

THE HISTORY OF FINANCIAL CRISES

Edited by
D'Maris Coffman and Larry Neal

CRITICAL CONCEPTS IN
FINANCE

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Critical Concepts in Finance

*Edited by D'Maris Coffman and
Larry Neal*

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CONTENTS

VOLUME II THE GROWTH OF FINANCIAL CAPITALISM

Acknowledgements

vii

Introduction

1

- 20 Efficiency of the Dojima rice futures market in
Tokugawa-period Japan**

6

SHIGERU WAKITA

- 21 'Veritable gold mines before the arrival of railway
competition': but did dividends signal rates of return in the
English canal industry?**

25

A. J. ARNOLD AND S. McCARTNEY

- 22 The first bank of the United States and the securities market
crash of 1792**

52

DAVID J. COWEN

- 23 The financial crises of 1825 and the restructuring of the
British financial system**

73

LARRY NEAL

- 24 Promotion, speculation and their outcome: the 'steamship
mania' of 1824-1825**

107

DAVID M. WILLIAMS AND JOHN ARMSTRONG

CONTENTS

25	Political economy, interest groups, legal institutions and the repeal of the Bubble Act in 1825	127
	RON HARRIS	
26	Jacksonian monetary policy, specie flows, and the Panic of 1837	150
	PETER L. ROUSSEAU	
27	The Railway Mania of 1845–1847: market irrationality or collusive swindle based on accounting distortions?	182
	S. MCCARTNEY AND A. J. ARNOLD	
28	Myopic rationality in a mania	216
	GARETH CAMPBELL	
29	The Panic of 1857: origins, transmission, and containment	249
	CHARLES W. CALOMIRIS AND LARRY SCHWEIKART	
30	Market contagion: evidence from the panics of 1854 and 1857	275
	MORGAN KELLY AND CORMAC Ó GRÁDA	
31	Western grains and the Panic of 1857	295
	JAMES L. HUSTON	
32	Extracts from <i>Lombard Street</i>	313
	W. BAGEHOT	
33	Business and financial conditions following the Civil War in the United States	371
	WARREN M. PERSONS, PIERSON M. TUTTLE AND EDWIN FRICKEY	
34	The Crisis of 1873: perspectives from multiple asset classes	402
	SCOTT MIXON	

INTRODUCTION

One great irony of the crises presented in Volume I is that for two centuries following the South Sea Bubble, the world witnessed the apparently unassailable spread of financial capitalism. Although the vast majority of contributions selected for this volume concern the Western European and North American experiences, we pause for a moment over the Dojima Rice Futures Market (1697–1939) in order to reflect on institutional development and also because the candlestick graphs so familiar to fans of technical analysis originated with Japanese rice traders (Wakita 2001; Poitras 2000). Wakita's now seminal description of the market microstructure builds on earlier work by Schaefer (1989), and is likely to remain the definitive treatment.

The so-called Long Nineteenth Century (1789–1914) witnessed a succession of asset-price bubbles, the focal points of which were technological innovations that successively revolutionised infrastructure. Canals, steamships and railroads each attracted speculative enthusiasm, with the resulting 'lemons problem' so masterfully described by Akerlof (1970) over forty years ago. In connection with the advent of new technologies, information asymmetries make it difficult for investors to 'tell good wine from bad'. As a consequence, the best strategy is to take a diverse portfolio approach, which has the affect of under-pricing the risk associated with the lemons while perversely also under-valuing the superior offerings. Eventually, the bubble bursts and the resulting shakeout protects the sounder ventures, at least theoretically, though generalized credit constrictions can bankrupt even otherwise promising firms.

The formation and magnitude of a particular speculative bubble equally depends on the availability of credit and the returns that might be realised from alternative investments, but capital-intensive infrastructure projects should be unsurprising candidates for speculation. On some level, bubbles are 'banal' (Janeway 2012). Canal Mania, associated with the building of canals in England and Wales during the French Revolutionary and Napoleonic Wars (1790–1815), caused such a speculative bubble in 1793. Arnold and McCartney (2011) illuminate the difficulties in reliably estimating rates of return from available dividend data. It is, however, important to remember that Canal Mania pre-dated the repeal of the Bubble Act of 1720, which had restricted public trading of shares

in joint-stock companies to those with Parliamentary charters (Harris 1997). After 1825, promotion of such ventures became easier, far less expensive and less geographically localised. The so-called 'Steamship Mania' of 1824/1825 occurred just as the restrictiveness of the Bubble Act was being lifted and was part of a wider speculative fever that gripped the market before the crash of 1825 (Williams and Armstrong 2008; Neal 1998). As Williams and Armstrong (2008) describe, the carnage was dramatic, as only three of the seventy steamship lines promoted in 1824 and 1825 remained in business in 1827 (2008, p. 646). Yet despite the shakeout, both the number of vessels and the tonnage they carried increased more or less unabated, doubling within two decades. Steamship Mania may have bankrupted weaker lines, but it did not dampen the public's appetite for the new technology.

The Crash of 1825 also occurred amidst a crisis for English country banks (Neal 1998), fuelled by the clumsiness that characterised Britain's return to gold after the Napoleonic Wars. The causes of the crisis were complex, but the main driver was that the number of country banks had expanded in the first decade of the nineteenth century in order to accommodate the demands of heavy military finance. High excises, which could capture up to 60 per cent of the commodity output of the kingdom (Bordo 1999, p. 369), coupled with income taxes, meant that country banks, which took in coin or Bank of England notes in payment of taxes, had been able to 'live on the float'. After the war, that source of funds evaporated with the repeal of the income tax. Elsewhere the Treasury, groaning under the strain of servicing wartime debt, contrived to effect a reduction of interest rates from 5 per cent to 3.5 per cent (in two steps) on circulating debt, which caused income-dependent investors to chase returns, even as the Bank of England was forced by the Treasury to conduct what amounted to 'open-market' operations with gold reserves that the Bank had intended to use to retire small denomination bank notes. As Neal (1998) explains, the problem was embedded in the Bank's ambivalent role as both a public servant and as a private company with an obligation to pay dividends to its own investors. Not surprisingly, the easy money environment of 1824 fuelled not only the Steamship Mania, but also an equally significant bubble in 'foreign stocks' (sovereign bonds), many of dubious creditworthiness and a few even fraudulent to the point of having been issued by a country that did not even exist! Like canal companies and steamship lines, sovereign bonds contained more than their share of lemons when the bubble finally burst in mid-1825. In the bank runs that followed during the seasonal strain on country banks with the autumn harvest, the Bank of England declined to act as an effective lender of last resort. Not surprisingly, the consequence was widespread economic hardship, bankruptcies and unemployment.

By contrast, Cowen (2000) found that the unsuccessful attempt by William Duer and Alexander Macomb to corner the US market in debt securities and bank stocks in the Crash of 1792 did not lead to more widespread economic hardship. Those who lost money explicitly compared the episode to the Mississippi Scheme, but the Bank of the United States got off lightly, at least until

recently (Cowen 2000). As with the Bank of England, the main problem was the tension between the public and private roles of the Bank, which resulted in precipitous credit restriction in the face of solvency concerns. Not surprisingly, this was a recurring theme before a truly national public bank emerged as a solution.

Far worse for the American economy and the banking industry was the Panic of 1837, which caused over a quarter of chartered banks to fail and the rest to lose 40 per cent of their book assets (Rousseau 2002). The crisis was conventionally blamed on Jackson's distribution of the federal surplus, magnified perhaps by events abroad, but recent scholarship has rehabilitated an older view that the crisis was caused by the 'Specie Circular', which required that public land sales be completed in specie. After the privatisation of the Second Bank of the United States upon the lapse of its charter in January 1836, Jackson's administration was left with very blunt policy instruments with which to try to prick a western land bubble, which they had actually abetted by their earlier redistribution of the Federal surplus (Knodell 2006). This policy, reckless at best (insofar as it seemed to offer unparalleled opportunities for banditry), and one that harkened back to eighteenth-century Europe when tax payments had to be made in gold or silver coin, required the physical movement of specie from New York to the western states. Draining New York of specie was not the Treasury's intention, but it might have been a predictable consequence. Although the public blamed Jackson's successor, Martin Van Buren, for not rescinding the Specie Circular, the absence of a lender of last resort is what brought the American banking system to its knees.

Britain and America also both experienced railway manias in the mid-nineteenth century. In the British case, there were successive waves – a minor railway mania accompanied the 1824–1825 enthusiasm for steamships, and also in 1835–1837, often dubbed the 'little' Railway Mania in anticipation of what was to come. To a degree, the phenomenon was driven by regulatory change. The repeal of the Bubble Act in 1825 was followed in 1844 with the passage of the Joint Stock Companies Act, which made incorporation of joint-stock companies far easier. Limited liability was not introduced until 1855, but this nevertheless represented a step-change in the ease of establishing such ventures. Moreover, in the early 1840s, the Bank of England responded to a sluggish economy by slashing interest rates, which again caused investors to chase higher returns. The Railway Mania of 1845–1847, which occurred amidst the Irish famine and considerable financial instability, snapped when the Bank of England was forced to raise rates again. The shakeout was impressive and many people, who had never before invested in railway securities in favour of safer government bonds, lost the substantial sums they had invested in the schemes. Who was to blame? As new ventures formed quickly to take advantage of the speculative atmosphere, accounting fraud was all too common. This is not unusual, but the scale of accounting irregularities caused at least one scholar Bryer (1991) to come down firmly on the side of contemporaries who saw the Railway Mania as a 'swindle' designed to enrich metropolitan elites at the expense of sturdy,

provincial middle class savers. Both governmental institutions and contemporary accounting practices were implicated in what was offered as a classic example of class conflict and predation. More recent work by McCartney and Arnold (2003) has thoroughly debunked Bryer's conclusions, but the debate should resonate with more recent events. Retail investors are all too willing to attribute speculative losses to malice and to the perceived omnipotence of financial and political elites.

The more pressing issue for most readers, however, will be the question of how far this episode served as an example of 'market irrationality'. Campbell (2012) has recently published what should become the definitive treatment of the subject, insofar as he uses a comprehensive data set of weekly share price data to construct total return indices for both railways and non-railway securities. Campbell finds that 'although their expectations were only accurate in the short-term, they acted in a utility maximising manner by pricing different assets consistently given those expectations' (Campbell 2012, p. 90). Although this is a helpful corrective to the outlandish claims often made about irrational exuberance in this episode, the notion of 'myopic rationality' is not immune from criticism. In effect, it amounts to suggesting that 'investor forecasts were right until they were wrong'.

The Panic of 1857 has often been described as the first global economic crisis. There were many factors, including the strain on the British Treasury caused by the Crimean War, the effect of discovery of California gold on the money supply, the end of the western railway boom and the sinking in a hurricane of the SS *Central America* carrying a massive cargo of gold, but the most persuasive explanation appears to be that offered by the contemporary business press (Huston 1983), namely that the crisis was sparked by a marked fall off in demand for American grain in European markets and the credit crunch that followed when American bankers tried to stem specie outflows. Further studies of the transmission mechanisms for contagion and of successful strategies for containment focus on the American banking system (Calomiris and Schweikart 1991), with southern branch banks and mid-western co-insuring correspondent banks faring best. More recent work employing social network analysis offers insight into how banking panics spread amongst retail depositors, especially those in close communities, such as the recently arrived Irish immigrants of New York (Kelly and Ó Gráda 2000).

The frequency of financial panics and crashes in the nineteenth-century-United States is not surprising, but the economic adjustments following the American Civil War deserve special mention as the National Bank system created as a wartime measure in the North continued to expand in competition with an increasing variety of state-chartered banks. The US experience, with only the Independent Treasury of the Federal government available to act as a lender of last resort, is often compared with the response of the Bank of England to the failure of Overend and Gurney in Britain in 1866. The collapse of this important London wholesale discount house remains a morality tale in the reckless management of the next generation, which borrowed short to lend long and

overestimated their skill in the process. The authoritative account of the crisis remains Walter Bagehot's *Lombard Street: A Description of the Money Market* (1873), in which he promulgates the doctrine now known as 'Bagehot's dictum' on how the Bank of England ought to behave as a 'lender of last resort'. In the United States, by contrast, the difficulties experienced by attempts to return to convertibility after the American Civil War ultimately led to the de-monetisation of silver in 1873 and the establishment of the gold standard. This tumultuous period of adjustment was regarded as an important lesson for those saddled with managing the return to convertibility after the First World War (Persons *et al.* 1920).

The Panic of 1873, which triggered the first 'Great Depression' or 'Long Depression', has received far less scholarly attention than it deserves. The geographical variation in severity and duration makes it difficult to analyse as a single phenomenon, but monetary adjustment and the genesis of the modern gold standard should be a large part of any story. Perhaps the best starting point is offered by Mixon (2008), which analyses the crisis from multiple asset classes and concludes that investors were not systematically under-pricing risk but rather labouring under information asymmetries, even as general economic conditions were reflected in deteriorating firm balance sheets. We will see this story again.

Additional reading

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EFFICIENCY OF THE DOJIMA RICE FUTURES MARKET IN TOKUGAWA-PERIOD JAPAN

Shigeru Wakita

Source: *Journal of Banking & Finance* 25:3 (2001): 535–554.

Abstract

Co-integration analysis is applied to historical data (1760–1864) from the world's first well-established futures market, in rice at Dojima (in Osaka, Japan). The market shows a strong seasonal character. The summer market was strongly characterized by producers' hedging behavior, and may be called a "commodity-oriented futures market". On the other hand, the spring and autumn markets in the middle of Tokugawa era were "financial" markets, characterized by the unbiasedness hypothesis from the theory of rational expectations.

1 Introduction

In Tokugawa-period Japan (1603–1867), the rice trading center was Osaka, a city called the "kitchen for the country". It was there that clan governments (Han) across the land shipped much of the rice they collected as land tax in lieu of cash. In Dojima, the site of the rice trading activities, a rice futures market continuously operated. Standard textbooks on futures markets (e.g., Duffie, 1989; Blank et al., 1991) identify the Dojima rice market as "the world's first well-established futures market", and the Chicago Commodity Exchange Handbook explicitly states that futures trading originated in Osaka.

During the past 50 years, this rice market has been well-investigated in Japan, and in English literature, Schaede (1989) offers an excellent description of it. Schaede has also identified the Dojima rice market as a futures market by examining the following criteria: (1) only exchange members can participate in the market; (2) contracts traded are standardized; (3) for each position, a "good-faith" money has to be deposited at the clearinghouse; (4) trading is not bilateral, but the clearinghouse enters each transaction as a third party and guarantees the

fulfillment of all contracts; (5) the contract runs for a certain trading period and open positions are reassessed daily in accordance with price fluctuations; and (6) positions dissolved before the end of the trading period are cleared by cash settlement. Schaede has concluded that the market practices generally satisfied these criteria.

In spite of careful examination of institutional setup of the market, Schaede, as well as many studies in Japan, have not analyzed it quantitatively because of the lack of reliable data. A recent paper by Ito (1993), however, has used standard techniques of present-day economics, i.e., he demonstrated that the Dojima rice market failed to satisfy the "unbiasedness" condition of the rational expectations test. In fact, Ito concluded that the market cannot be deemed to have consisted of participants who were using information effectively, and thus it was not "efficient"; a conclusion based on the fact that (i) the futures price in the market on average failed to predict the spot price accurately, and (ii) the stock of rice at the time of forecasting had a strong correlation with the ex post forecast error. This suggests that, contrary to the high degree of institutional perfection attributed to the market by the existing studies, the market was considerably limited in its ability to process information.

On the other hand, when considering the period's patterns of rice production and transportation, many institutional features seem to justify calling trading operations in the market efficient. It is this contradiction that underlies the purpose of the present paper. That is, to undertake an empirical analysis of the market by taking such features into account, and to demonstrate that rational expectations were indeed at work in providing an effectively operating futures market. The type of study used here is also meaningful in that, provided the theoretical constraints existing at the time are properly understood, it shows that standard analytical techniques of modern economics can be used for an analysis of economic phenomena taking place several hundred years ago. Moreover, it can elucidate across time and space our understanding of the universal nature of the market mechanism.

Compared to the present-day economy, which has a complex institutional setup and is subject to frequent violent shocks, the economy in the Tokugawa era was simpler and changed at a much slower pace; key features allowing us to assume with greater ease how a theoretically conceptualized economic model is supposed to operate. When considering that there exists an extensive time series of quantitative data on the rice trading activities in Dojima, it becomes quite apparent that the market serves as an ideal locus for verifying economic theory, while also offering a unique set of data factually substantiating the theory of a futures market with a level of precision that has not been reached by any other set of empirical data.

Subsequently, a brief overview of the Dojima rice market is presented in Section 2, being followed in Section 3 with a description of a theoretical seasonal pattern of markets emphasizing particular features of the market. Then, after data are described in Section 4, a test of unbiasedness is conducted in

Section 5; one which shows that the market followed a very regular seasonal pattern. Finally, more detailed discussions of the summer market are discussed in Section 6, with conclusions being contained in Section 7.

2 The Osaka rice market

In the Tokugawa era, the rice collected as tax by clan governments was shipped to their warehouses in Osaka for sale at the Dojima rice market, and then ultimately for distribution to consumers at large. A clan's warehouse issued a promissory note called a "rice ticket" promising to deliver a specified amount of warehouse-stocked rice to a particular individual on a specified date. Gradually, as rice tickets began to be transacted as negotiable instruments, an increase occurred in transactions based on purely speculative motives and on transactions in rice tickets for rice not yet shipped to Osaka. Taking note of this reality, the Shogunate government in 1730 issued an official permit to the Dojima rice market ratifying rice futures trading operations which had been going on for some time.¹

In addition to tickets for *shomai* (genuine rice), tickets for *choaimai* (rice on books) were transacted, with the settlement of deals by the delivery of actual rice being prohibited for choaimai transactions. The exact relationship between the price of shomai, that of choaimai, and the actual market price of rice relative to how "spot" and "futures" prices in present-day futures market are related to each other is rather complicated and cannot be answered in a straightforward manner. However, given that this paper is mainly concerned with the period when the market remained relatively stable (Miyamoto, 1988), we shall treat transactions in choaimai as similar to those in an ordinary commodity futures market.

Trading in rice futures then, unlike trading in the present-day futures market, was conducted in three seasonal markets, i.e.,

1. The spring market: January 8–April 28 (called "winter trading" along with that in the below autumn market).
2. The summer market: May 7–October 9 (called "summer trading").
3. The autumn market: October 17–December 24 (called winter trading).

During each seasonal market, the maturation date for rice futures extended only up to the "closing date" of that market. In other words, a speculative deal on spring market rice futures was carried out by forecasting the rice price as of April 28 at the latest, and no deal could be made on rice futures to be delivered at harvest time later in the year or in the following year. In this regard, the rice futures market was radically different from contemporary futures markets, where risks in principle can be hedged against an infinite time horizon through various financial instruments.²

This particular institutional feature of the Dojima market is nevertheless convenient for identifying the motive behind transactions in each season. That is,

the summer market seems to have primarily catered to the need for hedging against the risk of an unsatisfactory harvest; whereas the primary function of the autumn market opening shortly after the harvest may have been to facilitate hedging against the risks of shipping harvested rice to Osaka and determining the quantity that would actually be shipped. The spring market, on the other hand, can reasonably be characterized as the market for transactions of the rice already stored in Osaka as well as the additional shipments of rice from the colder Hokuriku districts which usually arrived in April.

In any case, it is clear that maintaining a market that can handle a diversity of transactions in futures commodities involves considerable costs; and in fact, no such futures market operates today that handles transactions over an extended time horizon like this. The division of the year into three separate trading seasons is therefore considered a rational means of minimizing both the cost of maintaining the futures market and that of transactions.

3 Theoretical seasonal patterns of futures and spot prices

Considering the existence of seasonal markets in accordance with the production pattern of rice, we are viewing the Dojima rice market not as a *financial securities exchange* but instead as a *commodity futures market* in which clan governments were the suppliers and the Osaka rice merchants were the buyers. With this in mind, a question arises as to what sort of relationship must the spot and futures prices satisfy within a commodity futures market. Two theories exist pertinent to the question: one, advanced by Working (1948) and others, attaches importance to the physical factors of the commodity concerned; while the other, advanced by Keynes (1930) and others, attaches importance to the risk premium involved. The following equation, which incorporates the two theories, describes the theoretically desirable relationship between spot and futures prices:

$$\begin{aligned}
 \text{Futures premium} &= (\text{Futures prices} - \text{Spot prices}) / \text{Spot prices} \\
 &= \text{Interest rate} - \text{Marginal convenience yield} \\
 &\quad - \text{Cost of storing and transporting stocked rice} \\
 &\quad + \text{Risk premium.}
 \end{aligned}
 \tag{1}$$

If the Dojima rice market had been a pure financial securities exchange incapable of readjusting the demand for and the supply of rice, both the convenience yield and the stock-carrying cost would have been irrelevant such that the risk premium would have had a positive effect on the futures premium. The implications of each of the terms in (1) are discussed below:

1. The "interest rate" has a positive effect on the futures premium. In any market it must usually and theoretically be positive, reflecting the opportunity cost when money can be invested in other interest-bearing assets.

2. The “convenience yield” represents the extent by which the utility derived from the purchase of actual rice at present exceeds the utility derived from rice futures. In the autumn and spring markets, which opened soon after harvest time, due to a sufficient rice stock the current convenience yield must have had a very small effect on the futures premium. On the other hand, in the summer market operating during the off-crop season, this value should have had a large negative effect on the futures premium.
3. While the “cost of storing stocked rice” would be fairly large in modern times, rice storage during the Tokugawa era was practically free since it was stored in warehouses operated by the ruling samurai class. Accordingly, this makes it difficult to surmise that the opportunity cost of storage found its way explicitly into the rice futures price.
4. In contrast, “the cost of transporting stocked rice” which would be small today was quite sizable at the time. It should be remembered, however, that (i) this cost would have affected the price evenly across all seasons, and (ii) even more importantly, the maritime transportation of rice to Osaka from various localities entailed great risks, e.g., a shipwreck or long delays due to bad weather; risks that naturally led to substantial risk premiums making maritime shipping an important factor affecting the rice trading in Dojima.³ Miyamoto (1988) showed that the rice stock in Osaka typically reached its peak in November, then declined subsequently. In other words, it is reasonable to surmise that this transportation-related risk presented itself in the autumn market producing a positive effect on the futures premium. It was also present in the spring market, since shipments from the colder Hokuriku districts typically arrived in April.
5. The production-related risk premium is the most important factor; especially so in the summer market when the market-supplying clan governments needed to hedge against such risk. The risk premium at this time directly reflected the uncertainty of the coming harvest, and produced a negative effect on the futures premium.
6. In the autumn and spring markets, where the harvest yield was known and trading was to be cleared before the next harvest, no risk peculiar to rice production could have been present. Thus, the risk premium, if present at all in the autumn and spring markets, could only represent the default risk of borrowers, producing a corresponding positive effect on the futures premium seen in an ordinary financial market.

In summary, as a commodity futures market, the Dojima rice market would have behaved as follows. In the summer market, which opened while rice was growing, either the convenience yield or the risk premium (reflecting clan governments' willingness to hedge against the uncertainty of the coming harvest) caused the futures premium to be lower; whereas in the autumn and spring markets, which opened during the transportation seasons and were affected by both the uncertainty in the amount of rice to be shipped to Osaka and the risk of transportation, the futures premium would be relatively lower.