International Journal of Management
Volume 12, Issue 2, February 2021, pp. 418-432. Article ID: IJM_12_02_042
Available online at http://iaeme.com/Home/issue/IJM?Volume=12&Issue=2
Journal Impact Factor (2020): 10.1471 (Calculated by GISI) www.jifactor.com
ISSN Print: 0976-6502 and ISSN Online: 0976-6510
DOI: 10.34218/IJM.12.2.2021.042

GLOBAL PORTFOLIO DIVERSIFICATION AND CURRENCY MARKET: A PANEL CO-INTEGRATION BASE EVIDENCE FROM TRADING PARTNERS OF PAKISTAN

Um-e-Habiba
PhD Scholar, School of Finance and Economics,
Jiangsu University, Zhenjiang, 212013, People's Republic of China

Muhammad Mudassar Anwar
Assistant Professor, Department of Commerce
University of Kotli Azad Jammu and Kashmir, Kotli, India

Muhammad Husnain*
Assistant Professor, Department of Business Administration,
University of Sahiwal, Sahiwal 57000, Pakistan

Muhammad Abdul Basit Memon
Assistant Professor, Department of Business Administration,
Sukkur IBA University, Sukkur Pakistan
*Corresponding Author

ABSTRACT

The influential work of Harry Markowitz (1952) provides foundation to modern investment thoughts. But, investor can enjoy the benefit of portfolio diversification only if asset classes are not co-integrated. The objective of this study is to analyze the dynamic integration of currencies between major trading partners of Pakistan i.e. China, Germany, Hong Kong, Italy, Japan, Kuwait, Saudi Arabia, UAE, UK, and USA. We employ the Pedroni panel co-integration (1999, 2004) techniques for the data period started from January 1, 2005 to January 31, 2017. We uses daily, weekly and monthly data series for robustness of our findings. Results of panel unit root test (ADF-Fisher Chi Square Choi, ADF-Fisher Choi Z- stat, PP-Fisher Chi Square Choi and PP-Fisher Choi Z- stat) confirms the application of panel co-integration test in our sample countries. This Study employs the seven co-integration tests (Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic, Panel ADF-Statistic, Group rho-Statistic, Group PP-Statistic, Group ADF-Statistic) and finds that there exist panel co-integration among the pairs of currencies between major trading partners of Pakistan. We recommend to

portfolio managers that they cannot diversify their portfolio by investing in the currency market of major trading partner of Pakistan.

JEL: C23, F 3, F 21, F 31, G 11

Key words: Investment Choice, Forex Market, Emerging Market, Panel Cointegration.

Cite this Article: Um-e-Habiba, Muhammad Mudassar Anwar, Muhammad Husnain and Muhammad Abdul Basit Memon, Global Portfolio Diversification and Currency Market: A Panel Co-integration Base Evidence from Trading Partners of Pakistan, *International Journal of Management (IJM),* 12(2), 2021, pp 418-432. http://iaeme.com/Home/issue/IJM?Volume=12&Issue=2

1. INTRODUCTION

In today's modern finance, portfolio selection phenomena have become the core of all financial investments decisions. The influential work of Harry Markowitz (1952) provides foundation to modern investment thoughts. Portfolio selection is all about picking of different asset classes in your investment basket from different markets. In relation to Markowitz (1952), the important deliberation in the selection process is co-movement between different preferred asset classes. Traditional investment dynamics strictly depends upon the boosting trend in homogenizations, financial innovation, harmonization, services proliferation, competition, technology, globalization and varying demographic patterns. These patterns are the driving forces for investors and shape the investor's attention towards cross boundaries investment. International portfolio diversification strictly depends upon the relative risk and relative return of international asset classes.

Global economic condition stimulate the co movements of global asset classes in developing and developed markets. But there is no homogeneity among emerging markets and have appreciably different financial dynamics of integration (Bekaert& Harvey 1995). The nature and speed of financial integration among world asset classes has been influenced by both internal and external factors: financial, economic conditions, international, and regional policies. In 1963, Sharp commenced famous capital asset pricing model – CAPM- that market risk or systematic risk is not possible to eliminate. While investors are more risk-averse, therefore risk diversification becomes their basic concern. Investors with international diversification concept consider to invest in various countries with general argument that the investments in overseas propose the additional possible profit at the same time reduces the total portfolio risk.

Academicians and investors in internationally integrated market are more concerned about keeping away the undesired effects by observing and controlling contamination from market to market. They believe, if there exist any co-movement long term relationship between currency markets then no one could get benefit of diversification through investment in different asset classes ((Baele&Inghelbrecht, 2009). But, investor may enjoy the benefit of portfolio diversification if asset classes are not co-integrated. Investors have different choices for their investment basket. Investors can invest in different asset classes like commodities, equities, bond, currencies etc. Financial markets are classified into interest rate market, foreign exchange market, bond market and stock market etc. Their exist a plethora of literature on the long term relationships among equity market of developing, and developed economics (Phylaktis&Ravazzolo, 2002; Kanas, 1999; Georgoutsos& Kouretas, 2003; Fraser &Oyefeso, 2005; Pukthuanthong& Roll, 2009; Eiling& Gerard, 2007; Sheng &Tu, 2000;Chelley-Steeley, 2004). But, evidence regarding the integration in currency markets is still limited. Foreign exchange market is the biggest and most copious element of financial market and defines as the "country's balanced economy", because in major countries of the world every fastidious day

there is just 1 trillion amount of foreign exchange takes place. Both developed and under-developed countries need to have foreign exchange market structure that is known as money in exchange fortitude. Foreign exchange market presents the institutional and substantial composition to exchange currencies among countries, as the foreign exchange transactions are actually accomplished after determination of exchange rate between currencies. The price of one country's currency is expressed in another country's currency called Exchange rate.

In the global market, value of currency is determined by demand and supply of the currency in case of floating exchange rate system and it is normally affected by factors like; economic environment, country investment, imports, exports and balance of trade. Foreign exchange market is used by international firms, tourists, importers, exporters and global portfolio investors to assist implementation of profit-making or savings transactions. Foreign exchange market is used by participants to hedge exchange risk. Through market trading profit is earned by arbitragers and speculators. They perform function for their own interest, without certainty of market continuity, need or responsibility to serve customers. Arbitragers seek profit through immediate exchange rate distinction in diverse markets. Leong and Felmingham (2003) and Baele and Inghelbrecht (2009) document that investor can increase the return of their portfolio through the process of portfolio diversification. Further, all the existing literature is skewed towards equity markets (Pascual, 2003; Gilmore & McManus, 2002; Syriopoulos, 2007; Égert&Kočenda, 2007; Gilmore et al., 2008; Demian, 2011; Wang & Moore, 2008; Syriopoulos&Roumpis, 2009; Aslanidis&Savva, 2011). There is no study that investigate the long term cointegration among the major trading partners of Pakistan by using the panel Cointegration approach in the currency market by using daily, weekly and monthly data series.

The objective of this study is to analyze the dynamic integration of currencies between major trading partners of Pakistan. Hence, it is an attempt to provide comprehensive policy guidelines to investors, global fund managers, policy makers that whether they can diversify their portfolio investment in the foreign currency markets. As our best knowledge, this is the first study of its nature that analyzes the cointegration among the currency markets of major trading partner of Pakistan in panel cointegration framework. We employed the Pedroni panel co-integration (1999, 2004) techniques to investigate the interlinkages among currency markets for the data period started from January 1, 2005 to January31, 2017. The other contribution of our study is the use of three level data i.e. daily, weekly and monthly exchange rate quotes of Pakistani rupee with its major trading partner. We analysis the seven co-integration tests, out of which four test (Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic, Panel ADF-Statistic) have common auto-regressive coefficient –within dimension - while other tests (Group rho-Statistic, Group PP-Statistic, Group ADF-Statistic) and finds that that there exist panel co-integration among the pairs of currencies between major trading partners of Pakistan. Furthermore, our findings are robust under daily, weekly and monthly data series of our study.

Main reasons due to which policy makers are concerned about inter linkage of currency markets are; it will help portfolio managers to make investment decisions, currency market's integration can transmit innovation to one another, higher level of liberalization and improvement in telecommunication systems inclined fund managers and investors among trading partners to think about short-term as well as long-term dependencies among currency markets. We recommend portfolio managers that they cannot diversify their portfolio by making their investments in the currency market of major trading partner of Pakistan. Investors and fund managers should also considers other international currencies for portfolio diversification rather concentrating only on the currencies of major trading partners of Pakistan in global foreign currency market.

1.1. Foreign Currency Market

Trade of home country currency with other foreign countries currency is possible through exchange markets. Foreign exchange contains any instrument that is haggard, received, prepared or subjected under the State Bank of Pakistan's (8) of section 17 of Act 1956, in any foreign currency payable balance, credits and all deposits. It also contains letters of credit, draft, bills of exchange and travelers cheques hat are due in any foreign currency but have stated or drawn in Pakistan currency. Foreign exchange transaction is contract between purchaser and a seller in which sum of one currency is delivered for various other currencies at a precise rate. Value of a currency's exchange rate is determined through major two types of systems; the first one is fixed exchange rates system while other one is floating exchange rates system. It is described by floating exchange rates that foreign exchange market readjusts itself, forces economic stability and actual time for real inflation portray through it. There is lot of reasons to prove that country's economy and investment is discouraged and suffered due to floating exchange rate system. The reasons may be foreign investment at floating rate, country political issues, high inflation disaster and exchange rate slouch.

Another type of exchange rate is a peg exchange rate system. This is the system whose exchange was not suffered by the market demand and supply where value exchange rate is fixed officially by any country government. The value of a country exchange rate in terms of another country exchange rate is determined by peg system. This system to some extent is difficult because under this system any country government fixes their currency exchange rates to a large extent and for a certain currency's demand goes up for exchange rates. To meet the demand of certain currency exchange rates, lot of releases are done by government according to demand. Therefore this method is only practiced by those countries that can control inflation in developed and underdeveloped countries.

The major Currencies of the world are USD, Euro, Yen, RMB and Pound Sterling. Participants of the foreign exchange markets are foreign exchange dealers, investment and commercial transaction participants, arbitragers and speculators, central bank and its treasuries exchange brokers. Both client and interbank markets are operated by exchange brokers. They earn profit through bid and ask rate difference, buy at bid rate and sell at higher ask price. Competition between brokers leads the markets towards efficiency due to reduction in bid ask spread. Market is used by central banks and treasuries for acquisition or use of country's foreign exchange reserves although manipulate the price on which their own currency buy and sell. Trading is facilitated by foreign exchange brokers between dealers; they don't behave in the transaction as principals. Small commission is charged by them for services and they create and maintain contact via open telephone to hundreds of worldwide dealers.

It is observed by last five decades that Pakistan's foreign exchange system is stirring toward an unrestrained market-oriented trend: till 1971 the Pak rupee was allied to the Pound Sterling and afterward to the US Dollar because of the increase in economic sway of the United States. However, a controlled floating exchange rate system has been implementing since 1982 onwards, till the Pakistani rupee had been attached to a group of trade-weighted currencies. Later, from mid-1994 for existing international transactions Pakistani rupee was become convertible after admitting agreement of the IMF Articles. Trade sanction was imposed on Pakistan after the nuclear detonation in 1998. A composite exchange rate system was established, in order to diminish the influence on official treasuries and to avoid the economy from the adverse cause of the sanctions; these integrated rates of an official rate (associated with the US Dollar), for example a Floating Interbank Rate (FIBR), the official and FIBR rates were combined by compound rate. When the economy improved from the economic disaster, there were incorporated three exchange rates and allied to the US Dollar inside a specific band

width. However, from 2000 the state bank of Pakistan is effectively following a floating exchange rate system.

2. REVIEW OF LITERATURE

Motivation behind the investigation of cointegration among asset classes is due to the potential advantage of international portfolio diversification (Leong &Felmingham, 2003). Existing literature discusses international portfolio diversification benefits in great details. Most of existing literature is skewed towards the equity market of developed countries (Gilmore & McManus, 2002; Balcilar et al., 2014). Our prime motive of this study is to provide the guidelines to international portfolio managers in the foreign exchange market of major trading partner of Pakistan. Some work has been done on market integration in South Asian area. The intention of these studies is to estimate market integration between diverse country's indices into the region. Whether forex markets are integrated or not it is a significant issue among the researchers and market participants. Along with other econometric methods, several studies have employed a co-integration analysis to study the co-movement of foreign exchange market. At the end of the 1980s, the co-integration analysis was applied to time series for the long-run co-movement (Gilmore et al., 2008; Yu et al., 2010;Balcilar et al., 2014). Granger (1986) squabbled on speculative market's-integration indicates that the inevitability of at least one price based on the ancient price of other assets as specified by the existence of an error correction term.

Engle and granger (1987) further extended the work of granger and presented that series which are co-integrated have an error correction characteristics. With error correction claim, a part of disequilibrium in one interval has supposed to be correlated in the next interval. The vector error correction model (VECM) explains the adjustment of the variables in the system to divergence from the stable state equilibrium. The presence of an error correction constraint including considerably into an equation of VECM that involves in causality (predictability) in the equation from the error correction term (that is a linear combination of the ancient behavior of the variables) to the endogenous variable. Interpretation of these results shows that the foreign exchange market is co-integrated. Co-integration itself explains that there must be one variable integrated among the variables.

The pioneers study in examining the foreign exchange market integration is the work of Haiko and Rush (1989); the exchange market was evaluated by using the Engle-Granger co-integration method for the deutschemark and Great Britain pound exchange markets. In this study the analyst concluded that the foreign exchange market of Germany was not co-integrated with United Kingdom exchange rate and joint hypothesis is rejected. Later, lot of studies based on this research had revealed the results which were consistent with the outcomes of Haiko and Rush. Relative research was conducted by Delcoure (2003) and Hai (1997). Further work on the foreign exchange market cointegration was done by Kaskarelis and Siriopoulos (1993). Anderson, Granger and Hall (1990) has present model of co-integrated system for Treasury bill and elaborate error correction demonstration. Barnhart and szakmary (1991) found that there was co-integration between spot and forward exchange rates and evaluated proper error correction model. Bessler and covey (1991) examined that there was any co-integration between live cattle and cash cattle of daily future market. Co-integration hypothesis was marginally supported by their findings. Copeland (1991) utilized daily data from 1976 to 1989 and found that there was no co-integration between Deutschmark, Swiss Franc, Pound, Yen and French Franc in terms of US dollar.

In the context of forward and future market, Karfakis and Moschos (1994) concluded that there was co-integration among the forward and the future spot rates. .Coleman (1990) has entailed that the asset prices cannot be co-integrated when markets move differently. This statement has been examined by him with daily data for eighteen foreign currencies and both higher-order systems and pair wise integration of currencies have tested. So no valid affirmation of co-integration between exchange rates has been found. Baille and Bollerslev (1994) have found contrary results in relation to Diebold (1994) with the use of daily data that there is co-integration between forward rates and the spot rates. Further, it is being concluded by these results that the probability for finding co-integrating vector is quite low. Zivot (1998) in his study examine correlation among the forward and spot exchange rate by utilizing co-integration model. Nonlinear error correction model was being used by Markellos and Siriopoulos (1997) for daily interest rates of Greek interbank. It is being predicted by them that error correction models are better than linear models due to accuracy of sample prediction.

Similarly, Napolitano (2000) by using co-integration approach on Euro/Dollar exchange rate in daily data of nineteen months studied the execution of the news in the foreign exchange rate market. His results showed that the market was co-integrated and so the forward rate cannot be predicted by the spot rate. Moreover, Karlsson and Rohl (2002) utilize Engle-Granger approach for co-integration in their empirical study for monthly data of the US dollar exchange rate, the Swedish kronor per US dollar. Lajaunie, McManis and Naka (1996) has continued and increased the frame of evidence concerned with foreign exchange market co-integration by using the Johansen approach and the single-equation co-integration test. MacDonald and Taylor (1989) tested this statement for 10 bilateral exchange rates of dollar for the period of January 1973 to December 1985. Rapp and Sharma (1999) used co-integration test and common-feature test between daily spot rates and forward rates of the G-7 countries. They tested the co-integration of the FOREX rates within countries and across the countries. They examined the co-movement among spot exchange rates and forward exchange rates of various countries. The across countries results show no co-movement but within-country the results are mixed for co-movement.

The seven dominant currencies of Japan, Germany, Canada UK, Switzerland, Italy and France is investigated by Baillie and Bollerslev (1989) by using daily data for the interval 1 March 1980 to 28 January 1985 and found that spot rates of these currencies were co-integrated. It has been found by Jeon and Lee (2002) that exchange rates of the G-7 countries' are co-integrated during the period under the Plaza Agreement 1985 and the Louvre Accord 1987. They concluded that co-movement of market become apparent throughout this period due to international policy support to stabilize the exchange rates. Moreover, Haug, Mackinnon, and Michelis (2000) and Rangvid and Sorensen (2002) have identified the co-integration between European Union (EU) countries exchange rate over prolonged time interval preceding to the commencement of the European Monetary Union in 1999. As respect to abundant studies have used long period data, while some studies have executed co-integration test for spot exchange rates during economic disorder interval. Co-integration between daily spot exchange rates of EU currencies was found by Aroskar, Sarkar and Swanson (2004) during the crisis of European currency for period 1992 and 1993. Aroskar and Swanson (2002) and Jeon and Seo (2003) found a co-integrating relation between daily spot exchange rates of currencies of Asia during the period of Asian crisis in1997 and 1998.

Previous studies (such as; Aroskar& Swanson, 2002; Aroskar, 2004; Jeon&Seo, 2003) have used the Johansen co-integration approach (e.g., Johansen, 1988) to check the long run relationship. Hakkio and Rush (1991) has investigated that co-integration is a long-run attribute and therefore wide time spans should be used in short term period analysis rather than high data frequency. However it was point out by Sephton and Larson (1991) and Crowder (1996) that the statistical influence of co-integration tests can be extremely distrusted. Different studies (such as, Kumar &Mukhopadyay, 2002; Sarkar et al., 2008; Burdekin&Siklos, 2012; Wong et al., 2004 and Bahng, 2005) used Granger causality models and supporting evidence was achieved for causality from international foreign exchange markets to Indian foreign exchange market. Park (1990) and Park and Choi (1988) first time introduced the multivariate adaptation of the J-test. Further Breitung (2002) thought the cog-native to a multivariate edition of a unit root test. Quah (1994), who examined the standard unit root in panels with correspondent dynamics, and Levin and Lin (1993) studied unit root tests in panels with heterogeneous influential. Autoregressive root was taken by these tests that was common under both the null of the unit root and alternative hypothesis for stationarity.

Im, Pesaran and Shin (1997) and Maddala and Wu (1999) recommended a number of panel unit root tests which also sanction autoregressive root's heterogeneity under the alternative hypothesis. Banerjee (1999) and Baltagi and Kao (2000) also conducted surveys on panel unit root. Bernard and Jones (1996), Frankel and Rose (1996) Coakley and Fuertes (1997) and Evans and Karras (1996), Lee, Pesaran and Smith (1997), Wu (1996), Papell (1997), MacDonald (1996), and Oh (1996) Wei and Parsley (1995), worked on panel unit root application and after their study lot of questions had been raised about co-integration among variables. Therefore, Pedroni (1995, 1997a) examined tests for the null of no co-integration in both kind of heterogeneous panels. Implementation of the panel co-integration tests has appeared in Pedroni (1995, 1997a) for the study in which heterogeneous co-integrating vectors have been included. McCoskey and Kao (1999) investigated alter null hypothesis of co-integration in their research of urbanization. Existing literature on co-integration in currency market in different countries gives mix results about the presence of long and short term relation in spot and forward exchange rate. Most of the literature in currency market skewed towards the cointegration in forward and spot markets, therefore it greatly ignored the portfolio diversification aspect of currency market. Different studies in literature uses different techniques to measure long term relationships. We employ the panel unit root test and panel cointegration approach to examine the long term relationship of the currencies of major trading partner of Pakistan by using the daily, weekly and monthly exchange rate quotes.

3. DATA DESCRIPTION AND METHODOLOGY

We uses Bloomberg database to collect the data of the exchange rate quotes of the currencies of major trading partners of Pakistan. Our data period starts from January 1, 2005 to January 31, 2017 on daily, weekly and monthly basis. Table 1 shows the details of export and import of Pakistan from its major trading partners in 2015. These value are collected form the state bank of Pakistan. Our selected major trading partners of Pakistan includes the China (Renminbi-CNY), Germany (Euro-EUR), Hong Kong (Hong Kong dollar-HKD), Italy (Italian Lira), Japan (Japanese Yen-JPY), Kuwait (Kuwaiti dinar-KWD), Saudi Arabia (Saudi riyal-SAR), UAE (UAE dirham-AED), UK (Pound sterling-GBP), and USA (US dollar-USD). Out of total export, 46.97% of Pakistani exports goes to our selected countries and similarly, Pakistan receives 61.73% of total imports from our sample countries.

Table 1 Details of Major Trading Partners of Pakistan

	Export		Import	
	Value (Billion $)	**Percentage**	**Value (Billion $)**	**Percentage**
China	2.44	9.30%	1.19	26%
Germany	1.62	6.20%	1.13	2.50%
Hong Kong	0.27	1.00%	0.10	0.23%
Italy	6.56	2.50%	0.49	1.10%
Japan	0.28	1.10%	1.7	3.80%
Kuwait	0.20	0.77%	1.6	3.60%
Saudi Arabia	0.55	2.10%	3.01	6.60%
UAE	0.90	3.40%	5.38	12%
UK	1.48	5.60%	0.74	1.60%
USA	3.93	15%	1.96	4.30%

The continuously compounded rate of return has been calculated is as follow; here R_t is the continuous compounded return for daily, weekly, monthly data and P_t, P_{t-1} is representations of currency value at time t and t-1, respectively and Ln denotes to natural log.

$$R_{t=Ln}\left(\frac{P_t}{P_{t-1}}\right)$$

We uses the descriptive statistics to describe different feature of our dataset. For the description of obtained distribution two statistics are used, skewness and kurtosis. The direction and extent of asymmetry has been measured by skewness.

$$\text{Skewness} = \frac{\sum_{i=1}^{n}(r_i - \bar{r})^3}{(n-1)k^3} \dots\dots\dots (1)$$

Here in equation (1), the value of skewness is 0 for normal distribution. Data is called skewed to left if skewness has negative values and for right skewed skewness will be positive. Positive skewed means right tail is longer relative to positive and vice versa. Around mean the distribution of observed data is kurtosis. The immensity of distribution's tail is measured by kurtosis. Kurtosis value must be 3 for normal distribution according to Blandaand MacGillivray (1988). If it is greater than 3 it is called leptokurtic and if less than 3 than platykurtic, we use the following equation (2) for kurtosis.

$$\text{Kurtosis} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^3}{(n-1)k^3} \dots\dots\dots (2)$$

Here in equation (2), number of data points are n, mean is $\bar{x}$ and k is standard deviation. Jarque-bera (JB) which has been suggested by Guajarati (1995, p. 143), given as in equation (3);

$$JB = \frac{n}{6}(S^2 + \frac{1}{4}(K-3)^2 \dots\dots\dots (3)$$

Kurtosis has been denoted by k while s denotes to skewness. The chi-square distribution has been followed by JB at two degrees of freedom. Hypothesis formulated under JB has null (H_o) JB=0and alternative (H_1)JB≠ 0. If critical value of chi-square is less than JB statistics with 95% confidence then null hypothesis will be rejected.

3.1. Panel Unit Root Test

The residuals of each one of the two cross-sections is determined through ADF Fisher unit root test anticipated by (Maddala and Wu, 1999), (ADF-Fisher Chi Square Choi, 2001) ADF-Choi Z-stat Maddala and (Wu PP-Fisher Chi, 1999) Square Choi (2001) PP-Choi Z-stat.

Null hypothesis of test is for all of two cross sections unit root in residuals (no co-integration) sets against alternative hypothesis that few cross sections have not unit root (co-integration).For each cross section p-values has been reported in underlying table which shows the rejection of unit root at 5% level of significance. Stacked residuals specify the rejection of null hypothesis of station-arty at level although stationary at 1st difference, while confirmation of non-stationary at level and stationary at 1st difference has been given by PP - Fisher Chi-square and Choi Z-stat.

3.2. Pedroni Panel Co-Integration Test

Pedroni panel co-integration is used to examine the long run co-integration between groups of currency markets after checking through unit root that series are stationary or not at level. Padroni panel co-integration use seven variables together with dependent variables as well-known as seven panel co integration test. Pedroni Panel co-integration (1999, 2004) is tested by heterogeneous panel and heterogeneous group means panel analysis. Statistics are classified in two groups.$Z_{v\hat{}S,T}$,$Z_{\rho\, S,T\ 1}$ and $Z_{tS,T}$ recognized in the 1st group by pooling residual together with inside the dimension of panel. Statistics are as follow:

Panel *v*-statistic;

$$T^2S^{3}/_{2}\ Z_{v\hat{},N,T} = \frac{T^2S^{3}/_{2}}{\Sigma_{i=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i\mu\hat{}}^{-2}\hat{\mathrm{e}}_{i,t}^{2}} \dots\dots\dots (4)$$

Panel ρ statistic;

$$T\sqrt{S}Z_{\rho\hat{}NT} = \frac{\mathrm{T}\sqrt{S}(\Sigma_{i=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i}^{-2}(\hat{\mathrm{e}}_{it}^{2}\Delta\mu\hat{\mathrm{e}}_{it}^{2} - \hat{\lambda}_i))}{\Sigma_{i=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i}^{-2}\hat{\mathrm{e}}_{\mu\hat{}it}^{2}} \dots\dots\dots (5)$$

Panel t statistics (Non-Parametric);

$$ZtSZtST = \sqrt{\sigma\bar{}S^{2}T\Sigma_{I=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i\mu\hat{}}^{-2}\hat{\mathrm{e}}_{it-1}^{2}} = (\Sigma_{I=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i}^{-2}\ (\hat{\mathrm{e}}_{it-1}^{2}\Delta\mu\hat{\mathrm{e}}_{it}^{2} - \hat{\lambda}_i)) \dots\dots\dots (6)$$

Panel t statistic (Parametric);

$$ZtST = \sqrt{\sigma\bar{}S^{*2}T\Sigma_{I=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i\mu\hat{}}^{-2}\hat{\mathrm{e}}_{it-1}^{2}}(\Sigma_{I=1}^{S}\Sigma_{t=1}^{T}\hat{\mathrm{k}}_{11i}^{-2}(\hat{\mathrm{e}}_{it-1}^{*2}\Delta\hat{\mathrm{e}}_{it}^{*2} - \hat{\lambda}_i)) \dots\dots\dots (7)$$

There are three test that are included in second group have based on grouping among the measurement average AR coefficient for all members of panel for residual's unit root test. These tests have been given as:

Group ρ statistic (Parametric);

$$T\sqrt{S}\acute{Z}_{\hat{\rho}ST} = \frac{T\sqrt{M}\ \Sigma_{t=1}^{T}\ (\hat{\mu_{it-1}^{2}}\ \Delta\hat{\mu_{it}^{2}} - \hat{\lambda}_i)}{\Sigma_{I=1}^{S}(\Sigma_{t=1}^{T}\hat{\mathrm{e}}_{it-1}^{2})} \dots\dots\dots (8)$$

Group t statistic (Non-Parametric);

$$\sqrt{S}\acute{Z}_{tST-1} = \sqrt{S}\ \Sigma_{I=1}^{S}(\sqrt{\sqrt{\sigma\bar{}_{i}^{2}}\ \Sigma_{t=1}^{T}\hat{\mathrm{e}}_{it-1}^{2}})\ \Sigma_{t=1}^{T}\ (\hat{\mathrm{e}}_{it-1}^{2}\Delta\hat{\mu_{it}^{2}} - \hat{\lambda}_i) \dots\dots\dots (9)$$

Group t statistic (Parametric);

$$\sqrt{S}Z'^{*}{}_{tST-1} = \sqrt{S}\ \Sigma_{I=1}^{S}(\sqrt{\sqrt{v\bar{}_{i}^{*2}}\ \Sigma_{t=1}^{T}\hat{\mathrm{e}}_{it-1}^{*2}})\ \Sigma_{t=1}^{T}\ (\hat{\mathrm{e}}_{it-1}^{*2}\Delta\hat{\mathrm{e}}_{it}^{*2}) \dots\dots\dots (10)$$

Here residual vector of the OLS estimation of equation is denoted by êand while the other terms are properly defined in Pedroni (1999). The second group of statistics is founded on pooling the residuals along the between dimension of the panel. We refere the Pedroni (1999, 2004) for full length discussion on the panel cointegration analysis. These statistics calculate the group mean of the individual predictable time series statistics. The asymptotic distribution for each of seven statistics can be articulated as follow:

$$\frac{X_{N,T}\ \mu\sqrt{N}}{\sqrt{v}} \Rightarrow N(0,1)$$

Here, mean and variance of each test are $\mu$and v respectively.

4. EMPIRICAL RESULTS

Table 2 presents the descriptive statistic of weekly exchange rate returns of major trading partners of Pakistan. It reports the mean, standard deviation, maximum, minimum, skewness, kurtosis and Jarque-Bera for selected currencies of our study. Weekly return for Pound sterling is 0.14% with a standard deviation of 1.2%. Besides this, average return for both of Euro, United stated dollar are 0.13% with a standard deviation of 1.2% and 0.6%, respectively. Maximum per week return is observed for Euro i.e. 7.3%, while maximum loss is for Italian Lira i.e. 8.6% in the sample period. Weekly returns have positive skewness in all countries except UK, and Italy. For all countries kurtosis is positive which indicates that rates distribution is leptokurtic demonstrates upper peaks being anticipated than normal distribution. We find statistically significant value for Jarque-Bera, and therefore we reject the null hypothesis of Jarque-Bera i.e. data is normally distributed. Further appendix A & B also reports the results of descriptive test for daily and monthly datasets.

Table 2 Descriptive Statistics

	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
UAE	0.0011	0.042	-0.030	0.006	1.026	11.592	2331**
China	0.0012	0.042	-0.030	0.006	0.889	10.421	1740**
Germany	0.0013	0.073	-0.040	0.012	0.275	4.795	105**
UK	0.0014	0.056	-0.049	0.012	-0.035	4.702	87**
HK	0.0013	0.042	-0.030	0.006	1.038	11.303	2188**
Italy	0.0012	0.042	-0.086	0.008	-1.719	27.246	17915**
Japan	0.0011	0.050	-0.046	0.012	0.267	3.986	38**
Kuwait	0.0011	0.043	-0.029	0.006	0.743	9.529	1339**
SA	0.0012	0.042	-0.030	0.006	1.022	11.468	2267**
USA	0.0013	0.042	-0.030	0.006	1.023	11.587	2328**

4.1. Panel Unit Root Test

We apply the panel unit root test to check the stationarity of exchange rate quotes. It includes ADF-Fisher Chi Square Choi, ADF-Fisher Choi Z- stat, PP-Fisher Chi Square Choi and PP-Fisher Choi Z- stat. Table 3 presents the results of panel unit root tests. Null hypothesis of test is panel data has unit root against alternative hypothesis that panel data has not unit root. For each cross section test statistics has been reported in underlying table 3. From the results it is clear that we cannot reject the null hypothesis at level, but when we take the first difference then all variables becomes stationary. Table 4 reports the result of unit root test PP - Fisher Chi-square, Choi Z-stat. Table 4 also confirms the results of table 3 of our study on weekly exchange rate quotes of major trading partners of Pakistan. Since, our variable are non-stationary at level but there first difference become stationary, therefore we can apply the panel cointegration in

sample currencies. Further appendix A & B also reports the results of panel unit root test for daily and monthly datasets.

Table 3 Panel Unit Root Test ADF - Fisher Chi-square, Choi Z-stat

	ADF-Fisher Chi-Square at level	ADF-Fisher Choi-Z-stat at level	ADF- Fisher Chi-square (at1st difference)	ADF- Fisher Choi Z-stat (at 1st difference)
UAE	0.0003	3.5997	183.85	-13.297
China	0.00001	5.1130	182.75	-13.256
Germany	0.0371	2.0875	173.72	-12.913
UK	0.0694	1.8234	123.17	-10.796
Hong Kong	0.0003	3.6003	183.58	-13.287
Italy	0.0008	3.354	184.18	-13.31
Japan	0.0672	1.8376	166.83	-12.645
Kuwait	0.0011	3.2467	180.66	-13.177
Saudi Arabia	0.0003	3.6079	184.01	-13.303
USA	0.0003	3.6021	183.89	-13.299

Table 4 Panel Unit Root Test PP - Fisher Chi-square, Choi Z-stat

	PP-Fisher Chi-Square at level	PP-Fisher Choi-Z-stat (at level)	PP- Fisher Chi-square (1st difference)	PP- Fisher Choi-Z-stat (at 1st difference)
UAE	0.0092	2.6036	184.96	-13.339
China	0.0014	3.1795	185.62	-13.363
Germany	0.126	1.5436	174.54	-12.944
UK	0.1601	1.422	179.38	-13.129
Hong Kong	0.0099	2.573	184.79	-13.33
Italy	0.0007	3.373	183.92	-13.303
Japan	0.0728	1.8094	178.46	-13.097
Kuwait	0.0205	2.383	182.91	-13.266
Saudi Arabia	0.0089	2.6406	184.99	-13.342
USA	0.0092	2.6224	185.01	-13.341

4.2. Pedroni Panel Co Integration Test

Co-integration between variables has been examined by using panel co-integration test (Pedroni's, 1999, 2001, 2004). We analyzes the long run relationship among currencies through panel co-integration framework by using daily, weekly and monthly data series. It is more substantial way to check long run relationship as compare to conventional co-integration. Panel unit root test also allows to proceeds for panel cointegration test in sample currencies. Table 5 presents the results of Pedronipanel co-integration test of our study. Here the null hypothesis, there is no co-integration is tested against alternative hypothesis of existence of panel co-integration test. We uses lag length one for weekly time series of our data.

Table 5 reports the value of seven co-integration tests, out of which four test (Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic, Panel ADF-Statistic) have common auto-regressive coefficient –within dimension - while other tests (Group rho-Statistic, Group PP-Statistic, Group ADF-Statistic) have individual auto-regressive between dimensions coefficients. Result shows that there exist panel co-integration among the pairs of currencies between major trading partners of Pakistan. Values with that sign * indicate rejection of null hypothesis of no co-integration and confirming the presence of panel co-integration in currency market at 5% level of significance. Further appendix A &B also reports the results of Pedroni panel co-integration test for daily and monthly datasets.

Table 5 Pedroni Panel Co-integration Test

Panel	Panel A	Panel B	Panel C	Panel D	Panel E
Countries	UAE China	Germany UK	Hong Kong Italy	Japan Kuwait	SA USA
Test statistic	Constant trend	Constant trend	Constant trend	Constant trend	Constant trend
Panel v-Statistic	1.9341*	2.0508*	15.1285*	2.7027*	3.0202*
Panel rho-Statistic	-0.8654	-4.8411*	-11.082*	-1.9488*	-65.75*
Panel PP-Statistic	-0.7666	-2.9572*	-5.4905*	-1.7629*	-21.766*
Panel ADF-Statistic	-1.0474	-4.6625*	-7.8294*	-1.6209	-22.968*
Group rho-Statistic	0.9430	-2.7632*	-8.5819*	-0.0669	-59.552*
Group PP-Statistic	0.3691	-2.2311*	-5.2383*	-0.8135	-24.559*
Group ADF-Statistic	0.0357	-4.2555*	-8.0147*	-0.6449	-25.985*

Note: adjusted values in Pedroni's procedure (1999) can be seen against the N (0, 1). The Pedroni (2004) with a critical value of 1.64 statistic is one-sided test (rejection of the null hypothesis of no-co integration is suggested at 5%, level of significance).

5. CONCLUSION AND POLICY IMPLICATION

The influential work of Harry Markowitz (1952) provides foundation to modern investment thoughts. Markowtiz (1952, 1959) statistically shows the importance of diversification. Portfolio selection is all about picking of different asset classes in your investment basket from different markets. International portfolio diversification strictly depends upon the relative risk and relative return of international asset classes. But, investor can enjoy the benefit of portfolio diversification only if asset classes are not co-integrated. The objective of this study is to analyze the dynamic integration of currencies between major trading partners of Pakistan i.e. China, Germany, Hong Kong, Italy, Japan, Kuwait, Saudi Arabia, UAE, UK, and USA. We employ the Pedroni panel co-integration (1999, 2004) techniques to investigate the interlinkages among currency markets for the data period started from January 1, 2005 to January 31, 2017. We uses daily, weekly and monthly data series for robustness of our findings.

Results of panel unit root test (ADF-Fisher Chi Square Choi, ADF-Fisher Choi Z- stat, PP-Fisher Chi Square Choi and PP-Fisher Choi Z- stat) shows that we cannot reject the null hypothesis at level, but when we take the first difference then all variables becomes stationary. These tests confirms the application of panel co-integration test in our sample countries. We analysis the seven co-integration tests, out of which four test (Panel v-Statistic, Panel rho-Statistic, Panel PP-Statistic, Panel ADF-Statistic) have common auto-regressive coefficient – within dimension - while other tests (Group rho-Statistic, Group PP-Statistic, Group ADF-Statistic) and finds that that there exist panel co-integration among the pairs of currencies between major trading partners of Pakistan. Furthermore, our findings are robust under daily, weekly and monthly data series of our study.

Finding of our study is equally important for investors, fund managers, policy makers, portfolio managers and other stakeholder in way that they can adjust the position on their portfolio in global foreign currency market. We recommend to portfolio managers that they cannot diversify their portfolio by investing in the currency market of major trading partner of Pakistan. Therefore, they can only pick one of currency from major trading partners of Pakistan in their optimal portfolio. Investors and fund managers should also considers other international currencies for portfolio diversification rather concentrating only on the currencies of major trading partners of Pakistan in global foreign currency market.

REFERENCES

[1] Breitung, J. and C. Gourieroux, 1997, Rank tests for unit roots. Journal of Econometrics 81, 7-27.

[2] Crowder,W. J. (1996).Anote on cointegration and international capital market efficiency:Areply. *Journal of International Money and Finance*, *15*, 661–664.

[3] Engel, C. (1996). A note of cointegration and international capital market efficiency. *Journal of International Money and Finance*, *15*, 657–660.

[4] Engle, R. F., and Granger, C.W. J. (1987): "Cointegration and Error Correction: Representation, Estimation and Testing," *Econometrica,* 55:251-276.

[5] Hakkio, C. S.,& Rush, M. (1991). Cointegration: How short is the long-run? *Journal of International Money and Finance*, *10*, 571–581.

[6] Haug, A. A., Mackinnon, J. G.,& Michelis, L. (2000). European Union: A cointegration analysis. *Journal of International Money and Finance*, *19*, 419–432.

[7] Kühl, M. (2010). Bivariate cointegration of major exchange rates, cross-market efficiency and the introduction of the Euro. *Journal of Economics and Business*, *62*(1), 1-19.

[8] Levin, A. and Lin, C. (1993). `Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties', University of California, San Diego Discussion Paper, December.

[9] Maddala, G. S. and Wu, S. (1999). `A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test', in this issue.

[10] Masih, R., &Masih, A. M. M. (2001). Long and short term dynamic causal transmission amongst international stock markets.j*ournal of International Money and Finance*, *20*, 563–587.

[11] Meese, R.A. and K.J. Singleton (1982), "On the Unit Roots and the Empirical Modelling of Exchange Rates," Journal of Finance, 37, pp.1029–1034.

[12] Pedroni, P. (1995). `Panel Cointegration; Asymptotic and Finite Sample Properties of Pooled Time Series Tests, with an Application to the PPP Hypothesis', Indiana University Working Papers in Economics, No. 95-013, June.

[13] Pedroni, P. (1997b). `On the Role of Cross Sectional Dependency in Dynamic Panel Unit Root and Panel Cointegration Exchange Rate Studies', Working Paper, Indiana University, November.

[14] Quah, D. (1994). `Exploiting Cross-section Variation for Unit Root Inference in Dynamic Data', Economics Letters

[15] Zivot, E., (2000). Cointegration and forward and spot exchange rate regressions. *Journal of International Money and Finance,* 19(6), 785-812.

APPENDIX A

Empirical Finding by Using the Daily Foreign Exchange Rate

Table A1 Descriptive Statistics (Daily)

	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
AED	0.000	0.059	-0.057	0.009	-0.060	17.154	41981**
CNY	0.000	0.058	-0.057	0.009	-0.074	16.725	39477**
EUR	0.000	0.056	-0.059	0.011	0.053	12.036	17111**
GBP	0.000	0.056	-0.056	0.010	-0.019	12.961	20791**
HKD	0.000	0.059	-0.057	0.009	-0.098	17.228	42424**
ITL	0.000	0.058	-0.056	0.009	-0.068	17.006	41107**
KWD	0.000	0.057	-0.061	0.010	-0.167	16.184	36445**
SAR1	0.000	0.055	-0.057	0.009	-0.065	16.990	41018**
USD	0.000	0.059	-0.057	0.009	-0.060	17.213	42330**

Table A2: Panel Unit Root Test ADF - Fisher Chi-square, Choi Z-stat (Daily)

	ADF-Fisher Chi-Square at level	ADF-Fisher Choi-Z-stat at level	ADF- Fisher Chi-square (at 1st difference)	ADF- Fisher Choi Z-stat (at 1st difference)
UAE	0.00619	2.73801	145.413	-11.7741
China	0.00055	3.45749	140.58	-11.5685
Germany	0.19214	1.33097	137.169	-11.4212
UK	0.2104	1.28239	137.27	-11.4257
Hong Kong	0.00608	2.74417	145.025	-11.7577
Italy	0.00019	3.73545	140.332	-11.5579
Japan	0.07518	1.78793	135.61	-11.3533
Kuwait	0.0143	2.45082	144.534	-11.737
Saudi Arabia	0.00604	2.74592	145.946	-11.7965
USA	0.00621	2.73675	145.155	-11.7632

Table A3: Panel Unit Root Test PP - Fisher Chi-square, Choi Z-stat (Daily)

	PP-Fisher Chi-Square at level	PP-Fisher Choi-Z-stat (at level)	PP- Fisher Chi-square (1 st difference)	PP- Fisher Choi-Z-stat (at 1 st difference)
UAE	0.0271	2.21267	18.4207	-3.71902
China	0.00288	2.98072	18.4207	-3.71902
Germany	0.18298	1.35676	18.4207	-3.71902
UK	0.28447	1.11426	18.4207	-3.71902
Hong Kong	0.02343	2.26861	18.4207	-3.71902
Italy	0.00091	3.31832	18.4207	-3.71902
Japan	0.07188	1.80802	18.4207	-3.71902
Kuwait	0.03972	2.06071	18.4207	-3.71902
Saudi Arabia	0.02424	2.25557	18.4207	-3.71902
USA	0.02449	2.25173	18.4207	-3.71902

Table A4: Pedroni Panel Co-integration Test for daily series

Panel	Panel A	Panel B	Panel C	Panel D	Panel E
Countries	UAE, China	Germany, UK	Hong Kong, Italy	Japan, Kuwait	SA USA
Test statistic	Constant trend	Constant trend	Constant trend	Constant trend	Constant trend
Panel v-Statistic	-0.834783	3.646905*	2.06794*	2.259497*	26.7633*
Panel rho-Statistic	-14.79197*	-6.54703*	-4.01921*	-2.58526*	-2154.95*
Panel PP-Statistic	-7.600436*	-3.8792*	-1.37164	-2.29857*	-140.804*
Panel ADF-Statistic	-10.93838*	-6.57989*	-5.909*	-4.71052*	-76.5737*
Group rho-Statistic	-12.19245*	-4.50609*	-2.14953*	-0.81272	-2007.36*
Group PP-Statistic	-7.854359*	-3.43706*	-0.46046	-1.56078	-165.974*
Group ADF-Statistic	-11.81667*	-6.64292*	-5.84654*	-4.42388*	-89.7291*

APPENDIX B

Empirical Finding by Using the Daily Foreign Exchange Rate

Table B1: Descriptive Statistics (Monthly)

	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
AED	0.004	0.061	-0.049	0.012	1.130	8.893	272**
CNY	0.006	0.065	-0.049	0.013	0.943	8.395	223**
ITL	0.004	0.061	-0.048	0.012	1.141	8.717	259**
GBP	0.004	0.067	-0.095	0.024	-0.328	4.527	19**
EUR	0.006	0.067	-0.061	0.025	0.128	2.815	1**
HKD	0.004	0.060	-0.048	0.013	1.112	8.425	235**
SAR	0.004	0.061	-0.049	0.012	1.126	8.911	273**
JPY	0.005	0.095	-0.071	0.027	0.090	3.205	1**
KWD	0.005	0.059	-0.051	0.013	0.316	7.056	115**
USD	0.004	0.061	-0.048	0.012	1.138	8.865	270**

Table B2: Panel Unit Root Test ADF - Fisher Chi-square, Choi Z-stat (Monthly)

	ADF-Fisher Chi-Square at level	ADF-Fisher Choi-Z-stat at level	ADF- Fisher Chi-square (at1st difference)	ADF- Fisher Choi Z-stat (at 1st difference)
UAE	0.02191	2.29405	27.538	-4.74402
China	0.01282	2.48982	23.4058	-4.30711
Germany	0.24619	1.19613	68.1547	-7.88392
UK	0.27607	1.13146	69.7521	-7.98306
Hong Kong	0.03987	2.05922	27.187	-4.70836
Italy	0.00191	3.10404	50.7888	-6.71565
Japan	0.15298	1.44924	60.8251	-7.41256
Kuwait	0.05182	1.95021	48.3884	-6.53841
Saudi Arabia	0.03826	2.07593	27.264	-4.71621
USA	0.02203	2.29202	27.4914	-4.7393

Table B3: Panel Unit Root Test PP - Fisher Chi-square, Choi Z-stat (Monthly)

	PP-Fisher Chi-Square at level	PP-Fisher Choi-Z-stat (at level)	PP- Fisher Chi-square (1st difference)	PP- Fisher Choi-Z-stat (at 1st difference)
UAE	0.03149	2.15394	54.3991	-6.97407
China	0.00884	2.61895	49.6527	-6.63233
Germany	0.15044	1.45771	67.7024	-7.85563
UK	0.17583	1.37761	69.6335	-7.97575
Hong Kong	0.03105	2.15952	54.3906	-6.97347
Italy	0.00315	2.95323	53.2624	-6.89371
Japan	0.12767	1.53951	62.4172	-7.51738
Kuwait	0.04208	2.03711	49.4132	-6.61464
Saudi Arabia	0.03083	2.16232	0.03083	2.16232
USA	54.8205	-7.00364	0.03168	2.1516

Table B4: Pedroni Panel Co-integration Test for monthly series

Panel	Panel A	Panel B	Panel C	Panel D	Panel E
Countries	UAE, China	Germany, UK	Hong Kong, Italy	Japan, Kuwait	SA USA
Test statistic	Constant trend	Constant trend	Constant trend	Constant trend	Constant trend
Panel v-Statistic	5.077952*	0.750644	2.159588*	3.527528*	1.910501*
Panel rho-Statistic	-3.174032*	-3.54184*	2.377483	-2.44352*	-17.4626*
Panel PP-Statistic	-2.328528*	-2.34492*	4.080488	-1.92981*	-9.12329*
Panel ADF-Statistic	-1.649087*	-3.23726*	5.409629	-2.09399*	-10.9256*
Group rho-Statistic	-1.361604	-1.70449*	3.813807	-0.68058	-14.6821*
Group PP-Statistic	-1.596334	-1.61579	6.011497	-1.12303	-9.66206*
Group ADF-Statistic	-0.789802	-2.67505*	7.589255	-1.31793	-11.8015*