Canadian-Bank Stability during the Great Depression: The Role of Banking Consolidation and Safety-Net Support*

John D. Wagster**

January 14, 2008

These results are preliminary and may not be quoted or cited.

*The author thanks Edward J. Kane for his comments and insights, especially regarding the interpretation of the test results of the diversification hypothesis. The author also thanks James T. Moser and Jack Reidhill for their thoughtful comments that have also substantially improved this paper. Any remaining errors are the sole responsibility of the author.

**Associate Professor of Finance, Business Department, Wayne State University, Detroit, MI 48202-3930 (email: J.D.Wagster@wayne.edu).

Canadian-Bank Stability during the Great Depression: The Role of Banking Consolidation and Safety-Net Support

Abstract

During the Great Depression more than 10,000 U.S. banks failed amidst widespread depositor runs while no failures or runs occurred in Canada. This paper credits the Canadian stability to a high degree of diversification brought about by banking consolidation and liquidity except during the highly volatile years of 1932 and 1933, when diversification benefits dissipated and bank stability became a function of implicit government support. This support provided moral-hazard incentives for bank managers to shift risk to the government, motivating regulators to pressure bank managers to implement excess-reserve strategies to help control bank risk and limit the government's loss exposure.

Canadian-Bank Stability during the Great Depression: The Role of Banking Consolidation and Safety-Net Support

Saunders and Wilson (1999) show that bank equity has been declining in Canada for over 100 years. Specifically, Canadian equity levels declined from approximately 25 percent in 1893 to about 5 percent in 1992. Seventy-five percent of this decline occurred by 1932, a period of time in which the number of banks in Canada also declined from 48 to 10. Because this period was also marked by a steady decline in Canadian bank failures, Saunders and Wilson (1999) suggest the decline in bank equity occurred because bank consolidation resulted in more diversified asset and liability portfolios, which made the provision of large amounts of stockholder equity unnecessary because of the reduction in non-systematic risk. Saunders and Wilson (1999, p.538) state that "bank consolidation and branching can reduce required capital by diversifying depositor risk…"

Moreover, Saunders and Wilson (1999) argue that the adoption of deposit insurance in the U.S. during the 1930s achieved the same result as did Canadian bank consolidation. Because the number of U.S. bank failures dropped significantly after deposit insurance was implemented, the new safety net "largely supplanted the historical role of high bank capital levels in providing protection to risk-adverse depositors." Furthermore, Saunders and Wilson (1999, p. 537) assert "that bank asset-risk choices in the 1980s are comparable to those observed in the 1890s" in both the U.S. and Canada, which suggests that deposit insurance can reduce bank risk without producing moral-hazard incentives. This explanation for the reduction in U.S. bank-capital levels stands in stark contrast to a long line of research starting with Buser, Chen and Kane (1981) and more recently Berger et al. (1995) and Wagster (2007), who argue that moral-hazard incentives in deposit-insurance contracts will encourage bank managers to increase asset risk and balance-sheet leverage.

Kane and Wilson (2002) use Saunders and Wilson's (1999) dataset and conduct an empirical analysis over the same time period and find numerous regulatory and crisis events in Canada and the U.S. where safety-net capital surged.[1] In Canada, from 1893 through 1936, 30 out of 43 years indicated surges (70 percent) while from 1937 through 1992, 8 out of 55 years indicated surges (15 percent). This suggests that during the period in which Canada's banks were consolidating and their capital levels were dropping, implicit government support was being provided 70 percent of the time. This finding directly contradicts the argument made by Saunders and Wilson (1999) that Canadian bank consolidation was eliminating the need for large amounts of stockholder supplied capital. Resolving this controversy has become critical because of the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 that marks the official abandonment in the U.S. of its historical unit-banking structure in favor of the Canadian model by allowing interstate branching and bank consolidation.[2]

This paper tests the "diversification" and "government-guarantee" hypotheses to help discriminate between the arguments of Saunders and Wilson (1999) and Kane and Wilson (2002). Canadian banks during the Great Depression are studied because Kane and Wilson (2002) find statistically significant evidence of a large surge in safety-net capital during this period, bank consolidation in Canada was mostly complete and because this time period provides the greatest contrast between U.S. and Canadian bank-failure rates.[3] The hypotheses are tested using stock-

[1] Safety-net capital is wealth that is transferred from governments to shareholders because shareholder-contributed capital is not adequate to support bank liabilities.

[2] While banks in the US were historically small unit banks because of the government's aversion to concentrated financial power, banks in Canada developed into large nationally branched institutions. Unit banks are restricted to one geographic area forcing them to be non-diversified in both their asset and liability portfolios while large banks with extensive branching networks promote stability in bank-asset values by increasing liability and asset diversification. Liability diversification results by collecting funds from depositors in different regions of a country and by accepting deposits in both rural and urban areas. Asset diversification results because loans are originated in different regional economies, which also helps increase diversification across industries.

[3] Even though the U.S. and Canada experienced similar declines in economic activity from 1929 to 1933, more than 20 percent of U.S. banks failed amidst widespread depositor runs (Friedman and Schwartz, 1963, p. 299) while no bank

market and accounting data of eight Canadian banks over the 1926 to 1934 period. Two exogenous shocks occurred to the banking system during this period with the first being the 1929 stock-market crash and the second the abandonment of the gold standard in late 1931. Consequently, the period is divided into the pre- (1926-1929) and post-stock-market-crash periods (1930-1931) and the post-gold-standard period (1932-1934).

The diversification hypothesis supports the argument of Saunders and Wilson (1999) who assert that the stability of Canadian banks was because the Canadian banking system had evolved into a relatively small number of large, highly branched, efficient banks.[4] To test this hypothesis, the sample is divided into large- and small-bank portfolios (see Appendix 1) consisting of four banks each. An event study is conducted around the "Black Tuesday" stock-market crash of October 29, 1929 and the ending of the gold standard on September 21, 1931. To support the diversification hypothesis, the large more-diversified banks are expected to have a larger positive (or a less-negative) abnormal return than the smaller less-diversified banks. Additionally, any large-bank risk reductions (increases) should exceed (be less than) that of the small banks.

Failure to support this hypothesis would suggest that an exogenous shock to the banking system can negate the benefits of diversification. The effects of non-systematic risk are reduced in a portfolio when correlation coefficients of the securities are less than 1. Shapiro (2006, p. 534) shows that in the presence of an exogenous, highly volatile event, the correlations of a portfolio of domestic and international stocks increase thus reducing the benefit of diversification. Moreover, this rarely happens when stock prices are increasing but most often occurs when stock prices are declining, the very event from which investors usually want protection. To the extent that a bank's

---

failures or runs occurred in Canada. This glaring contrast in failure rates during one of the most severe economic declines in history is usually attributed to the high degree of diversification that Canadian banks had achieved and the non-diversified structure of U.S. banks (Carr, Mathewson and Quigley, 1995).

asset and liability portfolios react in a similar manner, the benefits of diversification to a bank may also disappear when it's most needed.

The event-study results fail to support the diversification hypothesis. Table 1 shows the results produced by the stock-market crash are the opposite of that needed to support the hypothesis, while the results to the abandonment of the gold standard fail to show a benefit to being more diversified. To further investigate this hypothesis, estimates of a risk-adjusted deposit-insurance premium per dollar of deposits (*IPP*) is calculated using the methodology of Hovakimian and Kane (2000). Since *IPP* is the value of a put option on a bank's assets, it is a comprehensive idiosyncratic measure of bank risk. The results reported in Table 2 support the diversification hypothesis during the pre- and post-stock-market-crash periods but do not provide support during the post-gold-standard period. These results suggest that the diversification of Canadian banks helped to reduce their risk during the pre- and post-stock-market-crash periods, but that the diversification benefits declined for all banks during the highly volatile post-gold-standard period with the large banks suffering the greatest decline.

The government-guarantee hypothesis supports the argument of Kane and Wilson (2002) that suggests the stability of Canadian banks during the Great Depression was because of a surge of safety-net capital. This wealth transfer to stockholders from the Canadian government probably consisted of regulatory forbearance and an implicit guarantee of bank deposits.[5] The methodology of Hovakimian and Kane (2000) is used to calculate debt-to-assets ratios (*B/V*) using market-value

---

[4] Carr, Mathewson and Quigley (1995) also test this hypothesis during the Great Depression and make the additional argument that the absence of a deposit-insurance program helped to motivate stockholders and regulators to vigorously monitor bank mangers.

[5] Kryzanowski and Roberts (1993) test a similar hypothesis that maintains that during the Great Depression Canadian banks were insolvent on a market-value basis. They maintain Canadian banks avoided depositor runs and failure because of regulatory forbearance and a regulatory "policy of encouraging the early merger of troubled banks and healthier banks, standing ready to lend to banks, and providing an *implicit 100 percent guarantee* of bank deposits by effectively guaranteeing all deposits at par." They conclude that even though large, highly diversified banks may be

estimates. The results displayed in Table 2 show that the large Canadian banks were insolvent on a market-value basis during 1932 and 1933, the first two years of the post-gold-standard period, while the equity position of the small banks declined to zero in those years. Both large and small banks were solvent in all of the other years studied. These results suggest that the Canadian government may have provided safety-net capital to their banks during 1932 and 1933.

If the government is providing an implicit guarantee of bank deposits, bank managers could increase their bank's expected returns by shifting risk to the guarantor. Hovakimian and Kane's (2000) methodology is used to test for risk-shifting incentives and, as reported in Table 3, none are found in the pre- and post-stock-market-crash periods but they are detected in the post-gold-standard period. This finding is consistent with our previous finding that large and small banks were solvent throughout the study period except during 1932 and 1933, the first two years of the post-gold-standard period.

The remainder of the paper is as follows. Section 1 provides an event-study test of the diversification hypothesis by studying the stock-market crash of 1929 and the abandonment of the gold standard in 1931 (Appendix 1 provides information regarding the Canadian Bank sample). Section 2 provides yearly and period estimates of *IPP, B/V* and other risk measures and tests for differences in the means of the variables between periods. These results are used for insights into both the diversification and government-guarantee hypotheses. Section 3 tests the government-guarantee hypothesis using the methodology of Hovakimian and Kane (2000) to test for risk-shifting incentives for managers of Canadian banks. Section 4 provides evidence of regulatory efforts to contain bank risk by using balance-sheet data to show the amount of excess-bank-note collateral and Finance-Act advances and the ratio of these variables to demand deposits. A

---

able to withstand local or regional shocks better then unit banks, they may not be able to resist national or international shocks.

regression analysis is then performed to find any correlations between these two ratios and bank risk (Appendix 2 provides information about excess-bank-note collateral and the Finance Act). Section 5 concludes.

1. EVENT-STUDY AND CHANGE-IN-SYSTEMATIC-RISK TESTS

This section tests the diversification hypothesis by dividing the sample into large-bank and small-bank portfolios and conducting an event study of the two most important events that affected Canadian banks during the Great Depression, namely the "Black-Tuesday" stock-market crash on October 29, 1929 and the abandonment of the gold standard by Great Brittan over the weekend of September 19-20, 1931.

1.A. Data

Weekly stock-market prices are gathered from the *Financial Post* for Banque Canadienne Nationale (National Bank of Canada), Bank of Montreal, Bank of Nova Scotia, Bank of Toronto, Canadian Bank of Commerce, Dominion Bank, Imperial Bank of Canada and the Royal Bank of Canada from December 28, 1925 to August 13, 1934.[6] When a stock did not trade, the previous week's price is used for the no-trade week. Some no-trade weeks did occur for a few stocks, but these were infrequent events. There were no stock splits during the time period studied and all prices are in Canadian currency.

A market index that consists of 20 industrial stocks is gathered from the *Financial Post* for the same time period as the bank-stock prices. While the closing price for the week is given for all of the bank stocks, only the high and low values for the week are given for the market index. This paper uses the weekly low value for the market index because stock prices are declining over the

[6] Data collection stopped after August 13, 1934 because the *Financial Post* began publishing a new market index that was not comparable to the previous market index.

two periods studied thus the low value provides a more conservative estimate of abnormal returns. The test results reported in Table 1 have been replicated using the weekly high value of the index as well as an average of the weekly high and low values. The empirical results are qualitatively the same regardless of the index used.[7]

Staff (May 28, 1932) report that when Great Brittan abandoned the gold standard over the weekend of September 19-20, 1931, "To prevent panic, exchanges all over North America and Europe either closed, declared the last previous prices to be the minimum prices for trading, or forbade short selling." In Canada, minimum prices are established. Shortly thereafter, the minimum prices of internationally traded stocks and all stocks with prices below $3 are eliminated. However, the minimums remain in effect for Canadian banks through the week-ending price of May 16, 1932.

During this eight-month period, the *Financial Post* reports both over-the-counter prices and on-exchange minimum prices for Canadian banks. However, minimum and over-the-counter prices are identical and did not change until the week ending on January 11, 1932. Beginning with this date, prices began declining and the over-the-counter prices changed more frequently than did the minimum prices. Because minimum prices rarely changed, there is a large and abrupt price drop when the minimums are eliminated. The over-the-counter prices also change infrequently until about six weeks before the minimums are ended. The empirical tests whose results are reported in Tables 1 and 2 have been run using both minimum and over-the-counter prices. Minimum prices produce the most dramatic and statistically significant results; however, the qualitative results are unchanged regardless of the prices used. Therefore, in the interest of conservatism, over-the-counter prices are used during this time period.

1.B. Methodology

[7] These results are available from the author upon request.

To measure the wealth effects of the Black-Tuesday stock-market crash and the abandonment of the gold standard, this article uses a Multivariate Regression Model (MVRM) similar to that used in Wagster (1996, 2007). The MVRM explicitly incorporates contemporaneous dependence of the disturbances into hypothesis tests, which is important because systematic events in an economy or industry presumably affect firms during the same calendar time period making cross-sectional correlation in the error terms probable thus reducing the power of statistical tests. The MVRM is estimated as a system of seemingly unrelated equations and the return-generating process is explicitly conditioned on the occurrence or nonoccurrence of an event by appending zero-one dummy variables to the market-model equation. Another advantage of this model is in providing a framework for testing highly interesting cross-firm and cross-event coefficient restrictions in hypothesis tests.

Wealth effects and changes in systematic risk are estimated as follows:

$$R_{nt} = \alpha_n + \alpha_n D_{S,1} + \alpha_n D_{S,2} + \beta_n M_t + \beta_n D_{S,1} M_t + \beta_n D_{S,2} M_t + \Sigma D_e \delta_{ne} + \varepsilon_{nt} \qquad (1)$$

$n = 1, 2, \ldots, N;\ t =$ Jan. 4, 1926,..., August 13, 1934; $e = 1, 2;$

Where

R_{nt} = the weekly rate-of-return of bank n at time t (from January 4, 1926 through August 13, 1934);

α_n = the intercept coefficient for firm n;

$\alpha_n D_{S,1}$ = the first shift in the intercept coefficient for firm n;

$D_{S,1}$ = a shift dummy variable that equals zero from January 4, 1926 to October 28, 1929 (the pre-stock-market-crash period) and 1 from November 4,1929 to January 4, 1932 (the post-stock-market-crash period);

$\alpha_n D_{S,2}$ = the second shift in the intercept coefficient for firm n;

$D_{S,2}$ = a shift dummy variable that equals zero from January 4, 1926 to January 4, 1932 (the last week that banks' minimum and over-the-counter prices were identical) and 1 from January 11, 1932 to August 13, 1934 (the post-gold-standard period);

β_n = the systematic-risk coefficient measuring the sensitivity of firm *n*'s returns to market returns;

$\beta_n D_{S,1}$ = the shift in the systematic-risk coefficient for firm *n* between the pre- and post-stock-market-crash periods;

$\beta_n D_{S,2}$ = the shift in the systematic-risk coefficient for firm *n* between the post-stock-market-crash period and the post-gold-standard period;

M_t = the weekly rate-of-return on an index of 20 industrial stocks reported by the *Financial Post* at time *t*;

δ_{n1} = the effect of the October 29, 1929 stock-market crash on bank *n*;

D_1 = a dummy variable that equals one for the weeks of November 4 through November 25, 1929, thus encompassing the four weekly returns after the stock-market crash;

δ_{n2} = the effect of the abandonment of the gold standard on bank *n*;

D_2 = a dummy variable that equals one for the weeks ending January 11 through June 13, 1932, thus encompassing the period of price variability following the establishment of minimum prices until they are eliminated (January 11, 1932 through May 16, 1932) and the four weekly returns after minimum prices are eliminated;

ε_{nt} = random disturbances assumed to be i.i.d. normal, independent of the return of the market index and the event variables.[8]

1.C. Research Hypotheses

Test 1: H_o: $\Sigma_{n=1,\ ...N}\ \Sigma\delta_{na} = 0\ \forall_a$; *the abnormal return for a bank equal-weighted portfolio to each event a equals zero. This is tested with two F tests per portfolio, one test for each event studied. The results of this test are displayed in columns 8 and 9 of Table 1.*

Test 2: H_o: $\Sigma_{n=1,\ ...N}\ \Sigma_{a=1,\ 2}\delta_{na} = 0$; *the cumulative abnormal return for each portfolio over both events a equals zero. The purpose of this F test is to provide information about how the wealth of shareholders of Canadian chartered banks were affected by the two main events of the Great Depression. This is tested with one F test per portfolio, with the results displayed in column 10 of Table 1.*

Test 3: H_o: $\Sigma_{n=1,\ ...N}\ \beta_n D_1 M_t = 0$; *the change in systematic risk of an equally weighted bank portfolio to the stock-market crash of October 29, 1929 equals zero. The results of this test are displayed in column 6 of Table 1.*

Test 4: H_o: $\Sigma_{n=1,\ ...N}\ \beta_n D_2 M_t = 0$; *the change in systematic risk of an equally weighted bank portfolio because of the abandonment of the gold standard equals zero. The results of this test are displayed in column 7 of Table 1.*

Test 5: H_o: $\Sigma_{n=1,\ ...4} - \Sigma_{n=1,\ ...4} = 0$; *the difference in the coefficients of the large-bank and small-bank portfolios for all regression parameters and events is not significantly different from zero. The results of this test are reported in the bottom row of Table 1.*

1.D. Empirical Results

[8] Time series autocorrelation is detected and the residuals are transformed using the Prais-Winston methodology (Kmenta 1986).

The results for three equally weighted bank portfolios are presented in Table 1. The all-banks portfolio consists of the eight banks listed in Appendix 1. The large-bank portfolio consists of the four largest banks and the small-bank portfolio consists of the four smallest banks as ranked by total assets in 1927. Recall that the diversification hypothesis requires that shareholders of large, highly diversified banks experience smaller wealth losses than less-diversified banks and that any risk increases of more highly diversified banks should be less than the less-diversified banks.

The results for test 1 are displayed in columns 8 and 9 and reveal that shareholders of all three bank portfolios experience significant wealth losses to both events at the 1 percent level. Not surprisingly, the results for test 2 displayed in column 10 also show that all three portfolios have significant wealth losses at the 1 percent level cumulated over the two events.

Because the wealth losses of bank shareholders exceeded the wealth losses of the shareholders of the twenty industrial firms that make up the *Financial-Post* index, investors probably expected the future cash flows of Canadian banks to decline more than the future cash flows of Canadian industrial companies. As the demand for loans and bank notes declined along with the economy, two major sources of revenues for the banks were diminished.

Column 6 of Table 1 displays the results of test 3. This test reveals that the large-bank portfolio had a statistically significant increase in systematic risk at the 10 percent level because of the stock-market crash, while the small-bank portfolio did not. These findings are the opposite of what is needed to support the diversification hypothesis. Column 7 displays results of test 4, and indicates that all three portfolios had increases in systematic risk at the 1 percent level because of the abandonment of the gold standard.

The bottom row of Table 1 displays the results of test 5. Only the results for the stock-market crash displayed in column 8 indicate a significant difference between the large- and small-

bank portfolios. Shareholders of large banks had a wealth loss of 2.86 percent while shareholders of small banks had a loss of 1.79 percent, with the difference in these means being significant at the 10 percent level. Importantly, this finding is the opposite of what is needed to support the diversification hypothesis. Moreover, since no discernable difference was found between the results of the large and small banks to the abandonment of the gold standard or to increases in their systematic risk, no benefit to being highly diversified was detected. Therefore, no support for the diversification hypothesis is found by these tests.[9]

The next section presents the concluding tests of the diversification hypothesis and the first tests of the government-guarantee hypothesis.

2. LEVELS AND CHANGES IN *B/V*, *IPP,* σ_V and σ_e

2.A. Additional Evidence Regarding the Diversification Hypothesis

To help discriminate between these hypotheses, yearly and period estimates are made of a market-value leverage ratio (*B/V,* where *B* is the face value of deposits and other debt and *V* is the market value of assets), the level of the actuarially fair deposit-insurance premium per dollar of deposits (*IPP*), the volatility of assets (σ_V) and the volatility of equity (σ_e). *V*, *IPP,* σ_V and σ_e are estimated using Hovakimian and Kane's (2000) model (SPM 1).

The model requires the use of balance-sheet data, which are found in annual editions of *Moody's Bank and Finance Manual*. The pre-stock-market-crash period encompasses 1926

[9] The event study was also ran using a dummy variable to account for the minimum-price period (September 21, 1931 through May 16, 1932). The ending of the post-stock-market-crash period and the beginning of the post-gold-standard period were adjusted accordingly, as was the second event period (to May 23, 1932 through June 13, 1932). All of the results were qualitatively the same as those reported in Table 1 except for three, none of which affect the interpretation of the results. The differences are the significance of the market-return parameter for the all-banks portfolio increases from the 10 to the 5 percent level, the significance of the market-return parameter for the large-bank portfolio increases from the 5 to the 1 percent level, and the significance level for the difference-of-means test between the cumulative wealth effect of the large- and small-bank portfolios increases from non-significant to the 5 percent level. The author thanks James T. Moser for suggesting this modification.

through 1929, the post-stock-market-crash period encompasses 1930 through 1931, and the post-gold-standard period encompasses 1932 through 1934.

Deposit insurance is modeled as a single-period European put option on the bank's assets (Merton, 1977) with bank debt maturing in one year (the estimated time between bank audits by the insurer, hence $t = 1$ in the model). Following Giammarino, Schwartz and Zechner (1989) in studying Canadian banks and Ronn and Verma (1986) and Hovakimian and Kane (2000) in studying U.S. banks, regulatory forbearance is modeled by letting asset value decline to 97 percent ($\rho = 0.97$) of debt value before the equity call kicks in. The model allows shareholders to receive dividends (δ is the fraction of the bank's assets distributed at each interim dividend payment, denoted T) until the next audit occurs, even if, in the interim, the bank becomes insolvent. Bank equity (E) is modeled as the sum of the present value of the dividends distributed before the next audit and a dividend-unprotected European call option.

The variables *IPP*, V, and σ_V are not directly observable and must be estimated by solving two simultaneous equations. The first, equation (2), states σ_V as a function of E, V and σ_E via Ito's lemma. The second, equation (3), is the call-option formulation for equity. These solution values are used in equation (4) to find *IPP* as the value of a put option on bank assets.

$$\sigma_V = \sigma_E (E/V)/(\partial E/\partial V), \tag{2}$$

$$E = V[1-(1-\delta)^T]+V(1-\delta)^T N(x_1) - \rho B N(x_2), \tag{3}$$

$$IPP = N(-x_4) - (1-\delta)^T (V/B)N(-x_3). \tag{4}$$

where

$$x_1 = [ln[V(1-\delta)^T/\rho B] + \sigma_V^2 t/2]/[\sigma_V t^{1/2}],$$

$$x_2 = x_1 - \sigma_V t^{1/2},$$

$$x_3 = [ln[V(1-\delta)^T/B] + \sigma_V^2 t/2]/[\sigma_V t^{1/2}],$$

$x_4 = x_3 - \sigma_V t^{1/2}$.

Table 2 presents the results. Each year's results are detailed in columns 2 through 5 for the pre-stock-market-crash period, columns 7 and 8 for the post-stock-market-crash period, and columns 10 through 12 for the post-gold-standard period. Column 6 gives each variable's mean for the pre-stock-market-crash period, column 9 for the post-stock-market-crash period and column 13 for the post-gold-standard period. Column 14 displays the *t*-statistic for difference-of-means tests between the pre- and post-stock-market-crash periods (column 6 – column 9) and column 15 provides the *p*-value and significance level for the test results. Column 16 displays the *t*-statistic for difference-of-means tests between the post-stock-market-crash and the post-gold-standard periods (column 9 – column 13) and column 17 provides the *p*-value and significance level for the test results. The results for the all-banks portfolio are presented in Panel A, the results for the large-bank portfolio in Panel B and the results for the small-bank portfolio in Panel C.

The results displayed in column 6 for *IPP* provide support for the diversification hypothesis. The estimated premium for the large-bank portfolio is 0.01 percent while for the small-bank portfolio the estimate is 0.03 percent. This difference in estimated-deposit-insurance premiums reflects the lower risk of the large banks. The results displayed in columns 14 and 15 reveal that the small-bank portfolio shows a significant decrease at the 10 percent level in the means of σ_V and σ_e between the pre- and post-stock-market-crash periods. This result is further reflected in the results for *IPP* in column 9 where both the large- and small-bank premiums have declined to 0.00. These results are indicative of the outstanding stability of the Canadian banking system during the pre- and post-stock-market-crash periods. The diversified structure of the banks, their access to unlimited liquidity through the Finance Act, and the role of private-sector monitors through the double-liability provisions all contributed to their low-risk profiles.

However, the results displayed in columns 16 and 17 reveal that these benefits broke down in the post-gold-standard period. The large significant increases at the 1 percent level in σ_V, from 1.40 to 2.67 for the large banks and from 0.89 to 2.34 for the small banks, and σ_e, from 11.44 to 22.43 for the large banks and from 8.28 to 19.28 for the small banks, indicate that the post-gold-standard period was one of unprecedented volatility compared to the other two periods. The results displayed for *IPP* suggest that the benefit of greater diversification noted earlier for both the large and small banks decreases during the post-gold-standard period, with the large banks being affected the most. Column 13 shows that the large-bank *IPP* increased from 0.00 in column 9 to 3.02 percent, and the small-bank *IPP* increased from 0.00 to 1.04 percent.

It appears that the correlation among bank assets increases during periods of extreme volatility, which negates the benefits of diversification. This is reflected in Table 2 from the large banks having the lowest *IPP* in the pre-stock-market-crash period, one of low volatility, and the highest *IPP* in the post-gold-standard period, one of high volatility. This phenomenon is well documented in the investment literature in regards to diversified portfolios of domestic and international stocks.[10] For example, Odier and Solnik (1993) suggest that international diversification is of least value during periods of high market volatility. Moreover, Shapiro (2006, p. 533-4) argues that not only do "correlations among markets appear to increase when market volatility is at its highest," but "the markets appear to move in synchrony only when they are falling, not when they are rising." Thus when markets are crashing and an international investor most needs the benefits of diversification, correlations increase and the benefits of diversification disappear.

The post-gold-standard period was one of high volatility and declining stock prices and economic activity. The results displayed in both Tables 1 and 2 indicate that the benefits of being

highly diversified had been negated by the exogenous shock of the abandonment of the gold standard. This event probably increased the correlations among bank assets, which may have caused the benefits of bank diversification to disappear.

2.B. The First Tests of the Government-Guarantee Hypothesis

The results displayed in Table 2 for the variable *B/V* pertains to the government-guarantee hypothesis. The results reported in columns 2 through 5 and columns 7 and 8 indicate that both large and small banks were solvent on a market-value basis during the pre- and post-stock-market-crash periods. However, the results displayed in columns 10 and 11 indicate that the large banks were insolvent on a market-value basis and that the small banks market-value equity was reduced to zero during 1932 and 1933, the first two years of the post-gold-standard period. By 1934 (column 12), both the large and small banks were again solvent.

These results provide support for the government-guarantee hypothesis during 1932 and 1933. The next section provides the details of the final test of the government-guarantee hypothesis.

3. TESTS FOR RISK-SHIFTING INCENTIVES

If the provision of a Canadian-government guarantee was the source of stability for Canadian banks during the Great Depression, the guarantee would be expected to create moral-hazard and risk-shifting incentives. To detect the presence of a Canadian-government guarantee of liabilities, single-period and three-period models are estimated. The single-period models were developed by Duan, Moreau and Sealey (1992) and expanded by Hovakimian and Kane (2000). These models are then modified for three-period tests using dummy variables. The one-period models are:

[10] The author thanks Ed Kane for interpreting these results and for making the linkage to the investments literature.

$$\Delta(B_{nt}/V_{nt}) = \alpha_{0n} + \alpha_1 \Delta\, \sigma_{Vnt} + \varepsilon_{nt}, \quad (5)$$

$$\Delta IPP_{nt} = \beta_{0j} + \beta_1 \Delta\, \sigma_{Vnt} + \xi_{nt}. \quad (6)$$

The slope coefficients are interpreted as:

$$\alpha_1 = d(B/V)/d\sigma_V,$$

$$\beta_1 = dIPP/d\sigma_V = \partial IPP/\partial\sigma_V + \partial IPP/\partial(B/V)\alpha_1.$$

B is the face value of deposits and other debt, V is the market value of a bank's assets, σ_V is the volatility of asset returns, *IPP* is the actuarially fair deposit-insurance premium per dollar of deposits and Δ signifies the data are first-differenced.[11]

Since *IPP* is the value of a put option on a bank's assets, it is a comprehensive idiosyncratic measure of bank risk. The value of deposit insurance increases in σ_V and B/V (Merton, 1977) thus, holding the deposit-insurance premium fixed, positive partial derivatives for *IPP* with respect to σ_V and B/V imply stockholders can extract value from the deposit insurer. Therefore, β_1 measures the benefit from increasing the volatility of asset returns while α_1 measures any reduction in financial risk achieved by market forces or government regulators to temper higher asset risk by exerting pressure for lower bank leverage. Consequently, risk-shifting opportunities do not exist if α_1 is negative and β_1 is non-positive, indicating any increase in asset-risk incentives was offset with reductions in financial-risk incentives. Risk-shifting opportunities exist if α_1 is negative (or positive) and β_1 is positive, indicating financial-risk incentives declined (increased) but failed to completely offset increases in asset-risk incentives.

For the three-period model, data in the three periods are pooled. A dummy variable equal to one is used to signify the post-stock-market-crash period (D_1) and the post-gold-standard period (D_2). The equations estimated are:

[11] Time series autocorrelation is detected and the residuals are transformed using the Prais-Winston methodology (Kmenta 1986).

$$\Delta(B_{nt}/V_{nt}) = \alpha_{0n}+D_1\,\alpha_{0n}+ D_2\,\alpha_{0n}+\alpha_1\Delta\sigma_{Vnt}+D_1\,\alpha_1\Delta\sigma_{Vnt}+ D_2\,\alpha_1\Delta\sigma_{Vnt} + \varepsilon_{nt}, \quad (7)$$

$$\Delta IPP_{nt} = \beta_{0n}+D_1\,\beta_{0n}+ D_2\,\beta_{0n}+ \beta_1\Delta\sigma_{Vnt}+D_1\,\beta_1\Delta\sigma_{Vnt}+ D_2\,\beta_1\Delta\sigma_{Vnt} + \xi_{nt.} \quad (8)$$

The results for the single-period and three-period models are displayed in Table 3. The results for Equation (6) are displayed in columns 2 through 4 and the results for Equation (8) are displayed in columns 5 through 9. Because the coefficients for $\Delta\sigma_{Vnt}$ in equations (5) and (7) are positive and statistically significant in the same periods as those displayed in Table 3 for equations (6) and (8), the results for equations (5) and (7) have no effect on the interpretation of our hypotheses and thus are not reported.[12]

Recall that risk-shifting opportunities exist if β_1 is positive. The results for the single-period model that are reported in column 3 suggest that the Canadian government provided deposit guarantees to both large and small banks following the stock-market crash of 1929. The results reported in column 4 indicate that these guarantees were still being extended during the post-gold-standard period. However, the three-period model indicates that banks only had risk-shifting incentives during the post-gold-standard period. The results reported in column 8 indicate there was a significant increase in risk between the post-stock-market-crash period and the post-gold-standard period for both the large and small banks, and the results displayed in column 9 shows that both the large and small banks had risk-shifting incentives during the post-gold-standard period. The results of the three-period model support the results displayed in Table 2 that indicate government guarantees were only necessary during 1932 and 1933.

In summary, the results displayed in Tables 2 and 3 suggest that Canadian banks received implicit-government support during 1932 and 1933, and that because of the implicit government support, Canadian-bank managers engaged in risk-shifting behavior. Bank regulators would be expected to exert pressure on bank managers to reduce risk in this type of an environment.

Therefore, the next section presents an analysis of two risk-reducing strategies Canadian banks used to reduce their risk during 1932 and 1933.

4. EXCESS BANK-NOTE COLLATERAL AND FINANCE-ACT ADVANCES

In addition to structure, there were other differences between the U.S. and Canadian banking systems during this period: (1) Canada did not have a central bank until 1935, while the U.S. Federal Reserve was established in 1913. Canada did, however, have a "lender-of-last-resort" facility because the Finance Act of 1914 allowed the Canadian Treasury Board to lend reserves to banks in exchange for certain assets that would serve as collateral; (2) Canadian banks issued bank notes that served as Canada's currency while Federal-Reserve notes served as the U.S. currency; (3) shareholders in both countries were subject to double liability[13], however, Kane and Wilson (1998) argue that the effectiveness of double liability in the U.S. had broken down by the 1930s[14]; and (4), while the U.S. adopted a deposit-insurance program in 1933, Canada did not do so until 1967.[15]

4.A. Calculation of the Hypothetical Reserve Ratio (HRR) and the Finance-Act-Advances Ratio (FAR)

---

[12] These results are available from the author upon request.

[13] Wagster (2007) reports that double liability "meant that stockholders of an insolvent bank undergoing liquidation could lose the par value of their stock twice because the receiver could require them to pay the par value of their holdings to help liquidate the bank's unpaid debts. Hence, stockholders could lose the par value once if their shares became worthless and lose the par value again if the receiver issued a call for the maximum amount. Other bank shareholders relied upon this contingent liability to motivate large-block shareholders to monitor bank managers for them."

[14] Kane and Wilson (1998) assert that double liability in the U.S. became ineffective as banks sought a wider base of capital to fund growth opportunities. Their analysis is based on Winton's (1993) model of contingent-shareholder-liability that clarifies how bank-stock ownership and bank-management monitoring is affected by the amount of shareholder wealth, information asymmetry about shareholders' wealth, the financial condition of a bank, the honesty of large-block shareholders, and the proportionate degree of ownership of a shareholder. Winton's (1993) model suggests that when shareholder concentration declined in the U.S. during the 1920s, the effectiveness of double-liability provisions in controlling incentive conflict declined too.

[15] See Wagster (2007) for more about the 1967 adoption of deposit insurance in Canada.

Appendix 2 provides details about Canadian bank-note requirements that were in effect during the Great Depression and about the Finance Act. Table 4 presents an analysis of excess-bank-note collateral and Finance-Act advances. Panel A presents the data for the all-banks portfolio, Panel B for the large-bank portfolio and Panel C for the small-bank portfolio. The balance-sheet data primarily comes from issues of *Moody's Bank and Finance Manual* covering 1927 through 1934. However, the 1926, 1927 and 1933 entries for the central-gold-reserve (CGR) deposits for the Canadian Bank of Commerce, as did the 1927 entry for non-interest deposits, came from the *Financial Post*, which published bank-balance-sheet data under the heading "Return of the Chartered Banks of the Dominion of Canada" most months. The data for November of the stipulated years is used because November is the end of the bank's fiscal year. The *Financial Post* was also used to supplement the *Moody's* data for the Canadian National Bank, whose fiscal year also ends in November. The amount of the CGR deposits from 1926 through 1928 and for 1930 came from this source. For the CGR deposits for 1929, the December report was used because a November report was not published.

Column 1 lists the year. Column 2 details the amount of gold and Dominion notes that banks had on deposit at the CGR. Column 3 presents the paid-up value of the banks' outstanding stock, which is also the par value of the outstanding stock if it has been paid-in-full. Column 4 specifies the allowable amount of bank notes that could be issued (column 2 plus column 3) before a bank would have to start paying 5 percent interest to the Minister of Finance.[16] Column 5 shows the amount of outstanding bank notes. Column 6 reveals the percent of outstanding bank notes to allowable bank notes (column 5 divided by column 4 times 100). Column 7 provides, if the

[16] The Bank Act of 1908 allowed Canadian banks to increase the circulation of bank notes during the usual crop-moving season, but they had to pay 5 percent interest on the additional amount. Two of the banks in our sample used this provision during the time period of this study. The Provincial Bank of Canada's circulation exceeded the amount of its CGR deposits plus the par value of its stock by 0.41 percent in 1927, 1.36 percent in 1929, and 4.23 percent in

number is positive, the amount of excess-bank-note collateral (column 4 less column 5). A negative number would indicate the amount of notes the banks had outstanding using the crop-moving-season provision. Column 8 lists the amount of demand deposits. Column 9 details the hypothetical reserve ratio for each year (column 7 divided by column 8 times 100). Column 10 lists the amount of bank borrowing under the Finance-Act provisions. Column 11 lists the Finance-Act advances as a percent of demand deposits (column 10 divided by column 8 times 100).

Column 5 reveals that bank-note issuance peaked in 1928, and then started decreasing as bank-note demand declined along with economic activity as the Great Depression deepened. For both large and small banks, there was a small decline in 1929 followed by a large decline in 1930. Specifically, from 1928 to 1932, the amount of bank notes in circulation for all banks declined from C$182,946,132 to C$124,220,247 (a 32.10 percent decline). For large banks the decline was from C$143,168,583 to C$96,423,090 (a 32.65 percent decline) and for small banks the decline was from C$39,777,549 to C$27,797,157 (a 30.12 percent decline).

Column 2 reveals that the banks steadily reduced their CGR deposits during this period as these reserves were no longer needed as collateral for bank notes in circulation. For all of the banks the decline in CGR deposits was from C$81,130,867 to C$21,381,733 (a 73.65 percent decline), for large banks the decline was from C$63,900,000 to C$18,250,000 (a 71.44 percent decline) and for small banks the decline was from C$17,230,867 to C$3,131,733 (a 81.82 percent decline). In comparing the percentage changes of the large to the small banks, the large-bank note circulation declined more than that of the small banks, but the small-bank CGR deposits declined more than that of the large banks.

1930. The Imperial Bank of Canada's circulation exceeded this amount by 4.15 percent in 1930 and 6.47 percent in 1931.

Column 6 makes this comparison more clear. In 1928 the large banks had issued bank notes equivalent to 90.25 percent of their available collateral. By 1932, their outstanding bank notes were only equivalent to 73.47 percent of their available collateral. The small banks, however, had outstanding bank notes equal to 97.66 percent of their available collateral in 1928 and 92.25 percent in 1932. Clearly the small banks were quicker than the large banks to match up their required collateral to the amount of banknotes being demanded.

Column 7 details the amount of excess collateral in dollar terms. When comparing column 2 to 7 in Panel B, note that from 1926 through 1930 the large-bank deposits in the CGR exceed the amount of their excess collateral, which means the excess collateral was completely in the form of gold and Dominion notes. For example, in 1930 there is C$21,903,639 in excess collateral and C$28,500,000 in CGR deposits, which means the excess collateral is composed of C$21,903,639 in gold and Dominion notes. However, from 1931 through 1934, the excess collateral exceeds the amount of CGR deposits, which means that some of the excess collateral is now in the form of contingent shareholder liability. For example, in 1931, the excess collateral is C$23,678,977 while the CGR deposits are C$21,000,000. Therefore, the excess collateral is composed of C$21,000,000 in gold and Dominion notes and C$2,678,977 in contingent shareholder liability. For the small banks, their excess collateral is always in the form of gold and Dominion notes.

There were three types of deposits by the public: deposits payable upon demand, deposits payable after notice (savings deposits), and deposits payable after a fixed date (time deposits). No interest was paid on demand deposits while interest was paid on savings and time deposits (Falconbridge, 1929, p. 284). If a bank run had developed, non-interest bearing deposits would have been at risk because they were the only deposits available upon demand. For this reason, only demand deposits (called non-interest deposits by *Moody's*) are considered in this analysis.

The excess collateral that became available to back demand deposits in Canada during the Great Depression is similar to the reserves of a deposit-insurance fund. Using this comparison, column 9 in panel B shows that this hypothetical reserve ratio for the large banks grew from 1.43 percent in 1926 to 9.59 percent by 1932 (a 570.63 percent increase). In Panel C, the ratio grew from 2.64 to 3.65 percent (a 38.26 percent increase) over these same years. This suggests that excess CGR deposits were more important to the large banks.

To help give perspective to the size of the hypothetical reserve ratios, the U.S. Congressional Budget Office (2005) reports that from 1934 to 1969, the average reserve ratio of the Bank Insurance Fund was 1.5 percent of insured deposits. Moreover, the U.S. Deposit Insurance Funds Act of 1996 stipulated that once the deposit-insurance-fund reserves were above the Designated Reserve Ratio of 1.25 percent of insured deposits, institutions that were well capitalized and highly rated by supervisors no longer had to pay premiums. According to the Congressional Budget Office (2005) "that provision has exempted the vast majority of depositories from paying premiums."[17] This suggests that the demand deposits of large Canadian banks in 1932 had 6.39 times the backing that insured U.S. deposits averaged from 1934 through 1969 and that small Canadian banks held 2.43 times the average U.S. amount.[18]

If a bank run occurred, bank notes could be immediately issued up to the amount of excess collateral. For example, in 1932 the large-bank portfolio could have supplied C$34,826,910 (Table 4, column 7, panel B) in bank notes to meet a sudden surge in depositor withdrawals, which was equivalent to 9.59 percent of demand deposits (column 9). If depositor demand exceeded this amount, Courchene (1969, p. 369) relates that banks would "have to give up Dominion notes

[17] The Deposit Insurance Funds Act of 1996 was replaced by The Federal Deposit Insurance Reform Act of 2005. The 2005 legislation eliminated the restrictions on premium rates based on the Designated Reserve Ratio.
[18] On a total deposits basis (i.e., interest bearing and non-interest deposits), large Canadian banks had a hypothetical reserve ratio of 1.77 percent in 1932 and the small Canadian banks 0.59 percent.

(either directly to the public or to the Central Gold reserve, so that the chartered banks would be able to increase the issue of bank notes)." If the banks needed Dominion notes, they could borrow them from the Treasury Board at the advance rate by providing the required collateral.

Column 10 shows the amount of Finance-Act borrowings and column 11 expresses these as a percent of non-interest deposits. Column 10 shows that the largest amount of advances for the large banks were C$53 million in 1928 and C$71 million in 1929, during the height of the run-up in stock prices prior to the stock-market crash. Fullerton (1986, p. 36) asserts these borrowings were used to fund brokerage loans whose interest rates were higher than the advance rate for Finance-Act borrowings of 4.50 percent (Powell, 2005, p. 44). For the small banks, their largest borrowings were also in 1929, when they borrowed C$13.5 million. Column 11 shows that the largest Finance-Act ratio for both the large and small banks was in 1929, at 13.18 and 15.13 percent, respectively.

After the stock-market crash in 1929, the large and small banks paid down their Finance-Act advances. In 1930 the large banks had outstanding advances of C$20 million (a 4.39 percent Finance-Act ratio), while the small banks had outstanding advances of C$2 million (a 2.60 percent Finance-Act ratio). The next surge in Finance-Act advances for the large banks came in 1932 and 1933, when their Finance-Act ratios were 11.90 and 12.40 percent, respectively. The small banks, however, increased their borrowings in 1931, and maintained a balance between C$7 and C$8.6 million through 1934. Their Finance-Act ratio over these four years ranged between 10.43 and 12.29 percent.

Recall from Table 2 that during 1932 and 1933, the large banks were insolvent on a market-value basis and the small banks had zero equity. When combining the large-bank hypothetical reserve ratio with their Finance-Act ratio during these high-risk years, total reserves

equal 21.49 percent of large-bank demand deposits in 1932 and 19.53 percent in 1933. For the small banks, their total reserves equal 15.37 percent in 1932 and 15.79 percent in 1933.

In eyeballing columns 9 and 11 in Table 4, it appears that the large banks relied more on maintaining excess CGR deposits than did the small banks. For example, in 1932 the Finance-Act ratio for the large banks is 24 percent larger than their hypothetical reserve ratio, 11.90 percent versus 9.59 percent, respectively. However, for the small banks, their 1932 Finance-Act ratio is 221 percent larger than their hypothetical reserve ratio, 11.72 percent versus 3.65 percent, respectively.

4.B. Regression of IPP on HRR and FAR

To investigate these relationships further, the following regression is run using the Multivariate Regression Model (MVRM) used in section 1:

$$IPP_{n,t} = \alpha_n + \beta_n HRR_{n,t} + \beta_n FAR_{n,t} + \varepsilon_{n,t} \qquad (9)$$
$n = 1, 2, \ldots, N;\ t$=December 31, 1926,... December 31, 1934.

Where

$IPP_{n,t}$ = each bank's yearly actuarially correct deposit-insurance premium per dollar of deposits calculated using the model of Hovakimian and Kane (2000);

$HRR_{n,t}$ = each bank's yearly hypothetical reserve ratio (excess-central-gold reserves plus excess-contingent-shareholder liability/demand deposits);

$FAR_{n,t}$ = each bank's yearly Finance-Act ratio (Treasury-Board advances/demand deposits);

$\varepsilon_{n,t}$ = random disturbances assumed to be i.i.d. normal.

The research hypotheses are:

Test 1: H_o: $\Sigma_{n=1,\ \ldots N}\ \Sigma\beta_n = 0$; *the coefficient of the independent variables for a equal-weighted bank portfolio equals zero. This is tested with two F tests per portfolio, one test for each*

independent variable (i.e., HRR and FAR). The results of this test are displayed Table 5 in columns 3 (HRR) and 4 (FAR), rows 3 (all-banks portfolio), 4 (large-bank portfolio) and 5 (small-bank portfolio).

Test 2: H_o: $\Sigma_{n=1, \ldots 4} - \Sigma_{n=1, \ldots 4} = 0$; *the difference in the coefficients of the large-bank and small-bank portfolios for all regression parameters is not significantly different from zero. The results of this test are reported in the bottom row of Table 5 (large-bank coefficient – small-bank coefficient) and in column 5 of Table 5 (bank portfolio's HRR coefficient – FAR coefficient).*

Table 5 presents the results. Column 3 displays the coefficient for *HRR* with the *p*-value in parentheses and column 4 presents the coefficient for *FAR* with the *p*-value in parentheses. Column 5 presents a difference-of-means test to determine if there is a significant difference between each portfolio's results for *HRR* and *FAR*. Row 3 presents the results for the all-banks portfolio, row 4 for the large-bank portfolio and row 5 for the small-bank portfolio. The bottom row of the table presents a difference-of-means test to determine if there is a significant difference between the findings for the independent variables of the large-bank and small-bank portfolios.

Column 3 reveals there is a positive correlation significant at the 1 percent level between the risk (*IPP*) of the all-banks portfolio and the amount of their excess-bank-note collateral (*HRR*). Column 4 shows a non-significant negative correlation between risk and Finance-Act borrowings (*FAR*). Column 5 shows that these findings for the all-banks portfolio are significantly different at the 1 percent level. Row 4 shows that the large-bank portfolio had a positive correlation, significant at the 1 percent level, between its risk and *HRR,* and a negative correlation, significant at the 5 percent level, between its risk and *FAR*. Column 5 shows that the difference between these variables is significant at the 1 percent level. Row 5 reveals that the small-bank portfolio has a positive correlation, significant at the 10 percent level, between its risk and *HRR,* and a positive

correlation, significant at the 1 percent level, between its risk and *FAR*. Column 5 shows that the difference between these variables is not significant. The bottom row indicates that the difference between the findings for the large and small banks for both HRR and FAR is significant at the 1 percent level.

These results confirm the conclusions reached in the discussion of Table 4 that the large banks relied more on maintaining excess-bank-note collateral to control their risk than they did Finance-Act advances. The significantly positive coefficient for *HRR* in Table 5 reflects the distribution of the large-bank HRRs in Table 4 that peaks in the high-risk years of 1932 and 1933. Moreover, the significantly negative coefficient for *FAR* in Table 5 reflects the distribution of the large-bank FARs in Table 4 that peak in the low-risk year of 1929, then decline with only a slight increase in the high-risk years.

The small-bank results in Table 5 also confirm the conclusions reached in the discussion of Table 4 that the small banks relied more on Finance-Act advances to control their risk than they did excess-bank-note collateral. The results in Table 5 for the small banks also reflect the distribution of the small-bank *HRR* and *FAR* in Table 4. The coefficient of *HRR* is only positive at the 10 percent level in Table 5, which matches with the rather flat distribution of *HRR* in Table 4, with only a slight increase in the high-risk years of 1932 and 1933. In Table 5, *FAR* is significant at the 1 percent level, which reflects the large increase in *FAR* displayed in Table 4 over 1931-1934, which contains the riskiest years in the study.

5. CONCLUSIONS

The results of this paper indicate that the risk profile of Canadian banks was extremely low during the pre- and post-stock-market-crash periods during which no implicit government support for Canadian banks was detected. This period of low risk is attributed to the high degree of asset

and liability diversification of Canadian banks and their access to practically unlimited liquidity through the Finance Act. However, the collapse of the gold standard resulted in two years of extreme volatility during which the benefits of diversification for Canadian banks dissipated. Apparently, the correlations among the holdings of a bank's portfolio react in the same manner as do the correlations of a portfolio of domestic and international stocks in the presence of an exogenous, highly volatile event. Just as correlations increase with volatility in the stock markets reducing the benefit of diversification, so too was the benefit of diversification reduced for Canadian banks in the presence of high volatility during 1932 and 1933.[19]

During these high-risk years, the results indicate that the Canadian government provided implicit support for its banks and that bank managers responded to the resulting moral-hazard incentives. Bank regulators, in turn, apparently pressured bank managers to implement excess-reserve strategies to help control bank risk and limit the government's loss exposure. Large banks relied mainly on creating excess-bank-note collateral[20] while small banks relied mainly on Finance-Act advances. Excess bank-note-collateral would allow for an immediate issue of bank notes if there were a depositor run. If a run required more currency than a bank's excess reserves would allow, the bank could borrow additional Dominion notes from the Treasury Board by providing financial assets as collateral (thus avoiding having to sell them at a loss). These Dominion notes could then be deposited at the CGR Depository as collateral for issuing additional bank notes.

[19] The author thanks Ed Kane for this insight.

[20] The type and amount of this collateral was completely transparent to the public because it could be ascertained from monthly reports in the Canadian press.

Bibliography

Berger, A.N., R.J. Herring, and G.P. Szego. (1995) "The Role of Capital in Financial Institutions." *Journal of Banking and Finance*, 19, 393-430.

Buser, Stephen, Andrew Chen, and Edward J. Kane. (1981) "Federal Deposit Insurance, Regulatory Policy, and Optimal Bank Capital." *Journal of Finance*, 36, 51-60.

Carr, Jack, Frank Mathewson, and Neil Quigley. (1995) "Stability in the Absence of Deposit Insurance: The Canadian Banking System, 1890-1966." *Journal of Money, Credit, and Banking*, 27, 1137-1158.

Congressional Budget Office. (2005) "Modifying Federal Deposit Insurance." Congress of the United States, Washington, DC, May 9.

Courchene, Thomas J. (1969) "An Analysis of the Canadian Money Supply: 1925-1934." *The Journal of Political Economy*, 3, 77, 363-391.

Duan, Jin-Chuan, Arthur F. Moreau and C.W. Sealy. (1992) "Fixed-Rate Deposit Insurance and Risk-Shifting Behavior at Commercial Banks." *Journal of Banking and Finance,* 16, 715-742.

Falconbridge, John Delatre. (1929) *Banking and Bills of Exchange: The Law of Banks and Banking; Clearing Houses, Currency and Dominion Notes; Bills, Notes, Cheques and Other Negotiable Instruments*, fourth edition. Toronto: Canada Law Book Company, Limited.

Friedman, Milton, and Anna Jacobson Schwartz. (1963) *A Monetary History of the United States, 1867-1960*, Princeton, MA: Princeton University Press.

Giammarino, Ronald, Eduardo Schwartz and Josef Zechner. (1989) "Market Valuation of Bank Assets and Deposit Insurance in Canada." *Canadian Journal of Economics,* 22, 109-127.

Hovakimian, Armen, and Edward J. Kane. (2000) "Effectiveness of Capital Regulation at U.S. Commercial Banks, 1985 to 1994." *Journal of Finance,* 55, 451-68.

Kane, Edward J. (1996) "De Jure Interstate Banking: Why Only Now?" *Journal of Money, Credit and Banking,* 28, 141-61.

Kane, Edward J., and Berry K. Wilson. (1998) "A Contracting-Theory Interpretation of the Origins of Federal Deposit Insurance." *Journal of Money, Credit and Banking,* 30, Part 2, 571-95.

Kane, Edward J., and Berry K. Wilson. (2002) "Regression Evidence of Safety-Net Support in Canada and the U.S., 1893-1992." *The Quarterly Review of Economics and Finance,* 42, 649-71.

Kryzanowski, Lawrence, and Gordon S. Roberts. (1993) "Canadian Banking Solvency, 1922-1940." *Journal of Money, Credit and Banking,* 25, Part 1, 361-76.

Kmenta, Jan. (1986) *Elements of Econometrics* (Macmillan Publishing Company, New York, N.Y.).

Merton, Robert C. (1977) "An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees." *Journal of Banking and Finance,* 1, 3-11.

Moody's Bank and Finance Manual, John Moody, ed., 1927-1935.

Odier, Patrick, and Bruno Solnik. (1993) "Lessons for International Asset Allocation." *Financial Analysts Journal*, pp. 63-77.

Powell, James. (2005) *A History of the Canadian Dollar*, Bank of Canada.

Ronn, Ehud I., and Avinash K. Verma. (1986) "Pricing Risk-Adjusted Deposit Insurance: An Option-Based Model." *Journal of Finance,* 41, 871-895.

Saunders, Anthony, and Berry Wilson. (1999) "The Impact of Consolidation and Safety-Net Support on Canadian, U.S. and U.K. Banks: 1893-1992." *Journal of Banking and Finance,* 23, 537-571.

Shapiro, Alan C. (2006) *Multinational Financial Management*, John Wiley & Sons, Inc.

Staff. (May 28, 1932) "Exchange Now Doing Business in Normal Way." *Financial Post*, 22, 1.

Stigler, George J. (1971) "The Theory of Economic Regulation." *Bell Journal of Economics and Management Science*, 2, 3-21.

Wagster, John D. (1996) "Impact of the 1988 Basle Accord on International Banks." *Journal of Finance*, 51, 1321-46.

Wagster, John D. (2007) "Wealth and Risk Effects of Adopting Deposit Insurance in Canada: Evidence of Risk Shifting by Banks and Trust Companies." *Journal of Money, Credit, and Banking,* 39 (7), 1649-79.

Winton, Andrew. (1993) "Limitations of Liability and the Ownership Structure of the Firm." *Journal of Finance,* 48, 487-512.

Appendix 1: Canadian Bank Sample

Large-Bank Portfolio	1927 assets	Canadian branches	Foreign branches	Total branches	Capital and Reserve	Deposits
Royal Bank of Canada	894,663,903	766	108	874	60,000,000	722,636,091
Bank of Montreal	831,548,968	over 600	9	over 609	60,833,400	709,179,698
Canadian Bank of Commerce	558,709,494			575	40,000,000	464,299,000
Bank of Nova Scotia	261,736,980	over 296	over 4	over 300	30,000,000	207,497,249
Small-Bank Portfolio						
Canadian National Bank	148,702,336	255	1	256	11,000,000	121,863,295
Dominion Bank	141,482,753			126	14,000,000	113,881,724
Imperial Bank of Canada	138,899,197	184		184	14,500,000	109,014,919
Bank of Toronto	129,295,378	about 170		about 170	12,000,000	110,302,650

Appendix 2: Bank-Note Issuance and the Finance Act

Bank-note issuance[21]

Canadian bank notes were not legal tender but promissory notes that were payable at par to the bearer on demand at any of the issuing bank's branches, agencies or offices (Falconbridge, 1929, p. 139). Banks earned profits, or seigniorage, on the issue of bank notes because they did not pay interest on these liabilities while they earned interest on the loans and interest-bearing securities they acquired in exchange for their notes. The Bank Act of 1871 gave Canadian chartered banks the exclusive right to issue bank notes, up to the amount of their unimpaired paid-up capital (Falconbridge, 1929, p. 135).[22] This meant that bank notes were not secured by any sort of specific deposit with the government but were credit instruments secured by the general assets of the issuing bank.

The Bank Act of 1871 also introduced the double-liability clause. This clause states that in the event of liquidation, if the assets of the bank are insufficient to pay off the liabilities, shareholders are liable for the shortfall. A shareholder's liability is limited to the par value of their shareholdings in addition to any unpaid amounts for their shares.[23] A bank is declared insolvent if it fails to make payment on any of its liabilities for 90 consecutive days or, as added by the Bank Act of 1890, for multiple intervals of non-payment within 12 months (Falconbridge, 1929, p. 345). These rules are supplemental to the rules of the Winding-up Act, which can also be used to

[21] The source for most of the material concerning bank-note issuance comes from Falconbridge (1929).
[22] Falconbridge (1929, p. 29) reports there is a difference between authorized capital and paid-up capital. The authorized capital of a bank could not be less than $500,000. However, this amount could be raised by subscription of which only 10 percent had to be initially paid by any one subscriber. However, before receiving a banking certificate from Canada's Treasury Board, a minimum of $250,000 had to be remitted to the Minister of Finance.
[23] The par value of Canadian-bank stock during the Great Depression was $100 per share. There was no right of set-off for shareholders (Falconbridge, 1929, p. 441), thus an assessment against a shareholder under the double-liability provisions would not be reduced by the amount of any outstanding claim the shareholder had against the bank.

establish a bank's insolvency.[24] After a bank has become insolvent, and if no proceedings have been initiated under the Winding-up Act, and no payment has been made on any or all of a bank's liabilities for three months, the directors are obligated to make a call on the shareholders for the entire shortfall even if no debts have been collected by the bank or assets sold (Falconbridge, 1929, p. 346).[25]

The Bank Act of 1880 gave bank-note holders first claim on the assets of an insolvent bank (Falconbridge, 1929, p. 135). This made payment in full almost certain in the event of bank failure, however, when failures occurred there were sometimes lengthy delays in redeeming bank notes. The uncertain time of redemption would cause a severe discounting of the notes for anyone requiring liquidity. To address this issue, the Bank Act of 1890 established a bank-circulation-redemption fund that would redeem the notes of failed banks after two months and would pay 6 percent interest from the day of suspension of operations until the payment was made (Falconbridge, 1929, pp. 135-6).[26] The banks funded the redemption fund by depositing with the

[24] Under the Winding-up Act, a bank "is deemed insolvent (a) if it is unable to pay its debts as they come due; (b) if it calls a meeting of its creditors for the purpose of compounding with them; (c) if it exhibits a statement showing its inability to meet its liabilities; (d) if it has otherwise acknowledged its insolvency; (e) if it assigns, removes or disposes of, or attempts or is about to assign, remove or dispose of, any of its property, with intent to defraud, defeat or delay its creditors, or any of them; (f) if, with such intent, it has procured its money , goods, chattels, lands or property to be seized, levied on or taken, under or by any process or execution; (g) if it has made any general conveyance or assignment of its property for the benefit of its creditors, or if, being unable to meet its liabilities in full, it makes any sale or conveyance of the whole or the main part of its stock in trade or assets, without the consent of its creditors, or without satisfying their claims; or, (h) if it permits any execution issued against it, under which any of its goods, chattels, land or property are seized, levied upon or taken in execution, to remain unsatisfied till within four days of the time fixed by the sheriff or proper officer for the sale thereof, or for fifteen days after such seizure (Falconbridge, 1929, pp. 345-6)."

[25] Wagster (2007) reports that bank-note issuance and the double liability of shareholders were phased out in tandem. The Bank Act of 1934 was passed in conjunction with the Bank of Canada Act of 1934. The Bank of Canada Act established the Bank of Canada and its right of note issuance. The Bank Act of 1934 restricted note issuance by banks to their paid-up capital from the day the Bank of Canada began operation (March 11, 1935). It then established a schedule to reduce the amount of notes a bank could circulate by 5 percent of its paid-up capital each year for five years (starting January 1, 1936) and then by 10 percent a year for an additional five years. The double liability of bank stockholders was also reduced according to this schedule. The Bank Act of 1944 specified that the chartered banks had until January 1, 1950 to redeem with the Bank of Canada the remaining bank notes they had in circulation and that the double liability of shareholders would be reduced in lock step with the note redemption.

[26] In 1900, the rate of interest was changed from 6 percent to 5 percent (Falconbridge, 1929, p. 151)

Minister of Finance an amount equal to 5 percent of the average circulation of their bank notes over the previous year (Falconbridge, 1929, p. 137).

The Bank Act of 1908 was amended to allow a temporary issue of bank notes during the usual crop-moving season, which ran from the first day of September to the last day of February. This temporary issue was not to exceed 15 percent of the unimpaired paid-up capital plus the rest account, also called the reserve fund, of the bank (Falconbridge, 1929, p. 143). Banks had to pay interest to the Minister of Finance, not to exceed 5 percent, on the amount of excess circulation.

The Bank Act of 1913 allowed banks to "issue notes in excess of the amount of its unimpaired paid-up capital, to an amount not exceeding the amount of current gold coin and Dominion notes held for the bank in the central gold reserves" (Falconbridge, 1929, p. 138). [27] This Act also stipulated that if the amount of a bank's notes in circulation was less than the amount of its deposits in the central gold reserves, the difference was the bank's property and must be returned to the bank upon application (Falconbridge, 1929, p. 141).

The Finance Act of 1914

Powell (2005, p. 37) relates that in the days leading up to the August 4, 1914 declaration of war in Canada, heavy gold withdrawals from banks occurred causing concerns about the possibility of banking runs by depositors. Because there was not a lender of last resort, bank runs could shut down the banking system because banks were required to close if they could not meet

[27] Falconbridge (1929, p. 436-7) relates that Dominion notes were legal tender issued by the Dominion government. They were redeemable in gold and, by 1927, the first $50 million issued had to have a 25 percent gold backing with the remaining 75 percent backed by approved securities. Issues of Dominion notes exceeding this limit had to be fully backed by gold. Dominion notes would be advanced to the banks in return for "Treasury bills, bonds, debentures or stocks of the Dominion of Canada, Great Britain, any province of Canada and any British possession; Canadian municipal securities; Promissory notes and bills of exchange secured by documentary title to wheat, oats, rye, barley, corn, buckwheat, flax or other commodity; Promissory notes and bills of exchange issued or drawn for agricultural, industrial, or commercial purposes and which have been used or are to be used for such purposes" (Falconbridge, 1929, p. 441). Advances could not exceed one year and repayments by the banks had to be in the form of Dominion notes (Falconbridge, 1929, p. 441-2). In the event of the liquidation of a bank, all advances of Dominion notes were the second charge on the assets of a bank.

depositor demands for gold or Dominion notes. This led to Canada going off the gold standard and the passing of The Finance Act of 1914.[28]

The Finance Act suspended the redemption of Dominion notes into gold, made bank notes legal tender and made the government a "lender-of-last-resort" by allowing the Treasury Board to lend Dominion notes to banks in exchange for collateral in the form of financial securities. The Dominion notes could then be used to increase the amount of bank notes the banks had in circulation (Powell, 2005, p. 38). The Treasury Board set the Advance Rate, which was the cost to the chartered banks to borrow Dominion notes. Dominion notes issued under the Finance Act were not backed by gold, and because the annual limits for borrowing were set very high, there was essentially no limit to the amount that banks could borrow (Powell, 2005, p. 41).

The Finance Act was extended in 1919 and revised in 1923. The 1923 revision made provision for the return to the gold standard in 1926, at which time bank notes lost their legal tender status and Dominion notes regained theirs and they were once again redeemable in gold (Powell, 2005, p. 41). Because the Finance Act was in effect in conjunction with the gold standard after 1926, the government's gold holdings did not limit the amount of Dominion notes that banks could borrow as they did prior to World War I. Treasury-Board lending to the banks was institutionalized until the repeal of the Finance Act in 1935 by the Bank of Canada Act.

[28] The Finance Act (formally known as "An Act to Conserve the Commercial and Financial Interests of Canada") received royal assent on August 22, 1914, eighteen days after Canada entered World War I.

Table 1

Abnormal Return and Change in Systematic Risk for Canadian Banks to the October 29, 1929 "Black Tuesday" Stock-Market Crash and to the September 21, 1931 Ending of the Gold Standard

$R_{nt} = \alpha_n + \alpha_n D_{S,1} + \alpha_n D_{S,2} + \beta_n M_t + \beta_n D_{S,1} M_t + \beta_n D_{S,2} M_t + \Sigma D_e \delta_{ne} + \varepsilon_{nt.}$

$n = 1, 2, \ldots, N$; t = Jan. 4, 1926,..., August 13, 1934; $e = 1, 2$.

$D_{S,1}$ = a shift dummy variable that equals zero from January 4, 1926 to October 28, 1929 (the pre-stock-market-crash period) and 1 from November 4,1929 to January 4, 1932 (the post-stock-market-crash period);

$D_{S,2}$ = a shift dummy variable that equals zero from January 4, 1926 to January 4, 1932 (the last week that banks' minimum and over-the-counter prices were identical) and 1 from January 11, 1932 to August 13, 1934 (the post-gold-standard period);

D_1= a dummy variable that equals one for the weeks of November 4 through November 25, 1929, thus encompassing the four weekly returns after the stock-market crash;

D_2= a dummy variable that equals one for the weeks ending January 11 through June 13, 1932, thus encompassing the period of price variability following the establishment of minimum prices until they are eliminated (January 11, 1932 through May 16, 1932) and the four weekly returns after minimum prices are eliminated.

1	2	3	4	5	6	7	8	9	10
R_{nt}	α_n	$\alpha_n D_{S,1}$	$\alpha_n D_{S,2}$	$\beta_n M_t$	$\beta_n D_{S,1} M_t$	$\beta_n D_{S,2} M_t$	$D_1 \delta_{n1}$	$D_2 \delta_{n2}$	$\Sigma D_e \delta_{ne}$
	Intercept Parameter (F-statistic)	First Intercept Shift Parameter (F-statistic)	Second Intercept Shift Parameter (F-statistic)	Market Return Parameter (F-statistic)	First Market Shift Parameter (F-statistic)	Second Market Shift Parameter (F-statistic)	11/04/1929 through 11/25/1929 Estimate in % (F-statistic)	01/04/1932 through 06/13/1932 Estimate in % (F-statistic)	Cumulative Estimate in % (F-statistic)
All-Banks Portfolio	0.00 (1.45)	-0.00 (1.54)	-0.00 (0.29)	0.05 (3.24)*	0.06 (2.05)	0.12 (13.18)***	-2.32 (11.04)***	-1.35 (17.61)***	-3.67 (22.76)***
Large-Bank Portfolio	0.00 (1.68)	-0.00 (1.99)	-0.00 (0.68)	0.07 (5.21)**	0.08 (2.73)*	0.13 (10.03)***	-2.86 (11.52)***	-1.33 (11.77)***	-4.19 (20.39)***
Small-Bank Portfolio	0.00 (0.73)	-0.00 (0.62)	-0.00 (0.01)	0.02 (0.74)	0.04 (0.79)	0.12 (12.22)***	-1.79 (6.72)***	-1.37 (18.67)***	-3.16 (17.30)***
Large- versus Small-Bank Portfolios	0.00 (0.61)	-0.00 (1.00)	-0.00 (0.98)	0.05 (4.27)**	0.05 (1.47)	1.27 (0.16)	-1.07 (2.77)*	0.04 (0.02)	-1.03 (2.12)

Notes: Table 1 displays results from tests of the diversification hypothesis. When Great Brittan abandoned the gold standard over the weekend of September 19-20, 1931, minimum Canadian-bank-stock prices were established by using the previous Friday's closing price. These minimums remained in effect through the week-ending price of May 16, 1932. During this period, the *Financial Post* reported both over-the-counter prices and on-exchange minimum prices. Minimum prices and over-the-counter prices were identical until the week of January 11, 1932. Over-the-counter prices are used to produce the results reported in this table. The first three entries of column 1 list each portfolio studied. The bottom entry is the title of the difference-of-means test between the large-bank and the small-bank portfolios. Columns 2 through 7 display estimations of the regression parameters. Columns 8 through 10 display abnormal returns from the event study. Column 8 displays abnormal returns for the four weeks following the Black-Tuesday (October 29, 1929) stock-market crash. Column 9 displays abnormal returns related to the end of the gold standard by studying the weekly returns from January 11, 1932 (when minimum and over-the-counter prices began to vary) through June 13, 1932 (the fourth week after the elimination of bank-stock price minimums). For each event, the abnormal return is given in percent and its associated F-statistic is in parentheses. Column 10 displays the cumulative abnormal return across both events for each portfolio. Columns 6 and 7 display the results of a Chow test for changes in systematic risk. The bottom row of the table displays the results of difference-of-means test between the large-bank and small-bank portfolios for each indicated parameter and return coefficient. *, ** and *** indicate significance at the 10, 5 and 1 percent level, respectively.

Table 2

Difference-of-Means Tests for *B/V*, *IPP*, σ_V and σ_e between the Pre-Stock-Market-Crash Period (1926-1929) and the Post- Stock-Market-Crash Period (1930-1931); and the Post-Stock-Market Crash Period (1930-1931) and the Post- Gold-Standard Period (1932-1934).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Variable	1926	1927	1928	1929	**26-29 mean**	1930	1931	**30-31 Mean**	1932	1933	1934	**32-34 mean**	Diff.-of-Means: col. 6 – col. 9		Diff.-of-Means: col. 9 – col. 13	
Panel A: All-Banks Portfolio													*t* stat	Pr > |*t*|	*t* stat	Pr > |*t*|
B/V	0.93	0.93	0.92	0.93	0.93	0.92	0.93	0.92	1.02	1.00	0.96	0.99	0.53	0.60	-5.66	<.0001***
IPP (%)	0.00	0.00	0.06	0.02	0.02	0.00	0.00	0.00	3.23	2.28	0.59	2.03	0.86	0.40	-4.07	0.0005***
σ_V (%)	0.61	1.69	1.72	1.47	1.37	1.19	1.10	1.14	2.93	2.49	2.10	2.51	1.41	0.17	-6.19	<.0001***
σ_e (%)	6.00	13.32	13.44	12.22	11.25	9.88	9.62	9.75	24.05	21.63	16.89	20.85	1.43	0.16	-6.92	<.0001***
Panel B: Large-Bank Portfolio																
B/V	0.93	0.92	0.91	0.93	0.92	0.91	0.92	0.92	1.03	1.01	0.97	1.00	0.36	0.72	-4.10	0.0011***
IPP (%)	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	4.78	3.11	1.17	3.02	0.72	0.48	-3.48	0.0051***
σ_V (%)	0.58	1.88	1.87	1.85	1.54	1.46	1.34	1.40	3.10	2.50	2.41	2.67	0.60	0.56	-4.28	0.0005***
σ_e (%)	5.60	14.11	13.47	14.47	11.91	11.39	11.05	11.22	25.72	22.17	19.39	22.43	0.47	0.64	-4.88	0.0002***
Panel C: Small-Bank Portfolio																
B/V	0.93	0.93	0.94	0.93	0.93	0.93	0.93	0.93	1.00	1.00	0.94	0.98	0.49	0.63	-4.28	0.0006***
IPP (%)	0.00	0.00	0.12	0.00	0.03	0.00	0.00	0.00	1.68	1.44	0.00	1.04	0.70	0.49	-3.16	0.0092***
σ_V (%)	0.63	1.50	1.57	1.10	1.20	0.92	0.86	0.89	2.77	2.48	1.78	2.34	1.82	0.08*	-4.78	0.0003***
σ_e (%)	6.40	12.53	13.42	9.98	10.58	8.38	8.19	8.28	22.38	21.08	14.38	19.28	1.74	0.10*	-5.19	<.0001***

Notes: Table 2 presents tests of both the diversification and the government-guarantee hypotheses. Variables are estimated using the methodology of Hovakimian and Kane (2000). *B* is the face value of deposits and other debt, *V* is the market value of assets, σ_V is the volatility of asset returns, σ_e is the volatility of equity returns, and *IPP* is the risk-adjusted deposit-insurance premium per dollar of deposits. Each year's results are detailed in columns 2 through 5 for the pre-Black-Tuesday-stock-market-crash period (1926-1929), columns 7 and 8 for the post-stock-market-crash period (1930-1931), and columns 10 through 12 for the post-gold-standard period. Column 6 gives each variable's mean for the pre-stock-market-crash period, column 9 for the post-stock-market-crash period and column 13 for the post-gold-standard period. Column 14 displays the *t*-statistic for difference-of-means tests (column 6 – column 9) and column 15 provides the *p*-value and significance level for the test results. Column 16 displays the *t*-statistic for difference-of-means tests (column 9 – column 13) and column 17 provides the *p*-value and significance level for the test results. *, ** and *** indicate significance at the 10, 5 and 1 percent level, respectively.

Table 3
Tests for Risk-Shifting Opportunities by Managers of Canadian Charter Banks

$\Delta IPP = \beta_0 + \beta_1 \Delta\sigma_V + \varepsilon$				$\Delta IPP = \beta_0 + D_1\beta_0 + D_2\beta_0 + \beta_1\Delta\sigma_V + D_1\beta_1\Delta\sigma_V + D_2\beta_1\Delta\sigma_V + \varepsilon$				
1	2	3	4	5	6	7	8	9
	1926-1929	1930-1931	1932-1934	1926-1929	$D_S\beta\Delta$	1930-1931	$D_S\beta\Delta$	1932-1934
Panel A: All-Banks Portfolio								
Constant	-0.0002	-0.0001	-0.0035	-0.0001	0.0001	0.0000	-0.0034	-0.0034
Pr > |t|	0.6375	0.7499	0.4244	0.9630	0.9866	0.9868	0.3813	0.5011
$\Delta\sigma_V$	0.0610	0.0832	1.6381	0.0610	-0.0511	0.0099	1.5769	1.5868
Pr > |t|	0.1078	0.0217**	<.0001***	0.8534	0.9361	0.9855	0.0001***	0.0198**
R^2	0.11	0.22	0.56	0.56				
No. Obs.	24	24	24	64				
Panel B: Large-Bank Portfolio								
Constant	0.0001	0.0001	-0.0023	0.0001	-0.0002	-0.0001	-0.0022	-0.0023
Pr > |t|	0.5210	0.6004	0.8258	0.9912	0.9821	0.9840	0.8092	0.8435
$\Delta\sigma_V$	0.0054	0.0415	2.2551	0.0053	-0.0090	-0.0037	2.2724	2.2687
Pr > |t|	0.6705	0.0502**	0.0111***	0.9944	0.9943	0.9971	0.0151**	0.0984*
R^2	0.02	0.33	0.49	0.5035				
No. Obs.	12	12	12	32				
Panel C: Small-Bank Portfolio								
Constant	-0.0002	-0.0001	-0.0036	-0.0001	0.0000	-0.0001	-0.0034	-0.0035
Pr > |t|	0.7009	0.9055	0.1727	0.9413	0.9980	0.9562	0.1282	0.2380
$\Delta\sigma_V$	0.1265	0.1842	1.1525	0.1277	-0.1158	0.0119	1.0188	1.0307
Pr > |t|	0.1137	0.0495**	<.0001***	0.5356	0.8404	0.9823	0.0002***	0.0871*
R^2	0.23	0.33	0.81	0.81				
No. Obs.	12	12	12	32				

Notes: Table 3 presents results of tests of the government-guarantee hypothesis. Single-period and three-period models are estimated using the methodology of Hovakimian and Kane (2000) to estimate σ_V and *IPP*. σ_V is the volatility of bank-asset returns and *IPP* is the actuarially fair deposit-insurance premium per dollar of deposits. Δ signifies the data are first-differenced. *, ** and *** indicate significance at the 10, 5 and 1 percent level, respectively.

Table 4: Excess-Bank-Note Collateral and Finance-Act Advances: Calculating the Hypothetical Reserve Ratio and Finance-Act-Advances Ratio

Year	CGR deposits	Paid-up Capital	Maximum Circulation	Actual Circulation	Actual-to-Maximum	Excess Collateral	Demand (non-interest) deposits	Hypothetical reserve ratio (*HRR*)	Finance-Act advances	Finance-Act ratio (*FAR*)
1	2	3	4	5	6	7	8	9	10	11
Panel A: All-Banks Portfolio										
1926	68,060,334	107,816,700	175,877,034	167,840,034	95.43%	8,037,000	501,464,357	1.60%	6,500,000	1.30%
1927	70,370,334	113,416,700	183,787,034	171,065,382	93.08%	12,721,652	630,725,530	2.02%	9,000,0000	1.43%
1928	81,130,867	118,240,100	199,370,967	182,946,132	91.76%	16,424,835	616,707,798	2.66%	55,000,000	8.92%
1929	59,130,867	137,740,571	196,871,438	178,778,670	90.81%	18,092,768	628,040,095	2.88%	84,500,000	13.45%
1930	36,630,867	140,000,000	176,630,867	153,041,307	86.64%	23,589,560	532,796,853	4.43%	22,000,000	4.13%
1931	27,030,867	140,000,000	167,030,867	142,016,834	85.02%	25,014,033	521,690,327	4.79%	43,000,000	8.24%
1932	21,381,733	140,000,000	161,381,733	124,220,247	76.97%	37,161,486	427,090,586	8.70%	50,714,000	11.87%
1933	15,681,866	140,000,000	155,681,866	126,191,988	81.06%	29,489,878	450,153,408	6.55%	55,804,000	12.40%
1934	21,382,000	140,000,000	161,382,000	135,485,825	83.95%	25,896,175	467,589,624	5.54%	35,304,000	7.55%
Panel B: Large-Bank Portfolio										
1926	52,000,000	84,316,700	136,316,700	130,177,807	95.50%	6,138,893	429,457,795	1.43%	5,000,000	1.16%
1927	53,000,000	89,916,700	142,916,700	132,021,738	92.38%	10,894,962	543,155,868	2.01%	9,000,000	1.66%
1928	63,900,000	94,740,100	158,640,100	143,168,583	90.25%	15,471,517	521,655,805	2.97%	53,000,000	10.16%
1929	45,500,000	110,746,551	156,246,551	140,259,338	89.77%	15,987,213	538,833,209	2.97%	71,000,000	13.18%
1930	28,500,000	113,000,000	141,500,000	119,596,361	84.52%	21,903,639	455,783,418	4.81%	20,000,000	4.39%
1931	21,000,000	113,000,000	134,000,000	110,321,023	82.33%	23,678,977	445,007,976	5.32%	35,000,000	7.87%
1932	18,250,000	113,000,000	131,250,000	96,423,090	73.47%	34,826,910	363,103,605	9.59%	43,214,000	11.90%
1933	12,250,000	113,000,000	125,250,000	98,115,461	78.34%	27,134,539	380,810,251	7.13%	47,214,000	12.40%
1934	17,750,000	113,000,000	130,750,000	106,773,202	81.66%	23,976,798	400,230,071	5.99%	28,214,000	7.05%
Panel C: Small-Bank Portfolio										
1926	16,060,334	23,500,000	39,560,334	37,662,227	95.20%	1,898,107	72,006,562	2.64%	1,500,000	2.08%
1927	17,370,334	23,500,000	40,870,334	39,043,644	95.53%	1,826,690	87,569,662	2.09%	0	0.00%
1928	17,230,867	23,500,000	40,730,867	39,777,549	97.66%	953,318	95,051,993	1.00%	2,000,000	2.10%
1929	13,630,867	26,994,020	40,624,887	38,519,332	94.82%	2,105,555	89,206,886	2.36%	13,500,000	15.13%
1930	8,130,867	27,000,000	35,130,867	33,444,946	95.20%	1,685,921	77,013,435	2.19%	2,000,000	2.60%
1931	6,030,867	27,000,000	33,030,867	31,695,811	95.96%	1,335,056	76,682,351	1.74%	8,000,000	10.43%
1932	3,131,733	27,000,000	30,131,733	27,797,157	92.25%	2,334,576	63,986,981	3.65%	7,500,000	11.72%
1933	3,431,866	27,000,000	30,431,866	28,076,527	92.26%	2,355,339	69,343,157	3.40%	8,590,000	12.39%
1934	3,632,000	27,000,000	30,632,000	28,712,623	93.73%	1,919,377	67,359,553	2.85%	7,090,000	10.53%

Notes: CGR deposits are gold and Dominion notes deposited by banks with the Central Gold Reserve (column 2). Bank stock could be bought by subscription when issued, and only 10 percent had to be initially paid by any one subscriber (column 3). The maximum circulation of bank notes (columns 2 plus 3) is the amount allowed before any penalty interest charges to the banks would apply (column 4). Column 6 = columns 5/4. Column 7 = columns 4 - 5. Column 9 = columns 7/8. Column 11= columns 10/8.

Table 5
Regression of *IPP* on the Hypothetical Reserve Ratio (*HRR*) and the Finance-Act Ratio (*FAR*)

$IPP_{n,t} = \alpha_n + \beta_n HRR_{n,t} + \beta_n FAR_{n,t} + \varepsilon_{n,t}$
$n = 1, 2, \ldots, N$; t=December 31, 1926,... December 31, 1934.
$IPP_{n,t}$ = each bank's yearly actuarially correct deposit-insurance premium per dollar of deposits calculated using the model of Hovakimian and Kane (2000);
$HRR_{n,t}$ = each bank's yearly hypothetical reserve ratio (excess-central-gold reserves plus excess-contingent-shareholder liability/demand deposits);
$FAR_{n,t}$ = each bank's yearly Finance-Act ratio (Treasury-Board advances/demand deposits);
$\varepsilon_{n,t}$ = random disturbances assumed to be i.i.d. normal.
The research hypotheses are:
Test 1: H_o: $\Sigma_{n=1, \ldots N} \Sigma\beta_n = 0$; *the coefficient of the independent variables for a equal-weighted-bank portfolio equals zero. This is tested with two F tests per portfolio, one test for each independent variable (i.e., HRR and FAR). The results of this test are displayed in columns 3 (HRR) and 4 (FAR), rows 3 (all-banks portfolio), 4 (large-bank portfolio) and 5 (small-bank portfolio).*
Test 2: H_o: $\Sigma_{n=1, \ldots 4} - \Sigma_{n=1, \ldots 4} = 0$; *the difference in the coefficients of the large-bank and small-bank portfolios for all regression parameters is not significantly different from zero. The results of this test are reported in the bottom row(large-bank coefficient – small-bank coefficient) and in column 5 (bank portfolio's HRR coefficient – FAR coefficient).*

1 *IPP*	2 α	3 *HRR*	4 *FAR*	5 *HRR - FAR*
Actuarially Fair Deposit- Insurance Premium	Intercept Parameter	Hypothetical Reserve Ratio	Finance-Act Ratio	Difference-of-Means Test
All-Banks Portfolio N=72	-0.724 (0.0001)***	0.0352 (.0001)***	-0.0004 (0.5840)	0.0348 (0.0001)***
Large-Bank Portfolio N=36	-0.0709 (0.0001)***	0.0323 (0.0001)***	-0.0012 (0.0357)**	0.0311 (0.0001)***
Small-Bank Portfolio N=36	-0.0015 (0.8887)	0.0029 (0.0729)*	0.0008 (0.0119)***	0.0021 (0.2427)
Difference-of-Means Test: Large- versus Small-Bank Portfolios	-0.0694 (0.0001)***	0.0294 (0.0001)***	-0.0020 (0.0018)***	

Notes: *, ** and *** indicate significance at the 10, 5 and 1 percent level, respectively.