



**Real Shock, Monetary Aftershocks:  
The San Francisco Earthquake and the Panic of 1907**

Kerry Odell  
Department of Economics  
Scripps College  
Claremont, CA 91711  
E-mail: kodell@scrippscol.edu

Marc D. Weidenmier  
Department of Economics  
Claremont McKenna College and NBER  
Claremont, CA 91711  
E-mail: marc\_weidenmier@mckenna.edu

*Abstract*

Economists have long studied the relationship between the real and monetary sectors. We trace out the effects of an exogenous real shock, the 1906 San Francisco earthquake. The quake's impact manifested itself in international gold flows, as British insurance companies paid their San Francisco claims out of home funds in the fall of 1906. The capital outflow threatened the fixed sterling-dollar exchange rate, leading the Bank of England to raise interest rates and discriminate against American finance bills. The resulting contraction pushed the United States into recession, setting the stage for the 1907 Panic and the founding of the Fed.

The authors would like to thank Jeremy Atack, Tom Borchering, Michael Bordo, Richard Burdekin, Anne Hanley, Richmond Harbaugh, Michael Hauptert, Eric Helland, Jon Moen, Harold Mulherin, Larry Neal, Janet Smith, Adrian Tschoegl, Tom Willett, and seminar participants at the 2001 Economic History Association, 2001 Business History Conference, the University of Wisconsin at Lacrosse, and the Claremont Colleges for comments. A special thanks to Sheree Leeds, the archivist at CGNU, for locating and transcribing the Business Minutes of Norwich Union for 1906 and 1907. We would also like to thank the archivists at the Bank of England.

**I. Introduction.**

Economics has a large theoretical literature that explains the interaction between the real and monetary sectors of an economy. Empirical evidence on the money-output and output-money relationship is less clear, however. The endogeneity problem between the two sectors makes it difficult to identify the effects of shocks in vector autoregressions (VARs) and calibration exercises.<sup>1</sup> This paper takes advantage of a natural experiment created by the famous San Francisco earthquake and fire of 1906 to examine the effects of an exogenous real shock on financial and money markets as well as the response by a central bank. While recent disasters such as Hurricane Andrew in 1992 and the terrorist bombings of the World Trade Centers incurred property damage of about 1 percent of U. S. GDP, the costs of the San Francisco catastrophe were substantially higher (*Wall Street Journal*, October 9, 2001).<sup>2</sup>

Damage from the San Francisco earthquake and fire of April 1906 was estimated to be between \$350- \$500 million, or 1.3 to 1.8 percent of U. S. GNP in 1906;<sup>3</sup> large amounts of relief flowed into the city in the weeks immediately following the disaster. Because British companies underwrote the majority of the city's fire insurance policies -- an estimated £23 million (or \$108 million) at the time -- millions of pounds worth of insurance claims were soon presented in London. The magnitude of the resulting capital outflows in late summer and early autumn 1906 forced the Bank of England to undertake defensive measures to maintain a fixed sterling/dollar exchange rate. The central bank responded by raising its discount rate two hundred-fifty basis points between September and November 1906 and by pressuring British joint-stock companies to stop discounting American finance bills for the next year. (*Economist*, October 20, 1906, p. 1694).

Actions by the Bank of England attracted gold imports and sharply reduced the flow of gold to the United States. By May 1907, the United States had fallen into one of the shortest, but most severe

recessions in American history (Friedman and Schwartz, [1963]). Thus primed for a financial crisis, already-weakened world markets crashed in October 1907 with the collapse of the Knickerbocker Trust Company in New York. Ultimately, the Panic of 1907 led to one of the most important institutional changes in American history: the creation of the Federal Reserve System designed to provide for an elastic currency and to act as a lender-of-last resort.

## **II. Background**

The Panic of 1907 was a watershed event for the United States. This was the last in a series of financial crises during the National Banking Era that prompted reform of the American financial system. Troubled by recurring financial panics and the economic distress that resulted, Congress established the National Monetary Commission to consider whether there was a role for government in managing the nation's money supply. The Commission recommended the formation of a central bank that would provide for an elastic currency and serve as a lender-of-last resort. Congress passed the Federal Reserve Act in 1913.

Given the importance of the 1907 Panic in the development of American financial institutions, it is not surprising that this event has been the subject of much investigation. Many scholars have attempted to identify the shocks that primed the United States for a financial panic. In particular, several studies have tried to uncover the origins of a liquidity crisis that plagued the London and New York money markets from 1906 until the onset of the Panic. Previous literature has generally pointed to an American shock in 1906 that prompted nearly \$70 million of gold imports from England (see Sprague, [1910]; Sayers, [1963]; Clapham, [1944]; Friedman and Schwartz, [1963]; Goodhart, [1969]; Kindleberger, [1978]).<sup>4</sup> Policy responses of the U.S. Treasury and, more importantly, of the Bank of

England exacerbated the liquidity crisis, making American and world financial markets vulnerable to shocks that otherwise would have been temporary in nature. Markets finally collapsed in October 1907 with a run on New York's Knickerbocker Trust Company. We will briefly discuss some of the factors that contributed to the tightness in the London and New York money markets and their role in propagating the financial crisis. The accompanying timeline, Figure I, summarizes key events leading up to the Panic.

O.W. Sprague, writing on behalf of the National Monetary Commission, traces tight credit conditions in 1906 to New York (Sprague, [1910]). He notes that the United States experienced surges of gold imports between April and May, and again between September and October. As shown in Figure II, the United States imported over \$50 million in the spring and approximately \$80 million in the late summer and early fall. Sprague attributes the first wave of gold imports to a cyclical boom in 1905 that placed extraordinary credit demands on New York banks and the stock market, whereas he believes excessive speculation in the New York stock market explains the second wave of gold imports. The U. S. Treasury, led by Andrew Shaw, subsidized these gold flows by offering to temporarily place public deposits in banks if they imported gold from abroad. The policy lowered the gold import point by offsetting the interest lost while gold was in transit. Goodhart [1969], however, notes that the gold import point was often low enough to have justified specie inflows without the subsidy.

In the fixed exchange rate world of 1906, such large gold outflows were a significant threat to a country's ability to maintain the par value of its currency which, for the pound sterling, was \$4.867. Faced with its lowest ratio of reserves to deposits since the 1893 crisis, the Bank of England nearly doubled its discount rate, from 3 ½ percent on September 12 to 6 percent on October 19. As shown in Figure III, the Bank held the discount rate constant for the remainder of 1906 and then subsequently

lowered it in early 1907. This would seem to indicate an easing of credit conditions in England. On the contrary, the Bank of England had, in effect, closed down credit facilities with American firms when it raised the discount rate in the autumn of 1906: the central bank threatened joint stock companies with a 7 percent rate on money if they did not stop discounting U. S. finance bills, credit instruments used to borrow overseas in anticipation of profit from exchange rate fluctuations. The actions practically cut off gold exports to the United States. As shown in Figure IV, England reversed its position from a net gold exporter to a net gold importer. England successfully defended the dollar/sterling exchange rate, but at what cost?

Friedman and Schwartz [1963] argue that the Bank of England's policy toward American finance bills altered the normal course of gold arbitrage and pushed the United States into recession. Typically, American banks and trust companies drew finance bills payable in pound sterling on their correspondent banks in London during the summer. They would then sell sterling bills for dollars; this would result in a gold shipment to New York. The finance bills would be covered in the autumn when the demand for dollars was high following the export of U.S. agricultural goods to Europe. Forced by the Bank of England to pay off their finance bills upon maturity, American firms liquidated their stock portfolios in the spring of 1907. The stock sell-off led to a short but sharp "Rich Man's Panic", helping to push the United States into recession.<sup>5</sup>

European central banks exacerbated New York's liquidity crisis by raising their discount rates throughout 1906 and 1907. Open market rates in Berlin and Paris generally exceeded call money rates in New York by two to three percentage points during the first nine months of 1907. Interest rate hikes, in conjunction with the repatriation of finance bills drawn in London, led to the export of nearly \$30 million in gold from the United States in the summer of 1907 (Moen and Tallman, [1990]; Tallman and Moen, [1998]).

The New York money market entered the fall of 1907 low on cash reserves and primed for a panic. On Tuesday, October 22, New York's second largest trust company, Knickerbocker, experienced a run following news that the firm was in financial trouble. A day later, panic-stricken depositors ran on two other large trust companies, followed by several national banks. Within a few weeks, the panic spread to other regions of the United States.

Several measures were taken to contain the crisis. The New York Clearinghouse Association issued loan certificates, a money substitute used to clear accounts between banks. Clearinghouse loan certificates artificially increased the money supply and freed up currency for depositors who demanded cash. Federal aid came in the form of public funds deposited by the U.S. Treasury at key New York City banks, and J. P. Morgan formed a money pool with bankers to provide liquidity assistance to trust companies and the stock market (Donaldson, [1993]; Ramirez, [1995]; DeLong, [1997]). These measures eased conditions in the money market, but failed to prevent the suspension of specie payments (Moen and Tallman, [2000]).

As short-term interest rates rose to over 10 percent, gold poured into the United States from England and the rest of Europe. Figure II shows that the United States imported over \$100 million in gold during November and December. Although the specie arrived too late to prevent a panic, gold shipments probably shortened the period of suspension and reduced the duration of the recession. On the other hand, specie exports drained European money centers of gold, helping to transmit the "localized" New York panic to international financial markets (Goodhart, [1969]).

Previous research has focused on the role of "excessive speculation" and on the policies of the U.S. Treasury and the Bank of England in propagating the Panic of 1907. These studies, however, have overlooked the role of the San Francisco earthquake in the financial crisis. In this paper, we utilize data from contemporary newspapers as well as internal documents from British insurance companies to

examine the effects of the quake on American and world financial markets.<sup>6</sup> The payment of claims by British insurance companies to policyholders in San Francisco holds the key to understanding the shock that prompted defensive actions by the Bank of England and the chain of events that culminated in the Panic of 1907.

### **III. The Setting**

By the time the transcontinental railroad was completed in 1869, San Francisco had already established itself as the center for export trade from the Pacific Coast region. Endowed with an excellent natural harbor and easy coastal and river access to the agricultural and natural resource riches of the west, San Francisco had developed strong economic ties to other countries, particularly to Britain. Most of the wheat exported from the west coast and bound for England was financed through San Francisco, and a sizeable number of London banks had offices in that city.

At the same time, other British financial institutions sought to expand their business in the area. Prominent among these were the British fire insurance companies. In 1852, the Liverpool & London & Globe fire insurance company placed an agent in San Francisco -- the first such insurance firm (either foreign or domestic) in the city. Two years later, three more British firms were writing business in San Francisco and the first American company set up shop, but it wasn't until 1858 that a San Francisco-based company was established (Kirschner, [1922]). By 1890 in California, there were 127 American fire insurance firms, each underwriting an average of \$13.5 million in risks. On the other hand, there were 52 foreign firms (more than half of which were British), each of whom underwrote \$23.5 million in risks; nearly 27% of California term fire insurance policies were carried by British companies. In fact, the fire insurance company writing the most policies in California was Liverpool & London & Globe,

with total risks of \$173 million. In comparison, 28% of all fire insurance policy risks in New York were underwritten by foreign firms, while in Illinois foreign companies insured less than twenty percent of the value of all risks (United States Census, [1891]).

Twenty-five years later, these patterns persisted. At the end of 1905, slightly more than half of insured risks were underwritten by American firms, with almost forty percent of business still carried by foreign firms, most of whom were based in Britain. On the other hand, California-based firms were writing only seven percent of fire insurance business in the state (Kirschner, [1922]). The city of San Francisco was even more dependent on foreign fire insurers than the state as a whole. By the turn of the century, it was estimated that at least half of all fire insurance policies in San Francisco had been issued by British companies (Cockerell and Green, [1976]). One explanation for the dominance of British firms is the long history of trade relations between the city and Britain; another is simple economics: as agents from the London and Lancashire insurance firm noted, the profit on San Francisco business equaled thirty percent – “three times greater than that yielded by its business generally” (Kirschner, [1922]). Evidently, adjusters failed to consider earthquake risk.

#### **IV. The Disaster**

On Wednesday, April 18, 1906, an earthquake of Richter magnitude 8.3 hit San Francisco. Most of the damage was not done by the tremor itself (which was especially severe in areas of landfill where liquefaction occurred) but by the fires that followed. The majority of the city's buildings had been made of wood; this material was far more plentiful and inexpensive than brick, thanks to the city's central place in the coastal lumber trade. The combination of close quarters, highly flammable building materials, and earthquake-damaged water mains hampered the efforts of firefighters. Ultimately more

than four square miles -- about half of the city -- were destroyed. Although fewer than 1,500 of the city's 375,000 residents were killed, damage was estimated at between \$350 million and \$500 million (*Commercial and Financial Chronicle*, October 19, 1907).

Word of the disaster in San Francisco spread throughout the United States within hours. Prominent financiers, members of Congress, and foreign delegations all promised aid to the stricken city, but private and government relief were minimal (Haas, [1977]). Because San Francisco was a major market for British fire insurance companies, however, much of the brunt of financing San Francisco's recovery was borne abroad.<sup>7</sup> The *Economist* reported at length on the consequences of the disaster for British insurance firms, pointing out that they had more than \$87 million in policies in San Francisco, with an estimated \$46 million in losses (*Economist*, August 11, 1906):

Company	Value of San Francisco Policies in Effect (\$)	Estimated Losses (\$)
Alliance	3,526,220	1,758,686
Atlas (& subsidiaries)	6,790,000	2,757,957
Caledonian and Cal.-American	5,457,727	1,521,064
Commercial Union and Palatine	7,802,722	4,116,281
Law Union	2,205,290	1,368,460
Liverpool and London and Globe	4,850,000	3,998,000
London Assurance	7,668,471	4,016,471
London and Lancashire and Orient	9,662,291	4,229,721
North British	4,021,943	3,012,500
Northern	4,238,646	2,063,926
Norwich Union	2,716,097	750,030
Phoenix and Pelican	5,000,948	2,808,313
Royal and Queen	9,044,050	5,787,776
Royal Exchange	5,518,342	2,639,564
Scottish Union and National	2,013,185	1,300,000
Sun	3,122,091	1,651,666
Union	<u>4,238,775</u>	<u>2,345,420</u>

TOTAL	87,877,678	46,125,835
-------	------------	------------

Of course, the magnitude of policies did not reflect the size of insurance payments to be made; some properties survived the earthquake undamaged. At the same time, the insurers (in a particularly bad public relations move) indicated early on that no payments would be made on damage that resulted from the earthquake itself. This was a sticky point: If the fires that followed the earthquake caused the damage but the fires *themselves* were caused by the earthquake, insurers claimed that they were not liable. There were no clear means of allocating damage to the earthquake and to the fire, although some insurers proposed a 60-40 split: Forty percent of each policy claim would be denied "on the ground that the destroyed buildings were first damaged in that proportion by the temblor" (*Los Angeles Times*, May 8, 1906).

On the other hand, some company directors claimed that they were, in fact, forbidden to pay out such claims:

Under any circumstances, the British insurance offices will pay only losses for which they are legally liable, since to go beyond their contracts would be illegal. They cannot recognize any liability for damage by earthquake where no fire ensured nor for any damage by fire to fallen or partly fallen buildings, nor for any damages to buildings pulled down or destroyed by order of the San Francisco authorities. (*Los Angeles Times*, May 4, 1906)

Reaction to these statements was met with published outrage: In one San Francisco newspaper, the editor's sarcasm was unrestrained:

To say that [insurers] will not recognize as an obligation the destruction of a building by fire, which fire was the result of an earthquake, is to take a position hardly more reputable than that of an ordinary pickpocket. (. . .)

A HIGH WIND IS AS LIKELY TO CAUSE A GENERAL CONFLAGRATION UNDER CERTAIN CIRCUMSTANCES AS AN EARTHQUAKE. THE PROPOSITION IS YET TO BE ADVANCED THAT INSURANCE COMPANIES ARE

NOT LIABLE BECAUSE THE WIND BLEW.  
(*San Francisco Examiner*, May 7, 1906)

## V. The Cost

The short-run impact of the earthquake on financial conditions in general -- and interest rates in particular -- was, perversely, rather small. Certainly, the sell-off of stocks by insurance companies (and some panicked investors) resulted in a significant drop in the price of shares<sup>8</sup>, but there was little credit stringency in early spring. As the *New York Times* reported at the beginning of May,

whereas a few weeks ago bankers were looking forward with extreme misgivings to the Autumn, owing to the limitations of the money market, they believe now, or at least a good many of them do, that money is likely to be easier, and that the ease will be more prolonged than could possibly have been the case without the San Francisco disaster and the enormous liquidation of securities which it precipitated. (*New York Times*, May 3, 1906)

In essence, the earthquake had the effect of softening credit markets in the first two or three months after the disaster. As shown in Figure V, interest rates on 60-day commercial paper for both the United States and England moved very little in the weeks following the earthquake. Potential borrowers and stock speculators in the rest of the country were taking a wait-and-see attitude toward the disaster and its possible impact on economic activity. At the same time, insurance companies were liquidating stocks *in anticipation* of making payments to San Francisco.

Funds for relief and rebuilding flowed into the city quite quickly. As shown in Figure II, in late April and May of 1906, nearly \$50 million of gold poured into the United States from Germany, France, the Netherlands, and England (whose contribution amounted to \$30 million). The *New York Times* (May 7, 1906) indicated that 80 percent of these funds were transferred to San Francisco; much of the rest was used to replenish the gold reserves of New York banks depleted by specie shipments to

the West Coast.

Most insurance claims took months to settle as some companies equivocated (as noted in the press) while others waited for guidance from a report of the Insurance Department of New York State which outlined how American firms should settle claims. This four-point plan was not finalized until the end of July. At that time, most British fire insurance houses signed on and agreed to settle their claims in accordance with the New York agency. By October, it was estimated that more than \$100 million in insurance checks had been received in San Francisco (Douty, [1977]). Ultimately, British insurers paid out £10 million (\$48 million) for earthquake damage (Cockerell and Green, [1976]).

What made this all the more significant for international financial markets was the fact that most foreign insurers decided to pay claims out of "home funds" rather than reserves in the United States.<sup>9</sup> The rationale for this decision was apparently based on transactions costs and thickness of markets:

Considering that their outstanding liabilities in America have been largely curtailed by the San Francisco conflagration, it might have been thought the companies would utilise some portion of their funds there for the purpose of meeting the claims upon them. It was probably decided, however, that, in view of the magnitude of these claims, the amount that could be so obtained would be, comparatively speaking, so small that it would not be worth while going through the formalities requisite to obtain the release of the funds which are held by trustees for the company and for the American policyholders. (*Economist*, August 11, 1906)

At home, the British companies were also hesitant to liquidate the securities in which they held reserves.

Given the size of losses involved, such sales would undoubtedly depress stock prices. As a consequence, a number of firms negotiated term loans with their banks and so postponed securities sales for a few months (see *Financial Times*, July 6, 1906).

This pattern of insurance payments can be seen in the experience of one British company, the Norwich Union Fire Insurance Society, which had over \$15 million in San Francisco policies in effect

(Business Minutes of the Commercial Union Archives, [1906])<sup>10</sup>. Following the earthquake, British firehouses gathered in London on April 20th to discuss their liability in the disaster. The great majority of British insurance companies ultimately assumed liability for fire damage caused indirectly by the earthquake. Members of the Norwich Union, however, had a special clause protecting them against losses caused by or through an earthquake. These firms initially denied any liability in the San Francisco disaster.

Because the refusal of some British firehouses to assume liability in the quake produced a large public outcry in San Francisco, members of the Norwich Union reconsidered their liability in the San Francisco earthquake. Legal counsel in the United States advised these British firehouses to pay claims in order to avoid possible litigation. Lawyers for the firehouses noted that British companies were likely to lose in court given that a San Francisco jury would be influenced by the “extraordinary conditions” surrounding the quake (Business Minutes of the Commercial Union Archives, May 28, 1906). Persuaded by these arguments, directors for the Norwich Union accepted liability for damage caused by the earthquake.

Some British firehouses met early claims by selling assets held by New York trust companies. Norwich Union, for example, liquidated its portfolio in July 1906.<sup>11</sup> In the following months, the company utilized financial bills of exchange and even borrowed from London banks to settle insurance liabilities. Consider the following cablegrams from Mr. Hare of Norwich Union:

San Francisco drafts advised 523 thousand total drafts paid 447 thousand – Balance in banks 42 thousand – May I draw? (Business Minutes of the Commercial Union Archives, September 17, 1906)

Since this morning’s cablegram have additional notice of drafts so draw sight for £17,571.1.2 time money 6 per cent, financial advice here is to borrow in London and transfer by cable –such transfer being saleable here at higher rate than sight bills. (Business Minutes of the Commercial Union Archives, September 17, 1906)

Total San Francisco drafts advised six [sic] fifty one thousand draw sight tomorrow’s. £20,682.10.6. (Business Minutes of the Commercial Union Archives, September 19, 1906)

Total San Francisco drafts advised 800 thousand – draw sight tomorrow steamer £8,274.14.5. (Business Minutes of the Commercial Union Archives, October 3, 1906)

In sum, then, the San Francisco earthquake gave rise to a massive outflow of funds -- of *gold* -- from London, both immediately after the earthquake and again in the autumn of 1906. As shown in Figure VI, England exported \$30 million in gold to the United States in April and May; this was followed in September and October by a further \$35 million in specie. In total, quake-related payments to the United States represented *40 percent* of seasonally-adjusted British gold exports for all of 1906<sup>12</sup> and over 80 percent of seasonally-adjusted gold imports into the United States that year.<sup>13</sup>

Confirmation of the importance of insurance payments comes from gold imports into the port of San Francisco. Typically, the city accounted for a negligible amount of American gold imports in any given month. This was not the case in the fall of 1906, however. As shown in Figure VII, the city of San Francisco *alone* imported approximately \$11 million in the late summer and early fall of 1906. This accounted for approximately 9 percent of all seasonally- adjusted U.S. gold imports in 1906.

The magnitude of the British funds flows can be put into stark perspective by noting that they represented a *14 percent loss in the gold money stock* of England, exerting enormous pressure on the fixed sterling-dollar exchange rate.<sup>14</sup> Faced with its largest two-month net gold outflow of the entire period from 1900 to 1913 - Figure VIII,<sup>15</sup> the Bank of England nearly doubled the discount rate from 3½ percent to 6 percent between September and October.<sup>16</sup> As noted earlier, this was accompanied by a discriminatory policy towards American finance bills for the next year. This policy reversed England's position from a net gold exporter to a net gold importer by the end of 1906. Maturing finance bills led to a sell-off of American railroad securities and the export of gold to Europe.

The U.S. economy fell into recession by May 1907 and industrial production fell 40 percent in the next three months. Gold arbitrage was disrupted by the inability of American firms to borrow from

England and other European centers as central banks undertook measures to protect their domestic gold supplies. The United States exported over \$30 million in gold during the summer of 1907. New York financial institutions entered the fall low on gold reserves and primed for a panic, and American financial markets collapsed with a run on the Knickerbocker Trust Corporation in 1907. Specie poured into the United States, draining London and other European centers of gold. An international crisis followed shortly thereafter.

## **VI. Conclusion**

Economists have developed a number of theories to explain how real shocks affect the financial and monetary sectors of an economy. Empirical evidence on the links between real and monetary shocks, however, is often difficult to uncover given the endogenous interaction of the two factors. The San Francisco earthquake, on the other hand, is an identifiable exogenous real shock with a traceable impact. We follow the impact of this disaster and its effects on the American economy and world financial markets. We show how the payment of insurance claims resulting from the disaster prompted changes in money and financial markets worldwide; the Bank of England raised interest rates and discriminated against American finance bills for the next year. These actions helped push the U.S. economy into recession by May 1907 and the financial sector crashed with the collapse of the Knickerbocker Trust Company in October.

Overall, our analysis shows that real shocks as well as the response by a central bank can have large effects on money markets and the economy. Real shocks do not necessarily have an immediate impact on an economy or the financial sector, however. It takes time before even a sizable disturbance equal to 1.3 to 1.8 percent of GNP ripples through an economy and has its full effect. In the case of the San Francisco earthquake, the disaster propagated one of the shortest, but most severe recessions in

United States history and set the stage for an international financial crisis over a year later.

Historically speaking, the San Francisco earthquake was an important catalyst for reform of America's financial architecture. As noted by London's *Financial Times* of July 6, 1906, "San Francisco's \$200,000,000 'ash heap' involves complications which will be felt on all financial markets for many months to come [and] the payment of losses sustained . . . represents a financial undertaking of far-reaching magnitude. . . ." Just how far-reaching the impact of the earthquake and the following panic were can be seen in a modern monetary power: the Federal Reserve System. In response to the panic, Congress passed the Aldrich-Vreeland Act in March 1908; this authorized banks to issue emergency currency backed by commercial paper in time of crisis. More importantly, the Act also created a National Monetary Commission to investigate the American banking and financial system and to make recommendations for reform. The Commission's report called for the establishment of a central bank, and this formed the basis of the Federal Reserve Act that was passed in 1913.

Kerry Odell  
Department of Economics  
Scripps College

Marc Weidenmier  
Department of Economics  
Claremont McKenna College and NBER

## References

- Bureau of Domestic and Foreign Commerce. *Monthly Summary of Commerce and Finance of the United States*. (Washington: GPO, 1905-1908).
- Calomiris, Charles, and Gary Gorton. "The Origins of Banking Panics: Models, Facts, and Bank Regulation." In R. G. Hubbard (Ed.), *Financial Markets and Financial Crises*. (Chicago: Chicago University Press, 1991).
- Calomiris, Charles, and R. Glenn Hubbard. "Price Flexibility, Credit Availability, and Economic Fluctuations: Evidence from the United States, 1894-1909." *Quarterly Journal of Economics* CIV (1989), 429-452.
- Canova, Fabio. "The Sources of Financial Crisis: Pre- and Post- Fed Evidence." *International Economic Review* XXXII (1991), 689-713.
- Capie, F. and A. Webber. *A Monetary History of the United Kingdom, 1870-1982*. (London: George Allen and Unwin, 1985).
- Clapham, John. *The Bank of England*. Volume II. (Cambridge: Cambridge University Press, 1944).
- Clapham, John. *An Economic History of Modern Britain: Free Trade and Steel*. (Cambridge: Cambridge University Press, 1952).
- Cockerell, H.A.L., and Edwin Green. *The British Insurance Business 1547-1970*. (London: Heinemann Educational Books, 1976).
- Commercial and Financial Chronicle*. New York, various years.
- Cross, Ira. *Financing an Empire*. (Chicago: S.J. Clarke Publishing Co., 1927).
- Dacy, Douglas, and Howard Kunreuther. *The Economics of Natural Disaster*. (New York: The Free Press, 1969).
- De Long, J. Bradford. "Did Morgan's Men Add Value? An Economist's Perspective on Financial Capitalism." *Inside the Business Enterprise: Historical Perspectives on the Use of Information*. (Chicago: Chicago University Press, 1991).
- Donaldson, R. Glenn. "Financing Banking Crises: Lessons from the Panic of 1907." *Journal of Monetary Economics* XXXI (1993), 69-95.
- Douty, Christopher. *The Economics of Localized Disasters: The 1906 San Francisco Catastrophe*. (New York: Arno Press, 1977).
- Economist*. London, 1905-1908.
- Financial Times*. London, 1906.

- Friedman, Milton and Anna Schwartz. *A Monetary History of the United States 1867-1960*. (Princeton: Princeton University Press, 1963).
- Goodhart, Charles E. *The New York Money Market and the Finance of Trade*. (Cambridge: Harvard University Press, 1969).
- Haas, J. Eugene, Robert W. Kates, and Martyn J. Bowden, eds. *Reconstruction Following Disaster*. (Cambridge: The MIT Press, 1977).
- Kennedy, John Castillo. *The Great Earthquake and Fire, San Francisco, 1906*. (New York: William Morrow and Company, 1963).
- Kindleberger, Charles. *Manias, Panics, and Crashes: A History of Financial Crises*. (New York: Basic Books, 1978).
- Kirschner, Herbert A. *Fire Insurance Development on the Pacific Coast*. (San Francisco: Underwriters' Report, 1922).
- Los Angeles Times*, various issues.
- Moen, Jon, and Ellis Tallman. "Lessons from the Panic of 1907" *Federal Reserve Bank of Atlanta Economic Review* LXXV (1990), 2-13.
- Moen, Jon, and Ellis Tallman. "Clearinghouse Membership and Deposit Contraction during the Panic of 1907." *Journal of Economic History* CX (2000), 145-163.
- National Research Council. *The Economic Consequences of a Catastrophic Earthquake*. (Washington, D.C.: National Academy, 1992).
- Neal, Larry D. "A Shocking View of Economic History (Presidential Address to the Economic History Association)." *Journal of Economic History* LX (2000), 317-334.
- Odell, Kerry. *Capital Mobilization and Regional Financial Markets: The Pacific Coast States, 1850-1920*. (New York: Garland Publishing, 1992).
- Ramirez, Carlos. "Did J. P. Morgan's Men Add Value? Corporate Investment, Cash Flow, and Financial Structure at the Turn of the Century." *Journal of Finance* L (1995), 661-678.
- Romer, Christina D. "The Prewar Business Cycle Reconsidered: New Estimates of Gross National Product, 1869-1908." *Journal of Political Economy* XCVII (1989), 1-37.
- San Francisco Examiner*, various issues.
- Sayers, R. S. *The Bank of England 1891-1944*. (Cambridge: Cambridge University Press, 1976).

- Sprague, O.M. *History of Crises under the National Banking System*. (Washington, D.C.: National Monetary Commission, 1910).
- Tallman, Ellis, and Jon Moen. "Gold Shocks, Liquidity, and the United States Economy during the National Banking Era." *Explorations in Economic History* XXXV (1998), 381-404.
- Temin, Peter. "The Causes of American Business Cycles: An Essay in Economic Historiography." Federal Reserve Bank of Boston XCII (1998), 37-59.
- The Times*. London, 1905-1908.
- Thomas, Gordon, and Max Morgan Witts. *The San Francisco Earthquake*. (New York: Stein and Day, 1971).
- United States Bureau of the Census. *Report on Insurance Business in the United States*. Eleventh Census, Extra Census Bulletin no. 6, 1891.
- United States Comptroller of the Currency. *Annual Reports*, various years.
- United States Secretary of the Treasury. *Annual Report on the State of the Finances for the Fiscal Year Ended June 30, 1906*. (Washington: GPO, 1906).

### **Endnotes**

<sup>1</sup> Temin [1998] surveys the causes of American business cycles from 1890-1990. He discusses the

endogeneity problem confronting researchers when they try to identify the effects of real and monetary disturbances.

<sup>2</sup> Neal [2000] suggests that economists should pay closer attention to the economic effects of natural disasters and climate changes.

<sup>3</sup> The GNP data are taken from Romer [1989].

<sup>4</sup> In addition to standard sources, we also searched *The Times*, *The Economist*, *The Commercial and Financial Chronicle*, and *The Financial Times* for non-U.S. factors that might account for the stringency in the London money market during 1906. These periodicals also indicated that tightness in the New York money market was the key source of both the London liquidity crisis and the large gold outflows from England. For example, in the fall of 1906, *The Economist* opened several issues with a discussion of the economic effects of excessive speculation in the New York money market on London. Other authors such as Kindleberger [1978] cite various events ranging from an Italian banking failure to a Russian war loan as possible sources of the British gold outflow. It remains, however, that during this period British gold outflows to the United States were nearly 250 percent greater than to any other country in 1906.

<sup>5</sup> Calomiris and Hubbard [1989] find that credit supply shocks were an important source of business cycle fluctuations for the period 1894-1909.

<sup>6</sup> Tallman and Moen [1998] find that gold shocks had a significant effect on output and the financial sector of the United States during the National Banking period. They note large, abnormal gold shocks prior to many financial panics. Canova [1991] documents the importance of external gold disturbances in propagating American financial crises prior to the founding of the Fed. Our analysis identifies the San Francisco earthquake and fire as the real shock that caused large gold flows and primed the New York market for the Panic of 1907.

<sup>7</sup>This was anticipated by the editor of the *Los Angeles Times* who wrote, on May 1, that "It is going to tax the ability, not only of the United States, but of the civilized world under existing circumstances, to finance the enormous project of rebuilding the city of San Francisco. . . ."

<sup>8</sup>The *New York Times* of April 26, 1906 reported that "If it were possible to show the shrinkage that has occurred in the market valuation of securities as a result directly or indirectly of the San Francisco disaster, it would probably be found to greatly exceed \$1,000,000,000. (. . . and these data) support the assertion that the immediate effect of the San Francisco calamity has been sufficiently discounted in the security markets for the time being, with allowance, of course, for liquidation in special securities for special reasons."

<sup>9</sup>Liquidation of insurance company assets drove down stock prices in general; at the same time, anticipated losses reduced the value of insurance companies' shares. For example, shares in London Assurance (one of the companies heavily involved in the San Francisco market) fell from 75 on March 30 to 51 1/2 on April 26. See the *Economist*, April 28, 1906.

<sup>10</sup>This company consisted of four insurance firms: Norwich Union, Commercial Union, Palatine, and Alliance.

<sup>11</sup>Business Minutes of the CGNU Archives, March-November 1906.

<sup>12</sup>In contrast, exports to France, Egypt, India, and Argentina each amount to only 10 to 15 percent of total or seasonally adjusted British gold outflows. If we include British gold exports to France in the spring -- to shore up French reserves lost as a result of that country's relief and aid payments to the United States -- we can say that more than 42 percent of seasonally- adjusted British gold exports were quake related, and such payments to the United States would account for more than 2.5 times the British gold exports to any other country in 1906. (British gold exports were deseasonalized using the Holt-Winters exponential smoothing algorithm).

<sup>13</sup> If insurance payments by all foreign companies are totaled, the *Times* estimated that over \$55 million in claims were paid out in later summer and early fall. Although Britain was by far the largest foreign insurer in San Francisco, there were substantial amounts insured by France and, especially, Germany. (A few German firms were forced into bankruptcy by the disaster.) The *Times* estimated that non-British firms accounted for ten percent of foreign insurance payments made. The *Times* can also be used to pinpoint when insurance companies paid out most of their claims. It noted on August 9, 1906 that "[insurance] losses *will be paid out of home funds.*" nearly three weeks later, on August 29, it reported that "thirty-five companies of the 120 involved in the San Francisco disaster have paid an aggregate of \$55,000,000 in claims." Finally, on October 18, the *Times* wrote that "all claims have now been paid expect those arising under policies with 'earthquake clauses.'"

<sup>14</sup> Data for the U.K. gold money stock are taken from Capie and Webber (1985).

<sup>15</sup> Individually, September 1906 ranks as #3 and October 1906 ranks as #4 in terms of the size of England's monthly net gold outflows between 1900 and 1913. The largest single month outflow during that period was in October 1907, at the height of the Panic.

<sup>16</sup>We searched the recorded minutes in the Bank's archives but located no specific statement about the impetus for raising the discount rate. The Archivist at the Bank of England, Mr. Henry Gillett, noted that the Bank of England did not record discussions of discount rate changes during this particular period in British economic history.

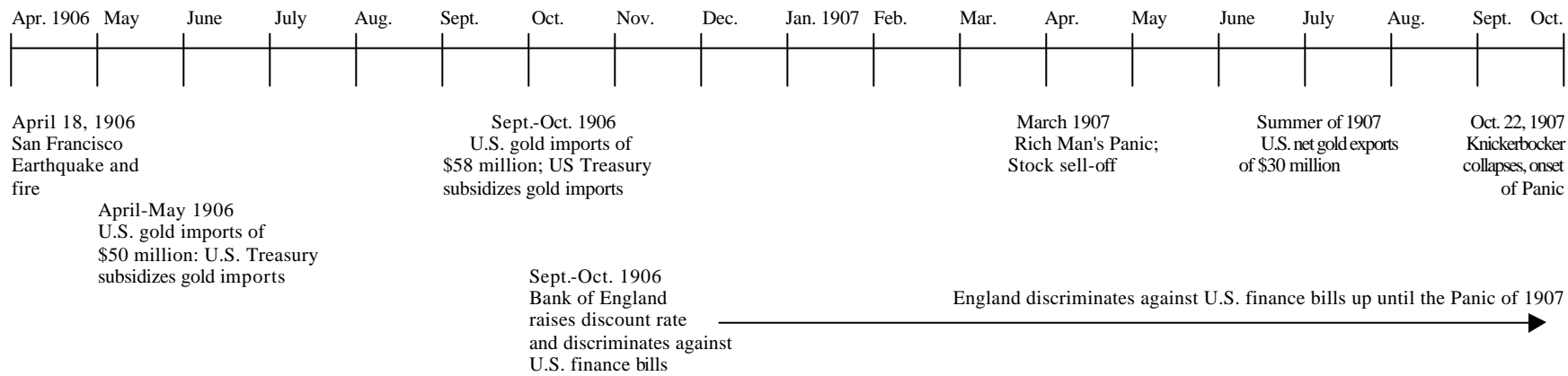
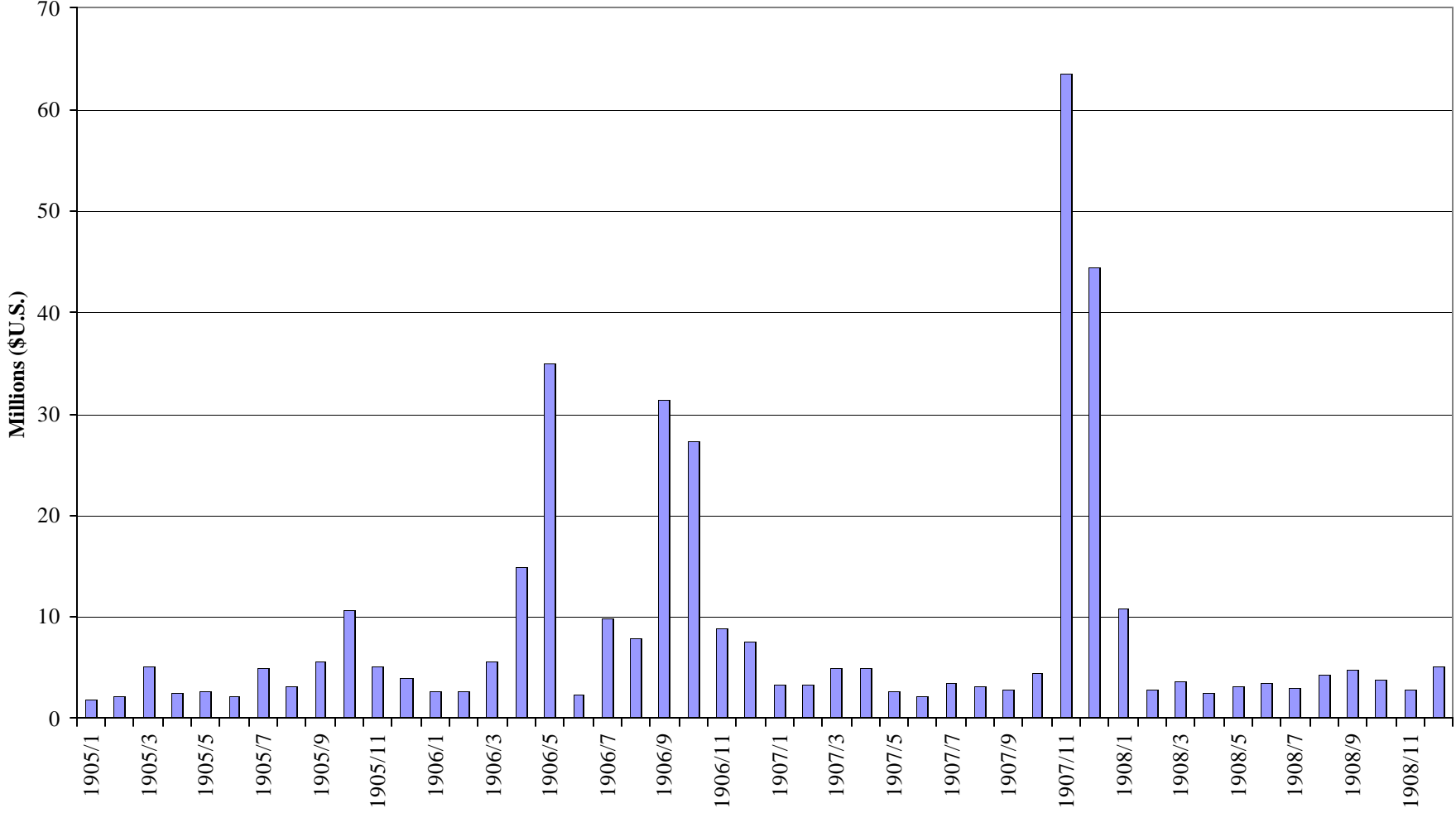


Figure I. Timing of Events Leading up to the Panic of 1907.

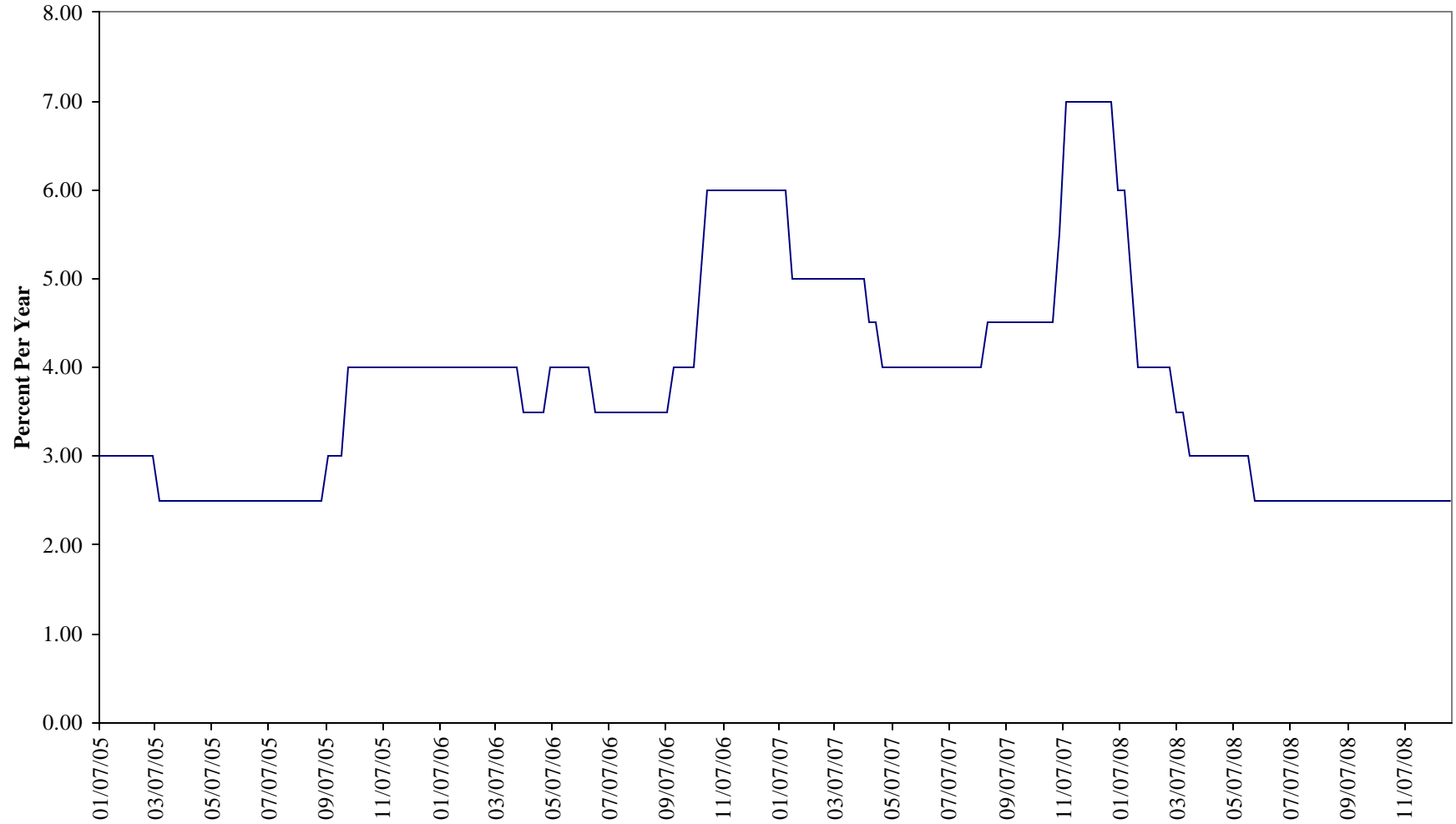
**Figure II**  
**United States Gold Imports 1905 - 1908**



Source: *Monthly Summary of Commerce and Finance*

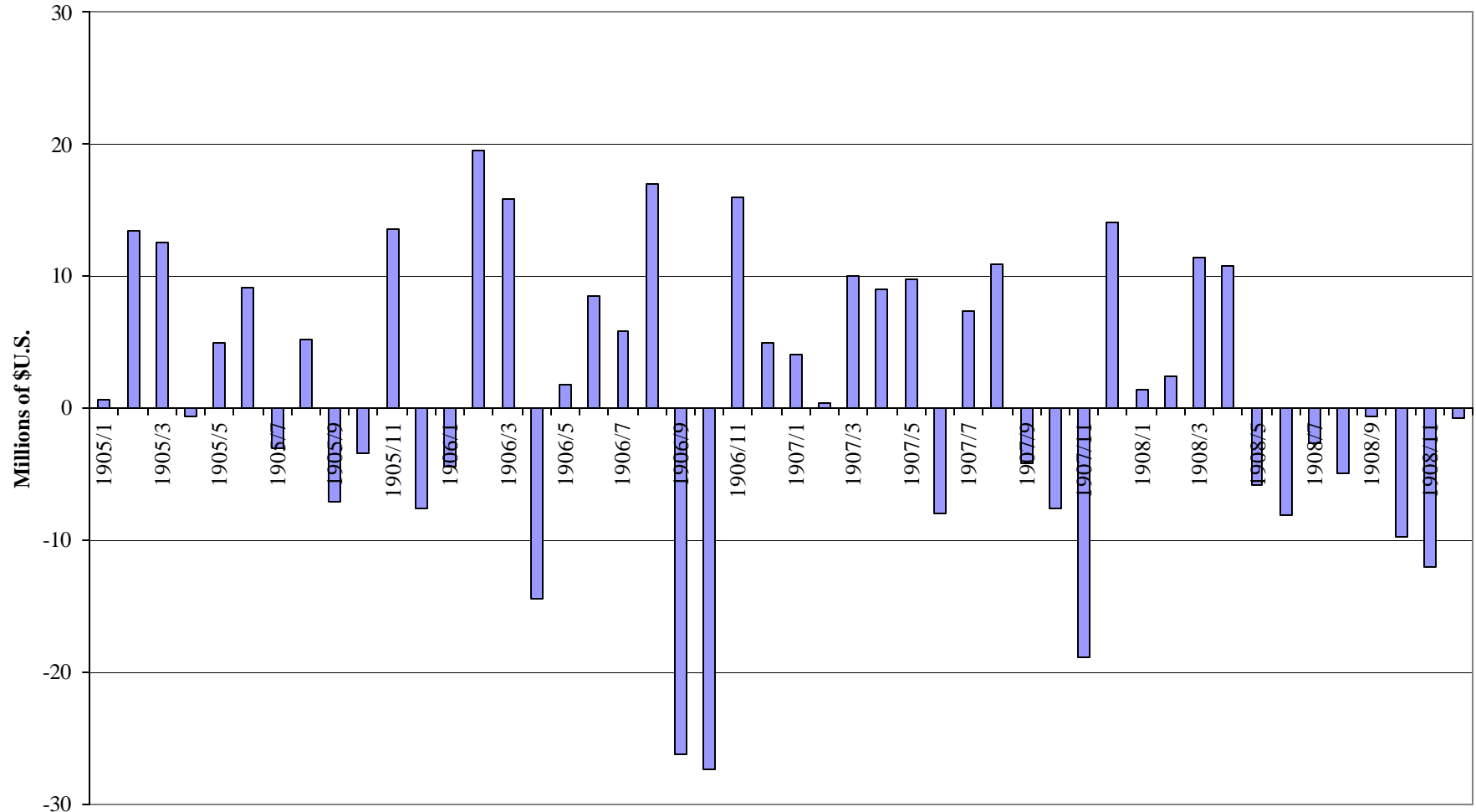
Monthly Intervals

**Figure III**  
**Bank of England Discount Rate 1905 - 1908**



Source: *Economist*

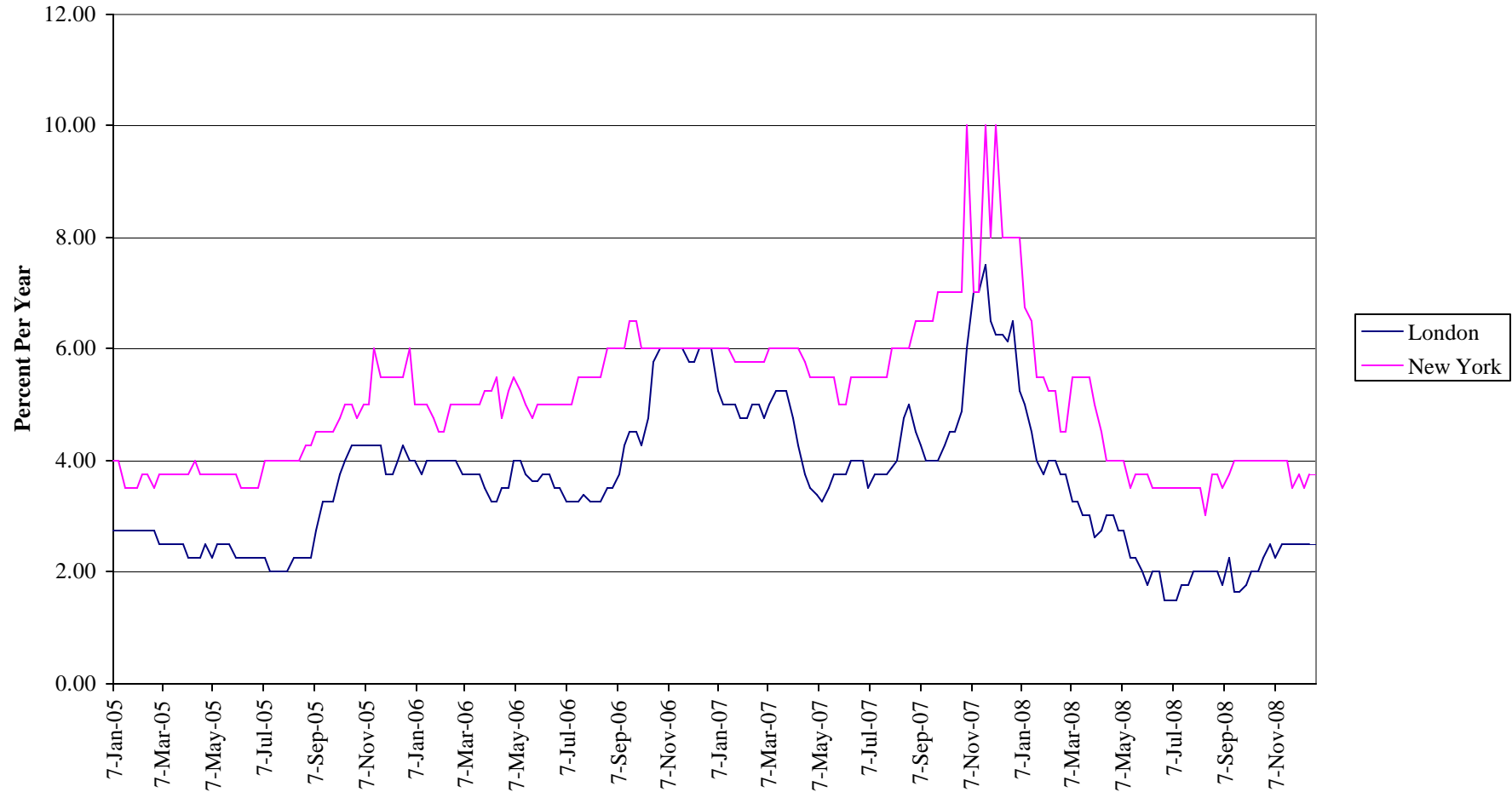
**Figure IV**  
**British Net Gold Imports (millions of \$U.S.) 1905 - 1908**



Source: *Economist*

Monthly Intervals

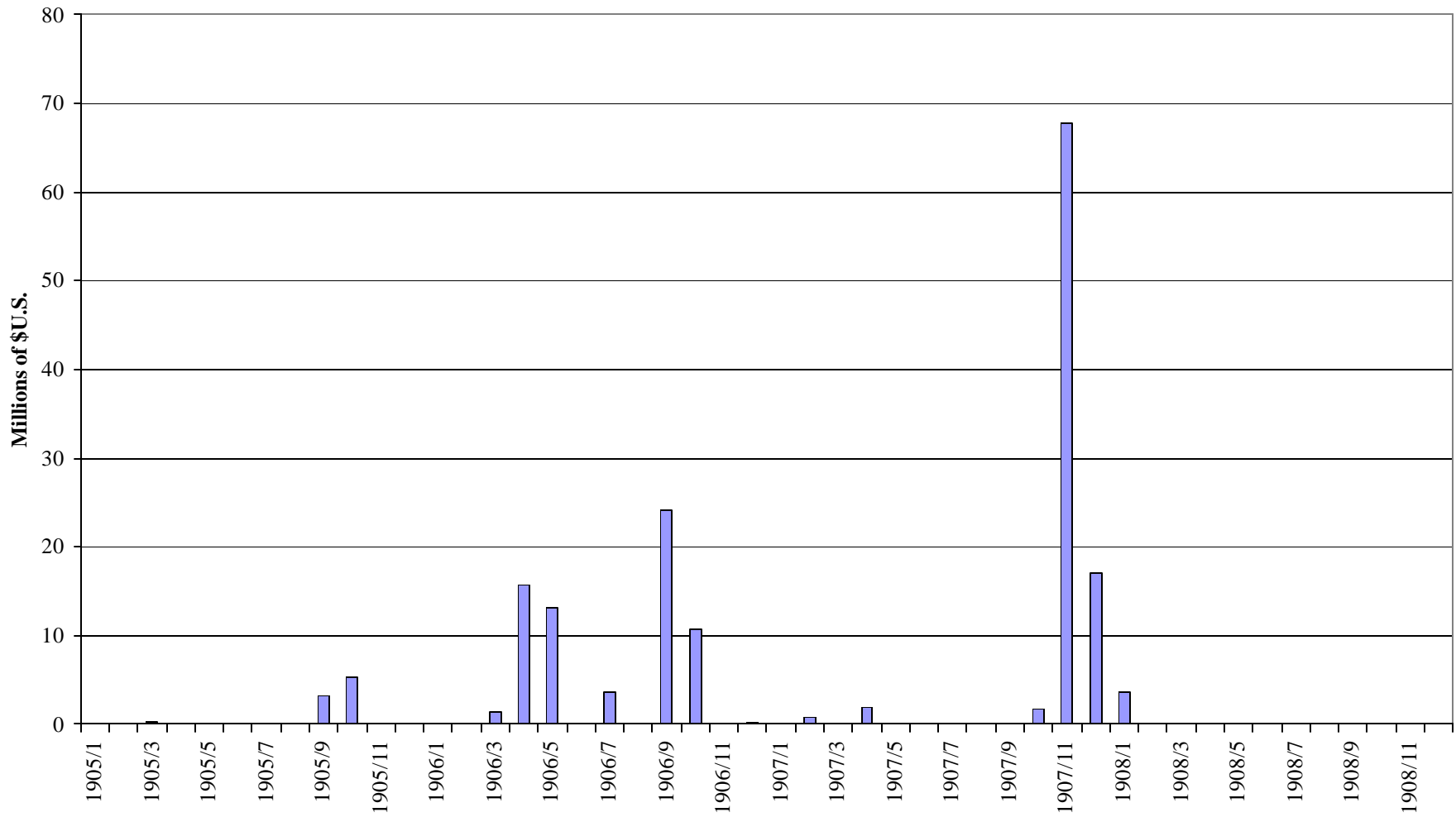
**Figure V**  
**U.K. and U.S. Short-Term Interest Rates 1905 - 1908**



Sources: *Economist* and  
*Commercial and Financial Chronicle*

Monthly Intervals

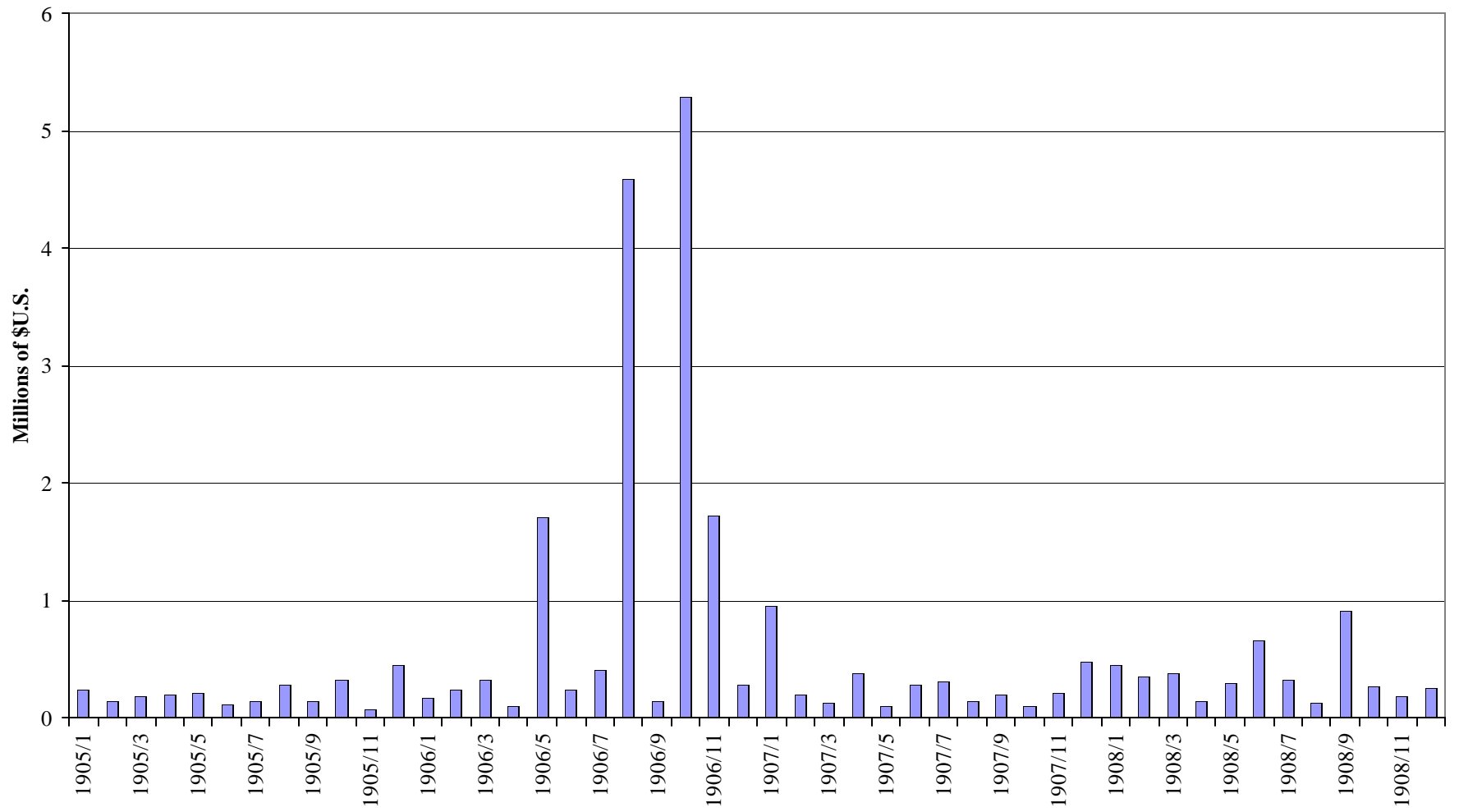
**Figure VI**  
**British Gold Exports to the United States (\$U.S.) 1905 - 1908**



Source: *Economist*

Monthly Intervals

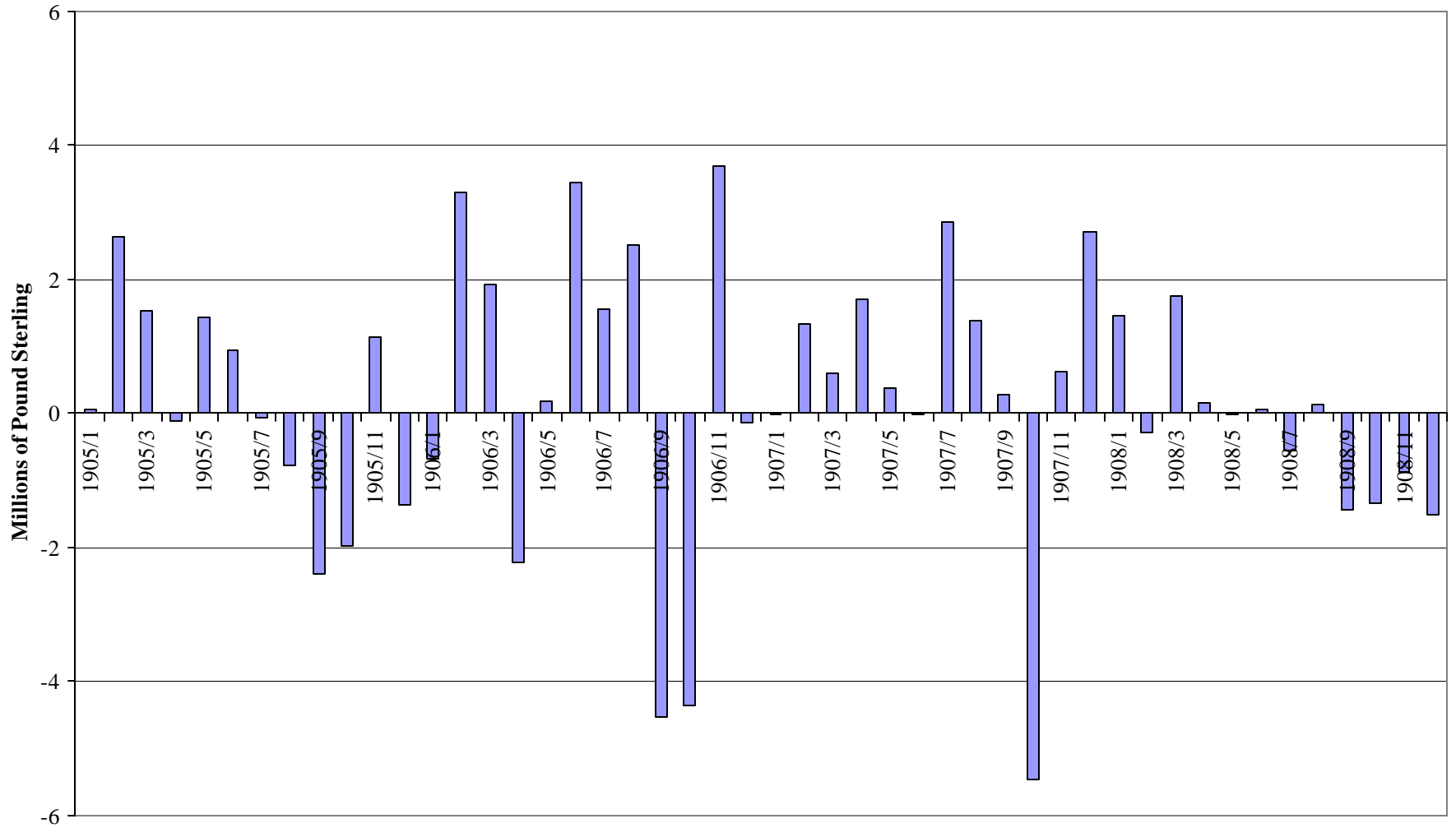
**Figure VII**  
**San Francisco Gold Imports 1905 - 1908**



Source: *Commercial and Financial Chronicle*

Monthly Intervals

**Figure VIII**  
**Bank of England Net Gold Flows 1905 - 1908**



Source: *Economist*

Monthly Intervals