

Sovereign Latin American Eurobonds

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ABSTRACT

This research study evaluated statistically the importance of bond structure, financing activity, and issuer characteristics to the relative yield spread for fixed-rate Latin American Sovereign Eurobonds. Higher grade issuers pay a relatively higher spread to borrow long-term funds and for larger issues; the findings are consistent with the notion of a term structure “liquidity” premium and a “market congestion” premium. Low-grade countries obviously pay a higher spread than countries assigned a better international credit rating. However, low-grade countries pay a relatively higher spread to borrow shorter term funds and for the inclusion of a call option; the findings are consistent with a term structure “crisis-at-maturity” and the higher probability that low-grade countries will later find it advantageous to refinance a fixed-rate bond. Sovereign borrowers appear to achieve lower relative yield spreads by repeatedly issuing securities. Although the sovereign Eurobond market has increased in importance during the last two decades, the growth has not proven consistent. Investors seek safety over yield during periods of economic contraction, and adverse region-specific events.

Key words: Sovereign Eurobond, yield spread, bond structure, term structure premia, country credit risk premia, embedded option premia, fiscal planning.

RESUMO

Este estudo avalia estatisticamente a importância da estrutura dos títulos, atividade de financiamento e características do emissor sobre os prêmios relativos (*relative spreads*) pagos por países na emissão de eurobonds soberanos com taxas de juros fixas. Emissores com bom *rating* internacional pagam um *spread* maior para obter prazos mais longos e maiores volumes de emissão. Estes resultados são consistentes com a noção de estrutura a termo baseada em prêmio de liquidez e um prêmio para saturação (*market congestion*). Obviamente, países com baixo *rating* pagam *spreads* maiores do que os países com *rating* mais elevado. No entanto, países com baixo *rating* pagam *spreads* relativamente maiores para obter fundos de curto prazo e para incluir uma opção de resgatar o título antes da data do vencimento (*call option*). Estes resultados são consistentes com uma estrutura a termo baseada na noção de crise-na-maturação e a alta probabilidade de que países com baixo *rating* posteriormente achem vantajoso refinar seus títulos com taxas fixas. Tomadores soberanos aparentemente pagam prêmios menores à medida que mais frequentemente emitem títulos. Embora o mercado de eurobonds soberanos tenha aumentado de importância nas duas últimas décadas, tal crescimento não se provou consistente: investidores procuram segurança sobre as taxas de retorno em períodos de contração econômica e eventos que afetam regiões específicas.

Palavras-chave: bônus soberano, dispersão de prêmios, estrutura de títulos, prêmio de risco de crédito de países, opções de prêmio embutidas, planejamento fiscal.

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1 Introduction

The international bond market expanded quickly between 1980 and the late 1990s. Countries, banks and non-financial companies borrowed less than US \$40 billion in 1980 compared to more than US \$800 billion of bonds issued in 1997; the market increased at an approximate rate of 20 percent per year. (International Bond Markets) The bond market growth has by no means been uniform. By contrast, the international syndicated loan market has grown far more slowly over the same time period. The bond market has expanded more quickly than syndicated loans for many reasons. Bond issuers can often obtain funds for a longer term than loans, and more frequently with a fixed rate than commercial banks provide in loan agreements. Investors can invest funds in smaller bond denominations than required to participate within a loan syndication, and securities are relatively more marketable or liquid than loans. In addition, international bond issuers have been less likely to default on a security than a loan given the large number of investors that must concur with a change in covenants relative to the fewer number of lenders in a syndication. Sovereign borrowers, including Latin American (South America, Central America and Mexico) countries have been an important issuer of international bonds during the past two decades.

International bonds comprise three components: foreign bonds, Eurobonds and global bonds. Foreign bonds represent securities issued by foreign borrowers denominated in the currency of the capital market where sold (e.g., Brazil issues a US dollar-denominated bond in the United States). Foreign bonds are subject to the security regulations of the country of issue. Eurobonds represent securities that are issued in a country different than the security's currency denomination (e.g., Mexico issues a US dollar-denominated bond in Europe or Japan). Generally, Eurobonds are not subject to as extensive regulation as either domestic or foreign issues. Global bonds represent a more recent innovation in financing; global bonds are simultaneously registered, offered and sold in two or more geographic markets (e.g., Argentina issues a US dollar-denominated bond in the United States, the United Kingdom and Japan).

From a financial perspective, sovereign borrowers tap the international bond market to fund specific projects (e.g., airports or power plants), to cover balance of payment deficits, or to increase foreign exchange reserves important to a country's transfer risk assessment. Sovereign borrowers may be able to issue international securities at a lower interest cost than domestic markets if market participants believe the inflation-adjusted value of nominal debt denominated in a government's own currency will be eroded by purchasing power loss. In addition, international markets often accept higher levels of financial risk, to include longer maturities, more credit risk and additional embedded options, than domestic investors will tolerate.

Researchers long have evaluated different aspects of domestic and international bond activity and risk. However, the majority of prior research has focused on domestic and international **corporate** bond issuance, and **domestic** governmental bond issuance. This paper focuses on sovereign Eurobond issuance by Latin American and other countries between 1980 and 1997. The research provides investors, investment banks, and public finance officials a context by which to assess the implications of emerging financial, economic and political problems that periodically surface in the global market. Some years, Latin American countries have easily and repeatedly issued international bonds with attractive features and relatively low cost; in other years these countries have been excluded from the market regardless of bond terms.

Sovereign borrowers invariably establish the pricing and structural framework for corporate issuance of debt; the topic therefore is of equal interest to both public policy and private business finance. This paper identifies the relative importance of Latin American sovereign bond issuance in the Eurobond market, compares the terms of Latin American sovereign bond issues to other securities in the market, and finally determines the factors that best explain the relative yield premiums of fixed-rate, sovereign bonds issued in the primary Eurobond market.

2 Sovereign bond issuance

Generally, sovereign Eurobond issuance has increased since 1980. The growth has been erratic. There are clear cycles to the issuance of sovereign bonds in the primary Eurobond market. The primary market refers to the initial issuance of a security whereby the issuer normally exchanges bearer bonds for cash proceeds. Figures 1a and 1b illustrate the financing trend by both the annual size (US dollar-equivalent) and annual number of sovereign Eurobonds initially placed in the primary market. The international bond activity data base is derived from **Euromoney's Bondware**. International bond yield data later introduced is compiled by **Datastream**. Overall, the bond market expanded as sovereign borrowers turned from obtaining credit from syndicated bank loans to international bonds. As illustrated by Figures 1a and 1b, the growth has not been continuous. The market declined in importance in 1981, 1987, 1989/1990 and 1994. The ability of countries to issue bonds and the willingness of investors to purchase securities varies with the global business cycle and in response to country- or region-specific economic events.

Figure 1a
Sovereign Eurobond Market Amount of Sovereign Eurobonds Issued

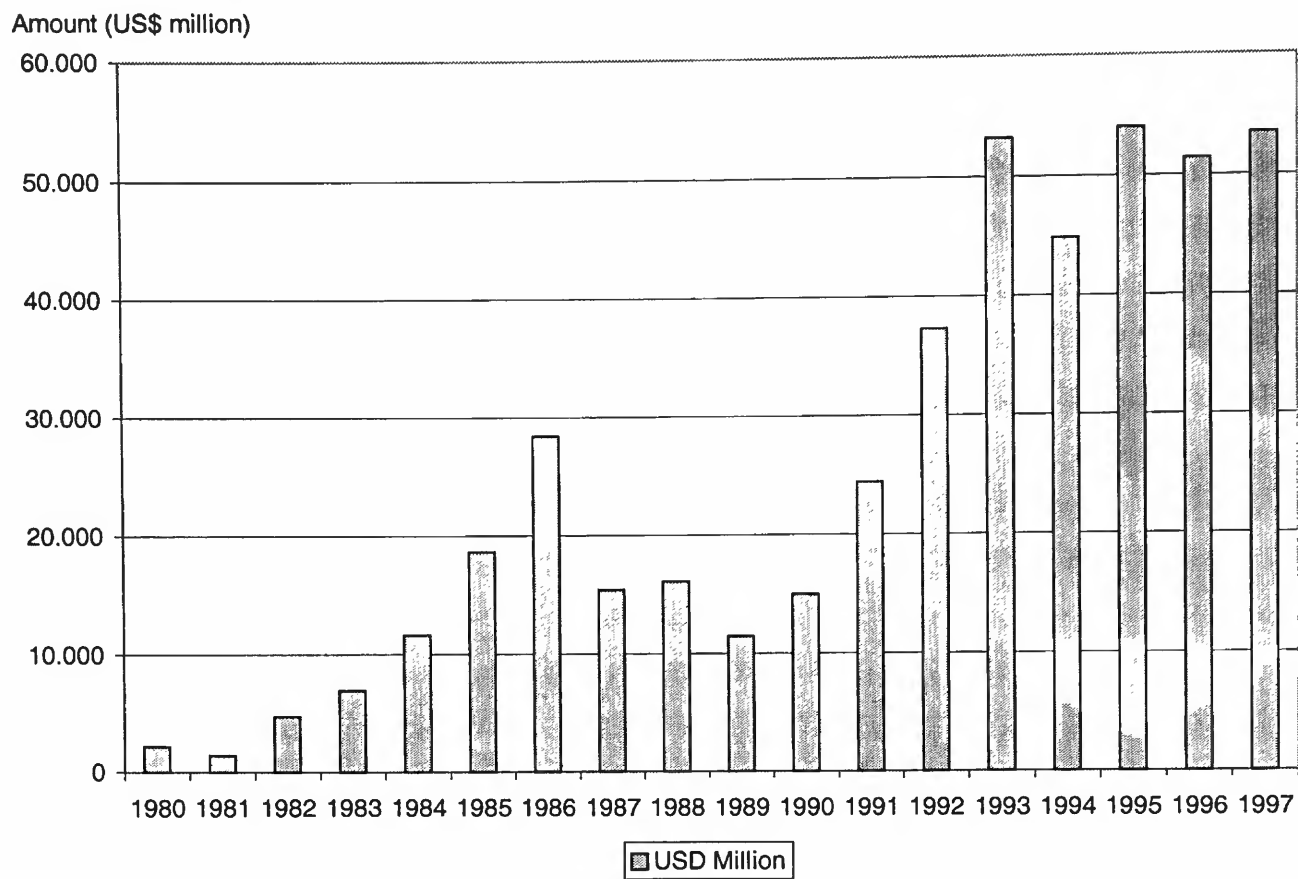
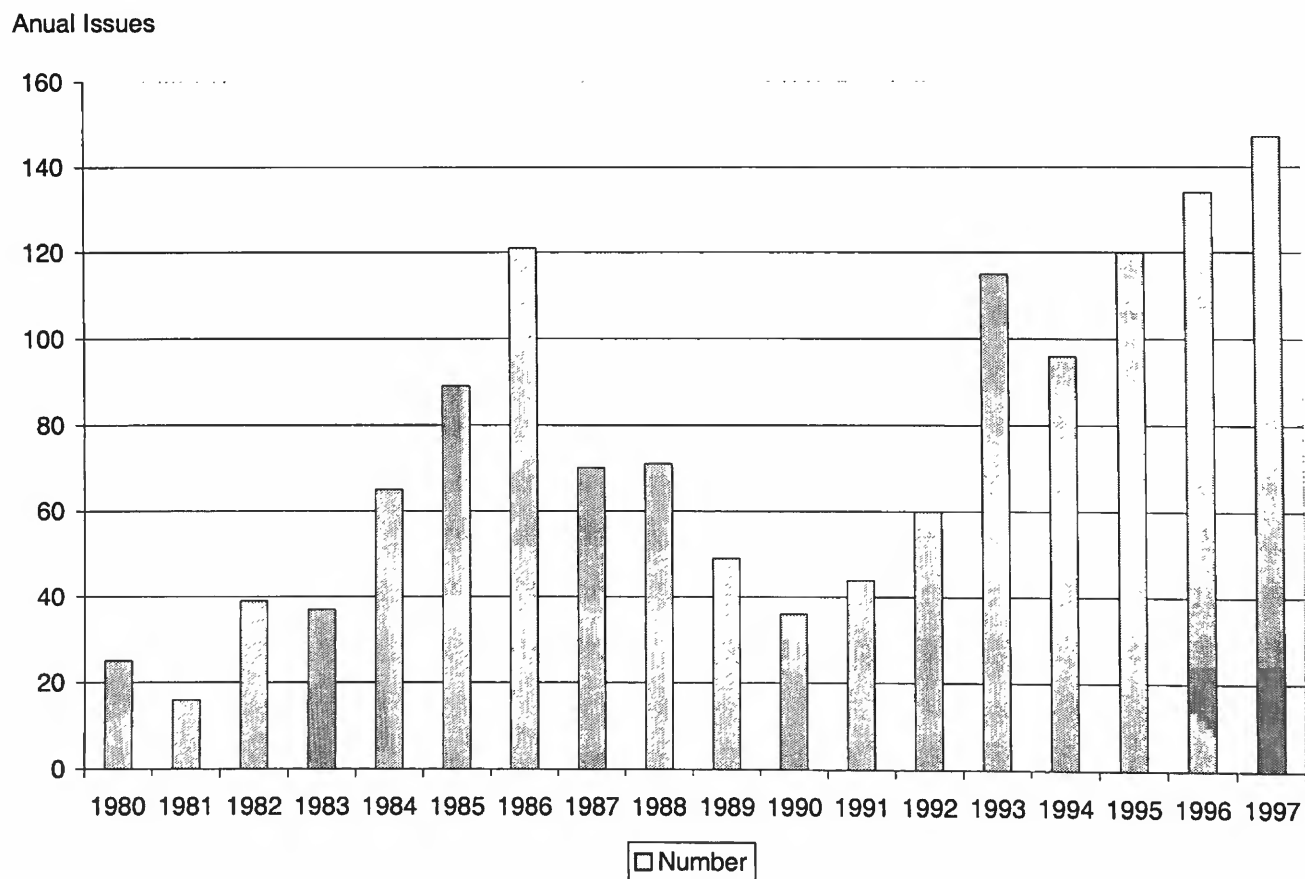


Figure 1b
Sovereign Eurobond Market Number of Sovereign Eurobonds Issued



The downturn in Eurobond activity in 1981 and 1989/1990 can, in part, be explained by the economic recessions of the United States and other developed countries that occurred in 1980, 1982 and 1990. Investors invariably shift portfolio risk limits in a business cycle contraction. Investors' appetite for risk changes from "reaching for yield" in economic expansion to a "flight to quality" in a recession. The Eurobond financing downturns in 1987 and 1994 can be traced to specific events, to include the accounting recognition of credit deterioration of loans-to-developing countries by global banks in 1987, and the currency crisis experienced by Mexico in 1994. Other such business cycle and event-specific factors will continue to affect the growth and contraction phases of the primary sovereign Eurobond market.

Numerous Latin American countries have issued sovereign Eurobonds between 1980 and 1997. Issuers include: Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Trinidad & Tobago, Venezuela, and Uruguay. Figures 2a and 2b illustrate the annual amount (US dollar-equivalent) and number of sovereign Eurobonds issued by Latin American countries. It is important to reiterate that the analysis focuses on Eurobonds; neither foreign bonds nor global bonds arranged by governments are represented. Figures 3a and 3b portray the regional geographical distribution of sovereign Eurobonds by both amount (US dollar-equivalent) and number issued between 1980 and 1997. Sovereign bonds issued by Latin American countries average 10 percent of the US dollar-equivalent amount of primary market issues and 11 percent of the number of issues. Because the proportionate number of bonds issued by Latin American countries is a little larger than the percentage funding amount raised, the issues are a little smaller than other countries. Still, Latin America is a significant issuer of sovereign debt internationally relative to Pacific-Rim, North American, Asian and African borrowers. European borrowers, however, comprise 81 percent of the amount borrowed and 76 percent of the number of Eurobonds issued between 1980 and 1997: European countries not only tap the bond markets more regularly than other regions of the world, they also issue relatively larger bonds than global counterparts.

The total number and amount of sovereign bonds issued by Latin America countries varies over time. No Central American or South American countries or Mexico issued Eurobonds between 1984 and 1986 as the loan-to-developing country crisis evolved, and in 1990 when global economic growth slowed and investors emphasized credit quality over yield. By contrast, Latin American issues reached 26 percent of the number of new bonds and 31 percent of the amount of new bonds issued by all of the world's countries in the 1996 sovereign Eurobond market.

Figure 2a

Latin America Sovereign Eurobond Market Amount of Sovereign Eurobonds Issued

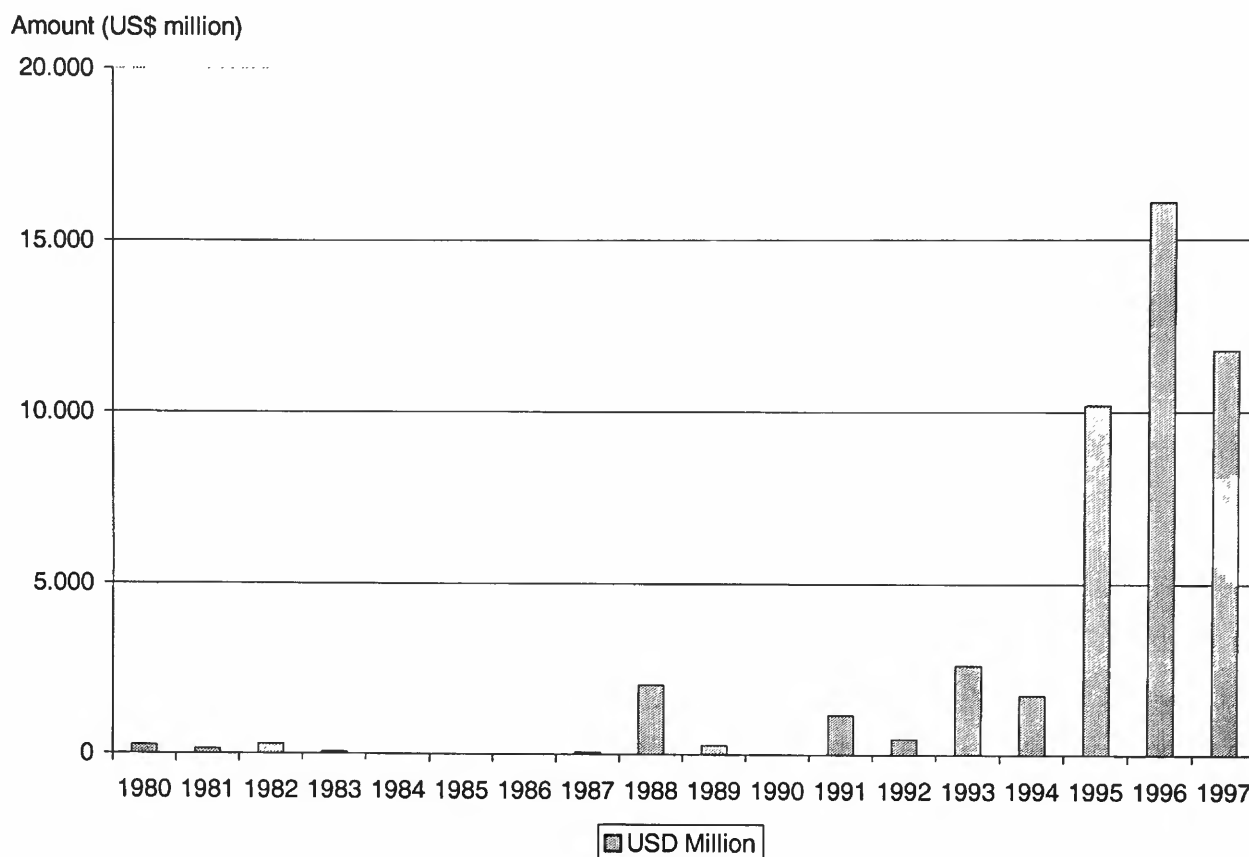


Figure 2b

Latin America Sovereign Eurobond Market Number of Sovereign Eurobonds Issued

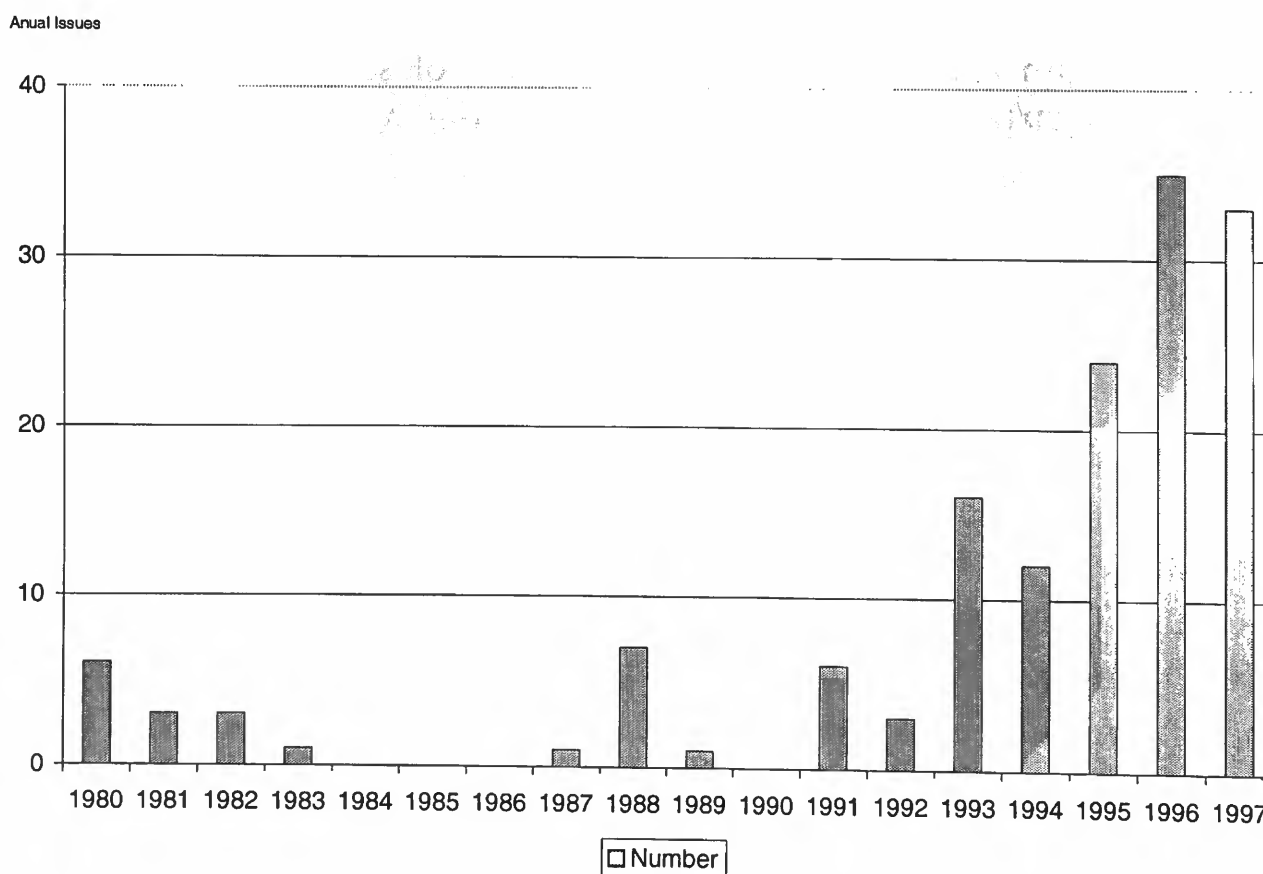


Figure 3a
Regional Distribution of Sovereign Eurobonds
Regional Distribution of Sovereign Eurobonds (1980 to 1997)

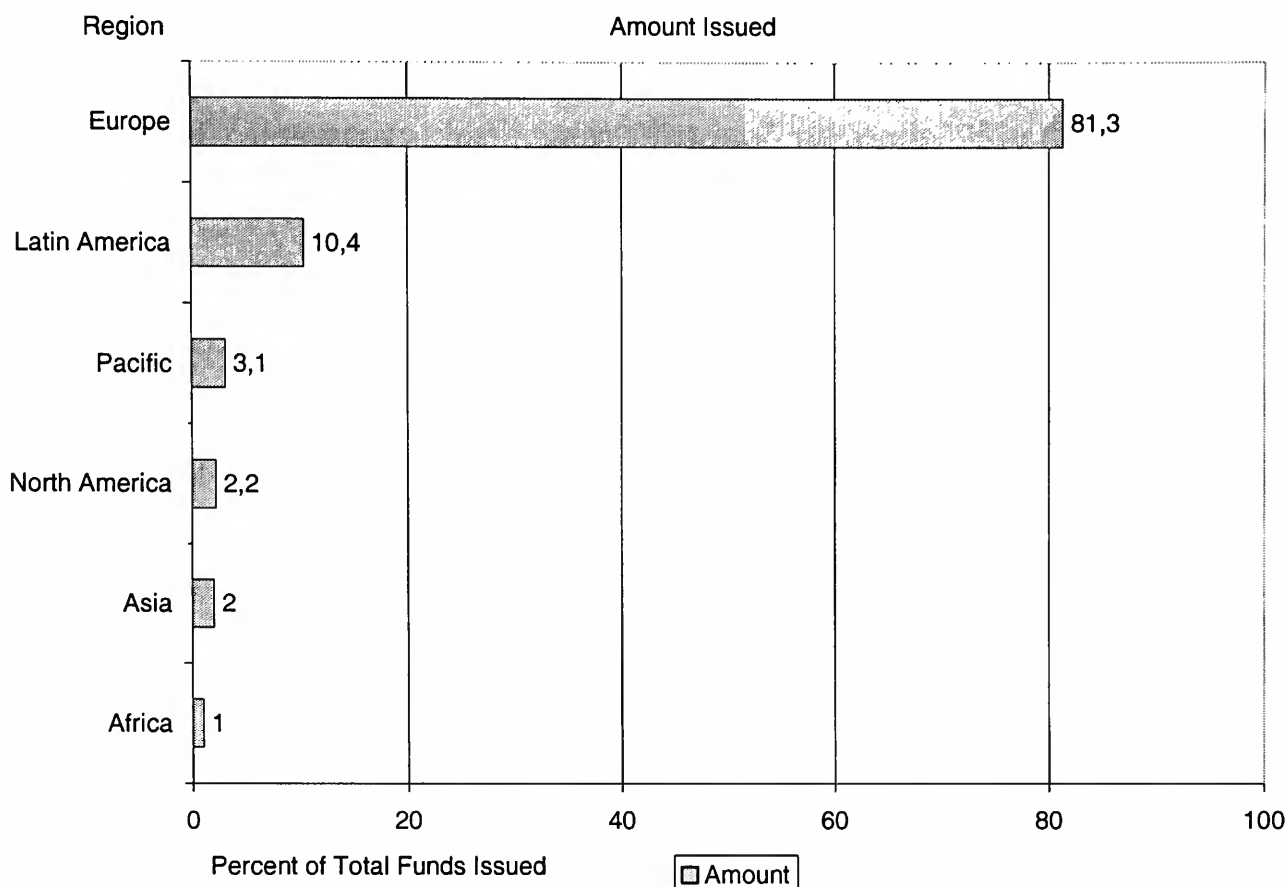
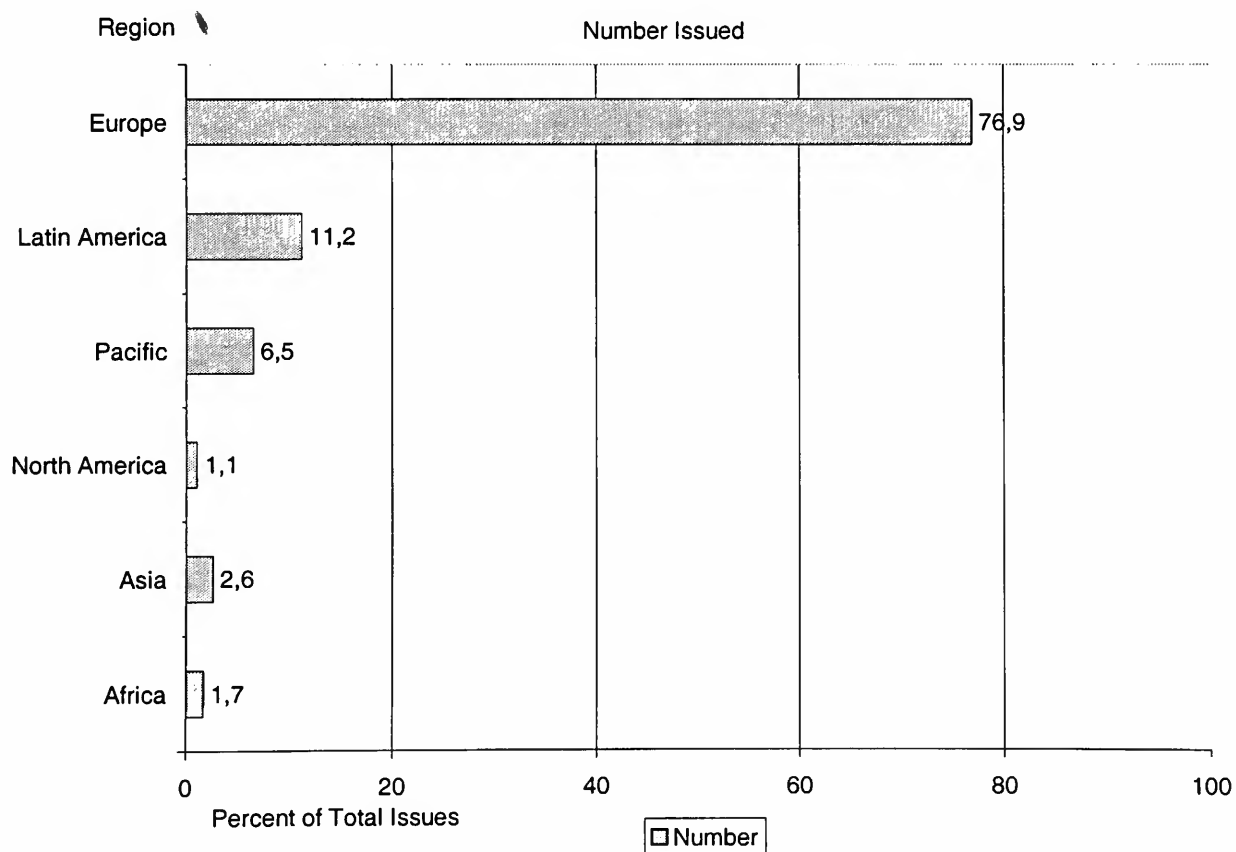


Figure 3b
Regional Distribution of Sovereign Eurobonds
Regional Distribution of Sovereign Eurobonds (1980 to 1997)



As illustrated in Figures 3a and 3b, Latin American sovereign bonds comprise the most important region issuing Eurobonds after European countries. Europe and Latin America issues combined represent over 90 percent of the amount of funds raised by countries in the Eurobond market between 1980 and 1997, and approximately 88 percent of the number of bonds issued. Table 1 identifies the number of times and amount of funds (US dollar-equivalent) specific Latin American countries raised funds between 1980 and 1997. There is a substantial difference in experience by Latin American countries issuing Eurobonds.

Table 1
Latin America Sovereign Eurobond Issuance Activity
(1980 to 1997)

Country	Number of Issues		Amount of Issues (million)	
	Count	Percent	Value	Percent
Argentina	65	43.4%	\$20,080	42.8%
Barbados	2	1.3%	\$ 50	1%
Brazil	13	8.3%	\$ 3,926	8.3%
Chile	1	.7%	\$ 43	1%
Columbia	7	4.7%	\$ 1,120	2.4%
Costa Rica	1	.7%	\$ 20	Neg.
Equador	2	1.3%	\$ 500	1.1%
Guatemala	1	.7%	\$ 150	.3%
Mexico	25	16.8%	\$16,538	35.0%
Panama	1	.7%	\$ 25	1%
Trinidad & Tobago	5	3.3%	\$ 575	1.2%
Uruguay	5	3.3%	\$ 544	1.2%
Venezuela	22	14.8%	\$ 3,489	7.4%
Total	150	100.0%	\$47,060	100.0%

Source: *Bondware*.

- Argentina issued 65 Eurobonds between 1980 and 1997. Chile, Costa Rica, Guatemala and Panama each tapped the international market just once. Overall, Argentina, Brazil, Mexico and Venezuela have been the most active issuers of sovereign Eurobonds.
- Four Latin American countries, Argentina, Brazil, Mexico and Venezuela, combined to borrow more than 93 percent of all sovereign Eurobonds issued by the countries in the geographic region during the two decades evaluated.

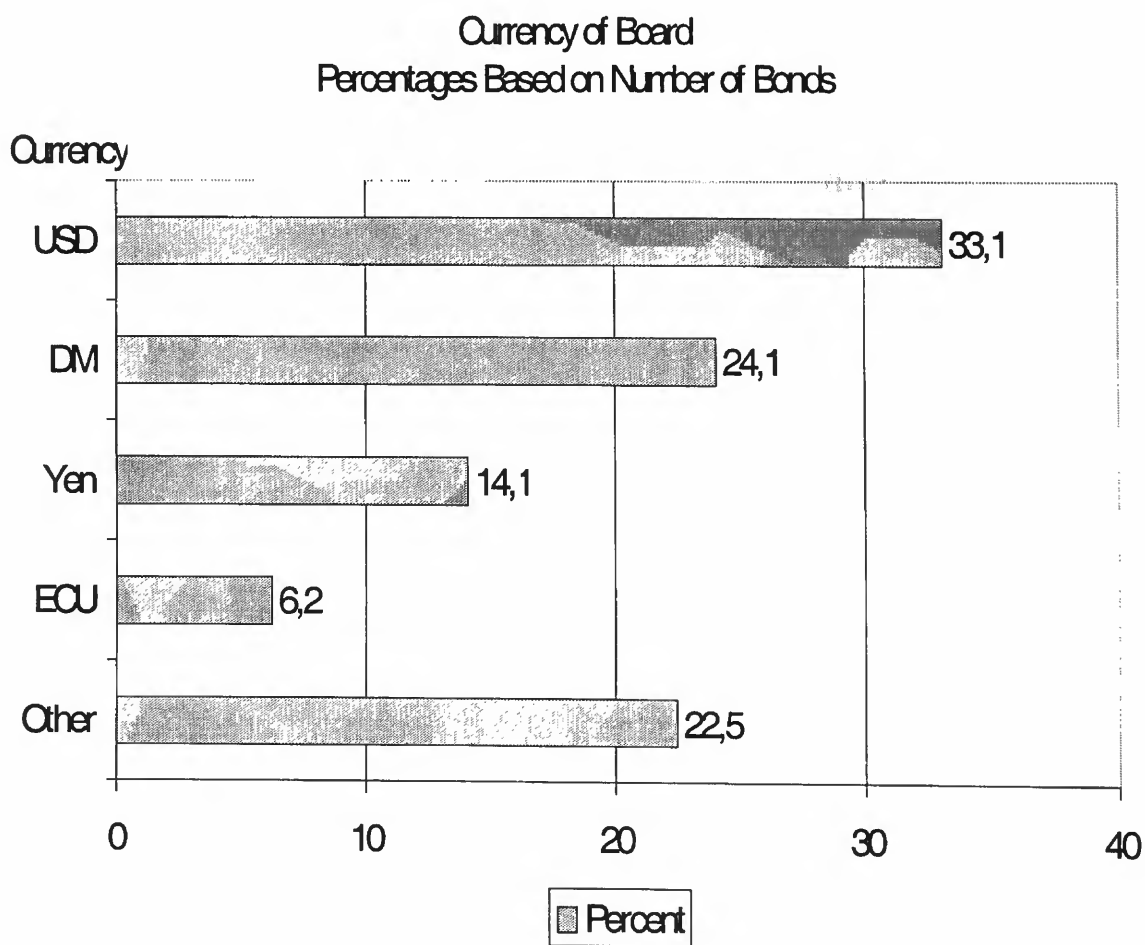
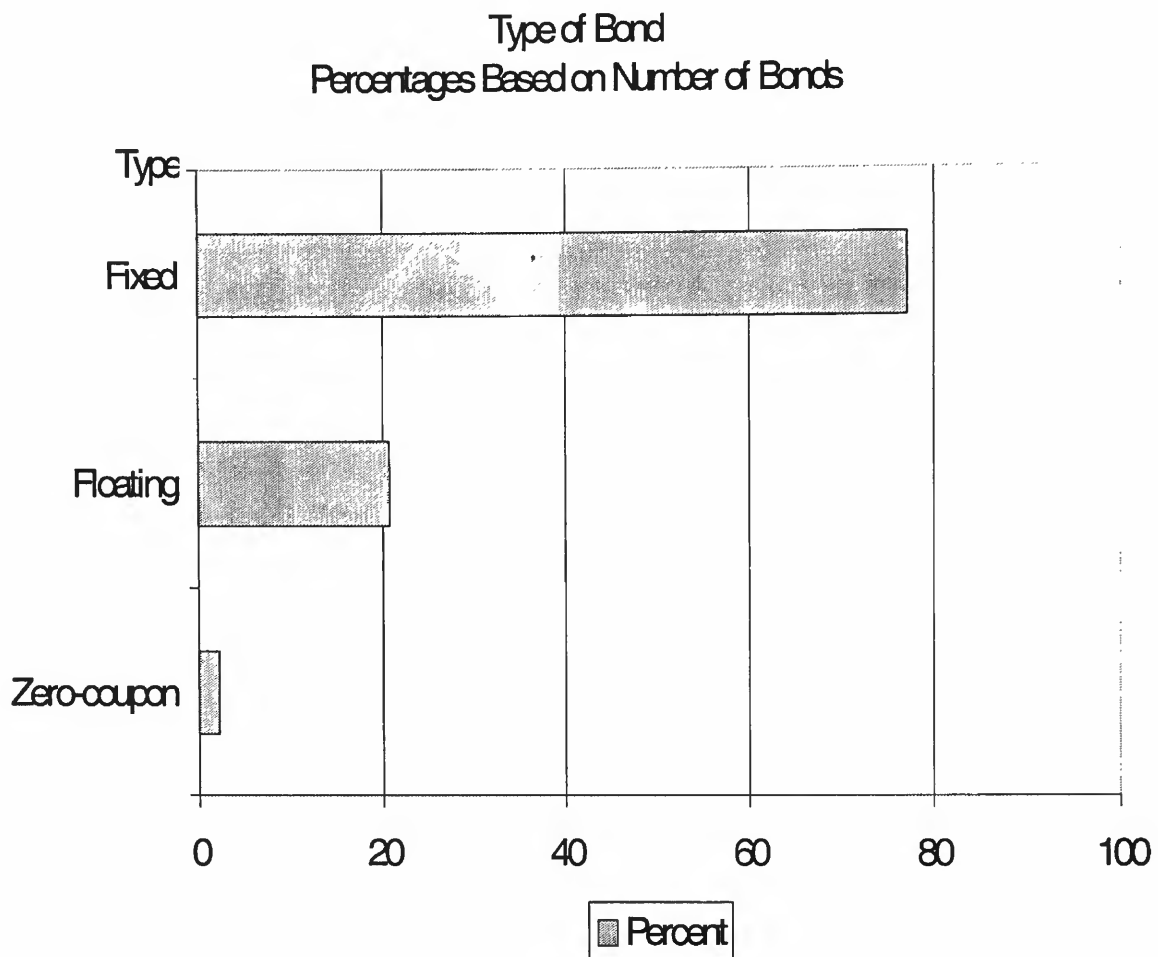
Clearly, selected countries in Latin America have substantial experience in the Eurobond market. The sovereign Eurobond experience of Latin America and other regions of the world has not been rigorously subject to research regarding variations in bond structure and/or yield premiums. For example, how does the average size of a sovereign Eurobond or the maturity of a bond affect the yield premium? Or, how does the number of times a country taps the market affect the yield required to entice international investors. The financial issues are addressed more fully from a statistical perspective after the Eurobond market structure is more fully described.

3 Bond structure

Although the structure of sovereign Eurobonds changes in response to the mix of issuers, the risk appetite of investors and the condition and trends within the global economy, it is instructive to briefly assess the general characteristics of the market between 1980 and 1997. Figure 4 depicts the percentage distribution of sovereign Eurobonds based on both type and currency denomination. The percentages are based on the 1,026 sovereign Eurobonds issued during approximately two decades of time.

- **Type** - Approximately 77 percent of the number of sovereign Eurobonds are structured with a fixed interest rate. About two percent of the bonds are issued without a coupon in the form of zero-coupon debt. The remaining 21 percent of bonds are floating-rate issues. Fixed-rate bonds protect issuers against rising short-term interest rates, but preclude the opportunity to take advantage of interest rates subsequently declining unless the bond includes a call option. Floating-rate bonds protect investors against rising interest rates related to the floating-rate index and currency of the bond; the floating-rate structure does not hedge against declining credit quality and increasing country risk. Zero-coupon bonds defer cash flow requirements of the issuer until maturity. The absence of a periodic coupon within a zero-coupon bond increases the security's duration and related market price sensitivity to the investor.

Figure 4
Structure of Sovereign Eurobonds (1980 to 1997)



- **Currency** - During the time period tested, countries issued Eurobonds denominated in 24 currencies. Sovereign Eurobonds are issued predominantly in one of four currencies. Although about 75 percent of syndicated bank loans are denominated in US dollars, only 33 percent of the number of sovereign Eurobonds issued between 1980 and 1997 are US dollar-denominated. The bond market allows issuers and investors to diversify asset/liability portfolio currencies. Approximately 24 percent of sovereign Eurobonds are denominated in German DM, 14 percent in Japanese yen, and six percent in the European ECU. Given the historical importance of both the German DM and the European ECU, market participants expect the recently launched Euro will provide competition to the dominant dollar denomination.

Given the predominant fixed-rate bond structure favored by sovereign Eurobond issuers, subsequent research focuses on such issues. The sample thereby includes almost 80 percent of the full sample of sovereign Eurobonds issued between 1980 and 1997. As a result, statistical models employed to evaluate factors affecting relative yield premiums are able to increase the degree of freedom important to obtaining meaningful empirical results. Table 2 depicts the characteristics of over 800 fixed-rate sovereign Eurobonds issued between 1980 and 1997.

Table 2
Fixed-rate, Sovereign Eurobond and Issuer Characteristics
(1980 to 1997)

Characteristic	Market Average
<i>Bond</i>	
Maturity	7.5 years
Call Option	7.5% of bonds
Term-to-call	5.2 years
Size	US \$353 million
<i>Issuer</i>	
Frequency of Borrowing	27 times (1.5 times per year)
Credit Quality	
High-grade (Aaa/Aa)	73%
Medium-grade (A/Baa)	8%
Low-grade (Ba/B/Caa)	19%

Source: *Bondware*.

- **Maturity** - Although selected fixed-rate sovereign Eurobonds were brought to market with a term as long as 30 years and as short as one year, the mean maturity is 7.5 years.
- **Call Option** - Because the average term of a fixed-rate sovereign Eurobond is only 7.5 years, few countries include a call option as a covenant within the bond indenture. The call option allows an issuer to redeem a bond prior to maturity if advantageous to the borrower. The option is typically exercised if interest rates have declined in the global markets and/or if the credit rating of the issuer has improved sufficiently to allow the country to refinance the bond at a lower coupon. Only 7.5 percent of fixed-rate, sovereign Eurobonds include a call option and the mean term-to-call is 5.2 years. Consequently, the term-to-call is not much shorter than the 7.5 year average maturity.
- **Size** - The mean size of a sovereign Eurobond is US \$353 million; the United Kingdom issued bonds equal to US \$3,868 million in 1991 while Spain tapped the market for only US \$19 million in 1984 with a DM-denominated bond.
- **Frequency of Borrowing** - On average, countries that issued fixed-rate Eurobonds tapped the market about 27 times between 1980 and 1997, which is equivalent to approximately 1.5 issues per year. Sweden borrowed funds 137 times. Many countries only tapped the international market once.
- **Credit Quality** - Country risk ratings are assigned by many global credit rating agencies. Normally, credit ratings are represented by letters (e.g., Aaa to Caa or AAA to CCC) and by notches that further refine letter grades (e.g., +/- or 1/2/3). Approximately 73 percent of fixed-rate, sovereign Eurobonds have been issued by countries with a high-grade (Aaa and Aa), eight percent with a medium-grade (A and Baa), and the remaining 19 percent with a low-grade (Ba and B). The credit ratings described are assigned by Moody's Investor Service.

To summarize, the typical sovereign Eurobond is a fixed-rate, US \$350 million, 7.5-year, non-callable bond denominated in US dollars. Many issues also are denominated in German DM, Japanese yen, and the European ECU. The typical issuer retains a high-grade country risk rating and taps the market about 1.5 times a year. There are substantial variations from the average characteristics of the Eurobond market.

Country issuers, portfolio investors and scholars alike are concerned with the consequence of bond structure, financial market activity and issuer attributes for the relative yield required to bring supply and demand functions into balance. What factors, if any, statistically increase or decrease the relative yield applicable to a fixed-rate, sovereign

Eurobond at initial time of issue? Economic theory provides a framework to judge the effect of bond structure, financial market activity and issuer characteristics.

4 Theoretical perspective and prior empirical research

The majority of prior empirical research has focused on yield spreads and relative yield spreads for corporate securities issued in domestic and/or international markets, and governmental securities issued in domestic markets. The literature provides a framework by which to judge empirical analysis of fixed-rate, sovereign Eurobonds in general and Latin American securities in particular.

Table 3
Latin America Fixed-Rate, Sovereign Eurobonds
(1980 to 1997 by Countries with Three or More Issues)

Country Last Issue	Number Low Rating	First Issue (Years)	High Rating (US Million)	Maturity Spread	Bond Size	Relative Yield
Argentina	54 1997	1991 B3	Ba3	6.4	\$290	88.6%
Brazil	8 1997	1980 B1	B1	10.8	\$381	82.5%
Columbia	5 1996	1993 Ba1	Baa3	5.0	\$178	44.9%
Mexico	17 1997	1981 Ba2	Ba2	7.8	\$426	101.9%
Trinidad & Tobago	4 1996	1992 Ba1	Ba1	8.0	\$131	67.1%
Uruguay	5 1996	1992 Ba1	Ba1	6.0	\$109	37.4%
Venezuela	16 1997	1980 Ba3	Ba1	5.9	\$161	54.2%

Sources: *Bondware* and *Datastream*.

- **Maturity** - How does the term-to-maturity of international sovereign bonds affect the relative yield spread? Based on the liquidity preference hypothesis of the term structure of interest rates, longer bond maturities should require higher yields. Cox, Ingersoll and Ross (1981), Sorrensen (1979) and Fisher (1959) have all derived positive relationships in prior empirical analyses. According to the liquidity preference

hypothesis, prices of long-term, fixed-rate bonds are more volatile than short-term, fixed-rate bonds or floating-rate bonds. Long-term, fixed-rate bonds retain a higher duration than shorter term or floating-rate bonds. For a given change in interest rates, the prices of high duration bonds are more sensitive or volatile than low duration bonds. Given the liquidity preference framework, interest rates, on average, must increase with maturity for fixed-rate bonds to compensate for incremental price or market risk. By contrast, Johnson (1967) has suggested that the relationship between maturity and yield should prove negative for low-grade issuers. Low-grade borrowers whose credit has been assigned letter grades of “Ba” or lower may experience a “crisis at maturity” for short-term bonds if repayment questions exist about the issuer’s ability to refinance the bond or obtain sufficient cash flow to repay principal at a quickly approaching maturity. Consequently, low-grade borrowers may be required to pay a higher yield to borrow short-term due to the immediate concern of default and credit quality. According to the conflicting arguments raised by liquidity preference and “crisis at maturity,” the relationship between Eurobond maturity and relative yield spread may be positive or negative.

- **Call Option** - How will the existence of a call option increase, if at all, the relative yield spread for a fixed-rate, sovereign Eurobond? Although a call option is not common within sovereign Eurobond issues, the covenant allows a country to refinance a previously-issued, high coupon bond with a new, lower cost alternative. Interest rates may decline subsequent to the primary market offering given lower market rates of interest or enhanced credit risk ratings of the issuer. A call feature exposes investors to several disadvantages. First, the cash flow of a callable bond is not known with certainty. Second, a callable bond will be called when interest rates have declined, which subjects an investor to reinvestment risk. Third, the price of a callable bond rarely appreciates as much as a non-callable security because the market projects the callable bond to be redeemed at or near par if required yields decline in relation to the coupon. The value of the option varies with the initial coupon of the Eurobond, the period-to-call, the deferral period between the call and contractual maturity, and the volatility of interest rates equivalent to the underlying bond. Regardless of cause, a callable bond exposes investors to some additional risk; risk should be compensated by a higher relative yield premium. Kidwell, Marr and Thompson (1985) determined that the existence of a call premium had no effect on the yield spread of Eurodollar bonds issued by public utilities. By contrast, Cook (1982), Ferri (1979) and Kidwell (1975) all determined that the call provision affects the yield spread for corporate and/or municipal bonds. The call option either should have no effect on relative yield spreads or a positive relationship for fixed-rate, sovereign Eurobonds.

- **Issue Size** - How will the size of a sovereign Eurobond affect the relative bond spread? Some consider the size of a bond a proxy for liquidity and marketability. If such is the case, larger bond issues should command lower relative yield spreads because more investors will be able to invest in and trade the bond. Broker/dealers will be able to achieve a given return on assets from a portfolio of securities with a smaller bid/asked spread if the bonds trade more frequently. Fisher (1959), and Lamy and Thompson (1988) support the marketability hypothesis. Others believe the size of a bond leads to market congestion. The Eurobond market is not considered deep or broad; larger issues will require a market congestion premium to clear the market. Kidwell, Marr and Thompson (1985), and Adedeji and McCosh (1995) support the market congestion premium. Again, the relationship between Eurobond size and relative yield spread may be positive or negative.
- **Experience or Frequency of Borrowing** - Does repeated experience issuing Eurobonds affect the relative yield spread for fixed-rate, sovereign borrowers? Ozler (1992) examined the importance of the number of times sovereign countries borrowed funds via the bank loan market and determined that the yield spread declines as borrowers successfully come to market more times. If investors are unable to easily distinguish credit quality of borrowers *ex ante*, creditors will require a higher relative yield spread to compensate for the lack of payment experience of new issuers. The relative yield spreads should decline for subsequent non-defaulting issues. The experience factor should lead to lower relative yields unless offset by market congestion. The frequency of borrowing factor may either produce a positive or negative relationship with relative yield spreads for sovereign Eurobonds.

5 Yield spread analysis

Research Design. To assess the financial effect, if any, that bond structure, financial market activity and issuer characteristics have on the relative yield of fixed-rate, sovereign Eurobonds, the research adopts a linear regression testing framework. The relative yield spread is functionally related to factors previously introduced. Yield spreads normally are measured two ways. An absolute yield spread (yield - index) represents the yield applicable to a fixed-rate, sovereign Eurobond minus an index comparable to the term and currency of the security when issued. To illustrate, if the fixed-rate yield on a Eurobond is 12 percent when the underlying index comparable to the term and currency of the issue at the time of primary market issue is 7 percent, the absolute yield spread is five percent (12% - 7%) or

500 basis points. One percent is equivalent to 100 basis points. The relative yield spread ($\frac{\text{yield} - \text{index}}{\text{index}}$) equals the absolute yield spread divided by the index comparable to the term and currency of the Eurobond when issued. To continue the above example whereby a country issues a bond at 12 percent when the underlying index is 7 percent, the relative yield spread would be 71.4 percent ($\frac{12\% - 7\%}{7\%}$). The two yield spread measures are frequently used when evaluating financial market performance of the bond market. However, the relative yield spread is more appropriate for periods of volatile interest rates comparable to that observed in the 1980 to 1997 time period, and for bonds denominated in various currencies. A five percent absolute yield spread is distinctly different when the underlying interest rate indices is three percent versus thirteen percent.

For the fixed-rate, sovereign Eurobonds evaluated, the relative yield spread averaged 16.8 percent. The relative yield spread for a specific issue ranged from as high as 597 percent by Argentina for a yen-denominated issue in 1995 to minus 44.6 percent by Denmark for a yen-denominated issue in 1995. By contrast, the average Latin America relative yield spread averaged 78.8 percent. Argentina issued a bond with a relative yield spread of just 12.9 percent for an Italian lire issue in 1994. On average, Mexican bonds required a relative yield spread of 101 percent; the absolute yield spread exceeded the underlying bonds' indices. By contrast, Uruguay was able to issue fixed-rate, sovereign Eurobonds with a relative yield spread of only 37 percent. It is instructive to determine systematically why some bonds carry a low relative spread and others require a high relative spread for reasons other than credit ratings and currency that obviously impact relative market premiums.

Because all Latin American Eurobonds were rated "Baa" or lower at the time of bond issuance, the study controls for credit rating by separating all fixed-rate sovereign bonds rated "A" or higher versus those rated "Baa" or lower. Approximately two-thirds of the bond sample are rated "A" or higher. In addition, to assess the effect, if any, of repeated experience factor, the sample is limited to those countries that issued three or more bonds during the 1980 to 1997 time period.

Relative Yield Spread = Function (Maturity, Issue Size, Call option, Repeated Borrowing Experience, Currency, Country)

where,

- Relative yield spread = $(\text{yield} - \text{index})/\text{index}$
- Maturity = term in years
- Size = log of issue amount (US dollar-equivalent)

- Call option = dummy variable of one if callable; 0 otherwise
- Repeated borrowing experience = number of prior times (squared) the country issued a fixed-rate, sovereign Eurobond
- Currency = dummy variable of one for one of 11 currencies; 0 otherwise
- Country = dummy variable of one for one of 32 countries; 0 otherwise

Latin American Eurobond Sample. Numerous Latin American countries have issued fixed-rate, sovereign Eurobonds between 1980 and 1997. Argentina tapped the fixed-rate Eurobond market 54 times while Trinidad & Tobago only borrowed four times. The sample of bonds subject to the least squares regression analysis only includes those countries that borrowed three or more times. The highest Latin American country credit rating at time of bond issue was “Baa1” while the lowest was “B1.” Brazil’s bonds were issued with an average maturity of 10.8 years while Columbia’s bonds only averaged 5.0 years. The average size of debt ranged from US \$426 million by Mexico to US \$109 million by Uruguay. The relative yield spread ranged from 101.9 percent by Mexico to 37.4 percent by Uruguay. Excepting credit ratings, there is substantial difference in bond structure arranged by Latin American countries. The subsequent statistical analysis attempts to determine which, if any, factors affect the relative yield spreads for the fixed-rate, sovereign Eurobond market.

Statistical Results. Table 4 provides the regression results for the credit risk-adjusted sub-samples of fixed-rate, sovereign Eurobonds issued between 1980 and 1997. Currency and country dummy variables are not displayed. Interpretation of the multiple regression equations depends on the assumption that the independent explanatory variables are not highly interrelated. When there are dependencies among the independent variables, multicollinearity exists that may seriously limit the usefulness of the regression model for inferences and/or prediction. Based on both a test of partial correlation coefficients and the variance inflation factor test, there were few indicators of multicollinearity. Ten of 32 country dummy variables possessed a high partial correlation coefficient or a high variance inflation factor and were removed from the statistical model.

- **A- and Higher-rated Bonds** - The first regression model exhibits an R-square of 53.5 percent, which suggests the regression equation is able to explain about 54 percent of the variation in relative bond spreads for upper-medium and high-grade, fixed-rate sovereign Eurobonds. Based on the F-value, the model is significant, which suggests one or more explanatory factors retain a significant linear relationship to the relative

yield spread. Relative yield spreads for “A-rated” and better quality bonds are positively related to both maturity and issue size at the one percent level of significance. Other factors, such as the existence of a call option or repeated experience, were not statistically significant. The positive coefficient between relative yield spread and maturity is in accordance with the liquidity preference hypothesis of the term structure of interest rates. Longer maturity, fixed-rate bonds exhibit more price volatility (i.e., possess a higher duration) than shorter maturity or floating-rate bonds. The potential price sensitivity of longer term bonds requires a yield premium for countries with high-grade and upper medium-grade credit quality. Such countries invariably are deemed to expose investors to little political risk, economic problems or transfer risk. The positive coefficient between relative yield spread and issue size is in accordance with the market congestion hypothesis. Because Eurobond markets are typically smaller than domestic capital markets for high-grade issuers, the market cannot absorb large size bond issues in a short term without affecting interest rates. Countries must offer a yield premium to induce investors to purchase a large bond within a single issue.

Table 4
Regression Results for Fixed-rate, Sovereign Eurobonds
(1980 to 1997)

Factor	“A-rated” and Higher	“Baa-rated” and Lower
Constant	-0.19118 (-2.19)**	0.13409 (.19)
Maturity	0.00328 (2.65)*	-0.03173 (-1.99)**
Issue Size (log)	0.02823 (4.18)*	0.10237 (1.06)
Call option	0.01895 (0.28)	0.82091 (1.67)***
Experience	0.00000 (0.81)	.00000 (-0.35)
R-squared	0.5352	0.7672
F-value	2.29*	2.71*
Sample Size	644	24

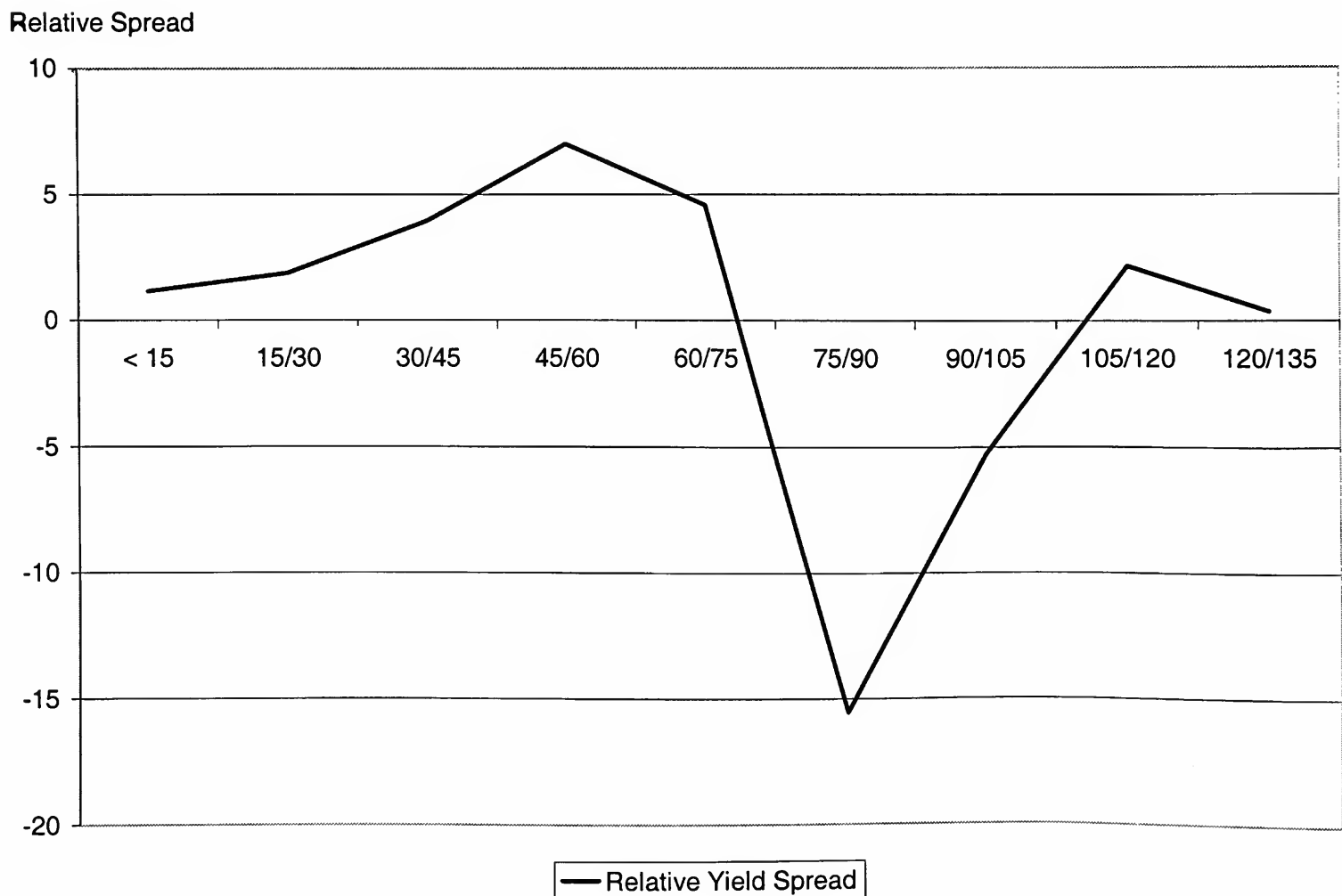
Significance @ 1%, ** Significance @ 5%, *** Significance @ 10%.

Sources: *Bondware* and *Datastream*.

- **Baa- and Lower-rated Bonds** - The second regression model exhibits a much higher R-square of 77.6 percent for fixed-rate, sovereign Eurobonds rated “Baa” or lower. The model is able to explain approximately 78 percent of the relative yield spread for lower medium-grade and low-grade, fixed-rate, sovereign Eurobonds. Lower rated countries often have a lower gross domestic product per capita, higher inflation, higher foreign-denominated debt as a percent of exports, and have previously defaulted on debt. Based on the F-value, the model is significant and one or more variables has a significant linear relationship to relative yield spreads. The results are not fully compatible with higher grade borrowers. Two factors significantly explain relative yield spreads for “Baa” and lower credit ratings common within Latin American countries. First, maturity has a negative relationship with the relative yield spread and is significant at the five percent level. Longer term issues require a lower yield. The finding is consistent with the “crisis at maturity” hypothesis. The perceived probability of default increases as maturity shortens for lower-grade borrowers; the issuer must not only pay annual interest but also repay principal more quickly with short-term bonds. Second, the coefficient for callability is positive and significant at the ten percent level. Investors expect to be compensated for bearing the call risk for bonds issued by lower-grade sovereign bond issues; the option was not significant for higher grade sovereign bond issues. Low-grade bonds possess two sources of risk that expose investors to call risk: first, general market interest rates may decline; second, the issuer’s credit rating may improve. The credit rating of a Aaa- or Aa-rated country is more susceptible to being downgraded than upgraded while the opposite is true for low-grade countries that do not default. No country defaulted on a sovereign Eurobond during the period tested. Although the coefficient for issue size is positive, it is not significant for lower quality issues. On average, lower credit quality issues are smaller than bonds rated “Aa” or higher. Only two Latin American countries, Mexico and Brazil, issued fixed-rate Eurobonds with a larger mean size than the worldwide sample. Investors and financiers have turned to the global bond market when a borrower requires a large amount of funding at one time.
- **Repeated Experience** - Neither regression of fixed-rate, sovereign Eurobonds grouped by credit quality showed that the number of times a country issues bonds significantly affects the relative yield spread. The relationship was negative for lower quality issuers and positive for higher quality issuers. However, when the repeated experience was evaluated for the full sample of fixed-rate, sovereign Eurobond the relationship was negative and significant at the five percent level. The relationship is

illustrated in Figure 5. Note the experience factor is not linear. In general, the relative yield spread declines with the number of times a country issues a bond. The finding is in accordance with prior research that investors are unable to easily distinguish the credit quality of borrowers *ex ante*; investors and portfolio lenders initially require a higher spread to compensate for the uncertainty associated with new issuers. The relative yield spread declines for subsequent issues for non-defaulting countries. The findings are compatible with the argument that the incremental cost of obtaining information on the borrower declines with the frequency of borrowing. At some point, generally about 80 issues, the relative cost of borrowing increases. The subsequent increased cost of borrowing reflects the market congestion issue associated with the Eurobond market; it is neither deep nor broad relative to a country's domestic capital market, especially for higher credit quality countries.

Figure 5
Repeated Experience and Relative Yield Spreads
Cumulative Number of Eurobond Issues: 1980 to 1997



6 Summary

Countries borrow money for a variety of political and economic reasons to include funding projects, covering balance of payment deficits and building reserves. Countries elect to borrow funds internationally to reduce funding costs, provide a framework for corporate issuance of debt or obtain funds with a different structure than available domestically. Fifty-nine countries borrowed funds in the Eurobond between 1980 and 1997. The typical bond was a dollar-denominated, fixed-rate, non-callable, 7.5 year issue of US \$350 million. Countries tapped the Eurobond market about 1.5 times per year. The typical borrower is of high-grade credit quality. Despite the averages, significant variations of bond structure, financing activity and borrower characteristic exist. Some countries borrowed at relatively high rates of interest in the primary market while other countries paid very little.

This research study evaluated statistically the importance of bond structure, financing activity and issuer characteristics to the relative yield spread of fixed-rate, sovereign Eurobonds. High-grade issuers pay a higher relative yield spread to borrow longer term funds and for larger issues. The findings are consistent with the notion of a term structure liquidity premium and a market congestion premium. Obviously, low-grade countries pay higher relative yield spreads than high-grade countries. Low-grade issuers also pay a relatively higher yield spread to borrow shorter term funds and for the inclusion of a call option. The findings are consistent with the term structure “crisis at maturity” hypothesis and the additional probability of non-defaulting, low-grade bond issuers refinancing at lower rates. Sovereign borrowers appear to be able to achieve lower relative yield spreads by repeatedly coming to the market.

Although the sovereign Eurobond market has increased in importance during the last two decades, the growth has not been uniform. Investors historically have sought safety over yield during periods of economic contraction and adverse region-specific events. Lower grade issuers, including most Latin American countries, can attempt to avoid the periodic closing of the international bond market by extending the maturity of debt. Countries must reevaluate funding choices upon being upgraded to upper-medium and higher credit quality.

Selected references

Adedeji, Abimbola and McCosh, Andrew M. Determinants of eurobond yields. *Journal of Business Finance and Accounting*, v. 22, n. 8, p. 1107-1124, 1995.

- Cook, Timothy, Q. Determinants of individual tax-exempt bond yields: a survey of the evidence. *Economic Review*, p. 14-40, May/June 1982.
- Cox, J. C., Ingersol, J. and Ross, S. A. A Re-examination of the traditional hypothesis about the term structure of interest rates. *Journal of Finance*, v. 36, p. 769-799, 1981.
- Ferri, Michael. How do call provisions influence bond yields? *Journal of Portfolio Management*, v. 5, n. 2, p. 55-57, 1979.
- Fisher, Lawrence. Determinants of risk premiums on corporate bonds. *Journal of Political Economics*, 67, p. 212-237, 1959.
- International Bond Markets. *Financial market trends*. Numerous Issues.
- Johnson, Ramon E. Term structure of corporate bond yields as a function of risk of default. *Journal of Finance*, 22, p. 318-321, May 1967.
- Kidwell, David S. Call provisions and their effect on municipal bond issues. *Governmental Finance*, p. 28-32, August 1985.
- Kidwell, David S., Marr, M. Wayne and Thompson, G. Rodney. Eurodollar bonds: alternative financing for U.S. companies. *Financial Management*, 14, p. 18-27, 1985.
- Lamy, Robert E., and Thompson, G. Rodney. Risk premia and the pricing of primary issue bonds. *Journal of Banking and Finance*, 12, p. 585-601, 1988.
- Ozler, Sule. The evolution of credit terms: an empirical study of commercial bank lending to developing countries. *Journal of Development Economics*, 38, p. 79-97, 1992.
- Sorensen, Eric H. The impact of underwriting method and bidder competition upon corporate bond interest cost. *Journal of Finance*, 34, p. 863-870, 1979.