

The 3rd Annual PECC Finance Conference

Institution-Building in a World of Free and Volatile Capital Flows: PECC Perspectives

Sheraton Santiago Hotel & Convention Center, Santiago, Chile
June 20-21, 2004

Session II

The Unfinished Business of Strengthening the Domestic Financial Systems:
How Much Unfinished and How to Help Finish

The Sovereign Risk Impact of Financial Services Internationalization

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June 14, 2004**

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I. Rationale

The paper develops a sovereign risk-based framework for analyzing the impact of financial services internationalization. It draws on the growing body of academic and empirical work focusing on the interlink between balance sheets of key sectors to explain modern-day financial crises (see Allen et.al, 2002). These so called “third generation crises models” center on the existence of incomplete financial markets, which cause an over-reliance by firms on debt and foreign financing (see Krugman 1999 and Allen et.al 2002 for a review).

Financial services internationalization entails three different, yet supplementary types of reform, namely: liberalization of *trade* in financial services, reform of *domestic financial regulation* and *capital flows* liberalization (Contreras and Yi, 2003). The paper argues that a downside risk measure such as the Value-at-Risk (VaR) of a sovereign, modified to incorporate these three types of reform, constitutes a powerful indicator of the sovereign risk impact of financial services internationalization. Moreover, since the VaR measure summarizes in one figure the exposure to different sources of market risk that affect a given portfolio (i.e. the economic balance sheet of the sovereign), as well as their correlations, the after-reform value of the modified sovereign VaR can also be interpreted as an indicator of the vulnerability of the economic system under the new regulatory regime. Most importantly, the modified sovereign VaR should help countries better determine a mix and sequencing of reforms that is consistent with their degree of risk aversion.

II. Financial Services Internationalization³

The internationalization of financial services must be distinguished from what is commonly known as financial liberalization or reform. The latter refers to an internal phenomenon dealing with domestic deregulation, like allowing interest rates to be market-determined or permitting domestic providers to supply new or complementary financial services. Financial services internationalization, on the other hand, deals with the opening of financial services markets to foreign competition, but also with supplementary domestic policies and regulations that have the potential to impede international transactions of financial services. For instance, a country might freely allow foreign financial firms to establish locally to compete with domestic providers within the system of regulation, and yet discourage foreign entry through excessively stringent non-discriminatory prudential regulations and/or by a prohibition to transfer capital necessary to establish the business. Alternatively, it is possible to deregulate a country's financial system completely but still keep its financial markets closed to foreign competition.

Formally, financial services internationalization requires the following types of regulatory reform: (1) liberalization of trade in financial services, (2) reform of domestic financial regulation and, (3) capital account opening. Trade liberalization in (financial) services involves essentially the removal of discriminatory regulation – that is, quantitative or qualitative regulations that discriminate between foreign and domestic providers both before

³ This section draws from Contreras and Yi (2003).

and after they enter the market. It comprises the liberalization of cross-border trade (modes one, two, and four in the WTO General Agreement on Trade in Services (GATS)) and commercial presence/investment in the form of portfolio or foreign direct investment (mode three). Domestic financial regulatory reform deals with measures that affect foreign and domestic providers alike, i.e. they are non-discriminatory, including licensing requirements and prudential regulation and supervision. Although it is usually associated with the deregulation of financial markets, it also involves the adoption of pro-competitive regulations. Capital account opening, on the other hand, involves the removal of restrictions on capital transactions essential to the supply of the financial service and currency convertibility.

Financial services internationalization does not, however, entail full capital account opening and complete deregulation of domestic financial markets. The requirement for capital flows liberalization – i.e. transfers, payments and/or investments essential for the supply of the service - is determined by the type of financial service and mode of supply being liberalized. For instance, the liberalization of mode one of supply of core banking services tends to be biased toward shorter term flows, whereas mode three opening of the same type of service is usually accompanied by longer term flows (see evidence below). The latter require that primarily the investment necessary to establish the business (including for complying with a capital requirement) be allowed free access. Similarly, cross-border securities trading tends to be associated to short term flows, contrary to investment advisory services (through mode one), which require very little capital transfers. Also, most of the auxiliary services to insurance and banking require very little capital movements, other than to establish a commercial presence if they are provided through mode three.

As regards financial domestic regulation, a financial system might remain heavily regulated as long as regulation is non-discriminatory and not more burdensome than necessary to achieve its legitimate objective. Here too, the requirement for reform might be associated with the type of financial service or mode of supply being liberalized. For instance, mode one of supply of core-banking services requires a much higher degree of regulatory symmetry between home and host country than what is the case with mode three (since an established institution operates under the regulatory framework of the host country). Also, the efficiency and contestability of the markets for pension funds and life insurance, for example, are heavily affected by regulations that limit portfolio allocations. Other services, such as data processing, corporate financial advisory and risk assessment outsourcing services tend to be very softly regulated compared to deposit and lending or securities services.

III. Literature Overview

The vulnerability of an economic system has been studied primarily in the context of the determinants of financial crises. Attempts to explain such crises have identified a number of potential sources of financial vulnerability and triggers of currency and banking crises (and ultimately a balance of payment crisis), namely: vulnerabilities in the banking and/or corporate sector (in terms of weak bank and/or corporate balance sheets), foreign exchange illiquidity, absence of financial breadth, weak rule of law and contagion (see Stone and Weeks, 2001 for a recent overview).

Very few systematic attempts have been made to assess the increased vulnerability/instability of a financial system arising from the internationalization of financial services. On the basis of a database covering the period 1973-1998, Kaminsky and Schmukler (2002) examine the dynamic effects of “domestic and external liberalization of financial markets.” (*Indicate the econometric technique used*) The authors conclude that while financial liberalization tends to trigger more explosive stock market cycles in the short run, as vulnerable domestic financial institutions obtain access to government guaranteed international funding, it also triggers beneficial institutional changes that attenuate such cycles in the long run. Their conclusions also suggest that emerging markets should delay capital account opening, as “crashes in emerging markets are larger in the immediate aftermath of liberalization when the first sector to be liberalized is the capital account.”

The implementation of the WTO GATS in 1994, and in particular, the Financial Services Agreement in 1997, promoted the multilateral opening of financial services trade across countries. The commitments scheduled by WTO Members provide a data set that more accurately reflects the extent of the financial services internationalization effectively bound by signatory countries. Two studies use these data to assess the impact of financial services internationalization in the stability of an economic system. On the basis of 1993 commitments for selected developing countries involved in the financial turmoil experience of the late 1990s, Kono and Schuknecht (1998) build an indicator that measures the stabilizing effect of the trade regime for the financial system. This is a combined indicator that equally weights indicators of the level of restrictions on activities of foreign affiliates and the policy bias towards a specific financial instrument and modes 1 or 3 of supply of five core banking and securities services – deposit-taking, lending and trading in foreign exchange for banking, trading in securities and underwriting securities. The authors apply OLS to the analysis of capital flows volatility and a probit model to the estimation of the occurrence of financial crises. They find empirical support for the belief that the liberalization of trade in financial services– which promotes the use of a broad spectrum of financial instruments and allows the commercial presence of foreign financial institutions, while not unduly restricting their business practices – results in less distorted and less volatile capital flows, while also promoting financial sector stability. This type of market opening requires only limited capital flows liberalization in the GATS context. It also instills competition and encourages the transfer of skills, increases market and infrastructure development, risk management and generates a more balanced maturity and instrument structure of foreign debt.

Valckx, 2001 studies whether the level of financial services commitments under GATS has had any influence on the occurrence of financial sector instability or exchange rate crises. The study covers a broad group of financial services, namely banking (deposits and lending), direct insurance (life and non-life), money broking and trading, reinsurance and insurance intermediation, securities trading and underwriting services, and other financial services (asset management, payment and settlement services, and information exchange). Using baseline probit functions for the period 1995-1999, Valckx finds that although current WTO commitments on financial services do not constitute a major cause of concern about currency or banking crises in any particular year, they do seem relevant as an historical (in-sample) indicator of overall vulnerability to such crises, in addition to other macro prudential indicators. Greater, more liberal commitments services seem to reduce the risk of currency crises, but tend to raise the likelihood of banking problems. Interestingly most of the

explanatory power derives from insurance (particularly modes 1 and 2) and securities (particularly modes 2 and 3) sector commitments rather than from core banking commitments. One possible explanation for the negative impact of commitments in banking problems is the lack of control in the regressions for the quality of financial sector regulation. Kono et.al control for such variable (proxied by the “law and order” index developed by the International Country Risk Guide) and find evidence that it negatively affects the incidence of financial crises and positively affects the volatility of “portfolio and other investment.”

Case studies provide further support for the belief that the presence of foreign financial institutions can lead to a reduction in the risks of sudden capital outflows, and that foreign banks can be a source of stable funding in the face of adverse shocks. For instance, in Argentina in the early 1990s and in Mexico in late 1994 and early 1995, foreign banks were able to maintain access to offshore funding while domestic banks experienced strains (Claessens and Jansen, 2000). Similarly, relatively high shares of foreign ownership have helped to maintain stable banking systems in Hong Kong (China), Chile and Malaysia (Goldstein and Turner, 1996).

A different strand of the literature has studied the optimum sequencing of policy reforms over the past 20-30 years. The earliest views were that capital account liberalization was best addressed at the end of the reform cycle. Chan-Lee (2002) writes that despite a certain appeal, these views proved too compartmentalized and were never applied. He argues that that existing theory is ill adapted to analyzing capital account crises, when weak institutions and incomplete domestic financial liberalization interact with significant capital account opening. Furthermore, the emergence of severe maturity and currency mismatches in the aftermath of the financial crises of the late 1990s prompted serious doubts over the sequencing of international financial liberalization in emerging markets, and debate over the soundness of the existing “international financial architecture.”

Against this backdrop, Chan-Lee proposes a “pragmatic” risk-based approach for analyzing the sequencing of “international financial liberalization,” which examines the interactions between core institutions, domestic financial liberalization, capital account opening and currency and maturity mismatches. The approach gauges the “distance” of specific new risks from systemic financial risk. The greater the distance, the earlier and easier the implementation of such measures should be (and vice versa).⁴ A quarterly, fixed effects panel regression for 24 Asian emerging economies, indicated that neither core institutions, domestic financial liberalization and capital account opening had the expected effect of lowering systemic risk (i.e. external vulnerability). By contrast, all three of these structural variables raised foreign exchange market pressure.

⁴ Systemic risk is assessed using Bank for International Settlements (BIS) indicators of external vulnerability and own indicators of core institutions (six core institutions), the effective degree of domestic financial liberalization (composite index incorporating the number of possible annual real interest rate observations and the proportion of real rates falling in a specified range), the intensity of capital controls (an index based on a coding methodology of quantitative restrictions and administrative rules, including restrictions of both cross-border trade in financial services and specific capital flows) and maturity and currency mismatches (international bond and bank debt to GDP and the ratio of short-term foreign exchange liabilities to assets).

The author argues that these results do not undermine the case for capital account opening as the external vulnerability measure is dominated by stock (i.e. long-term) variables.⁵ Reducing systemic risk is a medium-term structural task that depends importantly on establishing quickly the preconditions for effective domestic financial liberalization and capital account opening, notably good core institutions. Ineffective domestic financial liberalization juxtaposed onto high capital account opening can clearly lead to short-run foreign exchange market pressures that impedes this process by undermining the development of the banking system and the formation of deep financial and especially good long-term bond markets.

The evidence above provides important information regarding the impact of financial services internationalization on economic stability. These studies seem to suggest that the reforms necessary for financial services internationalization must be phased in, not necessarily with the same degree and speed. Moreover, sound domestic financial systems (i.e. sound domestic regulation) seem to be a precondition for more ambitious liberalization, in particular regarding financial services that require short- term capital flows liberalization. This study argues that this type of recommendation requires a more comprehensive assessment of the risks facing an economy, so that a country does not forgo the opportunity of benefiting from financial services market opening. This requires looking at the trade-offs in terms of risk exposure that are likely to arise after the regime change (financial services internationalization). This type of correlation analysis of risk exposures is importantly facilitated by the value-at-risk measure.

IV. Value-at-Risk

The disastrous consequences of excessive exposure to market risk experienced in the past years revitalized the search for early-warning and forward-looking indicators of financial vulnerability. The ability of value-at-risk (VaR) models to determine maximum expected losses taking into account a portfolio's overall exposure to different types of risk – i.e. adverse movement in relevant prices – has led to the widespread use of these models for internal monitoring and managing of market risk exposure. Even regulators have advocated the use of VaR models for purposes of financial solvency assessment and, in the case of banks, for capital adequacy determination.⁶

The value-at-risk figure measures the *downside risk*⁷ of a portfolio/position as the maximum loss that can be obtained at a future prescribed date with a given, small probability, due to adverse changes in relevant prices. Thus, VaR can be interpreted as a measure of the vulnerability of a particular portfolio/position. For general distributions the VaR of a portfolio can be defined as the absolute dollar loss,

$$\text{VaR} = W_0 - W^* = -W_0 r^* , \quad (1)$$

⁵ The level of the real exchange rate, the international foreign bond and bank debt to GDP ratio (and its change) and short-term foreign exchange liabilities to foreign exchange assets ratio.

⁶ The Basle Committee on Banking Supervision permitted at the beginning of 1998 that banks determine their capital adequacy for financial risk exposure using VaR models.

⁷ This concept believes that investors are more concerned about losses than about gains. In particular, individuals generally avoid situations which offer the potential for substantial gains but which also leave them even slightly vulnerable to losses below a threshold level.

where W_0 is the initial investment in the portfolio, r its rate of return, and $W^* = (1 + r^*)W_0$ the lowest portfolio value at a given confidence level α .⁸

In its simplest form the VaR approach assumes that all risks are normal and the portfolio is a linear function of these normal risks. In such case, the VaR is a multiple of the portfolio standard deviation, which in turn is a linear function of individual volatilities and covariances. The VaR is then calculated by multiplying the estimated standard deviation by a confidence level parameter and a scale variable reflecting the size of the portfolio:

$$\text{VaR} = -z_k \sigma W, \quad (2)$$

where z_k reflects the critical (standard normal) value associated to a lower-tail-event probability of $k\%$, σ is the portfolio standard deviation and W the initial portfolio value.⁹ For instance, at a 5% confidence level (i.e. $k\%$ equals 5% and the corresponding standard normal table value, $z_{5\%}$, is -1.645) the maximum expected loss of a \$1M investment is \$82,250.

VaR estimation is highly dependent on good predictions of uncommon events, since the VaR is calculated from the lowest portfolio values. As a result, any statistical method used for VaR estimation has to have the prediction of tail events as a primary goal. Two broad types of VaR analysis are employed: parametric VaR analysis and non-parametric or simulation approach to VaR analysis. Parametric methods estimate the distribution of price changes from historical data, assuming that this distribution is a member of a given parametric class (i.e. parametric prediction of conditional volatilities). They include the variance-covariance approach (used to generate equation 2) and some analytical methods, which normally suppose that price changes are stationary, joint normal, and independent over time. For instance, the more stable the standard deviation in equation 2 is over time, the more reliable the prediction of the future extreme loss.

Non-parametric methods consist of non-parametric prediction of unconditional volatilities. In this case, historical and Monte Carlo simulations are used, and no distributional assumptions are imposed. Simulation methods are particularly useful when dealing with portfolios composed of very different positions, as they can more easily accommodate, for example, non-normality in asset price changes (fat tails, skewness and the like), non-linearity in payoff structures and time variation of parameters.¹⁰

V. Sovereign Value-at-Risk

The VaR methodology has also been suggested to manage risk exposure at the macroeconomic level. Blejer and Schumacher (1998) and Cornelius (2000) suggest assessing the vulnerability, i.e. the exposure, of the overall balance sheet of the economy by consolidating the relevant central bank and treasury accounts.¹¹ The methodology builds on

⁸ See Jorion (1997), page 87.

⁹ Define VaR relative to the mean as $\text{VaR} = -W_0(R^* - \mu)$, where R^* is the lowest “acceptable” rate of return. Define $z = (R^* - \mu) / \sigma$, where $z \sim N(0,1)$. Substitute R^* into VaR and get equation 2. See Dowd (1998) page 41.

¹⁰ See Contreras (2000) for a detailed explanation of VaR methodologies.

¹¹ Cornelius argues that the treasury accounts must also be included in the analysis to enable the VaR approach to deal with the risk implications of direct lending to government and foreign borrowing by the treasury.

the view that a loss of sovereign solvency would tend to increase its vulnerability and, therefore, would lead to a loss of credibility on its ability to uphold a commitment to defend a given nominal regime. While a sovereign cannot commercially fail, it behaves equivalently if it forsakes its commitment to an (explicitly or implicitly) announced nominal regime. Since the probability of a default in sovereign commitments increases with the risk that the sovereign becomes insolvent, solvency measures, such as VaR, are good predictors of the probability of breaching the inflation target, of devaluation or of other plausible adjustments to a nominal commitment.

The focus on balance sheets stems from the view that balance sheet mismatches are the key triggers of extreme vulnerability; even if there were solvency they still create vulnerability related to liquidity problems. For instance, in a mismatch situation, exchange rate depreciation increases the prospect of insolvency of individual banks and the urgency of capital flight (Dornbusch, 2001). This makes the central bank and treasury all the more vulnerable, as not only the central bank and the treasury must face the costs of their own currency mismatches, but also the increase in value of the contingent liabilities resulting from the central bank's deposit insurance scheme and state guarantees given for non-sovereign borrowing (or private sector bailout). Country vulnerability is further increased by the liquidity problems resulting from a massive loss of foreign reserves. Under such outcome it is imperative that the risk analysis be all encompassing, in the sense that it incorporates all implicit and off-balance sheet operations of both the central bank and the treasury.

In order to apply a VaR-like approach to estimate a country's solvency risk it is necessary to determine and define the different positions that compose the *consolidated* portfolio of the central bank and the treasury. This requires calculating the economic, and not the historical, value of the assets and liabilities that compose the consolidated balance sheet by means of discounting all assets and liabilities by the relevant interest rates, and pricing accordingly all off-balance-sheet items that (explicitly or implicitly) commit the central bank or the treasury.

In the calculation of the variance-covariance *VaR* of the sovereign, the sectors of a national economy are viewed as interconnected portfolios of assets and liabilities. In particular, it is assumed that the non-financial sector borrows from the financial sector, which in turn borrows from the treasury and/or the central bank. The treasury borrows from the banking system (i.e. central bank and deposit money banks) and the public (by issuing bonds) and holds a stock of foreign debt. The market implicitly perceives that the central bank has a lender of last resort function (and acts accordingly) *vis a vis* the financial sector and the treasury gives explicit and/or implicit state guarantees for non-sovereign borrowing.¹² The central bank and/or treasury hold foreign assets in the form of foreign currency reserves and the central bank is active in the foreign currency forward market and performs foreign-

¹² Explicit state guarantees may be given for non-sovereign borrowing and obligations issued to sub-national governments and public and private sector entities (e.g. development banks); umbrella state guarantees, for example for small business loans; trade and exchange rate guarantees issued by the state; or state guarantees on private investments. Implicit guarantees may stem from defaults of sub-national government or public or private entities; the cleanup of liabilities of entities being privatized; the failure of a non-guaranteed pension fund or employment fund; or bailouts following the reversal in private capital flows. Also, since foreigners often hold the debt issued by the treasury in domestic currency, this could represent a significant contingent liability regarding the country's foreign exchange reserves (Cornelius, 2000).

exchange swaps (off-balance sheet liabilities).¹³ The consolidated balance sheet of the central bank and the treasury is as follows:

Consolidated Balance Sheet of the Central Bank and the Treasury

Assets	Liabilities
Total FX reserves (R)	Monetary Base (H)
FX forwards (F^d)	Borrowing from the public (B)
Net domestic credit to banks (D)	Stock of foreign debt (C)
Credit to enterprises (E)	FX forwards (F^x)
	Financial sector guarantees (P)
	State guarantees (SG)

where $R = R_{CB} + R_G$, $C = C_{CB} + C_G$ and $D = D_{CB} - G_{DMB}$. CB denotes the central bank, G the treasury and DMB deposit money banks. Forward transactions are decomposed into two interest rate positions and one foreign-exchange position, while foreign exchange swaps are a combination of a spot transaction with a forward transaction. It is assumed that it is possible to model the central bank's deposit insurance scheme as a put option sold to financial institutions, where the underlying asset of the option is given by the value of the financial institutions' assets and the strike price by the value of their debt. The value of this option rises with increases in the financial institutions' leverage, $\frac{L}{A}$, in the volatility of their assets, σ_A^2 , and in the domestic interest rate, i^d . Similarly, the value of the state guarantees is given by a put option, whose value rises with the foreign debt to assets ratio of the enterprise sector, $\frac{FD}{A}$, the volatility of the sector's assets, σ_Σ^2 and the foreign interest rate, i^f .

The variance-covariance VaR of the sovereign is (see Annex I for a detailed derivation):

$$\begin{aligned} \text{VaR}_S &= \left[E(dV)^2 \right]^{\frac{1}{2}} z_k \\ &= \left[\sigma_S^2 E_S^2 - \sigma_{i^f}^2 E_{i^f}^2 - \sigma_{EdS}^2 E_{EdS}^2 - \sigma_\phi^2 E_\phi^2 - \sigma_C^2 E_C^2 + \text{covariances} \right]^{\frac{1}{2}} z_k \end{aligned} \quad (3)$$

where z_k depends on the confidence level, dV is the change in the sovereign portfolio value (i.e. the change in value of its economic balance sheet). σ_h^2 and E_h denote, respectively, the variance and exposure to risk of the spot exchange rate, international interest rate, expected change in the exchange rate, country risk and foreign debt.

Given non-zero exposures to risk, the sovereign VaR increases with the volatility of the different sources of risk and decreases with the covariances of their returns (assuming these are less than one). Although the sovereign VaR also increases with the confidence level (z_k),

¹³ The treasury may also hold off-balance sheet liabilities. These may arise from a moral obligation of the government that reflects public and interest-group pressures. Typically, such liabilities affect the longer-term sustainability of the public finances, and ignoring them could result in a serious underestimation of the budget deficit and an overestimation of the true extent of fiscal adjustment (Cornelius, 2000).

it does so in a manner that is determined by the probabilistic behavior of the change in value (or return) of the sovereign portfolio.¹⁴

VI. Proposed Model

The paper proposes an analytical framework that supplements previous efforts to both understand the determinants of economic vulnerability and establish a risk-consistent sequencing of reforms. Its main input is the balance sheet of the sovereign, including contingent and off-balance sheet liabilities. As opposed to Chan-Lee (2002), here the focus is on the entire *economic* balance sheet of the sovereign, rather than just on historical stand-alone ratios. The analytical framework does not incorporate the quality or enforcement capacity of institutions, other than through the possibility that asset and liability mismatches reflect a weak institutional capacity to enforce and monitor the application of specific laws and regulations.

The model draws on Blejer and Schumacher (1998) and Cornelius (2000) above, and incorporates the effect of each of the reforms necessary for financial services internationalization. Probably, the most distinctive feature of this approach is that it distinguishes not only among the individual and combined effect of measures dealing with the liberalization of trade in financial services, domestic financial regulatory reform and capital account opening, but it also takes due account of the varying degrees for capital account opening required by each of the modes of supplying financial services internationally.

To facilitate the presentation and estimation, the paper studies the comparative statics of financial services internationalization, i.e. it looks at the risk exposure of the sovereign after the regime change. A more comprehensive analysis would require assessing the new equilibrium level of all relevant prices and assets and liabilities of the sovereign.

VI.I Financial Services Internationalization and the Sovereign VaR

To establish the impact of the regime change (financial services internationalization) in the sovereign VaR one must first analyze how the combination of reforms affects the sovereign economic balance sheet. This requires identifying the type of financial service and mode of supply being liberalized and the accompanying capital flows liberalization and domestic regulatory reform. This is done in tandem below.

Barriers to financial services internationalization

Barriers to financial services internationalization are modeled as “tax equivalents” on domestic and foreign capital. Lower barriers reduce the cost of capital, which in turn increases demand for equity financing and/or bond holdings.¹⁵ Assuming interest rate parity, the domestic and off-shore interest rates are:

¹⁴ Equation (3) assumes that the change in value of the sovereign portfolio has a normal distribution. This is an unrealistic assumption given the non-linearities of the different positions of the sovereign portfolio. It does provide, however, a simplified analytical framework.

¹⁵ The choice for equity or debt financing may be determined by the policy choice. For instance, the Korean government severely restricted FDI before 1997, encouraging external capital inflows to take the form of debt. Similarly, the tax regime favored corporate debt over equity in Thailand (Allen et.al, 2002).

$$i_t^d = i_t^i + E(dS)_t + \phi + \tau_t \quad (4)$$

$$i_t^f = i_t^i + \phi + \tau_t, \quad (5)$$

where $t=1$ denotes short-term maturity and $t=2$ long-term maturity. This distinction is necessary to take account of the term structure of the capital flows associated to a particular financial service or mode of supply. τ denotes the tax equivalent of restrictions to financial services internationalization. Since, international transactions on financial services (and hence the cost of capital) may be limited by each or a combination of barriers to trade in financial services (α), restrictions on capital flows (β) and non-discriminatory domestic regulations (γ), τ is a function of all three of these restrictions:

$$\tau_t = f(\alpha_t, \beta_t, \gamma), \quad (6)$$

where $f' > 0$. τ_1 combines restrictions on short term flows (β_1) and restriction on trade in financial services that require this type of capital flows liberalization (α_1) -e.g. core banking through mode one and securities services. τ_2 combines restrictions on long term flows (β_2) and restriction on financial services trade requiring long term flows (α_2) -e.g. core banking through mode three. Although ϕ may also be thought to be determined by restrictions to financial services internationalization, for simplicity, it is assumed to be exogenously determined.

τ_t may be estimated by means of a price (i.e. interest rate) impact analysis of restriction to financial services internationalization (see Deardorff and Stern, January 2004). This might be accomplished by econometrically testing equations (4) or (5) or the following equation:

$$i_t^p = g(\tau_t, J), \quad (7)$$

where $p = d$ (domestic), f (foreign) and J is a vector of economic variables. α, β and γ may be measured by the openness index (or its inverse) in Contreras and Yi (20003), Dailami (2000) and the IMF, respectively.

Fiscal budget

Financial services internationalization also impacts the consolidated balance sheet through its effect on the fiscal budget. As opposed to trade in goods, trade in services is rarely restricted by tariffs, but rather through non-income generating quantitative and non-quantitative regulatory restrictions. Consequently, there tends to be no tariff revenue implication for the fiscal budget arising from the elimination of restrictions to trade in services. Rather, services trade liberalization affects the fiscal budget through its implication on domestic (non-discriminatory) tax collection.¹⁶ This is particularly relevant in financial services, which

¹⁶ This should be specially important in developing countries, which tend to be demanders, rather than suppliers of services (in particular, financial services).

tend to be subject to a wide array of taxes.¹⁷ Honohan (2003) notes that governments have taxed financial intermediaries in three different ways. First, they have applied a variety of explicit taxes, such as taxes levied on net corporate income (profits), gross revenue (interest rates and fees), and the value of payments made or received through the intermediary. Although, these taxes are usually common to firms in other sectors, they might have a different impact on financial intermediaries due to the special characteristics of financial services.¹⁸ Second, reserve requirements and seigniorage have also been used to tax financial services intermediaries and have had the effect of boosting the net revenue of the central bank and hence indirectly the government. Finally, a number of regulations used to channel funds to governments or favored sectors and borrowers constitute implicit subsidies, notably by imposing interest rate ceilings.

There are also fiscal expenditure implications of financial services internationalization (and services liberalization more generally). These stem mainly from the costs of modifying and implementing regulations. For instance, under the recently concluded Central America-USA Free Trade Agreement, El Salvador, Guatemala and Nicaragua committed to adopt in the near future laws on portfolio management services, whereas Costa Rica will establish an independent insurance regulatory authority. Similarly, under the Chile-USA FTA, Chile will allow branching of USA financial institutions in the future, but it reserved the right to establish and implement specific regulatory requirements for these branches.

To see the fiscal impact of financial services internationalization, the model incorporates into the consolidated balance sheet future fiscal surpluses. These are usually denominated in local currency, and tend to be largely insensitive to the movement of short-term interest rate and inflation (Curie and Velandia, ?).

Domestic regulations

Domestic regulation helps create incentives – or disincentives – for sound financial sector balance sheet. In particular, prudential regulations might be used to limit financial sector currency and maturity mismatches. For instance, higher reserve requirements for foreign currency denominated liabilities would both lower the return on foreign currency deposits relative to local currency denominated deposits, and force the banks to hold more liquid assets. Similarly, capital requirements defined on the basis of risk-weighted assets for exposures to sovereign, banks, or corporate entities would limit credit risk exposure.¹⁹ In the simplified framework of section V, these measures affect the price of the contingent liability of the central bank through their impact on the leverage ratio and volatility of assets of the financial sector. They also indirectly affect the price of the contingent liability of the treasury through their impact on the structure of liabilities of the enterprise sector. The latter may also be affected through other regulations, such as domestic taxes or regulatory distortions that favor either debt or equity. Finally, barriers to international transactions on financial

¹⁷ Prudential regulation and monetary policies may be considered quasi-taxes, as they affect the cost structure of financial services providers. Since these quasi-taxes are not revenue generating, they are excluded from the analysis of the government budget.

¹⁸ For instance, taxes on the total value of payments made and received by a bank (credits and payment to customer accounts) have been used to approximate the value-added tax imposed on other firms. However, the value of payments bears no stable relationship to the value-added or profits of a bank. Similarly, gross interest, insurance premium income and fee receipts could be twice the value added in a non-inflationary environment. In a volatile inflationary environment, this too becomes a rather arbitrary tax base.

¹⁹ A number of developing countries are considering implementing the Basle II Accord. If implemented in a context of financial services internationalization, this type of reform should have important implications for the type of analysis proposed here.

services also affect the prices of the put options of the central bank and the treasury through their effect on the interest rate.

For simplicity, in the derivations below it will be assumed that regulatory measures are undertaken to limit the leverage ratio of the financial and enterprise sector, as well as the volatility of their assets. A scenario analysis should compensate for the lack of a more accurate estimation procedure.

VII. *Sovereign VaR After the Regime Change*

In order analyze the impact of financial services internationalization in the risk exposure of the sovereign, the following simplifying assumptions are made: (a) the sovereign issues short term domestic currency debt ($B_2 = 0$) and short and long term foreign debt (C_1, C_2); (b) the sovereign lends short and long term to the financial sector (D_1, D_2), but not to enterprises ($E_1 = E_2 = 0$); c) the fiscal revenue increases with tax collection ($Re(T)$), but the cost of modifying regulations or setting up and administering an independent regulator is negligible for the sovereign (i.e. fiscal expenditure is not affected by regulatory reform); and d) the government collects a lump sum tax (or a combination of taxes) and makes payments once a year. The consolidated balance sheet is then:

Consolidated Balance Sheet of the Central Bank and the Treasury	
Assets	Liabilities
Present Value of Fiscal Revenue (PVRe)	Present Value of Fiscal Expendit. (PVEx)
Total FX reserves (R)	Monetary Base (H)
FX forwards (F^d)	Borrowing from the public (B)
Net domestic credit to banks (D)	B_1
D_1	Stock of foreign debt (C)
D_2	C_1
	C_2
	FX forwards (F^x)
	Financial sector guarantees (P)
	State guarantees (SG)

and the value of the sovereign portfolio is:

$$V = Re(T)\Pi^{d2} + RS\Pi^{i1} + F^d\Pi^{d1} + D_1\Pi^{d1} + D_2\Pi^{d2} - Ex\Pi^{d2} - H - B_1\Pi^{d1} - C_1S\Pi^{f1} - C_2S\Pi^{f2} - F^x\Pi^{i1} - P\left[\Pi^{d2}, \frac{L}{A}, \sigma_A^2\right] - SG\left[\Pi^{f2}, \frac{FD}{A}, \sigma_\Sigma^2\right], \quad (8)$$

where the prices of zero coupon bonds were adjusted to reflect short term and long term maturities. The resulting VaR of the sovereign is:

$$\text{VaR}_{\text{Sov}} = \left[\begin{aligned} &\sigma_S^2 E_S^2 + \sigma_{i1}^2 E_{i1}^2 + \sigma_{i2}^2 E_{i2}^2 + \sigma_{\text{EdS}_1}^2 E_{\text{EdS}_1}^2 + \sigma_{\text{EdS}_2}^2 E_{\text{EdS}_2}^2 + \sigma_\phi^2 E_\phi^2 + \sigma_{\tau1}^2 E_{\tau1}^2 \\ &+ \sigma_{\tau2}^2 E_{\tau2}^2 + \sigma_T^2 E_T^2 + \sigma_{D_2}^2 E_{D_2}^2 - \sigma_{C_1}^2 E_{C_1}^2 - \sigma_{C_2}^2 E_{C_2}^2 - \sigma_{\frac{L}{A}}^2 E_{\frac{L}{A}}^2 - \sigma_{\sigma_A^2}^2 E_{\sigma_A^2}^2 \\ &- \sigma_{\frac{\text{FD}}{A}}^2 E_{\frac{\text{FD}}{A}}^2 - \sigma_{\sigma_\Sigma^2}^2 E_{\sigma_\Sigma^2}^2 \\ &+ \text{covariances} \end{aligned} \right]^{\frac{1}{2}} z_k \quad (9)$$

where, as before, σ_h^2 and E_h denote, respectively, the variance and exposure to risk of the spot exchange rate, short and long term international interest rates, short and long term expected change in the exchange rate, country risk, restrictions to international transactions of financial services requiring short term and long term capital flows, tax structure, short and long term foreign debt and financial structure (i.e. prudential and other regulations) of the financial sector and non financial enterprises. The exposures to risk are presented in extended form in Annex II.

The sovereign VaR (equation (9)) can be readily calculated for a given confidence level. It measures the risk of sovereign insolvency arising from its asset and liability management, its policies (including monetary, exchange rate, fiscal and trade policies), domestic regulations through their effect on the behavior of the financial sector and exogenous prices. From a sovereign risk viewpoint, Equation (9) suggests that:

- *Initial conditions, i.e. initial balance sheet mismatches, are a determining factor of a strategy to internationalize financial services.* For instance, if the reduced domestic interest rate resulting from the opening of financial services requiring short term capital flows is more than compensated by an expected devaluation of the short run exchange rate (possibly the case in emerging countries, which mostly import these type of services), the exposure to the international interest rate and hence the sovereign VaR increases (equation A.16, Annex II). To pursue this type of market opening, the sovereign would then have to reduce its positions on foreign assets ($RS - F^XS$), its exposure to expectations on the short run exchange rate (E_{EdS_1}) or its exposure to the fiscal surplus ($\text{Re}(T) - \text{Ex}$) plus the central bank's long term exposure to the financial sector $\left(D_2 - \frac{\partial P}{\partial \Pi^{d2}} \right)$.
- *Financial services trade policy cannot be seen in isolation.* Not only the sovereign VaR is affected by the mix of reforms necessary for financial services internationalization, but also by their correlation with fiscal, monetary and exchange rate policy. For example, equation (9) assumes that the nominal exchange rate is fixed and hence the monetary base expands in response to changes in international reserves and in public and private sector domestic net credit creation (Annex I). In this context a risk averse sovereign, might wish to design a financial market opening strategy whose negative covariance with the growth of the monetary base (or its components) is highest in absolute value. Similarly, the treasury might reform its tax policy so that it reduces the incentives for external

capital flows to take the form of debt over equity (negative covariance $\left(\sigma_T^2 E_T^2, \sigma_{\frac{FD}{A}}^2 E_{\frac{FD}{A}}^2 \right)$).

- *Strong prudential regulations allow further financial markets opening by providing more flexibility in government asset-liability management.* Prudential regulations that promote a more stable and sound financial system reduce the scale of the government contingent liabilities, and hence permit a more active management of government balance sheet mismatches.
- *The development of new financial instruments and markets may be instrumental in facilitating financial services internationalization.* Deeper derivatives markets are useful for reducing the exposure of the sovereign to financial sector instability and a market for long term debt in domestic currency could help the sovereign reduce its exposure to long term foreign currency debt and short term domestic currency debt.

VIII. Final Comments

The paper presents a risk-based analytical framework for financial services internationalization. The model, however, may be applied to assess the sovereign risk impact of trade liberalization more generally. Financial services were chosen given their enhanced need for capital account opening, and the key role that their regulatory system plays in economic stability.

The accuracy of the model critically depends on the statistical assumptions made about the change in value of the country portfolio. As presented here, the model assumes that this variable is distributed normal, with known parameters. Clearly, this is an unrealistic assumption given the non-linearities present in the sovereign's positions and the limited data available. Since determining the exact probability distribution of the change in value of the sovereign portfolio is nearly impossible, the researcher must resort to the empirical analysis. This will be the topic of a new section, which will apply numerical simulation methods to the case of Mexico. The analysis of the Mexican case should be prove revealing, given the long list of trade agreements it has signed since the beginning of the 1990s, and particularly, the financial crisis it experienced shortly after the implementation of the North American Free Trade Agreement in January, 1994.

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Annex I²⁰: The Sovereign VaR

The economic value of the consolidated balance sheet (section V) may be expressed as:

$$V = R\Pi^i S + F^d \Pi^d + D\Pi^d + E\Pi^d - H - B\Pi^d - C\Pi^f S - F^x \Pi^i S - P\left(\Pi^d, \frac{L}{A}, \sigma_A^2\right) - SG\left[\Pi^f, \frac{FD}{A}, \sigma_\Sigma^2\right], \text{ A.1.}$$

where $\Pi^d = e^{-(i^d)}$ is the price of a domestic zero coupon bond denominated in domestic currency and i^d its yield; $\Pi^i = e^{-(i^i)}$ is the price of the international zero coupon bond, whose yield is i^i and $\Pi^f = e^{-(i^f)}$ is the price of the country's foreign currency zero coupon bond, with yield i^f . For simplicity, all assets and liabilities are assumed to have the same maturity, $t=1$. Imposing uncovered interest rate parity and introducing a country risk factor, ϕ , we have that $i^d = i^i + E(dS) + \phi$, where $E(dS)$ is the expected change in the spot exchange rate, S , within period 1 and ϕ a sovereign country risk factor; and $i^f = i^i + \phi$. $P(o)$ and $SG(o)$ are contingent liabilities that represent the put options of, respectively, the central bank and the treasury.

In addition, the following simplifying assumptions are made:

- i) Given a nominal exchange rate commitment, the monetary base expands in response to changes in international reserves and in public and private sector domestic net credit creation (i.e. $dH = dR + dD + dE - dB$)²¹
- ii) new reserves are invested at par value (i.e. $dRS = dRS\Pi^i$)
- iii) new loans to financial institutions are granted at par value (i.e. $dD = dD\Pi^d$)
- iv) new loans to enterprises are granted at par value (i.e. $dE = dE\Pi^d$)
- v) new loans from the public are obtained at par value (i.e. $dB = dB\Pi^d$)
- vi) interest rate parity holds (i.e. $dF^d \Pi^d = dF^x S \Pi^i$)

Under the variance-covariance approach, the VaR estimate can be calculated as a multiple of the portfolio's standard deviation. First, totally differentiate equation A.1 above:

$$dV = \Pi^d \left[\frac{\partial \text{Re}}{\partial T} dT - d\text{Ex} \right] + d\Pi^i [RS - F^x S] + dS [R\Pi^i - C\Pi^f - F^x \Pi^i] + d\Pi^d \left[\text{Re}(T) + F^d D + E - B - \frac{\partial P}{\partial \Pi^d} - \text{Ex} \right] + d\Pi^f \left[-CS - \frac{\partial SG}{\partial \Pi^d} \right] - \Pi^f S dC \quad \text{A.2.}$$

then square the resulting equation after substituting equations A.2-A.4 below, and take expectations assuming changes are measured with respect to their mean values.

²⁰ This annex draws from Blejer and Schumacher and Cornelius.

²¹ Blejer and Schumacher assume that the government does not repay its debt to the central bank (i.e. the price of the government liabilities to the central bank, γ , is zero). Additional behavioral macroeconomic relationships, such as monetary equilibria or balance of payments and inflation equations could also be added to the model without changing its nature. This is not done here to avoid overcomplicating the presentation.

$$d\Pi^i = -e^{-i^i} di^i \quad \text{A.3}$$

$$d\Pi^d = -e^{-[i^i + EdS + \phi]} [di^i + dEdS + d\phi] \quad \text{A.4}$$

$$d\Pi^f = -e^{-[i^i + \phi]} [di^i + d\phi] \quad \text{A.5.}$$

The resulting VaR is a function of the volatilities of the exchange rate, the international interest rate, the expected devaluation, the country risk and the level of exposure to the different sources of risk:

$$\begin{aligned} \text{VaR} &= \left[E(dV)^2 \right]^{\frac{1}{2}} z_k \\ &= \left[\sigma_S^2 E_S^2 - \sigma_{i^i}^2 E_{i^i}^2 - \sigma_{EdS}^2 E_{EdS}^2 - \sigma_{\phi}^2 E_{\phi}^2 - \sigma_C^2 E_C^2 + \text{covariances} \right]^{\frac{1}{2}} z_k \end{aligned} \quad \text{A.6}$$

where z_α depends on the confidence level and Es are the exposures in the portfolio to the different sources of risk:

$$E_s = R\Pi^i - C\Pi^f - F^X \Pi^i \quad \text{A.7}$$

$$E_C = \Pi^f S \quad \text{A.8}$$

$$E_{\Pi^i} = RS - F^X S \quad \text{A.9}$$

$$E_{\Pi^d} = F^d + D + E - B - \frac{\partial P}{\partial \Pi^d} \quad \text{A.10}$$

$$E_{\Pi^f} = - \left[CS + \frac{\partial SG}{\partial \Pi^f} \right] \quad \text{A.11}$$

$$E_{i^i} = e^{-i^i} E_{\Pi^i} + e^{-[i^i + EdS + \phi]} E_{\Pi^d} + e^{-[i^i + \phi]} E_{\Pi^f} \quad \text{A.12}$$

$$E_{EdS} = e^{-[i^i + EdS + \phi]} E_{\Pi^d} \quad \text{A.13}$$

$$E_{\phi} = e^{-[i^i + EdS + \phi]} E_{\Pi^d} + e^{-[i^i + \phi]} E_{\Pi^f} \quad \text{A.14}$$

Annex II: Exposures to Risk After the Regime Change

$$E_S = e^{-i^{i1}} R - e^{-(i^{i1} + \phi + \tau 1)} C_1 - e^{-(i^{i2} + \phi + \tau 2)} C_2 - e^{-i^{i1}} F^x \quad A.15$$

$$E_{i^{i1}} = e^{-i^{i1}} (RS - F^x S) + e^{-(i^{i1} + \text{EdS1} + \phi + \tau 1)} (F^d + D_1 - B_1) + e^{-(i^{i2} + \text{EdS2} + \phi + \tau 2)} \left(\frac{\text{Re}(T) - Ex}{+ D_2 - \frac{\partial P}{\partial \Pi^{d2}}} \right) \quad A.16$$

$$E_{i^{i2}} = e^{-(i^{i2} + \phi + \tau 2)} \left(-C_2 S - \frac{\partial SG}{\partial \Pi^{f2}} \right) \quad A.17$$

$$E_{\text{EdS1}} = e^{-(i^{i1} + \text{EdS1} + \phi + \tau 1)} (F^d + D_1 - B_1) \quad A.18$$

$$E_{\text{EdS2}} = e^{-(i^{i2} + \text{EdS2} + \phi + \tau 2)} \left(\text{Re}(T) - Ex + D_2 - \frac{\partial P}{\partial \Pi^{d2}} \right) \quad A.19$$

$$E_\phi = e^{-(i^{i1} + \phi + \tau 1)} (-C_1 S) + e^{-(i^{i1} + \text{EdS1} + \phi + \tau 1)} (F^d + D_1 - B_1) + e^{-(i^{i2} + \text{EdS2} + \phi + \tau 2)} \left(\frac{\text{Re}(T) - Ex}{+ D_2 - \frac{\partial P}{\partial \Pi^{d2}}} \right) \quad A.20$$

$$E_{\tau 1} = e^{-(i^{i1} + \phi + \tau 1)} (-C_1 S) - e^{-(i^{i1} + \text{EdS1} + \phi + \tau 1)} (F^d + D_1 - B_1) \quad A.21$$

$$E_{\tau 2} = e^{-(i^{i2} + \phi + \tau 2)} \left(-C_2 S - \frac{\partial SG}{\partial \Pi^{f2}} \right) - e^{-(i^{i2} + \text{EdS2} + \phi + \tau 2)} \left(\text{Re}(T) - Ex + D_2 - \frac{\partial P}{\partial \Pi^{d2}} \right) \quad A.22$$

$$E_T = e^{-(i^{i1} + \text{EdS1} + \phi + \tau 1)} \frac{\partial \text{Re}}{\partial T} \quad A.23$$

$$E_{D_2} = e^{-(i^{i1} + \text{EdS1} + \phi + \tau 1)} \quad A.24$$

$$E_{C_1} = e^{-(i^{i1} + \phi + \tau 1)} S, \quad E_{C_2} = e^{-(i^{i2} + \phi + \tau 2)} S \quad A.25$$

$$E_{\frac{L}{A}} = \frac{\partial P}{\partial \frac{L}{A}} \quad A.26$$

$$E_{\sigma_A^2} = \frac{\partial P}{\partial \sigma_A^2} \quad A.27$$

$$E_{\frac{FD}{A}} = \frac{\partial SG}{\partial \frac{FD}{A}} \quad A.28$$

$$E_{\sigma_\Sigma^2} = \frac{\partial SG}{\partial \sigma_\Sigma^2} \quad A.29$$