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Covered Arbitrage Opportunities - A Filipino Perspective

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This paper examines the arbitrage opportunities from Filipino Investors' perspective in relation to their main trading partner, Japan. The study has been conducted with data between 1994-2013. Findings suggests absence of IFE and PPP. The exchange rate is affected by 1346 macro-forces. Investors or consumers should conduct a combination of technical and fundamental analysis to identify trends. Dominant higher real-interest rates and cheaper commodities at home suggest the local market to be stable, but for arbitrage opportunity seekers, it is proven that there exist such chances with different levels of risks involved depending on the era and the macro-economic conditions.

JEL Codes: D81, D84, E43, E47, F31, F37, F62, F65, G02, G14, G17, N15.

1. Introduction

The Philippines is an island that is situated in the South-Eastern part of Asia. Upon gaining independence in 1967, the establishment promptly took control of its trade routes. It joined the ASEAN as a founding member in 1967 along with other countries like Malaysia, Indonesia, Singapore, and Thailand, etc. However, astonishing till date, none of the ASEAN countries rank within the Top 4 trading partners of Philippines; currently Singapore only ranks at number 5, while the top spots are held by Japan, U.S.A., China and Honk Kong (Foreign Trade Statistics Authority of the Philippines 2015).

The trade relation with Japan, hence is particularly very important for the Philippines and as a result, the domestic currency value is rather dependent on the macroeconomic condition differentials between the home country and the foreign country, where Philippines is considered as the Home Country and the domestic Currency is Philippine Peso, while Japan is held to be the foreign country and the foreign currency pair is Japanese Yen (JpY). Japan being the top trading partner, investors may not only focus on commodity trade (may also opt for consumption) but also have the opportunity to enter the currency trading practice, which is by far the biggest market in the world (Menkhoff et al. 2016). This nature of arbitrage opportunity is tested by analyzing the exchange rate movements with the inflation, nominal and the real interest rate differentials (both actual as well as the expected real interest rate based on the IFE) as well as several other macroeconomic indicators to explain the exogenous forces that do not allow the IFE nor PPP to hold during the various eras. By excluding the element of hedging arrangements, it is possible to identify the investors' typical reaction to the uncertainties in the currency market. To eliminate complications, when testing the IFE and PPP, the midpoint of bid and ask rates have been utilized (taking into account any interbank transaction rates). To identify any trends, the data between the timeline of 1994-2013 has been selected.

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The hypothesis of this paper is that neither IFE nor PPP will not hold in the long term. The IFE and PPP are going to be tested using statistical spot rates. This initial hypothesis has been formulated to contrast preceding investigations that have been conducted, where the results of those previous investigations prove to be favourable towards the holding of PPP in the long-term (Chang et al. 2011; Lothian 2016) and support for the use of IFE (Salishali 2012; Neto 2015; Panopoulou & Pantelidis 2016) and the implication is that arbitrage opportunities arise only if PPP and IFE do not hold and vice versa. Thus, the objective of the study is to identify whether there had been any covered arbitrage opportunities from the point of view of the Filipino investors or consumers. If so, it will be studied whether it had been beneficial to invest in Japanese currency or deposits, and also whether it had been more cost savings to buy goods (or services) from abroad (Japan) or to stick to local offerings. Moreover, any risks associated with every foreign transaction will also be investigated.

In this paper, the authors have primarily expressed extensive literature, after formulating the hypothesis, through which research gap can be identified; this is to be followed by stating the methodologies, tools, procedures, and limitations of the investigations addressing the research gap. The next step is the implementation of the tools mentioned in the methodology and procedures to address the hypothesis and problem statement after which the results are presented.

2. Literature Review

Arbitrage opportunities had historically been hard to be exploited without the assistance of hedging derivatives (Hombert & Thesmar 2014). On top of that, in any form of transactions, intermediaries charge a flat fee or commission but when dealing with currencies, mostly banks are given licenses with exceptions of certain nonbanking financial institutions and hence they act as the intermediaries (Vivian & Spearman 2015) and charge an interbank transaction fee (Tennant & Sutherland 2014) in addition to the spread, which typically adds up to around 5%. The spread is the difference between the bid and ask rate for the currency (Hasman, Samartin & Bommel 2014).

When arbitrage opportunities are explored internationally, covered arbitrage (Skinner & Mason 2011) is usually looked unto. The International Fisher Effect (IFE) is more precise compared to Interest Rate Parity (IRP) as the IFE deals with the spot-rates rather than Forward-rates, although evidence does suggest that the forward-rate is a good indicator to the currency value movement (Eun & Resnick 2011), the spot-rates however, give much more accurate data, and therefore IFE is considered when testing for covered arbitrage.

There have been numerous studies that have been conducted that support the concept of International Fisher Effect (Hatemi-J 2009; Hall et al. 2010; Kulkarni 2011; Ray 2012; Incekara, Demez & Ustaoglu 2012). Further works on IFE had been conducted explicitly (Ucak, Ozturk & Aslan 2014; Zainal, Nassir & Yahya 2014; Puci & Mansaku 2016) that found results that even if the relationship of 1-to-1 is to the dot, IFE does hold in the long-term. Moreover, IFE only holds as long as PPP holds (Madura 2015), and therefore the significance of Purchasing Power Parity is substantial.

Parallel studies were similarly conducted, and couple of studies have found promising results supporting the strong presence of long-term Purchasing Power Parity (Sideris 2006; Bahmani-Oskooee, Kutan & Zhou 2007; Nagayasu & Inakura 2009; He, Ranjbar & Chang 2013). Furthermore, advanced researches depicted similar inferences (Kim & Lima 2010; Chang et al. 2011; Qiu, Pinfold & Rose 2011; Kutan & Zhou 2015), hence complementing the

results in favor of long term PPP, using tools such as non-linear STAR, historic deviations, etc.

Although such works suggest that existence of arbitrage opportunities do not exist, these data do not necessarily denote relevancy to the home conditions and settings. Macro-variables (Yin & Li 2014) or simply information barriers or distortions (Pfajfar 2013) may yield dynamics (Rodridigo 2012) varyingly depending on the level of heterogeneity. Although certain works mentioned such as those of Nagayasu & Inakura (2009), Chang et al. (2011), Salishali (2012), Kulkarni (2012), Ray (2012) deal with the variables of Japan (the selected foreign currency pair), there exists no prior studies on the exchange rate in context of the Philippines (which is in this case the home currency pair) and their macro-variable differentials. As a result, the previous studies are somewhat limited.

Furthermore, those studies were done pairing nations that have somewhat similar economy in terms of absolute GDP such as Germany, USA, etc., whereas the macro differences between the Philippines and Japan is considerably substantial which will be displayed in the later parts of this study. Hence, the authors find this literature gap significant as it is crucial for the investors in the Philippines while taking decisions when attempting to undertake arbitrage activities or for consumers that wish to capitalize on cheaper foreign goods.

3. The Methodology and Model

3.1 Source of Data and Sample

The information supporting this study is of secondary nature. The data has been collected from sources such as the World Bank and various articles from fields of economics, development studies, finance, etc.

3.2 Methodology, Instrument and Procedure

Twenty years' data from 1994-2013 has been collected from the World Bank statistical data bank which provides the various economic differentials between the domestic country and the trading company. The Philippines is locked as the home country while the trading country in this context is considered as Japan. The currencies of Philippines and Japan are Philippines Peso (PhP) and Japanese Yen (JpY) respectively. The spot rates between the currencies have been retrieved from the website of Oanda (2015). The average of the bid and ask rates (inclusive of any interbank transaction fees) have been used to determine the spot rates for the covered interest arbitrage so as to minimize pricing errors (Picotti 2015). As mentioned previously, no studies had previously been conducted pairing the currencies of Philippines (Philippines Peso) and Japan (Japanese Yen), hence this study has a somewhat novelty to it. This paper also aims to display the risks associated with taking a long position on Japanese Yen or when purchasing goods from Japan, which previous models have failed to identify.

3.3 Limitations

The full set of data that had been retrieved from the archives of the World Bank is only across 20-years period and as a result, when establishing any relationship, the data comes out as under-fitting. Moreover, the data provided by the World Bank only accounts for the annual positions of the focused years; yearly data are much less accurate than quarterly data which however are not recorded in any archives. Furthermore, the spot-rates include up to 5%

interbank spread rate, which further distorts the relationships between the macro-variables and the change in currency values. To add on, this study assumes a scenario where there are no hedging opportunities. Finally, only 8 macro indicators are given a microscopic view, whereas there are many other indicators at work affecting the currency valuation process.

3.4 Tools Used

The main statistical tools used is multi-regression analysis to identify the relationship between the macroeconomic variable differentials (between the home and the foreign country) to the change in the currency values, if any. Descriptive statistics is also used to state the probabilities (Percentile) of earning arbitrage profits in the foreign country or simply earning a higher yield at home and standard deviations were used to show the fluctuations in the spot-rate change in the currency values. Moreover, Coefficient of Variation tool has been depicted, in order to show, the risks associated with every 1% return on investment or cost saved.

4. The Findings

4.1 Opportunity for Covered Arbitrage

The economic data that have been retrieved are shown in Table 1. The Data contains information on the Nominal interest rate (deposit rate), inflation rate and real interest rate for both the home and the partner country.

Table 1: Inflation, Nominal and Real Interest Rates in the Philippines and Japan their exchange rates.

Year	Philippines Nominal Interest (Deposit) Rate (CPI) %	Japan Nominal Interest (Deposit) Rate (CPI) %	Philippines Inflation (CPI) %	Japan Inflation (CPI) %	Philippines Real Interest Rate %	Japan Real Interest Rate %	Average Spot Rate Mid of Bid/Ask Php/Jpy
1993	9.60575	2.144	6.716311041	1.267416485	7.348528765	4.40776042	0.2602
1994	10.53908333	1.698416667	10.38647343	0.687940323	4.605380666	4.013758697	0.2592
1995	8.391916667	0.9015	6.83199611	-0.123477116	6.630626429	4.262061122	0.2751
1996	9.683416667	0.3005	7.476103778	0.131871755	6.667883114	3.23248371	0.2414
1997	10.19383333	0.301333333	5.590259397	1.761461849	9.462382215	1.842808525	0.2447
1998	12.10633333	0.265916667	9.234934323	0.663269433	-4.57936545	2.376678674	0.3143
1999	8.167	0.11675	5.939049018	-0.329449578	4.870473677	3.47884313	0.3462
2000	8.305083333	0.070416667	3.977125032	-0.653015156	4.916715434	3.356642157	0.4109
2001	8.744166667	0.057083333	5.345501956	-0.803375801	6.491842174	3.205684058	0.4205
2002	4.608	0.035583333	2.722772277	-1.310882915	4.777422865	3.468968138	0.4138
2003	5.220666667	0.0425	2.289156627	0.167794547	6.07582317	3.598545662	0.4691
2004	6.1775	0.08025	4.829210836	-0.008275405	4.323601483	3.161811598	0.5194
2005	5.556	0.271083333	6.516853933	-0.273110982	4.116958779	2.96516728	0.5016
2006	5.294166667	0.68275	5.485232068	0.2406639	4.601887334	2.817865982	0.4417
2007	3.696	0.808166667	2.9	0.057951817	5.433189672	2.840427369	0.3917
2008	4.4895	0.58875	8.260447036	1.373489988	1.117651519	3.215382474	0.4326
2009	2.741	0.434916667	4.219030521	-1.346718903	5.636603046	2.234797053	0.5097
2010	3.219666667	0.500083333	3.789836348	-0.719781584	3.310495797	3.845998371	0.5151
2011	3.387916667	0.461583333	4.647302905	-0.283333333	2.539402681	3.41539718	0.5443
2012	3.155916667	0.478	3.172085646	-0.033428046	3.692300821	2.360664664	0.5301
2013	1.661833333	0.542166667	2.997694081	0.35947166	3.733573686	1.862391238	0.4358
2014	1.228833333	0.41525	4.129353234	2.748854644	2.336028904	-0.415791647	0.4209

(OANDA & World Bank Statistical Data 2016)

4.1.1 IFE Testing

From Table 1, the Derived Data is presented in Table 2 and Table 3.

Table 2: Differentials in the i_n, I and i_r between Philippines & Japan, and the e_f (Between 1994-2003)

Year	Change in Spot rate %	Nominal Interest Rate Differential %	Inflation Rate Differential %	Real Interest Rate Differential %	Japan Expected Real Interest Rate (%)	Philippines Expected Real Interest Rate %	Expected Real Interest Rate Differential %
1994	0	9	10	1	1	0	-1
1995	6	7	7	2	1	2	1
1996	-12	9	7	3	0	2	2
1997	1	10	4	8	-1	5	6
1998	28	12	9	-7	0	3	3
1999	10	8	6	1	0	2	2
2000	19	8	5	2	1	4	4
2001	2	9	6	3	1	3	3
2002	-2	5	4	1	1	2	1
2003	13	5	2	2	0	3	3

Note: As it can be noticed, the percentages have been converted to integers as the difference are negligible.

Table 3: Differentials in the i_n, I and i_r between Philippines & Japan, and the e_f (Between 2004-2013)

Year	Change in Spot rate %	Nominal Interest Rate Differential %	Inflation Rate Differential %	Real Interest Rate Differential %	Japan Expected Real Interest Rate (%)	Philippines Expected Real Interest Rate %	Expected Real Interest Rate Differential %
2004	11	6	5	1	0	1	1
2005	-3	5	7	1	1	-1	-2
2006	-12	5	5	2	0	0	-1
2007	-11	3	3	3	1	1	0
2008	10	4	7	-2	-1	-4	-3
2009	18	2	6	3	2	-1	-3
2010	1	3	5	-1	1	-1	-2
2011	6	3	5	-1	1	-1	-2
2012	-3	3	3	1	1	0	-1
2013	-18	1	3	2	0	-1	-2

Note: As it can be noticed, the percentages have been converted to integers as the difference are negligible.

For enhanced illustrations, the changes in the annual spot rate (in %) had been plotted in the X-axis while the interest rate differential between the home country and the foreign country (in %) had been plotted in the Y-axis using a scatter diagram. The IFE line is drawn with the equation X=Y or Y=X. It is assumed that, if IFE held (no arbitrage opportunities) all the data points will fall along the IFE line while if IFE failed to hold, then the points based on the data are to lie either above or below the IFE line. If the data points lie above the IFE line, it implies that a Filipino investor (domestic) would have earned lower returns from investing in Japanese

(foreign) deposits. On the other hand, if the data plots lie below the IFE line, it indicates that a Filipino investor would earn higher returns from investing in Japanese deposits. If IFE held, it indicates a Filipino investor would earn the same returns no matter where he chose to invest (in the Philippines or Japan) because the difference in returns would be offset by the exchange rate. From a Japanese investor's perspective, the scenario is exactly opposite of the Filipino investor except if the data falls along the IFE line. The data is plotted in Figure 1.

Figure 1: Graphical Analysis of the IFE using the data of Philippines and Japan

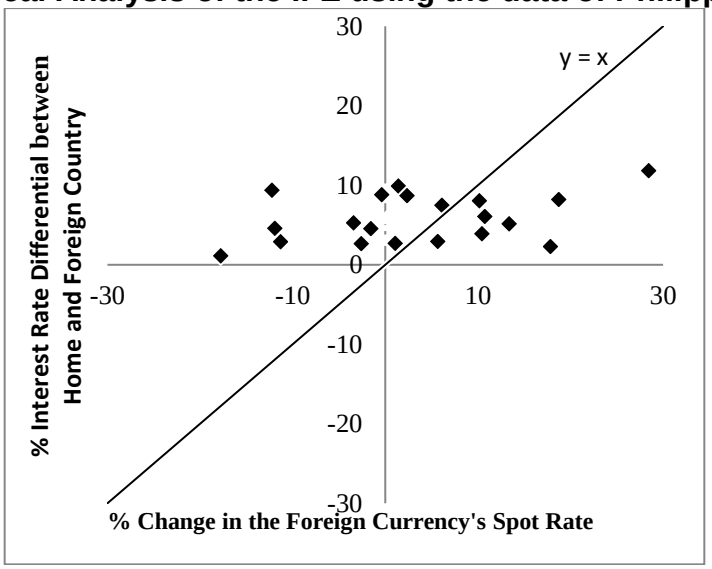


Figure 1 suggests that 40% of the time it had been beneficial to invest in Japanese deposits and majority of the time (60%) it was better for the Filipino investors to invest in domestic deposits. So, from Japanese investors' perspective, there were opportunities to earn a higher return from investing in the Filipino deposits. In the long-run, therefore, the IFE did not hold; at least, it did not do so between the Philippines and Japan. To understand better why the IFE didn't hold, the Purchasing Power Parity (PPP) data should be placed under the microscope. The PPP data can also be plotted graphically for better illustrations; the changes in the annual spot rate (in %) is plotted in the X-axis while the inflation rate differential between the home country and the foreign country (in %) is plotted in the Y-axis using a scatter diagram in the next section. The PPP line is also drawn with the equation X=Y or Y=X.

4.1.2 PPP Testing

Similarly, it is assumed that, if PPP had held (law of one price), all the data points will fall along the PPP line while if PPP failed to hold, then the data will lie either above or below the PPP line. If the data lies above the PPP line, it implies that a Filipino consumer (domestic) would have a higher purchasing power over Japanese (foreign) goods. On the other hand, if the data lies below the PPP line, it indicates that a Filipino consumer would have a lower purchasing power over Japanese goods. If PPP held, it implies that a Filipino consumer would have the same purchasing power no matter where he chose to buy from (in the Philippines or Japan) because the difference in prices would be offset by the exchange rate. From a Japanese consumer's perspective, the scenario is exactly opposite of the Filipino consumer except if the data falls along the PPP line. The data is plotted in Figure 2.

Figure 2: Graphical Analysis of the PPP using the data of Philippines and Japan

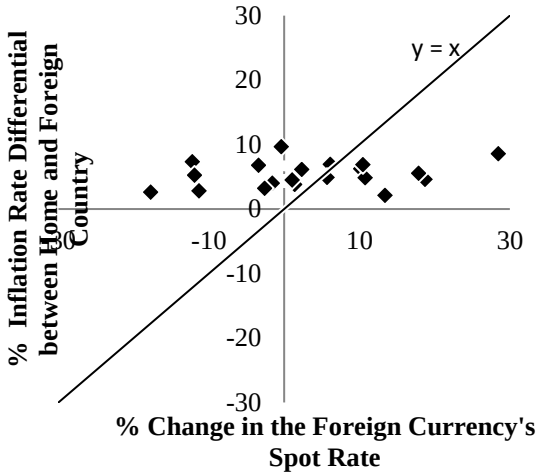


Figure 2 likewise suggests that 40% of the time it was disadvantageous to buy Japanese goods and the majority of the time (60%) it was better for the Filipino consumers (or middlemen) to buy goods from the foreign market (Japan). On the other hand, Japanese customers (or middlemen) were better-off most of the time if they sticked to purchasing goods from their own country. Therefore, in the long run, it can be seen that the PPP did not hold either in perspective of the Philippines and Japan. Since the IFE is derived from PPP, if PPP didn't hold than IFE would not hold either (Madura 2015) and this is what happened in the Philippines-Japan case. To identify a trend, the nominal interest rate differential (i_h-i_f), inflation rate differential (I_h-I_f) and the change in annual average Spot rate (100%*[S_t-S_{t-1}]/S_{t-1}) of the countries are plotted on the same graph using line graphs. The graph is plotted in Figure 3.

Figure 3: Nominal Interest Rate and Inflation Rate Differential and Change in Spot Rates

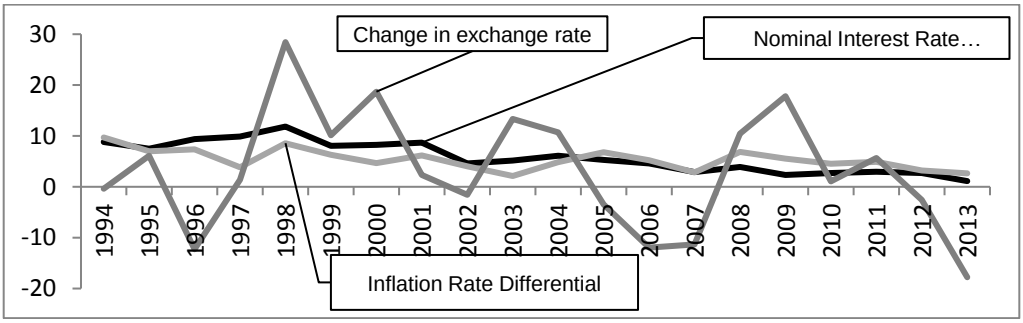


Figure 3 demonstrates that both the interest rate and inflation rate differentials had a downward trend in the long-term, of which the inflation rate differential seemed lower than the Nominal Interest rate differential from 1995-2004; however in 1994 and from 2005-2013, the scenario was opposite, while on the other hand, the change in spot rate had variations; from 1994-1997, 2001-2002, 2005-2007, 2010, and 2012-2013 the %Δ e_f was lesser than %Δ (i_h-i_f) and %Δ (I_h-I_f), while from 1998-2000, 2003-2004, 2008-2009 and 2011 %Δ e_f was greater than the %Δ (i_h-i_f) and %Δ (I_h-I_f). Thus, no clear pattern can be identified between the interest or inflation rates and the change in spot rate, but there lies a very low +ve correlation (Nominal exchange rate differential→ 0.371681, Inflation rate differential→0.267746). Falling nominal interest rate differentials and inflation rate differentials between the 2 countries imply the 2 indicators were becoming very similar to one another. However, to understand the inflation

rate and nominal interest rate differentials, the real interest rate differentials should also be taken into consideration. According to the International Fisher Effect theory, the Nominal Interest rate offered by the banks in a country contains the correction for expected inflation rate, and as a result, it is assumed that the real interest rates are somewhat similar across countries but the difference in nominal interest rates offered by banks are in response to the different inflation rates in the respective countries. Therefore, the actual real interest rate (after the fact measurement) and the expected real interest rate ($i_r = i_n$-I) according to IFE formula, and the change in Spot rates must be compared. The date is plotted below using a line graph in Figure 4.

Figure 4: Actual and Expected Real Interest Rate Differentials and the change in Spot rate

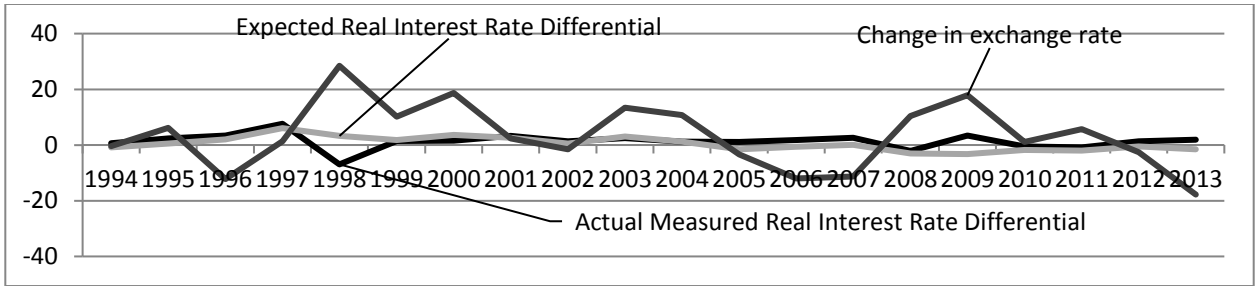
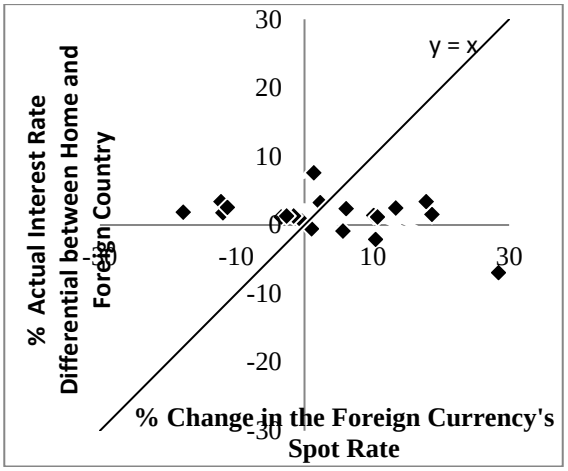


Figure 4 illustrates that there exists some differences in the actual measured interest rate differential and the expected real interest rate differential, which implies that it was expected that the real interest rates of the 2 countries would be somewhat close to each other as per the IFE theory, but in reality, the real interest rate had been more than expected, and as the real interest rate differentials had been calculated using i_n(Philippines) – i_n(Japan), higher differentials imply more beneficial investments in Filipino deposits, so in exceptions of 1998, 2008 and 2010-2011, it had always been beneficial to invest in Filipino deposits in case the exchange rate is not taken into considerations. Also, a rational investor tends not to keep his/her money overseas for a prolonged period of time and hence the dynamic spot rates have to be taken into consideration. The change in spot rate has a positive correlation with Expected Real Interest Rate Differentials (0.24158) while it has a stronger negative correlation with the Actual Real Interest Rate Differentials (-0.43102). This implies, that the spot rate changes can be predicted better with the Actual Interest Rate differentials; lower the Actual Differentials, higher the change in spot rate, however, the Actual Interest Rate can *only* be measured *after* the period has *passed*, and, *therefore*, we have to *rely on* the estimated Real Interest Rate Differential.

4.1.3 Results of IFE and PPP Testing, and Macro-Forces at Work

Figure 5 exhibits the periodic trend; there had been a 50-50 opportunity to gain a higher return from investing in Japanese deposits while 50% of the time it was better to exploit domestic deposits.

Figure 5: Testing the feasibility of Filipino investors investing in Japanese deposits



After rigorous comparison, it is established that neither IFE nor PPP held. The opportunity for arbitrage had arisen not only because of the change in spot rate but also because of the real interest rate differentials (in the Philippines, the real interest rate had mostly been higher than that in Japan), and this may be due to the fact that nominal interest rates had been mandated based on certain expected future inflation rates but the real inflation rates never went as high as expected and thus, the real interest rates substantially increased in the Philippines. In addition to that, the exchange rate changes due to multiple factors apart from interest rates and inflation rates, such as unemployment rate differentials, GDP growth rate differentials, foreign direct investment differentials, net export level differentials (all, in percentage of the respective GDPs), and many other indicators. Some of the indicators' data are given in Table 4.

Table 4: Various differentials in the economic indicators between Philippines and Japan are compiled.

	Differentials between Philippines (Home) and Japan (Foreign) Country								
	Unemployment Rate %	GDP Growth Rate %	FDI (Net Inflow) (% of respective GDPs)	Net Export (% of respective GDPs)	Remittance Inflow (% of respective GDPs)	Stock Trade (% of respective GDPs)	Total Trade (% of respective GDPs)	GNI Per Capita Growth	Change in exchange rate
1994	5	4	2	-8	5	0	58	3	0
1995	5	3	2	-9	7	-3	64	1	6
1996	4	3	2	-9	6	4	71	2	-12
1997	5	4	1	-11	8	-4	88	3	1
1998	5	1	3	-11	7	-10	79	8	28
1999	5	3	1	-6	8	-18	76	1	10
2000	6	2	3	-3	9	-47	84	3	19
2001	6	3	0	-7	11	-40	79	1	2
2002	6	3	2	-10	12	-36	81	2	-2
2003	6	3	0	-9	12	-50	80	5	13
2004	7	4	1	-7	13	-70	78	3	11
2005	3	3	2	-7	13	-103	71	3	-3
2006	4	4	3	-3	13	-134	64	1	-12
2007	4	4	0	-2	11	-130	53	2	-11
2008	3	5	1	-3	11	-111	41	5	10
2009	3	7	1	-1	12	-73	41	11	18
2010	2	3	0	-3	11	-64	42	2	1
2011	3	4	2	-3	10	-56	37	-8	6
2012	3	5	2	-1	10	-47	33	3	-3
2013	0	6	3	-1	10	0	25	4	-18
	Derived of World Bank Statistical Data								

(Again for the purpose of simplification, all the data are provided as integers).

Just to exemplify the various differences in the macroeconomic conditions between the Philippines and Japan, Table 4 has been plotted in graphical form. The graph is plotted in Figure 6.

Figure 6: Differentials of various macroeconomic indicators between Philippines and Japan

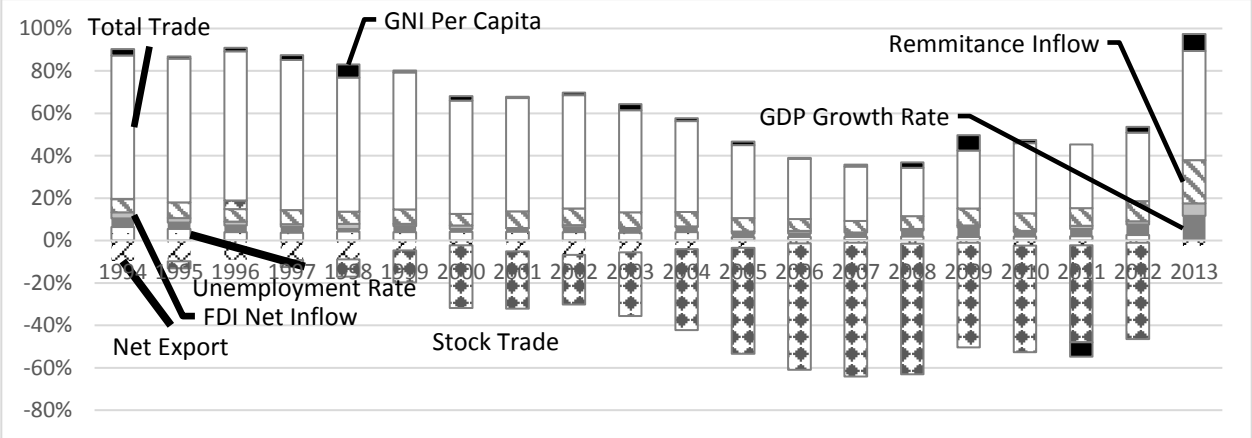


Figure 6, basically demonstrates 8 (out of the 1346 economic indicator data available in the World Bank statistics) economic indicator differentials between Philippines and Japan, and as it can be observed; the conditions seem to fluctuate vigorously. Any differential above 0% suggest that a certain economic indicator had been more dominant in the Philippines while the data below 0% suggests that a certain economic indicator was more dominant in Japan for the given period(s). A negative value in Table 9 or Figure 6 do not necessarily imply the absolute amount was negative; it merely means the home country's indicator in that certain area was weaker than the foreign country. To add on, most of the data above are specified according to % of GDP, and Japan has had a much higher **absolute** GDP compared to the Philippines, and, therefore, it doesn't mean that Japan had been or is economically weak but the indicators compared to the GDP size of Japan may be feeble.

In the Philippines, the dominant indicators were trade volume (% of GDP), GDP Growth Rate, Foreign remittance inflow (% of GDP), FDI inflow (% of GDP), Unemployment rate, and in most case GNI per Capita. On the other hand, in Japan, the dominant indicators were Net Export (% of GDP), and Stock traded (% of GDP). The trade volume indicates how much currency movement occurs at a given time. Given a certain country's dependency on trade (export or import); the country's currency is exposed to volatility. In this case, since the Philippines has had a high level of relative trade (Africa & Yu 2005), this suggests a volatile position for Filipino peso. The Higher outflow of goods should relate to higher export which should appreciate the Filipino peso as foreign currency supply rises in the market relative to the domestic currency (JpY depreciates).

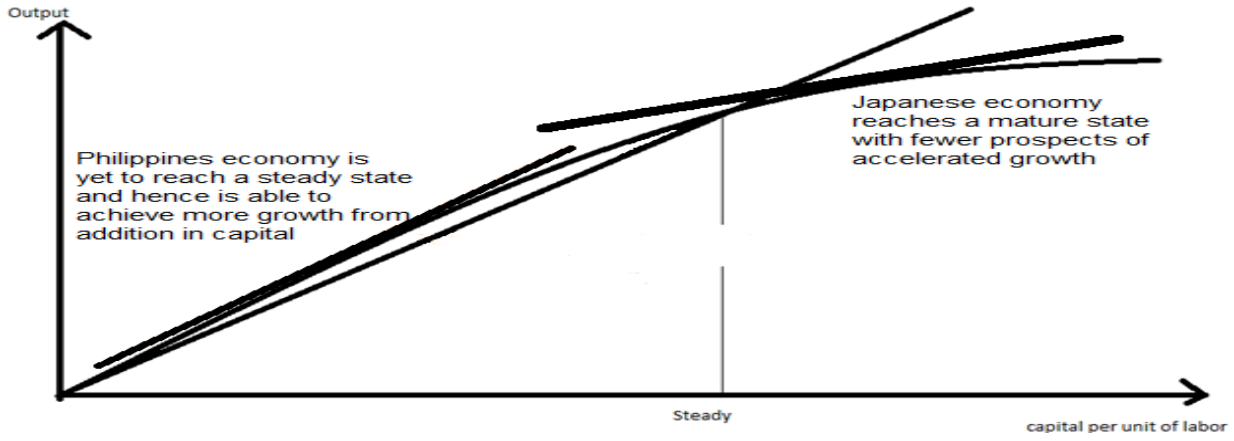
For a bigger picture, the net export level should thus be conceptualized and in this case, Japan has had a higher level of net exports as it relies on export of high-end large scale industrial technological goods (EW WORLD ECONOMY TEAM 2013) while Philippines relies heavily on its human resource exports (Aguilar 2015). However, in comparisons, industrial good exports give a higher yield compared to human resource and thus Japan has had a higher level of net exports. Hence the general notion is, a higher import level suggests that the currency should depreciate; however, since Japan has had a higher net export level, the Japanese Yen should appreciate against Filipino pesos (PhP to depreciate).

If human resource is mentioned, it is important to talk about the foreign remittances. From the above paragraph, it has been established that the source of earnings of the two countries have been historically quite different; Japan relies on goods while the Philippines relies on service. Japanese companies that rely on the business model that deals with goods (tangible products), it is possible for them to open subsidiaries abroad and hence it doesn't require them to remit much of their earnings back home. On the other, since the Philippines exports human resources, the individual workers at the end of the day sends back a huge chunk of their earnings back home to their friends and family as remittance which also contributes to the GNP (Banyan 2010). Therefore, there is such a huge differential in remittances received. Due to high level of remittances, it implies the Philippines gain a high level of foreign reserves, which in turn appreciates the Philippines Peso (Japanese Yen to relatively depreciate).

While the Philippines, relies on its human resource base, there is also higher level of unemployment that exists in the country compared to Japan (Salvosa 2015). As a result, it brings less confidence in the Philippines economy leading to fall in aggregate demand, and as a domino effect, the Philippines Peso depreciates (Japanese Yen relatively appreciates). A greater FDI inflow (% of respective GDP) in the Philippines compared to Japan implies an influx of the foreign currency in the domestic market (excess supply of foreign currency) which leads to depreciation of the foreign currencies and appreciation of the local currency (PhP).

Both the GDP growth rate and GNI per capita growth rates had been higher for the Philippines compared to Japan. This phenomenon can be explained using the Solow's model which articulates that less economically developed country will be able to grow at a faster rate compared to a more economically developed country when additional capital is injected into the economy. It can be demonstrated graphically in Figure 7.

Figure 7: Solow's model explaining why the Philippines has a higher growth rate compared to Japan.



From Figure 7, it can be seen that Japan has already reached a maturity level; which is theoretically beyond the steady state as it reached the steady state a long time back (Breton 2015), and now it has become more and more challenging to have a higher growth rate from additional capital while the Philippines is yet to reach a steady state and hence has more opportunities to grow at faster rate. A higher GDP growth rate and GNI per capita suggest that the productivity increases. In the Philippines, since it shows higher productivity level, the prices are expected to decline, which means the inflation rate is likely to dampen. The PPP formula is:

%change in exchange rate = Inflation in local economy - Inflation in foreign economy, and hence the Philippines peso is likely appreciate (Japanese Yen will relatively depreciate) in this kind of scenario.

Finally, Figure 6 further demonstrates that Stock trade level had been extremely high in Japan; this is because there is a huge market in Japan where investors and traders from across the whole world trade at extremely high values and it is called the Tokyo Stock Exchange (Fujikawa 2014). Since there is always such a huge volume of stock trade going on, there increases a demand for the Japanese Yen and as a result, the Japanese Yen appreciates against the Philippines Peso.

From all the 8 indicators mentioned above, it has been discussed how the currencies move against each other. For each case, the Philippines Peso either depreciates or appreciates against the Japanese Yen. Some indicators are lagging while some are leading, and different indicators carry different weightage in affecting the exchange rates.

4.1.4 Statistical Analysis of Macro-Forces & Their Effects

% change in exchange rate = -0.032342 + 2.148643*(r_1) - 2.63947*(r_2) - 0.40043*(r_3) + 2.678583*(r_4) + 2.998736*(r_5) - 1.79474*(r_6) + 1.56902*(r_7) + 1.48068*(r_8) + 0.110624*(r_9) + 0.113809*(r_{10}) + 0.703411*(r_{11}) + error

Where r_1 =Nominal Interest Rate Differential, r_2 = Actual Real Interest Rate Differential, r_3 = Inflation Rate Differential, r_4=unemployment rate differential, r_5=GDP Growth Rate differential, r_6= FDI net Inflow (% of respective GDP) differential, r_7= Net export (% of respective GDPs) differential, r_8= Remittance inflow (% of respective GDPs) differential, r_9= Stock trade (% of respective GDP) differential, r_{10} = Total Trade (% of respective GDPs), r_{11}= GNI per Capita Growth Rate differential

This disproves certain theories, where higher domestic inflation should depreciate the PhP, but on the contrary, it shows the domestic currency will appreciate (or JpY will depreciate) while a higher GDP growth rate, Higher Net Export, Higher Foreign Remittance Inflow, and higher trade (stock trade and total trade) in the domestic country should appreciate the PhP but it actually shows that they result in the depreciation of the PhP and a simultaneous appreciation of the JpY. This is because according to the simplified equation, only 8 indicators make the currency exchange rate shift, but it is worth imagining how much the spot rate fluctuates in the real-time where there are more than 1300 macroeconomic indicators at work in the same given time. Also, as mentioned, some indicators don't have equal or timely impact on the spot rate change and hence the data divided into 4 periods of 5 years each to see the impacts of certain indicators on the changed in spot rate.

4.1.4.1 1994-1998

% change in exchange rate = 0.030179 + 0*(s_1) - 1.06311*(s_2) + 0*(s_3) + 0*(s_4) + 0*(s_5) + 0*(s_6) + 0*(s_7) + 0*(s_8) - 2.26409*(s_9) - 0.01911*(s_{10}) - 0.47396*(s_{11}) + error; where *s_1 =Nominal Interest Rate Differential, s_2 = Actual Real Interest Rate Differential, s_3 = Inflation Rate Differential, s_4=unemployment rate differential, s_5=GDP Growth Rate differential, s_6= FDI net Inflow (% of respective GDP) differential, s_7= Net export (% of respective GDPs) differential, s_8= Remittance inflow (% of respective GDPs) differential, s_9= Stock trade (% of respective GDP) differential, s_{10} = Total Trade (% of respective GDPs), s_{11}= GNI per Capita Growth Rate differential*.

This shows that in this era, the Nominal interest rate, inflation rate, Unemployment rate, GDP growth rate, FDI inflow, net exports and foreign remittance inflow had no effect on the spot rate change, while some economic theories hold as it does prove that higher Real Interest Rate, higher Stock trade rate, total trade rate and higher GNI per capita in the home country appreciates the domestic currency thus depreciating the JpY.

During this era, 20% of the time it had been advantageous to invest in Japanese deposit whereas the rest of the 80% time, it had been better to invest in domestic deposits. Similarly, 20% of the time, it had been better to purchase goods from the home country while it had been cheaper to import from Japan 80% of the time.

The actual standard deviation of the % change in exchange rate was 14.92% in this era, which proved to be the most uncertain of all periods. Moreover, the mean change in spot rate was +4.66%, resulting in the Coefficient of Variation of 3.1995. This implies that for an investor without taking unto considerations any macroeconomic forces, there had been a risk of 3.1995% for every 1% long position in the Japanese Yen.

The economic indicators don't particularly have any predictive power in this era because in mid-1997 the Asian Financial Crisis occurred (Noland 2000), and the thus the Philippines Peso sharply depreciated while the Filipino banks tried to offer extremely high Nominal interest rates to discourage investors from moving their capital out of the country, but as the regression analysis also demonstrates, the investors found out that there was an increasing risk and hence moved their capital out anyways and thus, the nominal interest rates and many other economic indicators had no effect on the exchange rates, and this may be due to the deep fear among investors and their risk aversive nature, and hence PhP kept depreciating and the currency kept consistently losing its value even till the next period (hence JpY kept appreciating).

Assuming, IFE in fact held, the coefficient of variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 0.1338 (no unit), underestimating the actual risk per 1% increase in spot rate by as much as 3.0657%, which is threefold the payout. To add on, given that PPP at least held, the Coefficient of Variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 0.3051 (no unit), implying that for every 1% forecast of Japanese yen appreciating, the risk of would have been miscalculated by 2.8944%.

4.1.4.2 1999-2003

% change in exchange rate = $0.690561 + 0*(t_1) + 0*(t_2) + 0*(t_3) + 0*(t_4) + 0*(t_5) + 0*(t_6) + 2.497036*(t_7) + 0*(t_8) + 0.041052*(t_9) - 0.6388*(t_{10}) + 4.236327*(t_{11})$ + error; where *t_1 =Nominal Interest Rate Differential, t_2 = Actual Real Interest Rate Differential, t_3 = Inflation Rate Differential, t_4=unemployment rate differential, t_5=GDP Growth Rate differential, t_6= FDI net Inflow (% of respective GDP) differential, t_7= Net export (% of respective GDPs) differential, t_8= Remittance inflow (% of respective GDPs) differential, t_9= Stock trade (% of respective GDP) differential, t_{10} = Total Trade (% of respective GDPs), t_{11}= GNI per Capita Growth Rate differential*

In this era, despite what is suggested by economic theories, the best-fit line suggests that a lower export level, lower stock trade, lower GNI per Capita Growth rate in the Philippines would appreciate the PhP (deprecate the Japanese Yen), while only assumptions regarding

total trade rate was in sync with economic theories where it shows that higher trade level in the domestic country appreciated the PhP thus depreciating the JpY. Again, the economic indicators' impact seems non-conclusive due to the domestic structural inefficiencies, severe drought (The Philippines also rely on agriculture) and domino regional financial crisis (Yap 1999), and thus, the Philippines Peso continued to decline in regular interval throughout this period starting from 1999.

Since the aftermath of the crisis continued, during this period it had been beneficial to invest in Japanese deposits 60% of the time while only 40% of the time it had been better to invest in the domestic deposits. Similarly, only 40% of the time, it had been better to import goods from Japan, while as the currency fell in Philippines, it had been cheaper to purchase goods domestically 60% of the time. The standard deviation of the % change in exchange rate was 8.22% in this era, which was the least unpredictable of all times. Moreover, the mean change in spot rate was +8.59%, resulting in the Coefficient of Variation of 0.9569. This implies that for an investor without taking unto considerations exogenous forces, there was a risk of only 0.9569% for every 1% long position in the Japanese Yen, which is considerably more favourable to compared the previous era.

Supposing, IFE in fact held, the coefficient of variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 0.3110 (no unit), underestimating the actual risk per 1% increase in spot rate by as much as 0.6459%; as the risk was already relatively petty for this era, this underestimation wouldn't have any significant impact on the investors' decisions. In addition, even if PPP at least held, the Coefficient of Variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 0.3679 (no unit), implying that for every 1% forecast of Japanese yen appreciating, the risk of would have been misjudged by merely 0.5890%.

4.1.4.3 2004-2008

% change in exchange rate = $0.428339 + 0*(u_1) + 0*(u_2) + 2.433151*(u_3) + 3.152091*(u_4) + 0*(u_5) + 0*(u_6) + 0*(u_7) + 0*(u_8) + 0.328818*(u_9) - 0.55856*(u_{10}) + 0*(u_{11})$ + error; where *u_1 =Nominal Interest Rate Differential, u_2 = Actual Real Interest Rate Differential, u_3 = Inflation Rate Differential, u_4=unemployment rate differential, u_5=GDP Growth Rate differential, u_6= FDI net Inflow (% of respective GDP) differential, u_7= Net export (% of respective GDPs) differential, u_8= Remittance inflow (% of respective GDPs) differential, u_9= Stock trade (% of respective GDP) differential, u_{10} = Total Trade (% of respective GDPs), u_{11}= GNI per Capita Growth Rate differential*

Regression analysis shows that as per economic theories, a lower inflation and unemployment rate in the domestic country appreciated the currency (PhP) and thus JpY depreciated. However, according to law of economics, a lower stock trade level compared to the foreign country pair should have resulted in the depreciation of the PhP and an appreciation in the JpY, but the opposite was the case. Rest of the indicators seemed to have no impact at all.

During this era, regardless of the indicators as it can be seen, the Philippines Peso appreciated till 2007. This was due to the Updated Medium Term Philippine Development Plan which had started in 2004, and as a result, the Philippines enjoyed a boosted economy with emphasize in industries. However, in 2008 the global financial crisis struck and the Philippines Peso fell again regardless of other economic indicators (USAID 2008).

During this period, 60% of the time it had been better to invest in domestic deposits due to boosted economy and real effective interest rates while 40% of the time Filipino investors were better of investing in Japanese deposits. Similarly, 60% of the time it was more favourable to import goods from Japan while 40% of time, the consumers were better of purchasing goods domestically.

The standard deviation of the % change in exchange rate was 11.19% in this era, which is still relatively high level of uncertainty. Moreover, the mean change in spot rate was -1.10%, resulting in the Coefficient of Variation of -10.1046 (no unit). This is different from the analysis of the previous 2 eras as it yields a –ve sign, which can otherwise be misleading to interpret. This signifies, that no matter what, there was a trend towards fall in the Japanese Yen continually, hence investing in that currency would only result in severe loss. The Philippines investors, however could have alternatively taken a short position on the foreign currency pair. This implies that for an investor without taking unto considerations any macroeconomic forces, there is a risk of 10.1046% for every 1% short position in the Japanese Yen, which is still considerable for those with the highest risk appetite. The bottom line is, currency trading in this era had been highly catastrophic.

Given, IFE in fact held, the coefficient of variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been -24.0788 (no unit), underestimating the actual risk per 1% decrease in spot rate by 13.9742% when going short on Japanese Yen. Moreover, assuming PPP at least held, the Coefficient of Variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 0.3095 (no unit), implying that not only the Japanese Yen would have been appreciating rather than depreciating, but for every 1% forecast of Japanese yen appreciating, the risk would have been miscalculated by up to an incredible 9.7951%.

4.1.4.4 2009-2013

% change in exchange rate = $0.037951 + 0*(v_1) + 0*(v_2) + 6.613297*(v_3) + 0*(v_4) + 0*(v_5) + 0*(v_6) + 0*(v_7) + 0*(v_8) - 0.54874*(v_9) - 1.61896*(v_{10}) + 0.265084*(v_{11})$ + error; where *v_1 =Nominal Interest Rate Differential, v_2 = Actual Real Interest Rate Differential, v_3 = Inflation Rate Differential, v_4=unemployment rate differential, v_5=GDP Growth Rate differential, v_6= FDI net Inflow (% of respective GDP) differential, v_7= Net export (% of respective GDPs) differential, v_8= Remittance inflow (% of respective GDPs) differential, v_9= Stock trade (% of respective GDP) differential, v_{10} = Total Trade (% of respective GDPs), v_{11}= GNI per Capita Growth Rate differential.*

The best fit line suggests that a higher domestic inflation, a lower domestic stock & total trade level depreciated the PhP and thus appreciated the JpY which was in sync with established economic theories. However, economic theories also suggest that a higher GNI per Capita Growth rate should have appreciated the domestic currency, but the opposite had happened in that era as it rather appreciated the foreign currency value. The falling Philippines Peso starting from 2009, projected the continued economic plight from the previous period coupled with drought that hampered agricultural trade, however, the Philippines was projected to bounce back from 2011, and indeed, this is reflected in the exchange rate data as Philippines Peso continued to appreciate from 2012 onwards (NEDA 2009).

Due to the economic boost of Philippines from the middle half of this period, the Filipino investors were better off investing in domestic deposits 60% of the time, while the time it took for the economy to recover, the local investors were better off investing in Japanese deposits remaining 40% of the time. Similarly, rising PhP meant the domestic consumers were better importing their goods from Japan 60% of the time while when the JpY was getting stronger (40% of the time), the consumers were better off purchasing goods locally (from the Philippines) as it was cheaper.

The standard deviation of the % change in exchange rate was 12.95% in this era, and thus it had been another extremely volatile era. Furthermore, the mean change in spot rate was +0.83%, resulting in the Coefficient of Variation of 15.5490%. This implies that for an investor without taking unto considerations any macroeconomic forces, there was a risk of 15.5490% for every 1% long position in the Japanese Yen.

If, IFE in fact held, the coefficient of variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 27.8017 (no unit), overestimating the actual risk per 1% increase in spot rate by 12.2527%. Furthermore, suppose PPP at least held, the Coefficient of Variation (measured by using calculated spot rate change standard deviation divided by calculated spot rate change mean) would have been 0.2971 (no unit), implying that for every 1% forecast of Japanese yen appreciating, the risk of would have been miscalculated by an astonishing 12.2527%.

5. Results

Thus comparing the 4 different eras, it is proven that certain economic indicators become strong signals (of the direction of the strengths of the currencies) during some periods while they have almost no impact in other periods as sensitivity between currencies change over time; some indicators require a longer period of time to show any patterns (indicates they are lagging) and the time of their impact cannot always be properly predicted; while there are some indicators that have instant impact on the currency strengths.

There are some indicators which can’t be measured in reality such as people’s expectations which a leading indicator (Sargent 2008), etc. and hence fluctuations mostly happen due to the market forces of buy and sell other than the macroeconomic variables. If Filipinos expect the Japanese Yen to appreciate in the future, they will buy now to sell later so the demand increases which in turn actually strengthens Japanese Yen, while if the Filipinos expect the Japanese Yen to fall in the future, they will immediately sell off the Japanese Yen in hand, thus increasing the supply in the market and a result, the Japanese Yen really depreciates.

Besides, both IFE and PPP based on the statistical analysis were weak instruments to measure the currency movement as it on average continued to misrepresent the level of risk involved for each given era an investor wished to invest on Japanese deposits, or when consumers wished to purchase goods from Japan. Therefore, data suggests an existence of a situation with absence of any commendable form of PPP hence IFE as well. This means, arbitrage opportunities in fact actually historically existed between the Philippines and Japan. That being said, the findings are in fact contradicting to the previous studies that have been mentioned. That being said, there were more other studies conducted in other parts of the world, where findings depict absence of IFE and PPP which means the exchange rate actually fails to adjust as per the nominal interest or inflation rate differentials between the two paired countries.

Hence, this study contributes towards several findings that disproves the existence of Purchasing Power Parity (Seifollahi, Abbasi & Far 2012; Khawaga, Esam & Hammam 2013; Alizadeh, Nassir & Masoudi 2014; Chen, C 2015 and hence same goes for the International Fisher Effect phenomenon (Cushman 2008**;** Haque & Banerjee 2012; Su, Cheung & Roca 2014; Karagoz & Sarac 2016). Of all the studies, Cushman (2008) particularly had studied the IFE on Japan (the foreign currency pair in this context) even if the paired currency in that study was with Germany, but when the study has been conducted pairing with the Philippines, the result come out likewise.

Just as technical analysis is conducted as a successful tool when trading shares in the stock exchange (Abbad, Fardousi & Abbad 2014), this study has also initially tried putting it in trial for the currency market. However, based on the historical data, technical analysis seemed ineffective as there was no clear identification of the trend towards which the spot rates were following, and hence using the past data independently without complementing it with fundamental analysis proved to be incomplete. Based on the collected data, the analysis as well as past researches (Yin & Li 2014; Jotikasthira, Le & Lundblad 2015), it can be deducted that the exchange rates between countries are profoundly affected by the macroeconomic variables. The macroeconomic variables and their impacts also as depicted, change over time. As a result, data relations do not even hold across consecutive eras and hence it is a poor strategy to rely on technical analysis. The better strategy that have been identified is by dividing the time series into multiple periods and then identifying the major macroeconomic forces at play. When this is done, the next move is compare the cause and effect analysis of the past data. This gives the investors an idea on what decision they should take during an era, for example holding Japanese yen (or going short) or buying goods from Japan instead of the domestic market. It has been identified upon rigorous investigation, that opportunities are there for the Philippines investors to capitalize on arbitrage opportunities with certain level of risks involved.

6. Summary and Conclusions

To sum up, neither IFE nor PPP holds in the long run between Philippines and Japan because the spot rate changes are not only subjected to the change in inflation rate or nominal interest rates but also to, many other economic indicators. This is contrary to several findings in the literature. Furthermore, this currency pair has been investigated upon as a novelty, while similar studies have been conducted using Japanese yen as one of the currency pair but not with the Philippines. As neither of the two theories hold in the Philippines-Japan context, there are ample arbitrage opportunities in the currency market, however given an era with certain major macro-economic variables at work, the risks associated with them are different from each other; some being high while some being negligible. The environment where there are arbitrage opportunities is considered not a myth as several findings as stated earlier supports the inexistence of IFE or PPP even in weak forms. There are some indicators that are leading while some are lagging which affects the change in currency values. There exists, more than 1300 macroeconomic indicators that work together, and each of them affects the change in valuation differently; some causes the domestic currency while some cause the domestic currency to appreciate. A simplified regression analysis (using 95% confidence level in all of them) like using 8 indicators is hence not enough to predict the direction and change in exchange rate as the results are under-fitting with huge margin of errors. Some examples of economic indicators are unemployment rate, GDP growth rate, GNI per Capita growth rate, stock trade level, trade level, FDI level, net export level, inflation rate, nominal interest rates, remittance received level, etc. A major factor that causes the currency valuation to move is

"people's expectations" which causes the pressure in the market to buy and sell a certain currency and hence the spot rate fluctuates.

A key limitation of the study is that the data provided by the world bank only covers 20 common years for the two countries. More significant impacts could have been studied had the data been available broken quarterly instead of annually where only the weighted average figures are stated, which further erodes the statistical relationships, and that is why certain indicators seem lagging, leading or no impacting at all. Further studies can be conducted, by gathering more historical data (enlarged time frame; more years, more compounding periods, etc.) and inclusion of more economic indicators (more than the 8-10 indicators mentioned in this study) to identify the patterns of exchange rate, and to make decisions whether any arbitrary opportunities are there to be exploited. Additionally, financial derivatives such as options, future contracts, and swaps can be introduced to check the change in dynamics. However, based on the findings of this study, the verdict is, there exists covered arbitrage opportunities from the point of the investors and consumers in the Philippines when dealing with Japan, which previous studies have failed to identify. The suggestion is to use a combination of technical and fundamental analysis by first dividing the time series into multiple eras and identifying the major forces for a given period to contemplate whether there is any arbitrage opportunity for a given year, and the decision to go long or short can be taken accordingly.

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