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Abstract

This pedagogical paper demonstrates how “the Amoateng Gut check approach” uses a made-simple technique for international corporate finance and economics students to forecast exchange rates using parity relationships. The “Gut-check approach” uses two simple steps. First, check out if the spot exchange rate is either direct or indirect. Second, review the parity relationships (purchasing power parity or interest rate parity) for the two currencies in question to find out which currency appreciates or depreciates (zero-sum game in currency trading). The two steps help students to forecast future exchange rates with great accuracy. To this end, the paper provides historical review of the standard technique by many textbook authors. The “Amoateng Gut-check technique” yields similar but more precise foreign exchange rate forecasting results than the standard approach. Moreover, it provides creative and innovative thinking skills for international corporate finance and economics students who may not recognize foreign and home countries in the standard parity technique.

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1. Introduction

Forecasting in general is a tricky proposition and it has become an occupational hazard for students, investors, importers and exporters, and financial executives of multinational corporations. The potential for periodic, and unpredictable, government intervention makes currency forecasting much more difficult (Shapiro and Sarin, 2009). People’s expectations and news events also play important factors in exchange rate determination. As a result, exchange rates tend to exhibit dynamic and volatile short-term behavior responding to people’s expectations and news events (Eun and Resnick, 2009). In my two and half decades of teaching international finance, I have observed many bright students let alone average students

struggling to forecast the forward exchange rates using parity relationship models. The crux of this problem lies in detecting either which foreign inflation rate over/under domestic inflation rate (purchasing power parity) or which foreign interest rate over/under domestic interest rate (interest rate parity). Misalignment of these foreign inflation rates and domestic inflation rates on one hand and foreign interest rates and domestic interest rates can lead to wrong currency forecast. This difficulty has not killed the drive for students and financial economists to find easier ways to forecast exchange rates using purchasing power parity and interest rate parity relationships. The “Amoateng Gut-check” is designed as one of the newest approaches to currency forecasts using the standard parity relationships. It reviews quickly, whether the spot exchange rate is quoted as direct, or indirect as the first line gut check.¹ The second line of gut check is to review each of the parity relationships for two countries under question.² For example, the review on purchasing power parity shows that a country with relatively high inflation will have its currency depreciating (paying more for another currency) the opposite is true. Similarly, the review on the interest rate parity indicates that a country with relatively high interest rates will have its currency depreciating (having forward discount on its currency assets).

2. Review and Discussion of Literature

Many equilibrium-pricing relationships in economics finance come from imposing the law of one price (that is if two things are equal to each other then they must be selling for the same price). In profitable arbitrage opportunities, the market cannot be in equilibrium. Most fundamental analyses in economics start from arbitrage equilibrium, such as interest rate parity (IRP) and purchasing power parity (PPP) (Eun and Resnick, 2009).³ The IRP is a manifestation of the law of one price applied to international money market instruments. The IRP relationship among currency traders dates back to the late 19th century. However, it was during the 1920s that the relationship became widely known to the public from the writings of John M. Keynes and other economists (Keynes, 1924). IRP also applies the law of one price to financial assets, especially to risk-free assets denominated in different currencies. Thus, risk-free investment should offer the same return (after converting currencies) everywhere. Spot and forward rates correlate to each other and to interest rates in different currencies through arbitrage opportunities. Thus, the movement of funds between two currencies to take advantage of interest rate differentials is a major determinant of the spread between forward and spot rates (Shapiro and Sarin, 2009). For instance, when the dollar is at a forward discount the implication is that the dollar expects to depreciate against the British pound. If so, the U.S interest rate expects to rise higher than the U.K interest rate to compensate for the expected depreciation of the dollar. Otherwise, no investor would hold dollar-denominated securities. On the other hand, when the dollar is at a forward premium the implication is that the dollar expects to appreciate against the British pound. If so, the U.S. interest rate expects to fall lower than the U.K. interest rate to compensate for the expected appreciation of the dollar. Again, otherwise no investor would hold dollar-denominated securities. Therefore, the forward exchange rate will deviate from the spot rate as long as the interest rates of the two countries are not the same. When the IRP holds, an investor will be indifferent between investing in the U.S. and investing in the U.K. with forward hedging. However, if IRP is violated an investor will prefer one to another (Eun and Resnick, 2009 pp. 136).

Purchasing power parity implies that currencies with high rates of inflation should depreciate relative to currencies with lower rates of inflation. Thus, PPP argues that exchange rate movements should just cancel out changes in the foreign price level relative to the domestic price level. The simplest form of purchasing power parity is the law of one price. Thus, with the absence of trade barriers, transaction cost, transportation cost, identical goods trading in different markets should sell at the same price. For instance, if the price of an item in domestic currency is P_{dom} and the price of the identical item in foreign currency is P_{for} . If the spot exchange rate quoted in foreign currency per domestic is $S_{\text{for/dom}}$, then the law of one price holds if the following is true. $P_{\text{for}}/P_{\text{dom}} = S_{\text{for/dom}}$ The law of one price is applicable to any pair of countries (Graham et al, 2010). Since the absolute PPP ignores the effects on free trade of transportation costs, tariffs, quotas and other restrictions, and product differentiation, relative PPP is practical to exchange rate forecasting. Relative PPP states that countries with high inflation see their currencies depreciate over time, whereas the opposite happens for countries with lower inflation.⁴ If price differences across markets are sufficiently large and persistent, arbitrageurs find it profitable to trade. Hence, purchasing power parity does a good job of explaining long-run movements in currencies but not day-to-day (or even year-to-year) fluctuations.

3. Exchange rate Forecasting with Parity models (IRP and PPP) and “Gut Check

Approach”

Spot and forward rates closely link to each other and to interest rates in different currencies through the medium of arbitrage. For instance, the movement of funds between two currencies to take advantage of interest rate differentials is a major determinant of the spread between forward and spot rates.⁵ Thus, the forward discount or premium closely relate to the interest differential between the two currencies (Shapiro and Sarin, 2009).

IRP is expressed in mathematical terms as follow:

$$E(S_{t=n}) = S_0 \times [(1 + r_{\text{foreign}})/(1 + r_{\text{domestic}})]^n \rightarrow (1)$$

Where $E(S_{t=n})$ = the forward exchange rate forecast, S_0 = current spot exchange rate, n = number of forecast period (in days, weeks, months and years), r_{foreign} = foreign interest rate, and r_{domestic} = domestic interest rate. The equation (1) is the standard approach of forecasting foreign exchange rate using interest rate differentials across countries. The implication is that if domestic investors send money abroad then they realize an exchange loss (when they convert back to domestic currency) because the foreign currency buys less domestic currency than it did at the spot rate. Domestic investors this, so they require an incentive in the form of a higher foreign interest rate before they will send money abroad. To maintain equilibrium, the right-hand side must also be greater than 1.0, implying that when a nation’s currency trades at a forward premium (discount), risk-free interest rates in that country should be lower (higher) than they are abroad (Graham et al, 2009).

PPP states that if the law of one price holds at all times, then differences in expected inflation between two countries are associated with expected changes in currency values. Mathematically, it expresses, as follows:

$$E(S_{t=n}) = S_0 \times [(1 + h_{\text{foreign}})/(1 + h_{\text{domestic}})]^n \rightarrow (2)$$

Where $E(S_{t=n})$ = the forward exchange rate forecast, S_0 = current spot exchange rate, n = number of forecast period (in days, weeks, months and years), h_{foreign} = foreign expected inflation rate, and h_{domestic} = domestic expected inflation rate. It is to be noted that, the left-hand of equation (2) exceeds 1.0 if traders expect the domestic currency to appreciate but is less than 1.0 if traders expect the foreign currency to appreciate. Similarly, the right-hand side of the equation (2) exceeds 1.0 when expected inflation is higher abroad than it is at home, and the ratio falls below 1.0 when the opposite is true. Equation (2) produces the already familiar prediction that if inflation is higher in one country than another, then the currency of the country with higher inflation will depreciate. In addition, it offers the helpful information that traders who want to forecast currency movements should invest resources in forecasting inflation rates (Graham et al, 2009). Research evidence shows that over the long term there is a strong correlation between currency values and inflation rates. Therefore, countries with high inflation observe their currencies depreciate over time, whereas the opposite happens for countries with lower inflation.

4. Practical Applications of Exchange rate Forecasting with Parity models (IRP and PPP) and “Gut Check Approach”

(4i) Question on purchasing power parity (PPP) using “Amoateng Gut-Check”—Using indirect exchange rate quotation.

The inflation rate in Japan over next 3 years will run 1.10% per year, while the U.S. inflation rate will be 2.10%. If the yen/dollar rate is 110.75 what is the expected exchange rate in 3 years?

Example (4i): Apply the relative PPP that says a country with higher inflation will experience depreciating currency and the country with lower inflation will experience appreciating currency. If h_d (inflation) $\uparrow \rightarrow \Delta e_0 \uparrow$, consequently, h_f (foreign inflation) \downarrow (low). The opposite is true. The exchange rate market exhibits **the zero-sum game** which each currency's gains or losses of trading are exactly balanced by the losses or gains of the trading of the other currency.⁶

Applying Amoateng's Gut Check to the above problem \rightarrow (a) E_0 or S_0 is indirect quotation ($\text{¥} 110.75 = \text{U.S. } \1.00). Also, (b) shows that Japan's inflation rate is relatively lower than the United States inflation rate. Thus, 1.10% (Japan) $<$ 2.10% (United States) indicates that the Japanese Yen will appreciate over the U.S dollar. Therefore, the only set up according to the “Gut check” is to make Japan give less for the same amount of U.S dollar (appreciation) is as follows:

$$E[S_{t_3}] = \text{¥}110,75 \downarrow \times [(1.0110/1.021)]^3 \\ \text{¥}110.75 \times 0.970904 \rightarrow \text{¥}107.53$$

Therefore, the Japanese yen will appreciate over the US dollar in the observed period.

(4ii) Question on purchasing power parity (PPP) using “Amoateng Gut-Check”—Using direct exchange rate quotation.

Example (4ii): Suppose U.S. inflation is predicted to be 4% next year. The Barnes group tells you that

inflation in England is expected to be 10%. The current exchange rate is \$1.4868 = £1.00 (direct quotation). What is your best guess as to next year's exchange rate?

Example (4ii): Using “Amoateng’s Gut-Check” (a) **First condition**→ Is the spot exchange rate quoted direct or indirect? The answer is direct quotation because it is how much units of U.S. currency is used to obtain one British pound.

Second condition → Apply the relative PPP that says a country with higher inflation will experience depreciating currency and the country with lower inflation will experience appreciating currency. If h_d (inflation) $\uparrow \rightarrow \Delta e_0 \uparrow$, consequently, h_f (foreign inflation) \downarrow (low). The opposite is true.

U.K has the highest inflation rate relative to the United States, so the pound is expected to go down and the dollar goes up (**zero-sum game in currency trading**).

Now, we can use “Amoateng’s Gut-check” to calculate next year exchange rate.

$$\begin{aligned} E[St_1] &= \$1.4868 \downarrow (1.04)/(1.10) \\ &= \$1.4868 \times 0.945455 \rightarrow \mathbf{\$1.4057} \end{aligned}$$

Therefore, the US dollar will appreciate over the British pound in the observed period.

(4iii) Question on purchasing power parity (PPP) using “Amoateng Gut-Check”—Using direct exchange rate quotation

Example (4iii): If the spot exchange rate for US/Canadian dollar rate was US\$0.9570 in 2007, and the inflation rate was 3.5 % in Canada and US inflation rate was 2.5%, what would be the new exchange rate in 2018? (about 11 years).

Example (4ii): Using “Amoateng’s Gut-Check” (a) **First condition**→ Is the spot exchange rate quoted direct or indirect? The answer is direct quotation because it is how much units of U.S. currency is used to obtain one Canadian dollar.

Second condition → Apply the relative PPP that says a country with higher inflation will experience depreciating currency and the country with lower inflation will experience appreciating currency. If h_d (inflation) $\uparrow \rightarrow \Delta e_0 \uparrow$, consequently, h_f (foreign inflation) \downarrow (low). The opposite is true.

Canada has the highest inflation rate relative to the United States, so the Canadian dollar (C\$) is expected to go down and the US dollar goes up (**zero-sum game in currency trading**).

Applying Amoateng’s Gut Check to the above problem→ (a) E_0 or S_0 is direct quotation (US\$0.9570 = C\$1.0). Also, (b) shows that Canada’s inflation rate is relatively higher than the United States inflation rate. Thus, 3.5% (Canada) > 2.5% (United States) indicates that the United States dollar will appreciate over the

Canadian dollar in the observed period. Therefore, the only set up according to the “Amoateng Gut check” is to make US give less for the same amount of the Canadian dollar (appreciation of the US dollar) is as follows:

$$\begin{aligned} E(St_{11}) &= \text{US\$}0.9570 \downarrow \times [(1.025/1.035)]^{11} \\ &= \text{US\$}0.9570 \times 0.898708132 \\ &\rightarrow \text{US\$}0.8601 \end{aligned}$$

Therefore, the US dollar will appreciate over the Canadian dollar in the observed period.

(4iv) Question on interest rate Parity (IRP) using “Amoateng Gut-Check”—Using Direct Quotation:

Example (4iv): If the exchange rate of the U.S dollar and Euro rate (U.S.\$1.2818) in December 30, 2016, and the interest rates in the U.S. and Europe are 0.60%, and 0.7164%, respectively, what is the expected exchange rate in 5 years from 2016?

(a) First condition → Is the spot exchange rate quoted direct or indirect? The answer is direct quotation because it is how much units of U.S. currency is used to obtain one Euro.

Second condition → Apply the interest rate parity that says a country with relatively higher interest rate will experience forward discount (depreciating currency) and the country with lower interest rate will experience forward premium (appreciating currency). If r_d (interest rate) $\uparrow \rightarrow \Delta e_0 \downarrow$, consequently, r_f (foreign interest rate) $\downarrow \rightarrow \Delta e_0 \uparrow$ The opposite is true.

The spot rate is quoted in direct or American, and (b) US. T-bill rate < Europe’s LIBOR rate, reflecting on the IRP, the U.S dollar will project a forward premium and the Euro will project a forward discount. Thus, the US dollar will appreciate over the Euro, so the U.S will give less amount of dollars for the same amount of Euro (**zero-sum game in currency trading**).

Therefore, the \$1.2818 will drop so we will expect

$$\begin{aligned} E(St_5) &= [(1.04)/(1.05)]^5 < 1 = 0.9810 \\ &= (\text{U.S\$}1.2818 \downarrow) \rightarrow \$1.2818 \times [(1.0060)/(1.007164)]^5 \\ &\rightarrow \$1.2818 \times 0.994234739 \rightarrow \text{U.S\$}1.2744 \end{aligned}$$

Therefore, the US dollar will appreciate over the Euro in the observed period.

(4v) Question on interest rate Parity using “Amoateng Gut-Check”—Using indirect Quotation:

Example (4v): Assume that interest rate parity holds. The U.S. five-year interest rate is 5% annualized, and the Mexican five-year interest rate is 8% annualized. Today’s spot rate of the Mexican peso is 17.3914. What is the approximate five-year forecast of the peso’s spot rate if the five-year forward rate is used as a forecast?

(a) First condition → Is the spot exchange rate quoted direct or indirect? The answer is indirect quotation because it is how much units of Mexican peso is used to obtain one US dollar.

Second condition → Apply the interest rate parity that says a country with relatively higher interest rate will experience forward discount (depreciating currency) and the country with lower interest rate will experience forward premium (appreciating currency). If r_d (interest rate) $\uparrow \rightarrow \Delta e_0 \downarrow$, consequently, r_f (foreign interest rate) $\downarrow \rightarrow \Delta e_0 \uparrow$ The opposite is true.

The spot rate is quoted indirect and (b) US. interest rate < Mexico's interest rate, reflecting on the IRP, the U.S dollar will project a forward premium (appreciating currency) and the Mexican peso will project a forward discount (depreciating currency). Thus, the US dollar will appreciate over the Mexican peso, so the Mexicans will give more amount of the peso for the same amount of the US dollar (**Zero-sum game in currency trading**).

Therefore, the 17.3914 will increase based on the “Amoateng Gut Check” so we will expect:

$$\begin{aligned} E(S_{t_5}) &= P17.3914 \uparrow \times [(1.08)/(1.05)]^5 > 1 = 1.1513 \\ &= 17.3914 \times 1.151256995 \rightarrow \text{Peso } \mathbf{20.0220} \end{aligned}$$

Therefore, the Mexican peso will depreciate in the observed period.

(4vi) Question on interest rate Parity using “Amoateng Gut-Check”—Using indirect Quotation:

Example (vi): If the current US one- month T-bill rate is 1.82%, and the one-month LIBOR is 2.07%, and the exchange rate of the pound to the US dollar is 0.76, what is the expected exchange rate of the pound to US dollar in the next 6 years?

(a) First condition → Is the spot exchange rate quoted direct or indirect? The answer is indirect quotation because it is how much British pound is used to obtain one US dollar.

Second condition → Apply the interest rate parity that says a country with relatively higher interest rate will experience forward discount (depreciating currency) and the country with lower interest rate will experience forward premium (appreciating currency). If r_d (interest rate) $\uparrow \rightarrow \Delta e_0 \downarrow$, consequently, r_f (foreign interest rate) $\downarrow \rightarrow \Delta e_0 \uparrow$ The opposite is true.

The spot rate is quoted indirect and (b) US. interest rate < British's interest rate, reflecting on the IRP, the U.S dollar will project a forward premium (appreciating currency) and the British pound will project a forward discount (depreciating currency). Thus, the US dollar will appreciate over the British pound, so the British will give more amount of the pound for the same amount of the US dollar (**Zero-sum game in currency trading**). Therefore, the £0.76 will increase based on the “Amoateng Gut Check” so we will expect:

$$\begin{aligned} E(S_{t_6}) &= \text{£}0.76 \uparrow \times [(1.0207)/(1.0182)]^6 > 1 = 1.014822605 \\ &= \text{£}0.76 \uparrow \times 1.014822605 \rightarrow \text{£} \mathbf{0.7713} \end{aligned}$$

Therefore, the British pound will depreciate over the US dollar in the observed period.

5. Concluding Remarks:

The importance and the value of exchange rate forecast in our global economy cannot be underestimated. Multinational corporations (MNCs) apply it for the following strategic reasons:

(i) Hedging decision- to hedge future payables and receivables in foreign currencies to reduce currency losses (risk); (ii). Short-term financing decision- because currency and interest rate volatility (risk) may produce default or repayment problems; (iii). Short-term investment decision- MNC's deposits can be established in several currencies. The ideal currency for deposits would (a) exhibit a high interest rate; and (b) strengthen in value over the investment horizon. Currency crisis will dampen investment opportunities; (iv). Capital Budgeting decision- accurate forecasts of currency values will improve the estimates of the cash flows, and therefore enhance the MNC's decision-making abilities; (v). Long-term financing decision- to estimate the cost of issuing bonds denominated in a foreign currency, forecasts of exchange rates are required, and (vi). Earnings assessment- forecast of exchange rates play an important role in the overall forecast of an MNC's consolidated earnings (both home reporting and subsidiaries).

This pedagogical paper demonstrates how “the Gut check approach” uses made-simple technique for international corporate finance and economics students to forecast exchange rates using parity relationships. The “Gut-check approach” employs two simple steps. First, check out if the spot exchange rate is either direct or indirect. Second, review the parity relationships (purchasing power parity or interest rate parity) for the two currencies in question to find out which currency appreciate or depreciates (**Zero-sum game in currency trading**). To this end, the paper provides historical review of the standard technique by many textbook authors. The “Amoateng Gut-check technique” yields similar but more precise foreign exchange rate forecasting results than the standard approach. Moreover, it provides international corporate finance and economics students who may not recognize foreign and home countries an easy way of exchange rate forecast.

6. Endnotes

¹Direct exchange rate expresses the amount of domestic currency required to buy or sell one unit of the foreign currency. For example, it takes about US\$0.7546 to buy One Canadian dollar .., US\$1.1569= €1.00, US\$1.3078 = £1.00, etc on June 28, 2018 Indirect exchange rate also expresses the amount of foreign currency required to buy or sell one unit of the domestic currency. Also, it takes about C\$1.3253 to buy one US dollar., C\$1.3253=US1.00; €0.8644=US\$1.00; £0.7646=US\$1.00, on June 28, 2018.

²Relative PPP theory states that a country with a high inflation rates will have its currency depreciating over time, the opposite is true. The Interest rate parity states that a country with high interest rates will have a forward discount (depreciating currency).

³IRP is an arbitrage condition that must hold when international financial markets are in equilibrium. It is an arbitrage equilibrium condition holding that the interest rate differential between two countries should be equal to the forward exchange premium or discount. Violation of IRP gives rise to profitable arbitrage opportunities. The PPP is a theory stating that the exchange rate between currencies of two countries should be equal to the ratio of the countries' price levels of a commodity basket.

⁴This is not a fluke chance. If one did not observe this correlation in the data, then it would be a signal of gross violations of the law of one price and a sign that arbitrage was not working to bring prices back into line (Graham, et al, 2010).

⁵The implication is that if the forward premium is equal to the interest rate differential as explained above, covered interest arbitrage will not be feasible (Madura, 2010).

⁶In game theory and economic theory, a zero-sum game is a mathematical representation of a situation in which each participant's gain or loss of **utility** is exactly balanced by the losses or gains of the utility of the other participants. If the total gains of the participants are added up and the total losses are subtracted, they will sum to zero.

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