures. Let us consider the acceptance loan as described in section 2. On the face of it, the extension of such a loan is a relatively secure undertaking for all parties. The Amsterdam investor has transferred the credit risk from the bill to the two intermediaries, and implicitly pays for this service by accepting a lower interest rate on the loan. This can be interpreted as a purchase of *default insurance*. There are two layers of protection for the investor: Only if both the Hamburg and the Amsterdam bankers are unable to cover the Berlin merchant's bill, will the Amsterdam investor incur a loss. The two intermediaries take limited risks by selling default insurance against a commission. The Hamburg banker promises to pay in case the Berlin merchant is unable the honour the bill at maturity, and the Amsterdam banker covers the residual risk that both the Berlin merchant and the Hamburg banker cannot redeem the bill. However, even though the risk has been subdivided among several parties, the *aggregate risk* is nevertheless present. There is a limit to how much risk can be hedged away. This is reminiscent of the thought experiment suggested by Hellwig (1995) in order to emphasize the limits to individual hedging:[38]

> "... consider an institution that finances itself by issuing fixed-interest securities with a maturity of n months and that invests in fixed-interest rate securities with a maturity of $n + 1$ months. On the face of it, maturity transformation is small, and interest risk exposure is minimal. Suppose, however that we have 479 such institutions. These institutions may be transforming a one-month deposit into a forty year fixed interest rate mortgage, with significant interest rate risk exposure of the system as a whole. The interest rate risk exposure of the system as a whole is not visible to the individual institution unless it knows that it is but an element of a cascade and that credit risks in the cascade are correlated."

Hellwig touches upon the important issue of correlation of risks in the cascade of obligation, such as the one built up in an acceptance loan. Counterparty risks in the default insurance are correlated with the underlying risks to be hedged, especially since the assets held by the different parties were very similar: The merchants in Berlin would hold similar goods as the intermediaries in Hamburg and Amsterdam, who themselves ran their own merchant's businesses alongside their banking activities. As we have seen above, even the best laid hedges will come unstuck when price correlations change so as to thwart the trader.

[38] See Summer (2000) for further discussion of this issue, and a survey of related literature.

We draw two policy conclusions from the events of 1763 that have wider significance:

- There are limits to how much risk can be hedged away. Aggregate risk inheres in the financial system even though each individual trader may believe that his own risks have been hedged away. At the critical moment, the tensions finally manifest themselves in the form of increased co-movement of prices, and the increased correlation between credit risk and counterparty risk. The over-confidence in financial engineering was as dangerous in 1763 as it is today.

- Liquidity risk can have a devastating effect on a financial system populated with traders with highly leveraged, and similar balance sheets. As one trader attempts to repair his balance sheet by disposing of assets, the negative price impact of this action impacts on the balance sheets of all other traders in the financial system. This negative feedback effect has the potential to trigger a self-fulfilling flight to liquidity, and the consequent damage to potentially healthy balance sheets. In distressed market conditions, traders that are intrinsically solvent may nevertheless be pushed into failure. Scholes (2000) has argued for institutions that grant "liquidity insurance". To the extent that our first bullet point above has any force, such institutions must be regarded as providing only imperfect protection against a widespread flight to liquidity.

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