IMPORTS AND THE DEMAND FOR FOREIGN EXCHANGE:

Evidence from Jamaican Survey Data

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August 2006

Abstract

This paper estimates the leads and lags for foreign exchange demand in the domestic foreign exchange (FX) market, relative to recorded imports. This is accomplished principally through a survey of the delivery lags and credit terms faced by Jamaican importers. The results of the survey suggest that approximately 30.0 per cent of FX demand in Jamaica in any given month is associated with goods imports recorded in the previous month. However, the largest share of the demand is associated with imports to be recorded two months ahead.

JEL Classification Numbers: C42, L6, L81, Y1

Keywords: Survey, financing, imports

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[1] The views expressed are those of the author and not necessarily those of the Bank of Jamaica.

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1.0   Introduction

This paper is an attempt to estimate the derived demand for foreign exchange (FX) from import transactions as recorded in the Jamaican balance of payments (BOP). This is important given the size of Jamaica's import bill and the significant effect that it has on the FX market. Specifically, an attempt is made to uncover the nature of the dynamic link between recorded imports and the associated payment, after abstracting for known non-cash transactions. The intention is to parameterise a model that can be applied to BOP estimates and forecasts to explain and predict periods of increased FX market activity.

The paper uses a survey to obtain information on the delivery lags and credit terms for imports from a wide cross-section of importers. This is done through the administration of a structured questionnaire complemented by unstructured interviews with company officials.

The paper highlights that, consistent with casual observation, there is some seasonality in imports. The highest monthly levels of overall consumer goods imports, relative to trend, are evident over the period October to December. Fuel imports, which is classified as a raw material, is highest in July. The survey finds that 31.2 per cent of the demand for foreign exchange in month t is associated with the value of *overall* imports recorded in month $t-1$. The largest share of the demand, however, is associated with overall imports recorded in month $t+2$.

On a disaggregated basis, the paper finds that 43.0 per cent of the demand for foreign currency to pay for non-fuel raw materials in period t is related to imports that were recorded in the BOP one month before. Approximately 84.0 per cent of the demand for foreign exchange to pay for consumer items largely occurs within a one-month period before the imports pass through the ports. All the FX demand to purchase capital goods occurs one month before the goods cross the customs frontier.

The remainder of the paper is organized as follows: Section 2 provides a literature review. Section 3 presents a discussion on the motivation and framework used to recover

the parameters associated with FX demand and briefly discusses the structure of the survey. Stylised facts on imports over the period 1995-2005 is covered in Section 4. An assessment of the responses comprises Section 5. Summary remarks are presented in the final section.

2.0   Literature Review

The role of current account (and balance of payments) transactions on the FX market and the exchange rate has generally not been the focus of mainstream thinking. Traditional international economics theory has discussed the role of income and prices determining the exchange rate, with the balance of payments and trade flows representing underlying (and practically suppressed) elements of the transmission process. In this context, the central approaches of open economy macroeconomics have revolved around the Mundell-Fleming (or IS/LM/BP) and portfolio balance models (see for example Mundell (1963), Fleming (1962), Vines and Moutos (1987).

The development of models that assign relative importance to the current account has been pioneered by Kouri (1976), Dornbusch and Fischer (1980), Allen and Kenen (1980) Tobin and de Macedo (1981), Branson and Buiter (1983) and Branson and Henderson (1985). Among the key implications of these models was the impact of deficit financing and "news" or expectations of future changes in the current account for the exchange rate. They also permitted explicit assessments of the impact of current account deficits and surpluses on the exchange rate.

Some of the recent papers on the relationship between the BOP and the FX market have also focused on BOP crises as well as external competitiveness (see for example, Hau and Rey (2005), Henry and Longmore (2002), Milesi and Ferretti (1998), Krugman (1979), and Rodriguez (1980)). With regard to BOP crises, focus has been placed on private capital flows and the potential destabilising effect that reversal can have on exchange rates (Hau and Rey (2005) and Dooley (1982)).

More recently, much work has gone into explaining the behaviour of the domestic exchange rate in the context of a macroeconomic model (Robinson and Allen, 2004). The exchange rate is modelled along the lines of the standard monetary model with rational expectations, where the reduced form changes in the rate are driven by expected fundamentals. The forcing variables in this context are the US/Jamaica interest and inflation differentials and the demand for domestic money balances. To account for the market microstructure the paper included a measure of exchange rate volatility.

Cash Flow Framework

With respect to the role of the overall BOP on the market, the Bank of Jamaica also employs an embryonic cash flow framework. The intent of this framework is to estimate the quantum of foreign exchange that flows into and from the economy over a specified period, using BOP estimates and forecasts. The cash flow framework is an inventory type accounting system that involves separating BOP transactions into cash and non-cash items. Focus is placed on the cash transactions in terms of their prospective effects on the foreign exchange market and, consequently, the exchange rate. Cash transactions are those that impact the local foreign exchange market directly. Non-cash transactions describe a situation where an entry is made in the BOP, but the corresponding flow of foreign currency through the domestic banking system does not take place.

Cash flow analyses and forecasts can be used to alert policy makers to the likely sources of pressures in the FX market. If the analysis suggests that the deviations between inflows and outflows are temporary, sale of foreign exchange to the market by the Central Bank may be warranted. However, if deviations are likely to be protracted, other policy initiatives (such as interest rate adjustments) might become necessary. Theoretical studies on changes in the timing of exchange transactions associated with international trade credit have been forwarded as a possible explanation of instability in exchange rates (Van Der Toorn, 1986).

An important element of the cash flow framework is the estimate of FX demand that ensues from goods imports. Not all imports have a counterpart demand for FX, nor,

where they occur, are all such demands reflected in the domestic FX market. By convention, BOP trade statistics are recorded on the basis of customs documents reflecting the physical movement of goods across the national or customs frontier of an economy (International Monetary Fund, 1993). However, imports can be financed through grants, as well as capital inflows (including foreign direct investments), both of which would not immediately (if ever) result in a significant pull on the domestic market. As such, demand for the FX associated with these transactions may not coincide with the data recorded in the BOP.

Credit Terms

The temporal disjuncture between the physical movement of goods and payment flows (and consequent demand for FX) exists because of the payment arrangement between suppliers and importers. Imports can be paid for in advance of delivery (prepayment/cash in advance)[2], at the time of exchange (such as cash-on-delivery and sight draft[3]), after the importers have taken possession of the item (financed) or a combination of these methods.

Trade financing usually involves facilities from a bank (letters of credit) or the supplier (trade credit) (Watson, 1976). *Letters of credit* involve the issue, by a bank, of a letter to the supplier's bank on behalf of a customer, authorizing the supplier to access payment from his bank under certain conditions. On receipt of this letter, the supplier then authorizes shipment. *Trade credit* on the other hand is an arrangement between a buyer and a seller for the buyer to settle debt at a predetermined future date. One advantage to the importer of this method of payment is that it is relatively inexpensive and involves few restrictions. A popular form of trade credit is referred to as the open account method of payment[4].

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[2] For some companies, there are benefits associated with paying early, including trade discounts.

[3] Under this method of settlement, the importer pays for the value of the draft upon presentation of evidence that the goods have been shipped. It usually involves the issue of a guarantee by the importer's bank of documentary evidence that the importer's account will be debited upon confirmation of shipment.

[4] Unsecured Open Account terms allow the importer to make payments at some specific date in the future and without the buyer issuing any negotiable instrument evidencing his legal commitment to pay at the appointed time. These terms are most common when the importer/buyer has a strong credit history and is well known to the seller. The buyer may also be able to demand open account sales when there are several

The framework employed by the Bank is not fully informed of the leads or lags between BOP import data and developments in the foreign exchange market. The current working assumption is that bauxite related imports (fuel and other) do not require cash from the domestic foreign exchange market. For non-bauxite imports, which include raw materials (excluding fuel), consumer and capital goods, it is assumed that foreign direct investments and grants from abroad to the Jamaican government (both current and capital) are used to finance a part of the overall import bill. The demand for FX is then assumed to be 80.0 per cent of the remaining imports on the assumption that 20.0 per cent of this bill is financed through short-term credit from foreign banks. Importantly, no lag or lead is assumed between the demand for FX and the value of recorded imports.

This paper, therefore, seeks to contribute to the cash flow framework by determining the appropriate lags or leads between recorded imports and their impact on the foreign exchange market.

3.0 Motivation & Methodology

Cash Flow Framework
Conceptually, the cash flow model that relates the demand for FX at a point in time (Y_t) to the observed value of imports (by type or sector) at a different point in time (M^s_{t+j}), can be expressed as follows:

$$Y_t^s = \sum_{p-x=-\infty}^{\infty} \alpha_{p-x} M_{t+p-x}^s, \quad \sum_{p-x=-\infty}^{\infty} \alpha_{p-x} = 1, \ 0 < \alpha \leq 1 \quad (1)$$

where p is the delivery lag (the time between the ordering of the good from the supplier and its arrival at the customs frontier) and x is the credit terms (the number of days that the importer has to pay the supplier) associated with the particular class of import. If $p > x$, Y_t will be generated with a lead relative to M_{t+p-x}. This means the demand for foreign exchange will be manifested in the market <u>before</u> the goods arrive at the ports. If $p < x$, Y_t

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sources from which to obtain the seller's product or when open account is the norm in the buyer's market. This mechanism offers the seller no protection in case of non-payment.

will be generated with a lag relative to M_{t+p-x}, which means the demand for foreign exchange will occur <u>after</u> the goods arrive in ports. Equality between p and x indicates a contemporaneous relationship between observed imports and the associated demand for foreign exchange[5]. The presence of the summation term across p-x is an acknowledgment of credit terms and delivery lags that are not homogenous for any import class s.

Information on p and x can only be obtained from individual importers through a survey[6]. In this context, it is possible to recover the credit terms typically granted to Jamaican importers (by type of imports) from suppliers (x^s) from the following expression:

$$x^s = \sum_{r=1}^{f} \phi_r \, x_r^s, \qquad 0 \le r < \infty \qquad (2)$$

where $\phi_r \, x_r^s$ is the weighted credit terms by sector s, r is an index of the credit terms, the weights (ϕ_r) is the ratio of the imports that are purchased under a particular credit term r and overall imports purchased under credit terms; $\phi_r = \dfrac{M^r}{\sum_{s=1}^{g} M_s^r}$. s = {raw materials imports, consumer goods imports, capital goods imports}. We can recover M^r from the expression $M^r = \sum_{r=1}^{f} k_r^s \eta_m^s$ $\forall$ m = 1….u, where k_r^s is the number of respondents enjoying a particular credit term within a particular sector and η_m^s is the value of their imports by sector.

Similarly, p^s can be evaluated as follows:

$$p^s = \sum_{d=1}^{l} \phi_d \, p_d^s, \qquad 0 < d < \infty \qquad (3)$$

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[5] This framework is similar to the demand equations presented by Warner and Kreinin (1983).
[6] As a pretest, we estimated an OLS model in differences (to ensure that the variables were stationary) of the form $Y_t = \sum_{j=-3}^{3} \alpha_{t+j} M_{t+j}$. We used the total monthly sales of the authorised dealers and cambios as a proxy for Y_t while M_t was overall imports. The limits in the summation term were chosen for convenience, given that longer lags and leads made the overall regression insignificant. We found that all the coefficients on M_{t+j} were insignificant. The results can be requested from the author.

where $\phi_d \, p_d^s$ is the weighted delivery lag by sector s and d is an index for the delivery lag[7].

To parameterise the foreign exchange demand equation illustrated by (1), we propose the following schema for the lag/lead structure as illustrated in Table 1. For example, if [-15 < (p-x) < 15], the foreign exchange demand associated with an import is assumed to occur in the same month that the goods cross the customs frontier (i.e. at time period t).

Table 1:
Lag/Lead Structure of Foreign Exchange Demand

Range for (p-x) (in days)	Lag (-)/Lead(+)
-105<(p-x)<-75	t-3
-75<(p-x)<-45	t-2
-45<(p-x)<-15	t-1
-15<(p-x)<15	t
15<(p-x)<45	t+1
45<(p-x)<75	t+2
75<(p-x)<105	t+3

The α's in (1) can be recovered from the ratio of imports (in US$) associated with particular delivery dates and credit terms (*A*) to total imports (α = A/M). *A* can be recovered from the expression $A = \beta^c M$, where β^c is the number of firms by credit terms and M is the associated value of imports.

Survey Method

The survey was conducted over the period 14 July to 4 August 2006 by the author, assisted by other staff members at the Bank of Jamaica. Since mailed questionnaires tend

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[7] As for the credit terms, the value of imports associated with a particular delivery lag (M^q) can be evaluated as follows: $M^q = \sum_{j=1}^{l} k_j^s \eta_m^s \quad \forall \ m = 1....u$, where k_j^s is the number of respondents reporting a particular delivery lag within a particular sector and η_m^s is the value of their imports by sector.

to have a low response rate, unstructured interviews were considered necessary. Questionnaires were sent to 20 large importers, classified in a sample stratified by sectors[8]. To this end, 30.0 per cent of the sample consisted of manufacturing companies (that import raw materials); 45.0 per cent were companies involved in the distributive trade (importers of consumer goods) and 25.0 per cent were considered to be in the construction sector (that imports capital goods). Given the possibility that one company may be involved in all three activities, the survey contained ranked choices to account for such potential overlaps.

The instrument consisted of seven questions that sought to obtain information on how and when importers finance their imports[9]. To prevent auspices bias (adjustments to responses because of perceptions about the organization conducting the study), the respondents were assured that the information divulged would be kept in the strictest of confidence.

4.0   Imports: Stylised Facts

This section discusses stylised facts about Jamaican imports, derived from secondary data, as a preface to the discussion of the survey results. Jamaica's import bill increased from US$2.8 billion in 1995 (or approximately 46.0 per cent of GDP) to US$4.7 billion in 2005 (or 44.0 per cent of GDP) (see Figure 1). Goods imports also averaged approximately three times the level of net international reserves (NIR) over the review period, which suggests an average import cover of 3 – 4 months (12 - 16 weeks).

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[8] A stratified random sample was selected from firms in the distributive, manufacturing and construction sectors on the basis of their size and earnings.
[9] The questionnaire can be found in the Appendix.

Figure 1:
Total Goods Imports
(1995-2005)
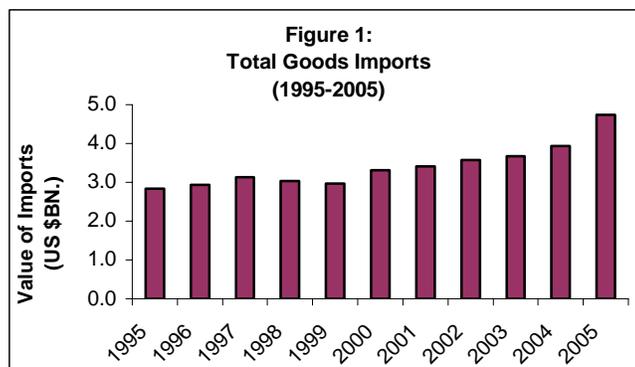
Data is available which makes it possible to disaggregate imports into the end-use classification *consumer goods*, *raw materials*, and *capital goods*[10]. *Raw materials* is the largest category of imports and also displays the highest variability (see Table 1, Appendix). The kurtosis statistic for raw materials is relatively low (5.6), indicating the presence of fat tails (a high percentage of low and high values are in the tails of the distribution) and confirms the variability of these imports. As indicated by the Jarque-Bera statistic, the distribution is non-normal and positively skewed.

Of the three components of the raw materials category, *other raw materials* has the highest percentage share of imports[11] (see Table 2, Appendix). *Fuel*, the other large component of raw materials, experienced the highest growth rate of all imports over the period. In 2005, mineral fuels accounted for 20.0 per cent of imported goods, compared with 6.0 per cent in 1995. This increase was attributable to the rise in world oil prices and strong growth in domestic fuel demand[12] (see Table 3, Appendix).

Consumer goods imports on the other hand accounted for approximately one third of the total value of imports and expanded at an annual average rate of 6.8 per cent between 1995 and 2005. The distribution of consumer goods is also fat-tailed and non-normal.

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[10] Consumer goods can be further disaggregated into food, other non-durables and durables. The raw materials category comprises fuel, food and other raw materials, while *capital goods* contains the categories transport, construction, other machinery and equipment, and other.

[11] This category typically consists of items such as ropes and cables, which are used by telecommunication companies; soft drinks, which are utilized by drink companies in Jamaica, and printed books.

[12] The price of oil on the international market increased from an average of US$18.52 per barrel in 1995 to US$54.38 per barrel in 2005, representing an annual average growth rate of 14.8 per cent. Similarly, the volume of imported fuel expanded by 47.9 per cent reflecting an average annual growth rate of 4.2 per cent.

Non-durable consumer goods is the largest component of consumer goods and experienced annual average growth of 9.4 per cent over the period.

Capital goods imports accounted for the smallest share of overall imports. The distribution of the data is non-normal, leptokurtic and peaked, confirming the low variability suggested by the standard deviation. This is different from those of consumer goods and raw material imports. *Transport*, the largest sub-category, experienced the highest annual average growth rate of 7.5 per cent. This was characterized by expansions in the imports of aircrafts, buses and police vehicles over the period, with a significant increase in 1997, due to the restructuring of the transport sector. *Other machinery* increased significantly over the period at an annual average growth rate of 5.8 per cent. This sub-category accounts for telecommunication equipment, which expanded by 27.5 per cent and 26.4 per cent in 2001 and 2002, respectively, due to the liberalization and subsequent advent of new firms into the Jamaican telecommunication sector.

There appears to be some seasonality in imports. Average transactions are generally highest in the December quarter and lowest in the March quarter (see Figure 2). The usual increase in the value of imports in December quarters, relative to September quarters, typically reflects heightened demand for goods in the Christmas holiday period. Inbound goods crossing the ports normally peak in December at an average of US$351.8 million, while February is noted as the month for the lowest import bill (see Figure 3).

For more precision, we disaggregate *consumer goods*, *raw materials* and *capital goods* into their components and test these components for seasonality[13]. Tables 3A-3C in the appendix indicate that consumer goods and raw material imports are seasonal, but for overall capital goods, none of the seasonal dummies are significant. All the sub-categories of consumer goods imports exhibit seasonality. For raw material imports, while fuel is seasonal, *food* and *other raw material* imports exhibited no such pattern.

Figure 2: Average Quarterly Imports 1995-2005

Figure 3: Average Monthly Imports 1995-2005
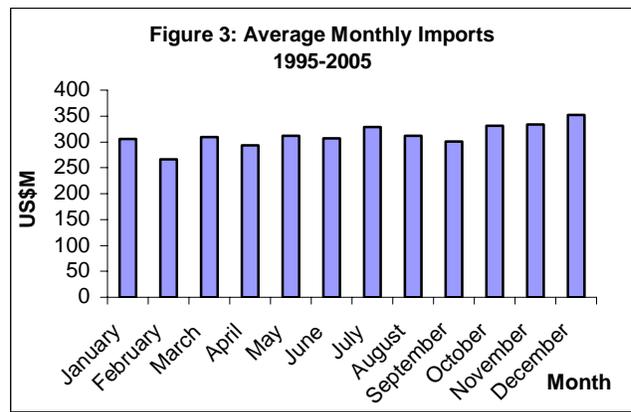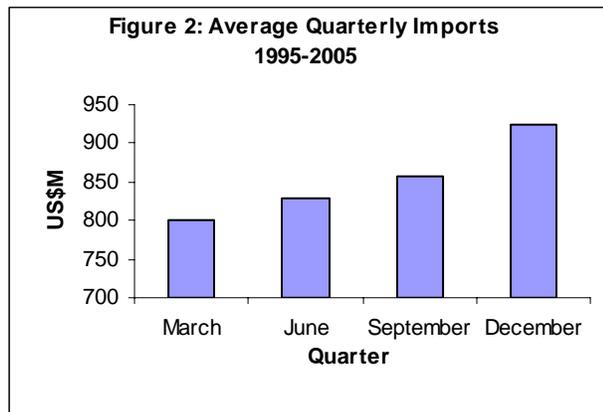
Interestingly, two of the components of capital goods imports are seasonal, despite no indication of seasonality for the overall category.

Tables 4A and 4B (Appendix), display deterministic seasonal factors for those categories of imports that were found to be seasonal. Consistent with casual observation, the highest monthly levels of overall consumer goods imports, relative to trend, are evident over the period October to December. Food and nondurable consumer goods are typically 6.0 per cent and 10.0 per cent above trend for December, respectively, while durables are, significantly, 41.0 per cent above trend in both November and December. For raw

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[13] The test for seasonality entails the estimation of the following regression for each category of imports:

$$m_t = \alpha_i \sum_{i=1}^{n} m_{t-i} + \beta_j \sum_{j=1}^{11} DUM_j + \eta T + \varepsilon_t$$

where m_t is the time series for imports (in US$mn), DUM is a dummy variable, which is equal to one at the j^{th} month and zero elsewhere, T is a time trend and ε is a white noise error process. For the purpose of the regression, we chose to omit the dummy variable corresponding to January. This implies that the remaining coefficients are interpreted as deviations (in US$s) from this month. "n" is chosen to ensure the absence of serial correlation in the error term, while *T* is included if significant. Seasonality exists when the coefficients of the second term on the right hand side of the equation are jointly significant.

materials, fuel imports are highest in July. This is consistent with peak electricity demand as well as the Jamaican driving season, characterised by holiday beach trips and reggae festivals. Construction material imports are usually heaviest in November, perhaps reflecting pre-Christmas home building and repair activities as well as the hotel refurbishing that usually occurs in advance of the winter tourist season. *Other machinery* imports are highest in January, relative to trend.

There is limited data on payment terms for Jamaican imports. Table 5 in the appendix, reports the categories of payment terms as captured by the Statistical Institute of Jamaica (STATIN). The largest credit terms used by Jamaican importers is open account, which, over the period 1999 to 2003[14], accounted for an average of 84.2 per cent of total imports. Letters of credit were used to finance a negligible share of imports.

Some focus can be placed on the payment terms for non-bauxite fuel, given its importance in the domestic FX market. The Energy Co-operation Agreement, PetroCaribe, between Venezuela and 13 Caribbean island nations was signed on 15 August, 2006 and superceded the Caracas Agreement. The main elements of the Agreement are that short-term credit for oil imports will be extended to 90-days from the 30-days that obtained under the Caracas Energy Accord. Agreed proportions of the cost of fuel will also be financed under a deferred payment arrangement. The percentage that will be financed will depend on the price of oil on the world market. This is illustrated in the following comparative table:

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[14] STATIN stopped publishing this type of data after 2003.

Table 2:
Comparative Financing Arrangements:
Caracas Agreement and PetroCaribe

Price per Barrel of Oil	Percentage of Fuel Bill to be Financed	
	PetroCaribe	Caracas
≥ 15	5	5
≥ 20	10	10
≥ 22	15	15
≥ 24	20	20
≥ 30	25	25
≥ 40	30	N/A
≥ 50	40	N/A
≥ 100	50	N/A

Source: PetroCaribe & Caracas Agreements

The repayment terms will also depend on the price of oil. At prices above US$40.00 per barrel for crude oil, the loan will be repayable over 25 years at an interest rate of 1.0 per cent. If crude oil prices fall below US$40.00 per barrel, the interest rate payable will be raised to 2.0 per cent and the repayment period reduced to 17 years. There will be a moratorium of 2-years on all repayments.

5.0   Survey Results

A very high response rate of 80.0 per cent was obtained from the survey. The highest percentage of respondents was involved in the manufacturing sector where their main imported goods consisted of raw materials (see Table 6, Appendix).

Information from the unstructured interviews and other secondary material indicated that most of the companies that participated in the survey had subsidiaries and associate companies in Jamaica and the wider Caribbean. The most common source countries for imports were the US, Canada, UK, and Japan. A common factor among the companies was that many had expanded their business operations into productive as well as distributive activities during the review period (1995-2005). A few of these organizations did not limit their operations to manufacturing and distribution within the domestic economy, but also exported manufactured products.

The level of representation of the sample was fairly high. Total imports, as reported by respondents, represented 59.6 per cent of the value of STATIN's recorded monthly import bill for 2005. The representation of the sample was highest for the raw materials category, while the median import bill of the company fell in the US$1.0 – US$20.0 million range (Table 7, Appendix).

Of the respondents, 81.2 per cent reported seasonal patterns in imports where the December quarter reflected the heaviest rate of imports (see Table 8, Appendix). The largest proportion of the respondents reporting seasonal imports were from the manufacturing. 18.8 per cent of the sample indicated that their imports were non-seasonal, which implies that they exert a constant demand for foreign currency to pay for imports. This was particularly noticeable in the distribution sector.

Approximately 93.8 per cent of the respondents source their foreign currency from the FX market (see Table 9, Appendix). A small proportion of importers (6.2 per cent) use their export earnings to pay for imports.

With regard to the payment terms, 81.3 per cent of the sample acknowledged use of credit to finance imports, which is consistent with the data supplied by STATIN. The remainder used cash. Approximately 90.0 per cent of the respondents who used credit indicated that they accessed trade credit. Of this amount, 25.0 per cent obtained 30–days, 31-60 days and 61-90 days trade credit, respectively. A small proportion of importers are financed by trade credits ranging between 91 and 180 days (see Table 10, Appendix and Figure 4).

Figure 4:
Payment Terms (in Days)

- 91-180 Credit 6%
- 60 – 90 Credit 25%
- Cash 19%
- < 30 Credit 25%
- 30 – 59 Credit 25%
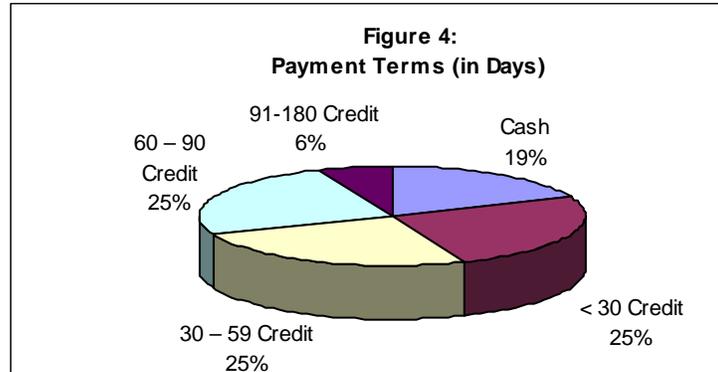
Notably, a large proportion of imports tended to access longer-term credit, as indicated by Table 10 in the Appendix. Approximately 50.0 per cent of the overall value of imports accessed trade credit between 60 and 90 days. The next largest proportion (17.8 per cent) accessed 30 days credit or less.

The average delivery lag was 29 days or 4.1 weeks, with the highest lag of 44 days being evident in the construction sector.

For overall imports, Table 11, appendix, reports the value of imports classified by delivery lags and credit terms. On the basis of this table and the rules in Table 1[15], we find that 31.2 per cent of the demand for foreign exchange in month t is associated with the value of imports recorded in month $t-1$. The largest share of the demand, however, (44 per cent) is associated with imports that occur in month $t+2$. In the context of the foregoing, the demand for foreign exchange in time t associated with the lag/lead structure of overall imports may be captured in the following equation (and for completeness, Table 3):

$$y_t = 0.31m_{t-1} + 0.14m_t + 0.09m_{t+1} + 0.46m_{t+2} \qquad (4)$$

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[15] The class marks of the classes are assumed to be the average delivery lag and credit terms.

Table 3: Distribution Parameters: Foreign Exchange Demand				
Lag/Lead Structure	Overall Imports	Consumer Goods	Non Fuel Raw Materials	Capital Goods
t-1	31.2%	33.1%	42.9%	100.0%
t	13.6%	50.4%	14.3%	0.0%
t+1	8.9%	16.5%	28.6%	0.0%
t+2	46.3%	0.0%	14.3%	0.0%

With respect to the demand for foreign currency to pay for raw materials in period t, 61.0 per cent is related to imports that will be recorded in the BOP two months ahead. This per cent however falls to 14.3 per cent when fuel is excluded. Approximately 84.0 per cent of the demand for foreign exchange to pay for consumer items largely occurs within a one-month period before the imports pass through the ports. Payments for capital goods are generally by cash[16]. Consequently, these transactions reflect FX demand one month prior to the goods being recorded in the BOP.

6.0   Summary and Conclusions

This study had as its major objective the estimation of leads and lags in FX demand equations, relative to recorded imports. In addition, it examined the trends in imports to uncover the stylised facts in the data.

In terms of the stylised facts relating to Jamaican goods imports, imports relative to GDP have remained fairly stable around 45.0 per cent of GDP between 1995 and 2005. *Raw materials* is the largest category of imports and also displays the highest variability. Within raw materials *fuel* experienced the highest growth rate over the period. Imports are seasonal with transactions being highest in December quarters and lowest in March quarters.

In terms of the financing of imports, Jamaican importers largely use open account trade credit, which, between 1999 to 2003, accounted for an average of approximately 84.0 per cent of total imports. Letters of credit were used to finance a negligible share of imports. Fuel imports is largely financed by the PetroCaribe Agreement.

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[16] Table 14 captures the value of capital goods imports which were used to generate the equation.

The response rate and the representativeness of the survey were very high. The survey results indicated that a very high proportion of the respondents source their foreign currency from the FX market. With regard to the payment terms, 81.3 per cent of the sample acknowledged use of credit to finance imports. Of the respondents who used trade credit, similar proportions obtained 30–days, 31-60 days and 61-90 days credit. The average delivery lag was 29 days or 4.1 weeks.

In this context, we estimated that approximately 30.0 per cent of the demand for foreign exchange in month *t* is associated with the value of imports recorded in month *t-1*. The largest share of the demand however is associated with imports that occur in month *t+2*.

With respect to the demand for foreign currency to pay for raw materials in period *t*, approximately two-thirds is related to imports that will be recorded in the BOP two months ahead. The majority of the demand for foreign exchange to pay for consumer items largely occurs within a one-month period before the imports pass through the ports. Payments for capital goods are generally by cash and consequently reflect FX demand one month prior to the goods being recorded in the BOP.

These findings stand in sharp contrast to the existing model in use at the Bank of Jamaica. The adoption of the new parameters relating FX demand to recorded imports should improve the Bank's understanding of the dynamics of the foreign exchange market.

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8.0 APPENDIX

Table 1: Summary Statistics for Imports (1995-2005)

	Mean	Std. Deviation	Skewness	Kurtosis	Jarque-Bera /1
Consumer Goods	84.2	17.2	0.8	4.2	21.8 (0.0)
Raw Materials	152.4	35.5	1.5	5.6	87.9 (0.0)
Capital Goods	49.1	13.9	2.8	16.1	1117.8 (0.0)

/1 The numbers in parenthesis are probability values

Table 1B: Imports by End-Use (1995-2005)

Categories	11 yr. Annual Average (US$M)	Annual average growth rate (%)	Average Percentage share of imports
Consumer Goods	**989.2**	**6.8**	**29.0**
Food	286.6	9.4	8.4
Durables	321.7	9.6	9.4
Non-Durables	380.8	3.8	11.2
Raw Materials	**1838.6**	**6.1**	**53.9**
Fuel	634.5	15.9	18.6
Other Raw Mat.	997.2	1.9	29.2
Food	206.8	2.4	6.06
Capital Goods	**582.1**	**3.8**	**17.1**
Transport	112.6	7.5	3.3
Construction	162.8	3.2	4.8
Other Capital	8.1	1.8	0.002
Other Machinery	298.6	5.8	8.8

Table 2:
Value of Fuel Imports and Average Price of Oil, 1995-2005[17]

Year	Value of Fuel Imports (US$M)	% Change in value of imports	Average Oil Price $US	% Change in price of oil
1995	394.64	-	18.52	-
1996	450.48	14.15	22.53	21.65
1997	408.56	-9.31	21.20	-5.90
1998	303.49	-25.72	14.24	-32.83
1999	416.56	37.26	18.92	32.87
2000	649.55	55.93	29.47	55.76
2001	615.47	-5.25	22.32	-24.26
2002	636.76	3.46	25.23	13.04
2003	830.09	30.36	31.37	24.34
2004	910.49	9.69	39.76	26.75
2005	1360.08	49.38	54.38	36.77

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[17] Source: Petroleum Corporation of Jamaica (PCJ).

Table 3A
Seasonality Test: Consumer Goods Import

Regressors	Overall	Food	Durable	Non - Durable
# of Lagged Dependent Variables	3	3	1	1
Constant	8.76	-0.56	12.62	12.82
Dum 2	-9.17*	-1.05	0.10	-2.46
Dum 3	5.63	2.34	5.77*	3.26*
Dum 4	6.56	1.23	2.60	0.06
Dum 5	10.28*	1.29	2.87	0.69
Dum 6	10.79*	0.25	4.63	3.98*
Dum 7	13.18*	1.59	5.23*	2.76
Dum 8	10.55*	1.22	3.42	2.64
Dum 9	1.16	1.78	-0.04	-1.87
Dum 10	16.86*	3.68*	10.09*	2.60
Dum 11	27.95*	3.26*	19.03*	3.09*
Dum 12	26.60*	2.52*	14.35*	3.74*
Trend	0.11*	0.02*	0.09*	0.05*
Diagnostics				
R-squared	0.84	0.83	0.81	0.57
Prob(F-statistic)	0.00	0.00	0.00	0.00
Breusch-Godfrey Serial Correlation LM Test /1	0.36	0.34	0.06	0.38

 * *Significant at the 5% level*

 /1 Probability value at 4 lags. A value greater than 0.05 indicates no serial correlation.

Table 3B
Seasonality Test: Raw Material Import

	Overall	Fuel	Food	Other Raw Mats
# of Lagged Dependent Variables	4	2	3	1
Constant	33.51	8.72	12.81	60.75
Dum 2	-28.79*	-14.21*	-3.16	-9.99
Dum 3	5.31	2.57	-0.44	1.63
Dum 4	-8.17	-5.39	-0.36	-2.51
Dum 5	1.04	0.30	-0.24	1.00
Dum 6	1.74	-0.90	0.93	-3.59
Dum 7	1.57	1.67	-0.25	1.33
Dum 8	-5.40	-2.17	-1.22	-3.91
Dum 9	-9.70	-7.73	-0.50	-1.13
Dum 10	1.93	-0.14	2.94	-0.57
Dum 11	-16.90	-15.10*	3.40	-1.29
Dum 12	-6.39	-5.13	0.87	-0.29
Trend	0.20*	0.22*	N/A	N/A
Diagnostics				
R-squared	0.65	0.74	0.21	0.13
Prob(F-statistic)	0.00	0.00	0.02	0.14
Breusch-Godfrey Serial Correlation LM Test /1	0.13	0.07	0.07	N/A

 * Significant at the 5% level

 /1 Probability value at 4 lags. A value greater than 0.05 indicates no serial correlation.

Table 3C: Seasonality Test: Capital Goods Import

	Overall	Transportation	Construction Mats	Other Machinery	Other Capital
Number of Lagged Dependent Variables	2	2	6	1	1
Constant	34.09	10.16	1.99	17.70	0.57
Dum 2	-6.32	2.22	0.75	-8.82*	0.00
Dum 3	-0.23	1.16	2.69	-3.90	0.27*
Dum 4	-1.30	0.13	1.36	-3.84	0.04
Dum 5	-1.41	2.79	2.91	-6.44*	0.11
Dum 6	-3.11	-0.11	3.14	-5.70*	-0.07
Dum 7	6.71	8.71	2.14	-4.47	0.04
Dum 8	-2.15	0.10	1.89	-4.96	0.07
Dum 9	-5.92	-0.23	0.67	-5.39	-0.09
Dum 10	1.66	0.66	2.75	-2.25	0.00
Dum 11	4.20	2.28	5.25*	-5.20*	0.10
Dum 12	10.35	10.88*	0.85	-1.67	0.14
Trend	N/A	-0.05*	N/A	0.06*	N/A
Diagnostics					
R-squared	0.16	0.16	0.39	0.41	0.10
Prob(F-statistic)	0.08	0.10	0.00	0.00	0.34
Breusch-Godfrey Serial Correlation LM Test /1	N/A	N/A	0.18	0.22	N/A

* Significant at the 5% level

/1 Probability value at 4 lags. A value greater than 0.05 indicates no serial correlation.

Table 4A /1   Deterministic Seasonal Factors: Imports by End Use

Months	Consumer Goods				Raw Materials	
	Overall	Food	Durables	Non-Durables	Overall	Fuel
Jan	0.98	0.99	0.97	0.98	0.98	1.01
Feb	0.86	0.93	0.83	0.84	0.86	0.79
Mar	0.99	1.04	0.96	1.01	0.99	1.04
Apr	0.93	0.98	0.89	0.95	0.93	0.92
May	0.95	0.98	0.92	0.96	0.95	1.08
Jun	0.98	0.95	0.94	1.07	0.98	1.08
Jul	1.03	1.00	0.99	1.10	1.03	**1.21**
Aug	0.98	0.96	0.94	1.05	0.98	1.04
Sep	0.88	0.99	0.81	0.89	0.88	0.95
Oct	1.08	1.10	1.12	1.03	1.08	1.04
Nov	1.20	1.04	**1.41**	1.06	1.20	0.84
Dec	**1.21**	**1.06**	1.41	**1.10**	**1.21**	1.08
Max Month	**December**	**December**	**November**	**December**	**December**	**November**

 /1 Uses the Ratio to Moving Average (multiplicative)
Method

Table 4B [1] **Deterministic Seasonal Factors: Imports by End Use**

Months	Overall	Capital Goods	
		Construction Mats	Other Machinery
Jan	1.03	0.91	**1.22**
Feb	0.91	0.88	0.89
Mar	1.00	1.06	0.98
Apr	0.95	0.93	1.02
May	0.98	0.99	0.95
Jun	0.91	1.03	0.91
Jul	1.12	1.03	0.96
Aug	0.93	1.03	0.94
Sep	0.91	0.91	0.98
Oct	1.03	1.09	1.11
Nov	1.06	**1.21**	0.99
Dec	**1.23**	0.96	1.10
Max Month	**December**	**November**	**January**

/1 Uses the Ratio to Moving Average (multiplicative) Method

Table 5: Imports By Payment Terms (US$MN)					
	1999	**2000**	**2001**	**2002**	**2003**
US$MN					
Prepayment	82.4	92.3	86.5	113	125.7
No Funds	215.9	280.6	245.6	266	185.4
Sight Draft	121.7	109.7	109.1	82	72
Letter Of Credit	42.9	32.4	30	27.4	19.4
Open Account	2437.9	2738	2878.3	3011.5	3192.4
Cash On Delivery	27.4	12	9.7	21.3	25.4
Bills Of Collection	11.9	1.5	2.2	1.1	0.7
Other	19.4	42.7	41.1	48	57.9
Total	**2959.5**	**3309.2**	**3402.5**	**3570.3**	**3678.9**
% Share					
Prepayment	2.8	2.8	2.5	3.2	3.4
No Funds	7.3	8.5	7.2	7.5	5.0
Sight Draft	4.1	3.3	3.2	2.3	2.0
Letter Of Credit	1.4	1.0	0.9	0.8	0.5
Open Account	82.4	82.7	84.6	84.3	86.8
Cash On Delivery	0.9	0.4	0.3	0.6	0.7
Bills Of Collection	0.4	0.0	0.1	0.0	0.0
Other	0.7	1.3	1.2	1.3	1.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: STATIN

Table 6

Main Sector	Manufacturing	Distribution	Construction	Total
Response Rate by Sector				
Number Sampled	8	9	3	**20**
Number of Respondents	8	7	1	**16**
Response Rate	100.0	77.8	33.3	**80.0**
Per cent of Responses	50.0	43.8	6.3	**100.00**

Table 7
Value of Reported Monthly Import Bill By Sector/End-use (US$mn)

Import Type (by End Use)/Sector	Raw Materials/Manufacturing	Consumer Goods/Distribution	Capital Goods/Construction	Total
< 1	0.0	0.5	0.0	0.5
1-20	73.5	63.0	10.5	147.0
21-50	0.0	0.0	0.0	0.0
51-75	0.0	0.0	0.0	0.0
76-100	88.0	0.0	0.0	88.0
101-200	0.0	0.0	0.0	0.0
Average Imports (Sample)	**161.5**	**63.5**	**10.5**	**235.5**
Imports (STATIN) (2005)	**231.5**	**110.3**	**53.1**	**394.9**
Per cent Representation	**69.8**	**57.6**	**19.8**	**59.6**

Table 8

Quarter	Manufacturing	Distribution	Construction	Total	Seasonal Percent
Number of Respondents Reporting Seasonal Imports by Sector					
Jan-Mar	0	0	0	0	**0.0**
Apr-June	0	0	1	1	**6.2**
Jul-Sept	0	1	0	1	**6.2**
Oct-Dec	7	4	0	11	**68.8**
Non-seasonal	1	2	0	3	**18.8**
Total	**8**	**7**	**1**	**16**	**100.0**
Percent Response by Sector	**50.0**	**43.8**	**6.3**	**100.0**	

Table 9					
Source of Foreign Currency by Sector					
Number of Respondents					
Sources	**Manufacturing**	**Distribution**	**Construction**	**Total**	**Per cent**
FX Market	7	7	1	15	93.8
Foreign Currency Investment	0	0	0	0	0.0
Export Earnings	1	0	0	1	6.3
Total	8	7	1	16	100.0
In US$MN					
FX Market	151.0	63.5	10.5	225.0	95.5
Foreign Currency Investment	0.0	0.0	0.0	0.0	0.0
Export Earnings	10.5	0.0	0.0	10.5	4.5
Total	161.5	63.5	10.5	235.5	100.0

Table 10:
Average Monthly Import Bill per Payment
Period and as a percentage of Total Imports

Payment Terms (days)	Average Monthly Import Bill (US$MN)	% of Total Imports
Cash	31.5	13.4%
1 – 30	42	17.8%
30 – 59	21.5	9.2%
60 – 90	119.5	50.7%
91-180	21	8.9%
Total	**235.5**	**100%**

Table 11A:					
Number of Respondents by Delivery Lag (In Days) and Payment Terms					
		Credit Terms			
Delivery Lag (in Days)	**Cash**	**< 30**	**30 – 59**	**60 – 90**	**91-180**
7 – 14				1	
15 – 30	2			1	
31 – 56	1	4	4	2	
84					1
Total	**3**	**4**	**4**	**4**	**1**
% of Respondents	**18.8**	**25.0**	**25.0**	**25.0**	**6.3**

Table 11B:					
Overall Imports in US$MN by Delivery Lag (In Days) and Payment Terms					
		Credit Terms			
Delivery Lag (in Days)	**Cash**	**< 30**	**30 – 59**	**60 – 90**	**91-180**
7 – 14				88.0	
15 – 30	21.0			10.5	
31 – 56	10.5	42.0	32.0	21.0	
84					10.5
Total	**31.5**	**42**	**32**	**120**	**11**
% of Respondents	**13.4**	**17.8**	**13.6**	**50.7**	**4.5**

9.0　　Survey Questions

Instructions: Please read the following questions and tick the appropriate response.

1. **What is the nature of your business? (You may tick more than one option)**
   ☐ **Manufacturing**　☐ **Distribution**　☐ **Construction**
   ☐**Other (Please specify)** _____

   - **If you ticked more than one option, rank your choices based on the value of imports in the previous year.**
     Key:　　**1 = Highest;**　　**4 = Lowest**

	1	2	3	4
Manufacturing	☐	☐	☐	☐
Distribution	☐	☐	☐	☐
Construction	☐	☐	☐	☐
Other	☐	☐	☐	☐

2. **What is your average monthly import bill?**
   ☐**US$1-20 MN**　　☐**US$21-50 MN**　　☐**US$51-75 MN**　　☐ **US$76-100 MN**
   ☐ **US$101-200 MN**　　☐ **Please specify (optional)** _____

3. **During which quarter do you import the most?**
   ☐ **January – March**　☐ **April – June**　☐ **July – September**
   ☐**October – December**

4. **What is the average time between your ordering and the delivery of imported items?**
   ☐ **1 - 2 weeks**　　☐ **3 - 4 weeks**　　☐ **5 - 8 weeks**
   ☐ **Other (Please specify)** _____

5. **What is your most important source of funds to pay for imports?**

   ☐ **Foreign exchange market**   ☐ **Foreign currency investments**

   ☐ **Export earnings**   ☐ **Other (Please specify)**_____

6. **Do you use "available" credit facilities to finance imports?**

   ☐ **Yes**   ☐ **No**

   If yes, complete the following questions; if no, go to question 7.

   ▪ **From where do you access this credit? (You may tick more than one option)**

      ☐   **Suppliers**   ☐   **Local Banks**   ☐   **Foreign Banks**

      ☐**Other (Please specify)**_____

   If you ticked more than one option, please rank your choices in terms of importance.

   Key: 1 = Most important   3 = Least important

	1	2	3
From Suppliers	☐	☐	☐
From Local Banks	☐	☐	☐
From Foreign Banks	☐	☐	☐
Other	☐	☐	☐

   ▪ **What are the payment terms extended by your suppliers? Payment to be made in :**

      ☐ **Less than 30 days**   ☐ **30-59 days** ☐ **60-90 days**

      ☐ **90-180 days**   ☐ **Other (Please specify)**_____

- **What are the payment terms extended by your local bank? Payment to be made in :**

  ☐ **Less than 30 days**   ☐ **30 – 59 days**   ☐ **60 – 90 days**

  ☐ **90-180 days**   ☐ **Other (Please specify)**_____

- **What are the payment terms extended by your foreign bank? Payment to be made in :**

  ☐ **Less than 30 days**   ☐ **30 – 59 days**   ☐ **60 – 90 days**

  ☐ **More than 90 days**   ☐ **Other (Please specify)**_____

- **If credit from local banks is used to finance imports, what is the main currency used to settle the debt?**

  ☐ **USD**   ☐ **British Pound**   ☐ **Euro**   ☐ **Jamaica Dollar**

  ☐ **Other (Please specify)**_____

7. **Where no credit is available or used, when do you buy the necessary foreign currency to pay for imports?**

   ☐ **2 months before ordering**   ☐ **1 month before ordering**

   ☐ **At the time of ordering**   ☐ **On demand from account / deposits**

   ☐ **Other (Please specify)** _____