THE DETERMINANTS OF JAMAICA'S SOVEREIGN SPREAD

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ABSTRACT

This paper investigates the determinants of the spreads on Jamaica's sovereign bonds for the period 1998-2004. It assesses, inter alia, the relative significance of the fiscal deficit and the interest rate on the ten-year US Treasury bond for the time path of the spread. The paper finds that the behaviour of Jamaica's sovereign spreads is largely influenced by sentiments about the emerging markets, but there seems to be considerable inertia in the US-dollar denominated spreads. To the extent that Jamaican investors are the main holders of the US-dollar denominated bonds, "brand loyalty" may induce them to react less noticeably to adverse news. By contrast, the Euro-denominated spreads react more noticeably to domestic macroeconomic fundamentals. The behaviour of the Euro denominated spreads to changes in sentiments about emerging market debt suggests that these bonds are "home ports" for investors. The primary balance was found to possess some significant explanatory power for the US-dollar denominated bond spreads, while the fiscal deficit was significant for the Euro-denominated bond spreads, albeit with a lag.

Introduction

There has been a significant increase in the use of sovereign bonds as a major source of financing by emerging market economies in the last decade. Jamaica is no exception. The country's sovereign issues rose from US$100 million in 1996, when the first Eurobond was floated, to US$1,692.4 million in 2003. There has, conversely, been a significant falloff in financing from other sources, for example, through multilateral and bilateral arrangements. Sovereign yield spreads on the secondary market have, therefore, become the clearest indicator of the cost of external financing for the Jamaican economy.

This paper fulfils the need, in part, to understand the main factors that influence Jamaica's sovereign spreads. To achieve this, two approaches have been taken in this paper. The first involves the use of time series models to capture the main characteristics underlying the behaviour of Jamaica's sovereign spread, that is, establishing the stylised facts; and the second involves the identification of the determinants of the Jamaican sovereign spreads using cointegration techniques.

The behaviour of Jamaica's sovereign spreads is largely influenced by sentiments about emerging markets, but there seems to be considerable inertia in the US-dollar denominated spreads. By contrast, the Euro denominated spreads react more noticeably to domestic macroeconomic fundamentals. The fiscal deficit was found to possess some significant explanatory power for the spread, albeit with a lag. The behaviour of the Euro denominated spreads to changes in sentiments about emerging market debt suggests that these bonds are "home ports" for investors.

The remainder of the paper is as follows: Section 2 provides a definition of yield spreads and discusses their theoretical and empirical determinants. Section 3 briefly describes the evolution of Jamaica's sovereign debt in the context of the prevailing international and domestic environment. In this section, Jamaica's sovereign spreads are compared with those of other emerging market economies of similar investment rating as Jamaica. Section 4 focuses on the time series analysis of the spread, using daily data. In Section 5, an assessment of the impact of macroeconomic fundamentals on Jamaica's sovereign spread is conducted, while Section 6 concludes.

2. Determinants of Yield Spreads

A yield spread is the difference, in basis points, between yields on debt obligations within and across selected categories[1] or debtors. Yield spreads primarily reflect the market's perception of the risks associated with a particular debt obligation, relative to the alternative or "base" debt. They also provide information about external financing conditions. Spreads typically encapsulate credit, market and liquidity risks in different proportions, based on a variety of factors, such as the characteristics of the debt issuer, investors' appetite for risk and the liquidity of particular instruments, among others. Yield spreads across countries can also be used to shed light on the extent to which shocks are common, while analyses of the term structure of yield spreads can provide an indication of the temporal property of risk. Caution must, therefore, be taken in interpreting yield spreads and their changes, since they are influenced by a variety of factors other than the perceived creditworthiness of the borrower.

Yield spreads on emerging market sovereign bonds differ widely. The yield spread for emerging market bonds is typically defined as the difference in yield between that bond and a benchmark bond with no risk, such as US Treasury bonds of a similar maturity. A number of financial firms publish summary statistics of emerging market bond spreads, including average yield spreads on subsets of emerging market bonds.

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1 These categories include sectors, industries, credit ratings, maturities and combinations of categories.

One such composite index is the JP Morgan Chase and Company's Emerging Market Bond Index (EMBI) Global, which, at end September 2001, was based on approximately 150 bonds, with a combined face value of US$245 billion, issued by 30 emerging market economies.[2] In 1999, Latin America and the Caribbean comprised approximately 66 percent of the index, followed by Asia (15 percent), Europe (14 percent), Africa (4 percent) and the Middle East (0.6 percent).

There are three major branches of research on sovereign bond spreads (Bekaert and Harvey, 2003). The first explores the question of when a country should borrow and when it should default. The other strand of the literature focuses on the likelihood of default and the determinants of the spread. In this context, sovereign yield spreads are usually modelled in a continuous time framework and incorporate default and liquidity risks. The third area of research focuses on the macroeconomic explanations of sovereign bond spreads. Some papers concentrate on the fundamentals as they relate to the spread for one sovereign (for example, Rojas and Jaque, 2003; Bernoth, von Hagen, and Schuknecht, 2003), while others conduct cross-sectional studies connecting macroeconomic variables with yield spreads.

There is some consensus that fundamentals[3] have some impact on bond spreads in emerging economies. These fundamentals can be grouped into three broad, though not necessarily exclusive, categories. The first includes variables related to a country's external financial position and seeks to capture the investors' assessment of the potential for liquidity problems relating to sovereign bonds. These variables include, for example, the level of international reserves and debt, as well as debt service ratios. The second category loosely relates to the domestic economic performance of an economy and includes fiscal and the external balances and gross domestic product (GDP) growth, among others. The third set of variables relates to international factors that may affect sovereign spreads. These may include crude oil prices, external interest rates and movements in key exchange rates such as the US dollar or the Euro, relative to other major currencies.

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2 Time series of average yield spreads are available both for emerging market economies in aggregate and by country, in all cases weighted by the market capitalisation of the instruments included in the average. However, summary information that includes all of Jamaica's sovereign issues is not available as Jamaica is a more recent addition to the index.

3 These fundamentals broadly include credit ratings, debt ratios, the level of foreign reserves, debt service ratios, domestic inflation rates, terms of trade, external interest rates, movements in a composite measure of emerging market spreads (for example, the EMBI), the fiscal balance, measures of income and growth, the external balance, oil prices, the movement in key exchange rates relative to the US Dollar and equity prices in mature markets, among others.

Previous work on the determinants of sovereign spreads offers mixed results as to the primary variables that affect sovereign spreads. Min (1998) found that improvements in domestic solvency and liquidity (debt to GDP, foreign exchange reserves to GDP and debt service ratios) and strong macroeconomic fundamentals (domestic inflation and improved terms of trade) are associated with lower spreads. Specifically, in Latin America, the volatility of bond spreads is highly correlated with domestic inflation rates, debt-to-GDP, and international reserves-to-GDP ratios. Cline and Barnes (1997), on the other hand, suggest that global capital surpluses led to the decline in bond spreads before the Asian crisis. Their study found that emerging market spreads fell systematically from 1995 to mid-1997 by more than could be explained by improving borrower fundamentals.

Lower world interest rates could reduce emerging market bond spreads for a number of reasons. The possibility of non-repayment of risky emerging market bonds drives a wedge between the riskless return and the return on the emerging market bond that, in equilibrium, is positively correlated with the riskless return. Thus, arbitrage should drive spreads lower when the riskless rate falls. A fall in world interest rates pushes down debt-servicing costs on floating-rate debt and hence improves creditworthiness of emerging markets. It also decreases the rate at which existing debt must be rolled over. Finally, a fall in world interest rates should increase investor risk tolerance, which should drive spreads on risky bonds lower.

Nevertheless, early empirical literature on emerging market spreads did not find the predicted relationship between external interest rates and emerging market bond spreads. Cline and Barnes (1997) and Min (1998) found insignificant relationships between US treasury yields and emerging market spreads.[4] Kamin and von Kleist (1999) also failed to find the expected relationship, and in some cases, observed that industrial countries' interest rates were negatively related to spreads. However, Eichengreen and Mody (1998) argue that higher US Treasury bond yields significantly reduced the probability of an issue of an emerging market bond. For instance, when US interest rates rise, there are fewer issues and lower spreads for emerging market bonds due to increased competition. More recently, Ferrucci (2003) mentions that while short-term US Treasury rates tend to be positively correlated with spreads, long-term rates (10-year treasury yields) are negatively correlated with spreads. Ferrucci (2003) posits that a steeper US yield curve is associated with lower emerging market spreads, a result that may be attributable to the presence of leveraged investors, who borrow at short-term rates to lend at longer term rates.

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4 Min (1998) also found that external shocks such as oil prices and the international interest rate are insignificant in determining bond spreads.

Most studies, however, have found that fundamentals are better at explaining differentials in spreads across countries at a given point in time than the changes in spreads over time (Eichengreen and Mody, 1998; Ferruci, 2003). Eichengreen and Mody (1998) assert that a significant component of the movements in spreads over time could be explained neither by domestic fundamentals nor external factors, such as US interest rates or oil prices. Thus, for example, factors that may be difficult to observe directly, like investors' risk appetite or herding behaviour resulting from imperfect information, may have explained episodes of significant spread movements over time, for instance, the 1995-97 period when Latin American bond spreads fell dramatically.

The existence of moral hazard, which is not directly observable, has been cited as one potential explanation for spread compression. This theory posits that investors may not need to be greatly concerned with the creditworthiness of sovereign borrowers if they believe that official lending would allow such borrowers to continue to service their debt, even though the country might be insolvent in the absence of such official support. Dell'Ariccia, Schnabel and Zettelmeyer (2002) test this theory by trying to ascertain whether emerging market spreads behaved differently after the Russian default. They interpreted that event as a largely unanticipated episode, which reduced investors' expectations of future bailouts by the International Monetary Fund (IMF). They found evidence of permanent and significant increases in spreads following the IMF's "non bail-out," as well as a significantly higher dispersion of cross-country spreads, suggesting that investors were subsequently paying closer attention to country fundamentals. At the same time, they noted that it was not possible to distinguish between the existence of moral hazard from IMF lending and the possibility that IMF lending raises expectations for improved policy, which could lead to an improved assessment of fundamental creditworthiness.

Applying common factor analysis, McGuire and Schrijvers (2003) found a significant role for a single common external factor underlying the variation of spreads across the constituents of the EMBI Global index. This factor accounted for about one-third of the variation of emerging market bond spreads, with the remainder driven by factors that were unique to a country's circumstances. The authors opined that the best fit for the common factor was investors' attitude toward risk, as proxied by the volatility implied by options on the S&P 500 index. Given that volatility has fallen sharply since the recovery in the equity markets that began in late 2002, this suggests at least one important factor in the recent rally is declining risk aversion.

Kamin and Kleist (1997), after analysing launch spreads[5] on 304 bonds issued in the 1990s, concluded that spreads on emerging market instruments have strong and

5 Launch spreads are spreads at issue.

well-defined relationships with credit rating, maturity and currency denomination. Eichengreen and Mody (1998), Kamin and Kleist (1999) and Sy (2002) all found that improved credit ratings were correlated with lower spreads.

3. The Evolution of Jamaica's Sovereign Debt: International and Domestic Context

The International Context

Between 1980 and 2003, the international debt securities market surpassed bank loans and official creditor flows to become the second largest source of capital (outside of foreign direct investment flows) for emerging market borrowers. Net financing in the form of bank loans constituted 26.0 percent of all medium and long-term private capital flows to these markets between 1980 and 1985 (Merrill Lynch, 2004). However, net intermediated credit fell to 11.0 percent of total financing to emerging markets between 1996 and 2002. Conversely, the gross issuance of debt securities rose from 2.0 percent to 35.0 percent of emerging markets financing between 1996 and 2002. Table 1 shows that the net issue of Eurobonds accelerated to 48.3 percent of total financing in 2003, while bank loans decelerated to 12.8 percent of total financing, relative to 2002.

The shift from loans to securities had its genesis in the financial crisis of the early 1980s when many developing countries, led by Mexico in 1982, suspended payments on unsustainable bank debts. In 1989, the US Treasury, with the help of the IMF and the World Bank, advanced the Brady Plan.[6] These events were followed by the Asian and Russian crises in the late 1990s, the Brazilian crisis (1999) and, more recently, the Argentine default in 2001. The net flow of bank loans to emerging market borrowers turned negative in 1999 for the first time in 20 years. With the significant decline in bank financing during and immediately after the series of crises, emerging market economies increased their issue of sovereign bonds. By 2002, outstanding emerging market bond debt had grown to US$485 billion, from US$155 billion in 1989, or by an average of 27 percent per year. Approximately 77 percent of the sovereign bonds (Eurobonds) issued between 1990 and 2000 by emerging market governments have been denominated in US dollars, followed by Euro (17.0 percent) and Yen (6.0 percent) denominations.

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6 The idea was to restructure bank debt into liquid, tradable and safe securities, the repayment of which was secured against US Treasury zero-coupon bonds that were to be held in a trust until the restructured bonds matured. In addition, countries were to undertake economic reforms to work their way out of financial distress. The restructuring resulted in Brady bonds worth US$155.0 billion.

Table 1
Emerging Market Financing
End of Period Stocks (in billions of US$)

	2000	2001	2002	2003
Gross issuance by asset	216.4	162.1	135.6	197.9
Eurobonds	80.5	89.0	61.6	97.4
Equities	41.8	11.2	16.4	28.7
Loans	94.2	61.9	57.6	71.8
Gross issuance by region	216.4	162.1	135.6	197.9
Asia	85.9	67.5	53.9	86.2
Latin America	69.1	53.9	33.4	42.8
Europe, Middle East, Africa	61.4	40.8	48.3	69.0
Amortisation by asset	114.3	148.0	129.3	124.2
Eurobonds	52.2	60.0	59.8	61.8
Equities	0.0	0.0	0.0	0.0
Loans	62.1	88.0	69.5	62.4
Amortisation by region	114.3	148.0	129.3	124.2
Asia	57.1	66.5	56.2	49.4
Latin America	32.3	45.9	41.2	40.8
Europe, Middle East, Africa	24.9	35.5	31.9	33.9
Net issuance by asset	102.2	14.2	6.4	73.8
Eurobonds	28.3	29.1	1.8	35.6
Equities	41.8	11.2	16.4	28.7
Loans	32.1	-26.1	11.8	9.4
Net issuance by region				
Asia	28.8	0.9	-2.3	36.7
Latin America	36.9	7.9	-7.8	1.9
Europe, Middle East, Africa	36.5	5.3	16.4	35.1

Source: Global Financial Stability Report, September 2004, IMF.

The market for emerging market sovereign issues has matured considerably in recent years. Market liquidity and transparency have been enhanced as the investor base has broadened. In 1998, hedge funds accounted for approximately 30 percent of all activity in this market, while high-grade or "real money" investors (for example, pension funds and other institutional investors) constituted only 9 percent. By 2002, the share of hedge fund's market participation declined to 10 percent, while that of "high-grade" investors rose to 32 percent. Furthermore, the maturity structure of the bonds in the market has lengthened (for example, 10-year maturity). Additional evidence of the maturing of this market is the decline in the share of Brady bonds in total emerging market debt. The share of outstanding Brady bonds issued by emerging

markets fell from 49 percent in 1995 to 12 percent in 2003. Of the emerging market economies, the most significant gross issue has been by Brazil, which accounted for approximately 47 percent of total emerging market debt in 2003. Russia and Turkey both accounted for approximately 33 percent. Jamaica accounted for approximately 0.3 percent of total emerging market debt in 2003.

The Domestic Context

Jamaica's total external debt, denominated in US dollars, increased to an average of 52.3 percent of GDP for the period 2000-2004, compared with an average of 47.3 percent of GDP for the period 1996-1999 (Table 2). The acceleration in growth in total external debt for the latter period was primarily the result of substantial increases in Eurobonds issued. This expansion was set against the backdrop of a significant widening in the fiscal deficit to 8.4 percent of GDP in 2003, compared with 4.8 percent of GDP in 1996. In addition, there was a notable deceleration in financing from other external sources.

Table 2
Jamaica-External Debt (1996-2003)
(Period Averages)

	1996-1999	2000-2003
Total External Debt US$M (e.o.p.)	3,223.13	4,015.23
% of GDP	47.27	52.72
1. Multilateral US$M	1,094.18	1,157.75
% of GDP	16.04	15.22
2. Bilateral US$M	1,524.15	1,068.53
% of GDP	22.46	14.08
3. Private creditors US$M	607.30	1,789.13
% of GDP	8.80	23.43
(i) Commercial Banks US$M	224.28	93.03
% of GDP	3.34	1.23
(ii) Other US$M	45.63	190.23
% of GDP	0.69	2.48
(iii) Bonds US$M	337.40	1,505.88
% of GDP	4.77	19.71

Source: Ministry of Finance and Planning, Jamaica.
Note: e.o.p. means end of period.

Given the positive external financing environment, the Jamaican government approached the international capital market for the first time in 1996 (Table 2). Following the financial sector crisis, which began in 1996, the Government's five-year programme to intervene and rehabilitate the banking and insurance sector resulted in increased public sector demand for financing. The Government's commitment to the maintenance of a stable macroeconomic framework and continued fiscal and monetary restraint under its IMF programme was perceived as a positive signal by international investors. Against the background of relatively sound macroeconomic fundamentals prior to the financial sector crisis,[7] the Government was able to successfully approach the international capital market to secure US$100 million in 1996 and then a five-year bond (GOJ 2005) for US$200.0 million at a coupon rate of 9.6 percent in 1997 (Table 3).

Table 3
Jamaica's Sovereign Debt Issues (1997-2004)

Issue Year	Bond Issue	Interest (%)	Maturity Date
1996	US$100	n.a.	n.a.
1997	US$200	9.6	02 July 2002
1998	US$250	10.9	10 June 2005
2000	•200	10.0	24 February 2003
2000	US$225	12.8	01 September 2007
2001	• 175	10.5	09 August 2004
2001	US$400	11.8	15 May 2011
2001	US$250	11.6	15 January 2022
2002	US$425*	10.6	20 June 2017
2004	•200	10.5	11February 2009
2004	•200	11.0	27 July·2012
2004	•150	10.5	27 October 2014

Notes: n.a. not available.

* Re-opened on 30 April 2004. Reopening amount was US$125 million.

7 Real output growth of the economy averaged 3.2 percent for the period 1987-1996. During the early 1990s, the country had undergone several significant changes that resulted in the liberalisation of exchange controls, the capital account and trade. The Government had also managed to lower the annual average measure of inflation from over 80 percent in 1992 to 25 percent in 1996.

By March 1998, Moodys' Investors Service, the first agency to rate Jamaica's long-term foreign currency debt, gave the country a speculative grade-rating, category Ba3[8] (Table 4). Moodys noted that although Jamaica was vulnerable to external shocks, the country had the capacity to expand its earnings from mining and tourism. The Government's commitment to rehabilitating the financial sector was deemed credible by the agency, thereby allowing the Government to successfully approach the international capital market again for financing in June 1998. However, the coupon rate on the loan increased by approximately 1.3 percentage points to 10.6 percent, relative to the previous bond issue, albeit the tenor was two years longer than the previous tenor of five years. The rise in yields was attributed to the negative effects on emerging market bond issues of the financial sector crisis in Asia during that year. International investors increased their scrutiny of emerging market economies and demanded higher returns on more risky investments.

Table 4
Jamaica: Historical Sovereign Credit Ratings

S&P (Long-Term Foreign Currency)	
Date	**Rating**
9-Nov-1999	B/Stable/—
2-May-2001	B/Positive/B+
28-Jun-2003	B/Negative/B
20-Jul-2003	B/Stable/B
05-Feb-2004	B/Negative/B
Moody's (Long-Term Foreign Currency)	
30-Mar-1998	Ba3
17-Apr-2003	Ba3
27-May-2003	B1

Source: Ratings Direct, RBC.

8 Moodys defines the Ba credit rating as: "Bonds that are judged to have speculative elements; their future cannot be considered as well secured. Often the protection of interest and principal payments may be very moderate and thereby not well safeguarded during both good and bad times over the future. Uncertainty of position characterises bonds in this class".

A significant decline in liquidity in the international capital market occurred in 1999, the result of the Asian financial crisis and the Russian Federation's default on its external debt obligations in August 1998. These events influenced the absence of the Jamaican Government from the market for that year. The effect of both crises on the price of Jamaica's Eurobonds on the secondary market was also significant, with the spreads over US Treasuries expanding by as much as 1237.0 basis points in October 1998 from 294.4 basis points in the similar period of the previous year (Figure 1).

In November 1999, Standard and Poors (S&P) assigned its single B long-term foreign currency rating to Jamaica's unsecured foreign currency debt.[9] This was the first rating assigned to Jamaica by the agency. The organisation noted that, although Jamaica had the highest level of public sector debt of all rated sovereigns (approximately 160.0 percent of GDP in 1999), largely due to the financial sector crisis, political stability in the country and progress in economic liberalisation and reform allowed for a stable outlook rating.

With this fairly favourable rating, Jamaica was able to approach the international capital market on two occasions during 2000. The first of the two issues was Jamaica's premier Euro-denominated global bond, which was issued on 24 February 2000 for •200 million. The 3-year instrument carried a coupon rate of 10 percent, in part attributed to the country's lack of a credit history in that market. The second instrument was issued during a period of tightness in liquidity in the international capital market. In this context, the seven-year US$225 million Eurobond was issued at a rate of 12.8 percent, which, although 2 percentage points above a similar tenor offered in 1998 and approximately 2.8 percentage points above the bond offered six months earlier, was better than anticipated.[10] The lower-than-projected interest rate was partly attributed to the start of an agreement with the IMF to informally monitor Jamaica's economic programme for FY2000/01 and FY2001/02.

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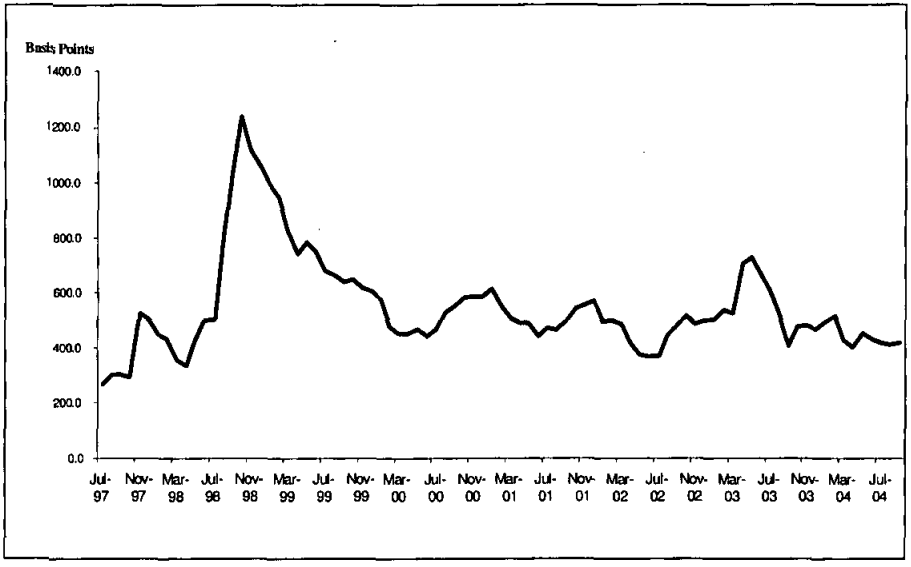
9 S & P's single B rating on long-term foreign currency issues indicates a "more vulnerable" country but one that currently has the capacity to meet its financial commitments. The rating agency also notes that adverse business, financial or economic conditions will likely impair the country's capacity or willingness to meet its financial commitments.

10 The Government had anticipated a coupon on the instrument of 13.125 percent. The actual coupon was approximately 38 basis points below that figure.

Figure 1

Jamaican Sovereign Spreads



In 2001, there was significant turbulence in both the international and the domestic environment. Following the tragic events on 11 September 2001 and the associated slowdown in economic growth, particularly in the US economy, there was rising instability in the international capital markets, which was exacerbated by an expected default in Argentina. Against the backdrop of these adverse international events, credit quality declined significantly in emerging markets, with a total of 223 downgrades reported by S&P in that year alone, compared with 120 downgrades in 2000. In Latin America, Argentina had the most significant downgrade. This country's default on its debt led to growing concerns by international investors regarding contagion effects and engendered heightened scrutiny of emerging market economies by rating agencies.

There was also increased concern about Jamaica's vulnerability to external shocks. With a downturn in the global travel industry, tourist arrivals declined. Moreover, violent disturbances in Kingston in July and severe flooding caused by Hurricane Michelle in November 2001 underscored the vulnerability of selected sectors of the economy to shocks. Global demand for alumina also fell as the international aviation industry rationalised its operations. In this context, growth in real output declined by an average of 0.3 percent during the second half of the year, relative to growth of 1.8 percent during the first half of the year. The external current account deficit widened to approximately 6.0 percent of GDP, from 3.9 percent the previous year.

Despite the macroeconomic challenges, in May 2001 S&P upgraded Jamaica's rating on its long-term foreign currency sovereign debt from B to B+ and revised the outlook from stable to positive. The organisation noted that the upgrade reflected the strengthening of the country's financial sector and better prospects for macroeconomic stability due to the government's continued adherence to tight fiscal policy.

Jamaica maintained its presence in the international capital market in 2001, approaching the market for funding on three occasions. The first issue was made on 9 February, for a total of •175 million, which was increased by •50 million due to higher than anticipated demand, while maintaining a relatively low yield of 10.5 percent. The bond had a maturity date of 9 August 2004. In the context of the favourable review, the Government of Jamaica was able to issue two bonds totalling US$450 million in May 2001[11] and another for US$250 million in December 2001.[12] The latter issue represented the Government's debut issue of a Schedule B Registered Global Bond. The Government achieved considerable success in extending the maturity profile on these two Eurobonds to 10 years and 20 years, respectively, with yields of 11.75 percent and 11.63 percent.

The success of the US$250 million Eurobond issue in December 2001 could be partly attributed to the fact that the Government was in the process of filing a Shelf Registration Statement with the United States Securities and Exchange Commission (SEC).[13] It was anticipated that the SEC registration would facilitate greater liquidity for the Government's Eurobond issues and a broadening of Jamaica's external investor base and therefore enhance secondary market trading of the country's bonds. The Shelf Registration would also give the Government greater flexibility to take advantage of market opportunities, with the ability to access the international capital markets at very short notice.

Jamaica completed the process of filing the Shelf Registration Statement with the SEC for US$700 million on 22 February 2002. During February, S&P also affirmed Jamaica's single B+ long-term foreign currency sovereign credit rating with the outlook being stable, although noting that the country faced a high government debt burden and severe fiscal inflexibility, poor growth prospects and external vulnerability. The

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11 Due to favourable market conditions and strong demand, the initial offering of US$275 million was re-opened two weeks later for an additional US$125 million.

12 From an initial amount of US$50 million, this was upsized to US$250 million due to favourable market conditions and strong demand.

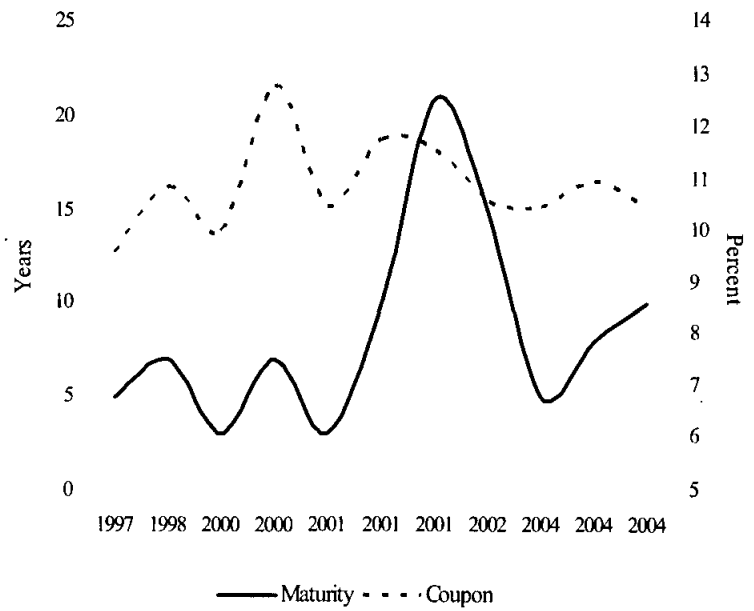
13 To be compliant with the 1933 US Securities Act (amended in 1934), all securities sold in the US must be registered with the SEC. The SEC has the power to register, regulate and oversee brokerage firms, transfer agents, and clearing agencies, as well as the US securities self regulatory organisations (SROs).

rating was supported by the existence of a "stable political environment" and "the restructuring of Jamaica's financial sector, which could strengthen the country's policy framework and set the stage for economic recovery and a gradual reduction of its high public debt burden" (see Standard and Poors, 2002).

With this rating, Jamaica was able to approach the international capital market for financing, amounting to US$300 million on 20 June 2002. The bond had a 15-year tenor and was issued with a significant reduction of 100 basis points in the yield to 10.63 percent, relative to the previous issue (Figure 2). The successful issue represented a continuation of the lengthening of the maturity profile of the country's external debt. In addition, for the first time, the Government advised local investors that income tax would be applied to the interest payable on the derivative instruments of Jamaica's sovereign issues, according to section (m) of the Income Tax Act.

For the period April to May 2003, Jamaica experienced a significant depreciation in the exchange rate, which was partly associated with the negative news that the Government had failed to meet its fiscal target, the consequence of a fall-off in tourism flows and increased expenditure related to several episodes of flooding. In fact, the country experienced a significant deterioration in its fiscal accounts to approximately

Figure 2
Average Maturity and Coupon Rate on New Issues: 1997-2004



8 percent of GDP, relative to the target of 4.5 percent of GDP for FY2002/03. In July 2003, consequent on this fiscal shock, S&P revised the outlook on the country's long-term foreign currency rating to negative from stable. This revision reduced the possibility of the Government launching a successful issue in the international capital market during that year.

In addition, with the continued downturn in the global economy, liquidity in the international capital market fell dramatically, as investors became concerned about the potential adverse impact of a war in Iraq on speculative grade countries and ultimately sovereign creditworthiness. The concern was particularly so for countries that were primarily net oil importers, as the war had resulted in significant increases in oil prices. It was felt that a prolonged war in Iraq would keep oil prices high, which could lead to contractions in global economic output. The fiscal accounts of many countries could worsen, with trade and capital flows falling. It was believed that, in such an environment, structural deficiencies in an economy might become more pronounced, with countries like Jamaica, that already had a negative outlook, being particularly at risk.

Despite the concerns, the global financial system was strengthened by acceleration in growth among the major industrialised countries for the period January to October 2004. During the first quarter of 2004, low bond yields in the developed economies and low emerging market bond spreads engendered strong demand for emerging market assets and thus created the incentives for emerging market issuers to accelerate funding plans. Jamaica was no exception. In February 2004, a Eurobond valued at •200 million was issued at 10.5 percent for 5 years (Table 3). The second issue on 30 April 2004 represented a reopening of the 2017 Eurobond, with the incremental issue being US$125 million. The Jamaican Government also issued an eight-year • 200 million bond at 11 percent on 27 July 2004. A 10-year Euro-denominated bond was issued on 12 October 2004 for • 150 million at 10.5 percent.

Despite the challenges facing emerging markets in general and the Jamaican economy in particular, the spreads on Jamaica's bonds have performed relatively well over the period 1998 to 2004, compared with those of similarly rated economies. As shown in Table 5, speculative grade countries, as rated by S&P, had spreads ranging from –39.4 to 2297.0 basis points. The mean spread of 594.6 basis points on Jamaica's sovereign issues[14] was significantly below this level, and has been lower than those for countries that have been more highly rated than Jamaica, such as Brazil and Turkey, whose average spread was 884.2 and 611.8 basis points, respectively.

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14 The Eurobonds included in this sample are only those that are currently traded.

Table 5
Comparative Assessment - Sovereign Spreads

Country	Mean	Std. Dev.	Median	Max.	Min.	S&P Rating*	Moodys*
	Investment Grade						
Poland	167.6	80.5	182.0	291.0	4.0	BBB+	A2
	Speculative Grade						
High Speculative							
Turkey	611.8	211.7	613.0	1133.0	237.0	BB-	B1
Brazil	884.2	354.5	780.8	2297.0	403.0	BB-	B1
Indonesia	376.1	259.1	390.1	776.8	-39.4	B	B2
Jamaica**	594.6	109.6	572.3	1005.3	392.8	B	B1
Low Speculative							
Argentina	3275.9	2295.9	4347.0	6858.0	523.0	SD	-

Notes: Weekly Observations - 265 for period 7/30/99 to 8/26/04.
* As at October 2004.
** Only includes Jamaican bonds that are currently traded.

4. Time Series Analysis of Jamaica's Sovereign Spreads

This section summarises the time series properties of Jamaica's sovereign spread, with a view to capturing essential stylised facts about the series. Daily data over the period 26 June 1997 to 24 September 2004 were used in the analysis.

An index of Jamaica's sovereign bond spreads (defined as the secondary market yields on Jamaica's bonds minus an average of yields on selected US Treasury bonds)[15] was calculated as a weighted average of the yield to maturity on Jamaica's bonds based on their outstanding par values, that is,

$$AverageYield = \sum_{i=1}^{N} W_i^t * Yield_i^t$$

where W_i^t represents the outstanding par value weighting. This index was also disaggregated into sub-indices, reflecting the spreads on the US-dollar-denominated bonds and the Euro-denominated bonds. Only those bonds that are currently being traded (with the exception of the recently issued GOJ2014) have been included in the assessment.[16] Table A1, in the Appendix, presents the descriptive statistics associated with each bond.

The average spread for Jamaica's bonds is 628.0 basis points, with an average standard deviation of 117.7 basis points. The spreads reached a maximum of 1487.5 basis points on 26 May 2003 and a minimum of 237.0 basis points on 24 September 2004. All the bonds noted in Table 4 have a positive value for the skewness statistic, which provides evidence of distributions that have long right tails, so that the spreads more often than not were above the 628.0 basis points average than below it.

For GOJ2005, GOJ2007, GOJ2011 and GOJ2022 issues, the distribution of the spreads on these bonds is leptokurtic, suggesting a tendency for clustering around the mean spread.[17] This implies that investors did not, despite the arrival of new

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15 These include the 3, 5, 7, 10 and 20-year US Treasury bonds.

16 The bonds excluded from the sample include the GOJ2002, GOJ2003 and GOJ2004, which have already matured and the GOJ2014, which was issued in October 2004.

17 $Kurtosis \ : K = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{X_t - X}{s}\right)^4$. Data sets with high kurtosis tend to have a distinct peak near the mean, decline rapidly and have heavy tails. Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. The kurtosis statistic for a standard normal distribution is 3. The estimated kurtosis statistic is compared with the value of 3 in order to know if the distribution is leptokurtic (values of kurtosis greater than 3) or platykurtic (values of kurtosis less than 3).

information, significantly change their view of the risk associated with Jamaican bonds over the sample period. Alternatively, the base rate used in the calculation of these spreads may be consistent with the rates investors view as their base rate. Interestingly, these bonds are all US$ denominated. However, the kurtosis for the GOJ2009 and the GOJ2012 bonds, which are Euro denominated instruments, indicates that the spreads are platykurtic, which implies that the spreads on these bonds are more variable than those associated with the US$ denominated instruments. It may be the case that the holders of these bonds re-price the instrument with the arrival of new information, or that the base rate used in the computation of the spread on these bonds may not accord with the base rates employed by investors.

Additionally, to test whether the series are normally distributed, the Jarque-Bera (*JB*) test statistic is used.[18] The results are presented in Table A2 (see the Appendix). Under the null hypothesis of a normal distribution, the *JB* statistic is distributed as a χ^2 with 2 degrees of freedom. The advantage of this test is that it is a joint test, since it measures the difference of the skewness and kurtosis of each series of spreads with those from the normal distribution. For all the US dollar-denominated bonds, the reported probabilities that the *JB* statistic exceeded (in absolute value) the observed value, were all zero, leading to the rejection of the null hypothesis of a normal distribution. Conversely, the spreads on the Euro-denominated instruments were more normally distributed.

The autocorrelation (ACF) and partial autocorrelation (PACF) functions are used to explore the possibility of fitting traditional time series models to the sovereign spread data. Tables A3 (a) and (b) present the ACF and the PACF for the spreads of the aforementioned bonds (see Appendix). The autocorrelation functions for all the US-dollar-denominated bonds exhibit a very slow decay, which is indicative of a high degree of persistence in the series, since after as many as 50 lags, the effect of a shock to the spread is still present. Interestingly, the shock to the Euro-denominated bonds is much shorter, with as few as 10 lags. The computation of the half-life of a shock to the sovereign spread allows for the assessment of the time it would take for the shock to reduce to half its impact (see Table A4, Appendix). A half-life value that is large means that the process is very persistent, so that any shock to the sovereign spread takes a long time to die out (as would be the case in the random walk). A low half-life value means that the time it takes for a shock to reach half of its original level is shorter, indicative of lower persistence in the process. For the US-denominated bonds, the half-life is 26 trading days on average, while for the Euro-denominated bonds, the

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18 *Jarque-Bera*: $JB = \frac{N-k}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right)$ where S is skewness and K is Kurtosis.

average half-life is approximately 2 trading days. The effects of shocks to US-dollar-denominated spreads are more persistent in the market for US dollar-denominated bonds than in the market for Euro-denominated instruments.

Stationarity

The Augmented Dickey Fuller (ADF) test was used to assess whether the sovereign spreads were stationary. Stationarity in time series also relates to shock persistence in that, for a stationary series, a shock has no permanent effect. Table A5 in the Appendix presents the results of the ADF under two different lag selection criteria. With the exception of GOJ2009, the ADF unit root tests fail to reject the hypothesis of a unit root series, which confirms the findings of the ACF and PACF.

ARCH Effects

For several of the series, there were episodes where positive (negative) shocks seemed to be followed by positive (negative) shocks, generating several clusters of upswings or downswings (Figure A1, Appendix), that is to say, current volatility can be explained by past shocks and past volatility (periods of high volatility will be followed by periods of high volatility).[19] This series displays Autoregressive Conditional Heteroskedasticity (ARCH) effects. The more formal Lagrange Multiplier test for ARCH disturbances, proposed by Engle (1982), is used. This test involves a two-step procedure: the first step involves capturing the mean regression, which will consist of an AR(n) specification of the form:

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + \ldots + a_n y_{t-n} + \quad _t \tag{1}$$

From this regression, the series of estimated errors ($\hat{\varepsilon}_t$) are recovered and these will be used in the second stage. The second stage involves regressing the square of the estimated error terms ($\hat{\varepsilon}_t^{\,2}$) on a constant and q-lags of the square of the estimated error terms.

$$\hat{\varepsilon}_t^2 = \alpha_0 + \alpha_1 \hat{\varepsilon}_{t-1}^2 + \alpha_2 \hat{\varepsilon}_{t-2}^2 + \ldots + \alpha_q \hat{\varepsilon}_{t-q}^2 \tag{2}$$

19 This phenomenon is called volatility clustering.

If there are no ARCH effects, the estimated values of α_1 through α_q should be zero. This regression would have little explanatory power, so that the coefficient of determination will be small. With a sample of T residuals, under the null hypothesis of no ARCH errors, the test statistic TR^2 converges to a χ^2_q distribution. Rejection of the null hypothesis that α_1 through α_q are jointly equal to zero is equivalent to rejecting the null hypothesis of no ARCH errors. If $T*R^2$ is sufficiently low, it is possible to conclude that there are no ARCH effects. From the results presented in Table A6 (see Appendix), the hypothesis of ARCH effects cannot be rejected at 1.0 percent significance level for the US dollar-denominated bonds. Therefore, a model that includes ARCH effects would better capture the behaviour of these sovereign spreads. The absence of ARCH effects for the Euro-denominated instruments suggests that news (positive or negative) does not precipitate volatility in these spreads.

GARCH (1,1) Model

Bollerslev (1986) extended Engle's (1982) original work by developing a model that allows the conditional variance to be an ARMA process. Under this generalised linear ARCH *(p, q)* model (GARCH(1,1)), the error process is such that conditional volatility takes the following functional form:

$$\Delta S_t = b_0 + \varepsilon_t, \qquad \varepsilon_t \, \Omega_{t-1} \sim D(0,h_t) \tag{3}$$

and,

$$h_t = \omega + \sum_{i=1}^{q} a_i \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i h_{t-i} \tag{4}$$

where ω, α_i and β_i are constant and non-negative parameters. This specification allows for the conditional variance to be dependent on past information. More specifically, the conditional variance is explained by past shocks and past variances.[20] The key features of this specification are that if $p=0$, the process reduces to an ARCH *(q)* process and ε_t a white noise process when $p=q=0$. To ensure stationarity and to prevent negative variances the restriction $\sum_{i=1}^{q} a_j + \beta_j < 1$ must hold.[21]

20 Engle and Ng (1991) examined the implied relationship between past errors and the conditional variance. The graphical representation of this relationship is termed the news impact curve. The exact shape of this curve is dependent on the specification of h_t.

21 See Bollerslev (1986) for a comprehensive discussion on the need for these restrictions.

Generally, the linear GARCH*(p,q)* model, based on the conditional normal distribution, captures thick tails and other stylised facts such as non-trading periods. Notwithstanding the apparent success of linear GARCH models, Engle and Ng (1991), Bollerslev, Chou and Kroner (1992) and other leading researchers have suggested that there are features of the data that this model cannot capture. For example, the GARCH *(p,q)* model does not always account for significant fat-tailedness in the unconditional distribution (see Baillie and Bollerslev, 1989; Hseih, 1988). In addition, the effect of either positive or negative shocks is symmetric, that is, it does not allow for different responses of the conditional variance in terms of the sign of the shock. This positive shock will have a different impact on the conditional variance than negative shocks. Against this background, there have been a number of extensions to the GARCH *(p,q)* model to explicitly account for skewness and asymmetric volatility.[22] The analysis will be restricted to the earliest extension of the GARCH model that incorporates asymmetric effects, the EGARCH model, in order to capture the asymmetric effects of positive and negative shocks on the conditional variance. In the EGARCH model, the specification for the conditional variance is:

$$\log(\sigma_t^2) = \omega + \sum_{j=1}^{q} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{p} \alpha_i \left| \frac{\varepsilon_{t-i}}{\alpha_{t-i}} \right| + \sum_{k=1}^{r} \gamma_k \frac{\varepsilon_{t-k}}{\sigma_{t-k}} \qquad (5)$$

where ω, α_j, β_i and γ_k are constant parameters. Unlike the GARCH *(p,q)* model, the form of the EGARCH *(p,q)* equation indicates that the conditional variance is an exponential function, thereby removing the need for restrictions on the parameters to ensure positive conditional variance. The asymmetric effect of past shocks is captured by the γ_k coefficient, which, when negative, indicate, *ceteris paribus*, that positive shocks generate less volatility than negative shocks. This captures the sign effect by allowing positive and negative innovations to have different effects on volatility. If $\gamma = 0$, positive and negative shocks have the same effect on volatility and the model reverts to an ARCH model. The size effect is captured by β_j and is expected to be positive. Shocks are measured relative to their standard deviations.[23] The specification

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22 These include the exponential GARCH (ECARCH) model proposed by Nelson (1991), the Glosten, Jogannathan and Rankle (1992) (GJR-GARCH) model, asymmetric power ARCH (APARCH) model, Zokian (1994) threshold ARCH (TARCH) model, to name a few.

23 The use of absolute shocks and logs in this parameterisation allows for the capture of the size effect, in that it increases the impact of large shocks on the next period's conditional variance.

used also includes lagged spreads in the variance equation. The model also assumes that investors are risk-averse and will require large compensation for holding risky assets. In this context, the ARCH-M framework proposed by Engle, Lilien and Robins (1987) is also incorporated in the model to allow the mean of a sequence to depend on its own conditional variance (see Enders, 1996, pp. 158-165).

The results presented in Table A7 (in the Appendix) generally support the use of GARCH models to explain volatility in Jamaica's sovereign spreads, with the exception of GOJ2012. This is explained by the significant coefficients on the alpha (ARCH) and beta (GARCH) terms. For the GOJ2012, the absence of ARCH and GARCH effects confirms the results from the Lagrange Multiplier tests for ARCH disturbances. The results suggest that, for the US dollar-denominated instruments, there is asymmetry in the response of volatility in spreads to the arrival of news. The positive coefficients on the gamma variables indicate that negative news has a greater impact on bond spread volatility than positive news. This implies that holders of these bonds are more sensitive to adverse information than to good news. The insignificance of the gamma term in the equations for the Euro-denominated instruments supports the view that this market is relatively more efficient, compared with the market for the US dollar-denominated instruments.

5. The Impact of Macroeconomic Fundamentals on Jamaican Spreads

This section assesses the macroeconomic factors (fundamentals) that play a critical role in determining changes to Jamaica's sovereign bond spreads. Following Engle and Granger (1987), if the variables used in a model are cointegrated, an OLS regression yields a "super-consistent" estimator of the cointegrating parameters $\alpha_{0,\ldots,}\ \alpha_{t.}$ In order to determine whether the variables are actually cointegrated, the residual series is $(\hat{\varepsilon}_t)$ derived from the long-run relationship:

$$S_t = \alpha_0 + \alpha_1 EFF_t + \alpha_2 MF_t + \alpha_3 GL_t + \alpha_4 MS_t + \varepsilon_t \qquad (6)$$

where, EFF_t represents the variables related to the country's external financial position (that is, the total debt to GDP and international reserves to months of imports). MF_t represents macroeconomic fundamentals (namely, the current account to *GDP*, changes in the real exchange rate, an indicator of openness and the exchange rate) and GL_t, which serve as a proxy for global liquidity (includes the yield on the US 10-year Treasury bond). The measure of market sentiment (MS_t) is the EMBI+.

If $(\hat{\varepsilon}_t)$ is stationary, the residuals from the equilibrium regression can be used to estimate an error correction model (ECM) of the form:

$$\Delta S_t = \alpha_0 + \alpha_1 \Delta S_{t-1} \ldots + \alpha_1 \Delta S_{t-i} + \alpha_2 \Delta EFF_t \ldots + \alpha_2 \Delta EFF_{t-i} + \alpha_3 \Delta MF_t \ldots + \alpha_3 \Delta MF_{t-i} + \alpha_4 \Delta GL_t \ldots + \alpha_4 \Delta GL_{t-i} + \alpha_5 \Delta MS_t \ldots \alpha_5 \Delta MS_{t-i} + \alpha_6 \hat{\varepsilon}_{t-1} + \varepsilon_t \quad (7)$$

A general to specific model selection process was used to obtain the most parsimonious model.

Data

The models considered included relevant measures of country-specific domestic economic fundamentals, the external financial position and global liquidity, the latter represented by the interest rate of a mature market, the USA. They were estimated using monthly data for the period December 1997 to June 2004. The variables that were used as proxies for the external financial position included total debt to GDP, external debt payments to government revenue, total external debt, international foreign reserves to imports of goods and services, total external debt to reserves, short-term debt to international reserves and total short-term debt. The macroeconomic fundamentals included the current account to GDP ratio, the fiscal balance to GDP, changes in the real exchange rate (as a measure of competitiveness) the exchange rate (J$/US$), openness (exports of goods and services plus imports of goods and services as a percent of GDP) and the twelve-month point-to-point measure of inflation, and the primary balance, among others.

A number of interest rate variables were considered to capture the incentives for investors in emerging market bonds to undertake leveraged trades, including the level of short-term and long-term rates. The short-term rates included the 3-month US dollar LIBOR rate, the effective federal funds rate and the 3-month US Treasury bond rate. These interest rates serve as a benchmark in determining the costs of borrowing for investors seeking to build leveraged positions. The long-term rate was the US 10-year Treasury bond rate.

The measures of external market conditions and sentiments included the spreads over US Treasuries of the Emerging Market Bond Index plus (EMBI+), oil prices and foreign exchange rates (Euro/US). The model also incorporated several dummies. The first identifies the crisis period of October 1998 to March 1999, the second was set during the period of the Russian default and one for April 2003, when Jamaica experienced significant depreciation in the exchange rate. Two dummies were included to consider the possible portfolio balance considerations due to the issue or maturing of a bond. A final dummy was included to capture movements in the spread which were attributed to a credit rating downgrade by S&P in June 2003 and again in February 2004.

A measure of monthly GDP was calculated by first computing a quarterly indicator for real imports and exports for the period March 1996 to September 2004. The indicators were fitted against quarterly GDP data provided by STATIN programme. The coefficients from the most parsimonious model were then applied to monthly-interpolated values of real GDP to attain an indicator that best patterned the changes in real GDP.

Results

The overall conclusion from the final short-run dynamic models (ECMs) was that external factors were more pervasive in explaining changes in the spread, relative to domestic factors (see Table A8, Appendix). Two alternative models for the average spread (Overall 1 and 2) were considered because the proxy for external interest rates could not coexist in a model with the domestic fiscal balance. For Overall 2, the fiscal balance was significant at the sixth lag, once the fourth and fifth lags were included. As such, a Wald test was conducted on the coefficients for the fiscal balance and was found to be zero. Thus, the fiscal balance was excluded from Overall 2. For the average spread associated with the disaggregated models by currency type, domestic factors appeared to be as important in determining changes in the spread on the Euro-denominated bonds as external factors.

With regard to the model of the overall spread, a positive acceleration in the EMBI affects the spread positively for up to three months. This is consistent with the view that investors generally make portfolio decisions on the basis of overall market trends, so that sentiments appear to play a significant role in affecting Jamaican bond prices. This finding was corroborated by the significantly negative relationship between a downgrade in credit ratings and spreads in the overall models.

In the first variant of the overall model, an increase in external interest rates causes the spread on Jamaican bonds to decline. This contradicts the theory that spreads should fall when external rates rise because the credit worthiness of borrowers improves as the lower external rates reduce the debt service charges on their variable rate debt instruments. For Jamaica, a rise in external rates will serve to merely reduce the spread in the short run, because such changes improve liquidity in the international market, which drives down the yields on secondary market trades, with no changes in investors' perception about the credit worthiness of the borrower.

For the disaggregated models, the primary balance was the only domestic macroeconomic variable that is important for the US dollar-denominated bonds, while the fiscal accounts are important for the Euro-denominated bonds. While the spreads on the US dollar-denominated bonds do not significantly respond to changes in the current account, this is the case for the Euro-denominated instruments. The lag on this variable is four, probably capturing the data release cycle of the authorities.

Interestingly, while positive market sentiments, as captured by changes in the EMBI, positively affect the US dollar-denominated instruments, there is a negative sign on the EMBI coefficient for the Euro-denominated instruments. This means that there is an increase in demand for these instruments (causing their yields to fall) whenever the yields on other emerging market bonds are rising (demand is falling). Portfolio reallocation therefore occurs, suggesting that Jamaican bonds are "home ports" for investors.

6. Conclusions

The world market for sovereign debt has grown considerably since the advent of financial crises in the early 1980s. The market for Jamaican bonds, however, is relatively new and shallow, compared with its counterparts in Latin America. Since the first flotation, the fortunes of bond placements appear to have revolved around developments in the emerging markets for sovereign issues. Domestic developments such as exchange rate shocks and fiscal excesses have also appeared to be relevant factors in investor pricing decisions.

One aim of this paper was to identify stylised facts that characterise the time series properties of Jamaican sovereign spreads, as well as to identify the main determinants of these spreads in the context of a simple error correction model. With regard to stylised facts, the average spread for Jamaican bonds of 628 basis points is comparatively lower than spreads of instruments in similar rating categories. The distribution statistics revealed that the yields on US dollar-denominated instruments were relatively clustered around its mean and displayed inertia in the face of new information. In contrast, the distribution of the Euro-denominated instruments were more normal, suggesting that investors in this class of instruments processed information relatively more efficiently.

Tests for the presence of volatility in the time series of the spreads indicated that the US dollar-denominated instruments were more volatile in the face of shocks, relative to the Euro-denominated instruments. This is confirmed by GARCH models. Moreover, the GARCH framework revealed asymmetric effects in the US dollar-denominated instruments.

As expected, the principal macroeconomic fundamental affecting Jamaican sovereign spread is market sentiments, as proxied by the EMBI+ and the credit rating downgrade dummy. External interest rates, the primary balance and the time path of the fiscal deficit are also important determinants of the spreads. However, the equation for the Euro denominated instrument indicates that domestic variables are as important for the spread as external variables. This strongly suggests that the market for these instruments is more mature and efficient than the market for the US dollar-denominated instruments. Beyond this, portfolio allocation towards Jamaican Euro-denominated

bonds seems to occur when sentiments change away from emerging market debt, suggesting that these bonds are "home ports" for investors.

In the context of the foregoing, the timing of all sovereign issues by the Jamaican Government becomes a critical issue. The likelihood of issuing a successful bond increases when market sentiment is positive. The Government should also seek to manage the fiscal deficit in an effort to meet credible targets. In this regard, the news regarding the fiscal deficit should also be managed to ensure that investors are informed about the extenuating circumstances that might lead to any deviation from target. Finally, the Euro market appears to be a more efficient and mature market and in this regard would be a more suitable source for financing.

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APPENDIX

Table A1
Descriptive Statistics of Jamaican Sovereign Bond Spreads

Variable	Currency	Mean	Std. Dev.	Knewness	Kurtosis	Minimum	Maximum	No. obs. (Trading days)
GOJ 2005	US$	612.1	213.4	1.3	5.1	181.5	1,487.5	1641
GOJ 2007	US$	577.4	154.3	0.6	4.0	236.6	1,135.7	1066
GOJ 2009	•	578.1	59.7	0.2	2.7	455.8	759.2	177
GOJ 2011	US$	590.1	124.1	1.1	4.7	380.2	1,039.9	888
GOJ 2012	•	676.4	23.2	0.3	2.2	631.7	718.9	52
GOJ 2017	US$	760.9	134.1	0.5	2.9	476.5	1,136.7	590
GOJ 2022	US$	601.2	115.2	1.1	4.3	407.8	1,036.0	723

Table A2
Jarque Bera Statistics

Variable	Currency	Jarque-Bera	Probability
GOJ 2005	US$	751.69	0.000
GOJ 2007	US$	110.25	0.000
GOJ 2009	•	1.94	0.377
GOJ 2011	US$	296.34	0.000
GOJ 2012	•	2.24	0.325
GOJ 2017	US$	26.83	0.000
GOJ 2022	US$	207.99	0.000

Table A3(a)
ACF and PACF, Sovereign Spreads

	GOJ 2005		GOJ 2007		GOJ 2011		GOJ 2017		GOJ 2022	
Lags	ACF	PACF	ACF	PACF	ACF	PACF	ACF	PACF	ACF	PACF
1	0.98	0.98	0.96	0.96	0.99	0.99	0.99	0.99	0.99	0.99
2	0.97	0.19	0.95	0.28	0.98	0.05	0.977	-0.099	0.99	-0.17
3	0.96	0.06	0.93	0.09	0.97	-0.04	0.964	0.01	0.98	0.03
4	0.95	0.05	0.92	0.06	0.95	0.01	0.952	0.002	0.97	0.06
5	0.94	0.01	0.90	0.03	0.94	0.02	0.941	0.017	0.97	0.02
6	0.93	0.08	0.89	0.05	0.93	0.02	0.93	0.033	0.96	0.02
7	0.92	0.00	0.88	0.01	0.92	-0.06	0.918	-0.054	0.95	-0.06
8	0.91	0.00	0.87	0.02	0.91	0.01	0.906	-0.003	0.95	-0.04
9	0.90	-0.03	0.86	-0.02	0.90	-0.01	0.894	-0.035	0.94	-0.05
10	0.89	-0.02	0.84	-0.05	0.89	0.01	0.88	0.02	0.93	-0.06
20	0.81	0.00	0.73	-0.01	0.79	-0.02	0.78	0.00	0.83	0.03
30	0.74	-0.04	0.64	-0.02	0.69	-0.01	0.69	0.02	0.72	-0.01
40	0.66	0.03	0.54	-0.04	0.58	-0.03	0.58	-0.08	0.59	0.02
50	0.57	0.01	0.43	0.02	0.46	0.03	0.47	0.03	0.45	0.04

Table A3 (b)
ACF and PACF, Sovereign Spreads

Lags	GOJ 2009		GOJ 2012	
	ACF	PACF	ACF	PACF
1	0.88	0.88	0.73	0.73
2	0.79	0.11	0.57	0.09
3	0.72	0.00	0.48	0.07
4	0.64	-0.03	0.44	0.12
5	0.59	0.07	0.38	-0.01
6	0.54	0.03	0.33	0.01
7	0.52	0.06	0.25	-0.07
8	0.48	-0.01	0.17	-0.07
9	0.45	-0.01	0.12	-0.01
10	0.41	-0.05	0.06	-0.08
20	0.08	0.01	-0.19	0.06
30	-0.03	0.02	0.00	-0.04
40	-0.15	-0.09	0.00	0.04
50	-0.44	-0.05	0.00	-0.02

Table A4
Half-Life (HL)

Eurobonds	Currency	HL
GOJ 2005	US$	18.4
GOJ 2007	US$	7.6
GOJ 2009	€	2.3
GOJ 2011	US$	24.9
GOJ 2012	€	0.9
GOJ 2017	US$	27.2
GOJ 2022	US$	50.0

Table A5
ADF Unit Root Tests

Variable	*Minimises AIC*			*Minimises SIC*		
	ADF(ì)*	Lag Length	ADF (ô)**	ADF(ì)*	Lag Length	ADF (ô)**
GOJ 2005	-2.37	2	-27.64	-2.37	2	-34.96
GOJ 2007	-1.82	3	-24.60	-1.82	3	-24.60
GOJ 2009	-3.79	0	-15.69	-3.79	0	-15.69
GOJ 2011	-1.52	1	-20.54	-1.52	1	-32.54
GOJ 2012	-2.14	0	-9.19	-2.14	0	-9.19
GOJ 2017	-2.13	1	-21.47	-2.13	1	-21.47
GOJ 2022	-1.67	1	-22.77	-1.67	1	-22.77
Critical Value		-3.43				

* Levels
** First Difference

Table A6
Test for ARCH Effects on Sovereign Spreads

Variable	Currency	Q-statistic	T^*R^2 Statistic	P-Value
GOJ 2005	US$	32.0	284.5	0.0
GOJ 2007	US$	42.5	179.6	0.0
GOJ 2009	•	0.0	3.5	0.1
GOJ 2011	US$	9.7	222.7	0.0
GOJ 2017	US$	14.8	32.7	0.0
GOJ 2022	US$	13.2	85.1	0.0
GOJ 2012	•	5.3	12.6	0.3

Lags (12)

Table A7
Parameter Estimates for GARCH Models

Variables	GOJ2005 US$	GOJ2007 US$	GOJ2009 •	GOJ2011 US$	GOJ2012 •	GOJ2017 US$	GOJ2022 US$
Variance							
Constant	0.03 (0.92)	3.57 (15.06)	1.90 (7.23)	0.14 (1.85)	5.02 (3.89)	0.44 (3.67)	0.27 (1.87)
á (ARCH Effect)	0.20 (6.58)	0.40 (9.96)	0.54 (3.37)	0.17 (3.76)	-0.02 (-0.22)	0.23 (5.73)	0.19 (3.46)
ß (GARCH Effect)	0.98 (178.59)	0.36 (8.51)	0.61 (12.83)	0.95 (62.55)	0.00 (0.00)	0.88 (35.96)	0.92 (28.79)
ã (Asymmetry)	0.06 (2.56)	0.20 (6.03)	0.17 (1.32)	0.07 (2.61)	-0.32 (-1.52)	0.08 (3.12)	0.07 (2.08)

N.B. The data in parentheses are t-statistics

Table A8
Parameter Estimates for Models

Variables	Models			
	Overall 1	Overall 2	US Deno-minated	Euro Deno minated
Constant	2.282	3.064	2.751	-4.322
	(0.368)	(0.480)	(0.459)	(-0.526)
IV (-1)			0.458	0.530
			(5.389)	(4.589)
IV (-2)				0.294
				(2.511)
IV (-4)			0.253	
			(2.700)	
IV (-5)	-0.207	-0.196		
	(-2.210)	(-2.037)		
CAD (-4)				-2.780
				(-2.577)
EMBI	0.158	0.167	0.119	-108.539
	(5.131)	(5.271)	(4.223)	(-3.803)
EMBI (-1)	0.129	0.147	0.069	-90.597
	(3.176)	(3.535)	(2.374)	(-2.381)
EMBI (-2)	0.176	0.195		-126.563
	(4.629)	(5.072)		(-3.381)
EMBI (-3)	0.109	0.117		66.179
	(3.400)	(3.533)		- (-2.221)
US TB (-1)	-61.369			
	(-2.311)			
Fiscal (-1)				-12.450
				(-2.140)
Primary Balance (-1)			-0.330	
			(-3.334)	
Primary Balance (-2)			-0.460	
			(-3.091)	
Primary Balance (-3)			-0.532	
			(-3.069)	
Primary Balance (-4)			-0.623	
			(-3.733)	
Primary Balance (-5)			-0.506	
			(-3.420)	
Primary Balance (-6)			-0.428	
			(-4.252)	
Credit Rating (Downgrade)	-106.075	-97.935		
	(-2.757)	(-2.476)		
ECM (-1)	-0.201	-0.239	-0.039	-0.979
	(-2.527)	(-2.977)	(-5.714)	(-6.722)
	Residuals: Serial Correlation LM Tests			
Breusch-Godfrey	4.440	3.419	1.111	1.008
Probability	0.109	0.181	0.574	0.604
ARCH	5.086	6.644	0.002	0.213
Probability	0.024	0.010	0.966	0.644

N.B. The data in parentheses are t-statistics

Figure A1
Typical Volatility Plot for US$ Denominated Bonds

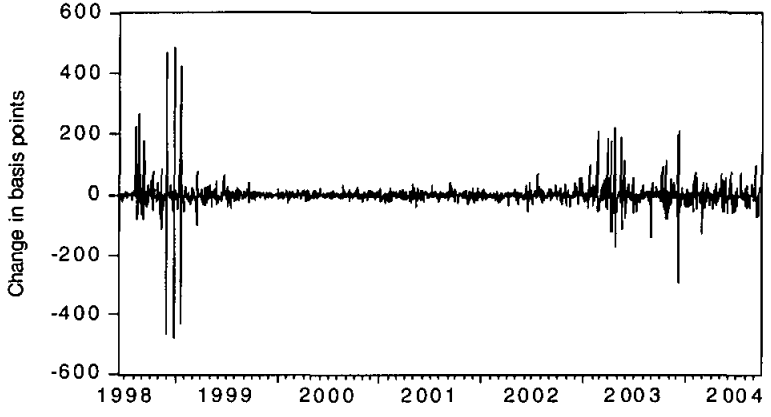

Figure A2
Typical Volatility Plot for Euro Denominated Bonds