

A Comparison of the Characteristics of Price Parity Constructs with Exchange Rates and the Potential Impact on Foreign Currency Translation

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Characteristics of a constructed time series of price parity numbers were compared with the time series of exchange rates between twenty-two countries' currencies and the United States dollar. These characteristics were analyzed to determine in which countries an accounting policy change from exchange rates to price parity for translation of foreign currency would result in greater information content of consolidated statements. The results of the study are consistent with the use of price parity for sixteen of the twenty-two countries studied, but not for translation of accounts between the Japanese yen and the United States dollar.

Introduction

Reported earnings variability is an indicator of the degree of risk associated with the earnings series. Material differences in variability of subsidiary earnings across translation methodologies do matter to assessment of earnings risk. Managers can be expected to prefer that their companies be perceived as less risky rather than more risky. Companies with significant foreign operations could therefore be expected to prefer translation methodologies that result in lower variability of translated subsidiary earnings which would result in lower variability of consolidated earnings. Further, accounting policy makers and analysts might prefer less variability if that variability could be ascribed to noise.

In 1974, the Committee on International Accounting suggested the possibility that purchasing power parity (PPP) constructs might be appropriate for foreign currency translation, indeed that such constructs might be superior to exchange rates for the purpose. At the time the committee raised this question, no empirical accounting research had been done to make the comparison between PPP constructs and exchange rates and suggest an answer. The committee was, in effect, calling for such research to be performed.

A small number of early papers (described in the literature review) provided theoretical insights into the consequences of using PPP numbers instead of exchange rates for currency translation and even presented fully developed translation methodologies based on PPP.

In more recent years, some empirical work has been done (also described in the literature review) to compare the consequences of using PPP instead of exchange rates and to bring accounting standard setting bodies and other accounting professionals closer to the answer to the committee's original question. These studies were based on translations between the US dollar and the UK pound. No similar empirical studies exist to describe what happens when PPP numbers are used instead of exchange rates for currency translation between the US dollar and various currencies other than the UK pound.

When foreign currency translation is required prior to consolidation of a parent and a foreign subsidiary, the current and historical exchange rates are assumed to represent the time-relevant

relationship between the two currencies. But actual exchange rates used for conversions of currencies are affected by numerous factors, some of which are transient. Indeed, day-to-day market and political factors can have major impacts on the conversion exchange rate.

Ideally, accountants would use the equilibrium exchange rate for currency translation. As discussed in detail in the literature review, PPP is the main determinant of the equilibrium exchange rate because the value of a currency is basically determined by its domestic purchasing power (Officer, 1982, page 93). Very early work (Cassel, 1916) demonstrates that the equilibrium exchange rate tends to equal the PPP. In fact, Cassel (1926) equates the PPP time series with the equilibrium exchange rate series.

Since the numbers used to translate foreign currency significantly affect all the numbers consolidated financial statements, it is theoretically sound to allege that the usefulness of reported earnings per share and numerous other ratios and relationships would be enhanced by using PPP numbers which are closer to the equilibrium exchange rate. The transient noise factors in conversion exchange rates can be expected to reduce the information content of consolidated financial statements to users.

Motivation

Accordingly, the purpose of the present study is to examine the characteristics of PPP time series constructs compared with exchange rate time series. One of the assumptions of the present inquiry is that the relative variability of the PPP series and the exchange rate series results in relative variability of reported earnings.

This study uses what may be referred to as “country pairings,” one of which is always the United States. For example, one pairing would be the United Kingdom and the United States. Another could be Russia and the United States. No pairings are considered which do not involve the United States. For example, the purpose of the study does not encompass PPP and exchange rate comparisons between say, Russia and the United Kingdom. For convenience, the term “country pairings” will be used in this study. For example, a “Germany pairing” will mean PPP time series and exchange rate comparisons between Germany and the United States.

To what extent the relative characteristics of PPP and exchange time series are the same for all currencies translated into the US dollar is not known. Such knowledge has substantial implications for any proposal to use PPP numbers instead of exchange rates for translation. Although the economics literature does suggest that a PPP time series for a given country (in a “country pairing” between that country and the United States) should have lower variability than an exchange rate time series, the extent to which this is true for all countries is not known. Such knowledge is critical to PPP translation proposals; despite the theoretical economics literature and the theoretical accounting literature, it may be true that PPP translation methodologies might be highly meaningful and useful in some country pairings, but less useful, even harmful in terms of financial statement information content, in other country pairings.

Literature Review

Does lower variability of reported earnings result in more useful information? That is, is lower variability of reported earnings a normative criterion against which to evaluate alternative accounting methods? There are numerous research articles in the accounting literature that indicate that managers and other users view high variability of earnings as undesirable and less accurate depictions of the

results of operations than lower variability of earnings.

Relevant and Representative 20th Century Literature

A number of foreign currency translation articles indicate that the requirements of SFAS #8 were perceived by many financial statement users, especially managers, to result in greater variability of reported earnings than other possible translation methodologies (Allan, 1976; Biel, 1976; Herschman, 1976; Mattlin, 1976; Merjos, 1977; Aggarwal, 1978; Porter, 1983; Selling and Sorter, 1983). Collins and Salatka (1993) concluded that including the translation adjustment in net income as required by SFAS #8 generated noise that made reported earnings less meaningful. But the translation adjustment is determined by the net effect of all the translated subsidiary numbers. None of these studies contemplated the issue of PPP versus ER to eliminate some of the noise in consolidated financial statement numbers.

From the economics literature, the PPP theory of exchange rates is summarized in Officer (1982) in three propositions: (1) PPP is the principal determinant of the long-run equilibrium exchange rate, (2) the short-run equilibrium exchange rate in any current period is a function of the long-run equilibrium exchange rate in the sense that the latter variable is the principal determinant of, and tends to be approached by, the former, and (3) the short-run equilibrium exchange rate in any current period is determined principally by the PPP, with the former variable tending to equal the latter.

The equilibrium exchange rate is the rate at which the demand for a currency and supply of the same currency are equal. At the equilibrium exchange rate, the price for exchanging two currencies will remain stable (The Free Financial Dictionary, 12/18/2014).

Actual exchange rates are not likely to be equilibrium. Temporary factors affecting exchange rates are always in play, a condition that continually adds to the variability of exchange rates. Under the PPP theory as described by Officer, PPP would mitigate the effects of these temporary noise factors. This is a reasonable argument in favor of the use of PPP numbers instead of exchange rates for foreign currency translation, but the argument is theoretical and is not acceptable in accounting standard setting without supporting empirical and normative research.

Relevant and Representative 21st Century Literature

Bazaz and Senteney (2001) used an equity valuation model to investigate the extent to which SFAS No. 52 unrealized foreign currency translation gains and losses are reflected in levels of equity security prices. It is a sound theoretical observation that using numbers closer to the equilibrium exchange rate would increase the studied relationship, although this has not yet been demonstrated with normative research.

Louis (2003) studied the association between change in firm value and the foreign translation adjustment. Accounting rules for currency translation usually result in financial statement numbers opposite to the economic effects of exchange rate variations. Thus, the translation adjustment could be associated with a loss of value instead of an increase in value. Comments similar to those made above in relation to Bazaz and Senteney (2001) are appropriate here.

Holt (2004), a descriptive study, used a complex method of estimating the temporal characteristics of accounts and compared the information content of return on assets across translation methodologies, including PPP. The study provides a short step toward answering the Committee on International Accounting's question regarding the viability of PPP for translation. But the study does not relate various returns on assets to any normative criterion, and because of its scope was unable to relate the findings to any implications of noise.

Kwon (2005) indicated that foreign investors generally price exchange risk differently from local investors, and that the source and magnitude of differences in exchange risk pricing varied

significantly across countries. It is not known, based on existing research, whether the use of PPP would mitigate the observed differences, or whether the differences are related to transient factors.

In another empirical study, Pinto (2005) tested foreign currency translation adjustment value relevance in an earnings and book value model and observed that foreign currency translation adjustments are significantly value relevant. But the study did not include a PPP methodology for testing against ER.

Liu (2006) used an accounting-based equity valuation model for multinational firms to examine the forecasting and valuation properties of foreign currency translation gains and losses. It found that translation gains and losses could be subdivided into a core component and a transitory component. The combined effect was that translation gains and losses were more transitory than transitory earnings. Current research does not answer the question as to how much of the transitory component is due to the use of ER instead of PPP.

Wang et al (2006) suggested that currency-translation differences are at times incrementally relevant to returns. It remains to be determined which performs better, PPP or ER in this regard.

Chambers et al (2007) provided evidence in the post-SFAS #130 period that other comprehensive income is priced by investors on a dollar-for-dollar basis. Two components of other comprehensive income, foreign currency translation adjustment and unrealized gains and losses on available-for-sale securities, were found to be priced by investors. But the study suggests that investors pay greater attention to other comprehensive information reported in the statement of changes in equity, rather than in a statement of financial performance.

Holt (2011) made a normative evaluation of translation methodologies based on firm valuation and found that PPP performed well against this criterion compared to exchange rates. Holt (2006) suggested superiority of the use of PPP over exchange rates for variability of reported earnings. Holt (2012) focused on two short-term liquidity ratios, the current ratio and inventory turnover and attempted to identify, in terms of empirical properties, if and in what ways foreign currency translation methodologies generate different results. Analysis of meaningfully-paired observations indicated substantially different current ratio and inventory turnover numbers across translation methodologies. But the results were not consistent from year to year and the results of all the fifty sample companies, taken together, did not hold for all the individual companies. At the firm level, the results were highly firm specific.

Holt (2013) tested alternative translation methodologies against the Fischer Black Method of Evaluating accounting alternatives with a conclusion favorable to PPP. Holt (2014a) tested alternative translation methodologies against the normative criterion of present values of future cash flows to investors and concluded a favorable result for PPP. Holt (2014b) tested methodologies against the predictability of reported earnings with similar favorable results for PPP.

Methodology

The countries used to form the “country pairs” were taken from the top twenty-five countries according to gross domestic product as indicated in International Monetary fund 2013 and augmented by Treasury Direct 2005 and United States Census 2014. As noted above, all country pairs include the United States leaving twenty-four countries for pairing. For various economic reasons, Iraq and Turkey were excluded, resulting in twenty-two country pairings.

Month-end exchange rates between each of the twenty-two countries and the United States were obtained from January 1999 through December 2013. In order to construct the PPP monthly time series for the same period, the United States monthly consumer price indexes and the corresponding consumer price indexes for the twenty-two countries were obtained.

Purchasing Power Parity (PPP) Time Series Construction

The use of exchange rates in translation has no rigorous defense, and exchange rates are not related in any clear way to accounting measures. None of the exchange-rate based translation methodologies has been shown theoretically or empirically to be superior to the others under all circumstances. Patz (1978) suggests this may result from the use of exchange rates themselves. The Price Parity Method of translation is described in full in Patz (1981). For an analysis of the state of the art of currency translation theory and the lack of definitive research of the PPP alternative, see Patz (2006).

Using the price parity methodology, foreign accounts are translated into dollars using a temporal method approach, but using a time series of price parity relative purchasing power indices. The purpose is to reflect the command over goods and services in the economy in which the subsidiary operates. It is assumed that foreign subsidiaries do not exist solely for the purpose of generating dollar cash flows to the parent, but rather for the maximization of economic power which can be defined as the size of assets held (Churchman, 1961).

The price parity indices needed for translation from foreign currency to dollars under the price parity method were calculated as follows:

$$PP_t = PP_b(CPI_{tk}/CPI_{ts})$$

Where

PP_t = the price parity index for point in time t ,

PP_b = an exchange rate assumed to approximate purchase power parity at the point in time b (b = December 31, 1993, a base point.)

CPI_{tk} = consumer price index in the foreign environment at time t , standardized to base period $b = 100$, and

CPI_{ts} = consumer price index for the U.S. at time t , standardized to base period $b = 100$.

The foregoing is called the “constructed rate” approach for obtaining a price parity index time series. It is the method suggested by Patz (1981) as the simplest and most practical.

This calculation must be performed for each point of time need for translation, and the purpose of the calculation is to generate a time series of PPP numbers which are closer to the equilibrium exchange rate than observed conversion exchange rates. Patz (1977) pointed out that foreign currency translation is a mathematical exercise in which measures scaled in a foreign currency are transformed into measures scaled in the domestic currency. It is a restatement process, not a remeasurement. The restatement should not introduce transient noise factors. The PPP theory of translation alleges that less noise is generated by the use of PPP numbers than by the use of conversion exchange rates.

Research Questions

The study addressed two research questions:

- (1) For how many of the twenty-two country pairings is the variability of PPP less than the variability of exchange rates, and which country pairings exhibit this characteristic?
- (2) Do any of the twenty-two country pairings exhibit anomalous results that would affect the use of PPP for currency translation in lieu of exchange rates, and what are the causes of these anomalies?

Results and Conclusions

The rank ordering of countries by gross domestic product according to the International Monetary Fund (2012) is as follows:

- | | | |
|-------------------|-----------------|------------------|
| 1. United States | 10. India | 19. Saudi Arabia |
| 2. China | 11. Canada | 20. Switzerland |
| 3. Japan | 12. Australia | 21. Iran |
| 4. Germany | 13. Spain | 22. Sweden |
| 5. France | 14. Mexico | 23. Norway |
| 6. United Kingdom | 15. South Korea | 24. Poland |
| 7. Brazil | 16. Indonesia | 25. Belgium |
| 8. Russia | 17. Turkey | |
| 9. Italy | 18. Netherlands | |

The purpose of consulting this list was to select countries which are active in international commerce. Such countries contain businesses which are likely to have Multi-national subsidiaries, and thus are affected by accounting principles relating to foreign currency translation. The list was used merely for selection for use in the present study. Factors such as the precise rank ordering were not relevant.

As indicated under methodology, for various economic reasons, Iraq and Turkey were excluded, resulting in twenty-two country pairings with the United States.

Several of these countries use the euro. Although the time series of exchange rates between those countries' currencies and the United States dollar is the same, the time series of the constructed PPP numbers is different. Thus, the fact that several countries use the same currency does not eliminate the use of that country in the present study.

An implication of Officer (1982) was that the PPP construct's variance is lower than that exchange rate variance. Tables 1 and 2 make that comparison for the study period. Countries are ordered by gross domestic product.

Table 1 was constructed with a United States parent and a foreign subsidiary in mind, translating foreign currency into dollars, whereas Table 2 used the opposite scenario, a foreign parent and a United States subsidiary.

To answer research question #1, in each table we observe sixteen of the country pairings with higher variances for exchange rates than for PPP and six country pairings with the opposite result. The six countries for which the results were contrary to Officer (1982) arranged in order of gross domestic product are: Japan, Brazil, Russia, India, South Korea, and Indonesia. A tentative and cautious implication is that the use of PPP instead of exchange rates for currency translation between these countries and the United States might not be advantageous from the viewpoint of the information content of consolidated financial statements.

Of special interest among these six countries is Japan, as it is the fourth largest trading partner with the United States. It is important to understand why these results are observed for Japan. A major factor in constructing the PPP series, as described in the methodology section of this paper, is the variability of the consumer price index. The following table shows the rank orderings of countries based on the lowest variances of the consumer price indexes. This result for Japan is an anomalous result mentioned in research question #2.

Table 1. Variances of Exchange Rates Compared to Variances of PPP (Dollars per Foreign Currency)

Country	Exchange Rate Variance	PPP Variance	X = Exchange Rate Variance > PPP Variance
China	0.0308	0.0298	x
Japan	0.0001	0.0028	
Germany	0.2528	0.0777	x
France	0.2528	0.0739	x
United Kingdom	0.0075	0.0011	x
Brazil	0.0969	0.1671	
Russia	0.0031	0.0168	
Italy	0.2528	0.0207	x
India	0.0048	0.0075	
Canada	0.1767	0.0273	x
Australia	0.1712	0.0364	x
Spain	0.2528	0.0301	x
Mexico	0.0200	0.0191	x
South Korea	0.00004	0.00004	
Indonesia	0.00004	0.00005	
Netherlands	0.2528	0.0258	x
Switzerland	0.3465	0.1210	x
Iran	0.0004	0.00034	x
Sweden	0.0296	0.0107	x
Norway	0.0270	0.0060	x
Poland	0.0616	0.0130	x
Belgium	0.2528	0.1809	x

Table 2. Variances of Exchange Rates Compared to Variances of PPP (Foreign Currency per Dollar)

Country	Exchange Rate Variance	PPP Variance	X = Exchange Rate Variance > PPP Variance
China	1.5529	1.5226	x
Japan	1.4051	29.9925	
Germany	0.1822	0.0684	x
France	0.1822	0.0654	x
United Kingdom	0.0028	0.0004	x
Brazil	0.4036	0.9102	
Russia	2.9367	44.7313	
Italy	0.1822	0.0196	x
India	12.9564	26.1340	
Canada	0.2774	0.0549	x
Australia	0.2903	0.0945	x
Spain	0.1822	0.0307	x
Mexico	2.4754	2.3257	x
South Korea	52.2268	61.9771	
Indonesia	3,337	5,187	
Netherlands	0.1822	0.0248	x
Switzerland	0.4929	0.2391	x
Iran	16,273	7,213	x
Sweden	1.677	0.6954	x
Norway	1.3309	0.3599	x
Poland	0.7790	0.2386	x
Belgium	0.1822	0.1437	x

Table 3. Rank Ordering of Countries by Lowest Variances of Consumer Price Indexes

Rank	Country	Variance of CPI
1	Japan	0.0131
2	China	0.0193
3	Switzerland	0.0631
4	Belgium	0.0712
5	Sweden	0.1567
6	Germany	0.1772
7	France	0.1816
8	Norway	0.2116
9	Canada	0.2204
10	Netherlands	0.2375
11	Italy	0.2455
12	United Kingdom	0.2692
13	United States	0.2735
14	Spain	0.3167
15	South Korea	0.3496
16	Australia	0.3592
17	Poland	0.3602
18	Mexico	0.6194
19	Brazil	0.9868
20	India	1.1083
21	Indonesia	1.2881
22	Russia	2.4444
23	Iran	5.9975

Pursuant to officer (1982) and the methodology of the PPP time series construction used in this paper, a preliminary observation is that the higher the variance of a country's CPI, the less valuable would be the use of PPP for foreign currency translation compared to exchange rates. The striking result from Table 3, compared with the results from Tables 1 and 2, is that Japan has the lowest variability among the countries included in this study.

The other major factor in the construction of the PPP series is the CPI in the United States. Hence, the coefficient of variation between the foreign country's CPI series and the United States CPI series is highly relevant. Intuitively, the coefficient of variation would be positive for all countries for which a constructed PPP series would be viable for currency translation.

Table 4 rank orders countries by the coefficient of variation between that country's CPI series and the United States CPI series, showing the lowest coefficients first.

Table 4. Rank Ordering of Countries by Lowest Coefficient of Variation Between That Country's CPI series and the United States CPI Series

Country	Coefficient of Variation
Japan	-0.5951
China	0.4737
India	0.8399
Mexico	0.8546
Iran	0.8952
Switzerland	0.9573
United Kingdom	0.9697
Poland	0.9762
Belgium	0.9772
Netherlands	0.9825
Norway	0.9836
Sweden	0.9862
Brazil	0.9876
Russia	0.9896
South Korea	0.9915
Australia	0.9939
Italy	0.9944
Indonesia	0.9948
Canada	0.9955
Germany	0.9956
France	0.9969
Spain	0.9971

Table 4 reveals Japan as a striking outlier; Japan's CPI series does not correlate with the United States series, an explanation for the anomalous result observed for the Japan pairing. This evidence suggests that the use of PPP for translation of accounts between the Japanese yen and the United States dollar for consolidation purpose is not likely to produce financial statements with information content superior to the use of exchange rates.

Limitations and Suggestions for Future Research

The present study drew on the implications of Officer (1982) and thus assumed that the use of an equilibrium exchange rate series, represented by PPP, rather than a market-generated exchange rate series would result in consolidated financial statements with greater information content. The study did not actually perform the daunting task of translating a significantly large sample of actual companies from one currency to another. Thus, no rank ordering of translation methodologies was done based on any normative criterion.

A number of papers reflect accounting normative criteria against which translation methodologies can be evaluated. For example,

Ohlson (2001) studied the relationship between earnings, book values, and dividends in equity valuation. Ohlson (2005) examined accounting-based valuation formulae, and Ohlson and Juettner-Nauroth (2005) studied the relationship between earnings per share and firm value.

The explanation of the anomalous Japan pairing was based on the lack of correlation between the Japanese CPI series and the United States CPI series. This was a mathematical explanation, but the underlying business environment and cultural explanations for this phenomenon remain unknown.

Despite the results of this study related to Japan, the author believes future research should perform currency translations between the Japanese yen and the U.S. dollar for the purpose of comparing the results with a wide range of normative criteria. Such research should also be performed for the other twenty-one country pairs.

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