FOREIGN EXCHANGE RISK EXPOSURE OF CANADIAN DOMESTIC, EXPORTING AND MULTINATIONAL FIRMS: MARKET AND INDUSTRY EFFECTS ON BILATERAL AND MULTILATERAL EXCHANGE RATES

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To My Dad, and my Mom,

To Khedija, and Aicha.

ABSTRACT

Foreign Exchange Risk Exposure of Canadian Domestic, Exporting and Multinational Firms: Market and Industry Effects on Bilateral and Multilateral Exchange Rates

By

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The failure of most previous research to support the widely accepted hypothesis of an existing relationship between exchange rate movements and stock returns is primarily attributed to research design drawbacks. In the present study we address the research design problem from a relatively new perspective, suggesting changes to the market index variable and to the exchange rate variable.

We use monthly stock returns for the 1971-1999 period to estimate *overall exchange rate exposure* of Canadian domestic and exporting companies to *trade weighted multilateral exchange rates* and to the Canada-U.S. bilateral exchange rate. The results show no significant exposure of the domestic firms sample, suggesting indirect exposure may be limited. However significant exposure effects are found for the exporting sample. In general, these results do not suggest that there are any benefits from using the more (theoretically) appealing industry specific exchange rates and the purely domestic index in studying the exposure to the multilateral exchange rates. Yet benefits from using the purely domestic index do exist when studying the exposure to the Canada-U.S. bilateral exchange rate.

We also examine the determinants of currency exposure for a set of Canadian multinational corporations. To this end we decompose our companies' exposure into a foreign sales variable, a foreign production variable, and a market concentration variable. All coefficients have the expected signs, although only foreign sales and foreign production are found to be significant. These results are contingent on the exchange rate proxy used – specifically significance is found only when industry specific rates are employed. In light of this result we hypothesize the existence of an *industry effect*. This *industry effect* captures industry specific trade flows components (foreign sales and foreign production).

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I. Introduction

Conventional wisdom assumes that exchange rate fluctuations affect the firm value. It is common belief that foreign currency exposure should have an effect on shareholders wealth: exporting (importing) companies should benefit (suffer) from a depreciation of their home currency, as the exports (imports) are more (less) valuable in terms of the depreciated currency. Most of the empirical research to date however fails to document a significant sensitivity of the value of the firm to exchange rate changes.

At least three explanations are given for major studies' limited success in documenting a significant exposure to foreign currency risk. First exchange rate fluctuations may affect the firm value through different potentially offsetting channels. A given change in the exchange rate has a singular effect on each of these channels and the firm's *overall exposure* is the aggregate of the individual effects.

As an illustration, consider the example of an exporting firm. As mentioned earlier it is a widely held view that the exporting firm should benefit from the depreciation of its home currency. Assume that the firm sells a fraction of its output on the local market and that it imports some of its production factors. Suppose further that the firm faces foreign competition on the domestic market. The considered firm will not necessarily profit from a depreciation of the home currency. Some of the firm's operating costs will increase in term of the local currency and foreign competitors who use domestic products as inputs, will benefit from reduced costs (see e.g. Booth and Rotenberg). Therefore the *net* or *overall exposure* of the *exporting* firm can be either positive or neutral or negative.

The earlier example takes into account three exposure determinants: exports or foreign sales, imported production factors and foreign competition. Other determinants would include foreign denominated debt, foreign assets, and the amount of hedging the firm undertakes.

In general, a firm is exposed to exchange rate risk via effects on the aggregate demand and supply of the market in which it operates. Hence even purely domestic firms are exposed to currency risk. Adler and Dumas (1984) provide the example of a regional electrical utility, a pure domestic firm with no apparent exposure. To the extent that customers of the utility are involved in foreign trade and are exposed to foreign exchange risk, the demand for electricity is indirectly affected by exchange rate movements. Therefore the electrical utility operations are exposed to foreign exchange risk.

To the extreme Adler and Dumas (1984) states, *"any domestic-currency price of asset or liability, physical or financial, whose future foreign-currency value is uncertain may be sensitive to, or correlated with exchange rate fluctuations"*.

A second explanation for the apparent trivial effect of exchange rate movements on stock returns is the time variability characteristic of currency exposure (Levi 1994). A firm may be highly affected by exchange rate movements at a point in time while insignificantly affected at others. Furthermore the sign of the exposure may change over time. For instance in Jorion (1990) no more than two thirds of the sample companies had an exposure with the same sign after a six-year period. Levi (1994) argues that the volatility of currency exchange rates drives the exposure toward statistical insignificance.

One could argue that a decomposition of the exposure into its determinants partially solves the problem of time variability since the determinants vary over time (See e.g. Gao 2000).

A third explanation for the limited success of previous studies in uncovering foreign exchange risk is the deficiency of research design of previous work. For example, Bartov and Bodnar (1994) allude to sample selection biases and errors in estimation effects.

In this study we address the research design problem from a new perspective. We first hypothesize that the use of the wide *'economy trade weighted exchange rates'*, as in most previous work, to examine firms' exposure is not appropriate. Rather a more disaggregated approach at the industry or firm level should be used.

Second, to control for market movements when estimating currency exposure it would be desirable to account for foreign currency effects on the national market portfolio return. As Lombard, Roulet, and Resnik (1999) note, domestic market indexes will likely contain some exchange rate exposure effects since they typically put large weights on multinational corporations. To overcome this problem, following the suggestion of Lombard et al. (1999), we create a domestic index that is purged of international factors to be used in the estimation.

In the first part of the present study, we use monthly stock returns for the 1971-1999 period to estimate Canadian firms and Canadian industries exposure to different multilateral exchange rates. We first estimate the *overall exchange rate exposure* of Canadian domestic and exporting companies.

Most of the previous studies have focused on capturing direct foreign currency exposure effects. They solely estimated exposure of exporting companies and multinational corporations. From Adler and Dumas (1984), indirect foreign currency exposure effects may also be expected. This is one of the very few studies[1], which attempts to identify such indirect effects empirically.

[1] To our knowledge only Doukas et al. (1999) estimate currency exposure of purely domestic companies.

Next, we look at the determinants of currency exposure for a set of Canadian Multinational Corporations. To this end we decompose our companies' exposure into a foreign sale variable, a foreign production variable, and a market concentration variable.

In the second part of the present work we analyze Canadian firms and industries exposure to a bilateral exchange rate, specifically the exposure to *the Canadian to U.S. dollar exchange rate*. The United States is the major Canadian trade partner. 75% to 80% of the Canadian exports and imports are made with the U.S. Hence we can fairly assume that Canadian firms are more sensitive to the U.S. dollar fluctuations than they are to any other currency.

For all of our estimations we compare the results obtained from the use of the *purely domestic index return* variable to those obtained from the use of the national market index variable; and the results obtained from the use of industry specific exchange rates to those obtained from the use of an economy trade weighted rate.

Our results show no significant currency exposure for the domestic firms sample. However, significant exposure effects are found for the exporting sample. In general, these results do not suggest that there are any benefits from using the more (theoretically) appealing industry specific exchange rates and the purely domestic index in studying the exposure to the multilateral exchange rates. Yet benefits from using the purely domestic index do exist when studying the exposure to the Canada-U.S. bilateral exchange rate.

Results for the estimation of the sample industries' exposure suggest that the two *metal manufacturing* industries are the most exposed to currency risk. Conversely, the *petroleum and coal product manufacturing* industry, the *non-metallic mineral product manufacturing* industry, and the *miscellaneous product manufacturing* industry appear to be the least exposed to currency risk.

In our analysis of the determinants of currency exposure for Canadian multinationals, we find that all coefficients have the expected signs, although only foreign sales and foreign production are found to be significant. These results are contingent on the exchange rate proxy used – specifically significance is found only when industry specific rates are employed. In light of this result we hypothesize the existence of an *industry effect*. This *industry effect* captures industry specific trade flows components (foreign sales and foreign production).

The remaining of this paper is organized as follows: Section II is a literature review on exchange rate exposure previous research. In section III we present the methodology we use in this paper and the data description is contained in section IV. We report our estimations results in section V and conclude the paper in section VI.

II. Related literature

Efficient market hypotheses imply that new information is instantaneously and entirely reflected in the stock market. That is unexpected changes in exchange rate should result in significant abnormal returns mainly for companies involved in foreign trade. Conversely literature on the effects of exchange rate fluctuations on the firm value fails to support the widely accepted hypothesis of an existing relation between changes in exchange rates and stock returns.

Using a sample of 287 U.S. Multinationals, Jorion (1990) finds no evidence for a significant correlation between exchange rate movements and stock returns. Jorion (1991) also finds no support for an existing relation and concludes that exchange risk is not priced in the stock market and therefore firms' active foreign currency hedging is not relevant to stockholders. Consistent with Jorion findings, Amihud (1994) fails to document a significant exposure for the 32 largest U.S. exporting companies during the 1982-1988 period.

Bartov and Bodnar (1994) attribute the limited success of most studies to research design drawbacks. They rigorously select their sample companies considering firms with similar exposure sign, and for which a considerable impact of exchange rate movements is found in the financial statements.

In addition to the sample selection problem, Bartov and Bodnar (1994) state that investors are subject to systematic errors when estimating the stocks' sensitivity to foreign currency swings. The resulting mispricing implies that corrections for exchange rate changes are not instantaneous, which may cause the contemporaneous exposure coefficient to be insignificant. To circumvent this potential problem Bartov and Bodnar (1994) include lagged changes in the U.S. dollar to explain the companies' currency exposure. Similarly Amihud (1994) uses lagged changes in exchange rates in his model, and both studies find the lagged variables to be significant suggesting that the mispricing occurs.

The weak evidence of currency exposure led researchers to focus on the analysis of the exposure components. Jorion (1990) was the first to address the problem of empirically estimating the determinants of foreign currency risk. For a set of U.S. multinationals he finds foreign sales to be significantly and positively related to the firm value.

Among studies conducted on non-U.S. sample companies, He and Ng (1998) estimate the exchange rate exposure of 171 Japanese multinationals for the period 1979 to 1993. They decompose the sample firms' exposure into an export component and a hedging needs component. Variables that are used to proxy for firms' hedging needs are size, leverage, and liquidity of the firm. He and Ng (1998) results are supportive of a positive relation between currency exposure and the liquidity and size variables, and a negative relation between currency exposure and companies' leverage.

Doukas, Hall, and Lang (1999) use an inter-temporal asset pricing model to estimate the overall currency exposure of 1079 Japanese firms. They break up their sample firms into 4 groupings: Multinationals, high-exporting companies, low-exporting companies, and domestic companies. Firms are categorized as Multinationals if they meet three of the criteria set by the Directory of Multinationals (Stopford 1992). High-exporting firms have a foreign to total sales ratio of 20% or more, and low-exporting firms have a foreign to total sales ratio less than 20%. Results of Doukas et al. suggest that the currency risk is priced on the Japanese stock market for the Multinational Corporations and the high-exporting firms.

Bodnar and Gentry (1993) examine the exposure at an industry level for Canada, Japan and the U.S. They find less than a third of the sample industries to be significantly affected by the exchange rates fluctuations.

The Canadian economy can be characterized as one that is small and open. These traits theoretically lead to an important exposure to exchange rate. Yet, only a small number of studies are conducted on the Canadian market. Using a sample of 156 Canadian firms, Booth and Rotenberg (1990) finds the counterintuitive result that most of Canadian mining firms do not benefit from an appreciation of the Canadian dollar. When decomposing the exposure, Booth and Rotenberg (1990) find the expected signs for the foreign debt and the foreign assets determinants. Their results are however statistically insignificant.

Unlike other studies, Choi and Prasad (1995) include the currency exposure determinants (operating profits, foreign sales, and foreign assets) one at a time. They find satisfying results with significant exposure coefficients for more than half of their sample companies. Yet grouping the sample firms into industry portfolios leads to insignificant results.

Several other researchers have used either a G-10 or any other multilateral economy trade weighted exchange rate[2] and only a small number considered the exchange rate variable issue (discussed later in the present paper).

Estimating the exposure of Australian mining companies, Khoo (1994) uses a vector of currencies for the exchange rate variable. He only includes relevant rates for each industry. For instance the German Mark and the U.S. Dollar are employed for the bauxite mining companies, and the South African Rand is added for the diamond mining companies. Moreover to avoid any correlation problem between currencies, the German Mark is used as a proxy for the European Community currencies, and the Canadian Dollar is left over because its U.S. counterpart is included for all companies' estimations.

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[2] Bodnar and Gentry (1993), Choi and Prasad (1995), He and Ng (1998), and Jorion (1990) and (1991), among others, used a G-10 trade weighted exchange rate.

Gao (2000) substitutes industry export weighted exchange rates for the usually used trade weighted exchange rates[3]. He estimates the foreign sales and foreign production components of exchange rate exposure for 80 U.S. manufacturing multinationals from seven different industries. Consistent with the theory Gao (2000) finds positive and significant foreign sales coefficient and negative and significant foreign production coefficient.

[3] Gao (2000) does not give any explanation as for why he uses industry export weighted rates instead of the often used economy trade weighted rates.

III. Hypotheses and methodology

Exchange rate exposure is defined to be the correlation between changes in exchange rates and firm stock returns. To estimate this correlation either a factor model or an augmented market model has been used in previous literature. Among others Jorion (1990), Amihud (1994), and Choi and Prasad (1995) use the following two factor model

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \gamma_i de_{u,t} + \varepsilon_{i,t} \tag{1}$$

Where $R_{i,t}$ is firm's i stock return, $R_{m,t}$ is the market portfolio return and $de_{u,t}$ is the unexpected change in the exchange rate. Booth and Gentry (1990) estimates the exposure with a single factor model that is without controlling for market movements.

In the present study we follow Bodnar and Gentry (1993) and Gao (2000) and use an augmented market model to estimate currency exposure. Similar to the two-factor model, the augmented market model is written as follows

$$(R_{i,t} - R_{f,t}) = \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + \gamma_i de_{u,t} + \varepsilon_{i,t} \tag{2}$$

We estimate equation (2) for a set of Canadian domestic and exporting companies. We include industry dummies to the model to allow for a different beta for each industry.

A. The exchange rate variable

1. Multilateral exchange rates

a. Economy trade weighted rate vs. industry specific rate

Most of former studies make use of a general economy trade weighted exchange rate in their estimation of the exposure to foreign currency risk. We hypothesize that the use of an industry specific exchange rate to estimate the exposure is more appropriate than the use of a more general economy trade weighted rate.

Assume an open economy with two industries I1 and I2. I1 trades only with country C1 and I2 trades with both countries C1 and C2. The economy trade weighted exchange rate with respect to countries C1 and C2 is

$$EWR = \frac{\sum_{i=1}^{2}(M_i + X_i)R_i}{\sum_{i=1}^{2}(M_i + X_i)}$$

Where M_i and X_i are respectively the economy total imports from and total exports to country i, and R_i is the direct quotation of the exchange rate between the currency of country i and the local currency of the considered economy[4].

Obviously the economy trade weighted rate (*EWR*) does not take into account the fact that firms of I1 trade only with country C1 and are therefore insensitive to R2 fluctuations[5]. As a result the use of the economy trade weighted rates to measure firms' currency exposure is inappropriate.

The same reasoning can be extended to the firm level and, ideally, firm specific exchange rates are used to estimate exchange rate exposure. Computing firm specific exchange rates however, requires detailed data on firms foreign operations. Because of the scarcity of such data, we use industry trade weighted exchange rates (*IWR*).

$$IWR = \frac{\sum_{i=1}^{2}\sum_{j=1}^{2}(M_i^j + X_i^j)R_i}{\sum_{i=1}^{2}\sum_{j=1}^{2}(M_i^j + X_i^j)}$$

Where M_i^j and X_i^j are respectively industry *j* total imports from and total exports to country *i*.

Due to data restrictions we use industry export weighted exchange rates i.e. we do not account for industry imports in our rates. Yet this should have only little effect on our results since our sample companies are primarily exporting.

In the present study we compare the results of testing equation (2) using economy trade weighted exchange rates and industry specific rates.

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[5] The price of one unit of country *i* currency in terms of the economy currency.

b. The exchange rate news variable

Given that anticipated changes in exchange rates should already be reflected in stock returns, only unanticipated changes should be used to estimate currency exposure. We use the same methodology as Gao (2000) to construct the exchange rate news variable $de_{u,t}$. Two alternative models are used.

The first alternative assumes that exchange rates pursue the following first-order autoregressive process:

$$e_{t+1} = \theta_1 e_t + (1 - \theta_1) e^* + de_{u,t}$$

Where e^* is the long-term equilibrium exchange rate. Since e^* is a constant the previous equation can be written as follows:

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t} \qquad \textbf{(3)}$$

The second alternative assumes that exchange rate movements are determined as a function of a set of macro-economic variables

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R R_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} m_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} y_{t-j} + \sum_{j=1}^{n4} \alpha_{x,j} X_{t-j} + \sum_{j=1}^{n5} \alpha_{\pi,j} \pi_{t-j} + de_{ut} \qquad \textbf{(4)}$$

[5] In reality firms of industry I1 are subject to economic exposure through R2 fluctuations. This exposure however is trivial compared to the exposure to R1 fluctuations.

Where $\Delta e_t = e_t - e_{t-1}$, R_t is the differential interest rate between Canada and the U.S., m_t is the money supply, y_t is the industrial production, X_t the net export, and π_t the differential inflation rate between Canada and the U.S.

The correlation matrix of the macro-economic variables (table 1) reveals high correlations between money supply, net exports, and industrial production. Therefore only one of these variables is considered to estimate equation (4), which becomes

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R.j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi.j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx.j} MYX_{t-j} + de_{ut} \qquad \textbf{(5)}$$

Where *MYX* represents money supply or industrial production or net exports. Among these three variables the one that best explains the changes in exchange rate Δe_t, is included in equation (5).

To determine the number of lags we use a very similar procedure to the nested-hypothesis testing of Grossman and Levhinson (1989). We limit the number of lags for each variable to 1, 4 or 8 lags. For each regressor we first jointly test for the significance of the 5^{th} to 8^{th}. If we cannot reject the null hypothesis that a set of lags is different from zero at the 90% level we include the variable with its 8 lags. We then re-estimate the equation including the lags identified as significant and the 2^{nd} to 4^{th} lags for the remaining variables. Similarly if we cannot reject the hypothesis that a set of the added lags (2^{nd} to 4^{th} lags) is different from zero at the 90% percent level we include the variable with its 4 lags. Finally we test for the significance of one lag for the last remaining variables.

Table 2 gives the explanatory variables and the lag structure for each exchange rate to estimate equation (5).

c. The two-stage estimation procedure

Substituting the exchange rate variable news from equation (3) and (5) in equation (2) results in the following relations

$$(R_{i,t} - R_{f,t}) = \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + \gamma_i (e_{t+1} - (\theta_0 + \theta_1 e_t)) + \sum_{j=1}^{m} \delta_j Ind_j + \varepsilon_{i,t} \quad \textbf{(6)}$$

and,

$$(R_{i,t} - R_{f,t}) = \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + \gamma_i(\Delta e_t - \theta_0 - \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} - \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j}$$

$$- \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j}) + \sum_{j=1}^{m} \delta_j Ind_j + \varepsilon_{i,t} \quad \textbf{(7)}$$

Where ind_j is the dummy variable for industry j.

Since equations (6) and (7) include a residual term $de_{u,t}$ as explanatory variable, an OLS estimation would result in biased estimates of the gamma coefficient. As pointed out by Gao (2000), Levinsohn and Mackie-Mason (1990) propose a two-step estimation procedure to correct the potential bias resulting from a one-stage estimation.

In the first stage we separately estimate equations (2) and (3) - and equation (5) as an alternative for equation (3). The results of these estimations are then employed to estimate the exposure as shown in equation (8)

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j \, Ind_j = \gamma_i \; d\hat{e}_{u,t} + \varepsilon_{i,t} \qquad \textbf{(8)}$$

We expect the exposure coefficient (γ_i) to be positive for the exporting companies' sample. That is a depreciation of the home currency i.e. an increase in the exchange rates positively affects the value of the exports.

2. The Canada-U.S. bilateral exchange rate

Similarly to the multilateral exchange rates, we use an autoregressive model (equation 3), and a macroeconomic model to construct the *bilateral exchange rate news* variable.

Gao (2000) derived the *multilateral exchange rate macro-model* (equation 4) from a macro model that is originally designed to bilateral exchange rates. The original model is the following

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} +$$

$$\sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} + \sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*{}_{t-j} + de_{ut} \qquad \textbf{(9)}$$

Where, $(R - R^*)$ is the differential short-term interest rate, $(m - m^*)$ is the logarithm of the ratio of Canadian money supply to foreign (U.S.) money supply, $(y - y^*)$ is the logarithm of the ratio of Canadian industrial production to foreign (U.S.) industrial production, $(\pi - \pi^*)$ is the inflation differential, and *TB and* TB^* are respectively the Canadian and the foreign (U.S.) trade balances.

Using the same methodology as that used in 1.b to determine the number of lags (refer to page 17), we only include lagged values of the interest rate variable[6].

[6] The optimal lag structure is (8,0,0,0,0,0).

B. The Market portfolio return variable

Using a two-factor model or an augmented factor model, the currency risk exposure is empirically estimated by the sensitivity of the firm stock return to the change in foreign exchange rate, conditioned on the market portfolio return. Previous studies use the return on the national market index for the market portfolio return.

National index returns however reflect a high degree of exchange rate exposure. This is due to the fact that market stock indexes are capital weighted and thus the largest national companies tend to be substantially present in these indexes. As a result a big part of companies' exposure to exchange rates is absorbed by the market portfolio return coefficient.

To remedy this problem we suggest the use of the return on a domestic market index instead of the return on the national market index. To construct the domestic index return variable we use the residuals from regressing the national index return on a world index return[7].

$$R_{m,t} = \alpha_0 + \alpha_1 R_{w,t} + R_{d,t} \qquad \textbf{(10)}$$

Where $R_{m,t}$ is the return on the national market index, $R_{w,t}$ is the return on a world index, and $R_{d,t}$ is the residual term of the regression.

[7] Lombard, Roulet and Solnik (1999) propose the use of a return on a domestic index rather than the return on national index to price domestic companies.

Substituting the domestic index return R_d to the market index return equation (8) becomes

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (\boldsymbol{R}_{d,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j \, Ind_j = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t} \quad \textbf{(11)}$$

C. Decomposition of exposure

To further investigate Canadian firms' exposure to foreign currency risk we decompose our exposure into three determinants, namely, foreign sales, foreign production and market concentration. Although the two first components of exposure have been extensively examined in previous research, very few studies considered market concentration when selecting their sample[8] and none included market concentration as a variable.

Equation (12) expresses the exposure coefficient γ_i in terms of FS, the firm's foreign sales, FP, the firm's foreign production, and CR4, the market concentration.

$$\gamma_i = \Phi_1 \, FS_i + \Phi_2 \, FP_i + \Phi_3 \, CR4 + \Phi_4 \quad \textbf{(12)}$$

We expect the foreign sales coefficient, Φ_1 to be positive. An increase in the exchange rate i.e. a depreciation of the home currency increases the value of foreign sales in terms of the depreciated currency. On the other hand the depreciation boosts the foreign inputs' costs and therefore a negative correlation between foreign production and the home currency movements (Φ_2) is expected.

Following Gao (2000), we use the firm's foreign assets as a proxy for its foreign production. Gao (2000) argues that if firms' foreign assets are primarily productive assets the approximation will be reasonable. In addition since data on firms' foreign operations and foreign assets is annual we assume foreign production and foreign sales to be constant within each year.

We follow Choi and Prasad (1995) and use *levels* of foreign variables (foreign sales and foreign production) rather than the commonly used *ratios* of foreign to total variables. Choi and Prasad (1995) argue that higher ratios of foreign to total variables do not necessarily reflect greater exposure. For instance let's assume two firms with $20 million each in foreign sales. Everything else being equal these two companies have the same amount of cash flow exposed to foreign currency risk and therefore should have the same degree of exposure. Conversely the $20 million may represent different ratios of foreign to total sales.

The market concentration variable is a dummy variable that takes a value of one if the market share of the four largest companies in the industry is more than 85%. The incentive behind including market concentration as a determinant of

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[8] Gao (2000) dropped industries for which market share of the 3 largest companies in the industry is more than 70%.

currency exposure is that in concentrated industries firms can offset their potential loss in foreign markets – *loss due to an appreciation of the home currency* - by increasing their home prices. In other words companies can reduce their loss i.e. benefit from an appreciation of their home currency and consequently CR4 coefficient is expected to be negatively related to exchange exposure.

The constant term Φ_4 catches the effects of the non-considered sources of currency risk and therefore its sign is unpredictable.

The combination of equations (2) and (12) results in the following relationship:

$$(R_{i,t} - R_{f,t}) = \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + (\Phi_1 FS_i + \Phi_2 FP_i + \Phi_3 CR4 + \Phi_4)\ d\hat{e}_{u,t} + \sum_{j=1}^{m} \hat{\delta}_j Ind_j + \varepsilon_{i,t} \qquad \textbf{(13)}$$

Where $de_{u,t}$ is obtained from the estimation of equation (3) and, alternatively equation (5). To estimate equation (13) the 2-stage estimation technique employed for equations (6) and (7) is used.

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = (\Phi_1 FS_i + \Phi_2 FP_i + \Phi_3 CR4 + \Phi_4)\ d\hat{e}_{u,t} + \varepsilon_{i,t} \qquad \textbf{(14)}$$

Substituting the domestic market index return from equation (10) leads the following equation

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{d,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j \, Ind_j = (\Phi_1 \, FS_i + \Phi_2 \, FP_i +$$

$$\Phi_3 \, CR4 + \Phi_4) \, d\hat{e}_{u,t} + \varepsilon_{i,t} \qquad \textbf{(15)}$$

Given that we group our sample firm observations in a panel dataset, we estimate equations (14) and (15) with the random effect model. We structure our disturbance term with the following relationship:

$$\varepsilon_{i,t} = v_t + w_{it}$$

Where v_t is the time-series error component of all sample firms and w_{it} is the combined error component.

D. An alternative model to estimate currency exposure

Following Gao (2000) we consider an alternative model to estimate foreign currency exposure. The alternative model presumes that market efficiency holds and consequently only unanticipated changes in the determinants of the stock price can result in abnormal returns.

$$AR_{i,t} = R_{i,t} - E_{t-1}(R_{i,t}) = f(z_{i,t} - E_{t-1}(z_{i,t})) \quad \textbf{(16)}$$

Equation (16) expresses stock i unanticipated – or abnormal - return i.e. the difference between the stock actual return and the stock expected return, as a function of unanticipated changes in the determinants of the stock price, where $z_{i,t}$ is the vector of these determinants.

Next, Gao (2000) assumes that stock i expected return is the summation of the risk free rate and a firm-specific risk premium, that is

$$E_{t-1}(R_{i,t}) = R_f + c_i \quad \textbf{(17)}$$

Combining equations (16) and (17) gives the following relationship:

$$R_{i,t} - R_f = c_i + f(z_{i,t} - E_{t-1}(z_{i,t})) \quad \textbf{(18)}$$

We consider the following variables as part of the vector $z_{i,t}$: the unemployment rate, the money supply, an energy price index, a commodity price index, an aggregate export price index, and an industry specific export price index and the exchange rate. The following multi-factor model is then obtained and estimated to analyze the exposure coefficient γ_i.

$$R_{i,t} - R_{f,t} = c_i + \pi_1 \Delta M1 + \pi_2 \Delta UNEM + \pi_3 \Delta ENERGY + \pi_4 \Delta COMMOD + \pi_5 \Delta EXP + \pi_6 \Delta INDEXP + \gamma_i \; de_{u,t} + \varepsilon_{i,t} \quad \textbf{(19)}$$

Where,

$\Delta M1$ is the unanticipated change in the money supply (M1),

$\Delta UNEM$ is the unanticipated change in the unemployment rate,

$\Delta ENERGY$ is the unanticipated change in an energy index,

$\Delta COMMOD$ is the unanticipated change in a commodity index,

ΔEXP is the unanticipated change in an aggregate export index, and

$\Delta INDEXP$ is the unanticipated change in an industry specific export index.

The unanticipated change variables are the residuals resulting from regressing each of the regressors on its lagged value.

$$VAR_{t+1} = \theta_0 + \theta_1 \; VAR_t + \Delta VAR \quad \textbf{(20)}$$

Where VAR_t is any of the stock price determinants in equation 19.

Applying the 2-stage estimation procedure, we first estimate equation (20) for each of the variables. In the second step results of the first stage are combined to equation (19), which becomes

$$R_{i,t} - R_{f,t} = c_i + \pi_1 \widehat{\Delta M1} + \pi_2 \widehat{\Delta UNEM} + \pi_3 \widehat{\Delta ENERGY} + \pi_4 \widehat{\Delta COMMOD} + \pi_5 \widehat{\Delta EXP} + \pi_6 \widehat{\Delta INDEXP} + \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t} \qquad \textbf{(21)}$$

Notice that when estimating the exposure of the domestic companies we drop the export variables (ΔEXP and $\Delta INDEXP$).

The alternative model is also used to estimate the exchange rate exposure determinants as follows:

$$R_{i,t} - R_{f,t} = c_i + \pi_{i1} \widehat{\Delta M1} + \pi_{i2} \widehat{\Delta UNEM} + \pi_{i3} \widehat{\Delta ENERGY} + \pi_{i4} \widehat{\Delta COMMOD} + \pi_{i5} \widehat{\Delta EXP} + \pi_{i6} \widehat{\Delta INDEXP} + (\Phi_1 FS_i + \Phi_2 FP_i + \Phi_3 CR4 + \Phi_4) \, d\hat{e}_{u,t} + \varepsilon_{i,t} \qquad \textbf{(22)}$$

Similarly to the augmented market model we apply panel data technique to estimate the exposure determinants with the alternative model. Because of data restrictions, we only estimate the alternative model for the 1994-1999 period.

IV. Data description

We estimate our model equations for Canadian domestic and exporting companies using monthly stock returns for the 1971 – 1999 period. The model is first estimated for the 29-year period. We then break down the overall sample period into four sub-periods. Period breakdowns correspond to major events in the history of the international monetary system (see figure 1).

The first period ends with the spectacular rise of the U.S. dollar, which starts in 1980. Despite a declining tendency in the second half of the decade, the seventies marked a strong Canadian dollar period (see figure 2). The Canadian currency was never as strong as it was during this time reaching an ever record-high of 1.03 U.S. dollar in summer 1976 (see figure 3).

The spectacular decline of the Canadian dollar between 1976 and 1979 is largely attributed to an uncertain political environment - due to the election of a *Parti Quebecois* Government in the Province of Quebec - and to a decline in the prices of commodities.

Our second sub-period goes from 1980 to January 1987, date of the *Louvre Accord*, which marked the origin of the *managed-float system.* Under this system the so-called G-7 countries agreed to cooperate in order to achieve a greater stability in the foreign exchange market.

After attaining a then –record low by the end of the second period, the Canadian currency started recovering thanks to an aggressive intervention of the Federal Government in the exchange market, and to a rebound in commodity prices. This recovery did not last through the entire third sub-period though. In the early nineties softening in commodity prices, combined with budgetary problems and current account deficits led to a weakening Canadian dollar.

The North American Free Trade Agreement (NAFTA) breaks up the third and fourth sub-periods. Created in 1994, NAFTA intends to eliminate all impediments to trade among members of the agreement i.e. The United States, Canada, and Mexico. The post-NAFTA period is marked by the Mexican peso crisis in 1994 and the Asian crisis in 1997.

To account for these major events we include events dummies in our estimations. Thus dummy variables for Bretton Woods, Plaza accord, Louvre accord, and NAFTA agreement are added to our equations.

A. The sample companies

The firms examined in this study are companies listed in the Toronto Stock Exchange. The sample firms' monthly stock returns are from the *TSE Western* database. We restrict our sample to companies operating in either a manufacturing or a mineral industry.

Two hundred and five firms are identified to be exporting from the *CANCORP* financial database. To increase the likelihood of selecting firms with homogeneous exposure we remove companies for which the import to total revenue ratio is higher than the export to total revenue ratio. Eight firms are therefore dropped. Among the 197 remaining companies, 13 started trading on December 1999 and are therefore dropped.

Given that for many companies the *CANCORP* financial database does not report any exporting data, we complete our sample with companies from the *Disclosure/World scope* database. One hundred and two companies that are mainly exporting are added to the *CANCORP* sample.

The final sample consists of 286 companies. Table 4 displays the distribution of these companies among the 3-digit NAICS industry classifications. The recently introduced *North American Industry Classification System* (NAICS) substitutes for the Canadian *Standard Industry Classification*. The NAICS aims to harmonize the categorization of the North American industries in order to provide a better comparability of statistics across North America.

Firm level data to estimate equations (14), (15), and (22) are obtained from the *Disclosure/World scope* database. Table 3 gives the annual average foreign sales, and the annual average foreign production for our sample firms.

Table 3. Sample average Foreign Sales and Foreign Production

	Foreign Sales*	Foreign production*
1994	*1,116,292*	*1,202,639*
1995	*1,108,370*	*1,185,299*
1996	*1,246,462*	*1,237,133*
1997	*1,662,385*	*1,659,358*
1998	*1,780,348*	*1,690,957*
1999	*2,357,292*	*2,940,620*

* In thousands of Canadian dollars

Because the data required is only available from 1993, the model that decomposes currency exposure is only estimated for the post-NAFTA period. In addition since we decompose the exchange rate exposure into a foreign production component we restrict our exposure decomposition analysis to manufacturing Multinational Corporations. The Multinational sample includes 53 companies (table 4).

Since 3-digit industries are too extensive, we consider 4-digit *NAICS* industries for the CR4 variable. Five companies are found to satisfy our market concentration criterion. These companies are from the following industries: 311 Food manufacturing, 323 Printing & related support activities, and 334 Computer and electronic product manufacturing.

For the domestic firms study we consider non-exporting companies for which the import to total revenue ratio is less than an arbitrary 10%. Consequently 8 of the

379 firms identified to be non-exporting are removed and the final domestic sample contains 371 companies.

B. The exchange rate data

1. Economy trade weighted exchange rates

We use two different economy trade weighted rates in our estimations: the IMF (International Monetary Fund) Canada's weighted exchange rate and the bank of Canada G10 weighted exchange rate.

Introduced in 1984 and backfilled to 1971, the Canadian G10 exchange rate weights for each currency are derived from Canadian trade flows with the group of 10 (G-10) countries. Table 5 shows the weights assigned to each of the G-10 currencies.

The IMF exchange rate series start in January 1975 and are obtained from the IMF *International Financial Statistics* tapes. As shown in figure 2, the behaviors of the two multilateral exchange rates are very similar. The correlation coefficient between the two series is 99.83%.

Table 5. Weights assigned to the G-10 currencies

Currency	Weight
U.S. Dollar	*0.818*
Japanese Yen	*0.060*
U.K. Pound	*0.042*
German Mark	*0.024*
French Franc	*0.014*
Italian Lira	*0.012*
Netherlands Guilder	*0.011*
Belgium Franc	*0.009*
Sweden Krona	*0.005*
Switzerland Franc	*0.005*

2. Industry export weighted exchange rates

Because Canadian industries exports by country are not available we construct our industry export weighted exchange rates using the *"merchandise exports to individual countries"* matrices from the *CANSIM* database. Except for Sweden and Switzerland, *CANSIM* detailed export matrices are available for the remaining G-10 countries. We also include Mexico, Australia, and Norway to compute the industry specific exchange rates[9].

Bilateral exchange rates of the Canadian dollar with respect to the eleven considered trading partners are from the *IBBOTSON* database. Table 6 provides some statistics for the industry export weighted exchange rates.

[9] Mexico, Australia, and Norway are respectively the 9th, 14th, and 15th Canada trading partners.

3. Macro economic variables

Canadian macro-variables to estimate equations (4), equation (9), and the alternative model (equations 21 and 22) are obtained from *CANSIM* database.

We use the 3-months Treasury bill rate as the risk-free rate.

Canadian and US monthly trade balances are obtained from the International Monetary Fund *IFS tapes*.

For the U.S. data (equation (4)) T-Bill rate series are obtained from the Federal Reserve web site and inflation rate series are from the *IBBOTSON* database.

Finally we use the Morgan Stanley World Index translated into Canadian dollar terms to estimate equation (9) and the TSE300 market index as the market return variable.

V. Results

A. Exposure to the multilateral exchange rates

1. Exposure of the domestic companies

Tables 7 and 8 provide results from the estimation of the exposure of the domestic sample firms. Results from the estimation of the augmented market model and the alternative factor model are respectively presented in tables 7 and 8. As shown in the tables, we find very little empirical evidence for the indirect effects of currency exposure. We find a significant exposure coefficient in only 9 of a total of 44 estimations.

Notice that in 8 of the 9 cases of significance, the exposure coefficient is negative suggesting that our domestic firms suffer from a depreciation of the Canadian dollar. One straightforward explanation is that our sample firms compete with exporting companies. Because a depreciation of the Canadian dollar is beneficial to the exporting companies i.e. the competitors, it is detrimental to the sample domestic firms.

In actual fact it is much more complex to give explanation for the direction of domestic firms' exposure. As mentioned earlier such explanation would involve effects of exchange rate changes on the Aggregate demand and supply.

2. Exposure of the exporting companies

As reported in table 9 and table 10, results are not supportive of our hypothesis that the use of industry specific rates is more appropriate than that of the broader economy trade weighted rate.

However, unlike previous research, using the economy weighted rates (IMF and G10 rates in the tables) we find evidence for a relationship between exchange rate movements and exporting firm value (31 of the 44 exposure estimates are significant).

For the market return variable, results are mixed and therefore do not allow us to argue in favor of either variables (the national market index or the constructed purely domestic market index).

Surprisingly the exposure sign is ambiguous. Half of the significant exposure coefficients are negative suggesting that the exporting companies do not necessarily benefit from a depreciation of their home currency. Two reasons may explain this result. First since we lack data on firms' hedging activities all our estimates should be considered as post-hedge measures. Therefore some of the companies might have hedged their foreign sales against foreign currency risk. Second, as discussed earlier in this paper, a company is exposed to exchange rate risk via different determinants and the company's overall exposure is the combined effect of these determinants.

The results also suggest that the exporting firms exposure is statistically and economically more significant in the post-NAFTA period. Furthermore the post-NAFTA exposure is positive as expected.

3. Exposure determinants

Tables 11, 12 and 13 provide results from the 2-stage estimation of the exposure components. Results from the estimation of the augmented market model using the national market index variable (R_m) and the constructed domestic index variable (R_d) are respectively presented in tables 11 and 12. Table 13 gives the results from the estimation of the alternative factor model.

Consistent with our hypotheses the foreign sales coefficient is positive and significantly different from zero and the foreign production coefficient is negative and significantly different from zero. Notice that results are not significant when we use the alternative exchange rate model[10] (equation 4).

Similar to the results from estimating the overall exposure of the exporting companies, we find no evidence that the use of a purely domestic market index instead of the national market index is more appropriate.

Although significant in one single case, the CR4 coefficient has the expected negative sign in all estimations.

It is worthwhile to notice that in contradiction with the estimation of the overall exposure, we only find significance when we substitute industry specific rates for the economy trade weighted rates.

Decomposing exchange rate exposure into its determinants accounts for Multinationals' trade flows; foreign sales and foreign production in our case. Unlike the overall exposure, these trade flows are highly sensitive to industry characteristics. Consequently, the use of industry specific rates, i.e. rates that take into account industry characteristics, is more appropriate when exposure to currency risk is decomposed.

We denote as the *"industry effect"* the significance resulting from the use of industry specific exchange rates when trade flows are accounted for. That is when exposure is decomposed. On the other hand the *"market effect"* is the significance of the overall exposure resulting from the use of the broad economy trade weighted exchange rates.

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[10] See panels B of tables 11, 12, and 13.

To confirm that the so-called *industry effect* is not merely a consequence of the use of a different sample[11] we re-estimate the overall exposure (equations 8 and 11) for the Multinational companies' sample.

Results of the estimations are reported in table 14. As revealed in the table, there is only one case of significance when industry weighted rates are used.

4. Exposure of the Canadian industries

As shown in the table 15, for 3 industries none of the exposure estimates is significant. These *non-exposed* industries are: 324-Petroleum and coal product manufacturing, 327-Non-metallic mineral product manufacturing, and 339-Miscellaneous product manufacturing. On the other hand industries 331-Primary metal product manufacturing, and 332-fabricated metal product manufacturing appear to be the most exposed to currency risk.

[11] Models decomposing the exchange rate exposure are estimated for the sample of multinational companies while the overall exposure models are estimated for the total sample of exporting companies.

B. Exposure to the Canada-U.S. bilateral exchange rate

1. Exposure of the domestic companies

Whether we use the autoregressive model or the macro-economic model of exchange rates, the results, reported in table 16 are consistent with those estimating the exposure to multilateral exchange rates. That is, we find no evidence of an existing relationship between domestic firms stock returns and the exchange rate fluctuations.

2. Exposure of the exporting companies

As reported in tables 18 and 19, we do find a significant exposure of Canadian exporting firms to the Canada-U.S. bilateral exchange rate. However, similar to our previous results the sign of the exposure remains ambiguous.

Results from table 18 are supportive of our market variable hypothesis. That is, the use of the constructed *purely domestic index* variable leads to better results than the use of the national market index variable, independently of which model of exchange rate (autoregressive model, or macro-economic model) is used.

3. Exposure determinants

Similarly to the aggregated *multilateral trade weighted exchange rates*, the bilateral exchange rate does not account for industry trade flows. Therefore, the results in tables 20 and 21, showing insignificance of the exposure components' coefficients, are consistent with our *industry effect* hypothesis.

4. Exposure of the Canadian industries

Results of the estimation of the industries' exposure (table 20) corroborate that industry 331-Primary metal product manufacturing is highly exposed to currency risk.

Three other industries, 212-Metal mining, 312-Beverage and tobacco product manufacturing, and 334 Computer and electronic product manufacturing seem to be highly exposed to the Canada-U.S. bilateral exchange rate movements.

As to the market variable hypothesis, the results are consistent with the previous section in that the constructed *purely domestic* market index is more appropriate to examine the exposure to the bilateral exchange rate. Besides using the *purely domestic* index variable, whenever significant, the exposure coefficient has the expected negative sign (except for industry 336), supporting the hypothesis that exporting companies suffer from an appreciation of the home currency.

VI. Conclusion

This paper aims to study whether exchange rate risk is priced in the Canadian stock market. We examine whether the failure of previous research to document significant exchange rate exposure is caused by *research design* drawbacks. We suggest changes with regard to the commonly used market return and exchange rate variables.

We estimate Canadian firms and industries exposure to different multilateral exchange rates (Canadian G10, the IMF Canadian multilateral exchange rate, and a constructed industry export weighted exchange rate), and to the bilateral Canadian to US dollar exchange rate.

Our results suggest that exchange rate movements do not significantly affect domestic companies. Conversely the results reveal that exporting companies are significantly exposed to currency risk. The sign of the exposure is however ambiguous given that is we do not find evidence that exporting companies benefit from an appreciation of their home currency.

When estimating the exposure to the multilateral exchange rates, findings are not supportive of the *'market return variable hypothesis'*. Indeed the constructed *purely domestic index* variable and the generally used national market index variable lead fairly similar results. Yet, the *purely domestic index* variable appears to be more appropriate to estimate firms and industries' exposure to the Canada-U.S. bilateral exchange rate.

Estimations of the industries' exposure evidence that each of the sample industries is exposed to the Canada-U.S. bilateral exchange rate movements. Yet, the *petroleum and coal product manufacturing* industry, the *Non-metallic mineral product manufacturing* industry, the m*iscellaneous product manufacturing* industry are not exposed to any of the multilateral exchange rates.

Furthermore the industries' exposure study suggests that the *metal product manufacturing* industries are the most exposed to exchange rate risk.

Regarding the exchange rate variable, the results presented suggest the existence of an *'industry effect'*. Recognizing that firms' trade flows are highly sensitive to industry characteristics, when we decompose currency exposure into its trade flows components (foreign sales and foreign production) only the use of *industry specific rates* (as opposed to the general *market rates*) makes our results statistically significant.

Conversely overall exposure results are only significant when *market rates* are used in the model i.e. when industry characteristics are not accounted for.

As it is the case for major studies, our findings are to be interpreted with caution. Undeniably our methodology is not devoid of weaknesses. First, even if our sample companies are mainly exporting, the use of industry export weighted rates, which do not take industry imports into account, may bias the results.

Second, the assumption of constant firm's foreign sales and foreign production within each year, and the approximation of firms' foreign production with firms' foreign assets are debatable.

Finally since we do not account for firms' hedging activities, our exposure estimates are perplexing. Nonetheless these estimates should be regarded as after hedging measures and may be used to assess the effectiveness of firms' hedging practices.

Table 1. Macro variables correlation matrix (Eq. 4)

	TBILL	*INFLATION*	*EXPORT*	*INDPROD*	*M1*	*M2*	*M3*
TBILL	1.00000 (0.0000)						
INFLATION	0.08725 (0.1007)	1.00000 (0.0000)					
EXPORT	-0.11160 (0.0356)	-0.12296 (0.0205)	1.00000 (0.0000)				
INDPROD	0.2033 (0.7026)	-0.13424 (0.0113)	***0.95624*** ***(0.0001)***	1.00000 (0.0000)			
M1	-0.10533 (0.0474)	-0.12119 (0.0224)	***0.98600*** ***(0.0001)***	***0.95434*** ***(0.0001)***	1.00000 (0.0000)		
M2	0.09812 (0.0648)	-0.13144 (0.0132)	***0.93185*** ***(0.0001)***	***0.93772*** ***(0.0001)***	0.92180 (0.0001)	1.00000 (0.0000)	
M3	0.04723 (0.3749)	-0.12915 (0.0149)	***0.96185*** ***(0.0001)***	***0.95391*** ***(0.0001)***	0.95811 (0.0001)	0.99324 (0.0001)	1.00000 (0.0000)

* We include Money Supply *M2*, and *M3* as alternatives to *M1*.

** Significance level of the correlation coefficients are between parentheses.

Table 2. Lag structure for the explanatory variables of equation (5)

					Exchange Rate					
Restriction	*G10*	*IMF*	*211*	*212*	*311*	*312*	*321*	*322*	*323*	*324*
5-8 lag										
T-bill	**0.069**	0.322	0.142	0.355	0.495	0.201	0.906	0.472	0.595	0.781
Inflation	0.629	0.461	0.404	0.485	0.586	0.572	0.983	0.514	0.962	0.373
MYX	0.730	0.726	0.995	0.543	0.690	0.767	**0.056**	0.287	0.823	0.994
2-4 lag										
T-bill	**	0.182	0.416	0.384	0.729	0.803	0.218	0.448	0.415	0.891
Inflation	0.593	0.560	0.353	0.717	**0.082**	**0.015**	0.658	0.465	0.833	0.678
MYX	0.461	0.895	**0.079**	0.139	0.450	0.963	**	0.717	0.413	0.929
1 lag										
T-bill	**	0.800	0.209	0.439	0.900	**0.052**	**0.035**	0.851	0.283	0.357
Inflation	0.162	**0.064**	0.928	0.190	**	**	0.421	0.385	0.100	0.924
MYX	0.916	0.626	**	0.507	0.904	0.595	**	0.545	0.711	0.999
Final lag structure	(8,0,0)	(0,1,0)	(0,0,4)	(0,0,0)	(0,4,0)	(1,4,0)	(1,0,8)	(0,0,0)	(0,0,0)	(0,0,0)

* 211, 212, ..., 324 are the 3-digit NAICS industry specific exchange rates.
** MYX denotes Money Supply (*M*), or Industrial Production (*Y*), or Exports (*X*).
*** T-Bill and Inflation are respectively the differences between the US and the Canadian 3-months T-Bill and rates of inflation.
**** Significant observations are presented in bold character.

Table 2 Cont'd. Lag structure for the explanatory variables of equation (5)

	Exchange Rate									
Restriction	*325*	*326*	*327*	*331*	*332*	*333*	*334*	*335*	*336*	*339*
5-8 lag										
T-bill	0.740	0.451	0.959	0.993	0.509	**0.022**	0.246	0.242	**0.075**	0.436
Inflation	0.115	0.171	0.966	0.664	0.950	0.824	0.464	0.340	0.667	0.339
MYX	0.996	0.910	0.327	0.210	0.551	0.494	0.602	0.415	0.845	0.851
2-4 lag										
T-bill	0.213	0.299	0.962	0.841	0.785	**	**0.028**	0.947	**	0.792
Inflation	**0.094**	0.341	0.182	0.997	0.967	0.762	0.336	0.986	0.218	0.227
MYX	0.985	0.983	0.688	0.531	0.136	**0.041**	0.763	0.606	0.852	0.431
1 lag										
T-bill	0.688	0.260	0.448	0.710	0.915	**	**	0.350	**	0.747
Inflation	**	0.252	0.294	0.419	0.154	0.944	0.362	0.877	0.668	0.896
MYX	0.809	0.809	0.321	0.921	0.136	**	0.930	0.238	0.676	0.273
Final lag structure	(0,4,0)	(0,0,0)	(0,0,0)	(0,0,0)	(0,0,0)	(8,0,4)	(4,0,0)	(0,0,0)	(8,0,0)	(0,0,0)

* 225, 326, …, 339 are the 3-digit NAICS industry specific exchange rates.

** MYX denotes Money Supply (*M*), or Industrial Production (*Y*), or Exports (*X*).

*** T-Bill and Inflation are respectively the differences between the US and the Canadian 3-months T-Bill and rates of inflation.

**** Significant observations are presented in bold character.

Table 4. Distribution of the sample companies on the 3-digit NAICS industries

	3 digit NAICS	Industry	Companies CANCORP	Companies Disclosure	Companies Total	Multinationals
Manufacturing	311	Food manufacturing	10	5	15	4
	312	Beverage & tobacco product manufacturing	10	0	10	2
	321	Wood product manufacturing	10	1	11	2
	322	Paper manufacturing	14	5	19	4
	323	Printing & related support activities	3	3	6	3
	324	Petroleum & coal product manufacturing	3	0	3	0
	325	Chemical manufacturing	12	8	20	5
	326	Plastics & rubber products manufacturing	3	2	5	3
	327	Non-metallic mineral product manufacturing	4	2	6	2
	331	Primary metal manufacturing	12	7	19	9
	332	Fabricated metal product manufacturing	3	3	6	3
	333	Machinery manufacturing	18	2	20	1
	334	Computer and electronic product manufacturing	22	10	32	7
	335	Electrical equipment, appliance and component manufacturing	5	4	9	1
	336	Transportation equipment manufacturing	11	5	16	6
	339	Miscellaneous manufacturing	3	2	5	1
Mineral	211	Oil & gas extraction	26	16	42	-
	212	Metal mining	15	27	42	-
Total			184	102	286	53

Table 6. Industry export weighted rates statistics

Industry 3-digit NAICS	*Standard deviation*	*Mean*	*Quartiles*			
			1st	*2nd*	*3rd*	*4th*
211	*0.1521*	*1.2100*	*1.0734*	*1.1965*	*1.3425*	*1.5631*
212	*0.1651*	*0.8853*	*0.7712*	*0.8682*	*0.9922*	*1.6054*
311	*0.7070*	*1.2962*	*0.9147*	*1.0446*	*1.2951*	*5.4650*
312	*0.1404*	*1.2874*	*1.1838*	*1.2791*	*1.3737*	*1.7039*
321	*0.1129*	*1.0751*	*0.9961*	*1.0572*	*1.1377*	*1.8989*
322	*0.3294*	*1.3233*	*1.1294*	*1.2070*	*1.3756*	*3.0131*
323	*0.1395*	*1.2262*	*1.1292*	*1.2185*	*1.3359*	*1.8116*
324	*0.7211*	*1.2355*	*1.0094*	*1.1821*	*1.3430*	*13.2625*
325	*0.1780*	*1.2313*	*1.1016*	*1.2005*	*1.3246*	*1.9834*
326	*0.6449*	*1.5279*	*1.2544*	*1.3600*	*1.5301*	*6.9895*
327	*0.2224*	*1.3050*	*1.1792*	*1.2863*	*1.3707*	*3.4271*
331	*0.4928*	*1.2624*	*1.1271*	*1.2162*	*1.3035*	*9.4539*
332	*1.0540*	*1.8330*	*1.2953*	*1.3920*	*1.9127*	*9.6129*
333	*0.7224*	*1.7106*	*1.2834*	*1.3859*	*1.9950*	*5.4325*
334	*0.2940*	*1.3337*	*1.1823*	*1.3019*	*1.3859*	*4.4002*
335	*1.1851*	*1.7146*	*1.2601*	*1.3757*	*1.6990*	*12.7413*
336	*0.1812*	*1.3579*	*1.2462*	*1.3316*	*1.4156*	*2.1864*
339	*0.5010*	*1.4785*	*1.1823*	*1.3042*	*1.5675*	*4.9226*

Table 7. Estimation of the exposure of the domestic sample

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Exchange rate	IMF		G10	
	Rm	*Rd*	*Rm*	*Rd*
1971-1999	$-7.843E^{-03}$ (0.1141)	$-2.353E^{-03}$ (0.6355)	$-9.193E^{-03}$ (0.1385)	$-3.588E^{-03}$ (0.5633)
1971-1979	**$-2.612E^{-03}$** * **(0.0233)**	$-8.704E^{-04}$ (0.4558)	**$-2.600E^{-03}$** * **(0.0290)**	-1.581^{E-03} (0.1931)
1980-1987	**$-2.777E^{-03}$** * **(0.0171)**	$8.121E^{-04}$ (0.4926)	**$-3.382E^{-03}$** * **(0.0169)**	$9.813E^{-04}$ (0.4954)
1987-1993	$-2.477E^{-03}$ (0.3861)	$1.628E^{-03}$ (0.5696)	$-3.310E^{-03}$ (0.3412)	$1.850E^{-03}$ (0.5955)
1994-1999	-0.0197 (0.1460)	$-9.502E^{-03}$ (0.4833)	-0.0247 (0.2206)	-0.0142 (0.4809)

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

Exchange rate	IMF		G10	
	Rm	*Rd*	*Rm*	*Rd*
1971-1999	3.650^{E-03} (0.4723)	$6.095E^{-03}$ (0.2301)	$4.071E^{-03}$ (0.5167)	$7.533E^{-03}$ (0.2303)
1971-1979	7.937^{E-04} (0.4895)	$-9.985E^{-04}$ (0.3888)	$9.209E^{-04}$ (0.4569)	**$-2.086E^{-03}$** * **(0.0985)**
1980-1987	**$-2.968E^{-03}$** * **(0.0139)**	$-1.633E^{-03}$ (0.1830)	**$-2.781E^{-03}$** * **(0.0706)**	$-2.401E^{-03}$ (0.1245)
1987-1993	$-2.695E^{-03}$ (0.3551)	$-2.408E^{-03}$ (0.4095)	$-3.122E^{-03}$ (0.3757)	$-2.523E^{-03}$ (0.4749)
1994-1999	0.0112 (0.4168)	0.0163 (0.2383)	0.0129 (0.5051)	0.0233 (0.2272)

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

Table 8. Estimation of the exposure of the domestic sample with the alternative model (eq.21)

$$R_{i,t} - R_{f,t} = c_i + \hat{\pi}_1 \Delta M1 + \hat{\pi}_2 \Delta UNEM + \hat{\pi}_3 \Delta ENERGY + \hat{\pi}_4 \Delta COMMOD + \gamma_i\, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Exchange rate	γ	π_1	π_2	π_3	π_4
IMF	-0.0110 (0.4200)	$1.624E^{-6}$ (0.9195)	0.0145 (0.6535)	$-9.835E^{-4}$ (0.8271)	**0.0149** * **(0.0994)**
G10	-0.0232 (0.2519)	$-6.850E^{-7}$ (0.9740)	0.0126 (0.7482)	$-1.297E^{-3}$ (0.8054)	**0.0206** * **(0.0563)**

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

Exchange rate	γ	π_1	π_2	π_3	π_4
IMF	**0.0306** * **(0.0323)**	$7.115E^{-6}$ (0.6626)	0.02282 (0.4849)	$-1.748E^{-3}$ (0.6983)	0.0130 (0.1500)
G10	**-0.0382** * **(0.0565)**	$8.109E^{-6}$ (0.7005)	0.0147 (0.7051)	$-2.223E^{-3}$ (0.6707)	0.0168 (0.1150)

* Significance level of estimates between parentheses.

Table 9. Estimation of the exposure of the exporting sample

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Exchange rate	IWR		IMF		G10	
	R_m	R_d	R_m	R_d	R_m	R_d
1971-1999	-1.579E^{-03} (0.4741)	-3.409E^{-03} (0.1303)	**-1.490E^{-03}** * **(0.0061)**	**3.400E^{-03}** * **(0.0000)**	**-1.493E^{-03}** * **(0.0161)**	**3.207E^{-03}** * **(0.0000)**
1971-79	-1.016E^{-03} (0.5605)	-2.539E^{-03} (0.1608)	1.460E^{-04} (0.8630)	**1.944E^{-03}** * **(0.0257)**	1.050E^{-04} (0.9094)	8.334E^{-04} (0.3843)
1980-87	**-0.0112** * **(0.0254)**	-6.188E^{-03} (0.2309)	**-3.906E^{-03}** * **(0.0007)**	2.791E^{-04} (0.8153)	**-4.751E^{-03}** * **(0.0007)**	3.163E^{-04} (0.8276)
1987-93	-4.591E^{-03} (0.7442)	-5.367E-^{03} (0.7099)	**-3.478E^{-03}** * **(0.0006)**	1.216E^{-03} (0.2445)	**-4.397E^{-03}** * **(0.0004)**	1.493E^{-03} (0.2404)
1994-99	-0.0008 (0.9491)	-0.0118 (0.3908)	0.0010 (0.3024)	**7.834E^{-3}** * **(0.0000)**	**0.0024** * **(0.0448)**	**9.187E^{-3}** * **(0.0000)**

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R.j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi.j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx.j} MYX_{t-j} + de_{ut}$$

Exchange rate	IWR		IMF		G10	
	R_m	R_d	R_m	R_d	R_m	R_d
1971-1999	8.518E^{-05} (0.9643)	-6.104E^{-04} (0.7537)	5.109E^{-04} (0.3570)	**2.530E^{-03}** * **(0.0000)**	2.676E^{-06} (0.9966)	**2.786E^{-03}** * **(0.0000)**
1971-79	-9.753^{E-04} (0.4973)	-7.756E^{-04} (0.6029)	8.267E^{-04} (0.3058)	-1.030E^{-03} (0.2134)	1.199E^{-03} (0.2107)	**-2.099E^{-03}** * **(0.0347)**
1980-87	1.676E^{-04} (0.9729)	1.810E^{-03} (0.7222)	**-3.259E^{-03}** * **(0.0067)**	-1.224E^{-03} (0.3241)	**-2.551E^{-03}** * **(0.0958)**	-1.365E^{-03} (0.3884)
1987-93	**0.0438** * **(0.0050)**	**0.0272** * **(0.0902)**	**-3.501E^{-03}** * **(0.0007)**	**-2.895E^{-03}** * **(0.0065)**	**-4.108E^{-03}** * **(0.0011)**	**-3.021E^{-03}** * **(0.0189)**
1994-99	0.0044 (0.7679)	**-0.0191** * **(0.0425)**	**0.0075** * **(0.0000)**	**0.0112** * **(0.0000)**	**0.0071** * **(0.0000)**	**0.0147** * **(0.0000)**

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *IWR* exchange rates are the Industry specific rates.

Table 10. Estimation of the exposure of the exporting sample with the alternative model (eq.21)

$$R_{i,t} - R_{f,t} = c_i + \pi_1 \Delta \hat{M1} + \pi_2 \Delta \hat{UNEM} + \pi_3 \Delta \hat{ENERGY} + \pi_4 \Delta \hat{COMMOD} + \pi_5 \Delta \hat{EXP} + \pi_6 \Delta \hat{INDEXP} + \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Exchange rate	γ	π_1	π_2	π_3	π_4	π_5	π_6
IWR	***-0.0737*** *	*1.943E^-7^*	*7.563E^-3^* *	***2.967E^-3^*** *	***1.298E^-3^*** *	***-0.0171*** *	*1.412E^-4^*
	(0.0005)	*(0.8821)*	*(0.0085)*	***(0.0000)***	***(0.0798)***	***(0.0000)***	*(0.6074)*
IMF	***9.665E^-3^*** *	*-5.892E^-7^*	*6.422E^-3^* *	***2.876E^-3^*** *	***1.257E^-3^*** *	***-0.0178*** *	*2.021E^-4^*
	(0.0000)	*(0.6532)*	*(0.0250)*	***(0.0000)***	***(0.0882)***	***(0.0000)***	*(0.4605)*
G10	***8.332E^-3^*** *	***-5.937E^-6^*** *	*7.196E^-3^* *	***2.954E^-3^*** *	***2.429E^-3^*** *	***-0.0186*** *	*-3.661E^-4^*
	(0.0000)	***(0.0000)***	*(0.0101)*	***(0.0000)***	***(0.0007)***	***(0.0000)***	*(0.1679)*

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

Exchange rate	γ	π_1	π_2	π_3	π_4	π_5	π_6
IWR	*-0.0219*	*2.248E^-7^*	*8.362E^-3^* *	***2.900E^-3^*** *	***4.524E^-3^*** *	***-0.0170*** *	*1.659E^-4^*
	(0.1685)	*(0.8638)*	*(0.0035)*	***(0.0000)***	***(0.0390)***	***(0.0000)***	*(0.5472)*
IMF	***0.0195*** *	*1.909E^-6^*	*2.806E^-3^*	***1.548E^-3^*** *	*-8.255E^-5^*	***-3.041E^-3^*** *	*3.775E^-4^*
	(0.0000)	*(0.1453)*	*(0.3305)*	***(0.0000)***	*(0.9118)*	***(0.0761)***	*(0.1675)*
G10	***0.0241*** *	***-3.164E^-6^*** *	***-4.965E^-3^*** *	***1.247E^-3^*** *	*-1.666E^-4^*	***-3.058E^-3^*** *	*9.566E^-6^*
	(0.0000)	***(0.0230)***	***(0.0828)***	***(0.0008)***	*(0.8209)*	***(0.0539)***	*(0.9710)*

* Significance level of estimates between parentheses.

Table 11. Estimation of exposure determinants (eq.14)

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = (\Phi_1 FS_i + \Phi_2 FP_i + \Phi_3 CR4 + \Phi_4)\, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_M e_t + de_{u,t}$$

Exchange rate	IWR	IMF	G10
ϕ_1	**$4.573E^{-07}$ ***	$4.663E^{-09}$	$1.166E^{-9}$
	(0.0005)	(0.5658)	(0.9430)
ϕ_2	**$-2.867E^{-07}$ ***	$4.573E^{-09}$	$4.713E^{-09}$
	(0.0271)	(0.5237)	(0.7264)
ϕ_3	-0.0908	**$-5.884E^{-03}$ ***	$-5.125E^{-03}$
	(0.1873)	**(0.0952)**	(0.2636)
ϕ_4	-0.0373	5.410E-06	$4.212E^{-03}$
	(0.1785)	(0.9980)	(0.1693)

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

Exchange rate	IWR	IMF	G10
ϕ_1	$5.329E^{-08}$	$6.679E^{-09}$	$9.034E^{-09}$
	(0.8262)	(0.4223)	(0.5393)
ϕ_2	$7.506E^{-08}$	$-8.613E^{-09}$	$-1.267E^{-08}$
	(0.7049)	(0.2419)	(0.3031)
ϕ_3	-0.0832	$7.598E^{-04}$	$6.259E^{-04}$
	(0.3423)	(0.8353)	(0.8886)
ϕ_4	$-1.857E^{-03}$	**$3.794E^{-03}$**	$4.339E^{-03}$
	(0.9656)	**(0.0714)**	(0.1621)

* Significance level of estimates between parentheses.
** *IWR* exchange rates are the Industry specific rates.

Table 12. Estimation of exposure determinants (eq.15)

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{d,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = (\Phi_1 FS_i + \Phi_2 FP_i + \Phi_3 CR4 + \Phi_4)\, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Exchange rate	IWR	IMF	G10
ϕ_1	***4.868E-07*** *	*6.257E-09*	*-1.206E-10*
	(0.0003)	*(0.4489)*	*(0.9942)*
ϕ_2	***-3.028E-07*** *	*2.546E-09*	*4.893E-09*
	(0.0219)	*(0.7275)*	*(0.7211)*
ϕ_3	*-0.0897*	***-6.280E-03*** *	*-4.913E-03*
	(0.2049)	***(0.0780)***	*(0.2904)*
ϕ_4	*-0.0259*	***8.128E-03*** *	***0.0150*** *
	(0.3661)	***(0.0028)***	***(0.0001)***

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

	IWR	IMF	G10
ϕ_1	*1.059E-08*	*3.442E-09*	*9.542E-09*
	(0.9658)	*(0.6845)*	*(0.5240)*
ϕ_2	*5.299E-08*	*-5.867E-09*	*-1.325E-08*
	(0.7930)	*(0.4342)*	*(0.2905)*
ϕ_3	*-0.0928*	*7.600E-04*	*7.888E-04*
	(0.2973)	*(0.8348)*	*(0.9861)*
ϕ_4	*-0.0644*	***9.682E-03*** *	***0.0145*** *
	(0.1512)	***(0.0004)***	***(0.0001)***

* Significance level of estimates between parentheses.
** *IWR* exchange rates are the Industry specific rates.

Table 13. Estimation of the exposure components with the alternative model (eq.22)

$$R_{i,t} - R_{f,t} = c_i + \pi_1 \Delta \hat{M1} + \pi_2 \Delta \hat{UNEM} + \pi_3 \Delta \hat{ENERGY} + \pi_4 \Delta \hat{COMMOD} + \pi_5 \Delta \hat{EXP} + \pi_6 \Delta \hat{INDEXP} + (\phi_1 FS_i + \phi_2 FP_i + \phi_3 CR4 + \phi_4)\ d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

	ϕ_1	ϕ_2	ϕ_3	ϕ_4	π_1	π_2	π_3	π_4	π_5	π_6
IWR	**5.054E^{-7}** *	**-3.237E^{-7}** *	-0.0658	**-0.1478** *	4.010E^{-6}	**0.0124** *	**1.539E^{-3}** *	**2.398E^{-3}** *	**-0.0193** *	-7.700E^{-4}
	(0.0133)	**(0.0271)**	(0.4551)	**(0.0133)**	(0.1344)	**(0.0263)**	**(0.0180)**	**(0.0680)**	**(0.0000)**	(0.1761)
IMF	7.358E^{-9}	5.972E^{-9}	**-7.680E^{-3}** *	**6.793E^{-3}** *	4.134E^{-6}	**0.0130** *	**1.510E^{-3}** *	**2.482E^{-3}** *	**-0.0198** *	-7.030E^{-4}
	(0.3975)	(0.4423)	**(0.0520)**	**(0.0044)**	(0.1221)	**(0.0186)**	**(0.0202)**	**(0.0585)**	**(0.0000)**	(0.2171)
G10	4.891E^{-9}	7.951E^{-9}	-7.130E^{-3}	**9.531E^{-3}** *	-6.610E^{-7}	**9.996E^{-3}** *	**2.031E^{-3}** *	**3.192E^{-3}** *	**-0.0210** *	-5.984E^{-4}
	(0.7826)	(0.5913)	(0.1656)	**(0.0022)**	(0.8255)	**(0.0884)**	**(0.0025)**	**(0.02331)**	**(0.0000)**	(0.3250)

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

	ϕ_1	ϕ_2	ϕ_3	ϕ_4	π_1	π_2	π_3	π_4	π_5	π_6
IWR	-4.916E^{-8}	9.427E^{-8}	-0.0884	**-0.0805** *	4.247E^{-6}	**0.0151** *	**1.434E^{-3}** *	**2.835E^{-3}** *	**-0.0185** *	-7.385E^{-4}
	(0.8485)	(0.6544)	(0.3477)	**(0.0866)**	(0.1131)	**(0.0066)**	**(0.0282)**	**(0.0303)**	**(0.0000)**	(0.1957)
IMF	2.511E^{-9}	-5.034E^{-9}	2.312E^{-3}	**0.0142** *	**5.144E^{-6}** *	**9.337E^{-3}** *	4.289E^{-4}	1.772E^{-3}	**-8.249E^{-3}** *	-4.294E^{-4}
	(0.7776)	(0.5263)	(0.5652)	**(0.0000)**	**(0.0544)**	**(0.0952)**	(0.5289)	(0.1796)	**(0.0075)**	(0.4531)
G10	1.143E^{-8}	-1.147E^{-8}	2.398E^{-3}	**0.0167** *	9.817E^{-6}	1.209E^{-3}	9.025E^{-4}	1.437E^{-3}	**-8.945E^{-3}** *	-1.690E^{-4}
	(0.4719)	(0.3935)	(0.6319)	**(0.0000)**	(0.7430)	(0.8410)	(0.2008)	(0.3131)	**(0.0040)**	(0.7820)

* Significance level of estimates between parentheses.

Table 14. Estimation of Multinationals' exposure

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Exchange rate	IWR	IMF	G10
R_m	0.0347	$-6.619E^{-04}$	$2.007E^{-03}$
	(0.1489)	(0.6850)	(0.3438)
R_d	-0.0249	**$5.519E^{-03}$** *	**$8.095E^{-03}$** *
	(0.3179)	**(0.0011)**	**(0.0003)**

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R,j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi,j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx,j} MYX_{t-j} + de_{ut}$$

	IWR	IMF	G10
R_m	5.123E-03	**3.863E-03** *	**4.262E-03** *
	(0.8873)	**(0.0196)**	**(0.0389)**
R_d	**-0.1136** *	**0.0101** *	**0.0135** *
	(0.0025)	**(0.0000)**	**(0.0000)**

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *IWR* exchange rates are the Industry specific rates.

Table 15. Estimation of industries' exposure

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

Industry NAICS	IWR		G10		IMF	
	Rm	*Rd*	*Rm*	*Rd*	*Rm*	*Rd*
211	0.0699	0.0909	$-1.995E^{-03}$	**$4.039E^{-03}$** *	$-5.269E^{-04}$	**$5.600E^{-03}$** *
	(0.5858)	(0.4863)	(0.4073)	**(0.0995)**	(0.7876)	**(0.0049)**
212	0.0161	-0.0193	**$-5.674E^{-03}$** *	$3.303E^{-04}$	**$-5.843E^{-03}$** *	$3.354E^{-04}$
	(0.2215)	(0.1438)	**(0.0023)**	(0.8625)	**(0.0003)**	(0.8366)
311	**$-6.217E^{-03}$** *	**$-6.156E^{-03}$** *	$-1.508E^{-03}$	$1.221E^{-03}$	**$-2.211E^{-03}$** *	$4.944E^{-04}$
	(0.0346)	**(0.0408)**	(0.2827)	(0.3967)	**(0.0629)**	(0.6849)
312	0.0184	0.0190	**$-4.379E^{-03}$** *	$-1.329E^{-03}$	**$-3.545E^{-03}$** *	$-2.024E^{-04}$
	(0.3958)	(0.3957)	**(0.0158)**	(0.4801)	**(0.0297)**	(0.9036)
321	3.282E-03	0.0475	$1.269E^{-03}$	**$6.856E^{-03}$** *	$7.549E^{-04}$	**$6.527E^{-03}$** *
	(0.9219)	(0.1842)	(0.5817)	**(0.0054)**	(0.6939)	**(0.0015)**
322	$-7.733E^{-03}$	**-0.0157** *	$4.198E^{-04}$	**$4.796E^{-03}$** *	$-1.449E^{-04}$	**$4.687E^{-03}$** *
	(0.2992)	**(0.0456)**	(0.7828)	**(0.0029)**	(0.9084)	**(0.0004)**
323	0.0386	0.0441	**$-3.938E^{-03}$** *	$-2.709E^{-04}$	**$-4.951E^{-03}$** *	$-1.261E^{-03}$
	(0.3398)	(0.3006)	**(0.0970)**	(0.9148)	**(0.0144)**	(0.5528)
324	$-8.034E^{-03}$	-0.0118	$2.184E^{-03}$	$6.917E^{-03}$	$1.720E^{-03}$	$5.836E^{-03}$
	(0.4112)	(0.2257)	(0.7637)	(0.3417)	(0.7699)	(0.3209)
325	-0.0225	-0.0198	$3.695E^{-04}$	**$4.767E^{-03}$** *	$-1.595E^{-03}$	$2.965E^{-03}$
	(0.3705)	(0.4387)	(0.8867)	**(0.0716)**	(0.4502)	(0.1676)
326	-0.1736	-0.1895	$8.131E^{-03}$	**0.0114** *	$2.145E^{-03}$	$6.332E^{-03}$
	(0.2413)	(0.2159)	(0.1376)	**(0.0465)**	(0.6028)	(0.1365)
327	$2.329E^{-03}$	$8.150E^{-03}$	$1.659E^{-03}$	$5.578E^{-03}$	$-1.425E^{-04}$	$4.047E^{-03}$
	(0.9004)	(0.6678)	(0.6235)	(0.1078)	(0.9614)	(0.1776)
331	$4.636E^{-04}$	$-1.080E^{-04}$	$2.598E^{-04}$	**$4.258E^{-03}$** *	$-2.254E^{-04}$	**$4.146E^{-03}$** *
	(0.8665)	(0.9705)	(0.8291)	**(0.0009)**	(0.8261)	**(0.0001)**
332	$-2.029E^{-03}$	$-6.653E^{-04}$	$3.625E^{-04}$	**$4.355E^{-03}$** *	$1.059E^{-03}$	**$5.888E^{-03}$** *
	(0.4372)	(0.8207)	(0.8573)	**(0.0567)**	(0.5746)	**(0.0056)**
333	$-4.512E^{-03}$	$-5.512E^{-03}$	$-8.940E^{-04}$	$3.518E^{-03}$	$-2.047E^{-03}$	$2.629E^{-03}$
	(0.4966)	(0.4162)	(0.6964)	(0.1361)	(0.2920)	(0.1843)
334	$-1.093E^{-03}$	$-7.691E^{-03}$	$-2.488E^{-04}$	**$6.088E^{-03}$** *	$-6.292E^{-04}$	**$5.875E^{-03}$** *
	(0.9554)	(0.7009)	(0.9304)	**(0.0376)**	(0.7917)	**(0.0159)**
335	$1.840E^{-04}$	$-4.445E^{-04}$	$-4.298E^{-03}$	$-6.261E^{-04}$	$6.009E^{-03}$	$9.822E^{-03}$
	(0.9841)	(0.9619)	(0.1164)	(0.8221)	(0.3207)	(0.1057)
336	$-2.721E^{-04}$	$-8.750E^{-03}$	$-1.715E^{-03}$	$2.363E^{-03}$	$-2.740E^{-03}$	$1.381E^{-03}$
	(0.9902)	(0.7000)	(0.4863)	(0.3492)	(0.1706)	(0.4985)
339	$4.213E^{-03}$	$4.501E^{-03}$	$-1.906E^{-03}$	$1.505E^{-03}$	$3.841E^{-03}$	$7.673E^{-03}$
	(0.8031)	(0.7922)	(0.7308)	(0.7890)	(0.4738)	(0.1561)

Table 15 Cont'd. Estimation of industries' exposure

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_{R.j} R_{t-j} + \sum_{j=1}^{n2} \alpha_{\pi.j} \pi_{t-j} + \sum_{j=1}^{n3} \alpha_{myx.j} MYX_{t-j} + de_{ut}$$

	IWR		G10		IMF	
	Rm	*Rd*	*Rm*	*Rd*	*Rm*	*Rd*
211	-0.1457	**-0.8056** *	$-2.027E^{-04}$	$3.812E^{-03}$	$-2.176E^{-03}$	$6.419E^{-04}$
	(0.2654)	**(0.0000)**	(0.9337)	(0.1246)	(0.2728)	(0.7505)
212	**0.0258** *	**0.0372** *	$-5.271E^{-04}$	$2.642E^{-03}$	$4.390E^{-04}$	$2.713E^{-03}$
	(0.0261)	**(0.0017)**	(0.7801)	(0.1724)	(0.7886)	(0.1037)
311	$1.509E^{-03}$	$-7.252E^{-04}$	$3.494E^{-05}$	$1.041E^{-03}$	$-5.316E^{-05}$	$7.737E^{-04}$
	(0.5684)	(0.7888)	(0.9807)	(0.4815)	(0.9650)	(0.5326)
312	-0.0213	**-0.0365** *	**$-3.637E^{-03}$** *	$-2.186E^{-03}$	$-2.585E^{-03}$	$-1.405E^{-03}$
	(0.3043)	**(0.0876)**	**(0.0525)**	(0.2607)	(0.1210)	(0.4105)
321	-0.0378	**-0.0964** *	$-2.572E^{-03}$	$1.468E^{-03}$	$-1.392E^{-03}$	$1.669E^{-03}$
	(0.2557)	**(0.0066)**	(0.2708)	(0.5575)	(0.4770)	(0.4246)
322	$-2.069E^{-03}$	$1.830E^{-03}$	$1.027E^{-03}$	$3.337E^{-03}$	$9.443E^{-04}$	**$2.846E^{-03}$** *
	(0.7646)	(0.8020)	(0.5078)	(0.0422)	(0.4624)	**(0.0359)**
323	$-7.749E^{-04}$	-0.0103	**$-4.563E^{-03}$** *	$-2.067E^{-03}$	**$-3.860E^{-03}$** *	$-2.012E^{-03}$
	(0.9847)	(0.8091)	**(0.0572)**	(0.4195)	**(0.0637)**	(0.3568)
324	$-1.827E^{-03}$	$-1.260E^{-03}$	$3.456E^{-03}$	$4.547E^{-03}$	$2.793E^{-03}$	$3.384E^{-03}$
	(0.7887)	(0.8534)	(0.6423)	(0.5419)	(0.6410)	(0.5722)
325	$8.477E^{-03}$	$7.006\ E^{-03}$	$2.458E^{-03}$	$5.426E^{-03}$	$2.268E^{-03}$	**$4.353E^{-03}$** *
	(0.7286)	(0.7782)	(0.3489)	(0.0426)	(0.2945)	**(0.0477)**
326	0.1368	0.0985	$7.862E^{-03}$	**0.0146** *	**$8.606E^{-03}$** *	**0.0124** *
	(0.2964)	(0.4669)	(0.1363)	**(0.0080)**	**(0.0386)**	**(0.0038)**
327	$-2.330E^{-03}$	$-4.587E^{-03}$	$2.004E^{-04}$	$1.700E^{-03}$	$2.068E^{-03}$	$3.433E^{-03}$
	(0.8822)	(0.7750)	(0.9536)	(0.6309)	(0.4927)	(0.2634)
331	$6.892E^{-04}$	$-3.184E^{-04}$	**$4.834E^{-03}$** *	**$6.706E^{-03}$** *	**$4.686E^{-03}$** *	**$6.322E^{-03}$** *
	(0.7624)	(0.8951)	**(0.0001)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
332	$1.054E^{-03}$	$1.908E^{-03}$	**$5.768E^{-03}$** *	**$7.750E^{-03}$** *	**$5.697E^{-03}$** *	**$7.619E^{-03}$** *
	(0.6447)	(0.4576)	**(0.0062)**	**(0.0011)**	**(0.0029)**	**(0.0004)**
333	$2.952E^{-03}$	$4.064E^{-03}$	$2.574E^{-03}$	**$5.733E^{-03}$** *	$2.532E^{-03}$	**$4.627E^{-03}$** *
	(0.6356)	(0.5231)	(0.2761)	**(0.0183)**	(0.2025)	**(0.0222)**
334	$-2.191E^{-03}$	-0.0143	$-3.188E^{-03}$	$1.925E^{-03}$	$-1.772E^{-03}$	$1.401E^{-03}$
	(0.8975)	(0.4103)	(0.2672)	(0.5144)	(0.4694)	(0.5761)
335	$-1.584E^{-03}$	$-9.269E^{-04}$	$-3.411E^{-03}$	$-1.034E^{-03}$	**0.0103** *	**0.0118** *
	(0.8460)	(0.9098)	(0.2201)	(0.7147)	**(0.0977)**	**(0.0575)**
336	0.0248	0.0166	**$-4.463E^{-03}$** *	$-2.041E^{-03}$	**$-3.933E^{-03}$** *	$-2.164E^{-03}$
	(0.2359)	(0.4384)	**(0.0749)**	(0.4268)	**(0.0535)**	(0.2977)
339	-0.0469	-0.0381	$6.162E^{-04}$	$2.615E^{-03}$	$4.726E^{-03}$	$6.313E^{-03}$
	(0.2135)	(0.3175)	(0.9152)	(0.6562)	(0.3866)	(0.2514)

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *IWR* exchange rates are the Industry specific rates.

Table 16. Exposure of the domestic sample to the CAD/USD exchange rate

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

	BXR(3)		BXR(9)	
	Rm	*Rd*	*Rm*	*Rd*
1971-1999	*0.3399* (0.3155)	*0.3890* (0.2508)	*0.3750* (0.2683)	*-0.4136* (0.2472)
1971-79	*-0.0296* (0.7861)	*-0.0484* (0.6630)	*-0.0403* (0.7186)	*-0.1392* (0.2094)
1980-87	*-0.1145* (0.1023)	***0.2063*** * **(0.0038)**	***-0.2205*** * **(0.0019)**	***-0.3287*** * **(0.0000)**
1987-93	*0.0525* (0.8187)	*0.2808* (0.2213)	*0.2737* (0.2332)	*-0.3768* (0.1400)
1994-99	*0.7849* (0.3235)	*0.8331* (0.2947)	*0.8078* (0.3096)	*-0.3941* (0.6264)

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *BXR(3)* denotes the exchange rate variable news constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

**** *BXR(9)* denotes the exchange rate variable news constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} +$$

$$\sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*_{t-j} + de_{ut}$$

Table 17. Exposure of the domestic sample to the CAD/USD exchange rate (Alternative model eq.21)

$$R_{i,t} - R_{f,t} = c_i + \pi_1 \Delta \hat{M1} + \pi_2 \Delta \hat{UNEM} + \pi_3 \Delta \hat{ENERGY} + \pi_4 \Delta \hat{COMMOD} + \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

γ	π_1	π_2	π_3	π_4
$-8.020E^{-07}$	0.0219	$-7.716E^{-04}$	**0.0156** *	1.1916
(0.9601)	(0.5070)	(0.8641)	**(0.0865)**	(0.1497)

B. With exchange rate variable constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} + \sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*_{t-j} + de_{ut}$$

γ	π_1	π_2	π_3	π_4
$1.841E^{-06}$	0.0195	$-1.694E^{-03}$	**0.0150** *	-0.7988
(0.9089)	(0.5585)	(0.7096)	**(0.0973)**	(0.3423)

* Significance level of estimates between parentheses.

Table 18. Exposure of the exporting sample to the CAD/USD exchange rate

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

	BXR(3)		BXR(9)	
	Rm	*Rd*	*Rm*	*Rd*
1971-1999	***0.0650*** *	***-0.1283*** *	***0.1137*** *	***-0.7598*** *
	(0.0814)	***(0.0008)***	***(0.0028)***	***(0.0000)***
1971-79	*-0.0977*	*0.1188*	*-0.1141*	***-0.3208*** *
	(0.2543)	*(0.1816)*	*(0.2060)*	***(0.0003)***
1980-87	***0.1796*** *	*0.1025*	*0.0840*	***-0.4984*** *
	(0.0094)	*(0.1515)*	*(0.2381)*	***(0.0000)***
1987-93	*0.1284*	***0.3886*** *	***0.3823*** *	***-0.2815*** *
	(0.1171)	***(0.0000)***	***(0.0000)***	***(0.0025)***
1994-99	*-0.0022*	*-0.0407*	*0.0222*	***-1.1372*** *
	(0.9713)	*(0.5125)*	*(0.7187)*	***(0.0000)***

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *BXR(3)* denotes the exchange rate variable news constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

**** *BXR(9)* denotes the exchange rate variable news constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} +$$

$$\sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*_{t-j} + de_{ut}$$

Table 19. Exposure of the exporting sample to the CAD/USD exchange rate (alternative model eq.21)

$$R_{i,t} - R_{f,t} = c_i + \pi_1 \Delta \hat{M1} + \pi_2 \Delta \hat{UNEM} + \pi_3 \Delta \hat{ENERGY} + \pi_4 \Delta \hat{COMMOD} + \pi_5 \Delta \hat{EXP} + \pi_6 \Delta \hat{INDEXP} + \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

γ	π_1	π_2	π_3	π_4	π_5	π_6
$-2.887E^{-06}$ *	**$-5.272E^{-03}$ ***	**$1.802E^{-03}$ ***	$6.745E^{-04}$	$2.425E^{-03}$	$-3.434E^{-04}$	0.1053
(0.0240)	**(0.0519)**	**(0.0000)**	(0.3661)	(0.5907)	(0.2013)	(0.1110)

B. With exchange rate variable constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} + \sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*_{t-j} + de_{ut}$$

γ	π_1	π_2	π_3	π_4	π_5	π_6
$-6.40E^{-07}$	**$7.493E^{-03}$ ***	**$6.390E^{-04}$ ***	**$1.378E^{-03}$ ***	$6.725E^{-03}$	$1.535E^{-04}$	**-1.3982 ***
(0.6132)	**(0.0055)**	**(0.0781)**	**(0.0611)**	(0.1314)	(0.5642)	**(0.0000)**

* Significance level of estimates between parentheses.

Table 20. Estimation of exposure determinants (eq.14 and 15)

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) - \sum_{j=1}^{m} \hat{\delta}_j Ind_j = (\Phi_1 FS_i + \Phi_2 FP_i + \Phi_3 CR4 + \Phi_4)\, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

	BXR(3)		BXR(9)	
	Rm	*Rd*	*Rm*	*Rd*
ϕ_1	$1.292E^{-07}$ (0.7725)	$9.704E^{-08}$ (0.8311)	$-2.875E^{-07}$ (0.5018)	$-2.700E^{-07}$ (0.5336)
ϕ_2	$-4.27E^{-07}$ (0.2747)	$-3.161E^{-07}$ (0.4276)	$4.37E^{-07}$ (0.2484)	$3.882E^{-07}$ (0.3128)
ϕ_3	0.0442 (0.8335)	0.0310 (0.8842)	0.1589 (0.4664)	0.1934 (0.3791)
ϕ_4	0.0335 (0.7880)	0.0229 (0.8876)	-0.1389 (0.2805)	**-0.9380*** **(0.0000)**

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the
domestic market index return is used (eq.11).

*** *BXR(3)* denotes the exchange rate variable news constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

**** *BXR(9)* denotes the exchange rate variable news constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} +$$

$$\sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*_{t-j} + de_{ut}$$

Table 21. Estimation of exposure determinants with the alternative model (eq.22)

$$R_{i,t} - R_{f,t} = c_i + \pi_{i1}\,\Delta \hat{M1} + \pi_{i2}\,\Delta \hat{UNEM} + \pi_{i3}\,\Delta \hat{ENERGY} + \pi_{i4}\,\Delta \hat{COMMOD} + \pi_{i5}\,\Delta \hat{EXP} + \pi_{i6}\,\Delta \hat{INDEXP} + (\phi_1 FS_i + \phi_2 FP_i + \phi_3 CR4 + \phi_4)\, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

A. With exchange rate variable constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

ϕ_1	ϕ_2	ϕ_3	ϕ_4	π_1	π_2	π_3	π_4	π_5	π_6
$1.831E^{-06}$	0.0134	$-1.794E^{-05}$	$2.713E^{-03}$	**0.0338** *	$-4.670E^{-04}$	$-2.466E^{-07}$	$-1.493E^{-07}$	0.1343	0.1557
(0.7028)	(0.1980)	(0.9867)	(0.2351)	**(0.0211)**	(0.4027)	(0.6398)	(0.7384)	(0.6277)	(0.4572)

B. With exchange rate variable constructed from equation (4)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1}\alpha_R (R-R^*)_{t-j} + \sum_{j=1}^{n2}\alpha_{m,j}(m-m^*)_{t-j} + \sum_{j=1}^{n3}\alpha_{y,j}(y-y^*)_{t-j} + \sum_{j=1}^{n4}\alpha_{\pi,j}(\pi-\pi^*)_{t-j} + \sum_{j=1}^{n5}\alpha_{TB,j}TB_{t-j} + \sum_{j=1}^{n6}\alpha_{TB,j}TB^*_{t-j} + de_{ut}$$

ϕ_1	ϕ_2	ϕ_3	ϕ_4	π_1	π_2	π_3	π_4	π_5	π_6
3.28^{E-06}	**0.0231** *	$-5.162E^{-04}$	$1.721E^{-03}$	**0.0270** *	$-2.497E^{-04}$	$-3.760E^{-07}$	$3.820E^{-07}$	0.1741	**-1.3146** *
(0.4809)	**(0.0211)**	(0.6259)	(0.4385)	**(0.0590)**	(0.6530)	(0.4541)	(0.3748)	(0.5430)	**(0.0000)**

* Significance level of estimates between parentheses.

Table 22. Estimation of industries' exposure to the CAD/USD exchange rate

$$(R_{i,t} - R_{f,t}) - \hat{\beta}_i (R_{m,t} - R_{f,t}) = \gamma_i \, d\hat{e}_{u,t} + \varepsilon_{i,t}$$

Industry NAICS	BXR(3) Rm	BXR(3) Rd	BXR(9) Rm	BXR(9) Rd
211	*0.0925*	*0.1776*	*0.1596*	***-1.0324*** *
	(0.4909)	*(0.1942)*	*(0.2426)*	***(0.0000)***
212	***0.2314*** *	***0.3021*** *	***0.2863*** *	***-1.3279*** *
	(0.0324)	***(0.0061)***	***(0.0093)***	***(0.0000)***
311	*0.1354*	***0.1540*** *	*0.1418*	***-0.3391*** *
	(0.1160)	***(0.0805)***	*(0.1067)*	***(0.0002)***
312	***0.2322*** *	***0.2756*** *	***0.2685*** *	***-0.3085*** *
	(0.0417)	***(0.0188)***	***(0.0221)***	***(0.0121)***
321	*-0.1465*	*-0.0460*	*-0.0588*	***-0.6415*** *
	(0.2778)	*(0.7496)*	*(0.6829)*	***(0.0000)***
322	*-0.1019*	*-0.0381*	*-0.0495*	***-0.6068*** *
	(0.2509)	*(0.6849)*	*(0.5968)*	***(0.0000)***
323	*0.1778*	*0.2409*	*0.2356*	***-0.2873*** *
	(0.2014)	*(0.1001)*	*(0.1073)*	***(0.0658)***
324	*-0.1141*	*-0.1326*	*-0.1583*	***-0.8833*** *
	(0.7959)	*(0.7637)*	*(0.7191)*	***(0.0565)***
325	*0.0585*	*0.1285*	*0.1163*	***-0.4589*** *
	(0.6831)	*(0.3783)*	*(0.4247)*	***(0.0028)***
326	*-0.1273*	*-0.0459*	*-0.0656*	***-0.5039*** *
	(0.5992)	*(0.8545)*	*(0.7916)*	***(0.0438)***
327	*0.0148*	*0.0612*	*0.0540*	***-0.4554*** *
	(0.9430)	*(0.7721)*	*(0.7985)*	***(0.0414)***
331	***0.1272*** *	***0.1795*** *	***0.1671*** *	***-0.8312*** *
	(0.0839)	***(0.0214)***	***(0.0317)***	***(0.0000)***

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *BXR(3)* denotes the exchange rate variable news constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

**** *BXR(9)* denotes the exchange rate variable news constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} +$$

$$\sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*_{t-j} + de_{ut}$$

Table 22 Cont'd. Estimation of industries' exposure to the CAD/USD exchange rate

Industry NAICS	*BXR(3)* *Rm*	*BXR(3)* *Rd*	BXR(9) *Rm*	BXR(9) *Rd*
332	*0.1384*	*0.2137*	*0.1946*	***-1.2359*** *
	(0.2908)	*(0.1465)*	*(0.1843)*	***(0.0000)***
333	*0.1363*	*0.1888*	*0.1750*	***-0.6066*** *
	(0.2941)	*(0.1547)*	*(0.1860)*	***(0.0000)***
334	***-0.3830*** *	***-0.2866*** *	***-0.3098*** *	***-0.5337*** *
	(0.0152)	***(0.0760)***	***(0.0543)***	***(0.0016)***
335	*0.5121*	*0.5600*	*0.5444*	***-1.9031*** *
	(0.2108)	*(0.1728)*	*(0.1848)*	***(0.0000)***
336	*0.1232*	*0.1801*	*0.1669*	*-0.1868*
	(0.3856)	*(0.2148)*	*(0.2496)*	*(0.2204)*
339	*-0.0103*	*0.0317*	*0.0248*	***-1.3123*** *
	(0.9776)	*(0.9320)*	*(0.9467)*	***(0.0007)***

* Significance level of estimates between parentheses.

** R_m means the national market index return is used in the model (eq.8), and R_d means that the domestic market index return is used (eq.11).

*** *BXR(3)* denotes the exchange rate variable news constructed from equation (3)

$$e_{t+1} = \theta_0 + \theta_1 e_t + de_{u,t}$$

**** *BXR(9)* denotes the exchange rate variable news constructed from equation (9)

$$\Delta e_t = \theta_0 + \sum_{j=1}^{n1} \alpha_R (R - R^*)_{t-j} + \sum_{j=1}^{n2} \alpha_{m,j} (m - m^*)_{t-j} + \sum_{j=1}^{n3} \alpha_{y,j} (y - y^*)_{t-j} + \sum_{j=1}^{n4} \alpha_{\pi,j} (\pi - \pi^*)_{t-j} +$$

$$\sum_{j=1}^{n5} \alpha_{TB,j} TB_{t-j} + \sum_{j=1}^{n6} \alpha_{TB,j} TB^*{}_{t-j} + de_{ut}$$

Figure 1. The U.S. G-10 trade weighted exchange rates

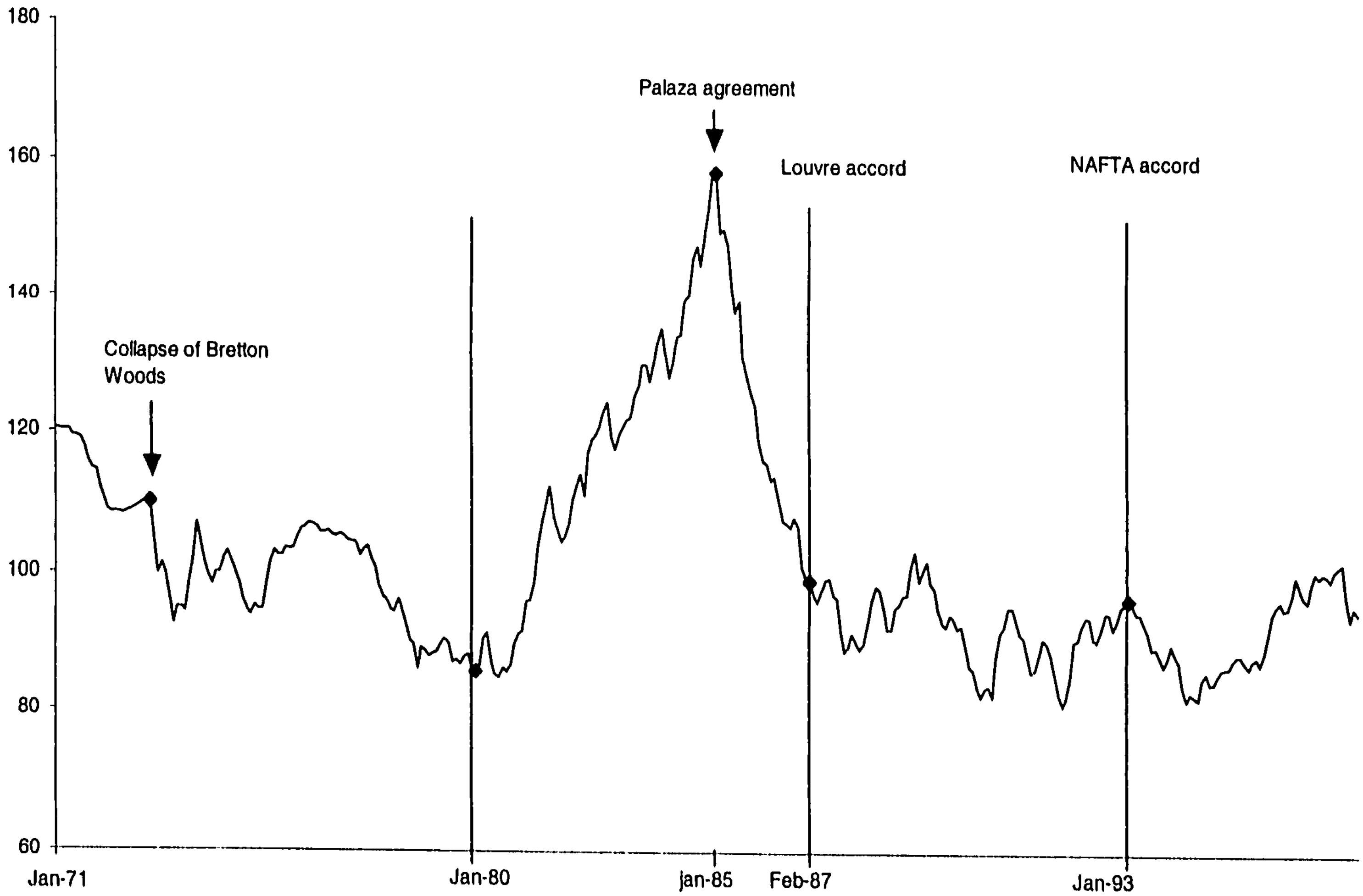


Figure 2. The IMF and the Canadian G-10 trade weighted exchange rates

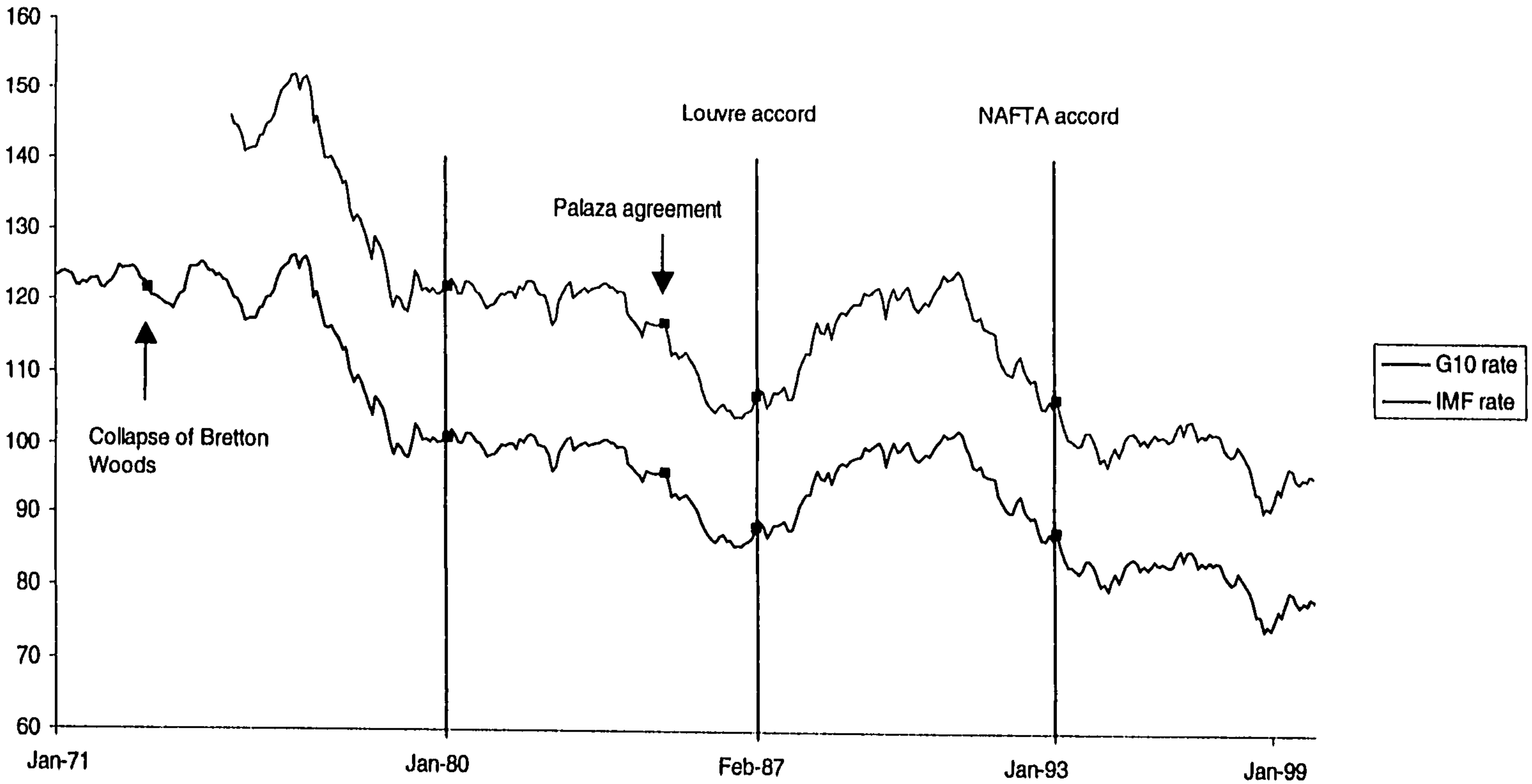
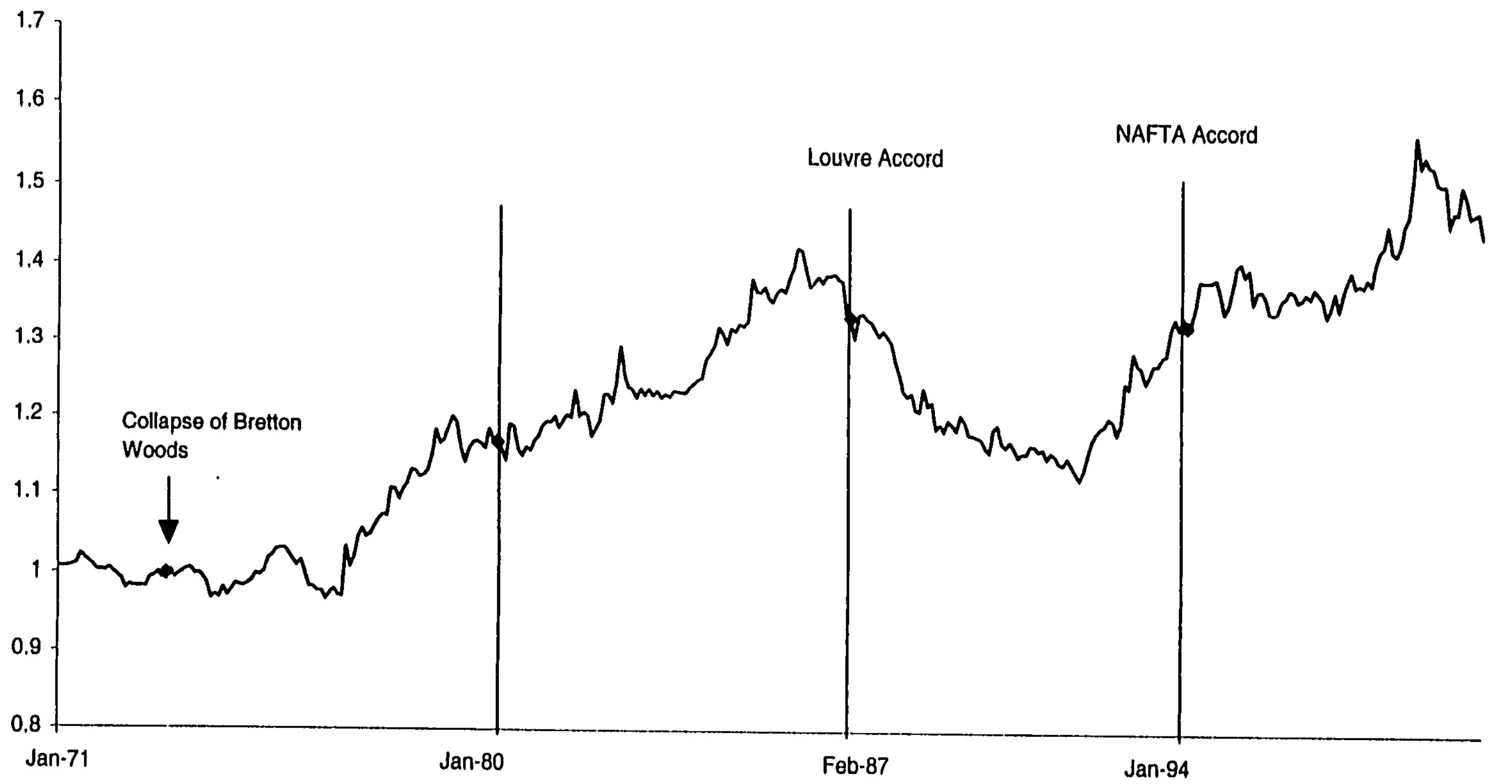


Figure 3. The Canada-U.S. bilateral exchange rate



References

Adler, M., and B. Dumas, 1984. 'Exposure to currency risk: Definition and Measurement', *Financial Management*, Summer, vol.13, 41-50.

Amihud, Y. Levich, 1994. 'Exchange and the valuation of equity shares.' In: Amihud, Y. Levich, Exchange Rates and Corporate Performance. Irwin Professional Publishing, New York, 49-59.

Bartov, E., and Gordon, M. Bodnar, 1994. 'Firm valuation, earnings expectations, and the exchange-rate exposure effect', *Journal of Finance*, vol.49, 1755-1785.

Bodnar, M. Gordon, and William, M. Gentry, 1993. 'Exchange rate exposure and industry characteristics: vidence from Canada, japan, and the USA', *Journal of International Money and Finance*, vol.12, 29–45.

Booth, L., and W. Rotenberg, 1990. 'Assessing Foreign Exchange Exposure: Theory and Application using Canadian Firms', *Journal of International Financial Management and Accounting*, vol.2, 1-22.

Choi, J.J.,1986. 'A Model for Firm Valuation with Exchange Exposure', *Journal of International Business Studies*, Summer, vol.17, 153-160.

Choi, J.J., and A. M. Prasad, 1995. 'Exchange Risk Sensitivity and its Determinants: A Firm and Industry Analysis of U.S. Multinationals', *Financial Management*, Automn, vol.24 (3), 77-88.

Cornell, B., 1980. 'Inflation, Relative Price Changes, and Exchange Risk', *Financial Management*, Autumn, vol.9, 30-34.

Davis, A. Henry, 1986. 'Foreign exchange exposure: it's not all on the balance sheet', *Cashflow*, December, 36-39.

Doukas, J., Patricia, H. Hall, and Larry, H. P. Lang, 1999. 'The Pricing of Currency Risk in Japan', *Journal of Banking and Fianace*, vol.23, 1-20.

Eun, S. Eunn, and Bruce, G. Resnick, 1998. International Financial Management, Irwin/McGraw-Hill Publishing.

Gao, T., 2000. 'Exchange rate movements and the profitability of U.S. multinationals', *Journal of International Money and Finance*, vol.19, 117-134.

Grossman, G. M., and J. A. Levinsohn, 1989. 'Import competition and the stock market return to capital', *American Economic Review*, vol.79 (5), 1065-1087.

He, J., and Lilian K. NG, 1998. 'The Foreign Exchange Exposure of Japanese Multinational Corporations', *The Journal of Finance*, April, vol.LII (2), 733-753.

Jorion, P., 1990. 'The Exchange Rate Exposure of U.S. Multinationals', *Journal of Business*, July, vol.63, 331-345.

Jorion, P., 1991. 'The Pricing of Exchange Rate Risk in the Stock Market, *Journal of Financial and Quantitative Analysis*, September, vol.26, 363-376.

Khoo, A., 1994. 'Estimation of foreign exchange exposure: An application to mining companies in Australia', *Journal of International Money and Finance*, vol.13 (3), 342-363.

Levi, M. D., 1994. 'Exchange rate and the valuation of firms.' In: Amihud, Y. Levich, Exchange Rates and Corporate Performance. Irwin Professional Publishing, New York, 37-48.

Levinsohn, J. A., and J. K. Mackie-Mason, 1990. 'A simple consistent estimator for disturbance components in financial models', *Review of Economics and Statistics*, vol.72 (3), 516-520.

Lombard, T., J., Roulet, and B., Solnik, 1999. 'Pricing of Domestic versus Multinational Companies', *Financial Analysts Journal*, vol.55, 35-49.

Pindyck, S. Robert, and Daniel, L. Rubinfield, 1998. Econometric Models and Econometric Forecasts, Fourth edition. Irwin/McGraw-Hill Publishing.

Powell, J. , 1999. 'A History of the Canadian dollar', *Bank of Canada web site,* **(www.bankofcanada.ca/en/dollar_book).**

Shapiro, A. C., 1975. 'Exchange rate changes, inflation, and the value of the multinational corporation', *Journal of Finance*, vol.30 (2), 485-502.

Solnik, B., 1978. 'International Parity Conditions and Exchange Rate', *Journal of Banking and Finance*, vol.2, 281-293.

Solnik, B., 1983. 'International Arbitrage Pricing Theory', *The Journal of Finance*, May, vol.XXXVIII (2), 449-456.

Stopford, J., 1992. Directory of Multinationals. MacMillan, New York.