An Analysis of the Relationship between GATS Commitments and the Liberalization Level in the Banking Sector

by

Lu Gao

(2625895)

Major Paper presented to the
Department of Economics of the University of Ottawa
in partial fulfillment of the requirements of the M.A. Degree

Supervisor: Professor Kathleen Day

Ottawa, Ontario
April 2003

I. Introduction

The General Agreement on Trade in Services (GATS) is one of the most significant agreements of the World Trade Organization (WTO). It established for the first time multilateral rules and disciplines governing trade in services. With respect to financial services, WTO Members have carried on rounds of negotiations and made commitments to "market access" and "national treatment" for opening their financial markets to foreign services and foreign suppliers. Although the GATS commitments are expected to promote progressive liberalization in financial services, the real relationship between specific commitments and the actual level of liberalization in some financial sectors, such as banking, insurance and securities, has long been subject to debate.

This paper mainly studies the "market access" commitments in the banking sector made by 88 WTO Members by the end of 1999. It uses a linear regression model to examine the correlation between the liberalization level that a Member has committed to in the GATS and the actual states of openness and development of its banking sector. The paper is organized as followings. Section II briefly introduces the framework of the GATS and describes the process of establishing agreements in financial services after each phase of negotiations. The Uruguay Round Agreement of 1993, the Interim Agreement of 1995, the Final Agreement of 1997 and the Fifth Protocol that entered into force in 1999 are four important legal documents that reflect progressive improvements in the committed level of liberalization (WTO 2000b). Meanwhile, a number of studies have been carried out on the changes and effects of the GATS commitments after the agreement of each phase was established. This paper mainly reviews earlier empirical studies and findings on the "market access" commitments. It focuses on the regression

analysis carried out by Sorsa (1997) and Qian (2000) on the correlation between the "GATS liberalization level" and the actual openness and development level of the financial sector. It explains how the dependent variable, the index of GATS commitments, is set up and what kind of financial indicators are selected as the explanatory variables. The econometric methods used by Sorsa (1997) and Qian (2000) are also compared.

Section III sets up a multiple linear regression model based on the previous studies. It concentrates on the limitations of commitments in the "deposit" and "lending" business of the banking sector. A weighted "liberalization index" is constructed for use as the dependent variable and five indicators for financial depth, efficiency and openness are used as independent variables. Eighty-eight WTO Members are divided into four groups according to their level of income. The descriptive statistics show that the average "liberalization index" of the low income group is the largest, but the high income group has the highest average level of financial depth, efficiency and openness.

The results of the OLS regression demonstrate that there is no strong correlation between a Member's commitments and the actual level of liberalization in the banking sector. A series of diagnostic tests indicate that multicollinearity, heteroskedasticity and specification problems do not exist in this model, but the normality of the errors is not confirmed. To detect influential observations in the model, some diagnostic techniques of Belsley et al. (1980) are adopted. After finding outliers based on different diagnostic measures, we attempt to carry out OLS regressions with two methods - deleting obvious outliers and identifying outliers with dummy variables. It is seen that the regression

results are changed to some extent, but strong correlation still cannot be found in the new models.

To better account for the special characteristics of the dependent variable, the "liberalization index," two additional estimation techniques are also applied in the paper: Tobit estimation for truncated regression models is used because the dependent variable is arbitrarily limited from 0 to 1; and a Probit model is estimated in an attempt to rectify the weakness of subjectively assigning values and weights when calculating the "liberalization index."

As for the conclusion of this paper, it is generally consistent with the earlier finding of Sorsa (1997), that there is no strong correlation between the liberalization level that a Member has committed to in the GATS and the actual level of development of its banking sector. This means that many WTO Members did not make GATS commitments on the basis of the level of development of their banking sectors. Although the committed level of liberalization is "progressive", the real contribution of the GATS to the openness and development of the banking sector is limited.

Furthermore, the paper points out two limitations of the model that require further study: firstly, it questions whether the indicators of financial depth, efficiency and openness are appropriate measures of financial liberalization; secondly, it pinpoints the need to improve the method of quantifying the "liberalization index."

II. Literature Review

II.1 GATS Commitments in Financial Services

As the first multilateral trade agreement on services, the General Agreement on Trade in Services (GATS) is one of the essential establishment agreements of the World Trade Organization. It set up landmark rules and disciplines on policies affecting the openness of trade in services (WTO 2001a). With respect to financial services, GATS agreements consist of two main elements: general agreements concerning all trades in services and specific national schedules of "market access" and "national treatment" commitments. Though it is declared that the GATS aims to remove discriminatory barriers, secure progressive liberalization and gain the benefits of a more competitive, efficient and stable financial system (Kono et al. 1997), the actual contribution of GATS commitments to the liberalization level of the financial sectors has long been subject to debate.

In the general agreements of the GATS, trade in financial services is defined in terms of four modes of supply: (1) cross-border supply, (2) consumption abroad, (3) commercial presence and (4) movement of natural persons (GATS: Part I-Article I 1997a). With respect to each mode of supply, Members make commitments on "market access" and "national treatment" but inscribe categories of restrictions in their national schedules. Some researchers have pointed out that the actual level of liberalization in the domestic financial market depends on the nature of individual Members' sector-specific commitments and limitations (Sorsa 1997; Mattoo 2000; Becchetta and Drabek 2002). Furthermore, observations on the heated negotiations to get the GATS agreements in

financial services showed that bargaining power, not economic reasons, partly brought into being those complicated limitations of the commitments (Key 1997).

Because of the importance of these national commitments in the GATS framework, much of the research on GATS agreements in financial services concentrates on examining the improvements or deteriorations in the commitments that were established after each phase of negotiations and analyzing their effects on the financial system and the economy. In the following we mainly discuss previous studies of "market access" commitments, since the "national treatment," defined as "...no less favorable than...own like services and service suppliers" (GATS: Part III-Article XVII 1997a), generally can only be achieved after the foreign-owned services realize market entry. In Mattoo's (1997) analysis of the interpretation of "national treatment," he argued that commitments to provide "national treatment" alone had limited value without complementary commitments to provide "market access."

The results of each phase of negotiations on GATS commitments in financial services are described clearly in Kampf 's (1995, 1998) articles and WTO (1998b, 2003) documents. Specific commitments on "market access" and "national treatment" in the financial sector were made at the end of the Uruguay Round in 1993 but remain unfinished. The United States and the European Community aimed to obtain strong commitments to market entry from emerging market countries, while developing countries were reluctant to make commitments on some significant points, such as allowing foreign firms to take majority-ownership positions in domestic financial institutions (Key 1997). Hoekman (1995) regarded the Uruguay Round Agreement on services as a "tentative first step" and remarked that it was "a failure" in maintaining

openness in current policies and in establishing a mechanism to induce further liberalization. His statistics in the table "Commitments by Sector" showed that 16 "High Income Countries" and 15 "Largest Developing Countries" had made commitments for only 59% and 19.5% of items with respect to four modes of supply in financial services (Hoekman 1995 p.24). There was much to be improved upon further negotiations.

To some extent, the Interim Agreement of 1995 can be regarded as a positive result of the second stage negotiations. Forty-three WTO Members made improvements in their schedules of specific-commitments in financial services (Kono, et al. 1997), which was publicly deemed as a worthwhile achievement in improving openness. However, Sorsa's (1997) empirical analysis took a negative view of the effect of this interim agreement. He examined the real status of development in the financial sectors of 12 industrial countries, 25 emerging markets countries and 26 developing countries. Using a linear regression model, he discussed the relationship between the "GATS liberalization level", represented by the "market access" commitments with respect to the first three modes of supply, and the actual development level in the banking and securities sectors. As a somewhat surprising result, he concluded that there was little correlation between the commitments made by selected country groups and their real development states in financial services, which means that many WTO Members made commitments more restrictive even than their openness status beforehand. It challenged the effectiveness of the GATS agreements in the financial sector. This conclusion is somewhat similar to Hoekman's (1995) view that the GATS "scores low" in maintaining openness in current policies, though Sorsa talked about a specific sector and Hoekman's

was a cross-sector study. The significance, drawbacks and applications of this model will be discussed in detail in the second subsection.

After rounds of extended negotiations, financial services were finally subject to the context of the GATS agreements in December 1997. Ninety-seven Members made their commitments in two categories of sub-sector services: (1) insurance and insurance-related services and (2) banking and other financial services (WTO 2001b). Since this Final Agreement of 1997 came into being, economists have been comparing the GATS commitments made in different phases, carrying out theoretical and empirical studies of the economic effects of financial services liberalization in selected countries, and discussing the benefits and challenges of opening financial markets under this multilateral agreement.

Supporters of the GATS think that it is an accomplishment to promote openness in financial sectors by establishing a framework with internationally enforceable rules. WTO (1998a) reviewed a large number of case studies of the economic effects of service liberalization under the GATS commitments, especially in the banking sector. In most of the selected countries, the liberalization of trade and investment in financial sectors strengthens the overall efficiency of the financial system and boosts income and growth. Another cross-country study on the GATS commitments of 27 emerging markets, that was carried out by Kono and Schuknecht (1998), regressed the level of capital flows on a series of trade policy, macroeconomic and regulatory environment indicators and concluded that liberalization helped to improve the quality of capital flows and strengthen financial systems. On the other hand, critics revealed that the GATS actually had to strike a difficult balance between creating meaningful discipline and accommodating

discriminatory practices in financial services. Consequently the effectiveness of the commitments is limited (OECD 2002).

Some empirical studies have concentrated on the "market access" commitments in the dimension of four modes of supply. Mattoo's (2000) cross-country study of 105 developing and transition WTO Members showed that over two-third of the selected countries made commitments to core banking services and half made commitments to direct insurance services. Full liberalization for the three modes (except Mode 4) was rare in both services and restriction patterns differ across regions. Although the GATS contributed to more stable and transparent policy regimes in many developing and transition countries, it placed less emphasis on the introduction of competition and did not pre-commit to further market access with all kinds of restrictions in commitments. A special WTO study (Kono et al. 1997) gave a comprehensive statistical analysis of the coverage, level and type of the GATS commitments in financial services, based on the data available before the Final Agreement of 1997. It was found that 71 out of 84 Members made commitments in financial services, in which 75% of the restrictions on "market access" were taken in banking and other financial services and 60% of the restriction measures were imposed on Mode 3. Using a model similar to that of Sorsa (1997), Qian (2000) carried out a regression analysis based on the data that were collected when the Final Agreement was established in 1997. After identifying outliers with respect to each independent variable, his paper demonstrated that significant coefficient estimates could be obtained for both the banking and insurance sectors. This is a valuable extension of Sorsa's model and will be further discussed in the second subsection.

With continuous new accessions to the WTO, the total number of WTO Members that had made commitments in financial services increased to 104 by the end of 1999 (WTO 2003). All the national commitments were annexed to the Fifth Protocol, a key legal document that was adopted in 1997 and entered into force in 1999 (WTO 1997b). Improvements have been achieved in eliminating limitations on foreign ownership of local financial firms, on the commercial presence of foreign suppliers and on the expansion of existing operations, etc. Hence, updated data are available to analyze the relationship between GATS commitments and the real liberalization level of the financial sectors in a larger country group with more detailed commitment measures and appropriate econometric methods.

II.2 Earlier Empirical Analysis

As mentioned in the first part of this section, Sorsa (1997) set up a linear regression model to analyze the relationship between the "GATS liberalization level" and the actual level of openness and development in the financial sector. The dependent variable is an index that represents the degree of liberalization in "market access" commitments. The independent variables are indicators of financial depth (the ratio of broad money to GDP and the share of private credit to GDP), openness (the share of foreign assets in total financial sector assets), and profitability and policy-related indicators (the real interest rate and the government's share in total credit). The significance of this model lies in two aspects: firstly, it quantifies the quota-like commitment into a comparable value that can be aggregated cross-country or cross-sector; secondly, it links the committed and the actual level of liberalization in the financial sector so that this trade-policy-related issue, the nature and effectiveness of

GATS commitments, can be numerically assessed. Nevertheless, it can be argued that Sorsa's study was limited by the number of available observations (only 63 countries had commitments in financial services by 1995) and the method used to quantify the GATS commitment level (the dependent variable). In other words, this model could be subject to measurement errors or specification problems. In the following some rectifications or applications with respect to the dependent variable, the independent variables and econometric methods will be discussed.

II.2.1 The Index of GATS Commitments

The index of "market access" commitment is a subjective measure. GATS agreements prohibit six types of restrictions in financial services: limits on "the number of service suppliers," "the total value of service transactions," "the total number of services operations," "the total number of natural person," "measures which restrict or require specific types of legal entity or joint venture" and "the participation of foreign capital." (GATS: Part III-Article XVI 1997) To make *full* "market access" commitments, a Member should state that it has "None" of the limitations in its national schedule. However, with respect to the four modes of supply, a Member is also permitted to make *partial* commitments by specifying the limitations applied in each sub-sector or indicating that it is "Unbound" by the agreement in some sub-sectors in its national schedule. In practice, it is quite difficult to measure and compare these full or partial commitments in a cross-country study, because the national schedules are not constructed in a uniform manner. Thus subjective judgments have to be made as to the economic meaning of these limitations.

In Sorsa's (1997) analysis, he used six letters (A to F) to represent the above limitations and calculated unweighted averages for country groups in the banking and securities sectors. His method was the first attempt to measure the commitments in financial services but it did not take into account the relative importance of the modes of supply in specific sectors.

Other economists have also made some meaningful attempts to set up a weighted index of commitments. Hoekman's (1995) study takes preliminary steps towards scaling the commitments in all services. He analyzed the sectoral commitments made by 96 Members that had presented their schedules by mid-1994. Commitments were classified into three categories: a weight "1" was allocated if "None" of the restrictions was applied to a given mode of supply; a weight "0" was allocated if a Member was "Unbound" and a weight "0.5" was allocated when some kinds of restrictions were listed for a mode of supply. The weights Hoekman used reflect the perception that limitations in the schedule have numerical values, that is, the higher the number is, the greater the extent of openness. However, this rough classification is not sufficient to compare the restrictions in a specific sector between Members.

Based on Hoekman's (1995) approach, Mattoo (2000) adopted a more complicated method of quantifying the restrictions with respect to Mode 3, "commercial presence." The commitments between "None" and "Unbound" were divided into four categories and assigned the following values: 0.10 for "no new entry or unbound for new entry," 0.25 for "discretionary licensing for new entry," 0.5 for "ceiling on foreign equity at less than 50%," and 0.75 for "ceiling on foreign equity at more than 50%, restrictions on the legal form and other minor restrictions." Another important contribution of Mattoo

was that he established "mode-of-supply" weights in the financial sector based on relative importance of modes. For the banking sector, "cross-border supply," "consumption abroad" and "commercial presence" were allocated the weights 0.16, 0.04 and 0.8 respectively, so that the index of commitments could be constructed as a weighted aggregate. For example, if a Member has "None" of limitations in Mode 1, is "Unbound" in Mode 2 and limits a 30% ceiling for foreign equity in Mode 3, its weighted commitment index will be 0.56 (= 1 x 0.16 + 0 x 0.04 + 0.5 x 0.8). This method provides a useful and convenient way to quantify the level of commitments.

As an extension of Mattoo's method, Qian (2000) also assigned values for different types of commitments but divided the restrictions into more categories when he calculated the "liberalization index" of financial services in the regression model. To make the index more precise, he added some relevant GATS provisions to the categories, such as "economic needs tests," "grandfathering provisions," "reciprocity condition or MFN exemption." In some individual Members' national schedules, these provisions are listed together with the commitments. Thus the commitments between "None" and "Unbound" were divided into 10 categories with 3 levels of values (0.25, 0.50 and 0.75). Using this measurement system, Qian (2000) got a more accurate dependent variable for his regression analysis, compared with Sorsa's (1997) study.

It has to be pointed that the effectiveness of the above methods are conditioned on the correct judgment of categories for each item of restrictions in national schedules and the rational allocation of values and weights in the calculation. The "mode-of-supply" weights that Mattoo (2000) adopted were based on the sectoral coverage of US data, because only the United States reports statistics on trade in financial services with respect

to three modes of supply. Further discussions of weights in cross-country studies are not available due to the insufficiency of statistics.

II.2.2 The Financial Indicators

In the financial sector, liberalization can be classified as domestic financial deregulation, internationalization of financial services and capital account liberalization (Claessens and Jansen 2000). The GATS commitments relate to the last two types of liberalization. The level of development of the liberalization can be reflected by a series of financial indicators, such as financial depth, openness, efficiency etc. As the regressors in the model, indicators that are compatible across countries should be selected.

Financial depth reflects the extent to which an economy relies on the banking sector in financial intermediation. As the economy develops, the indirect lending from savers to investors gradually increases financial assets relative to GDP. The conventional measures of financial depth are *the ratio of broad money to GDP (M2/GDP)* and *the real interest rate*. Pill and Pradhan's (1995) empirical study suggested that *the share of private sector credit to GDP* could be a better financial depth measure for countries during the period of financial liberalization. Sorsa (1997) used all three indicators above in his regression model. Another measure adopted by the World Bank's WDI (world development indicators) to assess the growth of the banking system is *the domestic credit provided by banking sector*, which reflects the extent to which savings are financial.

A financial market is regarded as "contestable" if it is open to foreign suppliers and the barrier to entry is low (Graham and Lawrence 1996). **Openness** can be measured by *the foreign share in total banking assets or liabilities*, *profitability* and the nature of restrictions on entry (such as *minimum capital asset ratio*, *maximum capital asset owned*

by foreigners, etc.) Claessens et al. (2001) provided data on *the number of foreign banks in total* and *foreign bank assets in total* to show the foreign entry level in 80 developed and developing countries. The latter measure has been used in Qian's (2000) regression model and was found to have a positive relationship with the GATS commitment index.

The interest rate spread (lending rate minus borrowing rate) is the margin between the cost of mobilizing liabilities and earnings on assets. It reflects the **efficiency** of the financial sector. A high interest rate spread increases transaction costs and overall investment costs, indicating inefficiency in banking system. In the World Bank's WDI, this measure is used along with *the spread over LIBOR (London Interbank Offer Rate).*

There are some economic indicators that relate to the development of financial services. *GDP per capita, trade as a share of GDP* and *service value added as a share of GDP* indicate the positive relationship between a country's economic activity and the level of development of its financial sectors. Chinn and Ito's (2002) econometric study of capital account liberalization and financial development adopted some of these indicators. Qian (2000) also uses the above three indicators as explanatory variables in his regression model.

II.2.3 Econometric Methods

Sorsa's (1997) OLS (ordinary least squares) regression has found that t-statistics are not significant for all the coefficient estimates in the model and most signs of them are incorrect. So he concluded that there is no correlation between GATS commitments and the indicators of financial development. He also pointed out that his model might be subject to specification problems due to the poor nature of the data on the dependent variables, but he did not carry out any diagnostic tests for specification errors.

As discussed above, Qian (2000) adopted a more precise method than Sorsa (1997) to construct the dependent variable. For the independent variables, he selected three economic indicators that relate to the development of financial services (GDP per capita, trade as a share of GDP and services value added as a share of GDP) and five financial indicators (the ratio of broad money to GDP, the interest rate spread, the real interest rate, foreign bank assets in total, credit to the private sector as a share of GDP) to reflect the level of development in the banking and insurance sectors. On one hand, Qian's OLS regression showed that the t-statistics and R-squares of all the coefficient estimates were quite low, which is consistent with Sorsa's (1997) findings. On the other hand, when he identified outliers with respect to each independent variable and singled out these outliers with dummy variables, significant coefficient estimates could be obtained. The method that he used to identify the outliers was to regress the "liberalization index" on each financial indicator and then examine the scatter diagram of this simple linear regression. An observation would be regarded as an outlier if the predicted and the actual values "overlap". It has to be pointed out that this method is not a type of systematical diagnostic to detect multiple discrepant observations.

Both Sorsa (1997) and Qian (2000) did not carry out diagnostic tests to see whether the assumptions of the model are valid. To our knowledge, if one or more of the assumptions of the model are violated, the OLS estimators may not have good properties and the results of the significance tests (t-test and F-test) may be invalid. Consequently, it appears useful to re-examine this model raised by previous studies with updated data and carry out diagnostic tests to evaluate the regression results.

III. Construction of the Dependent Variable and Data Analysis

III.1 Construction of the Dependent Variable

The linear regression model used in this paper is based on the previous studies of Sorsa (1997) and Qian (2000). The dependent variable, the "liberalization index," is constructed using a framework that combines the methods of Mattoo (2000) and Qian (2000): each type of limitation on the "market access" commitment is given a code and assigned a numerical value (shown in Table 1).

Table 1. Codes and Values Assigned for Limitations

Code	Type of limitations	Value (V)
U	"Unbound" by commitments	0.00
DL	Discretionary Licensing or Economic Needs Test	0.25
LC	Limited commitments	0.50
CO1	Ceiling on foreign ownership less than 50%	0.50
CO2	Ceiling on foreign ownership more than 50%	0.75
LL	Limits on the legal form	0.75
LP	Limits on type or number of operations	0.75
LV	Limits on value of asset transactions	0.75
RE	Reciprocity condition or MFN exemption	0.75
N	"None" limitations	1.00

Note: The codes and assigned values are based on Qian's (2000) article (Appendix 1) with two changes: (1) "Grandfathering Provision" is deleted, since this provision is parallel to (not included in) the commitment; (2) "Limits on type of operation" and "Limits on number of operations" are combined as LP, since both are relevant to the operations (branches or subsidiaries) but difficult to distinguish in the national schedules.

In this paper we concentrate on limitations of the commitments in the banking sector with respect to first three Modes. For banking services, Members generally make commitments to "acceptance of deposit from the public," "lending of all types" and other

business, such as "credit card business," "money transmission services," "money market instruments," etc. (WTO Services Database). To ensure that the data are comparable, we limit our study to the two main banking businesses, "deposit" and "lending," when calculating the "liberalization index." As in Mattoo's (2000) study, "deposit" and "lending" are given different weights with respect to each mode of supply (showed in Table 2). Hence the "liberalization index" is the weighted sum of the indexes of all three Modes.

Table 2. Weight for Each Mode of Supply

	Mode 1 "Cross-border Supply"	Mode 2 "Consumption abroad"	Mode 3 "Commercial presence"
Deposit	0.12 (W_{D1})	0.03(W_{D2})	0.85 (W_{D3})
Lending	0.20 (W_{L1})	0.05 (W_{L2})	0.75 (W_{L3})

Note: The weights used in this paper are from Mattoo's (2000) article (Annex 1).

The formula for calculating the weighted Liberalization Index (range 0-1) is:

Liberalization Index = $(W_{D1}+W_{L1})/2 \times V_1 + (W_{D2}+W_{L2})/2 \times V_2 +$

$(W_{D3}+W_{L3})/2 \times V_3$,

where W_{DN}: weight of "deposit" with respect to Mode N (N=1, 2, 3)

W_{LN}: weight of "lending" with respect to Mode N (N=1, 2, 3)

V_N: value for different types of limitations with respect to Mode N ((N=1, 2, 3).

Obviously, the assigned values of the weights greatly influence the measure of the "liberalization index". The value of a Member's "liberalization index" mainly depends on the level of its commitments to Mode 3 since it has the largest weight. It is consistent with economic intuition that the "commercial presence" of foreign suppliers is of crucial significance in financial sectors. Unlike trade in goods, many financial services require the provider and consumer to be in the same place. This requires the entry of the foreign

supplier, such as the establishment of branches/subsidiaries of a foreign bank in the domestic market. However, as is discussed in the literature review, Mattoo's (2000) weights were not set up based on cross-country statistics. Due to the unavailability of better statistics and methods, we still use these weights in this paper. But this weakness in calculating the dependent variable has to be taken into account when we evaluate the regression results.

III.2 Data Analysis

The data on Members' commitments are collected from the WTO Services Database. Since the database was updated till December 31st, 1999, this paper will carry out the regression with cross-sectional data for 1999 when the Fifth Protocol was ratified by 104 Member governments that had made commitments in financial services. Among them, 92 Members made commitments for "deposit" and "lending" in the banking sector with respect to the three modes of supply. Because the data for Cuba, Liechtenstein, Qatar and the United Arab Emirates is not available for some independent variables, the number of observations in this paper is 88. According to the type of limitation (Table 1), codes and values are assigned to each Member and the "liberalization index" is calculated using the above formula. The "liberalization indexes" of 88 Members are listed in Appendix 1.

Compared with the financial indicators selected by Sorsa (1997) and Qian (2000), the independent variables in this paper focus on the level of financial services development in the banking sector: indicators to reflect financial depth (*the ratio of broad money to GDP, the real interest rate, the domestic credit provided by the banking sector*), efficiency (*the interest rate spread*) and openness (*the share of foreign assets in deposit*

money banks[1]). The definitions of these variables and some descriptive statistics are discussed below. The data are collected from the WDI (World Bank), International financial statistics (IMF) and EUROPA online statistics (European Union) as shown in Appendix 2.

According to the WDI's categories, Eighty-eight Members are divided into four groups: low income, lower middle income, upper middle income and high income. A series of descriptive statistics for the dependent and independent variables are listed in Table 3 to Table 6.

Table 3. Descriptive Statistics for Liberalization Index

Member Group	Number of Members	Average	Minimum		Maximum	
			Value	Member	Value	Member
Low Income	20	0.723	0.20	Gambia	1.00	Ghana, Haiti, Kyrgyz Rep., Mongolia, Mozambique, Solomon Islands
Lower Middle Income	18	0.681	0.27	Honduras	1.00	Ecuador, Guyana, Papua New Guinea
Upper Middle Income	20	0.655	0.30	Korea Rep.	1.00	Panama
High Income	30	0.700	0.20	Cyprus	1.00	Iceland, New Zealand
Total	88	0.690				

It can be seen in Table 3 that the average "liberalization index" of Members in the low income group is the highest. Six out of 20 Members in this group make full commitments to "market access". The average of the index for the lower and upper middle income groups are below that for the sample as a whole. Thus it seems that the

[1] The term "deposit money bank" is from the International Financial Statistics (IMF).

low income Members like to open their banking sectors with few or no limitations on their commitments, while the middle income Members tend to protect their own banks by limiting foreign entries.

Table 4. Descriptive Statistics for Indicators of Financial Depth

	Member Group	Number of Members	Average	Minimum		Maximum	
				Value	Member	Value	Member
M2/ GDP (%)	low income	20	29.1	11.87	Kyrgyz Rep.	62.88	Nicaragua
	lower middle income	18	44.22	21.01	Romania	105.97	Thailand
	upper middle income	20	48.51	16.89	Gabon	97.88	Malaysia
	high income	30	77.73	6.37	Belgium	215.03	HongKong, China
Real Interest Rate (%)	low income	20	5.08	-72.69	Angola	25.50	Mongolia
	lower middle income	18	9.89	-28.05	Ecuador	27.01	Paraguay
	upper middle income	20	14.76	4.07	Venezuela, RB.	72.95	Brazil
	high income	30	6.47	-0.43	Ireland	32.20	Kuwait
Domestic Credit Provided by Banking Sector (%)	low income	20	34.06	-0.36	Lesotho	150.70	Nicaragua
	lower middle income	18	52.52	18.07	Romania	144.61	Thailand
	upper middle income	20	63.86	16.59	Venezuela, RB.	157.22	South Africa
	high income	30	111.05	7.64	Belgium	318.95	Japan

"Financial depth" in this paper indicates the extent to which a Member's economy depends on the banking system in financial intermediation. Three indicators are used as following:

The ratio of broad money (M2) to GDP measures the assets that are financed through the banking system relative to GDP. *The domestic credit provided by the banking sector* reflects the extent to which saving is transformed into investment by the banking sector. Larger values of these two indicators indicate a higher level of financial depth. The statistics in Table 4 show that the high income group obviously has a higher average level of financial depth than other groups.

The positive *real interest rate* indicates the cost of financing when the rate or credit control is eliminated. It has a negative relationship with the level of financial depth. However, four Members (Angola, Ecuador, Ireland and Zimbabwe) among the 88 observations have negative real interest rates. A negative real interest rate accompanied by high inflation may suggest that rate or credit controls exist in a country. Though it is not clear whether the negative real interest rates in these four Members are due to some kind of control or other reasons, we can see that the negative values do influence the statistical results. The average real interest rates of the low income group, the lower middle income group and the high income group would be 9.71, 12.21 and 6.71 respectively, if the four Members with negative real interest rates were deleted. Then, the high income group is seen to have the lowest average real interest rate.

Table 5. Descriptive Statistics for Indicators of Financial Efficiency

	Member Group	Number of Members	Average	Minimum		Maximum	
				Value	Member	Value	Member
Interest Rate Spread (%)	low income	20	12.74	1.93	Indonesia	43.72	Angola
	lower middle income	18	7.56	1.76	Tunisia	19.20	Romania
	upper middle income	20	10.83	1.45	Korea Rep.	54.42	Brazil
	high income	30	3.60	0.72	Netherlands	8.48	Iceland

In this paper we use *the interest rate spread* to reflect financial efficiency. It is defined as the difference between the lending and deposit rates. A high *interest rate spread* generally reflects a lack of competition and inefficiency in the banking system. But this indicator may not be a reliable measure of efficiency, if the government sets the deposit and lending rates. The descriptive statistics in Table 5 show that the high income group has the lowest average interest rate spread, suggesting that it has more efficient banking systems than other groups.

Table 6. Descriptive Statistics for Financial Indicators of Financial Openness

	Member Group	Number of Members	Average	Minimum		Maximum	
				Value	Member	Value	Member
Share of Foreign Assets in Deposit Money Banks (%)	low income	20	18.85	5.44	Pakistan	72.89	Angola
	lower middle income	18	15.38	1.64	EI Salvador	47.94	Latvia
	upper middle income	20	15.46	3.84	Mexico	53.72	Panama
	high income	30	26.45	2.68	Iceland	65.86	New Zealand

The share of foreign assets in deposit money banks is used to reflect the openness of the banking sector. If a Member has strongly opened its banking system to foreign entry, it is expected to make commitments to "market access" with few or no limitations. The descriptive statistics in Table 6 show that the average share of foreign assets in deposit banks of the high income group is the largest. It is interesting that New Zealand and Iceland have the highest and lowest values respectively in the high income group, although both of them have made full commitments to "market access."

From the above statistics, it can be seen that the high income group has the highest average level of financial depth, efficiency and openness, suggesting that the actual level of liberalization in this group should be high. Another finding is that several Members with full commitments show quite low levels of financial depth, efficiency or openness: the Kyrgyz Republic has the lowest value of M2/GDP in the low income group; Mongolia has the highest real interest rate in the low income group; and Iceland has the highest interest rate spread and the lowest share of foreign assets in deposit money banks in the high income group.

IV. Data Analysis

IV.1 OLS Estimation and Diagnostic Tests

As a first step, the "liberalization index" was regressed against five explanatory variables with the software SHAZAM. The OLS estimation results are showed in Table 7. Low values were obtained for R-square and the adjusted R-square, suggesting that the goodness-of-fit of this model is quite poor. For the overall significance test, the p-value of the observed F statistic (0.231) is larger than 0.05. So we cannot reject the null hypothesis that the slope coefficients are jointly zero.

The estimated coefficients of M2/GDP and the real interest rate have incorrect signs. Except for the estimated coefficient of *the share of foreign assets in deposit money banks*, the t statistics are not significant at the 5% level, implying that changes in four out of five financial indicators cannot explain the change in the "liberalization index."

Table 7. OLS Estimation Results

Number of observations: 88 R-square = 0.0790 R-square adjusted = 0.0228
F = 1.406 P-value = 0.231

Variable	Estimated Coefficient	T-Ratio 82 DF	P-value	Elasticity At Mean
M2/GDP (%)	-0.21521E-02	-1.9326	0.0567	-0.16566
Real Interest Rate (%)	0.16679E-02	0.8203	0.4145	0.21098E-01
Domestic Credit Provided by Banking Sector (%)	0.24753E-03	0.3680	0.7139	0.25497E-01
Interest Rate Spread (%)	-0.19960E-02	-0.6077	0.5451	-0.23488E-01
Share of Foreign Assets in Deposit Money Banks (%)	0.43005E-02	2.2481	0.0273	0.12424
Constant	0.70353	11.204	0.0000	1.0183

However, before using the above F and t statistics to evaluate the regression results, we should carry out a series of diagnostic tests to check whether the assumptions of the classical linear regression model are satisfied. The results are shown in Table 8.

Table 8. Diagnostic Tests

Jarque-Bera Normality Test	CHI-square (2 DF) = 4.4088 P-value = 0.110
Goodness of Fit Test for Normality of Residuals (10 groups)	CHI-square (2 DF) = 12.4442 P-value = 0.002
Breusch-Pagan-Godfrey Test (based on R^2)	CHI-square (5 DF) = 6.966 P-value = 0.22321
RESET Test Using Powers of YHAT	RESET(2): F (1, 81) = 0.12374 P-value = 0.726 RESET(3): F (2, 80) = 0.49120 P-value = 0.614 RESET(4): F (3, 79) = 0.41288 P-value = 0.744
Auxiliary R-square	R-square of M2/GDP = 0.6465 R-square of Real Interest Rate = 0.2624 R-square of Domestic Credit Provided by Banking Sector = 0.5271 R-square of Interest Rate Spread = 0.2651 R-square of Share of Foreign Assets in Deposit Money Banks = 0.3897
Condition Index	7.6206

		M2 /GDP	Real Interest Rate	Domestic Credit Provided By Banking Sector	Interest Rate Spread	Share of Foreign Assets in Deposit Money
Correlation Matrix of Variables	M2/GDP (%)	1.000		-	-	-
	Real Interest Rate (%)	0.066	1.000	-	-	-
	Domestic Credit Provided By Banking Sector (%)	0.693	-0.015	1.000	-	-
	Interest Rate Spread (%)	-0.347	0.213	-0.371	1.000	-
	Share of Foreign Assets in Deposit Money (%)	0.414	-0.309	0.142	0.017	1.000

Diagnostic Test 1: Tests for Normality

Both the Jarque-Bera test and the Goodness of Fit test were carried out with SHAZAM to check the assumption that the errors are normally distributed. For the 5% level of significance, the critical value of chi-square with 2 degrees of freedom is 5.99147. Since the observed value of chi-square for the Jarque-Bera test (4.4088) is less than this critical value, we cannot reject the null hypothesis that the errors are normally distributed. For the Goodness of Fit test for normality, we have 10 groups and 6 coefficients estimated in the regression model. The critical value of chi-square with 2 degrees of freedom for the 5% level of significance is 5.99147. Since the observed value of the test statistic (12.4442) is larger than the critical value, we can reject the null hypothesis of normally distributed errors.

Because the results of the two tests are contradictory, it is not clear whether the errors in this regression model are normally distributed.

Diagnostic Test 2: Tests for Multicollinearity

It is expected that the three indicators for financial depth (*M2/GDP*, *the real interest rate* and *the domestic credit provided by banking sector*) might be correlated. SHAZAM shows that the auxiliary R-square values of *M2/GDP* (0.6465) and *the domestic credit provided by banking sector* (0.5271) are obviously higher than others. Similarly, the Correlation Matrix of Variables shows that the simple correlation between *M2/GDP* and *the domestic credit provided by banking sector* is fairly high (0.69292), but it is not a strong sign for multicollinearity. The largest condition index (7.6206) suggests that there is no strong linear relationship between the explanatory variables. Therefore,

after considering all the test results together, we can conclude that multicollinearity is not a serious problem in this model.

Diagnostic Test 3: A Test for Heteroskedasticity

Heteroskedasticity is a common problem in cross-section data. Since we are not sure whether the errors in this regression model are normally distributed, the Breusch-Pagan-Godfrey test (based on R^2) is used.[2] As a result, we cannot reject the null hypothesis that the errors are homoskedastic since the observed value of 6.966 is lower than the critical value of 11.1 for 5 degrees of freedom at the 5% significance level.

Diagnostic Test 4: A Test for Specification error

Using Ramsey's RESET test, we test the hypothesis that the model is correctly specified. Since there are no tabulated F values for 70-90 degrees of freedom in the denominator, we use the F values for 60 degrees of freedom as the critical values. The three critical values for the 5% level of significance are F (1, 60) = 4, F (2, 60) = 3.15 and F (3, 60) = 2.76. In all three cases, the observed values of the RESET test statistic (RESET (2) = 0.12374, RESET (3) = 0.49120 and RESET (4) = 0.41288) are less than the critical values. So we cannot reject the null hypothesis that this model is correctly specified.

Summary

Based on the above diagnostic tests, we can conclude that there are no multicollinearity, heteroskedasticity or specification problems in this model. Since we are not sure whether the errors are normally distributed, F and t statistics should be used cautiously when evaluating the regression results. Assuming that the normality

[2] Breusch-Pagan-Godfrey test (based on R^2) is the modified test proposed by Koenker. See Greene (2000), p.510 for a discussion of this test.

assumption is valid in the model, F and t statistics indicate that there is no strong linear relationship between the "liberalization index" and these financial indicators. This result is consistent with the previous studies of Sorsa (1997) and Qian (2000).

IV. 2 Detect and Single out Influential Observations

IV.2.1 Testing for Outliers

Qian (2000) has pointed that some Members' data are quite different compared with others, so it is worthwhile to examine all the observations closely to detect outliers. In this step we try to identify the outliers that most influence the regression results and find out which parts of the model are most affected. The diagnostic techniques of Belsley et al. (1980) are adopted to systematically detect the location of the "influential" observations that have a greater impact on the estimates (coefficients, t-values, etc.) than most of other observations. In this paper we only discuss the influential observations based on the "single-row effects." This means deleting one row of observations at a time to examine its impact on the values of various estimates. The deleted rows that cause great impacts are deemed to be influential.

SHAZAM provides five measures for identifying influential observations: RSTUDENT, HT, COVRATIO, DFFITS and DFBETAS. The definition of each measure is given in Belsley et al. (1980).

1. RSTUDENT

By standardizing the residuals we can obtain the "studentized residual" (RSTUDENT) as: $e_i^* = e_i / (s^2(1-h_{ii}))^{1/2}$, where e_i is the residual, s is the estimate of the standard error σ, and h_{ii} is the *i*th diagonal element of the projection matrix. A particular observation with a value of RSTUDENT beyond 2.0 (the recommended cutoff value) is

regarded as an outlier. The output of SHAZAM (presented in Appendix 3) indicates that the RSTUDENT values of Angola, Gambia and Slovenia exceed the criterion.

2. HT

The Hat Matrix (HT), also called the projection matrix, is defined as $H = X (X^TX)^{-1}X^T$, where X is the explanatory variables matrix. The diagonals of the Hat Matrix, h_{ii}, are diagnostic tools. The average size of a diagonal element is p / n, where p is the number of explanatory variables and n is the number of observations. If the value of h_{ii} exceeds the size-adjusted cutoff 2p / n, the *i*th observation, called a leverage point, will be singled out as an outlier. The SHAZAM output (presented in Appendix 3) shows that the HT values of nine Members exceed the cutoff value of 0.1136: Angola, Brazil, Uruguay, Hong Kong (China), Japan and Macao (China), Malta, New Zealand and United Kingdom. Among them, Angola and Brazil have much higher HT values than other Members.

3. COVRATIO

The covariance matrix is defined as $\sigma^2 (X^TX)^{-1}$. When the *i*th row is deleted, the new covariance matrix is defined as $\sigma^2 (X^T(i)X(i))^{-1}$. The ratio of their determinants $\det [(X^T(i)X(i))]^{-1} / \det(X^TX)^{-1}$ (COVRATIO) is a good diagnostic measure for outliers. The size-adjusted cutoff for COVRATIO is $1 \pm 3p/n$. We note from the SHAZAM output (presented in Appendix 3) that the COVRATIO values of seven Members exceed the cutoff value of 1.17: Angola, Latvia, Brazil, Hong Kong (China), Japan, Macao (China) and the United Kingdom. Among them, Angola and Brazil stand out with their quite high COVRATIO values beyond the cutoff, while other five Members just barely exceed this benchmark.

4. DFFITS

When the *i*th row is deleted, the change in fit, y_i-hat – y_i-hat (i), is defined as $h_{ii}\ e_i / (1\text{-}h_{ii})$. For scaling purposes, it is divided by $\delta\ (h_{ii})^{1/2}$ to get $DFFITS_i = [h_{ii} / (1\text{-}h_{ii})^{1/2}] \times [e_i / s(i)\ (1\text{-}h_{ii})_{1/2}]$. The size-adjusted cutoff for DFFITS is $2\ (p / n)^{1/2}$. The SHAZAM output (presented in Appendix 3) shows that the DFFITS values of Angola, Benin, Ecuador, Brazil, Cyprus, Macao (China) and Malta exceed the cutoff value of 0.4767. Only Angola has extremely high DFFITS values beyond the cutoff.

5. DFBETAS

When the *i*th row is deleted, the changes in the estimated coefficients are defined as $[(X^TX)^{-1}x_i^Te_i] / (1 - h_{ii})$, where x_i represents a row vector. The scaled measure of change is defined as $DFBETAS_i = (n)^{1/2}e_i / [(n\text{-}1)\ s(i)]$. The size-adjusted cutoff for DFFITS is $2 / (n)^{1/2}$. The SHAZAM output indicates that the DFBETAS values of 17 Members exceed the cutoff value of 0.2132 with respect to five explanatory variables (shown in Table 9).

6. Summary

Angola is apparently an outlier since all five measures pinpoint it. Brazil is suggested to be an outlier by all measures except RSTUDENT. Its HT and COVRATIO values are much higher than the benchmarks. Other Members with one or two values beyond the cutoffs might also be outliers based on different diagnostic measures.

Table 9. DFBETAS Values Exceed Cutoff

Member	M2/GDP (%)	Real Interest Rate (%)	Domestic Credit Provided by Banking Sector (%)	Interest Rate Spread (%)	Share of Foreign Assets in Deposit Money (%)	Constant
Angola	-0.4584	3.3790	-	-2.8819	-	0.5633
Benin	0.2210	-	-	-	-0.4232	-
Gambia	-	-	0.2227	-	-	-0.2448
Ghana	-	-	-	-	-	0.2214
Bulgaria	-	-	-	-	-0.3253	-
Ecuador	-	-0.5145	-	-	-0.2274	0.2996
Morocco	-	-	-	-	-0.2470	-
Papua New Guinea	-	-	-	-	-	0.2366
Brazil	-	-0.2608	-	-0.3759	-	0.2677
Panama	-	-	-	0.2554	-	-
South Africa	-	-	-0.2572	-	-	-
Uruguay	-	0.2188	-	0.2642	-	-0.2296
Cyprus	-	-	-0.3253	-	-	-
Israel	0.2341	-	-	-	-	-
Macao(China)	0.5201	-	-0.3921	-	-	-
Malta	0.3176	-	-	-	-	-
New Zealand	-	-	-	-	0.2926	-
Singapore	-0.2182	-	-	-	-	-
Slovenia	-	-	-	-	-	-0.2431

IV.2.2 Two Ways of Singling out Outliers

How to deal with the outliers is another big question. One choice is to directly discard the outliers and then carry out the regression, which is feasible for a cross-section model but not a good idea for a time-series model (Greene 2000). Another choice is to carry out the regression with outliers identified by dummy variables. The outliers can be identified based on least one of above diagnostic measures. In this paper, both of the two choices are tried.

1. OLS regression after deleting outliers

We carry out the OLS regression with 86 observations after deleting Angola and Brazil, the two most obvious outliers identified by above five diagnostic measures. As is shown in Table 10, R-square is 0.1398 and the F statistic (2.600) for the overall significance test is larger than the critical value (2.37) at the 5% level, which suggests that this new model after deleting outliers has some explanatory power. However, only the t statistic for the estimated coefficient of *the share of foreign assets in deposit money banks* is significant at the 5% level. The signs of *M2/GDP* and *the interest rate spread* are not theoretically correct.

Table 10. Results of OLS Estimation after Deleting Outliers

Number of observations: 86 R-square = 0.1398 R-square adjusted = 0.0860
F = 2.600 P-value = 0.031

Variable	Estimated Coefficient	T-Ratio 80 DF	P-value	Elasticity At Mean
M2/GDP (%)	-0.16794E-02	-1.5208	0.1323	-0.13048
Real Interest Rate (%)	-0.44764E-02	-1.2833	0.2031	-0.57665E-01
Domestic Credit Provided by Banking Sector (%)	0.29623E-03	0.44321	0.6588	0.30787E-01
Interest Rate Spread (%)	0.83257E-02	1.5576	0.1233	0.86117E-01
Share of Foreign Assets in Deposit Money Banks (%)	0.46089E-02	2.4672	0.0158	0.12958
Constant	0.65343	9.4390	0.0000	0.94165

One interesting finding is that the sign of *the real interest rate* becomes theoretically correct but the sign of *the interest rate spread* is wrong after deleting two outliers. It is seen in Appendix 2 that Brazil and Angola have the largest and smallest values of *the real interest rate*, respectively. They also have the largest values of *the interest rate spread*. Table 9 shows that the DFBETAS measure identifies Brazil and Angola as outliers with respect to *the real interest rate* and the *interest rate spread*.

Therefore, when Brazil and Angola are discarded, the coefficient estimates for these two independent variables are greatly influenced.

2. OLS regression with dummy variables

DFBETAS can be used to identify influential observations that have impacts on the coefficient estimates. As is listed in Table 9, the DFBETAS values of 19 Members exceed the cutoff value of 0.2132. Among them, six Members (Angola, Benin, Ecuador, Brazil, Uruguay and Macao (China)) have DFBETAS values beyond the cutoff for at least two slope coefficients. These six Members are also pointed out as outliers by at least one of other four measures (RSSTUDENT, HT, COVRATIO and DFFITS). So we carry out an OLS regression with the above six outliers identified by dummy variables.

We note from Table 11 that the adjusted R-square is larger than that of the original model and the p-value of the F statistic is close to 0.05. However, for the individual tests of significance, we cannot reject the null hypothesis that the individual coefficients of *the real interest rate*, *the domestic credit provided by banking sector* and *the interest rate spread* are zero based on observed t statistics. The signs of *M2/GDP* and *the interest rate spread* are theoretically incorrect. Only two dummy variables, Angola and Benin, have significant estimated coefficients at the 5% level.

Table 11. Results of OLS Estimation with Dummy Variables

Number of observations: 88 R-square = 0.2120 R-square adjusted = 0.0979
F = 1.858 P-value = 0.059

Variable	Estimated Coefficient	T-Ratio 76 DF	P-value	Elasticity At Mean
M2/GDP (%)	-0.24643E-02	-2.0239	0.0465	-0.18970
Real Interest Rate (%)	-0.39347E-02	-0.89074	0.3759	-0.49770E-01
Domestic Credit Provided by Banking Sector (%)	0.42396E-03	0.58648	0.5593	0.43670E-03
Interest Rate Spread (%)	0.65678E-02	1.0669	0.2894	0.77285E-01
Share of Foreign Assets in Deposit Money Banks (%)	0.54790E-02	2.8160	0.0062	0.15829
Angola	-1.1007	-2.1133	0.0379	-0.18105E-01
Benin	-0.49386	-2.1462	0.0350	-0.81231E-02
Ecuador	0.12516	0.45907	0.6475	0.20586E-02
Brazil	-0.12711	-0.32945	0.7427	-0.20908E-02
Uruguay	0.08278	0.27248	0.7860	0.13615E-02
Macao (China)	0.25658	1.0113	0.3151	0.42204E-02
Constant	0.67768	8.1945	0.0000	0.98090

3. Summary

It seems that the overall significance of the model is improved after deleting outliers or adding dummy variables. But we still cannot get significant t statistics for most of the coefficient estimates even after singling out outliers. The signs of *the real interest rate* and *the interest rate spread* are changed after the two influential observations, Angola and Brazil, are deleted or identified by dummy variables. But the sign of *M2/GDP* is still theoretically incorrect. So the conclusion is that strong correlations cannot be found in the two new models.

IV.3 Tobit Estimation

The dependent variable, the "liberalization index," is arbitrarily limited in a range from 0 to 1 and thus is expected to have a truncated distribution. Although SHAZAM shows that all the predicted values of the "liberalization index" are within the range, a

further discussion of the Tobit regression is essential in the case of such a limited dependent variable.

SHAZAM cannot carry out Tobit analysis with two-side truncation, so we have to divide this problem into two parts: a lower limit of 0 and an upper limit of 1.[3] The result of the Tobit regression shows that there are no observations below the lower limit of 0, but it is found that 12 out of 88 observations equal the upper limit of 1. SHAZAM also shows that the observed frequency of the dependent variable being less than the limit of 1 equals 0.8636, which is close to the predicted probability (0.8801).

The regression results of Tobit estimation with an upper limit of 1 are exhibited in Table 12. For the overall significance test, the critical value of chi-square with 6 degrees of freedom for the 5% level of significance is 12.6. Since the observed Wald statistic (699.06211) is much larger than the critical value, we can reject the null hypothesis that the slope coefficients are jointly zero. However, the squared correlation between observed and expected values (0.0798) shows that the goodness of fit of this Tobit regression is not high.

It is seen that the estimates of coefficients in the Tobit regression are close to those of the original OLS regression. The signs of *M2/GDP* and *the real interest rate* are still theoretically incorrect. The asymptotic t statistics for *the real interest rate*, *the domestic credit provided by banking sector* and *the interest rate spread* are not significant at the 5% level.

[3] In fact, the "liberalization index" did not equal zero for any of the countries in the sample.

Table 12. Tobit Estimation Results (Upper Limit =1)

Number of observations: 88
Wald CHI-square statistic = 699.06211 with 6 D.F. P-value = 0.00000
Squared correlation between observed and expected values = 0.0798

Variable	Estimated Coefficient	Asymptotic t Statistic	P-value
M2/GDP (%)	-0.24390E-02	-1.9960	0.0459
Real Interest Rate (%)	0.19172E-02	0.8498	0.3955
Domestic Credit Provided by Banking Sector (%)	0.24331E-03	0.3301	0.7413
Interest Rate Spread (%)	-0.20944E-02	-0.5806	0.5615
Share of Foreign Assets in Deposit Money Banks (%)	0.47893E-02	2.2295	0.0258
Constant	0.72552	10.4581	0.0000

Thus the Tobit regression with upper limit of 1 does not change the conclusion of the original OLS model, that the variations in the committed level of liberalization cannot be explained by the different levels of development of these Members' banking sectors.

IV.4 Probit Model

As stated in subsection III.1, a weakness exists in the weights used to compute the dependent variable. Furthermore, the subjectively assigned value for each type of limitation in the commitment is possibly another factor that influences the regression results. In this step, we try to use Probit analysis to rectify the above two problems.

Since Mode 3, "commercial presence", is of the greatest importance as mentioned before, we focus our study on the limitations of commitments with respect to Mode 3. In all types of limitations listed in Table 1, it is clear that the item "discretionary licensing or economic needs test" has the lowest value as a "partial" commitment between

"Unbound" and "None" of limitation. Economic intuition suggests that the "commercial presence" of foreign suppliers will be greatly restricted if licenses are issued on the discretionary decisions of the home country or if foreign entry is permitted only for the "economic needs test." Therefore, we use this type of limitation as a standard for measuring the liberalization level. A binary (0/1) dependent variable is used in the new model: if a Member is "Unbound" by commitments or has a limitation in the form of "discretionary licensing or economic needs test", the dependent variable is assigned a value of 0; otherwise it is assigned a value of 1. The independent variables are still the five financial indicators in the original model.

Table 13. Probit Estimation Results

Number of observations: 88
Estrella R-square = 0.13029
Likelihood Ratio Test = 11.6527 with 5 D.F.

Variable	Estimated Coefficient	Asymptotic t Statistic	P-value	Elasticity At Mean
M2/GDP (%)	-0.23331E-01	-2.6239	0.00869	-0.73311
Real Interest Rate (%)	0.11394E-01	0.9032	0.36642	0.58833E-01
Domestic Credit Provided by Banking Sector (%)	0.10609E-01	2.0604	0.03936	0.44608
Interest Rate Spread (%)	-0.17163E-01	-0.8424	0.39959	-0.82440E-01
Share of Foreign Assets in Deposit Money Banks (%)	0.26425E-02	0.2369	0.81270	0.31164E-01
Constant	0.82008	2.0903	0.03659	0.48454

The results of the Probit regression are shown in the Table 13. For the Likelihood Ratio Test, the observed statistic (11.6527) is larger than the critical value of chi-square (11.1) with 5 degrees of freedom at the 5% level of significance. So we can reject the null hypothesis that the slope coefficients are jointly zero. But the Estrella R-square does not show a high goodness of fit. The asymptotic t statistics for *the real interest rate, the*

interest rate spread and *the share of foreign assets in deposit money banks* are not significant at the 5% level. The signs of *M2/GDP* and *the real interest rate* are theoretically incorrect.

It has to be pointed out that this new model only attempts to rectify the weakness in the subjective assignments of weights and values when the "liberalization index" is calculated. It thus limits the scope of the study on a specific type of limitation with respect to one mode of supply. It is not a complete rectification of the original model. Based on the above estimation results, we conclude that the explanatory power of the five financial indicators in this Probit model is not high.

IV.5 Summary and Comparison of Estimation Results

Firstly, it seems that the original OLS regression model does not have any explanatory power based on the result of F test and the poor value of R-square. After singling out the outliers, the overall significance of the model is improved. In both Tobit and Probit estimations, we can reject the null hypothesis that the slope coefficients are jointly zero. However, we obtain quite low R-squares in all the above regressions. It means that the correlation between the committed liberalization level and the financial indicators is not strong.

Secondly, the coefficient estimate of *M2/GDP* is always negative in all the regression estimations in this paper, which is inconsistent with the predictions of the underlying economic theory. The descriptive statistics in subsection III.2 show that the high and middle income groups have a much higher average level of *M2/GDP* than the low income group, but the low income group has the highest average "liberalization index." We can also find from Appendix 1 and 2 that only one out of six Members who

made full commitments in the low income group has a value of *M2/GDP* over the average group level. This indicates that some Members who committed to largely opening their financial markets still have undeveloped banking systems, though it was predicted that high level GATS commitments could facilitate Members to develop the banking sectors.

Thirdly, the t statistic of *the share of foreign assets in deposit money banks* is significant at the 5% level in all the above regressions except for the Probit model. Surprisingly, the other indicator, *the domestic credit provided by banking sector*, is statistically significant in the Probit estimation, though it is not in other models above. It seems that the alteration of the specification of the model, instead of economic reasons, might account for the significance changes of the estimates.

Fourthly, when comparing the regression results between the Probit model and the original OLS model, it is seen that the absolute values of the elasticity at means of the coefficient estimates in the Probit model are larger than those in the original model except for that of *the domestic credit provided by banking sector*. The Probit model has seemingly higher explanatory power than the original model when it focuses on one type of limitation, but it still cannot certify that a strong correlation exists between the committed liberalization level and the indicators of the level of development in the banking sector.

V. The Conclusion and Economic Implications

This paper adopts an approach similar to those of Sorsa (1997) and Qian (2000) to examine the relationship between the liberalization level to which a WTO Member in the GATS commits and the actual level of development of the Member's banking sector. The result is generally consistent with Sorsa's (1997) finding, that there is no strong correlation between the dependent and independent variables, even after the outliers are singled out and identified by dummy variables.

This result can be explained by the fact that the actual level of liberalization in the banking sector differs from the committed level in the GATS. For instance, several Members in the low income group with undeveloped banking sectors made full or high levels of commitments, because they believe that opening the banking system will help them grow quickly and achieve high levels of national income. Plenty of Members in the middle income group with relatively developed banking sectors kept some types of limitations in their commitments to protect their own banking institutions or to avoid negative consequences of financial liberalization. This means that many Members did not make GATS commitments on the basis of the actual level of development of their banking sectors. Some political reasons or bargaining powers in the negotiation might cause this result, which is not reflected in the econometric model.

The regression analyses that were carried out by Sorsa (1997), Qian (2000) and this paper used data for 1995, 1997 and 1999 respectively, which are three important time points when the GATS agreements in the financial services were established after each phase of negotiations. With the exception of Qian's rectified model that identified outliers with respect to each explanatory variable, the other regression models yield

similar results, that there is no strong correlation between the GATS commitments and actual level of liberalization of the banking sector. It seems that although the committed level of liberalization is "progressive," the real contribution of the GATS to the openness and development of the banking sector is limited.

On the other hand, it has to be pointed out that some limitations of the model might influence the results. Firstly, the actual state of liberalization is measured by a series of indicators of financial depth, efficiency and openness in Sorsa (1997), Qian (2000) and this paper. But the relationship between liberalization, financial depth and efficiency is not carefully examined. We cannot presume that a well-developed or efficient banking system is a liberalized one. Furthermore, we only have some empirical analyses, not adequate theoretical studies, to support the hypothesis that the five indicators adopted in this paper are appropriate proxies for financial depth, efficiency and openness. The regression results also show that only the indicator of financial openness, *the share of foreign assets in deposit money banks*, has a significant coefficient estimate in the original, modified (with dummy variables) and Tobit models. [4]

Secondly, some weakness does exist in the method of quantifying the dependent variable. The "liberalization index" is calculated with the values and weights subjectively assigned for each type of limitation in the commitments. This paper has carried out Tobit and Probit regressions for the characteristics of the dependent variable. But they do not rectify all the shortcomings of the original model. Thus, further studies on this topic need to resolve these two problems.

[4] However, the coefficient is not significant at the 5% level in the simple regression of the "liberalization index" on *the share of foreign assets in deposit money banks.*

Bibliography:

Bachetta, M. and Drabek, Z. (2002) "Effects of WTO Accession on Policy-Making in Sovereign States." WTO Staff Working Paper DERD-2002-02.

Belsley, D.A., Kuh, E. and Welsch, R.E. (1980) *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. New York: John Wiley & Sons.

Chinn, M.D. and Ito, H. (2002) "Capital Account Liberalization, Institutions and Financial Development: Cross-country Evidence." National Bureau of Economic Research, Working Paper 8967.

Chow, G.C. (1983) *Econometrics*. Singapore: McGraw-Hill International Book Company.

Claessens, S., Demirguc-Kunt, A. and Huizinga, H. (2001) "How Does Foreign Entry Affect the Domestic Banking Market?" *Journal of Banking & Finance* Vol. 25 (5): 891-911.

Claessens, S. and Jansen, M. (2000) *The Internationalization of Financial Services: Issues and Lessons for Developing Countries*. Hague: Kluwer Law International.

European Union (1997) EUROPA online statistics. http://europa.eu.int

Graham, E. and Lawrence, E.Z. (1996) "Measuring the International Contestability of Market: A Conceptual Approach." OECD Working Paper TD/TC (96)7.

Greene, W.H. (2000) *Econometric Analysis*. Upper Saddle River, N.J.: Prentice Hall.

Hoekman, B. (1995) "Tentative First Steps: An Assessment of the Uruguay Round Agreement on Services." Centre for Economic Policy Research, Discussion Paper 1150.

IMF (1999-2001) *International Financial Statistics*. Washington, D.C.: International Monetary Fund.

Kampf, R. (1995) "A Step in the Right Direction: Financial Services in the GATS." *International Trade Law and Regulation* vol. 1(5): 157-166.

Kampf, R. (1998) "Financial Services in the WTO: Third Time Lucky." *International Trade Law and Regulation* vol.4 (3): 111-123.

Key, S. (1997) *Financial Services in the Uruguay Round and the WTO*. Washington, DC: Group of Thirty.

Kono, M., Low, P., Luanga, M., Mattoo, A., Oshikawa, M. and Schukpecht, L. (1997) "Opening Market in financial Services and the Roles of the GATS." Geneva: World Trade Organization, Special Study No.1.

Kono, M. and Schuknecht, L. (1998) "Financial Services Trade, Capital Flow, and Financial Stability." Economic Research and Analysis Division, Staff Working Paper ERAD-98-12.

Mattoo, A. (1997) "National Treatment in the GATS: Corner-stone or Pandora's Box?" *Journal of World Trade* Vol. 31 (1): 107-135.

--- (2000) "Financial Services and the WTO: Liberalization Commitments of the Developing and Transition Economies." *The World Economy* vol. 23(4): 471-489.

OECD (2002) *GATS: the Case for Open Services Market.* Paris: Organization for Economic Co-operation and Development.

Pill, H. and Pradhan, M. (1995) "Financial Indicators and Financial Change in Africa and Asia." IMF Working Paper 95/123.

Qian, Y. (2000) "Financial Services Liberalization and GATS—Analysis of the Commitments under the General Agreement on Trade in Services (GATS) at the World Trade Organization (WTO)." Washington, D.C.: World Bank Working Paper http://www1.worldbank.org/wbiep/trade/manila/financial_services.pdf

Sorsa, P. (1997) "The GATS Agreement on Financial Services—A Modest Start to Multilateral Liberalization." IMF Working Paper WP/97/55.

Tobin (1958) "Estimation of Relationships for Limited Dependent Variables." *Econometrica* Vol. 26: 24-36.

World Bank (1999-2000) *World Development Indicators.* Washington, D.C.: World Bank.

WTO (1994) "Understanding on Commitments in Financial Services." Geneva: World Trade Organization, LT/UR/U/1.

--- (1995) "Decision on the application of the second annex of financial services" Geneva: World Trade Organization, S/L/6.

--- (1997a) "General Agreement on Trade in Services." Geneva: World Trade Organization, Legal Texts http://www.wto.org/english/docs_e/legal_e/legal_e.htm#services

--- (1997b) "Fifth Protocol to the General Agreement on Trade in Services." Geneva: World Trade Organization, S/L/45.

--- (1998a) "Economic Effects of Services Liberalization: Overview of Empirical Studies." Geneva: World Trade Organization, S/C/W/26/Add.1.

--- (1998b) "Financial Services." Geneva: World Trade Organization, S/C/W/72.

--- (2000a) WTO Services Database. Geneva: World Trade Organization.

--- (2000b) *The Results of the Uruguay Round of Multilateral Trade Negotiations: the Legal Texts*. Geneva: World Trade Organization.

--- (2001a) *GATS-Fact and Fiction*. Geneva: World Trade Organization.

--- (2001b) "Market Access: Unfinished Business – Post-Uruguay Round Inventory and Issues." Geneva: World Trade Organization, Special Study No.6.

--- (2003) *The Results of the Financial Services Negotiations under the General Agreement on Trade in Services (GATS)*. Geneva: World Trade Organization.

Appendix 1 Liberalization Index of Banking Sector (1999)

country name	mode 1			mode 2			mode 3			Total Index (0-1)
	deposit W_{D1}=0.12	lending W_{L1}=0.2	index	deposit W_{D2}=0.03	lending W_{L2}=0.05	index	Deposit W_{D3}=0.85	lending W_{L3}=0.75	index	
Angola	N	DL	0.085	DL	DL	0.010	N	U	0.425	0.520
Argentina	U	U	0.000	N	N	0.040	N	N	0.800	0.840
Australia	LC	LC	0.080	N	N	0.040	LL,LV	LL	0.600	0.720
Austria	RE	RE	0.120	N	N	0.040	LL,DL	LL,DL	0.710	0.870
Bahrain	DL	DL	0.040	N	N	0.040	LP,CO1	LP,CO1	0.500	0.580
Belgium	LC	LC	0.080	N	N	0.040	LL	LL	0.600	0.720
Benin	N	DL	0.085	N	DL	0.021	LL	U	0.320	0.426
Brazil	U	U	0.000	U	U	0.000	LP	LP	0.600	0.600
Bulgaria	U	U	0.000	U	U	0.000	CO1	CO1	0.400	0.400
Canada	N	N	0.160	N	N	0.040	LL	LL	0.600	0.800
Chile	U	U	0.000	U	U	0.000	LL,LV	LL,LV	0.600	0.600
Colombia	U	U	0.000	U	U	0.000	N	N	0.800	0.800
Costa Rica	U	U	0.000	U	U	0.000	LL	LL	0.600	0.600
Cote d'Ivoire	N	U	0.060	DL	U	0.004	LL,DL	LL,DL	0.710	0.774
Cyprus	U	U	0.000	U	U	0.000	DL	DL	0.200	0.200
Czech Rep.	U	N	0.100	U	N	0.025	LL,DL	LL,DL	0.710	0.835
Denmark	N	N	0.160	N	N	0.040	LL	LL	0.600	0.800
Dominican Rep.	U	U	0.000	U	U	0.000	DL,CO1,LV	DL,CO1,LV	0.400	0.400
Ecuador	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Egypt, Arab Rep.	U	U	0.000	U	U	0.000	CO1,DL	CO1,DL	0.300	0.300
El Salvador	U	U	0.000	U	U	0.000	CO1	CO1	0.400	0.400
Estonia	DL	N	0.120	N	N	0.040	N	N	0.800	0.960
Finland	N	N	0.160	N	N	0.040	CO1	CO1	0.400	0.600
France	N	N	0.160	N	N	0.040	LL	LL	0.600	0.800
Gabon	N	N	0.160	N	N	0.040	DL	DL	0.200	0.400
Gambia	N	N	0.160	N	N	0.040	U	U	0.000	0.200

Appendix 1 (continue) **Liberalization Index of Banking Sector (1999)**

country name	mode 1			mode 2			mode 3			Total Index (0-1)
	deposit W_{D1}=0.12	lending W_{L1}=0.2	index	deposit W_{D2}=0.03	lending W_{L2}=0.05	index	Deposit W_{D3}=0.85	lending W_{L3}=0.75	index	
Germany	N	N	0.160	N	N	0.040	LL	LL	0.600	0.800
Ghana	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Greece	N	N	0.160	LC	LC	0.020	LL,CO1	LL,CO1	0.500	0.680
Guyana	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Haiti	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Honduras	U	U	0.000	U	U	0.000	LL, DL, U	LL, DL, U	0.270	0.270
Hong Kong (China)	U	U	0.000	N	N	0.040	DL	N	0.480	0.520
Hungary	CO1	CO1	0.080	N	N	0.040	CO1	CO1	0.400	0.520
Iceland	N	N	0.160	N	N	0.040	N	N	0.800	1.000
India	U	U	0.000	U	U	0.000	LL,DL,CO1	LL,DL,CO1	0.400	0.400
Indonesia	N	N	0.160	N	N	0.040	CO1,LN	CO1,LN	0.500	0.700
Ireland	N	N	0.160	N	N	0.040	LL,LP	LL,LP	0.600	0.800
Israel	U	LC	0.050	U	LC	0.013	N	N	0.800	0.863
Italy	LC	LC	0.080	LC	LC	0.020	LL	LL	0.600	0.700
Japan	LC	LC	0.080	N	N	0.040	LC	LC	0.400	0.520
Kenya	U	U	0.000	U	U	0.000	N	N	0.800	0.800
Korea, Rep.	U	U	0.000	U	U	0.000	CO1,DL	CO1,DL	0.300	0.300
Kuwait	U	LP	0.075	N	N	0.040	CO1,DL	CO1,DL	0.300	0.415
Kyrgyz Rep.	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Latvia	U	U	0.000	N	N	0.040	N	N	0.800	0.840
Lesotho	U	U	0.000	U	U	0.000	CO1	CO1	0.400	0.400
Macau (China)	U	LV	0.075	N	N	0.040	LL,DL	LL	0.710	0.825
Malaysia	U	LC	0.050	LC	LV	0.026	LL,DL,CO1	LL,DL,CO1	0.400	0.476
Malta	N	N	0.160	N	N	0.040	LL,DL	LL,DL	0.710	0.910
Mauritius	U	N	0.100	N	N	0.040	DL	N	0.480	0.620
Mexico	U	U	0.000	U	U	0.000	CO1	CO1	0.400	0.400

Appendix 1 (continue) **Liberalization Index of Banking Sector (1999)**

country name	mode 1			mode 2			mode 3			Total Index (0-1)
	deposit W_{D1}=0.12	lending W_{L1}=0.2	index	deposit W_{D2}=0.03	lending W_{L2}=0.05	index	Deposit W_{D3}=0.85	lending W_{L3}=0.75	index	
Mongolia	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Morocco	U	LL	0.075	U	U	0.000	N	N	0.800	0.875
Mozambique	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Netherlands	N	N	0.160	N	N	0.040	LL	LL	0.600	0.800
New Zealand	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Nicaragua	U	U	0.000	U	U	0.000	LL,LV	LL,LV	0.600	0.600
Nigeria	N	N	0.160	U	U	0.000	N	N	0.800	0.960
Norway	N	N	0.160	N	N	0.040	LL,CO1	LL,CO1	0.500	0.700
Pakistan	U	U	0.000	U	U	0.000	LV,LL,CO1	LV	0.560	0.560
Panama	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Papua New Guinea	N	N	0.160	N	N	0.040	N	N	0.800	1.000
Paraguay	U	U	0.000	U	U	0.000	N	N	0.800	0.800
Peru	U	U	0.000	U	U	0.000	N	N	0.800	0.800
Philippines	N	N	0.160	N	N	0.040	LP,DL,CO2	LP,DL,CO2	0.470	0.670
Poland	U	U	0.000	U	U	0.000	LL	LL	0.600	0.600
Portugal	N	N	0.160	LV	LV	0.030	LL,DL	LL,DL	0.400	0.590
Romania	N	N	0.160	LC	N	0.030	N	N	0.800	0.990
Senegal	U	U	0.000	U	U	0.000	LL	DL	0.410	0.410
Sierra Leone	N	N	0.160	N	N	0.040	DL,LL	DL,LL	0.710	0.910
Singapore	U	U	0.000	N	N	0.040	LL,CO1,LC	DL	0.340	0.380
Slovak Republic	U	N	0.100	U	N	0.025	DL,LL	DL,LL	0.710	0.835
Slovenia	U	U	0.000	U	N	0.025	DL	DL	0.200	0.225
Solomon Islands	N	N	0.160	N	N	0.040	N	N	0.800	1.000
South Africa	U	U	0.000	U	U	0.000	LC	LC	0.400	0.400
Spain	N	N	0.160	N	N	0.040	LL	LL	0.600	0.800

Appendix 1 (continue) **Liberalization Index of Banking Sector (1999)**

country name	mode 1			mode 2			mode 3			Total Index (0-1)
	deposit W_{D1}=0.12	lending W_{L1}=0.2	index	deposit W_{D2}=0.03	lending W_{L2}=0.05	index	Deposit W_{D3}=0.85	lending W_{L3}=0.75	index	
Sri Lanka	U	U	0.000	U	U	0.000	CO1,DL,LL	CO1,DL,LL	0.400	0.400
Sweden	N	N	0.160	DL	DL	0.010	LL	LL	0.600	0.770
Switzerland	N	N	0.160	N	N	0.040	LC	LC	0.400	0.600
Thailand	U	U	0.000	U	U	0.000	DL,LP,CO1	DL,LP,CO1	0.400	0.400
Tunisia	N	N	0.160	N	N	0.040	LL,DL	LL,DL	0.710	0.910
Turkey	N	N	0.160	N	N	0.040	LL,DL	LL,DL	0.710	0.910
United Kingdom	N	N	0.160	LC	LC	0.020	LL	LL	0.600	0.780
United States	LC	LC	0.080	LC	LC	0.028	LL	N	0.690	0.798
Uruguay	N	N	0.160	N	N	0.040	LL,DL	LL,DL	0.710	0.910
Venezuela, RB	U	U	0.000	U	U	0.000	LL,DL	LL,DL	0.710	0.710
Zimbabwe	N	N	0.160	N	N	0.040	CO2	CO2	0.600	0.800

Appendix 2 **Financial Indicators (1999)**

Group	Country Name	Money and Quasi Money (M2) as % of GDP	Real Interest Rate (%)	Domestic Credit Provided by Banking Sector (% of GDP)	Interest Rate Spread (lending rate-deposit rate)	Foreign Assets in Deposit Money Banks (%)
1	Angola	13.20	-72.69	7.17	43.72	72.89
1	Benin	23.12	2.10	6.96	8.96	44.83
1	Cote d'Ivoire	24.73	0.80	26.19	4.07	13.07
1	Gambia	28.26	18.83	12.95	11.50	8.25
1	Ghana	17.37	2.50	35.81	3.44	10.31
1	Haiti	32.37	19.12	27.29	15.49	15.56
1	India	48.78	8.78	49.79	7.13	15.20
1	Indonesia	54.44	10.85	61.00	1.93	17.71
1	Kenya	43.09	15.68	50.43	12.83	5.90
1	Kyrgyz Rep.	11.87	16.93	14.61	25.28	17.72
1	Lesotho	30.97	7.57	-0.36	11.61	18.99
1	Mongolia	20.93	25.50	12.91	17.85	23.05
1	Mozambique	21.92	16.20	6.44	11.77	20.28
1	Nicaragua	62.88	9.90	150.70	11.87	9.33
1	Nigeria	19.08	7.13	19.68	7.48	17.32
1	Pakistan	43.89	4.80	48.02	6.76	5.44
1	Senegal	22.95	0.90	23.04	7.22	21.13
1	Sierra Leone	13.87	1.45	50.08	17.33	25.10
1	Solomon Islands	28.80	5.80	32.13	11.63	6.72
1	Zimbabwe	19.38	-0.47	46.36	16.88	8.18
2	Bulgaria	28.75	9.41	18.60	9.57	37.30
2	Colombia	24.64	14.12	42.23	4.44	2.14
2	Dominican Rep.	29.27	17.25	36.67	8.98	5.22
2	Ecuador	21.99	-28.05	41.24	7.25	13.85
2	Egypt, Arab Rep.	75.25	10.94	99.77	3.75	8.30
2	El Salvador	46.24	14.86	43.54	4.72	1.64
2	Guyana	64.34	7.96	105.52	8.03	8.03
2	Honduras	40.73	16.67	28.09	10.19	13.57
2	Latvia	25.62	6.32	18.81	9.17	47.94
2	Morocco	74.43	12.93	84.84	7.11	1.64

Appendix 2 (continue) **Financial Indicators (1999)**

Group	Country Name	Money and Quasi Money (M2) as % of GDP	Real Interest Rate (%)	Domestic Credit Provided by Banking Sector (% of GDP)	Interest Rate Spread (lending rate-deposit rate)	Foreign Assets in Deposit Money Banks (%)
2	Papua New Guinea	31.39	5.94	30.68	3.44	8.99
2	Paraguay	33.17	27.01	26.23	10.46	14.59
2	Peru	32.24	25.83	27.77	14.52	6.83
2	Philippines	59.53	3.47	69.17	3.61	17.19
2	Romania	21.01	6.40	18.07	19.20	15.74
2	Sri Lanka	33.53	10.14	39.96	5.61	13.81
2	Thailand	105.97	13.90	144.61	4.25	8.95
2	Tunisia	47.80	2.90	69.63	1.76	51.09
3	Argentina	30.86	13.20	35.54	2.99	13.11
3	Bahrain	77.05	8.62	77.54	7.06	41.88
3	Brazil	30.26	72.95	52.95	54.42	5.69
3	Chile	47.96	8.46	72.28	4.06	9.90
3	Costa Rica	30.15	10.17	29.16	11.43	5.86
3	Czech Rep.	65.19	5.38	60.95	4.20	24.33
3	Estonia	31.69	4.67	35.25	4.51	20.69
3	Gabon	16.89	16.38	22.49	17.00	9.03
3	Hungary	43.51	7.30	52.65	3.07	16.72
3	Korea, Rep.	60.89	11.67	96.82	1.45	8.71
3	Malaysia	97.88	7.33	151.59	3.16	5.61
3	Mauritius	76.18	15.38	77.00	10.71	10.38
3	Mexico	24.81	9.59	28.99	16.26	3.84
3	Panama	78.58	10.79	106.59	3.13	53.72
3	Poland	39.37	9.59	39.33	5.75	11.62
3	Slovak Republic	60.71	13.60	60.20	6.70	11.07
3	South Africa	55.60	11.07	157.22	5.76	4.83
3	Turkey	39.45	7.80	49.42	5.10	14.94
3	Uruguay	46.17	47.11	54.75	39.03	30.87
3	Venezuela, RB	17.06	4.07	16.59	10.85	6.47
4	Australia	64.65	5.67	89.60	3.98	7.54

Appendix 2 (continue) **Financial Indicators (1999)**

Group	Country Name	Money and Quasi Money (M2) as % of GDP	Real Interest Rate (%)	Domestic Credit Provided by Banking Sector (% of GDP)	Interest Rate Spread (lending rate-deposit rate)	Foreign Assets in Deposit Money Banks (%)
4	Austria	52.74	4.72	98.43	3.43	31.89
4	Belgium	6.37	2.87	7.64	2.66	15.08
4	Canada	60.86	4.74	91.90	1.53	12.47
4	Cyprus	107.01	5.74	184.14	1.50	24.75
4	Denmark	55.56	4.02	56.73	4.70	39.56
4	Finland	52.74	4.17	58.02	3.49	12.50
4	France	52.74	5.87	96.45	3.67	18.38
4	Germany	52.74	7.86	147.15	6.38	25.10
4	Greece	52.74	11.78	94.35	6.31	10.60
4	Hong Kong (China)	215.03	14.68	141.37	4.00	63.08
4	Iceland	34.29	9.20	96.38	8.48	2.68
4	Ireland	52.74	-0.43	106.74	3.24	19.37
4	Israel	90.78	9.06	87.50	5.02	10.96
4	Italy	52.74	3.91	95.55	3.98	10.41
4	Japan	119.51	3.60	318.95	2.04	9.98
4	Kuwait	83.94	32.20	109.81	2.80	15.45
4	Macao (China)	180.10	12.48	82.94	4.16	58.62
4	Malta	160.20	4.83	138.52	3.04	55.04
4	Netherlands	52.74	2.13	98.16	0.72	21.75
4	New Zealand	90.23	8.22	118.70	3.93	65.86
4	Norway	55.19	1.77	73.83	2.78	8.80
4	Portugal	52.74	1.81	122.47	2.79	14.20
4	Singapore	117.96	9.18	95.90	4.12	32.73
4	Slovenia	43.49	5.43	43.30	5.14	16.07
4	Spain	52.74	1.03	115.16	2.10	31.05
4	Sweden	52.74	4.96	114.44	3.88	33.44
4	Switzerland	154.39	3.32	185.08	2.66	49.82
4	United Kingdom	52.74	2.99	126.99	2.73	50.63
4	United States	59.51	6.40	162.19	2.70	25.60

Note: Group 1— Low Income Group, Group 2— Lower Middle Income Group, Group 3— Higher Middle Income Group, Group 4— High Income Group.

Appendix 3. Diagnostic Measures for Outliers

Group	Country Name	RSTUDENT	HT	COVRATIO	DFFITS
1	Angola	*-2.4763	*0.7707	*3.0303	*-4.5404
1	Benin	-1.8954	0.0781	0.8999	*-0.5516
1	Cote d'Ivoire	0.3010	0.0318	1.1043	0.0545
1	Gambia	*-2.2418	0.0335	0.7761	-0.4172
1	Ghana	1.2706	0.0332	0.9891	0.2356
1	Haiti	1.3040	0.0276	0.9772	0.2196
1	India	1.2290	0.0161	0.9792	-0.1573
1	Indonesia	0.0359	0.0215	1.0999	0.0053
1	Kenya	0.6691	0.0264	1.0696	0.1102
1	Kyrgyz Rep.	1.2011	0.0598	1.0298	0.3030
1	Lesotho	-1.3849	0.0356	0.9699	-0.2659
1	Mongolia	1.0504	0.0551	1.0503	0.2536
1	Mozambique	1.1258	0.0353	1.0166	0.2154
1	Nicaragua	-0.1737	0.0660	1.1499	-0.0462
1	Nigeria	0.9853	0.0277	1.0307	0.1662
1	Pakistan	-0.3500	0.0308	1.1006	-0.0624
1	Senegal	-1.4707	0.0278	0.9453	-0.2488
1	Sierra Leone	0.6634	0.0442	1.0902	0.1427
1	Solomon Islands	1.5053	0.0288	0.9392	0.2593
1	Zimbabwe	0.5644	0.0461	1.1021	0.1241
2	Bulgaria	-1.8467	0.0528	0.8873	-0.4360
2	Colombia	0.5120	0.0328	1.0915	0.0943
2	Dominican Rep.	-1.2638	0.0260	0.9829	-0.2063
2	Ecuador	1.5802	0.1155	1.0142	*0.5709
2	Egypt, Arab Rep.	-1.4026	0.0295	0.9603	-0.2444
2	El Salvador	-1.0624	0.0365	1.0282	-0.2069
2	Guyana	1.7003	0.0293	0.8985	0.2952
2	Honduras	-1.8908	0.0243	0.8514	-0.2985
2	Latvia	-0.0524	0.0906	*1.1833	-0.0165
2	Morocco	1.3405	0.0486	0.9918	0.3030
2	Papua New Guinea	1.4127	0.0307	0.9596	0.2513
2	Paraguay	0.3324	0.0423	1.1148	0.0699
2	Peru	0.5151	0.0382	1.0974	0.1027
2	Philippines	0.0219	0.0186	1.0968	0.0030
2	Romania	1.2911	0.0375	0.9897	0.2549
2	Sri Lanka	-1.3668	0.0203	0.9583	-0.1970
2	Thailand	-0.7434	0.0609	1.1004	-0.1894
2	Tunisia	0.3267	0.0968	*1.1824	0.1070
3	Argentina	0.5406	0.0313	1.0874	0.0972
3	Bahrain	-0.7013	0.0354	1.0760	-0.1342
3	Brazil	-0.5565	*0.5102	*2.1480	*-0.5680
3	Chile	-0.2944	0.0183	1.0895	-0.0403
3	Costa Rica	-0.2889	0.0277	1.1002	-0.0488
3	Czech Rep.	0.6697	0.0196	1.0622	0.0948
3	Estonia	1.0153	0.0249	1.0232	0.1622

Appendix 3. (continue) Diagnostic Measures for Outliers

Group	Country Name	RSTUDENT	HT	COVRATIO	DFFITS
3	Gabon	-1.3691	0.0324	0.9697	-0.2503
3	Hungary	-0.8008	0.0199	1.0475	-0.1140
3	Korea, Rep.	-1.5730	0.0249	0.9215	-0.2513
3	Malaysia	-0.3821	0.0676	1.1420	-0.1029
3	Mauritius	0.0554	0.0363	1.1167	0.0107
3	Mexico	-1.1555	0.0388	1.0152	-0.2321
3	Panama	0.9044	0.0917	1.1158	0.2874
3	Poland	-0.3666	0.0210	1.0886	-0.0537
3	Slovak Republic	0.8440	0.0223	1.0446	0.1274
3	South Africa	-1.1443	0.0716	1.0530	-0.3178
3	Turkey	0.9390	0.0173	1.0265	0.1247
3	Uruguay	0.7950	*0.2331	1.3395	0.4383
3	Venezuela, RB	0.1160	0.0336	1.1127	0.0216
4	Australia	0.4412	0.0285	1.0922	0.0756
4	Austria	0.5228	0.0350	1.0931	0.0996
4	Belgium	-0.1616	0.0518	1.1330	-0.0378
4	Canada	0.6472	0.0222	1.0672	0.0974
4	Cyprus	-1.9967	0.0646	0.8626	*-0.5249
4	Denmark	0.1538	0.0378	1.1167	0.0305
4	Finland	-0.2569	0.0230	1.0963	-0.0394
4	France	0.4616	0.0189	1.0800	0.0641
4	Germany	0.2952	0.0681	1.1477	0.0798
4	Greece	0.0616	0.0188	1.0967	0.0085
4	Hong Kong (China)	-0.2279	*0.3040	*1.5406	-0.1506
4	Iceland	1.5173	0.0361	0.9438	0.2935
4	Ireland	0.4761	0.0266	1.0874	0.0786
4	Israel	1.2707	0.0496	1.0061	0.2902
4	Italy	0.1899	0.0228	1.0986	0.0290
4	Japan	-0.2672	*0.3287	*1.5951	-0.1870
4	Kuwait	-1.1317	0.0580	1.0400	-0.2807
4	Macao (China)	1.1403	*0.2532	*1.3099	*0.6639
4	Malta	1.3159	*0.1295	1.0891	*0.5076
4	Netherlands	0.3988	0.0266	1.0928	0.0659
4	New Zealand	0.8121	*0.1362	*1.1869	0.3224
4	Norway	0.2735	0.0285	1.1019	0.0469
4	Portugal	-0.3955	0.0359	1.1036	-0.0763
4	Singapore	-1.0946	0.0605	1.0491	-0.2777
4	Slovenia	*-2.0986	0.0195	0.7990	-0.2957
4	Spain	0.2253	0.0454	1.1233	0.0491
4	Sweden	0.0327	0.0490	1.1318	0.0074
4	Switzerland	-0.1461	0.1102	1.2078	-0.0514
4	United Kingdom	-0.2744	*0.1260	*1.2248	-0.1042
4	United States	0.3053	0.0802	1.1623	0.0902

Note 1: * exceeds the benchmark: RSTUDENT = 2.0, HT = 0.1136, COVRATIO = 1.17, DFFITS = 0.4767.

Note 2: Group 1— Low Income Group, Group 2— Lower Middle Income Group, Group 3— Higher Middle Income Group, Group 4— High Income Group.