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ABSTRACT

The paper develops an empirical model to explain growth of total assets of a sample of the world's largest banks. The model was estimated over a period in which U.S. banks' assets grew less rapidly than the assets of large banks headquartered in other industrial countries. The model provides an estimate of the banks' allocation between home currency and foreign currency assets which allows an estimate of the impact of exchange rate changes on bank asset growth.

The results of the model suggest that no single economic variable explains the faster growth of non-U.S. banks. Changes in real exchange rates were estimated to have had a significant impact on bank asset growth through their impact on the dollar value of banks' home-currency assets. This impact was greater over a shorter time period when exchange rate movements tended to be larger. Over the longer run other factors, such as faster home-country economic growth, an expanding trade and foreign investment sector, and the ability of large banks to retain their share of domestic intermediation, tended to be relatively more important.

The model tested whether banks headquartered in particular countries tended to respond in a similar manner to economic variables and could be aggregated into a single behavioral equation. Aggregation was generally indicated for non-U.S. banks and was rejected for American banks. The model overpredicted asset growth for large U.S. and Canadian banks after 1982, suggesting that various factors including pressure by bank regulators to increase capital ratios and asset quality questions may have affected their asset growth sooner than banks headquartered in other countries.

The Determinants of the Growth of Multinational Banking Organizations: 1972-86

Robert S. Dohner* and Henry S. Terrell**

Our goal is to become the world's largest and strongest comprehensive financial service institution.

(Dai-Ichi Kangyo Bank, 1985)

International league standing became a key strategic objective for many banks in the 1970s, measured by total asset growth...

(Benjamin J. Cohen, 1986)

I. Introduction

This paper attempts to estimate empirically the factors associated with the growth of total assets of the world's largest banks. In particular, it attempts to determine the extent to which observable economic variables, including changes in the exchange rate of a bank's home country currency, affect the growth of bank assets. Understanding the economic factors influencing bank asset growth is important because asset growth is sometimes thought to be a goal of bank management, may be

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**Staff Member, Division of International Finance, Board of Governors of the Federal Reserve System. The views expressed in this paper are those of the authors and should not be interpreted as representing the views of the Board of Governors of the Federal Reserve System or its Staff. We wish to thank Neil Ericsson for comments and suggestions, and Shane Grady and Kim Coleman for valuable research assistance.

cited as evidence of competitive advantages or disadvantages affecting certain banks or the banking industry vis-a-vis other financial intermediaries, and because bank asset growth is of concern to bank regulatory authorities and legislators.

Banking organizations may have specific reasons for promoting asset growth.¹ The first reason is a publicity effect. Major international and other financial publications, including Euromoney, The Institutional Investor, The Banker, and The American Banker all regularly publish lists of the world's largest banks. Publicity from these rankings reflects a certain measure of the bank's success, particularly if it is associated in customers' minds with the ability of the banking organization to deliver a full range of financial services over a broad geographical area.² The ability to provide large loans to single borrowers may be associated with the absolute size of a bank's assets, although in fact it is determined by the capital or net worth of the bank.³

1. For a general treatment of alternative corporate objectives see William J. Baumol, Business Behavior, Value, and Growth (Harcourt Brace, World Inc., 1967) and Stephen A. Rhoades, Power, Empire Building, and Mergers (Lexington Books, 1983). For an application of alternative theories to banks see Jeffrey Arthur Clark, "Alternative Explanations Of Commercial Bank Behavior and the Structure - Conduct - Hypothesis" (Ph.D. dissertation, University of Illinois at Urbana - Champaign, 1980).

2. As one observer noted: "A handful of large global players intermediating on all markets, regardless of national origin." John C. Heimann, "Statement Before the Senate Banking Committee, October 13, 1987, p. 4.

3. A recent article suggests that the real measure of a bank's strength is the equity market capitalization of its outstanding stock. See: "The Power League," Euromoney (February 1987), pp. 85-95.

A second reason why banking organizations may emphasize growth is that absolute size can affect funding costs. Banks are unique in that they need to rollover a large proportion of their liabilities on a very short-term basis. The absolute size of a bank might offer some assurance of stability to investors in bank liabilities and provide large banks some advantage in competing for funds. Since banks are highly leveraged, a small advantage in funding costs can translate into a large gain in profits. A larger bank may also be able to reduce its overall asset risk and reduce fluctuations in its earnings growth over time by increasing its portfolio diversity.

Thus the potential for reducing risk exposure by increasing bank size provides a further motivation⁴ for including bank size in the banks objective function...

A third reason why banks may stress asset growth is because banking is a regulated industry. Because of the high costs of bank failure, related to potential disruption to the payments system, loss of essential credit facilities, and costs to the public sector in paying out claims of insured depositors, large banking organizations encountering problems can usually rely on the liquidity resources of their home-country central banks. Since the costs associated with banking problems increase in direct relation to the size of the banking organization, it is often argued that some banks are simply "too big to fail." Therefore, banks may seek to maximize asset growth to increase their chances of liquidity support in the event of a problem. To the extent that market investors perceive this advantage to size, larger banks derive an

4. Clark, p. 130.

additional benefit of lower cost funding or the ability to operate with lower capital ratios. Philip Wellons has noted certain differences in national support for large banks that may have long-run competitive implications:

All governments offer some form of deposit insurance and provide an implicit guarantee that no big bank will be allowed to fail, but in France and Japan that guarantee reaches much further than it does in Germany, the United Kingdom, or the United States. The effect on the capital structure of the banks, and hence on their costs, is striking. The French government implicitly guarantees the banks it owns. The Japanese government has permitted no bank to fail since World War II.

A general reason for growth as an objective of management, which is often applied to banking, is economies of scale of operation. This argument of economies of scale is often cited to counter anticompetitive arguments against bank mergers. While often cited, sophisticated empirical research has failed to demonstrate any consistent relationship between bank cost efficiency and the absolute size of banking organizations.⁶

Bank asset size is also of interest to policymakers as well as a decline in asset rankings may be perceived as a loss of competitive status of a nation's banks. The brief moratorium on foreign bank acquisitions of domestic U.S. banks enacted on March 31, 1980, as part of

5. Philip A. Wellons, "Competitiveness in the World Economy: The Role of the U.S. Financial System," in Bruce R. Scott and George C. Lodge, eds., U.S. Competitiveness in the World Economy, (Harvard University Press, 1985), p. 366.

6. For a survey article on this subject for U.S. banks see: David B. Humphrey, "Costs and Scale Economies in Bank Intermeditation," in Richard C. Aspinwall and Robert A. Eisenbeis, eds., Handbook for Banking Strategy (John C. Wiley and Sons, 1985), pp. 745-753.

the Depository Institutions Deregulation and Monetary Control Act (Title IX), was in large part motivated by Congressional concern about the declining presence of U.S. banks among the list of the world's largest banks.⁷ The decline in the number of U.S. banks among the world's largest commercial banks has also been cited as a rationale for expanded interstate activities as well as deregulation for U.S. banks.⁸

II. The Historical Experience of Bank Asset Growth

Table 1 traces the historical record of the growth of assets of a constant sample of the world's largest banks from 1972 to 1986. To facilitate comparability, total assets are reported less contra accounts.⁹ Total assets, rather than total deposits, are used because that concept is a closer measure of the total size of the banking firm without the need to make arbitrary distinctions about which liabilities constitute deposits. Whenever possible the data follow the convention of The Banker in referring to the parent (holding) company, since that is the relevant corporate decisionmaking unit and because that is the unit that issues equity stock to the public. The data cover the consolidated

7. For more detailed analysis see C. Stewart Goddin and Stephen J. Weiss, "U.S. Banks Loss of Global Standing," in Foreign Acquisitions of U.S. Banks (Robert F. Dame, 1981), pp. 191-229.

8. See statement by George D. Gould, Under Secretary for Finance, U.S. Department of the Treasury, before the Senate Committee on Banking, Housing, and Urban Affairs, January 21, 1987, p. 10.

9. Contra accounts are items that appear on both sides of a bank's balance sheet and thus do not represent funds for the bank's own use. Contra accounts include such things as acceptances, securities held for customers, and letters of credit. Accounting conventions differ across countries as to whether these are counted as a bank's total assets or as off-balance sheet (below the line) items.

Table 1
Total Assets of Major Multinational Banking Organizations¹
(1972=100)

<u>Year-end</u>	<u>Banks Headquartered in:</u>						
	<u>United States</u>	<u>Canada</u> ²	<u>France</u>	<u>Germany</u>	<u>Japan</u> ³	<u>Switzerland</u>	<u>United Kingdom</u>
1972	100	100	100	100	100	100	100
1973	122	121	140	135	140	116	134
1974	145	148	164	173	145	158	158
1975	155	164	182	191	158	177	149
1976	171	196	197	244	185	209	148
1977	195	211	252	317	218	268	187
1978	221	244	377	428	335	368	224
1979	255	291	472	498	334	422	311
1980	281	352	507	462	392	424	402
1981	290	439	494	429	437	493	442
1982	306	452	502	428	460	482	456
1983	311	443	473	406	564	474	451
1984	338	450	475	384	618	449	418
1985	366	464	571	522	773	595	499
1986	387	473	670	707	1,179	842	559
<u>Memoranda</u>							
Average Annual Growth Rate (percent)	10.1	11.7	12.2 ⁴	15.0	19.3	16.4	13.1
Standard Deviation of Growth Rate	5.7	9.0	12.9 ⁴	17.5	16.6	15.3	14.4
Coefficient of Variation	.56	.77	1.06	1.17	.86	.95	1.10
Number of Banks	7	5	3	4	7	3	4

1. Total assets less contra accounts measured in U.S. dollars, as reported in The Banker (various issues).

2. For year-end October 31.

3. For year-end September 30.

4. Excludes 1978 because of major accounting change.

(worldwide) activities of the banking organizations, including their assets at domestic banking offices, assets at branches and subsidiaries outside of the home country, and in some cases assets of nonbanking affiliates.

The data in Table 1 refer to the growth patterns of a sample of specific banks rather than following the technique of counting the number of banks headquartered in any particular country in the world's top 50 or top 100 banks.¹⁰ That method avoids problems when the list of institutions changes to include a new banking institution or deletions that occur because of mergers or failed institutions.

The list of specific banks included in Table 1 is contained in Appendix A. The criteria for inclusion were: (1) that the bank is headquartered in a developed country so that adequate macroeconomic data are available; (2) that the bank is among the world's top 100 banks for every year from 1972 through 1986 to avoid undue influence from special cases; (3) that the bank is continuously either privately owned or owned by the government over the entire period, to avoid discontinuities in corporate strategy associated with changes in the form of ownership; (4) that the bank is primarily engaged in commercial banking, to avoid special cases such as agricultural banks, giro or postal savings banks, and local state-owned savings banks; and (5) that there are between three and seven banks headquartered in any particular country to avoid

10. See, for example: Stephen A. Rhoades, "Concentration of World Banking and the Role of U.S. Banks among the 100 Largest," in Journal of Banking and Finance (1983), pp. 427-437, and Goddin and Weiss, op. cit., pp. 191-229.

overweighting or underweighting any particular individual bank or any national economic experience.¹¹ Thirty-three banks headquartered in seven different countries satisfied these criteria. In several cases the banks in the sample did expand by major mergers, and in one case there was a major sale of a foreign subsidiary. The impact of these transactions will be analyzed in an empirical model.

The data in Table 1 indicate that over the 1972-86 period U.S. banks experienced the slowest growth in total worldwide assets measured in U.S. dollars, while the Japanese banks grew the most rapidly.¹² Growth rates for European and Canadian banks were somewhere in-between the U.S. and Japanese experiences. The standard deviation and coefficients of variation of the growth rates for each of the national groupings are shown as memoranda in Table 1. Since the data on bank assets are reported in U.S. dollars, it is not surprising that both measures of growth variability were lowest for U.S. banks since relatively little of their total assets were adjusted for changes in exchange rates vis-a-vis the U.S. dollar. The Canadian banks displayed the second lowest measures of growth variability, again because a relatively high proportion of their portfolios are comprised of assets denominated in U.S. dollars, and, because fluctuations between the U.S.

11. For Japan, this meant the sample only included the City Banks and not the Long-Term Credit Banks, Trust Banks, or Bank of Tokyo.

12. By contrast, the share of world exports of manufactured goods of U.S. multinational firms, including their overseas affiliates, has been nearly stable since 1966. See Robert Lipsey and Irving R. Kravis, "The Competitiveness and Comparative Advantage of U.S. Multinationals, 1957-83," National Bureau of Economic Research Working Paper No. 2051, October 1986.

and Canadian dollar have been relatively less than fluctuations of the U.S. dollar vis-a-vis the home-country currencies of the other banks.

Table 2 scales the growth of the banks' assets to the growth of the nominal GNP in their home country. This simple scaling reduces asset growth from a range of 4 to 12 over the entire period to a range of 1.1 to 1.9 when total assets are deflated by nominal GNP. Bank assets grew more rapidly than nominal home-country GNP over the period as a whole for each national banking group. The experience of the Japanese banks is broadly consistent with the European experience. American banks grew the most rapidly relative to GNP from the beginning of the period through the end of the first oil shock (1972-74), but their growth relative to home-country GNP was by far the slowest over the entire period.

The growth of the Japanese banks is also interesting. From 1972 through 1980 the Japanese banks had the slowest growth relative to their home-country nominal GNP. In fact, in some years the growth rate of their total assets was below the growth of their home-country economy suggesting, as will be discussed more fully below, that they became relatively uncompetitive in markets outside of Japan. In the period since year-end 1980, the performance of Japanese banks has changed considerably as their asset growth has exceeded the growth of their home-country GNP by a far greater margin than any other sample of banks. By contrast, U.S. bank asset growth since year-end 1980 has not kept pace with the growth of the U.S. economy.

The fact that large bank assets for all countries have widely outpaced the growth of their nominal home country GNPs over the entire

Table 2

Ratio of Large Bank Assets to
Nominal GNP¹
(1972=100)

Bank Headquartered in:

<u>Year</u>	<u>United States</u>	<u>Canada</u>	<u>France</u>	<u>Germany</u>	<u>Japan</u>	<u>Switzerland</u>	<u>United Kingdom</u>
1972	100	100	100	100	100	100	100
1973	109	106	108	97	99	86	114
1974	119	105	116	114	96	95	121
1975	118	109	108	124	95	103	104
1976	116	108	114	134	97	111	107
1977	119	115	126	152	94	124	108
1978	119	129	147	160	95	122	102
1979	123	138	156	162	99	133	111
1980	125	147	157	153	108	132	112
1981	115	168	174	161	118	150	141
1982	117	169	193	173	133	162	152
1983	111	151	187	167	146	155	155
1984	109	149	198	172	151	163	162
1985	111	148	186	188	174	172	150
1986	112	145	171	188	167	174	153

1. Measured in U.S. dollars at current exchange rates. Data for banks assets are year-end; data for GNP are fourth quarter (third quarter for Japan and Canada) at annual rates converted into U.S. dollars at quarterly average exchange rate.

14-year period suggests that international factors may also be influencing bank asset growth. Bryant has shown that over roughly the same period world trade has grown much faster than domestic economic activity, and that international banking aggregates have grown much faster than world trade.¹³ Thus a shifting pattern of banks' business towards more rapidly growing international trade transactions, and the fact that this kind of business appears to be bank asset intensive, explains the fact that nominal bank assets have systematically outpaced nominal home-country GNP.

The reason why international bank intermediation is asset intensive is not entirely clear but Bryant has noted that interbank redepositing as well as dealing with nonbanking customers is important in international banking because:

International banking plays a much more prominent role in channeling funds among financial institutions themselves than in providing direct intermediation and maturity transformation between ultimate nonbank savers and ultimate nonbank investors.¹⁴

Table 3 disaggregates bank asset growth into three shorter periods; and Table 4 provides macroeconomic data for those periods. As shown in Table 3, in the 1972-80 period the assets of all groups of banks grew rapidly. This was a period of relatively rapid worldwide inflation. The assets of U.S. banks grew the least rapidly, in part because the value of other currencies (except the Canadian dollar) appreciated

13. Ralph C. Bryant, International Financial Intermediation (Brookings, 1987), pp. 19-30.

14. Ibid., p. 30.

Table 3

Average Annual Growth of Worldwide Assets of
Multinational Banking Organizations¹

(percent per year in U.S. Dollars)

	<u>Period</u>		
	<u>1972-80</u>	<u>1980-84</u>	<u>1984-86</u>
<u>Banks Headquartered in:</u>			
United States	13.8	4.8	6.9
Canada	17.0	6.3	2.5
France	19.1 ²	-1.6	18.7
Germany	21.1	-4.5	35.6
Japan	18.6	12.1	38.1
Switzerland	19.8	1.4	37.0
United Kingdom	19.0	1.0	15.7

Source: Same as Table 1.

-
1. Measured from end-year dates.
 2. Excludes data for 1978.

Table 4

Average Annual Growth of Selected Indicators
 against the U.S. dollar, and thus assets denominated in non-U.S. banks.
 home-country currencies increased in value when measured in U.S. dollars.

The period from year-end 1980 through year-end 1984 witnessed a dramatic decline in nominal income growth, because of reduced inflation

Nominal Gross National Product	Country						United Kingdom
	United States ¹	Canada	France	Germany	Japan ⁴	Switzerland	
1972-86	11.5	8.8	9.8	9.3	14.2	11.2	9.7
1972-80	13.8	11.5	16.4	15.5	16.8	16.2	17.3
1980-84	9.4	6.0	-6.6	-6.7	4.4	-2.8	-7.9
1984-86	6.8	4.0	20.4	20.4	25.0	21.9	19.0

Total Exports Plus Imports

1972-86	13.6	10.9	11.9	12.1	14.2	12.3	11.5
1972-80	18.0	15.6	21.6	20.2	22.9	20.0	20.4
1980-84	8.9	6.1	-5.4	-3.9	3.2	-4.3	-2.8
1984-86	6.6	2.9	12.5	15.6	4.6	18.9	8.0

Exchange Value of Currency vs. U.S. Dollar²

1972-86	-2.4	-1.9	3.4	5.0	6.2	-3.3
1972-80	--	-2.0	1.7	6.7	4.3	10.3
1980-84	3.1	17.1	11.1	2.5	9.0	-15.5
1984-86	--	2.6	19.4	23.3	25.0	24.5

Real Exchange Rate vs U.S. dollar³

1972-86	4.7	0.7	1.0	3.7	3.6	0.7
1972-80	--	-0.7	4.2	3.7	4.5	7.2
1980-84	2.4	1.4	1.1	3.3	5.9	-15.7
1984-86	--	-2.4	20.5	23.1	23.5	22.4

1. Annual average growth in U.S. dollars terms.
 2. Computed from year-end exchange rates, except end Q3 for Canada and Japan.
 3. Using GNP deflators for Q4 (Q3 for Canada and Japan). An increase indicates a real appreciation.

against the U.S. dollar, and thus assets denominated in non-U.S. banks' home-country currencies increased in value when measured in U.S. dollars.

The period from year-end 1980 through year-end 1984 witnessed a dramatic decline in nominal income growth, because of reduced inflation and because of slower real economic growth. The growth of assets declined sharply for each country's banks. This was also a period of strong appreciation of the U.S. dollar against all currencies, and in this period large U.S. bank assets grew more rapidly than all other banking groups except the Japanese and Canadian banks. Between year-end 1984 and year-end 1986 the U.S. dollar depreciated sharply against the European currencies and the Japanese yen (but not the Canadian dollar), and U.S. and Canadian bank assets grew less rapidly than the assets (measured in U.S. dollars) of the other groups of banks.

Two briefer subperiods are worth noting because of special factors that appear to have influenced the growth of banks headquartered in specific countries. Between year-end 1973 and year-end 1976 assets at Japanese banks grew at an average annual rate of only 9.7 percent, compared with a growth rate of 11.9 percent for U.S. banks and 21.8 percent for German banks. This period of relatively slow growth for Japanese banks appears to have resulted from international investor discrimination in placing funds with Japanese banks because of fears that Japan's overall financial stability would be badly affected by the first oil shock. In many cases, branches of Japanese banks operating in the Euromarkets were required to pay above market interest rates to attract deposits, the so-called "tiering" of deposits, and Japanese banks become

less competitive in international lending. As fears about the Japanese banks subsided, the market tiering ceased, and Japanese banks resumed their rapid growth.¹⁵

A second unusual period is the pronounced and sustained absolute decline in total assets, measured in U.S. dollars, of large German banks between year-end 1979 and year-end 1984. During that period their assets declined by 23 percent, or about 5 percent per year. As shown in Table 4, this was generally a period of negative growth in nominal German domestic economic activity, when measured in U.S. dollars, although not as negative as the French, Swiss, or U.K. experience. The poor growth performance of the German banks appears related to the structure of their asset portfolios. German banks held a large proportion of their assets in fixed-rate term loans to domestic German corporations as well as fixed-rate securities, while their domestic deutschmark liabilities had a much shorter interest rate structure. This mismatch of the interest structure of their assets and liabilities cost the German banks heavily in earnings as interest rates on their short-maturity deutschmark deposits rose sharply in 1979 and again in 1980, and remained quite high before declining in late 1982. The poor earnings performance of the German banks resulting from this asset-liability mismatch appears to have

15. Ian Giddy reports the results of an informal survey that in November 1974 interbank traders rated Japanese banks tenth in the hierarchy of banks for safety. In July 1981, the largest Japanese banks were ranked second in safety. See Ian D. Giddy, "The Eurocurrency Market," in Abraham M. George and Ian H. Giddy, eds., International Finance Handbook, vol. 1, (John H. Willey and Sons, 1984), Chapter 3-1, p. 18.

had a negative impact on their ability to grow.¹⁶ During this period, for example, one large German bank suspended its dividend payout.

Table 5 reviews the overall record by computing implied elasticities of bank asset growth with respect to nominal GNP and nominal total trade over the entire period. Asset elasticity with respect to GNP was highest for German banks at 1.51, ranged between 1.33 and 1.39 for Canadian, Japanese, Swiss, and U.K. banks, and was somewhat lower for U.S. and French banks. The implied elasticities with respect to trade were relatively high for Swiss and German banks, ranged between 1.03 and 1.13 for Canadian, French, Japanese banks, and were actually quite low (0.77) for U.S. banks.

In summary, it appears that bank asset growth measured in U.S. dollars is related to growth of nominal domestic GNP in the bank's home country, growth of international trade, and changes in the value of the banks' home country currency relative to the U.S. dollar. These relationships are explored in more detail in a formal model.

III. The Model

The rapid growth of the largest banks headquartered outside the United States, and the slippage of U.S. banks in the ranks of the world's largest banks, have led to concerns in some quarters about the competitive position of U.S. banks, and the role of policy, in the United States or abroad, in promoting domestically chartered banks. While the

16. For more details see Salomon Brothers, The Universal Banks of West Germany: Competitive Strategies Begin to Emerge, (Salomon Brothers, 1986), p. 18.

Table 5

Major Bank Asset Growth Rates
and Implied Elasticities
1972 - 1986

<u>Country</u>	<u>Bank Asset Growth Rate</u>	<u>GNP Growth Rate (US\$)</u>	<u>Total Trade Growth Rate (US\$)</u>	<u>Implied Elasticity wrt.₁ \$ GNP¹</u>	<u>Implied Elasticity wrt. \$ Trade²</u>
Canada	11.7	8.8	10.9	1.33	1.07
France	12.2	10.3	11.9	1.19	1.03
Germany	15.0	9.9	12.1	1.51	1.24
Japan	20.9	15.0	19.1	1.39	1.09
Switzerland	16.4	11.9	12.3	1.38	1.33
United Kingdom	13.1	9.7	11.5	1.35	1.13
United States	10.1	9.3	13.2	1.09	.77

1. Ratio of average growth rate of bank assets, in U.S. dollars, to average growth rate of GNP expressed in dollars.

2. Ratio of average growth rate of bank assets, in U.S. dollars, to average growth rate of total combined exports and imports expressed in dollars.

decline in the ranking of U.S. banks has been taken in some quarters as prima facia evidence of a decline in American competitiveness, little attempt has been made to explain bank asset growth in terms of underlying variables determining demand for bank intermediation.¹⁷

Although the assets of the world's major banks are denominated in a variety of currencies, bank asset rankings are reported using asset values in U.S. dollars. Because of the translation that takes place in converting to dollars, exchange rate levels have an obvious influence on asset totals and rankings. In addition, there are other economic variables that affect the size of a bank's assets, some specific to the bank, and some characteristic of the environment in which the bank operates.

Bank asset growth is determined by: (1) changes in exchange rates that have valuation effects; (2) other economic variables that affect the demand for bank financing, and therefore bank assets; and (3) the response of an individual bank's assets to changes in these economic variables.

The third item deserves a brief comment. The underlying variables determining bank asset growth may be increasing at the same

17. Chairman Greenspan has noted the need to analyze the faster growth of Japanese banks in a more structured manner. "... we must ask ourselves whether these changes in relative rankings of Japanese firms can be explained largely by Japan's rather highly concentrated banking system, its appreciated currency, its trade surplus, and very high domestic savings. It is no surprise that under these circumstances Japanese institutions would be growing rapidly, particularly in terms of dollars." Statement by Alan Greenspan, Chairman, Board of Governors of the Federal Reserve System, before the Subcommittee on Telecommunications and Finance of the House Committee on Energy and Commerce, October 5, 1987, Federal Reserve Bulletin, vol. 73 (December 1987), p. 909.

rate across countries, but individual banks, or all of major banks in an individual country, may be growing faster than the other banks in the sample. This differential growth could result from several factors including: (1) more rapid growth of financial intermediation in the home country; (2) increasing banking concentration in the home country; and (3) increases in the domestic or international competitive position of an individual bank or of the country's largest banks.

The factors noted above may affect the ranking of an individual bank, or they may affect the rankings of all of the major banks headquartered in a particular country. Individual banks headquartered in a specific country might show a greater or lesser asset response to variables that are country specific. One of the important questions that an analysis of bank asset growth can address is the extent to which the major banks in a country behave in a similar fashion, so that it is possible to speak of the factors determining the competitiveness of a country's banks as a group, or the extent to which individual banks react differently in response to environmental variables, i.e., the extent to which bank asset growth responses are idiosyncratic to individual banks.

Our model of bank asset growth makes the simplifying assumption that a major multinational bank has two types of assets: (1) domestic assets that are denominated in its home currency; and (2) international or foreign assets that are denominated in U.S. dollars.¹⁸ For an

18. We are assuming either that all foreign assets are denominated in U.S. dollars, or that third currency denominated assets change in proportion to the third country/U.S.\$ exchange rate. Since the model is intended to test the impact of changes in exchange rates on relative growth rates, (Footnote continues on next page)

individual bank i from country j ,

$$\begin{aligned} \text{Total Assets } \$ = & e \text{ (Domestic Currency Denominated Assets) } + \\ & \text{(Foreign Currency Denominated Assets in \$)} \end{aligned}$$

or:

$$A_{ij} = e_j d_{ij}(X_{ij}) + f_{ij}(Y_{ij}) \quad (1)$$

where e_j is the domestic exchange rate in dollars per unit of domestic currency, X_{ij} is a vector of variables determining domestic assets, and Y_{ij} is a vector of variables determining foreign currency denominated assets.

The model stated above is the most general specification of asset determinants. In addition, we will test whether behavior of the major banks can be described by a single country-specific function, differing only by scale across banks. For bank i in country j this alternate specification would be:

$$A_{ij} = a_{ij} (e_j d_j(X_{ij}) + f_j(Y_{ij})) \quad (1')$$

where a_{ij} is a constant scale factor.

(Footnote continued from previous page)
the foreign/domestic distinction is by currency rather than residence of customer.

The functions $d()$ and $f()$ can be considered as simple demand functions for bank intermediation. Both determine nominal magnitudes, and are functions of nominal variables. We assume that both $d()$ and $f()$ are homogeneous of degree one. This homogeneity assumption means that the behavior summarized by $d()$ and $f()$ is independent of the units of valuation of X and Y . Thus we can express X and Y in units of domestic currency or in dollars since

$$e d(X) = d(eX)$$

A second consequence of the homogeneity assumption is that an increase in prices that leads to a equiproportionate increase in all variables in X will lead to the same proportionate increase in $d(X)$.

Therefore we can write

$$d(X) = P_j D(X_{\text{real}}) \quad \text{where } X_{\text{real}} = (1/P_j)X$$

Using the model developed above, we can approach the question of the effects of exchange rate changes on relative bank asset rankings.

Consider two banks, one in country j and one in country k . The

relative asset size (ignoring individual bank subscripts) is:

$$\frac{A_j}{A_k} = \frac{e_j P_j d_j(X_{real_j}) + f_j(Y_j)}{e_k P_k d_k(X_{real_k}) + f_k(Y_k)} = \left(\frac{e_j P_j}{e_k P_k} \right) \left[\frac{d_j(X_{real_j}) + f_j(Y_{real_j})(P_w/e_j P_j)}{d_k(X_{real_k}) + f_k(Y_{real_k})(P_w/e_k P_k)} \right]$$

where P_w is an index of internationally traded goods prices in U.S. dollars. It is clear from this formulation that changes in real rather than changes in nominal exchange rates affect relative bank asset growth measured in U.S. dollars.¹⁹ To the extent exchange rate changes offset differing rates of inflation, bank asset size (measured in dollars) should not be affected.

The period over which we compare bank asset growth was one in which there were substantial deviations of exchange rates from their purchasing power parities (PPP), as shown in the lower panel of Table 4. A 10 percent change in real exchange rates, however, would not lead to a full 10 percent change in the size of a non-U.S. bank measured in U.S. dollars. Part of the asset holdings of major non-U.S. banks are denominated in foreign (non-home country) currencies, largely U.S. dollars. To the extent that these holdings of non-home country currency assets are determined by variables that are themselves denominated in a foreign currency, the dollar value of these assets is not affected by a change in the bank's home-country exchange rate against the dollar. The

19. Or more precisely, deviations from purchasing power parity are the source of differential exchange rate effects on relative bank asset growth.

higher the proportion of a bank's assets that are denominated in its home-country currency, the greater the response of its total assets (measured in U.S. dollars) to changes in real exchange rates.

Unfortunately, existing bank asset data do not distinguish domestic currency and foreign currency denominated assets. However, it is possible to estimate the breakdown of foreign and domestic currency assets by specifying the variables in X and Y , and estimating the d and f functions in equation (1).²⁰

Our choice of variables for the domestic and foreign assets functions was guided by the desire to keep the variable list small so that equations could be estimated for individual banks over the sample period. The second consideration was that the same or similar variables be available for all of the countries in the sample, so that comparisons could be made across countries.

For the domestic currency asset function d , we chose nominal GNP (or GDP where GNP was not available) as a measure of the domestic demand for bank intermediation, and a broad measure of monetary assets (M) to capture the changing role of banks in domestic financial intermediation, which would include any competitive changes, including changes in regulation in domestic banking and financial markets.

20. The success of this approach depends upon the important variables in the X and Y vectors being distinct. If a determining variable were to appear in both functions $d()$ and $f()$, its contribution could not be allocated between domestic currency and foreign currency assets.

Thus:

$$d_{ij} = d_{ij}(\text{GNP}_j, M_j) \quad (2)$$

Bank holdings of assets denominated in foreign currency are assumed to result primarily from foreign trade financing and the overseas operations of the bank. In most cases, overseas operations have arisen as a result of the movement of domestic firms into foreign markets and foreign direct investment. Data on trade flows, measured in U.S. dollars, are readily available. However, data on foreign direct investment are not available on a comparable basis across countries. Therefore, the current account balance of the home country is used as a proxy for overseas capital flows. Finally, a variable for the aggregate current account deficits of the developing countries identified as market borrowers by the International Monetary Fund was also included to determine whether the rapid buildup of external debts of these countries affected the growth of particular banks.

Total foreign currency assets of the i^{th} bank in country j thus depends upon:

$$f_{ij} = f_{ij}(\text{TRADE}_j, \text{CA}_j, \text{DEF}) \quad (3)$$

where: TRADE_j = Exports plus imports in U.S. dollars of country j.
 CA_j = Current account balance of country j.
 DEF = Aggregate current account deficit of the IMF Group of market borrowers.

In addition to the economic variables, individual dummy variables were added for several large bank acquisitions, and a dummy variable was included for a major accounting change that boosted the reported assets of the French banks on a one-time basis in 1978.²¹

Two variables that were not included in our demand-based model are differences in the cost of capital to major multinational banks and differences in the ability of banks headquartered in various countries to leverage their growth off their capital or net worth.²² Differences in the cost of capital may result from differences in savings propensities and taxation structures, while differences in acceptable leveraging ratios may reflect differences in prudential supervision, perceptions about the risks in an institution's portfolio, and market beliefs about the extent to which official institutions will stand behind the liabilities of a particular bank. A lower cost of capital and any advantages in leveraging will provide a competitive advantage in growth

21. See Appendix B for list of major acquisitions.

22. These issues are discussed more fully in: David Hale, "Competitiveness and the Cost of Capital in the United States and Japan," Center for Study of Financial Markets, 1988.

by allowing a bank to charge a lower interest rate on a particular loan. Reliable data on both the after-tax cost of capital to banks and the true extent of leveraging are not available. Published data on capital for continental European banks and Japanese banks exclude rather large holdings of "hidden" reserves and this exclusion makes meaningful cross-country comparisons of capital ratios impossible.

The model described is based entirely on the demand for bank assets. That demand is derived largely from macro-economic factors common to all banks headquartered in a particular country.

IV. The Empirical Results

The variables used in the estimation of equations (1) and (1') have been described in the previous section. Since the model tests whether the individual bank asset functions are identical, up to a scale factor, for each bank in a country, the asset variables have been scaled so that the sample average values of assets for each bank are identical, and equal to the sample average value of the largest bank in that country. We have used the homogeneity assumption to convert variables measured in domestic currency GNP into U.S. dollar values, using the exchange rate corresponding to the year-end for the asset data reported in The Banker. Data for the variables included in the foreign asset function are measured as annual totals, in U.S. dollars.

Both the dependent variable and the independent variables are measured in nominal U.S. dollar terms over a period of high inflation. As shown in Table 1, bank assets, by country, grew by a factor of 4 to 12

over the 14 year period from year-end 1972 to year-end 1986. Because of this large trend factor, simple estimation of equation (1) or (1') has several problems. The first is the possibility of heteroskedastic error terms, since beginning and end values differ widely in scale. A second and more serious problem is the possibility of spurious correlation among variables with such strong trend elements. To avoid these problems, we have scaled all the variables by a common variable, also measured in dollar terms. The scale variable chosen was annual GNP, converted to dollars at the point of asset translation. Thus the equations estimated, either for individual banks, or for all banks within a country, are:

$$\text{Assets*}_t = d_1 + d_2 M*_t + f_1 \text{Trade*}_t + f_2 \text{CA*}_t + f_3 \text{DEF*}_t + \text{Dummies}_t \quad (4)$$

where variables denoted with an asterisk are scaled by nominal GNP.

Dummy variables are included to capture the effects of major bank mergers and divestments (a total of 4 in the sample), and to capture the effect of an accounting change affecting the reporting of French banks.

Scaling by dollar GNP does not completely eliminate the trend in the variables, but it does greatly reduce it. As data in Table 2 indicate, the ratio of major bank assets to GNP for the seven countries increased by a factor of 1.1 to 1.9 over the sample period. None of the dependent variables is monotonically increasing; for each group of banks there is some subperiod when bank assets relative to GNP fall as well as periods when that ratio rises.

Testing for Aggregation at the Country Level

We tested whether a single equation is adequate to explain the behavior of bank assets, adjusted for scale, for all banks within a country using a Chow test. The restricted regression is a pooled regression for all banks within a country. Dummy variables, where they are specific to banks, are included in this equation. The unrestricted sum of squared residuals is calculated by running separate regressions for each of the banks within a country. The test results are reported in Table 6.

The tests reported in Table 6 indicate the assumption that individual banks can be aggregated at the country level is generally good, with the notable exception of the United States. Aggregation is strongly indicated for banks headquartered in Japan, France, and Switzerland.²³ The ability to aggregate is narrowly rejected in the Canadian case at the 10 percent level, but not at any lower level. This suggests that the major banks within countries outside the United States respond in similar fashion to the same economic influences, in part because of similarity of their asset portfolios. It also suggests that banks outside the United States maintain their market shares relative to

23. One observer commenting on the similarity of growth in assets of major Japanese banks has noted: "It is a cardinal principle of the regulators not to upset the pecking order between the banks... The Bank of Japan's role is to coordinate new loans so as to keep the relative size of each bank intact, judged by loans and assets." Akio Mikuni, "Evaluating Japanese Banks," A Speech Delivered to International Banking Conference, Washington, D.C., February 17, 1988. For a more detailed account of the influence of the Japanese Government on Japanese banks see: J. Andrew Spindler, The Politics of International Credit: Private Finance and Foreign Policy in Germany and Japan (Brookings Institution, 1984), pp. 135-176.

Table 6
Aggregation at the Country Level
F-test Results

<u>Banks Headquartered in:</u>	<u>Number of Banks</u>	<u>F Statistic</u>	<u>Degrees of Freedom</u>	<u>Probability¹ Value</u>
Canada	5	1.575	20,49	.099
France	3	.750	12,27	.693
Germany	4	1.437	15,40	.178
Japan	7	.546	30,70	.966
Switzerland	3	.814	10,30	.618
United Kingdom	4	1.412	24,28	.190
United States	7	8.080	30.69	.000

1. Probability of observing a value of the F statistic this high or higher if the null hypothesis of country level aggregation is true.

the leading bank within their home country. U.S. banks, in contrast, seem to be more idiosyncratic in their behavior, and therefore are not subject to description by a single asset function. We report below the results for country equations for all of the countries except the United States, where we report regression results for the individual banks.

Two estimation procedures were utilized for the country aggregations. The first was ordinary least squares applied to the pooled data for the major banks in that country. The second was a time-series cross-section procedure that corrects for serial correlation within each block of observations.²⁴ The two procedures produced coefficient estimates that were almost identical. The results from the time-series cross-section estimation are reported in Table 7.

The results of the estimations were generally good, although there were some surprises in the size, and in some cases, the sign, of coefficient estimates. The first two coefficients, the constant term and the coefficient on M/GNP, form the domestic asset block. The surprising feature here is the number of times the constant term appears with a negative sign. In all of these cases, M/GNP is the more influential variable. Its coefficient is larger, and its effect dominates, so that in each case implied domestic assets are positive. This suggests that M and GNP in combination proxy for the level of domestic financing activity, even though the regression estimates a negative value for the constant in several cases. These results caution

24. The procedure is described in Jan Kmenta, Elements of Econometrics (Macmillan, 1971), pp. 508-514.

Table 7

Regression Results for Factors Determining Ratio of Bank Assets to GNP

Independent Variables	Banks Headquartered in:					United Kingdom
	Canada	France	Germany	Japan	Switzerland	
Constant	-.021 (1.01)	.076 (1.38)	-.306 (11.6)	-.182 (12.8)	-.005 (.04)	-.020 (.44)
M/GNP	.292 (6.44)	.026 (.21)	.794 (15.2)	.267 (16.9)	1.78 (4.51)	.338 (4.51)
Trade/GNP	.044 (1.02)	.048 (.67)	.097 (2.67)	.180 (7.41)	-.412 (1.97)	.077 (.99)
CA/GNP	.130 (1.14)	-.126 (.55)	.011 (.16)	.273 (5.61)	1.76 (3.21)	.046 (.19)
DEF/GNP	.066 (10.8)	.084 (8.20)	-.031 (2.35)	-.044 (3.33)	.047 (4.06)	.085 (5.28)
D ₁	.024 ¹ (2.18)	.038 ² (6.39)				.032 ³ (2.61)
D ₂						-.043 ⁴ (2.86)
D ₃						.008 ⁵ (1.25)
R ²	.97	.99	.98	.98	.95	.96
SE	.806	.830	.846	.836	.865	.731
Rho	.440	-.099	-.014	.045	.343	.487
DW	1.76	2.08	2.06	1.88	1.38	1.78

T statistic in parentheses.

-
1. Acquisition of Harris Trust by Bank of Montreal.
 2. Accounting change affecting French banks.
 3. Purchase of Crocker Bank by Midland.
 4. Sale of Crocker Bank by Midland.
 5. Acquisition of National Bank of North America by National Westminster Bank.

us to be careful with individual coefficient estimates, and instead utilize the entire block of variables determining domestic assets.

The coefficient estimates for the foreign asset block show no clear pattern across countries. In some cases TRADE/GNP is the more important variable, in others it is the current account to GNP ratio. The negative and large coefficient for TRADE/GNP in the Swiss equation is troubling because it dominates the foreign asset block. The coefficients on the combined current account deficits of market borrowing LDCs are the most unusual feature of the foreign asset block. The coefficient is significant in all cases, and has the expected positive sign for Canada, France, Switzerland, and the United Kingdom, but a negative sign for Germany and Japan. It is not clear what interpretation should be given to this difference in bank responses to these deficits. It may be that lending to these countries is a substitute for other kinds of foreign-based lending in the portfolios of Japanese and German banks. A second possibility is that the three foreign block variables all proxy for foreign activity and the result is similar to that for GNP (the constant term) in the domestic block. Finally, it is possible that the LDC deficit is a proxy for a missing variable in the Japanese case, since LDC current accounts deficits were large in the mid-1970s when Japanese bank asset growth was weak, and low after 1982 when Japanese bank asset growth was very strong.

The dummy variables included to capture accounting changes and major mergers were generally significant and had the expected sign. The

equations estimated for Canada, Switzerland, and the United Kingdom showed moderate serial correlation.

Table 7a gives the estimation results for the seven large U.S. banks individually. Just as in the case of the country regressions in Table 7, the signs for the constant and the coefficient on M/GNP vary across banks. In each case, the variable with the positive coefficient dominates. The coefficients on the trade and current account variables, with one exception, have the expected positive signs. For U.S. banks, the TRADE/GNP ratio is generally the more important variable, particularly for Citibank and Morgan Guaranty. The sign of the LDC deficit variable differs widely across the banks; the possible reasons for this variation are the same as those discussed for non-U.S. banks. The equations for Bank of America and for Chase Manhattan are the weakest of the seven reported in Table 7a; both show significant serial correlation, even after estimation with a correction for first-order serial correlation.

The results for both the country aggregations and the individual bank regressions for U.S. banks caution against putting too much emphasis on the value of individual coefficients. These results are not surprising since the variables specified all tend to grow together, and are included to capture domestic financing activity in case of GNP and M, and foreign financing activity in the case of the other variables. Of more importance to us here are the implications of the set of coefficient estimates in Table 7 for the allocation of bank assets between domestic currency denominated assets, and assets denominated in foreign

Table 7a

Regression Equations for Factors Determining Ratio
of U.S. Bank Assets to GNP

<u>Independent Variable</u>	<u>Citibank</u>	<u>Bank of America</u>	<u>Chase Manhattan</u>	<u>Manufacturers Hanover</u>	<u>Morgan Guaranty</u>	<u>Chemical Bank</u>	<u>Bankers Trust</u>
Constant	-.060 (1.86)	.048 (1.01)	.079 (3.54)	.010 (.40)	-.308 (1.33)	-.006 (.25)	-.073 (1.87)
M/GNP	.101 (2.41)	-.022 (.35)	-.055 (1.89)	.012 (.37)	.069 (2.27)	.048 (1.52)	.149 (2.92)
Trade/GNP	.192 (5.52)	.050 (1.20)	.031 (1.27)	.124 (4.72)	.144 (5.67)	.087 (3.31)	.079 (1.86)
CA/GNP	-.027 (.34)	.163 (1.91)	.044 (.84)	.012 (.21)	.066 (1.15)	.129 (2.15)	.187 (1.94)
DEF/GNP	-.085 (2.38)	.017 (.25)	-.040 (1.69)	.032 (1.18)	-.041 (1.57)	-.041 (1.52)	-.149 (3.39)

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R ²	.82	.93	.87	.91	.86	.67	.58
SE	.0017	.0018	.0015	.0013	.0013	.0013	.0021
DW	2.11	1.05	2.51	2.09	2.08	1.91	1.93
Rho	-	.92	-.60	-	-	-	-

currencies. To estimate domestic and foreign currency assets separately, we used the estimated coefficients for a block (domestic or foreign) to obtain the estimated asset to GNP ratios. These estimated ratios in turn were multiplied by GNP in dollars, and rescaled to original levels to reverse the scaling that was done across banks. Dummy variables were included in the appropriate block, depending on whether the acquisition was primarily a domestic-based bank or a foreign bank. The equation residuals were not allocated. Table 8 reports the estimated proportion of domestic currency assets in the aggregate portfolios of the major banks in each of the seven countries.

With the exception of Switzerland, the allocation between domestic and foreign currency assets reported in Table 8 appears reasonable.²⁵ It also corresponds to limited information from published data.²⁶ Canadian and British banks were estimated to hold a larger proportion of their assets in foreign currency, while banks headquartered in France, Germany, and Japan were estimated to hold a larger percentage of domestic currency assets as of year-end 1986. The impact of the

25. Two distinguishing characteristics of the Swiss banks are: (1) they are very large relative to the domestic economy (2-3 times as large as the French or Canadian banks), which may explain the large M/GNP coefficient; and (2) a large proportion of their international activities are conducted through their off-balance sheet Trust Accounts with non-Swiss residents, which may explain the poor fit for the foreign currency variables.

26. For example, as shown in Table 8, the model estimated that dollar-denominated assets accounted for about 35 percent of total assets of Japanese banks as of September 1983. Data published by the Federation of Bankers Associations of Japan in Banking System in Japan estimated that on that date overseas branch and subsidiary assets (almost entirely denominated in dollars) accounted for 31 percent of total assets of the Japanese City Banks.

Table 8

Estimated Share of Domestic Currency
Assets in Total Bank Portfolios

<u>Year End</u>	<u>Banks Headquartered in:</u>						
	<u>Canada</u>	<u>France</u>	<u>Germany</u>	<u>Japan</u>	<u>Switzer- land</u>	<u>United Kingdom</u>	<u>United States</u> ¹
1972	0.746	0.777	0.614	0.511	1.433	0.712	0.742
1973	0.736	0.788	0.585	0.548	1.472	0.723	0.688
1974	0.743	0.737	0.548	0.333	1.449	0.681	0.639
1975	0.715	0.737	0.635	0.419	1.151	0.609	0.657
1976	0.717	0.691	0.650	0.452	1.077	0.543	0.663
1977	0.698	0.694	0.697	0.445	1.109	0.534	0.678
1978	0.666	0.707	0.743	0.535	1.123	0.532	0.672
1979	0.660	0.693	0.709	0.580	1.255	0.526	0.643
1980	0.647	0.652	0.677	0.539	1.422	0.535	0.620
1981	0.614	0.586	0.713	0.540	1.110	0.479	0.647
1982	0.561	0.523	0.754	0.612	.980	0.451	0.716
1983	0.538	0.508	0.775	0.646	.959	0.439	0.755
1984	0.509	0.497	0.751	0.620	.940	0.415	0.757
1985	0.516	0.559	0.775	0.637	.950	0.486	0.777
1986	0.529	0.608	0.794	0.715	1.013	0.560	0.786

1. Data for U.S. banks refer to claims on domestic residents and were derived from the individual regressions in Table 7a.

dollar depreciations of 1978 and 1986, and the appreciation of 1980-1984, influenced the estimated allocations. The increase in the share of domestic currency assets in Japanese bank portfolios between 1980 and 1983, despite the depreciation of the yen against the dollar, results in part from a rapid growth of the domestic Japanese economy.

V. Estimating the Impact of Specific Economic Variables on Bank Asset Growth

This section will utilize the regression results in Section IV to make quantitative estimates of the contribution of selected economic variables to the faster asset growth of major banks headquartered outside the United States. A counterfactual approach is used to estimate the contribution of individual variables, comparing the actual increase of total assets for non-U.S. banks with the estimated increase in total assets that would have occurred had specific variables changed to the same extent as the corresponding variables affecting U.S. bank asset growth.

This "growth accounting" exercise is difficult because the model of asset determination has both additive and multiplicative elements which prevents a breakdown of the growth differential into independent, additive contributions. Since this problem particularly affects average annual growth rates, we have used the total percentage increase of assets over a period as our measure of growth. This approach has the advantage of clarity and consistency, but has the disadvantage that the measures are not comparable across time periods of different lengths.

As in the previous section, the regression equations are used to estimate total bank assets for each country group. The individual coefficients from those regressions provide an estimated breakdown of this total into domestic and foreign asset components. Thus, multiplying equation (4) by GNP in dollars:

$$\begin{aligned} \text{Assets} &= [d_1 + d_2 M^* + f_1 \text{Trade}^* + f_2 \text{CA}^* + f_3 \text{DEF}^* + \text{Dummies}] \text{GNP}\$ \\ &= [d_1 + d_2 M^*] \text{GNP}\$ + [f_1 \text{Trade}^* + f_2 \text{CA}^* + f_3 \text{DEF}^*] \text{GNP}\$ + \text{Dummies} \text{GNP}\$ \\ &= \text{DA}\$ + \text{FA} + \text{UA} \end{aligned}$$

where DA\$ = estimated domestic assets in U.S. dollars
FA = estimated foreign assets in U.S. dollars
UA = estimated unallocated assets in U.S. dollars

Algebraic manipulation, using the definition of GNP in dollars, allows a further decomposition of the domestic asset component.

$$\begin{aligned} \text{Assets} &= [d_1 + d_2 M^*] \text{RGNP P E} + \text{FA} + \text{UA} \\ &= [d_1 + d_2 M^*] \text{RGNP PER P}_{\text{usa}} + \text{FA} + \text{UA} \end{aligned}$$

where:

- P - country GNP deflator
- E - exchange rate (\$ per unit of domestic currency)
- Pusa - US GNP deflator
- PER - $P E/Pusa$, the real exchange rate

Domestic assets in U.S. dollars can be expressed as the product of four terms. The first, $d_1 + d_2 M^*$, is the ratio of total domestic assets of our selected group of major banks to domestic GNP, a term referred to as large bank intermediation. This ratio can increase because total domestic assets of all banks in the country are increasing relative to GNP, or because the major banks in our sample increased their share of the domestic banking market.

Bank assets will be growing more quickly, other things equal, in countries experiencing rapid economic growth. This effect is captured in RGNP. Finally, the translation of domestic assets into dollars is affected by exchange rates. When exchange rate changes just offset differences in rates of inflation across countries, no differential in asset growth rates results. But shifts in real exchange rate, captured by RER, will lead to variations in asset growth rates. The final term in the domestic asset block, Pusa, merely expresses assets in nominal U.S. dollars, and is the same for all countries, so that it does not contribute to any differential in bank asset growth.

The dummy variables included in the estimated equations are of two types. The first captures the effect of major acquisitions or sales of

banks. Since these all involved acquisition of banks headquartered outside the country of the bank in question, the acquisition effects were included in estimated foreign assets. The remaining dummy variable captures the change in French accounting rules that took place in 1978. The effect of this change could not be allocated between domestic and foreign asset growth.

Table 9 presents the estimates of the breakdown of total asset growth differentials into the growth differential resulting from more (or less) rapid growth of domestic (currency) assets reported in U.S. dollars, and the growth differentials resulting from more (or less) rapid growth of foreign assets. For the domestic asset effect the counterfactual is the growth of total assets that would have occurred had domestic currency assets (measured in U.S. dollars) grown at the same rate as that estimated for the domestic assets of the seven major U.S. banks. The foreign asset effect calculation used a counterfactual with the foreign asset growth rate held equal to that of the U.S. banks. These two effects do not add to the actual differential for two reasons. The first reason is that the shares of domestic and foreign assets in total assets may differ between the United States and the country of comparison, allowing a faster growth rate to be applied to a larger share of assets for one of the two countries. The second reason is that the foreign and domestic asset breakdowns come from the regression equations' predicted values for domestic and foreign assets. Statistical errors in predicting total assets at the endpoints of the period, for either the U.S. banks or for banks headquartered in the country of comparison, will affect the explained differential. These two effects are captured in the "Other" column of Table 9.

Table 9

Factors Explaining Bank Asset Growth Differentials
(percent increase over period)

Banks Headquartered in:	Differential in Asset Growth from U.S. Banks	Contribution of Selected Factors in Explaining Differential Asset Growth			Other ⁴ (of which)
		Faster Growth of Domestic Currency Assets in U.S. \$	Faster Growth of Foreign Assets		
<u>1972-86</u>					
Canada	86.2	-18.5	125.3	-20.6	
France	283.3	10.7	99.2	173.4	(131.8) ⁵
Germany	320.4	333.2	-10.8	-2.0	
Japan	792.5	641.8	121.9	28.8	
United Kingdom	172.6	15.8	101.8	55.0	
<u>1972-80 subperiod</u>					
Canada	71.6	75.4	18.5	-22.3	
France	226.6	74.9	32.9	188.8	(108.2) ⁵
Germany	181.1	173.6	-17.6	25.1	
Japan	111.2	98.0	-37.3	50.4	
United Kingdom	121.0	26.6	33.9	60.5	
<u>1980-84 subperiod</u>					
Canada	7.1	-27.9	31.9	-3.1	
France	-26.9	-46.2	17.5	1.8	
Germany	-37.4	-36.2	-8.9	7.8	
Japan	37.2	19.6	18.1	-0.4	
United Kingdom	-16.6	-30.0	24.5	-11.1	
<u>1984-86 subperiod</u>					
Canada	-9.2	-4.9	-3.8	-0.5	
France	26.7	23.8	-0.8	3.7	
Germany	69.7	61.7	13.0	-4.9	
Japan	76.4	62.3	13.2	0.9	
United Kingdom	19.6	23.0	-5.3	1.9	

1. Percentage increase in total assets of country's banks minus percentage increase in assets of U.S. banks over comparable time period.
2. Difference between actual percentage increase in total assets and increase that would have occurred had domestic currency assets in dollars grown at same rate as U.S. banks' domestic assets.
3. Difference between actual percentage increase in total estimated assets and increase that would have occurred had foreign assets (in dollars) grown at same rate as U.S. banks' foreign assets.
4. Impact on total asset growth of unallocated factors including differing initial shares of domestic and foreign currency assets, statistical prediction errors at endpoints, and accounting change for French banks.
5. Of which accounting change affecting French banks.

The results indicate that there is no single explanation for the faster asset growth of banks headquartered outside the United States. Over the entire 1972-86 period the more rapid growth of domestic currency assets was the more important explanation for the faster growth of German and Japanese banks relative to U.S. banks. Differences in foreign asset growth largely explained the faster growth of Canadian, French, and British banks relative to U.S. banks. In addition, the one-time accounting change that boosted reported assets of French banks after 1977 was responsible for much of their observed growth during the 1970s. The faster estimated growth of foreign assets for each group of non-U.S. banks (except the German banks) augmented their growth above that of U.S. banks by approximately the same percentage over the entire 1972-86 period.²⁷

The 1972-80 subperiod was characterized by very rapid growth of assets of non-U.S. banks relative to U.S. banks. For Canadian, German, Japanese, and French banks (excluding the accounting change) the faster growth was almost entirely due to more rapid growth of domestic currency assets, while for British banks faster growth resulted from foreign assets (including acquisitions) and unallocated factors. During 1972-80 the model estimated that Japanese banks' foreign asset growth actually lowered total asset growth relative to U.S. banks, which is consistent with the problems

27. The faster growth of foreign assets of non-U.S. banks has been noted in: Rodney H. Mills, Jr., "U.S. Banks are Losing Their Share of the Market," *Euromoney*, February 1980, pp. 50-58, and H. Robert Heller, "The Internationalization of World Banking Markets -- It's a Small World," (Speech delivered at 1988 Financial Analysts Federation Annual Conference, May 9, 1988).

Japanese banks had in attracting Eurocurrency deposits following the first oil price shock.

The 1980-84 period was characterized by faster total asset growth of U.S. banks, associated with the increase in the real exchange value of the dollar. For each country grouping except Japan the sluggish growth of domestic currency assets converted to dollars tended to pull total asset growth below that of U.S. banks. Faster foreign asset growth partially offset this for most of the countries in Table 9, but only for Canadian banks did this fully offset slower domestic asset growth.

The most recent 1984-86 subperiod has been one of dramatically higher asset growth for non-U.S. banks. As shown in Table 9, in this short period there has been a very close correspondence between faster overall asset growth of non-U.S. banks and faster growth of their domestic currency assets measured in U.S. dollars. For French, German, Japanese, and British banks almost the entire growth differential appears related to differential domestic currency asset growth.

As equation (5) makes clear, the dollar value of domestic assets can be decomposed into a real exchange rate component, a real domestic output component, and the extent of large bank intermediation, which is measured as the ratio of bank assets to domestic GNP, or $[d_1 + d_2M^*]$ in equation (5). Table 10 breaks down the domestic asset effect in Table 9 into changes in each of these three components. Since these three are multiplied together to form $DA\$,$ there is an interaction among them, for which a correction term is entered in the interaction column in Table 10. (Thus if any two components were positive, there would be a positive interaction between them,

Table 10

Contribution of Selected Factors Affecting
Domestic Currency Asset Growth

Banks Headquartered in:	Total Differential in Bank Asset Growth	Differential Resulting From Faster Domestic Asset Growth	Real Exchange Rates Changes ¹	Faster Domestic Economic ² Growth	Differential Change of Large Bank Intermediation ³	Interaction ⁴ Correction	Contribution of Selected Domestic Factors to Differential Total Asset Growth	
<u>1972-86</u>								
Canada	86.2	-18.5	-27.5	32.2	-0.2	7.0		
France	283.3	10.7	27.7	6.6	-25.8	2.3		
Germany	320.4	333.2	71.4	-33.9	314.6	-18.8		
Japan	792.5	641.8	332.3	150.3	444.2	-284.9		
United Kingdom	172.6	15.8	27.0	-15.8	3.3	1.4		
<u>1972-80 subperiod</u>								
Canada	71.6	75.4	-13.5	26.1	65.1	-2.3		
France	226.6	74.9	70.6	6.5	-0.5	-1.7		
Germany	181.1	173.6	78.9	1.0	125.8	-32.1		
Japan	111.2	98.1	63.5	25.1	27.3	-17.9		
United Kingdom	121.0	26.6	79.7	-17.3	-68.9	33.1		
<u>1980-84 subperiod</u>								
Canada	7.1	-27.9	-5.9	-1.7	-23.4	3.1		
France	-26.9	-46.2	-41.2	-0.8	-2.5	-1.8		
Germany	-37.4	-36.2	-41.2	-3.1	10.9	-2.8		
Japan	37.2	19.6	-20.6	7.1	33.8	-0.6		
United Kingdom	-16.6	-30.0	-42.0	2.5	12.5	-3.0		
<u>1984-86 subperiod</u>								
Canada	-9.2	-4.9	-3.1	0.8	-2.6	0.1		
France	26.7	23.8	24.7	0.6	-3.3	1.8		
Germany	69.7	61.7	51.7	-2.1	20.8	-8.7		
Japan	76.4	62.3	46.0	4.9	28.8	-17.4		
United Kingdom	19.6	23.0	13.0	-0.6	8.7	1.8		

-
1. Difference between actual percentage increase on total assets and increase that would have occurred had real exchange rates remained constant over the period.
 2. Difference between actual percentage increase in total assets and increase that would have occurred had real domestic GNP grown at U.S. rate over the period.
 3. Difference between actual percentage increase in total assets and increase that would have occurred had domestic assets/GNP ratio changed at same rate as corresponding ratio for large U.S. banks.
 4. Correction term for interaction among exchange rates, real output, and domestic intermediation (see text).

and this would show up as a negative correction entry in the interaction column.) In most cases this interaction term is small, except for Japanese banks in the last subperiod, when a positive contribution from all factors multiplied together accelerated the growth of Japanese banks relative to U.S. banks.

As shown in Table 10, over the entire 1972-86 period changes in real exchange rates accounted for about two-fifths of the growth differential of Japanese banks relative to U.S. banks, and a relatively smaller percentage of the faster growth of banks headquartered in other countries. A declining real exchange rate for Canada, over the entire period, more than offset the effect of faster domestic economic growth in the Canadian economy. While faster home-country economic growth was an important factor for Japanese banks, an even more important factor for both Japanese and German banks in the sample was the differential in the path of their estimated domestic assets to GNP ratio.

In the 1972-80 subperiod U.S. banks were growing the least rapidly of all banks, and changes in real exchange rates had an impact for French, German, and Japanese banks. German banks benefited from a growth of their domestic assets relative to GNP, while faster growth of British banks resulted from international asset growth.

The 1980-84 period was one of very sharp dollar appreciation and generally faster asset growth of U.S. banks. Faster growth for U.S. banks in this period appears largely related to the effects of changes in real exchange rates on the value of other banks' domestic currency assets. The Japanese banks managed to outgrow U.S. banks in this period, despite the real

depreciation of the yen because of the contribution of faster growth of their international assets in this period and the growth of large Japanese banks' domestic assets relative to GNP.

The 1984-86 period is of particular interest because it is short, because changes in real exchange rates have been sharp, and because U.S. banks' assets have grown relatively little compared with assets at other banks. Especially fast asset growth in this period was observed for Japanese and German banks. The data in Tables 9 and 10 indicate that a large proportion of the faster growth of non-U.S. banks over this period is due to growth in the dollar value of their domestic currency assets. For large Japanese and German banks about two-thirds of the differential growth of domestic currency assets, expressed in dollars, appears to have resulted from changes in real exchange rates, and about one-third from a stronger performance of domestic assets relative to GNP. Faster growth of French banks appears more closely related to exchange rate appreciation. For no group of non-U.S. banks did differential domestic economic growth account for a significant share of the faster growth of bank assets in this period.

As the data in Table 10 indicate, faster asset growth of German and Japanese banks arises to an important extent from the intermediation component, the ratio of their domestic assets to GNP. In other words, large German and Japanese banks appear to have retained a larger proportion of domestic intermediation than U.S. banks. This higher retention of domestic intermediation may result from a broad range of factors. These factors include: (1) a general decline of all domestic banks in the United States compared with other forms of domestic intermediation, including securitized

credit, intermediation by non bank financial institutions, and access to offshore banking services by domestic depositors and borrowers; or (2) factors influencing large domestic banks' share relative to smaller banks, so-called super-regional banks, and foreign banks. This relative decline in share of the large U.S. banks may have resulted from difficulties encountered by large banks because of troubled international or domestic loan portfolios, growth constraints imposed by capital standards which are more binding on large banks, or deliberate decisions by larger U.S. banks to deemphasize growth as an objective in favor of a "merchant bank" strategy favoring fee-based growth over asset growth.

Exploring all of these factors explaining the growth of banking assets in particular countries is outside the scope of this paper. Table 11 presents some roughly comparable data on the share of large banks in total bank assets for Germany, Japan, and the United States for one dimension of this question -- namely how well did the largest banks do in these three countries compared with other banks. Clearly over the entire period large banks in Germany and Japan have been substantially more successful than their large U.S. counterparts in maintaining shares in their domestic banking markets relative to other banks, and this success has contributed to faster growth of total assets of the large German and Japanese banks relative to U.S. banks.²⁸

28. Had the seven large U.S. banks only lost ten percent of their domestic market share in the 1972-86 period (from 15.5 percent at year-end 1972 to 14.0 percent at year-end 1986 instead of the actual 11.6 percent share at year-end 1986), their total assets would have been about \$70 billion, or 11 percent, greater at year-end 1986.

Table 11

Share of Large Banks in Domestic Bank Assets
(percent)

Year-end	Assets of Japanese City Banks as Percent of Total Assets of Banks in Japan		Assets of Three Large German Banks as Percent of Assets of All Credit Banks in Germany		Assets of Seven Large U.S. Banks as Percent of Assets of All Banking Institutions in the United States	
	Share	Percent of 1972 Share	Share ¹	Percent of 1972 share	Share ²	Percent of 1972 Share
1972	57.5	100.0	39.5	100.0	15.5	100.0
1973	57.4	99.8	38.5	97.5	15.4	99.4
1974	56.7	98.6	39.0	98.7	16.5	106.5
1975	56.5	98.3	40.3	102.3	15.7	101.3
1976	55.7	96.9	41.2	104.3	15.4	99.4
1977	54.7	95.1	41.7	105.6	15.4	99.4
1978	54.0	93.9	42.1	106.6	14.9	96.1
1979	53.0	92.2	42.4	107.3	14.6	94.2
1980	53.2	92.5	40.6	102.8	14.7	94.8
1981	52.7	91.7	39.4	99.7	13.9	89.7
1982	52.6	91.4	38.6	97.7	14.4	92.9
1983	53.3	92.7	37.6	95.2	13.4	86.5
1984	51.7	89.9	37.0	93.7	12.3	79.4
1985	51.7	89.9	37.8	95.7	11.8	76.1
1986	52.5	91.3	36.8	93.2	11.6	74.8

1. Three large German banks' assets as percent of assets of all credit banks in Germany.

2. Includes U.S. Branches and agencies of foreign banks.

Source: Bank of Japan, Economic Statistics Monthly, Deutsche Bundesbank, Statistical Supplement Series 1, Banking Statistics by Banking Group, and Federal Reserve data bank.

VI. Stability of the Model: Potential Structural Changes After 1982

Beginning with the Mexican declaration of debt servicing difficulties in August 1982, international commercial banking has been buffeted by a series of events. The environment for commercial bank lending to developing countries and other international borrowers changed dramatically in the wake of the Mexican declaration. The sharp and lingering recession in the OECD countries, combined with high real interest rates, raised problems for domestic borrowers as well. In response to these problems, bank regulatory authorities, particularly in the United States, began to press for higher capital ratios, and large banks shifted increasingly to off-balance sheet services, including arranging and selling loans, as a way of providing for the financial needs of their customers while meeting the new capital requirements.

In view of these developments, it is useful to test whether commercial bank behavior changed in this new environment, and whether the equations estimated in Section IV over the entire 1972-86 period adequately describe bank behavior since 1982. In particular, did the shift to securitized intermediation, sometimes resulting in off-balance sheet fee business for banks, cause the equations estimated in Section IV to overpredict bank asset growth in this changed environment?

These issues are examined in Tables 12 and 13. The approach taken is to re-estimate the bank asset equations over the period 1972-1982, and use the estimated behavioral equations to forecast the actual level of bank assets in the 1983-86 period. The accuracy of those forecasts, and any

Table 12

Structural Change in Bank Asset Equations:
Out of Sample Forecasts 1983-86
(billion dollars)

<u>Country</u>	<u>1983-86 Average Assets</u>	<u>Mean Prediction Error</u> ^{1/}	<u>In Sample Root Mean Square Error</u>	<u>1983-86 Root Mean Square Error</u>	<u>Theil's Inequality Coefficient</u>	<u>of which: proportio</u>	
						<u>Bias</u>	<u>Variance</u>
Canada	250.7	- 60.8	4.4	62.3	8.69	.95	.03
France	318.5	1.7	4.5	10.0	.19	.03	.55
Germany	271.7	- 3.3	5.7	17.0	.21	.04	.27
Japan	882.2	104.9	10.6	117.5	.26	.80	.13
United Kingdom	334.3	- 11.8	8.8	14.8	.36	.64	.24
United States	585.1	- 50.5	6.6	53.8	.61	.88	.09

^{1/} Actual assets minus predicted assets based on aggregate equations for non-U.S. banks and sum of individual bank equations U.S. banks. Positive value indicates underestimation.

Table 13

Country Bank Equations--Prediction Errors
(Number of Standard Errors Away from Zero^{1/})

<u>Country</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Canada	-4.02	-4.53	-3.81	-3.61
France	-1.37	-.26	1.32	.75
Germany	-1.44	-.20	2.89	-1.98
Japan	5.28	3.06	6.85	3.20
United Kingdom	-.66	-1.81	-.94	.14

U.S. Bank Equations--Prediction Errors^{1/}
(Number of Standard Errors Away from Zero^{1/})

<u>BANK</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Citibank	-.53	-.94	.16	.30
Bank of America	-.63	-1.39	-1.54	-2.04
Chase Manhattan	-.58	-2.23	-1.72	-1.52
Manufacturers Hanover	-2.34	-.40	-1.16	-3.14
Morgan Guaranty	-.16	-.58	-.05	-.04
Chemical Bank	-.52	-1.29	-.99	-1.04
Bankers Trust	-.09	.51	.60	.40

^{1/} Prediction error divided by estimated standard error of predicted.

systematic error in the forecasts, is used as a gauge of structural shifts that might have occurred since 1982.

The second column of Table 12 shows the extent to which the equations underestimated (positive mean error) or overestimated (negative mean error) actual total bank assets for the group of banks in each country. The shift in bank behavior suggested in the previous paragraphs appears to be strongest for Canadian and U.S. banks, where the equations overestimated total bank assets by about 24 percent and 9 percent respectively. For European banks the effect, if any, appears to be much smaller, although there is weak evidence that the model overpredicts British bank assets. By contrast, Japanese bank assets in the 1983-86 period are underpredicted by the 1972-82 equation.

The remaining columns of Table 12 provide information on the predictive accuracy of the equations. A comparison of in-sample and out-of-sample root mean square errors shows that the equations estimated over the 1972-82 period do reasonably well for the three European countries' banks, but do poorly for Canadian, Japanese, and U.S. banks, reflecting primarily the systematic error in their estimates. Theil's inequality coefficient, shown in Column 5, defined as the ratio of the mean squared prediction error divided by the average squared error using the 1982 value of assets as a forecast for 1983 through 1986, is a general index of predictive ability. The extreme value of this index for Canada reflects the fact that Canadian bank assets measured in U.S. dollars, remained almost constant after 1982, while the regression equation predicted a substantial increase.

Theil's coefficient may be broken down into components measuring the contribution of systematic error, error in matching the underlying variability of the series, and unsystematic error, to total mean squared error. For Canadian, Japanese, British, and U.S. banks, the prediction error is almost entirely systematic, suggesting that a structural shift may have taken place.

A more precise estimate of the stability of the regression equations is given in Table 13 which compares prediction errors from the equation to the predicted variance of the estimates if the model were correct for the extended period. Here the tendency of the equations to overpredict for Canadian banks and underpredict for Japanese banks is clear. The equations perform much better for French and British banks, and for German banks with the exception of 1985. Similar comparison for the seven individual U.S. banks are shown at the bottom of Table 13. Somewhat surprisingly, most of these prediction errors are within two standard errors of zero, however the limited number of degrees of freedom in each equation (5-6) means that the standard prediction errors are large. While the equations overpredict for U.S. banks most of the time, this is not true in all cases, and there appears to have been little systematic effect for Citicorp, Morgan, and Bankers Trust.

While the asset model that we have estimated appears to have obvious drawbacks for Canadian, Japanese, and U.S. bank totals, the size of the prediction errors is not surprising given the turbulence of the period over which they were estimated. There does appear to be a structural shift in the anticipated direction toward slower asset growth for banks headquartered in

Canada, the United States, and possibly the United Kingdom. For French and German banks the equations hold up very well. Japanese banks grew faster in 1983-86 than the model based on 1972-82 data would have predicted. A comparison of the coefficient estimates in the equation for Japanese banks estimated through 1982 and the equation estimated over the whole period suggests that the out-of-sample prediction error based on the 1972-82 equation for Japanese banks originated largely from an underprediction of international assets in 1983-86 because the two equations estimated similar growth of domestic assets in 1983-86.²⁹

VII. Summary and Conclusions

This paper has developed and estimated a model of bank asset growth based on observable economic variables. The model covered the 1980-84 period when U.S. banks' asset growth was relatively fast compared with non-U.S. banks, as well as periods such as 1972-80 and 1984-86 when non-U.S. banks grew more rapidly.

The main conclusion from the model is that while bank asset growth can be modelled with macroeconomic data, no single variable explains the rate of asset growth of multinational banks over a sustained period of time.

The model tested whether a group of large banks headquartered in a particular country could be aggregated for statistical purposes, that is do they react in a similar fashion to the same economic variables. Tests on the

29. The model is consistent with data in the 1987 Annual Report of the Bank For International Settlements which indicated that the Japanese bank share of total international bank assets increased from 23.0 percent in December 1984 to 32.4 percent in December 1986.

model suggested that aggregation worked extremely well for Japanese, French and Swiss banks, satisfactorily for British and German banks, marginally for Canadian banks, and was clearly rejected for U.S. banks.

The model suggests that changes in exchange rates, when they exceed differences in inflation rates, have an important impact on relative growth of assets of different countries' banks because of the impact on the value of home-country currency assets. Exchange rate changes played an important role in explaining the faster observed growth of non-U.S. banks over the 1984-86 period. Over longer periods the impact of exchange rate changes on bank asset growth was less important than in the short-run, largely because over the long-run real exchange rate changes tend to be smaller.

The period over which the model was estimated was characterized by a very rapid growth of large German and large Japanese banks relative to large U.S. banks. A significant part of this growth differential resulted from faster growth of domestic home-country currency assets of these German and Japanese banks compared with the U.S. banks. In the case of Japanese banks, faster domestic currency asset growth was associated with faster domestic economic growth. For both Japanese and German banks faster domestic asset growth was associated with a greater role of large bank intermediation which in part resulted from the ability of large German and Japanese banks to maintain market shares of banking business in their home country.

The model also tested whether the banks' asset growth response was stable over the entire 1972-86 period by estimating it for the years 1972-82, and using the estimated coefficients to predict bank asset growth in the 1983-86 period. The results of that test indicated that the model tended to

overpredict assets for U.S. and Canadian banks and underpredict assets for Japanese banks in the 1983-86 period. These results suggest that problems in loan portfolios, the trend towards nonbank intermediated credit, changes in management strategies away from asset growth, and pressure from regulators for higher capital relative to assets may have come sooner for U.S. and Canadian banks than for other banks in the sample. The underprediction for Japanese banks appears related to faster growth of their international assets in 1983-86.

Appendix A

List of Banks in Sample

United States

Citicorp
BankAmerica
Chase Manhattan
Manufacturers Hanover
J.P. Morgan
Chemical Bank
Bankers Trust

Canada

Royal Bank of Canada
Bank of Montreal
Canadian Imperial Bank
of Commerce
Bank of Nova Scotia
Toronto-Dominion Bank

France

Banque National de Paris
Credit Lyonnais
Societe Generale

Japan

Dai-Ichi Kangyo Bank
Fuji Bank
Sumitomo Bank
Mitsubishi Bank
Sanwa Bank
Tokai Bank
Mitsui Bank

Switzerland

Union Bank of Switzerland
Swiss Bank Corporation
Credit Suisse

United Kingdom

National Westminster Bank
Barclays Group
Midland Bank
Lloyds Bank

Germany

Deutsche Bank
Dresdner Bank
Commerzbank
Bayerische Vereinsbank

Appendix B

Major International Mergers and Acquisitions

	<u>Bank</u>	<u>Action</u>	<u>Year</u>
(1)	Bank of Montreal	Acquired Harris Trust	1984
(2)	Midland Bank	Acquired Crocker Bank	1981
(3)	Midland Bank	Sold Crocker Bank	1986
(4)	National Westminster Bank	Acquired National Bank of North America	1979

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