DM/83/81

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

The Impact of Taxation on International Capital Flows--Some Empirical Estimations

Prepared by Menachem Katz*

Approved by Peter S. Heller

November 30, 1983

In recent years, only a few studies taking account of the impact of taxation have been added to the large body of literature on international finance. These studies have attempted analytically to demonstrate how the introduction of taxation can affect the links among interest rates, inflation rates, and exchange rates. The objective of this paper is to empirically demonstrate the impact of tax factors on international capital flows.

The interrelationships among interest rate differentials, expected inflation differentials, and expected exchange rate movements, which are also known as the interest rate and the purchasing power parities, have been shown to hold simultaneously in equilibrium in theoretical papers (Aliber (1973), Hodjera (1973)). However, empirical studies have found deviations between interest rate differentials and forward exchange rate premia on the one hand and between each of the above and differentials in expected inflation on the other. These deviations have been explained by transaction costs, degrees of political risks, government interventions, and varying degrees of exchange controls; tax factors have not been suggested as a possible explanation (Aliber (1973), Frenkel and Levich (1975)). Thus, it can be argued that these studies have implicitly assumed that tax factors do not affect these differentials or alternatively that tax factors affect all relevant variables proportionally so that the net effect is neutral.

The recent studies that introduce tax considerations have demonstrated that differences in tax practices among countries may affect the links between interest rate parity and purchasing power parity

*This paper benefited from comments by Ved Gandhi and Peter Heller and from research assistance by Ziba Farhadian. The usual disclaimer applies here.

(Ben-Zion and Weinblatt (1982) and Blejer (1983)). In addition, they have shown how taxes may affect the direction of capital flows, for example, capital can flow simultaneously in opposite directions (Levi (1977)), and how taxes introduce nonneutrality in that a change in expected inflation in one country affects the expected real rate of interest or the path of the real exchange rate in a two-country setting (Hartman (1979), Howard and Johnson (1982)).

The first part of this paper provides empirical evidence on the impact of tax factors on the relationship between interest rate differentials and expected inflation differentials for the United States and each of seven other industrial countries--Canada, France, the Federal Republic of Germany, Italy, Japan, the Netherlands, and the United Kingdom, based on quarterly time series data over the period 1972-1980.

The second part focuses on the potential for "abnormal" simultaneous capital flows in opposite directions, between the United States and each of the seven industrial countries based on Levi's methodology, and shows to what extent it is a significant phenomenon.

1. Impact of taxation on link between interest rate and expected inflation differentials

International capital flows arise from interest rate differentials across countries when investors choose securities yielding the highest return. With exchange rate uncertainty, investors in foreign-denominated securities can hedge against the risk of fluctuations in the value of foreign currencies by buying a contract to sell the foreign exchange in the forward market upon redemption of the foreign-denominated securities. Consider a two-country case: residents of country 1 can buy domestic securities and receive a yield, i_1, or they can buy foreign securities, the yield of which is composed of two components, the foreign interest, i_2, and the expected foreign exchange gain (or loss), s^e, which is defined as the expected percentage change of the spot exchange rates and is denominated in units of domestic currency per unit of foreign currency. From the point of view of residents of country 1, portfolio equilibrium will exist when

$$(1) \quad i_1 = i_2 + \dot{s}^e.$$

Viewed from a different angle, the expected change in the exchange rate is equivalent to the differential in expected inflation, or

$$(2) \quad i_1 - i_2 = \pi_1^e - \pi_2^e$$

where π^e is the rate of expected inflation.

The first is known as the interest rate parity, while the second is the purchasing power parity. A third link can be established by applying the Fisher equation to a two-country setting.

$$(3)\quad i_1 = r_1^e + \pi_1^e$$

$$(4)\quad i_2 = r_2^e + \pi_2^e$$

where r^e is the expected real rate of interest.

Thus, subtracting equation (4) from equation (3) yields

$$(5)\quad i_1 - i_2 = (r_1^e - r_2^e) + (\pi_1^e - \pi_2^e).$$

Equation (2) differs from equation (5) in that it assumes that there is no difference in expected real rates of interest (actual real rates of interest can diverge due to differences in productivity of capital). In other words, equation (5) assumes that a "Mundell effect" may exist in a two-country case operating in a similar manner to the Mundell effect in a single-country case. Namely, a change in the differential of expected inflation between two countries may affect the differential of expected real interest rates.

Before introducing tax factors into the analysis, it would be useful to describe briefly how industrial countries tax income arising from international transactions. The treatment of taxation on interest income and capital gains arising from foreign exchange gains varies across countries. Tax laws in industrial countries generally do not contain explicit provisions about the treatment of foreign exchange gains so that practices tend to reflect accounting and legal practices. For example, taxes on exchange gains are payable on an accrual basis in Canada and France. Furthermore, exchange gains are taxed at the capital gains tax rate rather than at the income tax rate in Canada, the United Kingdom, and the United States. With the exception of these countries, all other sample countries allow deductions for unrealized exchange losses. Moreover, the eight industrial countries in this sample have tax treaties allowing for reduced withholding tax rates on the interest income of nonresidents. This does not necessarily mean that investors abroad enjoy lower tax rates; the general practice has been that the withholding tax paid on interest income abroad is deducted from total domestic tax payments. Thus, investors continue to pay on the basis of domestic tax rates. In effect, tax treaties distribute tax revenue between the capital-exporting and capital-importing countries.

Of the eight sample countries, only Canada, the United Kingdom, and the United States apply capital gains tax rates that are lower than interest income or company income tax rates. And only in Canada and

the United Kingdom do these capital gains tax rates apply to short-term gains. In the United States, the capital gains tax is applied only on gains realized after 12 months; short-term gains are taxed as normal income.

The introduction of taxation into the Fisher equation in the single-country case results in a modified Fisher effect, as has been demonstrated theoretically by Darby (1975) and Tanzi (1976), and empirically for eight industrial countries (Katz, 1983).

Consider the introduction of tax factors into the analysis: suppose a tax rate, τ_1, is applied to interest income of residents of country 1 earned in any of the countries. If the tax applies to interest income while capital gains are exempt, the relationship in equation (1) will be modified as follows:

$$(6) \quad i_1(1-\tau_1) = i_2(1-\tau_1) + \dot{s}^e \text{ or}$$

$$(7) \quad i_1 - i_2 = \left(\frac{1}{1-\tau_1}\right) \dot{s}^e.$$

If the tax applied to capital gains, θ_1, is equal to the tax rate on interest income, then equation (6) collapses to equation (1). However, if there is no capital gains tax ($\theta_1=0$), then equation (7) remains intact.

If a reduced capital gains tax, $\theta_1 < \tau_1$, applies, then equation (6) becomes

$$(8) \quad i_1 - i_2 = \left(\frac{1-\theta_1}{1-\tau_1}\right) \dot{s}^e ;$$

similar considerations apply to residents of country 2.

When the expected rate of change of the exchange rate is replaced by the differential of expected inflation rates, the introduction of tax factors viewed in terms of the portfolio equilibrium requirements of residents of country 1 would require equating the net of tax interest rate differential to the differential of expected inflation. If capital gains tax rates are equal to interest income tax rates, then equation (2) will not be affected by the introduction of tax factors:

$$(9) \quad i_1 (1-\tau_1) - i_2 (1-\tau_1) = (1-\tau_1)(\pi_1^e - \pi_2^e).$$

If, however, foreign exchange gains are not subject to any tax or if foreign exchange gains tax does not apply to unrealized gains then equation (2) becomes

$$(10)\quad (i_1 - i_2) = \frac{1}{(1-\tau_1)}\,(\pi_1^e - \pi_2^e).$$

Alternatively, if foreign exchange gains are subject to a reduced capital gains tax, $\theta < \tau$, then equation (10) becomes

$$(11)\quad (i_1 - i_2) = \frac{(1-\theta_1)}{1-\tau_1}\,(\pi_1^e - \pi_2^e).$$

As the United States applies a capital gains tax of 20 percent on foreign exchange gains to individuals realized after at least 12 months, one would expect this to affect the relationship between interest rate and expected inflation rate differentials. In order to verify this hypothesis, the following tests were conducted

$$(12')\quad i_{1t}^s - i_{2t}^s = \alpha^s + \beta^s(\pi_1^e - \pi_2^e)$$

$$(12'')\quad i_{1t}^L - i_{2t}^L = \alpha^L + \beta^L(\pi_1^e - \pi_2^e)$$

where superscripts s and L represent short term (3 months) and long-term (12 months) maturities, respectively. In order to account for a possible two-country Mundell effect, an alternative formulation to equation (12) is considered. This alternative formulation constrains the constants, α^s, and α^L, to the actual ex post differential of real interest rates, $(r_1 - r_2)$.

$$(13')\quad (i_{1t}^s - i_{2t}^s) - (\bar{r}_1 - \bar{r}_2) = \beta^s(\pi_{1t}^e - \pi_{st}^e)$$

$$(13'')\quad (i_{1t}^L - i_{2t}^L) - (\bar{r}_2 - \bar{r}_2) = \beta^L(\pi_{1t}^e - \pi_{st}^e).$$

The time series for expected inflation were derived from the term structure of interest rates using the Frankel (1982) method. 1/

To the extent that the differential tax treatment of foreign exchange gains on short- and long-term flows on the part of the United States affects the link between interest rate and expected inflation differentials, this can be demonstrated in coefficients of equations (12) and (13). If short-term foreign exchange gains are not realized, for tax purposes, one would expect β^s in both formulations--(12) and (13)--to be greater than β^L, as the first reflects $1/(1-\tau_1)$, while the latter reflects $(1-\theta_1)/(1-\tau_1)$ (> 1 if $\theta_1 < \tau_1$). If, however, short-term foreign exchange gains are realized and taxed as income, β^s could be smaller than β^L.

1/ An application of this method to single-country Fisher effects appears in Katz (1983).

The results of the estimations as summarized in Table 1 demonstrate that β^S are significantly greater than β^L for all differentials between the United States and each of the seven countries. These indicate that the link between interest rate and expected inflation differentials is affected by tax considerations. They also suggest that short-term foreign exchange gains are effectively taxed at lower rates than long-term gains, although other nontax factors may explain the emergence of these results. The results also demonstrate that the two alternative formulations do not result in substantially different coefficients.

2. Taxation and direction of capital flows

The previous section empirically demonstrates that tax factors may affect the relationship between interest rate differentials and expected inflation differentials. This section investigates to what extent tax factors may lead to simultaneous movements of capital in opposite directions between two countries.

The following investigation is an extension of Levi's (1977) framework (which relates to flows between the United States and Canada) to flows that occur between the United States and each of six additional industrial countries.

Levi's demonstration of "abnormal" capital flows is based on a differential tax treatment of interest income and capital gains.

Suppose there is a pretax-covered advantage of investing in country 1

$$(14) \quad i_1 - i_2 + (1+i_2)\left(\frac{F-S}{S}\right) > 0$$

where S and F are the spot and forward exchange rates denominated in units of domestic currency per unit of foreign currency.

Residents of country 1 are subject to interest income tax, τ_1, and capital gains tax, θ_1, where $\theta_1 < \tau_1$; residents of country 2 are subject to income tax, τ_2, and no capital gains tax. Residents of country 1 will prefer to buy securities of country 2 when the foreign currency is at a premium because the exchange gain component of their earnings is taxed at a lower rate. Residents of country 2 will prefer to buy securities of country 1 because of their higher yield.

This situation arises when

$$(15) \quad i_2(1-\tau_1) + \left[(1+i_2)\left(\frac{F-S}{S}\right)(1-\theta_1)\right] > i_1\,(1-\tau_1)$$

Table 1. United States and Seven Industrial Countries: Short-Term and Long-Term Interest Rate and Expected Inflation Differentials, $1972Q_1$-$1980Q_4$

Country	β^S	β^L	β^S	β^L
	Without adjustment for real interest rates 1/		With adjustment for real interest rates 2/	
Canada	1.517	1.029	1.515	1.024
France	1.333	1.075	1.248	1.069
Germany, Federal Republic of	1.184	1.022	1.142	1.023
Italy	0.231	0.123	0.231	0.121
Japan 3/	1.349	1.012	1.265	1.005
Netherlands	1.413	1.078	1.421	1.090
United Kingdom	1.213	1.017	1.038	1.003

1/ Based on Appendix Tables 3 and 4.
2/ Based on Appendix Tables 5 and 6.
3/ Data for $1977Q_2$-$1980Q_4$.

or (16) $\frac{(i_1-i_2)}{1+i_2}\ \frac{(1-\tau_1)}{1-\theta_1} < \frac{F-S}{S}$

and $\frac{F-S}{S} > 0$ and $\tau_1 > \theta_1$.

Such a situation may result in capital flowing in both directions as residents of both countries buy each other's securities. Because only Canada and the United Kingdom apply differential tax rates on interest income and foreign exchange gains on short-term securities with maturities of less than 12 months, the frequency of such potential occurrences for these two countries vis-à-vis other countries can be measured. Canada applies a corporate income tax rate of $\tau_1 = 0.46$ and a capital gains tax of $\theta_1 = 0.23$. Let Canada be country 1 and the United States country 2. Canadians will buy short-term U.S. securities and U.S. residents will buy Canadian securities simultaneously when

(17) $1 > \frac{F-S}{S}/\frac{(i_1-i_2)}{1+i_2} > \frac{1-\tau_1}{1-\theta_1} = 0.7.$

During 1972-80, using weekly data on three-month Treasury bills and three-month forward exchange rates with annualized premia, such a potential existed during 3.2 percent of the weekly observations (14 out of 436). The frequency of abnormal capital flows arrived at by Levi is considerably higher. This may be due to the fact that he does not use annualized three-month forward exchange rate premia. When three-month Eurocurrency deposit rates were used, no such observations were recorded (Table 2). Similarly, with three-month Treasury bills, a potential for simultaneous flows between the United Kingdom and the United States existed in 2 out of 437 weekly observations.

Because the United States applies lower foreign exchange gains tax rates for realized gains of at least 12 months, such an exercise can be conducted on differentials between the United States and other countries using 12-month Eurocurrency deposit rates. Consider the U.S. tax treatment of interest income and capital gains arising from foreign exchange gains. U.S. corporations are subject to a 48 percent tax rate that applies to interest income ($\tau_2 = 0.48$) and to a 30 percent capital gains tax ($\theta_2 = 0.30$) that applies to foreign exchange gains realized after at least 12 months. Denote the foreign country as country 1 and the United States as country 2. Suppose there is a pretax advantage to investing in U.S. securities.

(18) $i_2 - \left[i_1 + (1+i_1)\ \frac{S-F}{F}\right] > 0$

Table 2. United States and Seven Industrial Countries: Frequency of "Abnormal" Capital Flows, 1972-80

	Number of Observations when US$ at Forward Premium (1)	Number of Observations when US$ at Forward Discount (2)	Total Number of Observations (3)
Canada			
3-month Treasury bill rate	14	1	436
3-month Eurocurrency deposit rate	0	6	423
12-month Eurocurrency deposit rate	15	1	406
France			
12-month Eurocurrency deposit rate	13	2	431
Germany, Federal Republic of			
12-month Eurocurrency deposit rate	0	0	436
Italy			
12-month Eurocurrency deposit rate	12	0	390
Japan			
12-month Eurocurrency deposit rate	0	1	262
Netherlands			
12-month Eurocurrency deposit rate	3	1	435
United Kingdom			
3-month Treasury bill rate	2	1	437
3-month Eurocurrency deposit rate	0	0	433
12-month Eurocurrency deposit rate	82	8	430

where i_1 and i_2 are 12-month Eurocurrency deposit rates, and $\frac{S-F}{F}$, which is derived from $\frac{1/F-1/S}{1/S}$, is the 12-month forward premium of the foreign currency vis-à-vis the U.S. dollar. Without taxes, U.S. residents will clearly prefer to buy securities denominated in U.S. dollars, as will residents of country 1. With the introduction of taxes on interest and foreign exchange gains on U.S. residents, the above relationship becomes

$$(19)\quad i_2(1-\tau_2) - \left[i_1(1-\tau_2) + (1+i_1)\frac{S-F}{F}(1-\theta_2)\right].$$

Under certain conditions, the pretax advantage of buying U.S. securities can be reversed and U.S. residents will prefer to buy foreign securities on which the exchange gain component of their earnings is taxed at a lower rate. Algebraically,

$$(20)\quad i_1(1-\tau_2) + (1+i_1)\frac{S-F}{F}(1-\theta_2) > i_2(1-\tau_2)$$

$$(21)\quad \frac{S-F}{F} > \frac{(i_2-i_1)}{(1+i_1)}\frac{(1-\tau_2)}{(1-\theta_2)} > 1$$

or

$$(22)\quad 1 > \frac{(S-F)}{(F)}/\frac{(i_2-i_1)}{(1+i_1)} > \frac{(1-\tau_2)}{(1-\theta_2)} = 0.74.$$

As far as residents of country 1 are concerned and as long as there is no distinction between interest income tax and foreign exchange gains tax, they will prefer U.S. securities when equation (17) obtains. Thus, if relationship (22) obtains, U.S. residents will prefer buying foreign securities and residents of France, the Federal Republic of Germany, and Japan, inter alia, will prefer buying U.S. securities, thus giving rise to simultaneous capital flows in opposite directions. The frequencies of a potential for such occurances, which appear in column 2 of Table 2, are very low for all the above countries. Such a situation may or may not arise regarding Canada and the United Kingdom, which apply differential tax treatment to foreign exchange gains. Because Canada and the United Kingdom also apply lower foreign exchange gains tax rates, the existence of equation (22) will result in capital flowing to the country with the lower pretax yields.

It is possible to conceive of situations in which U.S. residents will prefer buying U.S. securities while foreign residents will prefer buying their own securities. Such situations may arise when the U.S. dollar is at a forward premium and condition equation (22) obtains.

Suppose there is a pretax advantage to buying foreign securities. Under such conditions, U.S. residents will borrow in foreign currency in order to invest in securities denominated in U.S. dollars. Because the U.S. dollar is at a forward premium, the foreign exchange gain is treated as a capital gain that will more than compensate for any higher foreign interest cost. Every dollar lost through the high foreign interest cost will represent a net tax loss of $0.52 but every exchange gain will represent a net tax gain of $0.70. The frequencies of a potential for such occurances, which appear in column 1 of Table 2, are low, with the noteworthy exception of the United Kingdom. Therefore, it can be argued that, while the concept of "abnormal" capital flows is an appealing one in that it can explain simultaneous flows in opposite directions, during 1972-80 such flows rarely took place.

Conclusion

This paper empirically examines two ways in which tax factors may affect the flow of international capital.

The first method is designed to test whether tax factors affect the link between interest rate and expected inflation differentials. The empirical tests show that the coefficients of the regression of long-term interest rate differentials on expected inflation differentials are smaller than those for short-term interest rates. These findings suggest that if the difference in the coefficients is wholly attributable to tax factors, then short-term foreign exchange gains are effectively taxed at lower rates than long-term gains. This is a surprising conclusion, which would bear further analysis.

The second, which is an application of the Levi (1977) method, demonstrates how differential tax treatment by the United States of interest income and foreign exchange gains realized after 12 months can lead to simultaneous capital flows in opposite directions. Under certain conditions and when the U.S. dollar is at a forward discount, U.S. residents will be inclined to buy foreign securities while residents of the foreign country will be inclined to buy U.S. securities; in the opposite case, and when the U.S. dollar is at a forward premium, residents of both countries will be inclined to buy their own securities. In practice, however, the frequency of a potential for such flows is shown to be very low.

APPENDIX

Table 3. United States and Seven Industrial Countries: Short-Term Interest Rate Differentials and Expected Inflation Differentials, $1972Q_1$-$1980Q_4$ 1/

$$[i^s_{1t} - i^s_{2t} = \alpha + \beta^s(\pi^e_{1t} - \pi^e_{2t}) + u_t]$$

Country	α^s	β^s	$\overline{R}^2$	D.W.
Canada	0.393 (0.134)	1.517 (0.091)	0.944	1.78
France	0.856 (0.356)	1.333 (0.102)	0.901	1.96
Germany, Federal Republic of	-0.008 * (0.341)	1.184 (0.094)	0.862	1.88
Italy	-5.021 (1.871)	0.232 (0.022)	0.849	2.05
Japan 2/	-2.571 (0.405)	1.349 (0.141)	0.886	1.89
Netherlands	0.971 (0.336)	1.413 (0.186)	0.677	1.77
United Kingdom	3.851 (0.532)	1.213 (0.080)	0.910	1.96

1/ Short-term interest rates are three-month Eurocurrency deposit rates; standard errors in parentheses; * represents insignificant coefficients.

2/ Data for $1977Q_2$-$1980Q_4$.

APPENDIX

Table 4. United States and Seven Industrial Countries: Long-Term Interest Rate Differentials and Expected Inflation Differentials, $1972Q_1$-$1980Q_4$ 1/

$$[i^L_{1t} - i^L_{2t} = \alpha^L + \beta^L (\pi^e_{1t} - \pi^e_{2t}) + u_t]$$

Country	α^L	β^L	$\overline{R}^2$	D.W.
Canada	0.194 (0.039)	1.029 (0.025)	0.989	2.12
France	0.210 * (0.121)	1.075 (0.288)	0.990	2.01
Germany, Federal Republic of	-0.123 * (0.065)	1.022 (0.016)	0.995	1.84
Italy	-5.707 (1.908)	0.123 (0.023)	0.761	1.98
Japan 2/	0.333 (0.025)	1.012 (0.054)	0.999	1.88
Netherlands	0.846 (0.121)	1.078 (0.058)	0.935	1.78
United Kingdom	2.829 (0.042)	1.017 (0.006)	0.999	2.06

1/ Long-term interest rates are 12-month Eurocurrency deposit rates; standard errors in parentheses; * represents insignificant coefficients.
2/ Data from $1977Q_2$-$1980Q_4$.

APPENDIX

Table 5. United States and Seven Industrial Countries: Short-Term Interest Rate Differentials and Expected Inflation Differentials, $1972Q_1$-$1980Q_4$ 1/

$$[(i^s_{1t}-i^s_{2t}) - (\bar{r}_1-\bar{r}_2) = \beta^s(\pi^e_{1t}-\pi^e_{2t}) + u_t]$$

Country	β^s	$\bar{R}^2$	D.W.
Canada	1.515 (0.100)	0.941	1.83
France	1.248 (0.101)	0.891	2.02
Germany, Federal Republic of	1.142 (0.053)	0.865	1.86
Italy	0.231 (0.022)	0.838	2.11
Japan 2/	1.265 (0.110)	0.888	1.83
Netherlands	1.421 (0.170)	0.687	1.77
United Kingdom	1.038 (0.029)	0.901	1.85

1/ Short-term interest rates are three-month Euro-deposit rates; standard errors in parentheses; $\bar{r}_1$ and $\bar{r}_2$ represent real ex post interest rates.

2/ Data for $1977Q_2$-$1980Q_4$.

Table 6. United States and Seven Industrial Countries: Long-Term Interest Rate Differentials and Expected Inflation Differentials, $1972Q_1$-$1980Q_4$ 1/

$$[(i^L_{1t} - i^L_{2t}) - (\bar{r}_1 - \bar{r}_2) = \beta^L(\pi^e_{1t} - \pi^e_{2t}) + u_t]$$

Country	β^L	$\bar{R}^2$	D.W.
Canada	1.024 (0.026)	0.987	2.12
France	1.069 (0.029)	0.990	2.10
Germany, Federal Republic of	1.023 (0.010)	0.996	1.84
Italy	0.121 (0.022)	0.739	2.06
Japan 2/	1.005 (0.003)	0.999	1.90
Netherlands	1.090 (0.053)	0.937	1.77
United Kingdom	1.003 (0.002)	0.999	1.86

1/ Long-term interest rates are 12-month Eurocurrency deposit rates; standard errors in parentheses; r_1 and r_2 represent real ex post interest rates.

2/ Data for $1977Q_2$-$1980Q_4$.

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