TAXATION OF CAPITAL GAINS ON FOREIGN EXCHANGE TRANSACTIONS
AND THE NON-NEUTRALITY OF CHANGES IN ANTICIPATED INFLATION

by

Garry J. Schinasi

Abstract

In a two-country world with perfect capital markets and no taxes, the existence of purchasing power parity is fully consistent with interest parity and the equalization of real interest rates across countries. In such a world, changes in anticipated inflation in either country will not alter the world equilibrium real interest rate. If asset returns are taxed, the existence of taxes may drive a wedge between real after-tax interest rates, and changes in anticipated inflation may create arbitrage opportunities, thereby creating capital flows between countries and thereby altering equilibrium interest-rate differentials.

The purpose of this paper is twofold. First, the paper demonstrates that the source of the wedge between real rates is not the existence of a tax on interest income (as argued in the literature on this subject) but instead the implicit assumption that capital gains are taxed as if they were interest income. Second, the paper attempts to clarify the conditions under which the basic proposition first argued by Howard and Johnson (1982) holds "exactly" (rather than as an approximation) -- the proposition that in a world in which interest income is taxed, both purchasing power parity and equalization of real after-tax interest-rates (or constancy of the real after-tax interest-rate differential) cannot hold simultaneously. Furthermore, cases in which real returns are taxed are also considered.

Taxation of Capital Gains on Foreign Exchange Transactions
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Garry J. Schinasi, Economist*
International Finance Division
Federal Reserve Board
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I. Introduction

In a two-country world with perfect capital markets and no taxes,
the existence of purchasing power parity is fully consistent with interest
parity and the equalization of real interest rates across countries. In
such a world, changes in anticipated inflation in either country will not
alter the world equilibrium real interest rate. In a world in which taxes
exist, real after-tax interest rates need not be equal, and changes in
anticipated inflation may create arbitrage opportunities, thereby creating
capital flows between countries and thereby altering equilibrium
interest-rate differentials.

It was argued in Howard and Johnson (1982) that in a two-country
world the "existence of taxes on nominal interest receipts" introduces a
"non-neutrality" in the sense that changes in anticipated inflation cause
either a change in the real after-tax interest-rate differential or a
departure from purchasing power parity. H-J (1983) further showed that if
real after-tax interest rates are equalized across boundaries then
purchasing power parity will not hold.[1] It was argued that each
proposition holds even if tax rates in both countries are equal; these
propositions are counter-intuitive. Why should the introduction in each
country of an equal, proportional tax on interest receipts earned at home

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[1] It was further shown in H-J (1983) that if a tax is imposed on real
interest instead of nominal interest, departures from purchasing power
parity can also occur. This is further discussed in the final section of
this paper.

and abroad drive a wedge between real interest rates that would otherwise be equal (i.e., why should the imposition of a proportional tax on all goods create reallocations of resources?)?

The purpose of this paper is twofold. First, the paper demonstrates that the source of the wedge between real rates is not the existence of a tax on interest income but instead the implicit assumption that capital gains are taxed as if they were interest income. Secondly, the paper attempts to clarify the conditions under which the basic H-J proposition holds "exactly" (rather than as an approximation) -- the proposition that in a world in which interest income is taxed, both purchasing power parity and equalization of real after-tax interest-rates (or constancy of the real after-tax interest-rate differential) cannot hold simultaneously. Furthermore, cases in which real returns are taxed are also considered.

Three tax regimes are considered: the first is one in which interest receipts are taxed where they are earned; the second is one in which interest receipts are taxed at home regardless of where they are earned; and the third is one in which both interest receipts and capital gains on foreign exchange transactions are taxed at home. Double taxation is not considered. All cases are considered in "exact" rather than "approximate" form.

The results of the paper can be summarized as follows. In the first regime, if purchasing power parity holds, changes in anticipated inflation will not alter the equilibrium real after-tax interest-rate in either country, regardless of the relative rates of taxation. In the

second regime neutrality exists only when tax rates are equal. In the

third regime, where interest and capital gains are both taxed, real

after-tax interest rates will change even if tax rates are equal, but only

because capital gains are taxed as if they were interest receipts. If

capital gains on foreign exchange transactions are taxed at rates below

taxation of interest receipts, then it can be shown that the results in the

second regime hold. For cases in which neutrality prevails, it can further

be shown (trivially) that the real after-tax interest differential will be

zero.[2]

When real returns are taxed instead of nominal returns, taxing

capital gains as interest income preserves neutrality, while taxing only

interest income introduces non-neutrality.

Section II briefly reviews the H-J results. Section III

specifies the exact interest parity conditions for three relevant tax

regimes (treaties). Section IV derives results for the case in which

nominal returns are taxed and section V derives results for the case in

which real returns are taxed.

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[2]One can assume, without loss of generality, that the real after-tax
interest-rate differential is zero. After substituting various interest
parity conditions in the interest-rate equalization equation, one can then
determine whether or not ppp holds. In instances where the two are
consistent (not consistent) it can be shown that the real interest
differential will be zero (nonzero) and changes in anticipated inflation
will be neutral (nonneutral) in the sense that changes in anticipated
inflation will not (will) alter the initial interest-rate differential.
Note that in general the differential as represented in eq. (2), and
particularly eq. (10) will be nonzero.

II. Taxing Capital Gains as Interest Income and the Non-neutrality Proposition: The Case of Approximate Arbitrage Relations

In a two-country world in which nominal interest receipts are taxed, real interest rates in the two countries are assumed to obey a Fisherian hypothesis represented below as

(1a) $i(1-\tau) = r + \pi$, and

(1b) $i^*(1-\tau^*) = r^* + \pi^*,$

where, * indicates foreign and,

i = nominal interest rate
τ = tax rate on nominal interest receipts
π = expected inflation rate
r = inflation adjusted after-tax interest rate (or the "real after-tax" interest rate)

From (1), the real after tax interest-rate differential can be derived as

(2) $r - r^* = i(1-\tau) - i^*(1-\tau^*) - (\pi - \pi^*)$.

In general, the differential will be nonzero. H-J (1982) show that a change in anticipated inflation in the home country would create a change in the differential, even if tax rates were equal. This result is reproduced here, and it is then shown to depend on the assumption that capital gains on foreign exchange transactions are taxed as if they were interest income.

Let S_t be the domestic currency price of foreign currency, and define $e_t=(1+\varepsilon_t)=E_t(S_t/S_{t-1})$ so that ε represents the expected depreciation of the home currency. The arbitrage relation assumed in H-J is

(3) $\quad i = i^* + \varepsilon.$

This approximate arbitrage relation has at least two interpretations: either arbitrageurs ignore taxes; or domestic interest, foreign interest, and capital gains are taxed at equal rates at home. In this second interpretation the arbitrage relation can be written as

(3)' $\quad i(1-\tau) = i^*(1-\tau) + \varepsilon(1-\tau).$

If purchasing power parity (ppp) holds, as H-J (1982) assumes, then (4) holds:

(4) $\quad \varepsilon_t = \pi_t - \pi_t^*.$

Substitution of (4) into (3) and then of (3) into (2) yields

(5) $\quad r - r^* = i^*(\tau^*-\tau) - \varepsilon\tau \quad .$

In a two-country world, where Fisher relations hold for domestic trades but where interest parity condition (3) holds, equalization of real after tax interest rates and purchasing power parity cannot both hold when at least

one tax rate is non-zero. Furthermore, anticipated changes in inflation will alter the interest-rate differential betweeen countries as long as the home tax rate is nonzero, even if tax rates are equal.

However, if only nominal interest receipts are taxed, the existence of equal tax rates alters these conclusions. When only nominal interest receipts are taxed, the appropriate arbitrage relation is eq. (6)

$$(6) \qquad i(1 - \tau) = i^*(1 - \tau) + \varepsilon \; .$$

Substituting equation (6) into (2) yields

$$(7) \quad r - r^* = i^*(\tau^* - \tau) + \varepsilon - (\pi - \pi^*) \; .$$

If ppp holds, (4) can be substituted in (7) to yield

$$(8) \quad r - r^* = i^*(\tau^* - \tau) \; .$$

In a world where only interest receipts are taxed and ppp holds, real after-tax interest rates differ between the two countries and changes in anticipated inflation alters this differential <u>only</u> when <u>tax rates differ</u>. Stated differently, when only interest receipts are taxed and when tax rates at home and abroad are equal, real after-tax interest-rate equalization is fully consistent with ppp.

III. Exact Arbitrage Relations for Three Tax Regimes[3]

The General Set-up

Fisherian relations in exact form are written as follows:

(9a) $1 + i(1-\tau) = (1+r)(1+\pi)$,

(9b) $1 + i^*(1-\tau^*) = (1+r^*)(1+\pi^*)$.

From (9), the real after tax interest-rate differential is

(10) $r - r^* = [1 + i(1-\tau)]/[1 + \pi] - [1 + i^*(1-\tau^*)]/[1 + \pi^*]$.

Furthermore, an exact form of ppp is required and is represented as follows:

(11) $e_t = [1+\pi_t]/[1+\pi_t^*]$.

Three Exact Arbitrage Relations

One can think of at least two other relevant tax regimes (treaties) to consider. The first regime is one in which interest payments (nominal or real) are taxed only by the country in which they are earned. The second regime is one in which interest is taxed only in the country where one resides. One can of course also consider cases of double

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[3]Similar results can be found in approximate form in Blejer (1983).

taxation, where interest earned abroad is taxed by both the foreign and
home countries, but this appears to be less relevant.[4]

Each of these tax treaties implies a different foreign exchange
arbitrage relation. Equations (12) and (13) represent arbitrage relations
for the first and second tax regimes, respectively, while (14) reproduces
in exact form, the arbitrage relation used by H-J in which both interest
income and capital gains are taxed at the home country tax rate:[5]

(12) $1 + i(1-\tau) = [1 + i^*(1-\tau^*)]e$;

(13) $1 + i(1-\tau) = [1 + i^*(1-\tau)]e$; and,

(14) $1 + i(1-\tau) = 1 + [(1 + i^*)e - 1](1-\tau)$.

Arbitrage at home implies that the (expected) after-tax nominal
return (cost) at home must equal the (expected) after-tax return (cost)
abroad. Eq.(12) represents the arbitrage relation when interest income is
taxed where it is earned so different tax rates appear on either side of
the relation. In (13), home taxes are paid on interest earned in either

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[4]According to Blejer (1983, page 5, footnote 2), "Japan, the Netherlands,
and some other industrial countries do not distinguish for tax purposes
between regular income and exchange gains. The United States, Canada, and
the United Kingdom apply rates of capital gains,..., to foreign exchange
transactions...." "An additional distinction refers to the timing of
taxation. While most countries tax foreign exchange gains and losses when
they are realized, the United States, Japan, Canada and the United Kingdom
also tax accrued gains and losses. In the Federal Republic of Germany,
unrealized gains are not taxable until realized wherever unrealized losses
are deductible when incurred."

[5]This exact arbitrage relation was also used by Ben Zion and Weinblatt
(1984).

country. And in (14) home taxes are paid on capital gains as well as interest income.

IV. Non-neutrality when Nominal Returns Are Taxed

Taxes on Interest Income Paid where Earned

In the first tax regime, where interest is taxed where it is earned, arbitrage relation (12) is relevant. Substitution of (12) into (10) yields

$$(15) \quad r - r^* = [1 + i^*(1-\tau^*)]e/[1 + \pi] - [1 + i^*(1-\tau^*)]/[1 + \pi^*] \, .$$

Under the assumption that ppp holds we can substitute (11) into (15) and find that the real interest-rate differential is zero. In the first tax regime, equalization of inflation-adjusted after-tax interest rates is fully consistent with purchasing power parity, and changes in anticipated inflation will not create changes in real after-tax interest rates in either country.

If interest receipts are taxed where they are earned, and ppp holds, investors in each country consider domestic and foreign tax rates in portfolio decisions. Nominal interest rates fully reflect tax differentials as well as inflation differentials.

Taxes on Interest Income Paid to Home Country

Now consider the second tax regime, where residents are taxed only in their own country. Arbitrage relation (13) is relevant in this regime and substitution into (10) yields

(16) $r - r^* = [1 + i^*(1-\tau)]e/[1 + \pi] - [1 + i^*(1-\tau^*)]/[1 + \pi^*]$.

If ppp holds, (10) can be substituted in (16) to yield

(17) $r - r^* = [i^*(\tau^*-\tau)]/[1 + \pi^*]$.

When interest receipts are taxed at home, changes in anticipated inflation alter the real after-tax interest-rate differential _only_ when tax rates differ. Because foreign tax rates do not directly affect domestic nominal interest rates, foreign and domestic portfolio decisions for home-country investors are not directly affected by foreign tax rates. Nominal interest rates will not fully reflect tax differentials and the real after-tax rates will differ; the non-neutrality exists. When tax rates are equal, the home tax rate conveys the same information as the foreign tax rate. Nominal interest rates fully reflect all tax information in both countries and the real after-tax differential is zero.

Tax on Interest and Capital Gains Paid to Home Country

When taxes are paid on both interest income and capital gains, the H-J exact arbitrage relation is appropriate. Substituting (14) into (10) yields the real after-tax interest-rate differential,

(18) $r - r^* = [(1+i^*)(1-\tau)e+\tau]/(1+\pi) - [1+i^*(1-\tau^*)]/(1+\pi^*)$.

If ppp holds, (11) can be substituted into (18) to yield

$$(19) \quad r - r^* = \tau(\pi^* - \pi)/(1+\pi)(1+\pi^*) + i^*(\tau^* - \tau)/(1+\pi^*) \; .$$

This is the original H-J result, in exact form. Even with equal tax rates, equalization of real after-tax interest rates does not hold as long as tax rates are non-zero. Recall that in a two-country world where <u>only</u> interest income is taxed, and where tax rates in both countries are identical, purchasing power parity is consistent with real after tax interest rate equalization. One can then conclude that the existence of the capital gains tax, not the tax on interest receipts, creates this non-neutrality.

If capital gains on foreign exchange transactions are taxed at rates lower than interest receipts, as shown by Blejer (1983), one can without loss of generality normalize the tax rate on capital gains to be zero. This case can then be analyzed as if only interest income were taxed at home, as analyzed above. If tax rates differ, changes in anticipated inflation will alter the interest-rate differential, whereas if tax rates are equal, neutrality is preserved.

V. Non-neutrality when Real Returns Are Taxed

It was shown above that in a two-country world in which <u>nominal</u> returns are taxed, in which interest parity exists, and in which purchasing power holds, taxing capital gains on foreign exchange transactions introduces a non-neutrality; changes in anticipated inflation will alter

the real after-tax interest differential even when tax rates are equal.
Taxing only interest receipts preserves the type of neutrality that would
exist in a world without taxes. The non-neutrality occurs because in the
first world the inflation differential (i.e., the expected change in the
exchange rate) is taxed while in the second it is not.

If real returns are taxed instead of nominal, these conclusions
are reversed. Taxing capital gains as if they were interest receipts
preserves neutrality while taxing only interest receipts introduces a
non-neutrality. Governments intent on taxing real returns will preserve
neutrality if they tax capital gains on foreign transactions as interest
income. These propositions will now be demonstrated.

When real returns are taxed the relevant Fisher relations are

$$(20a) \quad r = [(1+i)/(1+\pi) - 1](1-\tau),$$

and

$$(20b) \quad r^* = [(1+i^*)/(1+\pi^*) - 1](1-\tau^*)$$

Subtracting (20b) from (20a) yields the real interest-rate differential in
(21):

$$(21) \quad r-r^* = (1+i)(1-\tau)/(1+\pi) - (1+i^*)(1-\tau^*)/(1+\pi^*) - (\tau^*-\tau) .$$

Substituting the various arbitrage relations (12), (13), and (14) into (21)

and assuming purchasing power parity yields (22), (23), and (24), respectively:[6]

(22) $r - r^* = \tau^*/(1+\pi^*) - \tau/(1+\pi) - (\tau^* - \tau)$;

(23) $r - r^* = i^*(\tau^* - \tau)/(1+\pi^*) + \tau^*/(1+\pi^*) - \tau/(1+\pi) - (\tau^* - \tau)$;

and,

(24) $r - r^* = [(1+i^*)/(1+\pi^*) - 1](\tau^* - \tau)$.

By inspection it can be seen that only in the case when capital gains are taxed as interest income (eq. (24)) will equal tax rates in both countries preserve neutrality.

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[6]Strictly speaking, the arbitrage relations derived earlier do not apply in a world in which real returns rather than nominal returns are taxed. Arbitrageurs would behave differently if real returns were taxed. It can easily be shown that the results derived in section V are correct, however.

References

Ben Zion, Uri and J. Weinblatt, "Purchasing Power, Interest Rate Parities and the Modified Fisher Effect in Presence of Tax Agreements," Journal of International Money and Finance ,3, (1984), p.67-73.

Blejer, Mario I., "Financial Market Taxation and International Capital Flows," in Taxation, Inflation, and Interest Rates, edited by Vito Tanzi, International Monetary Fund, 1984.

Howard, D.H. and K.H. Johnson,"Interest Rates, Inflation, and Taxes: The Foreign Connection," Economic Letters, 9, (1982), p.181-4.

_____, "Purchasing Power Parity and Real After Tax Interest Rate Arbitrage," International Finance Discussion Paper #222 ,May 1983.

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