Volume Title: A Retrospective on the Classical Gold Standard, 1821-1931

Volume Author/Editor: Michael D. Bordo and Anna J. Schwartz, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-06590-1

Volume URL: http://www.nber.org/books/bord84-1

Publication Date: 1984

Chapter Title: Canada without a Central Bank: Operation of the Price-Specie-Flow Mechanism, 1872-1913

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Chapter URL: http://www.nber.org/chapters/c11137

Chapter pages in book: (p. 547 - 586)

12 Canada without a Central Bank: Operation of the Price-Specie-Flow Mechanism, 1872–1913

Georg Rich

12.1 Viner's Analysis of the Price-Specie-Flow Mechanism

Viner's (1924) celebrated study of the Canadian balance of payments before 1914 represents one of the first attempts to verify empirically the classical adjustment mechanism under the gold standard, as described by the venerable price-specie-flow (PSF) model. In Viner's opinion, the Canadian experience between 1900 and 1913 provides an almost perfect opportunity for studying the operation of the classical adjustment mechanism. Towards the end of the nineteenth century, Canada experienced a remarkable surge in economic growth, triggered by a strong expansion in exports of mineral and agricultural products. Around 1903, the economic boom also led to an enormous acceleration of capital imports from Great Britain and the United States. Viner felt that the massive capital inflow created conditions highly favorable to an empirical test of the PSF model. On the basis of Canadian experience, it was possible to investigate how the capital inflow had been translated into a real transfer of goods and services and how efficiently the classical adjustment mechanism had operated.

After a laborious investigation of the relationship observed between the Canadian current-account balance, prices, the money stock, and the capital inflow Viner concluded that

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The author would like to thank Keith Acheson, Andre Burgstaller, Derek Chisholm, Jack Galbraith, Ed Neufeld, Gilles Paquet, Soo Bin Park, Ron Shearer, Anna Schwartz, Alexander Swoboda, and Tom Rymes for their very helpful suggestions and comments on this project. The author would also like to thank the Canada Council for the award of two research grants to support this study. Moreover, he is indebted to Carleton University for financial support in the form of a GR-6.

> Canadian borrowings obtained transfer into Canada smoothly and without noticeable friction in the form of a net commodity and service import surplus, as the result of relative price changes (and shifts in demands) which were of the character indicated as to be expected by the older writers. (Viner 1937, p. 413)

In order to summarize Viner's account of the adjustment mechanism, suppose that there occurred a once-and-for-all increase in the Canadian foreign debt. Moreover, assume that the current-account balance was zero initially. According to Viner, the capital flow led to an increase in the Canadian money stock as the Canadian borrowers converted their foreign-exchange receipts into domestic money and deposited these funds with the chartered banks, that is, Canada's commercial banks. As a result of the capital inflow, the chartered banks acquired additional reserves. However, despite the increase in their reserves, the banks did not augment their lending to Canadian residents; instead, they allowed their reserves to rise relative to their liabilities. The increase in bank-reserve ratios implied that the capital inflow was associated only with a primary round of domestic money creation—a direct result of foreign borrowing—but not with a secondary round, due to an expansion of the banks' Canadian loans (Viner 1924, chap. 8).[1]

As the Canadian money stock increased, Canadian demand for goods and services also rose. Since the prices of Canadian imports were largely set abroad, the increase in demand elicited primarily a rise in the relative prices of nontraded goods. The relative prices of exportable goods also rose, but less than those of their nontraded counterparts. These relative price changes were responsible for a shift in demand from nontraded to imported and exportable goods. Thus the current account tended to deteriorate in response to the capital inflow. Balance-of-payments equilibrium was restored when the cumulative value of the ensuing current-account deficits exactly matched the increase in the Canadian foreign debt. As a result of these deficits, the initial change in the Canadian money stock and relative prices was reversed. Since the money stock and prices only changed temporarily, the current-account balance in the new equilibrium was once again zero (1924, chaps. 9–11).[2]

In one respect, Viner found that the Canadian evidence did not conform to the classical PSF analysis. The students of the pre-1914 Canadian financial system (Johnson 1910, pp. 49–50; Viner 1924; Beckhart 1929, pp. 416–17, 430; Shearer 1965, p. 331) generally agree that the chartered banks held their reserves not only in the form of cash, but also in the form of foreign short-term assets—in particular, call loans extended in New York and London, as well as deposits with foreign banks. These foreign short-term assets, which I shall call secondary reserves, could be readily converted into gold if the chartered banks faced an unexpected drain of the precious metal. In Viner's opinion, the secondary reserves played an

important role in the adjustment mechanism. In the initial phase of the adjustment process the capital flow was not accompanied by an inflow of monetary gold, as the proponents of the PSF doctrine would have argued. Instead, the chartered banks augmented their secondary reserves. According to Viner, monetary gold was imported only as a result of the subsequent increase in the Canadian money stock since the chartered banks strove to maintain a stable ratio between their cash reserves and their liabilities. Thus flows of monetary gold across the Canadian border were not directly related to the capital inflow, but were a consequence of the change in the Canadian money stock. Viner's conclusions imply that the pre-1914 Canadian monetary system resembled a gold-exchange rather than a pure gold standard. However, in his view, this did not render the PSF mechanism inoperative since "fluctuations in the [secondary] reserves played the same role in the Canadian mechanism as that assigned to gold movements in the classical doctrine" (1937, p. 414).

Viner's account of the Canadian adjustment mechanism did not go unchallenged and elicited a large number of critical comments. Two shortcomings of his analysis are especially noteworthy.

First, his method of verifying the PSF model is valid only if capital flows can be regarded as a truly exogenous variable. Viner's verdict as to the speed and smoothness of the adjustment mechanism depends crucially on a close positive correlation he uncovered between the current-account deficit and capital inflows. In the presence of endogenous capital flows, it is conceivable that the correlation was merely the consequence of common factors impinging on the two variables. Therefore, the positive correlation does not necessarily indicate that the current account would have adjusted quickly if an exogneous capital inflow had occurred. A number of authors treating capital flows as an endogenous variable (Carr 1931; Meier 1953; Ingram 1957; Stovel 1959; Borts 1964; Cairncross 1968) have cast doubt on Viner's conclusions and have demonstrated convincingly that the evidence is consistent with alternative interpretations of the adjustment mechanism. For example, both the acceleration of the capital inflow and the deterioration of the current-account balance could have been explained by the shift to rapid economic growth observed around the turn of the century. However, these studies do not refute the Viner analysis; they merely suggest that Viner failed to furnish sufficient empirical support for the PSF model. Viner himself later on admitted that the evidence was consistent with alternative interpretations.[3]

Second, Viner's analysis of the link between the Canadian money stock and the balance of payments leaves much to be desired. A number of his critics have called into question his conclusion as to the unimportance of secondary money creation in the adjustment mechanism.[4] In reply to his critics, Viner conceded that "primary and secondary expansion of means

of payment both contributed to the creation of a situation in which necessary import surpluses could develop" (1937, p. 429). However, he did not completely change his mind in this regard, for he continued to insist that primary money creation had played the dominant role in the adjustment mechanism (p. 431).

If we consider the procedure Viner adopted for analyzing money creation by the chartered banks, his conclusions are hardly surprising. Interestingly enough, in his 1924 study he did not examine the relationship between the aggregate liabilities to Canadian nonbanks and the reserves of the chartered banks, but between a series that he called foreign-loan deposits and reserves. He defined foreign-loan deposits as the difference between the banks' aggregate liabilities and loans to Canadian nonbank residents (1924, p. 187).[5] As Goodhart (1969, pp. 148–51) has convincingly demonstrated, the Viner procedure is largely tautological since it effectively eliminates from the data on aggregate bank liabilities much of the variation due to secondary money creation.

In his 1937 study Viner evidently sensed the inadequacies of his procedure, for he decided to compare bank reserves with aggregate bank liabilities, as well as with foreign loan deposits. Although even a cursory glance at the data suggests that aggregate liabilities and reserves were not closely correlated, Viner stuck firmly to his conclusions as to the speed and efficiency of the Canadian PSF mechanism. In his opinion, the adjustment mechanism had operated efficiently despite the existence in Canada of a fractional reserve banking system. However, it is doubtful whether Viner correctly interpreted the available evidence. If he had carefully scrutinized the data, he would have noticed that over the period 1900–1913, out of thirteen pairs of annual changes in aggregate liabilities and reserves, five exhibited opposite signs.[6] Thus it does not appear that the link between the capital inflow, bank reserves, and the money stock was as close as Viner suggested.

Since Viner's conclusions are not entirely convincing, this paper reexamines the Canadian evidence on the operation of the PSF mechanism. Specifically, the objectives of the paper are twofold.

First, the link between the Canadian balance-of-payments surplus (or monetary flows in the balance of payments) and the Canadian money stock is analyzed. A study of this link is hampered by the fact that the existing data on monetary flows are marred by serious omissions and inconsistent reporting. In an effort to improve the quality of pre-1914 Canadian balance-of-payments data, I reestimated monetary flows on the basis of unpublished and hitherto unused published evidence available for the major chartered banks. For a discussion of the estimation procedure, the reader is referred to Rich 1983. I show that the evidence contradicts Viner's account of the way the PSF mechanism operated in Canada. In the long run, the money stock was determined chiefly by the

balance of payments, as suggested by the classical PSF-doctrine. However, in the short run, the two magnitudes were but loosely related. Over the business cycle, in particular, the money stock was negatively correlated with the balance-of-payments surplus. The money stock displayed a distinctive procyclical pattern, while an inverse relationship existed between the surplus and the business cycle. Thus, contrary to Viner's view, the PSF mechanism did not work well in the short run.

Second, I attempt to demonstrate that the failure of the PSF mechanism to operate in the short run was an important cause of cyclical instability in economic activity under the gold standard. The defects in the PSF mechanism implied that a cyclical change in the demand for goods and services could be accommodated, at least to some extent, by procyclical movements in the money stock, despite the severe constraints imposed by the gold standard on the ability of central and commercial banks to create money. The PSF mechanism acted as an effective stabilizer in the longer run, but it did not work quickly enough to prevent destabilizing movements in the money stock.

The reasons that various defects in the PSF mechanism could generate procyclical movements in the money stock are discussed in section 12.2 of the paper. In section 12.3 the relationship between the Canadian money stock and the balance-of-payments is examined. The empirical work is based on the period 1872–1913 for which adequate data are available, rather than the much shorter period underlying Viner's study. The principal conclusion of section 12.3 is that changes in the reserve ratios of the chartered banks were an important source of the procyclical movements in the money stock. Section 12.4 demonstrates how bank-reserve management was responsible for the failure of the PSF mechanism to operate in the short run and thus contributed to cyclical instability in Canadian economic activity.

12.2 Procyclical Movements in the Money Stock and Defects in the Price-Specie-Flow Mechanism

If the PSF mechanism had operated without any flaws, it is likely that the gold standard would have acted as an effective automatic stabilizer of cyclical fluctuations in economic activity. In order to illuminate the stabilizing role of the PSF mechanism, I first assume that cyclical disturbances were confined to Canada and then move on to the more realistic case in which business cycles were closely synchronized among the various gold standard countries.

Suppose that there was a cyclical surge in Canadian economic activity, while foreign economic activity remained unchanged. Moreover, assume that the current-account balance was zero initially. If we abstract from international capital flows, the cyclical upswing was bound to generate a

balance-of-payments deficit. Since, by assumption, the cyclical disturbance only affected Canada, foreign demand for Canadian exports was liable to remain unchanged, while the cyclical increase in Canadian economic activity induced a rise in imports. If the adjustment mechanism had worked along the lines postulated by Viner, the adverse balance of payments would have caused secondary reserves of the chartered banks, the money stock, and the stock of monetary gold to drop. The adjustment in the money stock would have acted as an automatic stabilizer designed to dampen the cyclical surge in economic activity.

The PSF mechanism would not have played a stabilizing role if the cyclical upswing in Canada had triggered an increase in domestic interest rates and capital imports. In that case the balance of payments would have shown a surplus despite the deterioration of the current account. Thus, the cyclical increase in economic activity could have been accommodated by a rise in the money stock and an outflow of monetary gold. The possibility of capital flows playing a destabilizing role was first recognized by Taussig (1927, pp. 207–9). In what follows, I attribute procyclical movements in the money stock to a Taussig effect if they were caused by destabilizing capital flows.[7]

In practice, cyclical disturbances were not confined to Canada, but affected several or all the gold standard countries. In a study of pre-1914 business cycles, Morgenstern (1959, chap. 2) uncovered a high degree of correlation between cyclical activity in Britain, France, Germany, and the United States. Moreover, a number of authors have shown that the Canadian economy was highly sensitive to cyclical fluctuations in U.S. economic activity. Prior to 1914, there was also a good correspondence between Canadian and British cycles, but the relationship was less close than with fluctuations in the United States (Chambers 1964; Hay 1966; Bonomo and Tanner 1972). In general the parallelism of cyclical movements was very close within North America and Europe, but less so between the two continents. However, North American and European cycles were not out of phase in any fundamental sense. The turning points of major cycles coincided closely, but North America witnessed a number of minor cycles that were not transmitted to Europe.

The high degree of synchronization among national busines cycles implies that the gold standard would have acted as an automatic stabilizer, as long as each country was prepared to maintain a rigid link between its money stock and reserve of monetary gold. Since the world stock of monetary gold was unlikely to vary procyclically,[8] it would have been impossible for all countries to import simultaneously additional monetary gold in order to accommodate a cyclical surge in economic activity through an expansion in their money stocks. Balance-of-payments surpluses or deficits would not have altered the world stock of monetary gold; they would merely have redistributed that stock among

the various countries. The money stocks could have moved procyclically in some countries, but only at the expense of countercylical fluctuations in the rest of the world. Thus the gold standard would have played a stabilizing role in the sense that it would have served as a prophylactic against procyclical movements in the money stock.

The available evidence for the pre-1914 period suggests that the prophylactic function of the gold standard left much to be desired. Although the cyclical pattern of the money stock has not been examined for all gold-standard countries, it is safe to argue that procyclical movements tended to dominate the scene. Existing research indicates that a variant of the Taussig effect was responsible for procyclical movements in the British money stock (Beach 1935; Ford 1962, chap. 3; Goodhart 1972, pp. 205–7; McCloskey and Zecher 1976). A persistent procyclical pattern has also been shown to exist for the U.S. and Canadian money stocks (Friedman and Schwartz 1963; Hay 1967). Similarly, it appears that the German and French money stocks were positively correlated with their respective business cycles (Rich 1983, chap. 8).

The pervasive procyclical pattern of the money stock documented for a variety of gold standard countries lends support to the view that the PSF mechanism suffered from serious defects which loosened the links between the various national money stocks and the respective reserves of monetary gold. At least three factors explain why the gold standard did not forestall procyclical movements in the money stock.

First, monetary authorities frequently did not observe the gold standard rules of the game (see Bloomfield 1959). Even before 1914, governments or central banks were empowered to issue notes under carefully specified conditions. Compliance with the rules of the game implied that the monetary authorities did not attempt to offset the impact of international gold flows on the supply of their notes. If they failed to adhere to the rules of the game, they effectively detached the money stock from international gold flows.

Two other sources of destabilizing movements in the money stock were, respectively, countercyclical changes in the reserve ratios of the commercial banks and cyclical shifts in the composition of that stock as between notes issued by the monetary authorities and liabilities of the commercial banks. The problem arising from cyclical movements in commercial-bank reserve ratios, in particular, was extensively discussed in the older literature on the gold standard (Hawtrey 1928, 1947; Taussig 1927, pp. 200–203; Beach 1935, chap. 2).

As far as Canada is concerned, the existing literature does not shed any light on the reasons for the procyclical pattern of the pre-1914 money stock. However, the above analysis points to two possible explanations. The first one is that the Canadian PSF mechanism worked without any flaws, but defects afflicted the mechanisms of other countries. In this

event, procyclical movements in the balance-of-payments surplus would have been responsible for the observed cyclical pattern of the money stock. Alternatively, defects in the Canadian mechanism itself might have been at the root of the problem.

In the following section, the sources of the procyclical movements in the Canadian money stock are traced, but before proceeding with this analysis we can dispense with one possible source. In pre-1914 Canada, destabilizing behavior on the part of the monetary authorities was not a significant cause of cyclical changes in the money stock. Although a central bank was not established until 1935, the government was entitled to issue notes, circulating under the name of Dominion notes. These notes served both as media of exchange for the nonbank public and as cash reserves for the chartered banks. They were convertible into gold at a fixed exchange rate and subject to a minimum gold-reserve requirement. However, while the government was obliged to maintain a minimum gold reserve, Canadian legislation did not impose minimum reserve requirements on the chartered banks. Nonetheless, the banks held ample cash reserves in the form of gold, subsidiary coin, and Dominion notes in order to safeguard the convertibility of their liabilities.

A large fraction of the Dominion notes was backed by gold in government vaults, but occasionally notes were issued on an uncovered basis. During the pre-1914 period, changes in uncovered Dominion notes, though quite important prior to 1886, were not a significant source of cyclical variation in the Canadian money stock. Aside from a temporary issue of uncovered Dominion notes at the end of 1907, the Canadian government from 1886 onwards was exemplary in its adherence to the rules of the game.[9]

12.3 Cyclical Movements in the Canadian Balance of Payments, the Monetary Base, and the Money Stock

12.3.1 Balance of Payments and Monetary Base

Table 12.1 presents data on the three major components of the Canadian balance of payments. The current account covers merchandise- and non-merchandise-trade flows, excluding net interest and dividend receipts for which the available data are extremely unreliable. The overall surplus or net monetary inflows equal the first differences in Canada's stock of international monetary assets, embracing monetary gold in the hands of the government, as well as monetary gold and secondary reserves held by the chartered banks. Data on monetary gold in the hands of private nonbank residents are not available, but it is generally agreed that in Canada holdings of gold coin outside the government and the chartered banks were negligible, at least prior to 1914. The difference

between the overall and current-account surplus is defined as residual inflows. In the absence of any errors and omissions, the latter would cover net interest and dividend receipts, as well as net inflows of foreign capital, excluding changes in secondary reserves of the chartered banks. Residual inflows are here employed as a proxy for nonmonetary capital flows. It is safe to assume that over the business cycle, the residual was closely correlated with nonmonetary capital flows since net interest and dividend receipts, in all probability, did not display much cyclical variability.[10]

The data on the current account are drawn from the standard sources (Viner 1924; Hartland 1955, 1960), save for the inclusion of new estimates of nonmonetary gold flows. The series on international monetary assets is compiled from the official banking statistics (Curtis 1931), but incorporates new data on monetary gold held by the chartered banks and the government, as well as revised estimates of secondary reserves. The available data on international monetary assets appear to be reasonably accurate for the post-1900 period, but not for the earlier years. However, the quality of the pre-1900 data is adequate for analyzing the cyclical attributes of the overall surplus.

In order to identify the cyclical characteristics of the Canadian balance of payments, the three components are related to the Canadian reference-cycle turning points (table 12.1). As indicated by that table, the overall surplus exhibits a cyclical pattern that is remarkably regular. The largest (smallest) surpluses tended to coincide with reference-cycle troughs (peaks), that is, the overall surplus was negatively correlated with the reference cycle throughout the period under study. The only exception to this finding was the cyclical upswing from 1896 to 1900, during which exports of gold (Yukon gold rush) and other mineral products grew very rapidly. The current-account surplus also moved countercyclically, but table 12.1 suggests that its cyclical pattern was not as regular as that of the overall surplus.[11] For the subperiod from 1894 to 1904, in particular, no distinctive pattern can be observed. Residual inflows, by contrast, displayed a complex pattern. From about 1885 to 1895 and 1900 to 1913, they also seem to have varied countercyclically, but during the remainder of the period the fluctuations were irregular.

The conclusions drawn from a cursory examination of table 12.1 are confirmed by a comparison of the average overall and current-account surplus, as well as average residual inflows, observed during the boom and depression phases of the reference cycle. The boom (depression) phase is defined as the period between the midpoint of a cyclical expansion (contraction) and the midpoint of the subsequent contraction (expansion). For each of the three series shown in table 12.1, the yearly observations are assigned to either the boom or depression phase, and averages are calculated for each of the two phases (table 12.2). Since the

Table 12.1 **Canadian Balance of Payments (millions of dollars)**

	Current-Account Surplus (excl. interest and dividends)	Residual Inflows	Balance-of-Payments Surplus	Reference Cycle		Current-Account Surplus (excl. interest and dividends)	Residual Inflows	Balance-of-Payments Surplus	Reference Cycle
1868	−8.2				1890	−21.4	15.6	−5.8	
1869	−1.7				1891	−12.3	28.6	16.3	T/03[a]
					1892	−6.5	8.4	1.9	
1870	−9.9				1893	−0.5	−2.8	−3.3	P/02
1871	−21.9				1894	3.1	10.4	13.5	T/03
1872	−28.6	20.6	−8.0		1894	4.2	9.3	13.5	
1873	−28.5	29.1	0.6	P/11[a]	1895	3.9	−9.4	−5.5	P/08[a]
1874	−33.3	32.8	−0.5		1896	12.5	−11.7	0.8	T/08[a]
1875	−19.7	18.9	−0.8		1897	42.4	−30.8	11.6	
1876	−10.0	7.0	−3.0		1898	19.2	−21.4	−2.2	
1877	−8.8	10.2	1.4		1899	15.0	−15.2	−0.2	
1878	−6.9	4.9	−2.0		1899	14.9	−15.1	−0.2	
1879	4.3	16.4	20.7	T/05					
					1900	18.5	−7.5	11.0	P/04
1880	5.6	0.4	6.0		1900	23.3	−12.3	11.0	
1881	−3.3	−2.9	−6.2		1901	21.3	8.7	30.0	T/02
1882	−15.4	1.4	−14.0	P/07	1901	21.3	−1.4	19.9	
1883	−21.0	31.3	10.3		1902	22.9	−16.2	6.7	P/12
1884	−15.6	12.3	−3.3		1903	−14.4	18.2	3.8	
1885	−12.5	15.2	2.7	T/03	1904	−39.0	70.4	31.4	T/06

1886	−14.5	10.5	−4.0		1905	−33.2	36.9	3.7	
1887	−13.7	11.5	−2.2	P/02	1906	−52.1	53.1	1.0	P/12
1888	−17.5	26.9	9.4	T/02	1907	−119.5	102.4	−17.1	
1888	−17.5	28.8	11.3		1908	−29.7	147.9	118.2	T/07
1889	−22.9	8.3	−14.6		1909	−66.8	94.8	28.0	
1890	−20.8	15.0	−5.8	P/07[a]	1910	−141.9	112.5	−29.4	P/03
					1911	−213.6	248.8	35.2	T/07
					1912	−316.9	310.3	−6.6	P/11
					1913	−254.5	281.7	27.2	

Sources: Rich 1983, table 2.4. For data on the Canadian reference cycle, see Hay 1966.

Notes: The turning points are identified by P for peak and T for trough. The number following the dash indicates the month in which a turning point occurred.

Discontinuities in the data, shown by entries above and below a horizontal line for the same year, are accounted for as follows:

1888: The discontinuity in the overall balance-of-payments surplus is due to discontinuities in the available data on monetary gold and secondary reserves of the chartered banks. The official statistical sources on monetary gold (Curtis 1931, p. 36) omit part of the gold the chartered banks held at their foreign branches. For this reason, I compiled a new series on monetary gold including most of the omitted items. The new series is available for the period from the end of 1887 to the end of 1913. For the pre-1887 period, I employed the Curtis data. As far as secondary reserves are concerned, no information is available on the chartered banks' foreign call loans prior to 31 December 1887.

1890: Minor discontinuity in the current-account surplus, due to a break in the data on net exports of nonmonetary silver.

1894: Discontinuity in the current-account surplus. Prior to 1894, reasonably reliable data on merchandise trade are available only for fiscal years. For the pre-1894 period, the data shown in the table are calendar-year estimates, derived from fiscal-year data.

1899: Minor discontinuity in the current-account surplus. Data for 1899 onwards include my own estimates for net exports of nonmonetary refined gold.

1900: Major discontinuity in the current-account surplus, due to a discontinuity in the Hartland (1955, 1960) estimates of nonmerchandise trade.

1901: Major discontinuity in the overall balance-of-payments surplus due to a discontinuity in the data on the chartered banks' secondary reserves. The official sources (Curtis 1931) do not provide data on foreign call loans of the chartered banks for the period prior to 31 July 1900. On the basis of unpublished information, I was able to make fairly crude annual estimates of foreign call loans back to 1887.

[a]Some uncertainty exists about the exact timing of these turning points.

Table 12.2 **Cyclical Characteristics of the Balance of Payments and the Monetary Base (millions of dollars)**

Averages of Annual Data	Boom Phase	Depression Phase
1872–87		
Current-account surplus	−18.8	−5.6
Residual inflows	16.0	9.9
Overall surplus	−2.8	4.3
Δ monetary base	−2.6	4.8
1888–96		
Current-account surplus	−9.5	−3.3
Residual inflows	4.0	13.8
Overall surplus	−5.5	10.5
Δ monetary base	−5.6	10.4
1901–13		
Current-account surplus	−117.9	−58.8
Residual inflows	119.6	100.5
Overall surplus	1.7	41.7
Δ monetary base	2.4	41.0

Sources: Table 12.1 and Rich 1983, tables 2-1 and 2-2.

Notes: The following years are assigned to the boom phase: 1872–76, 1881–83, 1886–87, 1889–90, 1892–93, 1895, 1898–1900, 1902–3, 1906–7, 1909–10, 1912–13. The remaining years are assumed to belong to the depression phase.

data in table 12.1 suffer from a number of major breaks, the period under study is divided up into subperiods delineated by these breaks. The subperiod extending from 1897 to 1900, for which the normal cyclical pattern of the overall surplus does not obtain, is ignored altogether.

If the current account and overall surplus had reached a peak (trough) near a reference-cycle trough (peak), we should find that the corresponding averages were consistently higher during depressions than during booms. Table 12.2 brings out clearly the expected pattern. Not surprisingly, for residual inflows the data do not reveal a clear-cut pattern. From 1872 to 1887 residual inflows moved procyclically, if at all, while in the second subperiod the observed pattern was countercyclical. In the third subperiod no marked cyclical pattern seems to have prevailed. However, the average for booms is strongly influenced by the exceedingly high figure for 1912. If the averages are recalculated for the shorter subperiod from 1901 to 1911, they take on values of $60.8 and $100.5 million for booms and depressions, respectively. Thus, the evidence confirms our earlier observation that during much of the post-1900 period, residual inflows varied countercyclically.

On the basis of quarterly data available for the post-1900 period, it is possible to test the null hypothesis that on average, the overall surplus or the growth in international monetary assets was the same during booms and during depressions. The test of the null hypothesis involves rates of

change, rather than first differences in international monetary assets, in order to eliminate the scale effect arising from the rapid growth in that variable after 1900. If the scale effect were not eliminated, the test would be biased against the cyclical fluctuations in the overall surplus observed in the early part of the 1900s. As indicated by table 12.3, the null hypothesis is clearly rejected at the 99 percent level of significance, that is, the rate of growth in international monetary assets displayed a statistically significant countercyclical pattern.

The countercyclical movements in the overall surplus also produced countercyclical movements in the growth of the monetary base, assumed to embrace the bank's cash (in the form of monetary gold and Dominion notes) and secondary reserves, as well as Dominion notes in the hands of the nonbank public. Alternatively, the monetary base may be defined as the sum of international monetary assets and uncovered Dominion notes. Since I pointed out earlier that uncovered Dominion notes did not vary much over the business cycle, the cyclical pattern of the monetary base was almost identical to that of international monetary assets (tables 12.2 and 12.3). As indicated by figure 12.2, the growth in the monetary base invariably reached a peak (trough) near reference-cycle troughs (peaks). In the subsequent analysis, I assume that the monetary base consisted entirely of international monetary assets.

12.3.2 Money Stock

The cyclical pattern of the balance of payments can be contrasted with that of the money stock. In this study I employ a broadly defined concept of the money stock, embracing Dominion notes outside the banking system, demand and notice deposits in the hands of the private nonbank public and the provinces, as well as notes issued by the chartered banks. Notice (or time) deposits are included in the money stock since they differed from demand deposits by degree rather than substance. A large fraction of notice deposits consisted of funds in savings accounts that were endowed with limited checking privileges.

In table 12.3 various significance tests are performed in order to ascertain the cyclical attributes of the money stock. The tests are based on quarterly rates of growth in the money stock for the period from 1874 III to 1913 IV. The evidence suggests that the difference in the average growth between booms and depressions was not statistically significant. However, a distinctive cyclical pattern can be discerned from the data if the reference cycle is split up into an expansion and a contraction phase (extending from trough to peak and peak to trough respectively). Throughout the period under study, the average growth in the money stock was significantly higher during expansions than during contractions, with the exception of the subperiod from 1887 to 1895 for which no statistically significant pattern can be observed.

Table 12.3 **Cyclical Characteristics of International Monetary Assets, the Monetary Base, and the Money Stock (arithmetic means of quarterly rates of change)**

	Boom Phase	Depression Phase	*t*-values	Expansion Phase	Contraction Phase	*t*-values
			International Monetary Assets			
1901 III–1913 I	0.80	4.62	5.14 (52)	2.76	2.62	0.14 (52)
			Monetary Gold			
1888 III–1894 IV	1.39	1.99	0.43 (16)	1.67	3.10	1.00 (15)
1901 III–1913 I	2.92	4.06	2.51 (52)	2.83	4.25	3.11 (52)
			Monetary Base			
1901 III–1913 I	0.80	4.14	5.00 (52)	2.55	2.35	0.24 (52)
			Money Stock			
1874 III–1886 IV	1.00	0.62	0.82 (52)	2.24	−0.19	7.86 (51)
1887 I–1895 III	1.18	1.56	1.79 (39)	1.37	1.21	0.66 (40)
1895 IV–1913 I	2.28	2.40	0.55 (78)	2.65	1.86	4.20 (78)

Source: Rich 1983, tables 2-1 and 2-2.

Notes: The data are smoothed by a seven-quarter moving average in order to eliminate intracyclical variation. Rates of change are calculated from the smoothed series. The significance tests for monetary gold for the period 1888 III–1894 IV rest on semiannual rates of change since quarterly data are unavailable. The semiannual rates of change are calculated from data smoothed by a 1½-year moving average. The quarterly and semiannual observations, respectively, are assigned to the various reference-cycle phases as follows:

Boom phase—quarterly: 1874 III–1876 III, 1880 IV–1883 IV, 1886 I–1887 III, 1889 II–1890 IV, 1892 I–1893 III, 1984 IV–1896 I, 1898 II–1900 III, 1902 I–1903 III, 1905 III–1907 III, 1909 II–1910 IV, 1921 I–1913 IV.

Boom phase—semiannually: 1889 first half–1890 second half, 1892 first half–1893 second half, 1894 second half.

Depression phase: remaining and overlapping observations.

Expansion phase—quarterly: 1879 II–1882 III, 1885 I–1887 I, 1888 I–1890 III, 1891 I–1893 I, 1894 I–1895 III, 1896 III–1900 II, 1901 I–1902 IV, 1904 II–1906 IV, 1908 III–1910 I, 1911 III–1912 IV.

Expansion phase—semiannually: 1888 second half–1890 second half, 1891 first half–1893 first half, 1894 first and second halves.

Contraction phase: remaining and overlapping observations.

The figures in parentheses denote degrees of freedom. For the significance test, see Yamane 1973, pp. 661–69.

The evidence suggests that in general, the growth in the money stock reached a cyclical peak (trough) near the midpoint of an expansion (contraction). From the cyclical pattern displayed by the *growth rate* of the money stock, it is possible to make inferences about the cyclical pattern of its *level*. If the money stock had been characterized by regular oscillations, the turning points in its level would have followed the corresponding turning points in its rate of growth (or, more precisely, in its first differences) by a lag amounting to one quarter of the length of a full reference cycle. Since the growth rates typically peaked at the midpoint of expansions, it is likely that the peaks in the level coincided with reference-cycle peaks. An analogous pattern would have obtained for the contraction phase. Consequently, the results of table 12.3 can also be interpreted to imply that the *level* of the money stock was positively correlated with the *level* of economic activity.

It would be useful to test directly the proposition that the cyclical turning points in the levels of the money stock and the reference cycle tended to coincide. As it is well known, however, all the available techniques for identifying the cyclical turning points in a series subject to a strong trend are somewhat arbitrary (see Mintz 1969; Beveridge and Nelson 1981). Besides drawing inferences from the observed variation in growth rates, we may analyze the cyclical attributes of the money stock on the basis of a detrended series. Figures 12.1 and 12.2 show how the deviations in the money stock from its trend are related to the reference cycle. The message conveyed by the two charts tends to confirm the conclusions drawn from the analysis of growth rates. Save for the subperiod from 1887 to 1895, the detrended money stock as a rule, reached peaks (troughs) near reference-cycle peaks (troughs) with little evidence of systematic leads or lags between the turning points in the two series.[12] The only exceptions to this rule were the expansion of 1885–87 and the contraction of 1910–11. During the expansion of 1885–87, the detrended money stock decreased, but at a much lower rate than during the preceding contraction. Similarly, the contraction of 1910–11 witnessed a decline in the growth of, but not an absolute decrease in, the detrended money stock. During the subperiod from 1887 to 1895, by contrast, the detrended money stock did not always move procyclically (1894–95) or the cyclical turning points in that stock led cyclical turning points in the reference cycle by several quarters (1887, 1889, and 1890).

12.3.3 Relationships between the Money Stock and the Balance of Payments

Since the balance of payments was virtually the only source of change in the monetary base, the relationship between the money stock and the balance of payments can be analyzed by examining the link between that stock and the monetary base. Considering the cyclical attributes of the

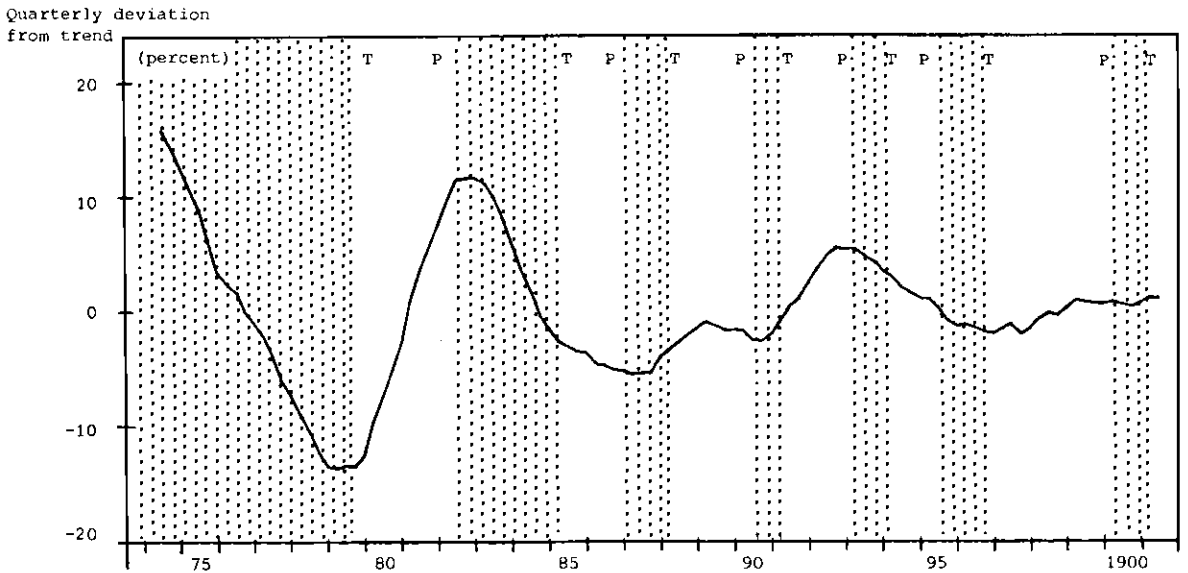

Fig. 12.1 Cyclical movements in the money stock, 1874 II–1901 II. The data were adjusted by a seven-quarter moving average. The percentage deviations represent the difference between the natural logs of the actual and trend values of the money stock. Since the growth in the money stock accelerated considerably with the onset of the natural-resources boom around 1896, trend values were determined by two regression equations:

$$\text{Subperiod 1874 II–1896 III: } \ln M = \underset{(308.9)}{4.34} + \underset{(44.9)}{0.0121}t,\ R^2 = 0.958.$$

$$\text{Subperiod 1896 III–1913 I: } \ln M = \underset{(888.7)}{5.40} + \underset{(155.0)}{0.0241}t,\ R^2 = 0.999.$$

M and t denote the money stock and time, respectively; numbers in parentheses are t-values. Shaded areas identify reference-cycle contractions. *Source*: See Rich 1983, table 2-1.

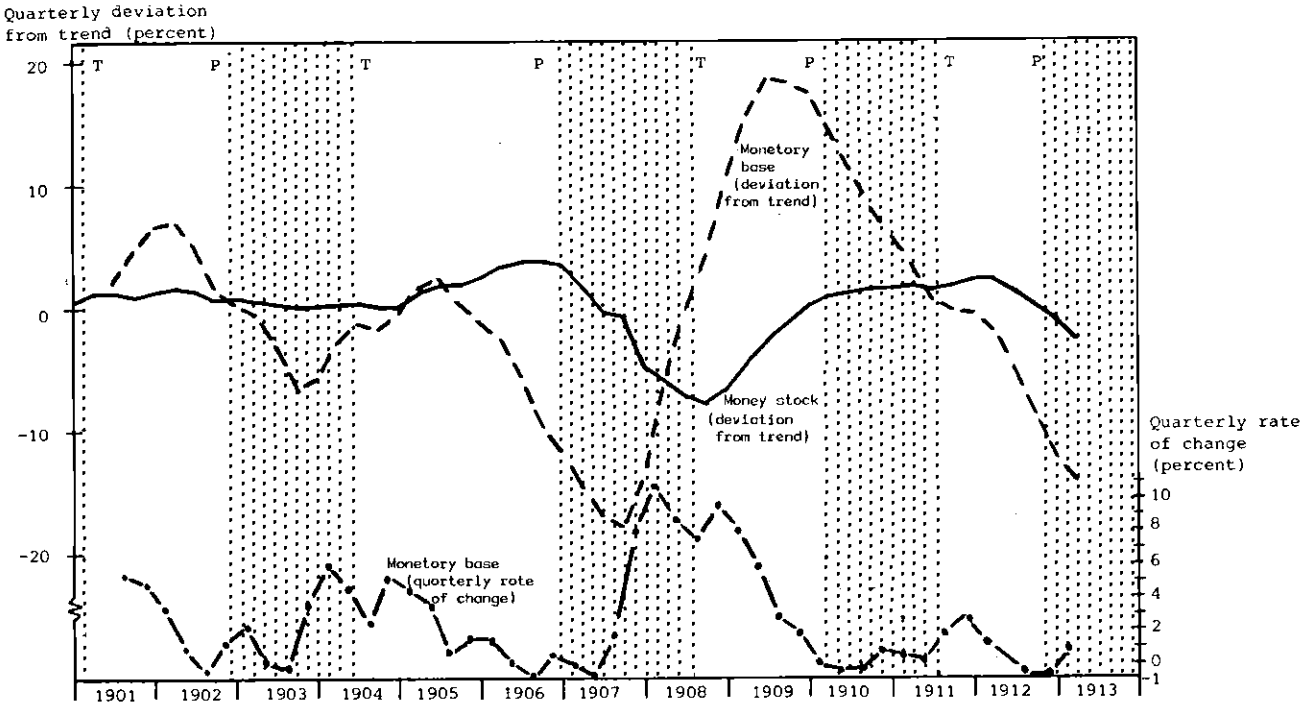

Fig. 12.2 Cyclical movements in the monetary base and the money stock, 1900 IV–1913 I. The data were adjusted by a seven-quarter moving average. Trend values of the monetary base (H) were determined by the following regression equation for the period 1901 II–1913 I.

$$\underset{}{\ln H} = \underset{(167.9)}{4.47} + \underset{(29.8)}{0.0281t}, \; R^2 = 0.950.$$

Source: See fig. 12.1.

two monetary aggregates, it is evident that the cyclical turning points in the money stock tended to lag the corresponding turning points in the monetary base. The growth in the base typically peaked near reference-cycle troughs, while the growth in the money stock attained its highest value near the midpoint of the subsequent expansion (tables 12.2 and 12.3). The observed growth patterns imply that the level of the monetary base and the money stock, respectively, peaked near the midpoint and the end of reference-cycle expansions (figure 12.2). Thus, under the pre-1914 Canadian gold standard, the money stock and the monetary base, at least in the short run, were not closely correlated.

The reason that there was only a very loose short-run link between the two variables must be sought in bank-reserve management. In order to analyze this link, the money stock is related to the monetary base by the well-known identity:

$$M = H(1 + e)/(c + e), \tag{1}$$

where M, H, c, and e denote, respectively, the money stock, the monetary base, the aggregate reserve ratio (cash and secondary reserves ÷ liabilities, i.e., deposits and notes) of the chartered banks, and the currency-liability ratio (Dominion notes in the hands of the nonbank public ÷ liabilities of the banks). Identity (1) captures the various possible sources of change in the money stock.

Since H varied countercyclically, the procyclical pattern in the money stock was not attributable to changes in H, but to marked countercyclical movements in the aggregate reserve ratio. That ratio typically rose during the depression phase of the reference cycle, reaching a peak as it approached the midpoint of an expansion. The opposite pattern can be observed for the boom phase (table 12.4.). During the first half of an expansion, a cyclical increase in the money stock was accompanied by a cyclical increase in the monetary base, but part of the latter was absorbed by a drop in the aggregate reserve ratio. During the second half, however, the cyclical increase in the money stock was due entirely to a cyclical rise in the aggregate reserve ratio. The currency-liability ratio, by contrast, did not make any contribution to the cyclical variation in the money stock. Holdings of Dominion notes outside the banking system were neither a large component of the money stock,[13] nor did e fluctuate cyclically (table 12.4).[14] Prior to 1914, the Canadian money stock consisted almost exclusively of assets supplied by the chartered banks.

An analysis of the link between the Canadian money stock and the balance of payments also yields intriguing results concerning the role of gold flows in the adjustment mechanism. During the period under study, the monetary gold stock typically varied in a countercyclical fashion, very much like total international monetary assets. The only exception to this pattern was once again the subperiod from 1897 to 1900. Prior to 1897,

Table 12.4 **Cyclical Characteristics of the Aggregate Reserve Ratio and the Currency-Liability Ratio (percent)**

	Boom Phase	Depression Phase	Expansion Phase	Contraction Phase	Total
Aggregate Reserve Ratio					
1873–1887	30.2	29.1	37.5	26.0	29.6
1887–1900	22.9	24.3	24.3	22.5	23.7
1900–1913	25.8	25.9	28.7	23.8	25.9
Currency-Liability Ratio					
1873–1913	3.0	3.0	3.0	3.0	3.0

Source: Calculated from Rich 1983, table 3-3.

Notes: The data in the table represent arithmetic means of end-of-year ratios. The annual observations were allocated to the various reference-cycle phases in the following way. Boom phase: 1873–75, 1880–82, 1886, 1889, 1892, 1894–95, 1898–99, 1902, 1905–6, 1909, 1912–13. Expansion phase: 1879–81, 1885–86, 1888–89, 1891–92, 1894, 1896–99, 1901, 1904–5, 1908–9, 1911. The depression and contraction phases cover the respective remaining years.

however, the countercyclical movements in the monetary gold stock were completely dwarfed by secondary-reserve flows. After 1900 the amplitude of these movements increased considerably relative to that of secondary reserve flows, but the latter continued to fluctuate more strongly than the former. Table 12.3 sheds light on the cyclical attributes of the monetary gold stock. Over the subperiod from 1888 III to 1894 IV, for which reasonably reliable semi-annual data are available, the monetary gold stock tended to grow most rapidly (slowly) during the contraction/expansion phase of the reference cycle. The observed cyclical pattern, however, was not statistically significant. In the post-1900 period, by contrast, the growth in the monetary gold stock displayed a statistically significant countercyclical pattern.[15]

In summary, the Canadian evidence on the link between the money stock and the balance of payments does not accord well with the classical PSF-analysis. Over the business cycle, the growth in the money stock was not closely correlated with the overall balance-of-payments surplus. During the latter stages of a reference-cycle expansion and contraction, in particular, the balance of payments failed to act as an effective prophylactic against procyclical movements in the money stock. These movements were not due to a procyclical pattern of the current-account surplus or to the influence of a Taussig effect, but were explained by a defect in the Canadian PSF mechanism. Consequently, the evidence clearly contradicts Viner's assertion that the Canadian mechanism operated efficiently both in the short and long run.

At least for the post-1900 period, the evidence is also inconsistent with Viner's contention that payments imbalances were settled by flows of

secondary reserves, rather than monetary gold. Admittedly, over the business cycle, secondary reserves fluctuated more strongly than monetary gold, but after 1900 the roles played in the adjustment mechanism by the two categories of monetary flows were no longer fundamentally different. Interestingly enough, during cyclical upswings, the deterioration in the overall balance of payments implied that Canada curtailed the growth in imports of monetary gold. In this manner, precious metal was made available to the rest of the world and helped to accommodate to a modest extent cyclical upswings through increases in the money stock abroad.

12.4 The Role of Bank-Reserve Management in the Canadian Business Cycle

Considering the importance of bank-reserve management as a source of procyclical movements in the Canadian money stock, the question arises how profit-maximizing banks, operating within the constraints of the gold standard, could contribute to cyclical instability in economic activity. In this section of the paper, I sketch in a nontechnical manner a model designed to elucidate the significance of bank-reserve management as a destabilizing force.[16] The theoretical analysis rests upon two building blocks. First, following the majority of other investigators, I assume that cyclical movements in Canadian economic activity were induced by disturbances from abroad. For the sake of simplicity, the foreign cyclical disturbance is depicted by an exogenous change in Canadian exports. Furthermore, drawing on the research by Bryce (1939) and Rosenbluth (1958), I assume that a cyclical change in exports resulted in a deterioration rather than an improvement in the Canadian current-account balance, owing to an accelerator effect on imports of capital goods. Second, the model incorporates the observation that the chartered banks accommodated cyclical movements in economic activity by varying the aggregate reserve ratio. Countercyclical changes in the aggregate reserve ratio could have been caused by a number of factors, but as a first step I assume that they were the result of procyclical movements in domestic interest rates or in the opportunity cost of holding reserves.

Now suppose that a cyclical expansion in foreign economic activity elicited a rise in Canadian exports. Provided the Canadian current and capital-account balance was zero initially, the impact effect of the exogenous disturbance was to augment economic activity, the demand for money, and interest rates in Canada. As interest rates rose, the chartered banks were prompted to expand the money supply by lowering the aggregate reserve ratio. But the impact effect of the exogenous disturbance was not the end of the story. The cyclical surge in Canadian economic activity was associated with a deterioration in the current-

account balance. Abstracting for the moment from capital flows, the current-account deficit should have led to a reduction in the monetary base, pushing up domestic interest rates still further.

The surge in economic activity tapered off when exports reached a cyclical peak. The theoretical analysis suggests that a subsequent downturn in economic activity, induced by a cyclical drop in exports, did not cause domestic interest rates to decline instantaneously. At this stage of the cycle, domestic interest rates were influenced by two opposing forces. On the one hand, the cyclical contraction in economic activity and the attendant decrease in the demand for money tended to lower domestic interest rates. On the other hand, the overall balance-of-payments deficit, inherited from the previous expansion, induced a decrease in the monetary base, putting upward pressure on domestic interest rates. Since the monetary base ceased to fall at the end of a boom, domestic rates should have reached a cyclical peak at some point during the first half of a reference-cycle contraction. In other words, the cyclical turning points in domestic interest rates should have followed the corresponding reference-cycle turning points with a time lag amounting to less than half the length of the respective reference-cycle expansion or contraction. Thus, the model yields a testable proposition about the cyclical pattern of Canadian interest rates.

Since there is a dearth of statistics on pre-1914 Canadian interest rates, I limit myself to an examination of the cyclical movements in the Montreal call-loan rate, for which data are available for the period 1900–1913.[17] Figure 12.3 suggests that the Montreal call-loan rate tended to peak during the first half (1903) or near the midpoint (1911) of reference-cycle contractions. During the contraction of 1907–8, it attained a peak of 6 percent in the first quarter of 1907 and stayed at that level for half a year (on a seasonally adjusted basis). Therefore, the timing of that peak is somewhat uncertain. The evidence is consistent with the view that the Montreal call-loan rate peaked either during the first half or near the midpoint of the contraction of 1907–8. Similarly, the cyclical troughs in that rate tended to occur during the first half (1901, 1905) or near the midpoint (1909, 1912) of reference-cycle expansions. On the whole the cyclical peaks (troughs) in the Montreal call-loan rate were closer to the midpoints of reference-cycle contractions (expansions) than to the reference-cycle peaks (troughs). For the period extending from the trough of 1901 to the peak of 1912, the turning points in the Montreal call-loan rate lagged the corresponding turning points in the reference cycle by an average of 2.5 quarters and led the corresponding midpoints by an average of 0.7 quarters.[18] Thus, the theoretical analysis is at least partly supported by the empirical evidence. The Montreal call-loan rate clearly lagged the reference cycle, but for roughly half of all the expansions and contractions the lag was longer than predicted by the model.

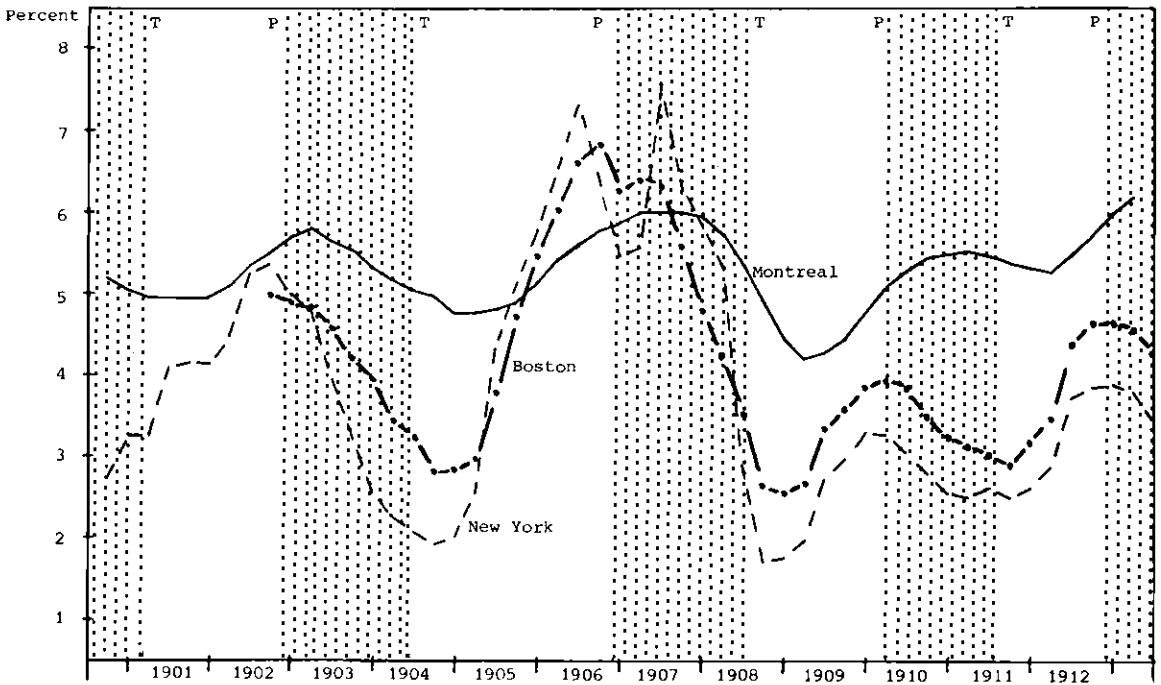

Fig. 12.3 Call-loan rates in Montreal, New York, and Boston, 1901–12. The U.S. short-term rate is an average for the last month of the quarter, while the Montreal rate refers to the first day following the end of the quarter. All the interest-rate data were seasonally adjusted by a thirteen-month moving average. *Sources*: Montreal call-loan rate: Canada 1915, p. 739. Short-term interest rates in New York: Macaulay 1938, appendix, table 10; and in Boston: Goodhart 1969, pp. 206–19.

Interestingly enough, the cyclical pattern of the Montreal call-loan rate mirrored closely the cyclical pattern of the monetary base (figure 12.4). The strong negative correlation observed between cyclical movements in the two variables suggests that over the business cycle the balance of payments was the chief determinant of the Montreal call-loan rate. During the depression phase of the reference-cycle, for example, the size of the overall surplus was above average. International monetary assets, as well as the monetary base, tended to grow rapidly and caused the Montreal call-loan rate to decline.

The model is capable of explaining the cyclical patterns revealed by figure 12.4 if we assume that the aggregate reserve ratio was negatively related to both domestic interest rates and cyclical movements in economic activity. It is plausible to argue that a cyclical expansion (contraction) in economic activity resulted in a drop (rise) in the aggregate reserve ratio even if interest rates remained constant. A cyclical slump in economic activity, for example, opened up the prospect of major bank failures. If the reserve holdings of the chartered banks were inadequate, the prospect of bank failures could result in a run on the banks and an attendant liquidity crisis. In order to be able to weather a potential liquidity crisis, the banks were likely to build up precautionary reserves when the economy plunged into a recession.[19] It would have been sensible for the chartered banks to vary their reserve ratios in a countercyclical manner despite the fact that during the period under study, Canada—unlike the United States—did not experience runs on banks and major liquidity crises. The public confidence instilled by strong countercyclical movements in the aggregate reserve ratio could have been a reason for the absence of financial panics in Canada.

Provided the aggregate reserve ratio responded to cyclical movements in economic activity, a cyclical increase in exports and the ensuing expansion in economic activity, in the short run, caused both the supply of and demand for money to rise. The supply was boosted as the chartered banks curtailed their precautionary reserves in relation to their liabilities. Given the simultaneous increase in money demand and supply, the Montreal call-loan rate need not have changed in the short run. However, this did not imply that it was completely invariant to the cyclical disturbance. In the longer run, the cyclical deterioration in the overall balance of payments, as well as the attendant drop in the monetary base, led to an increase in the Montreal call-loan rate. Thus, it is possible to explain why a cyclical increase in that rate was due chiefly to a cyclical reduction in the monetary base, despite the fact that the ultimate source of the disturbance was a cyclical expansion in exports.

Needless to say, the explanation advanced in this paper for the cyclical pattern of the Montreal call-loan rate would not be valid if the Canadian and U.S. money markets had been closely integrated. In that event,

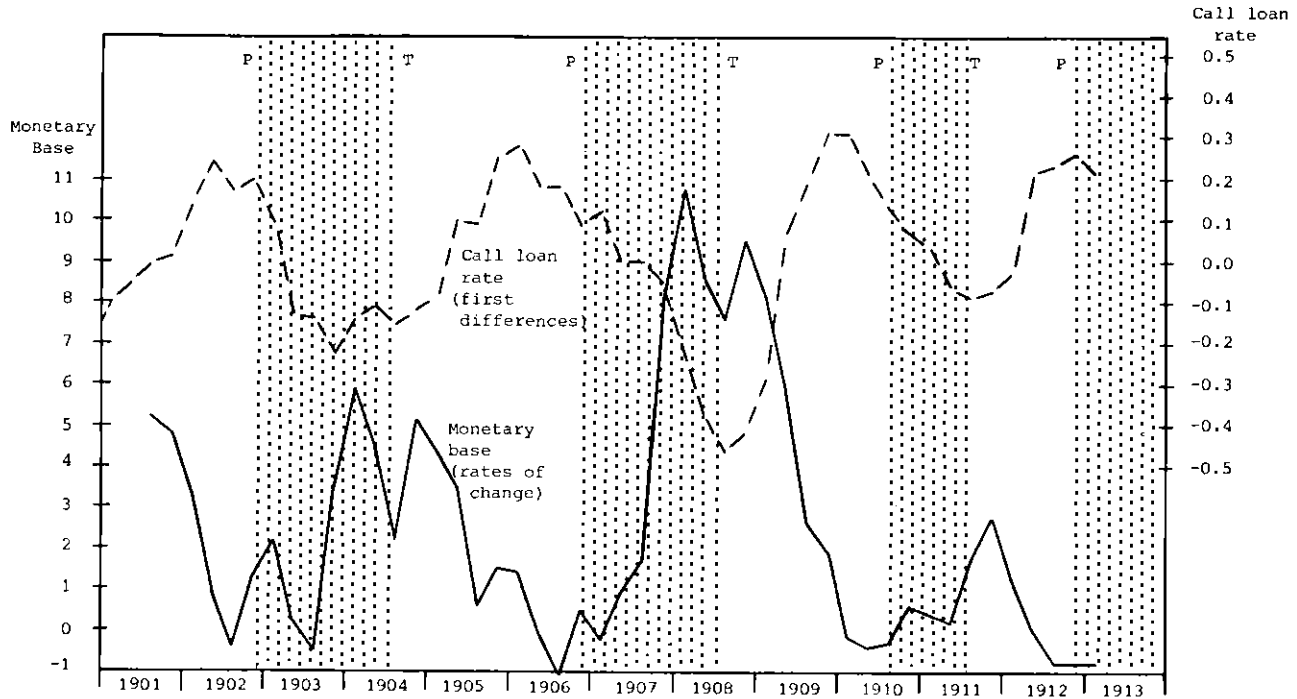

Fig. 12.4 Quarterly change in the Montreal call-loan rate and the Canadian monetary base, 1901–13. *Sources*: See figs. 12.2 and 12.3.

Canadian money-market rates would have moved in unison with their U.S. equivalents and would not have been systematically related to the Canadian monetary base. Prior to 1914, however, cyclical movements in Canadian and U.S. call-loan rates were anything but perfectly synchronized. In figure 12.3 the Montreal call-loan rate is compared with the corresponding rates in New York and Boston, the two closest major American financial centers. The evidence clearly indicates that the Montreal call-loan rate lagged its New York and Boston equivalents. Moreover, the cyclical amplitude of the two U.S. rates was much larger than that of the Montreal call-loan rate. It is interesting to note that the average return on Canadian bank loans, as well as Canadian bond yields, on the whole, also displayed a smaller cyclical variance than their U.S. equivalents (Rich 1983, chap. 5). Since the cyclical stability of interest rates was much greater in Canada than in the United States, it is not surprising that the capital inflow to Canada often varied countercyclically. The relative stability of Canadian interest rates explains why the capital account frequently made a significant contribution to the countercyclical movements in the overall balance-of-payments surplus.

Evidently, bank-reserve management was not only responsible for procyclical movements in the money stock, but also served to keep the cyclical variance of Canadian interest rates within narrow bounds. Furthermore, the ability of the banks to accommodate a cyclical surge in economic activity through an expansion in the money stock delayed the upward adjustment in interest rates that would normally have occurred at this stage of the business cycle. Interest rates did eventually rise, but not quickly enough to restrain effectively a cyclical expansion in economic activity. Typically, they continued to rise well after economic activity had reached a cyclical peak. In this way, the rise in interest rates was liable to aggravate the subsequent contraction. Consequently, the evidence lends strong support to the view that bank-reserve management amplified the cyclical fluctuations in Canadian economic activity by diluting the stabilizing role of interest rates.

12.5 Summary and Conclusions

In this paper I attempted to show that the PSF mechanism did not act as an effective stabilizer of cyclical fluctuations in economic activity. Although the gold standard constrained the ability of the chartered banks to create money, the restrictions imposed on the banks were not severe enough to prevent procyclical movements in the Canadian money stock. The fetters were sufficiently flexible to allow them to accommodate a cyclical surge in economic activity through an expansion in the money stock. Accommodative behavior on the part of the banks did elicit balance-of-payments deficits (or a reduction in the growth of interna-

tional monetary assets), as suggested by the classical PSF doctrine. However, while the PSF mechanism operated in the long run, the deficits did not effectively curb the growth in the money stock in the short run. Accommodative behavior also delayed the increase in Canadian interest rates that would normally have followed the cyclical surge in economic activity. Interest rates were adjusted only when the overall balance of payments began to deteriorate. Consequently, the PSF mechanism eventually forced up interest rates. But they responded to the cyclical increase in economic activity with such a long lag that they were liable to aggravate the subsequent contraction, instead of restraining the expansion. In summary, the evidence is inconsistent with Viner's contention that the Canadian PSF mechanism operated smoothly not only in the long run, but also in the short run.

Notes

1. Viner did not compare bank reserves with the money stock, but with bank liabilities to Canadian nonbanks, which consisted of notes, demand and notice (or time) deposits. As will be shown later, bank liabilities accounted for the lion's share of the money stock.

2. Viner also analyzed the more realistic case of a permanent increase in the capital *inflow*. He clearly realized that there was a difference between a once-and-for-all change in Canada's foreign debt and a permanent increase in its growth (1924, pp. 177–80). In his analysis he ignored the implications of changes in interest payments on the foreign debt.

3. According to Viner (1937, pp. 429–30), it was "possible to argue that at times at least" the observed increase in the money stock was due to purely internal factors, rather than a capital inflow. The rise in the money stock caused the current account to deteriorate. Moreover, "the borrowings were engaged in to obtain the foreign funds necessary to liquidate trade balances already incurred." However, he felt this interpretation was "quite consistent with the orthodox explanation." He also admitted that the current-account balance was likely to respond to an exogenous capital inflow with a lag (1937, p. 423).

4. To be precise, in his 1924 study Viner argued that secondary money creation had played a role only towards the end of the period under study (1924, pp. 189–90).

5. Viner (1924, pp. 184–85) appears to have argued that loans to Canadian residents were unrelated to the capital inflow.

6. See Viner's table VI (1937, p. 428). In 1902–3, 1906–7, 1910–11, and 1912–13 reserves decreased (column 6), while liabilities increased (column 1). For 1907–8 the opposite pattern can be observed.

7. The Taussig effect has been revived and reformulated by Johnson (1972, chap. 9) and others under the heading of the monetary approach to balance-of-payments analysis. For an application of that approach to the gold standard, see McCloskey and Zecher 1976.

8. It is likely that the world stock of monetary gold was negatively correlated, if at all, with the business cycle. During a cyclical upswing, the demand for nonmonetary gold was liable to rise, drawing the precious metal away from monetary use. Needless to say, this argument is not applicable to long swings in economic activity which, among other factors, were caused by changes in gold production, resulting from new discoveries.

9. During the entire period under study, the Canadian government and the chartered banks were never forced to suspend the convertibility into gold of Dominion notes and bank liabilities respectively. After the United States returned to the gold standard in 1879, the

mint-par values of the U.S. and Canadian currencies were identical, that is, the Canadian dollar was worth US $1.00. For a detailed discussion of pre-1914 Canadian monetary policy, see Rich 1977, 1983, chap. 7.

10. Much of Canada's foreign debt was held in the form of fixed-interest assets. Some information is available on net interest paid to foreigners by the Canadian government. This item did not vary with the reference cycle (Rich 1983, chap. 7).

11. The countercyclical pattern of the current-account surplus mirrored strong countercyclical movements in the merchandise-trade surplus. It is well known (see Taylor 1931, p. 3) that the Canadian merchandise-trade surplus was negatively correlated with the business cycle.

12. Hay (1967) argues that the turning points in the money stock led the corresponding turning points in economic activity. However, his conclusion is not inconsistent with my own since he compares rates of change in the money stock with the level of economic activity.

13. The Canadian government possessed a monopoly of the issue of notes in denominations of $4 and less. The nonbank public did not use the Dominion notes to any great extent unless it was compelled to do so by the government.

14. This evidence contrasts sharply with that presented by Cagan (1965) for the United States for the same period. For the United States, it was movements in the currency ratio that dominated cyclical movements in the money stock, whereas movements in the reserve ratio played a relatively minor role.

15. A more detailed discussion of these points is provided in Rich 1983, chap. 3.

16. For a full discussion of the model, see Rich 1983, chap. 4.

17. Only rudimentary data are available on other Canadian bank-loan rates. The evidence suggests that the average return on Canadian bank loans exhibited the same cyclical pattern as the Montreal call-loan rate (Rich 1983, chap. 5).

18. The turning points in the Montreal call-loan rate are determined on the basis of seasonally adjusted quarterly data (see figure 12.3). The timing of the turning points does not pose any problems, except for the peak of 1907 that I assume to have occurred at the end of the second quarter. For the reference cycle, a turning point or midpoint occurring in, say, March–April and February, respectively, is assigned to the end and the middle of the first quarter.

19. For a similar explanation of cyclical movements in bank-reserve ratios, see Friedman and Schwartz 1963, pp. 449–62 and Morrison 1966, chap. 3.

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Comment Peter Temin

It is both a pleasure and a burden to comment on Dr. Rich's paper—pleasure because the paper is an interesting one that contains an intriguing view of the Canadian economy before the First World War; a burden because it appears to be a summary of a larger work as yet unpublished and inaccessible to me in the time allowed for the writing of comments. I will enjoy the pleasure and try to ignore the burden, recognizing that Dr. Rich may well have all the answers in his larger work to the questions I pose here.

My comment has three parts. First, I want to place Rich's argument about Viner into the context of modern theories of the balance of payments. Second, I will review Rich's argument and the tests he performs to substantiate it. And third, I will redo a few of his tests from a slightly different perspective and comment on the results.

There seem to be three theories of the balance of payments that have achieved wide currency today. The price-specie-flow theory views capital flows as exogenous and uses a flow concept of equilibrium: trade flows must interact with capital flows to provide a balance-of-payments equilibrium. The monetary theory of the balance of payments views capital flows as endogenous and uses a stock concept of equilibrium: residents of each country must desire to hold the existing stock of money. These two theories differ both in how they view capital flows (exogenously or endogenously) and how they view equilibrium (flow or stock), suggesting that theories of the balance of payments can be arranged in a two-by-two table.

Table C12.1 is such an arrangement, where the two theories just discussed form the main diagonal. Only one of the off-diagonal alternatives is represented in the literature. It is what I will call the "real" theory of the balance of payments which uses a Keynesian flow equilibrium and views capital flows as endogenously determined to maintain this equilibrium. The final combination—exogenous capital flows and stock equilibrium—is not yet represented in the literature.

Tests of these different theories are hard to design, which may be one reason why they are still extant. In order to discriminate between them, investigators generally have looked at the mechanisms underlying these different theories. The price-specie-flow theory consequently has been tested by a long line of scholars from Viner to Rich by looking at the operation of the banking system to see if the money stock responded to changes in capital flows. McCloskey and Zecher have evaluated the monetary theory by asking whether markets in different countries were

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Table C12.1 Classification of Balance-of-Payments Theories

		Type of Equilibrium	
		Flow	Stock
Capital-Movements Views	exogenous	price-specie-flow theory	?
	endogenous	"real" theory	monetary theory

integrated. And Ingram (1957) verified that for Canada, capital flows could be explained by the needs of domestic investment.

It is worth noting that the tests of the price-specie-flow theory have generally been negative, while the tests of the other two theories have tended to be positive. Does this tell us something about the world or about publication bias? Without the ability to test the suggestion, I suspect that the power of the tests used to accept these theories is rather small.

Rich supplies in this paper new disconfirmation of the price-specie-flow theory. As with most other tests of this theory, he examines its apparent Achilles heel—the link between the balance of payments and the domestic money supply. Rich first criticizes Viner and then constructs a new data set to perform a better test. He argues that the Canadian money stock did not vary countercyclically. In fact it varied procyclically, but not because of the behavior of the monetary authorities and not because of what Rich calls the "Taussig effect"—induced capital flows that cause the balance of payments to move procyclically. And not, in fact, because the monetary base failed to move countercyclically. The money stock moved procyclically because anticyclical movements in the reserve ratio of the Canadian banking system more than offset the anticyclical pattern of the monetary base.

Before discussing Rich's explanation for this phenomenon, it is worth pausing for a moment to look at the evidence, which, in keeping with much of the evidence of the paper, is curiously indirect. Rich first averages the rates of growth of the money stock in all of the booms and depressions from 1874 to 1913. This procedure fails to produce any significant difference between the booms and depressions. So Rich then averages the rates of growth of the money stock in the expansions and contractions of the economy. (A boom includes the period of high economic activity, both before and after a cyclical peak, while an expansion includes the period when the rate of change of economic activity was positive, from a cyclical trough to a cyclical peak.) Here he finds a pattern; the money stock grew faster in expansions than contractions.

This pattern suggests, according to Rich, that the rate of growth of the

money stock peaked near the middle of expansions. If the Canadian economy resembled a regular oscillator, the pattern implies that the level of the money stock, which should have followed the rate of growth with a quarter-cycle lag, peaked at the end of expansions, that is, at the cyclical peak. In other words, the level of the money stock was positively correlated with the level of economic activity.

This conclusion gains only indirect support from the foregoing chain of reasoning. I do not know why Rich did not compute the correlation directly, and there are not enough data in the paper for me to do so. Perhaps the book contains the data needed to verify his statement.

Having laid the price-specie-flow theory to rest, Rich sets out to explain what was going on in turn-of-the-century Canada. His model is only sketched out in this paper, but it appears to go like this:

An "expansion of foreign activity," which appears to mean an expansion of Canadian exports, sets off the Canadian expansion. Canadian production rose, putting upward pressure on the money supply. Interest rates rose, and banks reduced their reserve ratios both because they were less afraid of failure during a boom than during a depression and because they wanted to take advantage of the profit opportunities offered by the higher interest rates.

The reduction in reserve ratios moderated the rise in interest rates, and Rich suggests that Canadian interest rates varied less over the cycle than comparable U.S. ones—a notion verified in Rich's book, although not in his paper. Since the data for replication of this test were available to me, I will comment on it shortly.

But it is worth noting that this test is also indirect. Since the core of the theory is about Canadian reserve ratios, it would be nice to see data about them or comparisons between them and, say, U.S. ones. After the next step, a comparison of cyclical movements in the money stock in the two countries, the meaning of a smaller variance of the Canadian interest rates would be clear.

Returning to the theory, Rich argues that the Canadian expansion led to a deficit in the current account, a pattern that seems odd in light of the role of export expansion in causing the expansion. Rich appears to be saying that the expansion, once started by an export rise, acquired a life of its own. He claims both that the relative stability of interest rates encouraged the expansion and that it discouraged capital imports, reducing the monetary base. The relative magnitudes of these effects is not clear, but the existence of the latter suggests caution in accepting Rich's principal conclusion that the Canadian banking system aggravated Canadian business cycles.

Rich places great weight on the link between interest rates and capital imports in deriving the second test of his theory. He argues that peaks in interest rates *followed* peaks in economic activity. Just after the peak, the

reduction in economic activity worked to lower interest rates, but the decrease in the monetary base resulting from the cyclical capital exports kept them up. Consequently, interest rates did not decline immediately after the peak.

There are two problems with this test. First, since Rich argues that the effect of the fall in the reserve ratio on interest rates was stronger than the effect of the fall in the monetary base during the expansion, it is not clear why it was not stronger also during the early stages of the contraction. Second, again the test is curiously indirect. Rich reports that peaks in the first differences in the interest rate coincided with cyclical peaks in economic activity, so the peak in the interest rate itself must have followed it. A more direct test would have been preferable, and I will report the results of one here.

Both of Rich's tests of his positive theory involve interest rates. And since these rates were available in the sources he cites, I replicated them. The rates involved are call-money rates in Montreal, New York, and Boston. I presume this rate was used because it was available, but I wonder how closely it mirrors overall monetary conditions in Canadian financial markets. As before, I can only presume that evidence on this question appears in Rich's longer work.

The first proposition is the the Canadian interest rate varied less than the U.S. rate. And it did. The variance of the Montreal rate was 0.34; the New York rate, 7.67; and the Boston rate, 2.76. But while the result of this test is favorable to Rich's theory, examination of the raw data raises some uncomfortable questions. There are five occasions between 1900 and 1913, when the Montreal rate is available, that it was reported as constant for eight months or more. In four of these episodes the interest rate was an integer; one of the episodes lasted for nineteen months (October 1906, through April 1908).

This constancy in a call-money rate is puzzling in the extreme. If the rate was accurately reported, then there is more to the Canadian institutions than Rich has allowed in his tale. And if the periods of constancy are the results of gaps in reporting, then the test is weaker than it appears.

As an aside, it is worth noting that the New York and the Boston call-money rates were more highly correlated ($\rho = .72$) than either was with the Montreal rate. But since the Montreal and Boston rates were more highly correlated ($\rho = .42$) than the Montreal and New York rates ($\rho = .26$), it is hard to know if this was the effect of distance or of national boundaries. Given the constancy of the exchange rate between Canada and the United States, is an argument needed to justify analyzing Canadian monetary conditions separately from those in the United States?

Rich's second proposition is that cyclical peaks in the Montreal call-money rate lagged behind peaks in Canadian economic activity. Taking the peaks and troughs of economic activity from Rich's table 12.1 and the

peaks and troughs of the interest rate from the rates as reported in Rich's sources yields the results shown in table C12.2. The peaks and troughs of reference cycles and of interest-rate cycles are shown using Rich's notation whereby the number after the slash is the month. Figures in parentheses are the duration of peaks and troughs when the interest rate was constant for several months at its extreme value. The lag of the interest rate behind the reference cycle is shown in months, where a negative number indicates a lead and a range indicates uncertainty about the interest-rate peak or trough.

The data offer only limited support to Rich's hypothesis. The interest rate lagged behind general economic activity at the trough of the reference cycle, but it led as often as it lagged at the peak. Only in 1910 did the interest rate clearly peak after the economy. It may have done so as well in 1906–7, but the constancy of the interest rate for nineteen months around its peak precludes any firm conclusion. Considering the short lags at several of the peaks, it might be fair to say that the peaks were roughly contemporaneous at three of the four peaks where determination can be made, while the interest rate clearly lagged at the fourth. In short, the interest rate lagged behind economic activity at troughs, but not (in general) at peaks.

Rich's story, therefore, stands as an intriguing hypothesis. It is hard to do justice to a monograph in a brief summary, and the problems of the tests used in this paper may well be solved in Rich's forthcoming book. I hope so for two reasons. First, the story is an appealing one. And second, it offers a "nonmonetary" theory for the lower-right-hand cell in my table C12.1. Rich clearly views capital movements as endogenous, and he appears to say that they move to establish a stock equilibrium. But, in

Table C12.2 **Timing of Troughs and Peaks in Canadian Interest Rates Compared with Timing of Business Cycle**

Date		Lead (−) or Lag (+) in Months at Reference Peak	Date		Lead (−) or Lag (+) in Months at Reference Trough
Reference-Cycle Peak	Interest-Rate Peak		Reference-Cycle Trough	Interest-Rate Trough	
1900/04	1900/01	−3	1901/02	1901/09	7
1902/12	1902/10–1903/01 (4)	−2–1	1904/06	1905/04–09 (6)	10–15
1906/12	1906/10–1908/04 (19)	−2–16	1908/07	1909/02–09 (8)	7–14
1910/03	1910/12–1911/02 (3)	9–11	1911/07	1912/06–08 (3)	11–13
1912/11	1912/01 (1)	2			

contrast to the monetary theory, the equilibrium is in the bond market, not the money market. That is, capital moves internationally in response to interest-rate differentials in much the same way as capital moves domestically between any two assets of slightly differing characteristics earning quite different returns. It moves until the holders of each asset are happy with the quantities they hold at market prices. Rich's story, therefore, is important both for Canadian history and for balance-of-payments theory.

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General Discussion

PIPPENGER expressed puzzlement regarding Rich's references to the transfer problem. If a country suddenly finds that four-fifths of its gold stock has disappeared, Pippenger argued, it can merely run balance-of-payments surpluses until its gold stock is restored to desired levels. This action may entail some change in the combination of traded and nontraded goods that the country produces, at least during the process of adjustment, but Pippenger saw no reason why this should create a problem, and hence no justification for the phrase "transfer problem."

Several participants suggested that the problem potentially lay in the economy's inability to adjust the combination of traded and nontraded goods, or importables and exportables, that was required to facilitate the adjustment process. In this view, countries can experience a transfer problem when the excess demand for money entails a shift in demand away from one type of good and toward another, but markets do not function so as to smoothly effect the transfer of resources.

MELTZER argued that an excess demand for commodities would be satisfied both by an excess supply of securities and a money flow. The excess supply of securities would raise interest rates, which would move securities and also cause a movement along the demand-for-money curve, releasing some of the excess supply of money to go along with the excess supply of securities.

CAGAN prefaced his remarks with a caution to those who refer to "typical" cyclical patterns or "average" cyclical patterns. In fact, Cagan pointed out, cyclical patterns can vary greatly, and cyclical averages can be a very misleading indicator of the characteristics of a majority of cycles. Before generalizing, it is necessary to examine each cycle, or at least a large number of them, and to analyze the degree to which they

conform to a typical pattern. On the other hand, the pattern Rich documents for Canada is typical also of the United States, and it would not be surprising if it were typical of many other countries as well.

Cagan also commented on Rich's discovery that Canada's reserve ratio moves countercyclically: the reserve ratio declines during expansions, which would give rise to an increase in money supply, and rises in contractions. In his study of the U.S. money supply, Cagan did not find that changes in the reserve ratio were the main reason why the money supply fluctuated cyclically. The United States's money supply moved for a variety of reasons, the most important of which was the currency-deposit ratio.

Cagan's study of U.S. interest rates showed that they tend to lag the business cycle, particularly at the trough. Thus, interest rates in Canada and the United States exhibit similar cyclical behavior. The parallel is not surprising because U.S. and Canadian interest rates are connected by interest arbitrage.

KOCHIN asked whether it was realistic to treat Montreal as another adjunct to the New York money market, much like St. Louis, San Francisco, or Philadelphia. He wondered whether interest rates in Canada and in the American West exhibited similar relationships to fluctuations in the New York rate.

EICHENGREEN responded to Kochin's question by observing that there were in fact connections between money rates in New York and elsewhere in the United States. However, these connections were apparently quite different from those observed by Rich for Canada. For the first decade of the twentieth century, rates in St. Louis and similar midwestern centers typically fluctuated one to one-and-a-half months in advance of the New York rate. The explanation for these fluctuations is found in the harvest cycle: Interest rates in the agricultural regions rose when the demand for cash was stimulated by increasing economic activity during the planting season in the spring and the harvest season in the fall. Higher interest rates in the West attracted funds from the East, as southern and western banks liquidated their correspondent balances in New York in order to exploit the profit opportunities provided by interregional interest arbitrage. The outflow of funds from New York then raised interest rates in the East. It does not appear likely the relationship between interest-rate fluctuations in Montreal and in New York observed in Rich's paper on Canada reflects the impact on local money-market conditions of the agricultural cycle, for that explanation would suggest that Canadian rates should have led rather than lagged rates in New York. The lagging behavior of Canadian rates may therefore reflect the imperfectly competitive nature of the Canadian money market.

A number of participants expressed reasons for skepticism concerning use of the call-loan rate in Montreal. For example, LINDERT noted that

the call rate was recorded as unchanging from October 1906 through April 1908, a period that spanned the 1907 financial panic in the United States. It is unlikely, therefore, that this series reflects the actual cost of funds. MOGGRIDGE noted that it made little difference which call-loan rate was considered, because the Canadian banking system was much less competitive than the U.S. system. Indeed, the Canadian system was oligopolistic, and the few banks in existence coordinated their administration of call-money rates.

RICH acknowledged that the Canadian call-loan rate was probably not comparable with the New York call-loan rate because Canadian call loans seldom were called. He also discussed the problem of the constancy of the rate. In the contemporary literature, there is considerable discussion of price-fixing among oligopolistic banks, which may explain why the rate sometimes failed to move with changing market conditions. However, that literature fails to address the linkages between the U.S. and the Canadian markets. Those links were close enough that such price-fixing arrangements probably could not have survived for long.

Rich insisted that the Canadian call-loan rate lagged the business cycle and the New York call-loan rate. He had considered the question of whether Canada was not simply a region within a unified North American financial market comparable to various regions in the United States, which is why he included the Boston call-loan rate. The Boston call-loan rate fails to lag the business cycle in the manner of the Montreal call-loan rate. However, rates on longer-term assets in Boston do begin to lag interest rates in New York. Rich also had attempted to consider other interest rates for Canada, but that had proven difficult because of data limitations. His preliminary conclusions were that federal-, provincial-, and municipal-government bond yields in Canada evince no cyclical relationship to yields in the United States. Rich had also considered a series for the average return on bank loans for one Canadian bank and compared it to estimates of the return on U.S. bank loans for various regions. All he could conclude was that the pattern of yields is extremely complex.

PART

V. The Gold Standard as a Stabilizer of Commodity Prices