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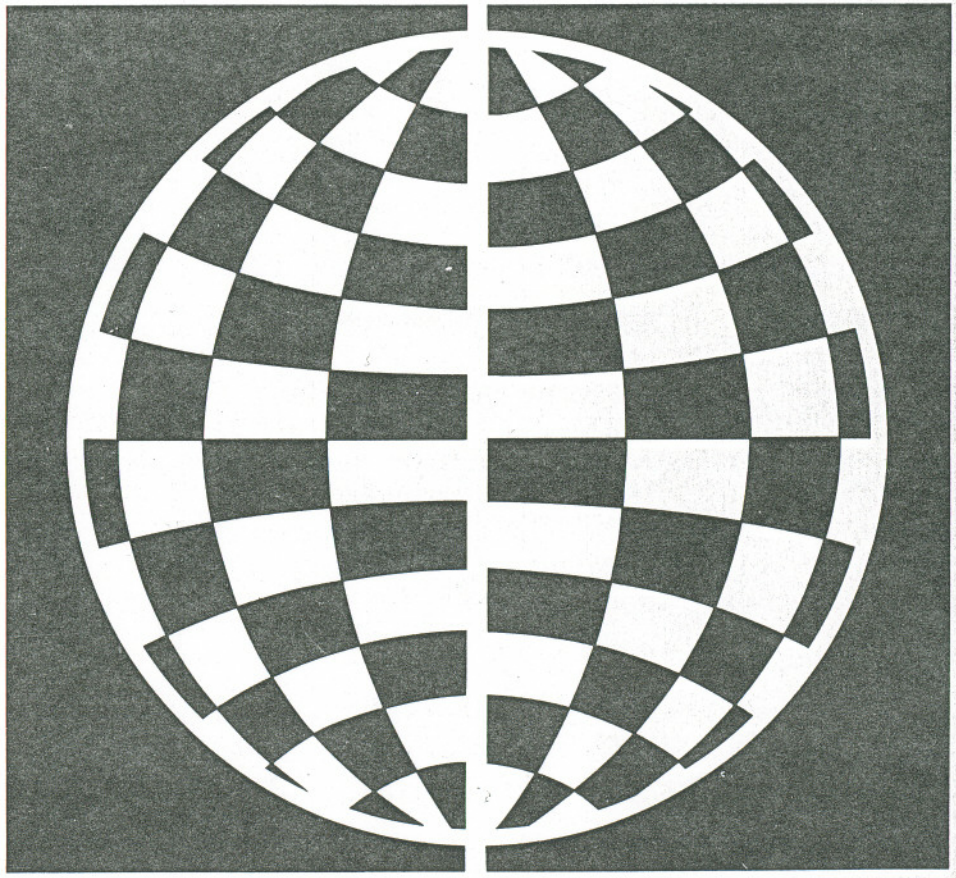

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Foreign Currency Translation Under Two Cases–Integrated and Isolated Economies

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Abstract

Beaver and Wolfson (1982 BW) identify economic interpretability and symmetry as desirable properties for financial statement translation. They then analyze translation methods with respect to these properties assuming perfect and complete markets between and within both countries (referred to, here, as the integrated economies case).

This study extends BW's analysis by examining isolated economies characterized by perfect and complete internal markets and a random relationship between prices and exchange rates. In BW's integrated economies case, inflation differentials drive exchange rate changes. No exchange risk exists, although monetary assets are exposed to the risk of unexpected inflation. Isolated economies expose monetary and nonmonetary items to both exchange and inflation risk.

In both cases, economic interpretability and symmetry can be achieved only by current value accounting translated at current exchange rates. In the integrated economies case, symmetry alone is achieved through current value accounting translated by current exchange rates for monetary items and historical costs translated by historical rates for nonmonetary items. In the isolated economies case, symmetry alone is achieved through current value accounting for monetary items and historical cost for non-monetary items, all translated at the current rate. In both cases, including translation gains or losses in income is a condition for these results.

This extension of BW demonstrates (1) the translation rate required for symmetry depends upon the assumed relationship between prices and exchange rates, (2) a well-defined economic scenario exists where historical cost accounting using current rate translation results in symmetry, and (3) the results depend on including translation gains and losses in income.

I. Introduction and Properties of Translation Methods

Beaver and Wolfson (1982 BW) identify desirable properties for financial statement translation. They then analyze translation methods with respect to these properties assuming perfect and complete markets between and within both countries. Our analysis extends BW by assuming that trade and capital barriers isolate the economies.

The two properties BW use to analyze translation methods are 'economic interpretability' and 'symmetry.' Economic interpretability is '(a) book

values reported on the balance sheet are equal to the present values of the future cash flows of the assets, liabilities and net worth of the firm; and (b) the reported return on investment (net income divided by beginning of the year assets) is equal to the nominal rate of return on investment denominated in terms of the domestic currency.' (BW 529) Economic interpretability requires present value accounting. In perfect and complete markets, economic, present, and current (exit or entry) value are all equal.

Symmetry is achieved when 'two economically equivalent investments produce the same financial statement numbers when the investments are translated into a common currency.' Symmetry requires financial reporting of equivalent investments to result in equivalent post-translation net income and net investment. Equivalent investments are those with equivalent beginning and ending nominal values of domestic currency.

SFAS No. 8 (FASB 1975) states that 'translation should change the unit of measure without changing accounting principles.' Further, 'the objective of translation requires that the assets, liabilities, revenue, and expenses in foreign statements be translated and accounted for in the same manner as assets, liabilities, revenue, and expenses that result from foreign currency transactions of the [domestic] enterprise.' Translated financial statements reflect transactions of the foreign operation as if they were recorded in the parent's domestic currency at the time the transactions were entered into. Thus, BW interpret the intent of SFAS No. 8 as the symmetric reporting of transactions conducted in domestic and foreign currencies. If historical cost is the basis for recording domestic transactions, symmetry would preserve historical cost in the translation process.[1] BW identify a set of sufficient conditions under which historical cost/historical rate (H/H) results in symmetric translation for equivalent investments.

SFAS No. 52 (FASB 1981) adopted the following as 'the basic objective' of foreign currency translation: 'To provide information that is generally compatible with the expected economic effects of a rate change on an enterprise's cash flows and equity.' The analysis is consistent with the objectives of both SFAS Nos. 8 and 52. The analysis defines symmetric translation of economically equivalent investments as a desirable property (SFAS No. 8). Also, the efffect on value of an exchange rate change on the foreign investment is included in the analysis (SFAS No. 52).

In the BW or integrated economies case, exchange rate changes are driven solely by inflation differentials. No exchange risk exists, although

monetary assets are exposed to the risk of unexpected inflation. BW conclude that economic interpretability and symmetry can only be achieved with current value accounting translated at current exchange rates. Symmetry alone can be achieved by translating balance sheet items recorded at historical costs, at the historical rate. Including translation gains or losses in income is a condition for both results.

This study extends BW's analysis by examining isolated economies characterized by perfect and complete internal markets and a random relationship between prices and exchange rates. Foreign investments are, therefore, exposed to exchange risk. Adler and Dumas (1975) develop the economic characteristics of this case. This case differs from BW's in the relation between exchange rates and prices, in that, isolated economies expose monetary and nonmonetary items to both exchange and inflation risk.

In each case, economic interpretability and symmetry can be achieved only by current value accounting translated at current exchange rates since book values are required to be the present value of future cash flows. In the isolated case, symmetry alone is achieved through current value accounting for monetary items and historical cost for non-monetary items, all translated at the current rate. Again, including translation gains or losses in income is a condition for these results.

This extension of BW demonstrates (1) the translation rate required to achieve symmetry depends upon the assumed relationship between prices and exchange rates, (2) a well-defined economic scenario exists where historical cost accounting using current rate translation results in symmetry, and (3) the results are conditioned on including translation gains and losses in income.

There is a difference between objectives of BW and the present study. BW identify a set of sufficient conditions under which historical cost accounting, historical rate translation (H/H) achieves symmetry. This study, on the other hand, looks at two classic economic cases and determines what combination of accounting and translation methods results in symmetry.

The difference in approach manifests itself in the definition of economically equivalent investments and the results obtained for monetary items recorded at historical costs and translated at historical rates (for the integrated case). In BW's analysis, H/H results in symmetric statements. Our analysis of the integrated case, which uses a different definition for economically equivalent investments than BW, concludes that financial statements achieve symmetry through current value accounting for

monetary items translated at the current rate and historical cost accounting for non-monetary items translated at the historical rate.

The analysis has implications for two key issues in translation accounting: (1) which exchange rates should be used for translation; and (2) whether unrealized exchange gains and losses should be recognized immediately or deferred until settlement.

As with much economic analysis, analytical conclusions are best derived at the extremes of the spectrum. BW's case of perfect and complete worldwide markets and economies lies at one extreme. The case in this paper of isolated economies with perfect and complete internal markets lies at the other extreme. Our analysis does not address an intermediate case where industry and firm specific (microeconomic) factors must be considered to determine the economic effect on the firm of exchange rate changes.[2] The type of products sold and purchased and the countries in which a firm operates determine how much a firm's economic environment resembles the integrated case, the isolated case, or the intermediate case.

For comparison, we adopt BW's notation and analytical framework. Assume a world of uncertainty with two economies (countries), one domestic another foreign. Each economy issues its own currency. The integrated case assumes total integration of all markets of the two economies for transactions both between and within each economy. In this case, exchange rate changes are driven solely by differential inflation rates. In the isolated case, trade and capital barriers isolate the economies. The isolated case assumes a random relationship between price level changes and exchange rate changes. Exchange rate changes are determined exogenously to the analysis. All markets within each economy are perfect and complete for both cases.[3,4]

The second section introduces models, notation and assumptions. In the third section, the analysis proceeds after subdividing the balance sheet into monetary investments, nondepreciable assets, and depreciable assets. Section IV summarizes the analysis, discusses the ability of accounting models–translation methods to achieve desired properties under the defined cases, and makes comparisons to Adler and Harris (1989) (AH) which defines and develops conditions which ensure aggregative consistency and thus representational faithfulness of translated financial statements.[5]

II. Accounting Models, Notation and Assumptions

Similar to BW, three 'accounting models–translation methods' are analyzed: 'historical cost accounting with foreign-denominated subsidiary financial statements translated at historical rates of exchange, comprehensive market value accounting with translation at current rates of exchange, and historical cost accounting with translation at the current exchange rate (hereafter the H/H, C/C, and H/C methods respectively).' (BW 528,29) The major methods of translation are included in these three methods or hybrids of these methods.

Table 1 summarizes the BW notation, assumptions and relationships for integrated economies (the integrated case). Relationship R4 is a formulation of purchasing power parity. Integrated perfect and complete markets also implies strict adherence to the law of one price. That is, the price of each commodity or service anywhere in the world must have only one price after translation. Otherwise, unexploited profit opportunities exist through arbitrage.

Table 2 summarizes changed or additional notation, assumptions, and relationships for analysis of the Isolated Economies Case. As in Gjesdal (1981), we assume a linear utility function for users of translated financial statements. This assumption of risk neutrality allows the analysis to ignore the change in risk of the foreign investment. The expected value of the future exchange rate equals the current exchange rate.[6] Therefore, the analysis focuses on expected future exchange rates which is the current exchange rate. Cash flows are convertible and remittable to the parent. Value is determined by discounting the expected value of future cash flows. Therefore, users are interested in a single unit of measure, the domestic currency. The integrated case requires no valuation assumption.[7]

Perfect and complete markets within and between countries implies unimpeded capital mobility. Frankel (1992) presents four definitions of capital mobility, discusses conditions required for each definition to be met, and then relates the discussion to empirical findings.[8] Covered interest parity or equal interest rates across countries when contracted in a common currency (condition iv) requires capital market integration across boundaries. Uncovered interest parity or equal rates of return on countries' bonds (condition iii) requires that condition iv hold and in addition no exchange risk premium. Real interest parity or equal real interest rates across countries (condition ii) requires condition iii and expected real currency depreciation is zero. The Feldstein-Horioka condition or exogenous changes in the national savings rate having no effect on investment rates (condition i) requires condition ii plus 'any and all determinants of a country's rate of investment other than its real interest rate be uncorrelated with its rate of national savings.'

Table 1. *Notation, Assumptions, and Relationships for the Integrated Case—Integrated Economies*

I. NOTATION

E_t = the exchange rate at time t expressed as a ratio of one unit of the domestic currency to one unit of the foreign currency

d = subscript denoting domestic

f = subscript denoting foreign

i_d (i_f) = ex post inflation rate in the domestic (foreign) economy from $t = 0$ to $t = 1$

I_d (I_f) = amount of initial investment in the domestic (foreign) economy (i.e., at $t = 0$) denominated in the local currency

r_d (r_f) = ex post real rate of return on the domestic (foreign) investment from $t = 0$ to $t = 1$

R_d (R_f) = ex post nominal rate of return on the domestic (foreign) investment from $t = 0$ to $t = 1$

${}_fR_d$ = ex post nominal return from $t = 0$ to $t = 1$ on a domestic investment whose ex post real return is equal to r_f, the real rate of return on foreign investment

C_d (C_f) = cash flow on domestic (foreign) investment at $t = 1$

M_d (M_f) = end-of-period market value of domestic (foreign) investment (i.e., at $t = 1$)

D_d (D_f) = historical cost depreciation on domestic (foreign) investment from $t = 0$ to $t = 1$

II. ASSUMPTIONS

A1 Markets are perfect and complete
A2 Without loss of generality, $E_0 = 1$
A3 Without loss of generality, $I_f = I_d = 1$
A4 Events, inflation, exchange rate changes, and cash flows occur at discrete intervals $t = 0, 1, \ldots, T$
A5 Monetary investments are 'riskless' in nominal terms (i.e., R_f and R_d are known with certainty at $t = 0$)
A6 Nonmonetary items are riskless in real terms (i.e., r_f and r_d are known with certainty at $t = 0$, although R_f and R_d may be uncertain)

III. RELATIONSHIPS

R1 $(1+i_f)(1+r_f) = 1+R_f$
R2 $(1+i_d)(1+r_d) = 1+R_d$
R3 $(1+i_d)(1+r_f) = 1+{}_fR_d$
R4 $E_1 = E_1/E_0 = (1+i_d)/(1+i_f)$

Note: This table is the same as Beaver and Wolfson's (1982) Appendix A.

Table 2. *Additional Notation and Changed Assumptions and Relationships for the Isolated Case—Isolated Economies*

1. ADDITIONAL NOTATION

E_t = the exchange rate at time t, it is a random variable determined exogenously to the model

${}_xR_d$ = ex post nominal return from $t = 0$ to $t = 1$ on a domestic investment whose ex post real return is equal to the nominal rate of return on the foreign investment adjusted for change in exchange rate less domestic inflation

II. CHANGED OR ADDED ASSUMPTIONS

A1 Markets are perfect and complete within each economy; however, price changes within one economy will not affect prices in the other economy
A7 Investors are risk neutral
A8 Expected value of the future exchange rate is the current exchange rate
A9 Cash flows are convertible and remittable to the parent and value is determined by discounting the expected value of these future cash flows

III. CHANGED OR ADDED RELATIONSHIPS

R3 $(1+i_d)(1+r_f)$ does not necessarily equal $1+{}_xR_d$; the isolation of the economies results in no defined relationship between r_f and r_d (or R_d)
R4 E_1 is not necessarily equal to $(1+i_d)/(1+i_f)$; no defined relationship exists between the two terms
R5 $(1+R_f)E_1 = 1+{}_xR_d$

Note: Other nomenclature, assumptions or relationships are the same as in the integrated case as shown in Table 1.

Real interest differentials have been significant, and countries' rates of national savings have had large effects on their rates of investment. Frankel suggests that a currency premium, consisting of an exchange risk premium and expected real depreciation of the domestic currency, drives real interest differentials away from zero. In BW's and our integrated markets case, there is perfect capital mobility because, by construction, there is no exchange risk and no real depreciation of currencies.[9] Thus, capital mobility is perfect in the integrated economies case under all four of Frankel's conditions. With neither exchange risk nor other trade barriers, there is, in effect, only one country (i.e., economy) in the world. This situation is analogous to the relationships between markets in different regions of the same country. Frankel refers to empirical findings that support no positive correlation between savings and investment across intranational regions (the Feldstein-Horioka condition and thus all four conditions) in studies of the U.S. and U.K. In addition, more recent

studies of saving–investment correlations do show some evidence that the coefficient fell in the 1980s as markets integrated. Our isolated economies case assumes markets are not integrated and therefore none of the four definitions of capital mobility hold. In this scenario, exchange risk is significant, consistent with significant variations in real interest rates.

In the integrated case, an investor would be indifferent between a foreign investment whose return is R_f and a domestic investment whose return is ${}_fR_d$, the nominal return on an economically equivalent domestic investment. (BW 534) (See Table 1) Given assumptions that the initial exchange rate (E_0) and the initial investment (I_f or I_d) equal 1, if the translated financial statement indicates net income equal to ${}_fR_d$, and the balance sheet (i.e., net assets) as $1+{}_fR_d$, then the translation method results in both economic interpretability and symmetry.

For the isolated case, ${}_xR_d$ is the return conceptually equivalent to the nominal returns from (1) converting one dollar (i.e., unit of domestic currency) to a foreign currency, (2) investing the foreign currency for one period and earning R_f on the investment, (3) liquidating the investment at the end of the period, and (4) converting the foreign currency back to dollars. (See Table 2) A domestic investor would be indifferent between a foreign investment whose return is R_f and a domestic investment whose return is ${}_xR_d$. For this case, ${}_xR_d$ is the nominal return on an economically equivalent domestic investment. Therefore, in the isolated case, a translated statement that indicates $1+{}_xR_d$ in the balance sheet and ${}_xR_d$ in the income statement achieves economic interpretability and symmetry.

Economically equivalent investments are defined by the following:

$$(1+R_f) * E_1 = (1+R_d).$$

Economically equivalent investments have the same ex post nominal and real rates of return in the domestic currency. If the domestic equivalent to foreign net income is equal to ${}_fR_d$ in the integrated case or ${}_xR_d$ in the isolated case, the nominal rate of return of the foreign investment, denominated in the domestic currency, has a nominal rate of return equal to $(1+r_d)(1+i_d)-1 = R_d$. In the integrated case, for economically equivalent investments, $r_d = r_f = r$. In the isolated case, r_d is not necessarily equal to r_f. Since the economies are not integrated, the relationship among exchange rates, inflation, and real return can differ.

Following BW, translation is addressed by dividing the balance sheet items into three categories: (1) Monetary Investments (i.e., monetary assets less monetary liabilities), (2) Net Nondepreciable Assets

(i.e., nondepreciable assets less nonmonetary liabilities), and (3) Depreciable Assets (including cash flows generated by these assets). The implications of three accounting model–translation method pairings will be analyzed for each balance sheet category using the assumptions of both cases.

Assumptions A5 and A6 in Table 1 are keys to understanding the analyses. Monetary investments, by definition, are denominated in nominal terms and, therefore, have certain nominal returns (in the currency in which they are denominated), but uncertain real returns because of uncertain inflation rates and, in the isolated case, unexpected changes in the real exchange rate (exchange risk). Nonmonetary items are riskless in real terms in the currency environment in which they are held. Thus, in the integrated case, with no exchange risk, domestic and foreign nonmonetary items are riskless in real terms. In the isolated case, in terms of the domestic currency, foreign nonmonetary assets have uncertain nominal returns due to inflation and exchange risk and uncertain real returns due to exchange risk (i.e., exchange rates moving independently of prices).

III. Translation Analysis

Tables 3, 4 and 5 contain the translation analysis for each of the three accounting model–translation methods for the first period of an investment in a multiperiod monetary investment, nondepreciable asset, and depreciable asset, respectively. Panel 1 of each table analyzes the C/C method. Panel 2 analyzes the H/H method and Panel 3 analyzes the H/C method. The discussion will cover the first panel of each table, then the second panel, and finally, the third panel.

C/C: Current Value Translated at Current Rates

In integrated economies, arbitrage conditions result in the exchange rate (E_1) equaling $(1+i_d)/(1+i_f)$. Under the assumptions of isolated economies, exchange rate movements are random. As the analyses for the C/C method (Panel 1, Tables 3, 4 and 5) indicate (1) economic interpretability is achieved in both cases for all three type of investment since the translated amount of the balance sheet expressed in domestic currency equals $1+{}_fR_d$ in the case of integrated economies and $1+{}_xR_d$ in the case of isolated economies, and (2) symmetry is achieved in both cases since the translated amount of equivalent investments results in the same

Table 3. *Multiperiod Monetary Investment for First Period (From t = 0 to t = 1)*

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Panel 1: Current Market Value Translated at Current Rate (C/C Method)			
Balance Sheet			
End of period (EOP) principal plus interest expressed in local currency	$M_d+C_d =$ $(1+R_d) =$ $(1+r_d)(1+i_d)$	$M_f+C_f =$ $(1+R_f) =$ $(1+r_f)(1+i_f)$	$M_f+C_f =$ $(1+R_f) =$ $(1+r_f)(1+i_f)$
Translated amount expressed in domestic currency	$(1+R_d)$	$(M_f+C_f)((1+i_d)/(1+i_f)) =$ $(1+r_f)(1+i_f)(1+i_d)/(1+i_f) =$ $(1+r_f)(1+i_d) =$ $1+_fR_d$	$(M_f+C_f)E_1 =$ $(1+R_f)E_1 =$ $1+_xR_d$
Income Statement			
Interest income expressed in the local currency	C_d	C_f	C_f
Capital gain expressed in the local currency	M_d-1	M_f-1	M_f-1
Net income expressed in the local currency	R_d	R_f	R_f
Translated net income (a)		$(C_f+M_f-1)(1+i_d)/(1+i_f)$	$(C_f+M_f-1)E_1$
Translation gain or loss (b)		$(1+i_d)/(1+i_f)-1$	E_1-1
Translated net income after translation gain or loss [Sum of (a) and (b)]	R_d	$(C_f+M_f)(1+i_d)/(1+i_f)-1$ $=_fR_d$	$(C_f+M_f)E_1-1$ $=_xR_d$
Properties		EI,S	EI,S
Panel 2: Historical Cost Translated at Historical Exchange Rate (H/H Method)			
Balance Sheet			
EOP principal plus interest—local	$1+C_d =$	$1+C_f$	$1+C_f$
Translated amount		$1+[C_f(1+i_d)/(1+i_f)]$	$1+C_f(E_1)$

Note: EI refers to economic interpretability. S refers to symmetry.

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Panel 2: (*continued*)			
Income Statement			
Interest income in local currency	C_d	C_f	C_f
Translated interest income (a)		$C_f(1+i_d)/(1+i_f)$	$C_f(E_1)$
Translation gain or loss (b)		0	0
Net income after translation gain or loss [Sum of (a) and (b)]	C_d	$C_f(1+i_d)/(1+i_f)$	$C_f(E_1)$
Properties		None	None
Panel 3: Historical Cost Translated at Current Exchange Rate (H/C Method)			
Balance Sheet			
EOP principal plus interest—local	$1+C_d$	$1+C_f$	$1+C_f$
Translated EOP amount		$(1+C_f)(1+i_d)/(1+i_f)$	$(1+C_f)E_1$
Income Statement			
Interest income—local	C_d	C_f	C_f
Translated interest income (a)		$C_f(1+i_d)/(1+i_f)$	C_fE_1
Translation gain or loss (b)		$(1+i_d)/(1+i_f)-1$	E_1-1
Net income after translation gain or loss [Sum of (a) and (b)]	C_d	$(1+C_f)(1+i_d)/(1+i_f)-1$	$(1+C_f)E_1-1$
Properties		None	None

Table 4. *Non-Depreciable Assets—First Period Held (From t = 0 to t = 1)*

Panel 1: Current Market Value Translated at Current Rate (C/C Method)

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Balance Sheet			
End of period (EOP) book value—local currency	$M_d = (1+i_d)(1+r_d) = 1+R_d$	$M_f = (1+i_f)(1+r) = 1+R_f$	$M_f = (1+i_f)(1+r_f) = 1+R_f$
Translated book value		$(1+i_f)(1+r)(1+i_d)/(1+i_f) = (1+r)(1+i_d) = 1+{}_fR_d$	$M_f(E_1) = (1+R_f)E_1 = 1+{}_xR_d$
Income Statement			
Capital gain—local currency	$R_d = (1+i_d)(1+r_d)-1$	$R_f = (1+i_f)(1+r)-1$	$R_f = (1+i_f)(1+r_f)-1$
Translated capital gain (a)		$R_f(1+i_d)/(1+i_f)$	$R_f(E_1)$
Translation gain or loss (b)		$(1+i_d)/(1+i_f)-1$	E_1-1
Net income [Sum of (a) and (b)]		$(1+i_d)(1+r)-1 = {}_fR_d$	$R_f(E_1)+E_1-1 = (1+R_f)E_1-1 = {}_xR_d$
Properties		EI,S	EI,S

Note: EI refers to economic interpretability. S refers to symmetry.

Panel 2: Historical Cost Translated at Historical Exchange Rate (H/H Method)

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Balance Sheet			
EOP book value—local	1	1	1
Translated book value		1	1
Income Statement			
Income—local	0	0	0
Translation income (a)		0	0
Translation gain or loss (b)		0	0
Net income [Sum of (a) and (b)]		0	0
Properties		S	None

Panel 3: Historical Cost Translated at Current Exchange Rate (H/C Method)

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Balance Sheet			
EOP book values—local currencies	1	1	1
Translated book value		$(1+i_d)/(1+i_f)$	E_1
Income Statement			
Income—local currency	0	0	0
Translated income (a)		0	0
Translation gain or loss (b)		$(1+i_d)/(1+i_f)-1$	E_1-1
Net income [Sum of (a) and (b)]		$(1+i_d)/(1+i_f)-1$	E_1-1
Properties		None	S

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Table 5. *Depreciable Assets—First Period Held (From t = 0 to t = 1)*

Panel 1: Current Market Value Translated at Current Rate (C/C Method)

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Balance Sheet			
End of period (EOP) book value—local (Including cash flow from operations)	$C_d+M_d = 1+R_d$	$C_f+M_f = M_d(1+i_f)/(1+i_d)+C_f$	C_f+M_f
Translated book value		$[[C_f+M_d(1+i_f)/(1+i_d)](1+i_d)/(1+i_f)] = C_d+M_d = 1+_fR_d$	$(C_f+M_f)E_1 = 1+_xR_d$
Income Statement			
Cash flows—local currency	C_d	$C_f = C_d(1+i_f)/(1+i_d)$	C_f
Translated cash flows		$C_d[(1+i_f)/(1+i_d)][(1+i_d)/(1+i_f)]$	$C_f(E_1)$
Depreciation—local currency	$1-M_d$	$1-M_f = 1-M_d(1+i_f)/(1+i_d)$	$1-M_f$
Translated depreciation (b)		$(1-M_f)(1+i_d)/(1+i_f)$	$(1-M_f)E_1$
Translation gain or loss (c)		$(1+i_d)/(1+i_f)-1$	E_1-1
Net income [Sum of (a), (b) and (c)]	$C_d+1-M_d = R_d$	$C_d+M_d-1 = {}_fR_d$	$(C_f+M_f)E_1-1 = {}_xR_d$
Properties		EI,S	EI,S

Note: EI refers to economic interpretability. S refers to symmetry.

Panel 2: Historical Cost Translated at Historical Exchange Rate (H/H Method)

Balance Sheet			
EOP book value—local currency	$C_d+(1-D_d)$	$C_f+(1-D_f)$	$C_f+(1-D_f)$
Translated book value		$C_d+(1-D_d)$	$C_d(E_1)+(1-D_d)$

	Domestic Investment	*Foreign Investment where Economies are: 1. Integrated*	*2. Isolated*
Panel 2: (*continued*)			
Income Statement			
Cash flow from operations—local currency	C_d	$C_f = C_d(1+i_f)/(1+i_d)$	C_f
Translated cash flow (a)		$\{C_d(1+i_f)/(1+i_d)][(1+i_d)/(1+i_f)]\} = C_d$	$C_f(E_1)$
Depreciation	D_d	D_f	D_f
Translation depreciation (b)		D_d	D_d
Net income [Sum of (a) and (b)]	C_d-D_d	C_d-D_d	$C_f(E_1)-D_d$
Properties		S	None

Panel 3: Historical Cost Translated at Current Exchange Rate H/C Method)

Balance Sheet			
EOP book values—local currencies	$C_d+(1-D_d)$	$C_f+(1-D_f)$	$C_f+(1-D_f)$
Translated book value		$C_d+(1-D_d)(1+i_d)/(1+i_f)$	$C_f(E_1)+(1-D_f)E$
Income Statement			
Cash flow from operations	C_d	$C_f = C_d(1+i_f)/(1+i_d)$	C_f
Translation cash flow (a)		C_d	$C_f(E_1)$
Depreciation	D_d	D_f	D_f
Translated depreciation (b)		$D_f(1+i_d)/(1+i_f)$	$D_f(E_1)$
Translation gain or loss (c)		$(1+i_d)/(1+i_f)-1$	E_1-1
Net income [Sum of (a), (b) and (c)]	C_d-D_d	$\{C_d-D_f(1+i_d)/(1+i_f) + (1+i_d)/(1+i_f)-1\}$	$\{[C_f+(1-D_f)]E-1\}$
Properties		None	S

nominal return in domestic currencies. That is, symmetry is achieved if (a) the beginning-of-period amounts after translation of the market value and book value of a foreign and domestic investment are equal (in our case both investments equal 1 by assumption), (b) the after-translation end-of-period market values are equal, $(C_d+M_d) = (C_f+M_f)E_1$, and (c) the book value after translation of the foreign investment equals the book value of the domestic investment. By definition, if (a) and (b) hold, the investments are economically identical. If (a) and (c) hold, the amounts reflected in the income statement and balance sheet are the same. Thus, symmetry is achieved. The results are clearest in this case (C/C) since, by assumption, the end-of-period balance sheet amounts are equal to the present value of future cash flows. For each of the balance sheet categories, it is assumed that the initial investment (which is also market value and present value of expected future cash flows) is equivalent and end-of-period values are equal to the market value (present value of future cash flows) translated at the end-of-period exchange rate. Change in value is reflected in the financial statements if translation gains or losses are included in income. As the analyses indicate, under both cases, the properties of economic interpretability and symmetry are only achieved by the C/C method of translation. For monetary investments, this method translates interest accumulated in the period and end of period value (including interest) at the current or balance sheet date translation rate.

H/H: Historical Cost Translated at Historical Exchange Rate

Monetary Investments

Panel 2 of Table 3 analyzes translation of monetary assets under H/H. Assuming i_f is greater (lesser) than i_d, H/H results for both cases, in overstating (understating) the monetary investment (assuming monetary assets exceed liabilities) and income. Using the historical rate to translate the principal amount of the monetary investment ignores the capital loss[10] resulting from a devaluation. Therefore, Panel 2 shows that neither economic interpretability nor symmetry is achieved.

BW restrict their analysis regarding equivalent investments. In BW's footnote six, a domestic and foreign investment for the period $t-1$ to t are defined as economically equivalent 'if and only if $C_{f,t}E_t = C_{d,t}$, $M_{f,t-1}E_{t-1} = M_{d,t-1}$, and $M_{f,t}E_t = M_{d,t}$. . . . In other words, $(1+R_{f,t})E_t = (1+R_{d,t})$. . . .' By assumption, all variables in the equality $M_{f,t-1}E_{t-1} = M_{d,t-1}$ equal one and the equality holds. The interest paid on monetary investments ($C_{f,t}$ and $C_{d,t}$) is known at the beginning of the period. The

exchange rate (E_t) is based on ex post or realized inflation. We are assuming uncertainty in our economic scenarios. Therefore, both the domestic and foreign inflation rates and end-of-period market values of the monetary investments contain random components. Only coincidentally would $C_{f,t}E = C_{d,t}$ or $M_{f,t}E_t = M_{d,t}$. There is no economic reason for these conditions to hold.

This study defines economically equivalent investments, simply, as investments where $(1+R_{f,t})E_t = (1+R_{d,t})$; that is, where the investments have equivalent nominal and real returns in the domestic currency. Monetary investments are equivalent if the interest received plus the change in market value of the domestic investment equal the interest received plus the change in market value after translation of the foreign investment. Consider the situation where worldwide markets are perfect and complete, integrated, and ex-ante inflation rates (differ by country and) equal ex post inflation rates. In other words, the market correctly anticipates inflation rates. Higher interest is paid in the country with higher inflation. The change in exchange rates completely offsets the interest differential and, therefore, the domestic interest equals the foreign interest less the translation loss.

We conclude H/H is not symmetric for monetary items because the translation loss is excluded from income. In addition, the market generally is not expected to correctly anticipate future inflation rates in both countries. As a result, there exists a random relationship between prices and exchange rates. In the BW analysis, H/H translation is symmetric due to the additional restrictive requirements on economic equivalence. Their results apply to a limited class of investments.

H/H—Nondepreciable and Depreciable Assets

Non-depreciable assets by definition are not associated with cash flows. Depreciable assets are, however. As in BW, a foreign and a domestic depreciable asset are identical in real terms, if 'these two assets have the property that for all $t = 1, \ldots, T$, $C_{f,t}/C_{d,t} = \pi^t_{s=1}[(1+i_{f,s})/(1+i_{d,s})]$, where $C_{f,t}(C_{d,t})$ is the cash flow in period t for the foreign (domestic) asset and T is the useful life of the asset. For simplicity and with no loss of generality, we take i_f and i_d to be constants, in which case $C_{f,t}/C_{d,t} = [(1+i_f)/(1+i_d)]^t$. The market value at time t, $M_{f,t}$ and $M_{d,t}$, will obey the following relationship

$$M_{f,t} = M_{d,t}(1+i_f)^t/(1+i_d)^t.$$

Note that market value translated at the current exchange rates will always be equal.'

Panel 2 of Tables 4 and 5 show economic interpretability is violated for both cases because no economic information is conveyed about holding gains and losses due to changes in the market value of the firm's assets. The H/H method is symmetric for the integrated economies case since (1) no change in income is reported for the foreign subsidiary and no change in income would be reported for a domestic operation and (2) price changes are completely offset by exchange rate changes. Income will be equally misstated for both a foreign subsidiary and a domestic operation.

In isolated economies, symmetry is violated because there is a differential economic effect to a foreign versus a domestic operation that is not reflected. The exchange rate does not offset the differential effect of price changes. The risk of unexpected inflation and exchange rate changes are independent and not offsetting. Future exchange rate changes are random with an expected value of zero. Due to a devaluation of the foreign currency, the after-translation expected value of future cash returns has shifted down relative to the domestic investment.

H/C: Historical Cost Translated at Current Exchange Rate

Monetary Investments

The H/C method has economic interpretability and symmetry when the nominal or book value of a monetary investment equals the market value. This situation would be equivalent to C/C and tends to be the case with short term monetary assets and liabilities. In the integrated case, interest in the foreign economy equals interest in the domestic economy plus the expected difference in inflation between the two countries (The International Fisher Effect). The H/C method recognizes the higher level of interest in the foreign economy (assuming this is the case) less the capital loss on the principal portion of monetary investment. The translation is symmetric only if inflation differentials are anticipated correctly. Nothing in our assumptions or the real world, however, requires accurate anticipation of inflation differentials. This isolated case recognizes the economic effect of the exchange rate change but does not reflect the economic effect of changes in the prices (M) of monetary assets (see Panel 3, Table 3). Therefore, when historical cost does not equal current value, neither property is achieved.

H/C—Nondepreciable Assets

Economic interpretability is achieved in neither case (Panel 3, Table 4) since market value (M) changes in the firm's assets are ignored. Symmetry is violated in the integrated economies scenario because the economic effect of holding inventory (or other nondepreciable assets) is identical for a foreign and domestic investment; however, the foreign subsidiary's assets will reflect the change in exchange rates and not the change in market values.

The isolated economies approach assumes markets and price relationships within each country are unaffected by exchange rate changes. The economic effect in this scenario of a devaluation is not offset by price changes. We have assumed random exchange rate changes with a zero expected value. The value of the foreign assets in foreign currency is unaffected by exchange rate changes. If the foreign currency is devalued, the value of foreign assets in the domestic currency is lower by the percentage change in devaluation. The inaccuracies, inefficiencies, or inappropriateness of historical cost is assumed equivalent in both countries. The effect of an exchange rate change shifts the distribution of expected home currency cash flows. The distribution of expected foreign-currency cash flows remains unaffected by an exchange rate change. The only amount shown on the translated statements is the loss due to devaluation (shift in total expected value of cash flows) which equals $E_1 - 1$. From a domestic perspective, there is an economic effect of an exchange rate change on the foreign but not on the domestic investment. In summary, the translated financial statements reflect the economic effect of exchange rate changes, but ignores the effect of local market price changes in both countries. Thus, after reflecting the economic effect of the random exchange rate change, inflation is equally ignored in the domestic and foreign statements and symmetry is achieved.

H/C—Depreciable Assets

As with nondepreciable assets, Table 5, Panel 3 shows symmetry is not attained under the integrated economies case since: (1) undepreciated asset values and depreciation expense of the subsidiary are based upon historical costs, (2) no real economic effects are possible solely due to exchange rate changes (i.e., price changes will offset this), and (3) historical costs are translated at current exchange rates. Since there is only one price for any good after conversion at any time, there is a 'meaningful' temporal relationship in this scenario between asset prices or values and exchange rates. Any translation of a cost at an exchange rate other than the one in

effect when the cost price was established distorts economic relationships. Therefore, symmetry between foreign and domestic investments is lost when this temporal relationship is violated in translation.

Under the isolated economies case, intertemporal changes in exchange rates and prices are unrelated. The net assets of the foreign operation are exposed to exchange rate changes. To achieve symmetry, the current exchange rate is used to translate all financial statement items. This will recognize the loss in investment value by devaluation and economically equate the accounting for domestic and foreign operations.

IV. Discussion and Conclusions

In both integrated and isolated cases, translating current-value financial statements at the current rate results in economic interpretability and symmetry. This accounting model–translation method is the only one that reflects present-value accounting.

In the integrated case, markets are perfect and complete. Exchange rate changes are driven solely by inflation differentials. Nonmonetary assets are not exposed to exchange-rate or inflation risk. Translating nonmonetary items at historical rates results in symmetric financial statements. Because of the temporal symmetry between exchange rates and prices, translated balance sheet amounts and economic value are the same as they would be if the items were purchased at the same time in the domestic market. Foreign monetary items, by definition, are denominated in the foreign currency and therefore subject to inflation risk, that is, a risk of changes in value due to unexpected changes in inflation rates. Real differential changes in value of monetary items result from differences between actual and expected domestic and foreign inflation rates. BW restrict their analysis to the situation in which differences in interest paid are proportional to changes in market value of the investments and therefore conclude that H/H results in symmetric translation. Our analysis concludes that H/H does not result in symmetric financial statements, however, since the real changes in the value of monetary assets are likely to differ by country and are not reflected in either the domestic or foreign financial statements.

In the isolated case, internal markets are perfect and complete, but there is a random relationship between inflation rate changes and exchange rate changes. Domestic nonmonetary items are not exposed to inflation risk. Foreign nonmonetary items are exposed to exchange rate risk. Within the local economy, these items are not exposed to inflation risk. H/H ignores

the economic effects of exchange rate changes and therefore results in nonsymmetric statements. H/C ignores both domestic and foreign inflation (consistent with the concept of historical cost accounting), but reflects the economic effect of exchange rate changes (consistent with the objective of SFAS No. 52) and, therefore, results in symmetric financial statements. Domestic monetary items are subject to inflation risk. Foreign monetary items are subject to both inflation risk and exchange risk. For the same reasons as in the integrated case, no translation method results in symmetry other than the C/C method.

The analysis suggests several conclusions. First, the translation rate required to achieve symmetry depends upon the assumed relationship between prices and exchange rates. Second, a well-defined economic scenario exists where historical cost accounting using current rate translation results in symmetry. Third, similar to the BW conclusions, the results depend on including translation gains and losses in income.

Adler and Harris (1989)(AH) define aggregative consistency and thus representational faithfulness (ACRF) of translated financial statements and then develop conditions which ensure ACRF. A comparison between the AH analysis and our own demonstrates the difference in conclusions arising from different economic assumptions and selection of alternative desirable properties of financial statements. Aggregative consistency requires the value reflected in the financial statements to preserve the ability of users to derive the total quantity of the relevant commodity (e.g., inventory consisting of one good). It is assumed that users have knowledge of prices of commodities and are primarily interested in the underlying service potential (e.g., quantities) of assets.

Aggregative consistency does not require any explicit assumption about value of the firm or the firm's assets. Economic interpretability requires balance sheet value to be equal to the present value of future cash flows generated by the asset, but does not necessarily require the user to be able to deduce the quantity of any assets. Thus, economic interpretability and aggregative consistency are alternative properties assumed to be important to users of financial statements. BW's (and thus our) symmetry does not require that financial statements reflect (present) value of assets or aggregative consistency. Symmetry simply requires that equivalent domestic and foreign investments have the same income and balance sheet amounts after translation to a common currency.

AH conclude that any deviations from commodity price parity (CPP or the law of one price) prevents ACRF. Thus, for current cost financial statements translated at current rates to be ACRF, the financial reports

should correct CPP deviations. CPP holds perfectly in our (BW's) integrated case and thus ACRF could hold (additional assumptions about prices are required). CPP (thus ACRF) does not hold in the second or isolated economies case.

AH conclude H/C is not ACRF. We conclude this approach does not achieve economic interpretability. Symmetry is violated in the scenario (the integrated case) where exchange rate changes are driven solely by differential price changes. However, H/C achieves symmetry in our isolated case where changes in exchange rates are unrelated to differential price changes.

Sufficient conditions for ACRF under C/C require, in addition to CPP, that purchasing power parity (PPP) holds at each point in time. By definition condition CPP and PPP hold in the integrated case, not the isolated case. AH conclude that 'when relative prices change, current cost accounting becomes the only method that ensures' ACRF.[11,12]

There are real world examples to which the conclusions of this research potentially apply. Historical costs of monetary assets and liabilities that are close to maturity approximate current value. Therefore, foreign operations with monetary assets and liabilities close to maturity and input and output prices that are not responsive to exchange rate changes may approximate the isolated markets case. Also, foreign operations with monetary assets and liabilities close to maturity and input and output prices that are responsive to exchange rate changes may approximate the integrated markets case.

Notes

1. Defining symmetry as a desirable property assumes the usefulness of historical cost accounting.

2. See Shapiro (1975, 1992) for discussion of the cash flow effects of an exchange rate change in the intermediate case.

3. It is an empirical question as to which industries and countries operate closer to the integrated case, the isolated case, or neither of the cases developed below. If one were compelled to choose a position between markets functioning perfectly versus no relationship between inflation rates and exchange-rate changes, there is evidence toward no well defined relationship, i.e., isolated economies case. (Alder and Dumas 1983, Frankel 1989, and Mark 1990).

4. One scenario supporting the isolated economies case is a situation where (1) markets are functioning efficiently within the economy, (2) trade and capital flows are restricted by either physical barriers (e.g., distance and cost) or regulatory restrictions (e.g., exchange controls, tariffs, import quotas or import bans), and (3) equity flows are allowed at government established exchange rates.

5. The comparison to AH provides insight into the strengths, weaknesses, and differences between analytical approaches to translation. We are grateful to a reviewer for suggesting consideration of AH.

6. Frankel (1989), in a review of research on exchange rate changes, state[s] that 'the proportion of exchange rate changes that are forecastable in any manner—by the forward discount, interest rate differential, survey data, or models based on macroeconomic fundamentals—appears to be not just low, but almost zero.'

7. See Patz (1977) for a discussion of alternative approaches to value theory and translation.

8. We are grateful to a reviewer for pointing out the Frankel article.

9. In this case, monetary and non-monetary assets are not exposed to exchange risk. However, monetary assets are exposed to the risk of unexpected inflation.

10. The capital loss is equal to the original investment less the original investment multiplied by new exchange rate or $1-[1(1+i_d/1+i_f)]$.

11. In the BW or integrated economies case, due to the assumption of perfect and complete markets, under the C/C approach, restate-translate and translate-restate result in identical financial statements.

12. Since we consider current cost accounting but not price level adjusted accounting (PLA), we avoid issues related to PLA. Thus, we do not discuss AH's conclusions related to PLA.

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