



## Are the inflations of world co-integrated?

Muhammad Imtiaz Subhani, Syed Akif Hasan, Amber Osman and Junaid Minhas\*

### ABSTRACT

*The hike in prices to any product and/or service is the common man's fright. Inflation has faced upheavals regardless of the countries around the world. This study has specifically quantified the co-movement of inflation rates of different countries around the globe. Johansen Co-integration was used to analyze the co-movements of the inflation rates of the selected world regions divided as South Asia, North Asia, Africa, Middle East, South America, North America, Central America, Europe and Australia. The results revealed that co-movements of inflation rates prevails in North Asia, Africa, Middle East, North America, Central America, Europe and Australia whereas; South Asia and South America's co-movements in regards to inflation rates was not found. This simply depicts that the territorial inflation levels in most of the economies shift mutually all around the globe and most of the countries are absorbing the inflationary trends from each other regardless of political, social, technological diversity. But in few nations despite of their symmetric socio-economic nature the inflationary trends are asymmetric.*

**Keywords:** Inflation, Co-integration

**JEL Classification:** P24, P44, E31, F02, F15, F36

### Introduction

The most noticeable effect of inflation in the modern world is its effect upon actual output, comparative prices, taxes and rates of interest. It discourages savings and boosts expenditure. Prices in international markets are also fueling the fire as goods and petroleum prices soared at an unprecedented rate. Instance of inflation is that it travels around the world through international oil prices and impact energy prices as well, which then impacts different commodities. Inflation is one of the global issues to induce and practice the fiscal policies.

Since the 1980's, the shocks of inflation are less powerfully transferred over the Europe than in the earlier years. It was also detected that the area in which the shock appears, turns back quite quickly to the long-term balance, which opposes established determinations that inflation in the smaller country is stimulated from the big country (Thams, 2007). Beck, Hubrich, and Marcellino (2009) demonstrated that only about one-half of the rates of inflation fluctuations are accounted for by area-wide elements such that as fiscal policy or

---

\* Corresponding author's email: [drsubhani@iurc.edu.pk](mailto:drsubhani@iurc.edu.pk) and [amber.osman@iurc.edu.pk](mailto:amber.osman@iurc.edu.pk)

\* The material presented by the author does not necessarily portray the view point of the editors and the management of the Iqra University, Karachi.

international crude oil price evolutions. Interior elements (labor market institutions) act as a very significant function and a regional factor accounts for approximately 18% of inflation variance. In the dynamic mutual construction of internal price levels of the G7 nations on the post-Breton Woods time period (1973 to 1996), it was discovered that an important balance of all nations' internal rates of inflation variation is due to extrinsic shocks of inflation, particularly in the long-term. Likewise, each foreign country is discovered to import inflation of America. The empirical determinations entail that flexible rates of exchange don't isolate the domestic price levels from extrinsic price hikes, which nullifies an important statement for the flexible rate of exchange (Eun & Jeong, 1999).

Sinicakova, Sulikova, Horvath, Gazda, and Grof (2011) found that Poland was not affected by the shocks of prices from Europe but it was concluded that V4 countries had an effect from these shocks. Slovakia (part of Europe since 2009) is also under ERM II system from 2005 and is not affected from the shocks in prices from other countries. In Yang, Guo, and Wang (2004) study about inflation, it was investigated that the inflation among G7 nations that unforeseen alterations in America's inflation had significant effects upon inflation of foreign countries. Likewise, shocks in other countries had economically and statistically substantial impact on America's inflation.

The details of different and vast studies on the subject are expressed in the later section, which describes two or more countries inflation in one research study and similarly relevant studies are outlined here to get the overview about inflation. This research precisely has taken the larger world pool of inflation and analyzed it, which endorses different results than previous studies.

### **Literature Review**

A research study by Subhani, Hasan, Mehar, and Osman (2011), entails all stock markets non-stationarity at zero level and these markets were co-integrated with each other altogether. On one to one basis it was found that KSE 100 is not co-integrated with Bombay and Nepal's equity markets. Similar results were found by Karolyi and Stulz (1996) in which there were weak Co movements among the major equity markets of the euro for the period 1990 to 1994. Syriopoulos (2004) inquired the rising central Europe's Stock markets, which are comprised of Czech Republic, Slovakia, Hungary and Poland. The markets were found to be co-integrated with USA and Germany's stock markets but on the other hand Nath and Verma (2003) found that the indices of NSE NIFTY (India), STI (Singapore), and TAIEX (Taiwan) were not co-integrated. They did not find any long-term relationship but they did find some causality for a few years between the markets. Pan, Liu and Roth (1999); Corhay and Urbain (1993) also concluded that the stock markets of Australia, Japan, Hong Kong, Singapore & Malaysia has no co-integration amongst them. Pynnonen and Knif (1998) investigated the non-significant association between the Scandinavian Stock markets but the conclusion drawn from this research and previously mentioned research studies present a quandary about the properties of stock markets of the different regions of the world.

The growth in the supply of money and inflation appears to connect in an endless loop, since the wider budget shortfall is lead by inflation and this direct towards the increased supply of money and this leads to a greater budget shortfall. To defend inflation, the authorities should have a good control over budget shortfall and loan adeptness. Rates of interest appear to exercise inflationary forces by their effect upon costs and investment depression. Sensible rates of interest could assist to control inflation and hence real rates of interest. Rate of exchange stableness might stabilize prices, even though this may result in real rate of exchange admiration and this could harm the extraneous competitive factors of Egypt in the long run. Striking for a balance among the two situations should constitute the focus of the country's extraneous rate of exchange direction in the coming years. Bad effects

due to increase in inflation, functional reclaims and betterment in the infrastructure to gain the production capability of the country must be dealt as significant factors for combating inflation. The findings also propose that defending inflation is not a gentle task since few policies might be opposed.

Akdi, Berument, and Cilasun (2006) explained the long-term association among CPI and WPI, which was identifying the co-integration among the price series. The Johansen's test and the period gram based test results in not being co-integrated in respect to any country. If one studies the Engle Granger test, which discovered seemingly co-integration among the CPI and WPI in Sweden only and not Canada and UK. This means that the two price levels may systematically deviate over a period of time between three nations. Through this study, one can say that two or more price indices weighted average should be evaluated and targeted by the Central banks.

Beck, Hubrich, and Marcellino (2009) found that the inflation derivatives over regions of an amalgamated economy can contemplate a suitable reaction to demand and supply disciplines but can also imply deformations with negative welfare significance. A fresh dataset was applied including regional rates of inflation from six countries of Europe. The size and continuity of their derivatives has been examined and it was discovered that they appear to be associated to factor market deformations and other constructive characteristics, instead of two cyclical and growth kinetics. Further, it was visible that about one-half of the rates of inflation fluctuations are comprised by the area-wide factors such as pecuniary policy or oil price growths. Internal factor such as labor market foundations still plays a very significant part and regional element accounts for about eighteen percent of inflation variance.

Eun and Jeong (1999) inquired the mutuality construction of domestic price degrees after the Bretton woods era which was from (1973 to 1996). This study found that the price levels had long term relationship/ co-integration and suggested that the prices had a binding relationship through a basic equilibrium. Findings of this study concluded that a country's ability to control the price-levels is limited in the long-run. At this point, it's best for countries to opt for management of their monetary policies, exchange rates policies and restricting domestic policy independence. Exchange rates diversities were quite unsuccessful to fill the national pricing range (external price shocks) in the times of post Bretton Woods, which had consistent price levels legalized. Thams (2007) investigated the inflation mechanism in the Europe for the period (1970 to 2006) and applied Markov switching model. This investigation showed that the inflation dynamics in the Europe were stable from the mid 1980's. This was the period of Germany's weak exogeneity which has already finished in 1983, this means that the control of German Monetary policy on today's Europe has finished a lot earlier than is thought. It was concluded that this reduction of inflation persistency in Germany & France has lead to lower lasting reaction on other countries to inflation shocks in Germany & France. Since the mid 1980s, they had discovered that country specific shocks of inflation are less powerfully carried over Europe than the earlier period. Alternatively, those countries in which the shock returns occurred quickly to long-term equilibrium, opposes the conventional conclusion that larger countries is responsible for the inflation in smaller countries.

The corporate investors like pension funds showed interest to hedge their domestic inflation exposure by inflation linked securities offered by other countries. As an outcome they should account for the mismatch risk of difference among the domestic inflation measures and international inflation measure. Mahieu and Roode (2011) found that the chance of mismatch for Netherlands investor who circumvents its inflation by the inflation linked securities offered in Europe is considerable. The correlation between the inflation rate of Netherland and the inflation rates of Europe isn't quiet higher, which implies that circumventing Netherland's inflation with the securities in Europe will only bring on the

mismatch risk. They showed that conceiving international inflation linked securities might allow better ways of circumventing the risk of inflation mismatch (Mahieu & Roode, 2011). Mismatch risk from Europe and Holland rates of inflation showed that there's a long-term co-integration relation between the Holland CPI and the consumer price indexes of countries that have acquainted inflation-linked certificates established on this inflation assessment. The significance of these events is that other country's inflation-linked certificates could be applied to circumvent Holland's inflation. The coefficient of the co-integration relation is important; the coefficients are not persistent whilst applying a rolling-window approach. As a consequence, a buy and hold strategy might not minimize the mismatch risk in the long-run. With reference to the policy argument in Holland whether or not to bring on inflation-linked bonds, the report presented that Holland authorities can considerably reduce the mismatch risk of investors by bringing in inflation-linked securities established on national inflation measures such as the Holland consumer price index. This will be crucial for circumventing actual pension rights in a pension fund. Particularly for those investors that can't enroll into over the counter inflation switch rate contracts (Mahieu & Roode, 2011).

Gregoriou and Kontonikas (2006) investigated the time-series magnitudes of inflation. Seven countries who had implemented IT after the 1990's were taken as a sample and Unit Root Test was used. Results indicated that apart from Chile, inflation variation of the target had followed non-stationary mode. The reason was that the regulating rate of inflation to its score is accelerating. For this action by applying ESTAR unit root test, it was found that inflation is following a stationary way in relation to its target, entailing eminent IT execution. Applied the comparatively low ability of basic unit root tests, it seems to be a crucial empirical finding (Gregoriou & Kontonikas, 2006).

In a study carried out by Cheung and Yuen (2002), fundamental interaction of prices and rates of inflation in the United States, Singapore and Hong Kong were studied. It was revealed that in the long-run, the consumer price index of the three countries was co-integrated. Vector Error Correction technique was used, in which the assessment resulted that large countries are responsible for the inflation in smaller countries. The extrapolated impulse reaction and predict error variance disintegration placed few standardized conclusions on the ascendant function of United States inflation on the two countries. e.g. in the long-run, the consumer price indexes of Singapore & Hong Kong increases as the inflation increase in the United States. It was also concluded that seventy percent (or higher) inflation is transmitted to these small countries and the three countries had a contemporized cycle of consumer price index. Generally, Singapore and Hong Kong had inflation impacting from the United States but the impact on Hong Kong is greater than the impact on Singapore. The inflation effect of United States on Hong Kong is similar to the basic understanding that inflation in small country is caused by the large country when the exchange rate is fixed. The effect on Singapore is challenging. It was identified that both countries had used different exchange rate policies but still they had to face United States inflation. Singapore, who had adopted flexible rate of exchange system, was still facing transmitted inflation from the United States. Result isn't inevitably conflicting to the detachment debate. Foreign transmitted inflation can be dealt with flexible exchange rates.

Sinicakova, Sulikova, Horvath, Gazda, and Grof (2011) investigated the common relation between the price index in the V4 nations and the Europe for the time period 1996 to 2010. The price levels were co-integrated, which indicated that there is a basic balanced relationship bonding between price levels. The negligible effect of V4 price levels on the Europe price levels was visible. On the other side, uni-directional price levels affect arising from the Europe, which was aggregated with the superior inflation transmission arriving from Poland.

## Research Method: Hypotheses, Sampling Criteria, Statistical Technique

- H1:** There is Co-Integration between the rates of inflation of North Asia  
**H2:** There is Co-Integration between the rates of inflation of South Asia  
**H3:** There is Co-Integration between the rates of inflation of Middle East  
**H4:** There is Co-Integration between the rates of inflation of Africa  
**H5:** There is Co-Integration between the rates of inflation of Europe  
**H6:** There is Co-Integration between the rates of inflation of North America  
**H7:** There is Co-Integration between the rates of inflation of South America  
**H8:** There is Co-Integration between the rates of inflation of Central America  
**H9:** There is Co-Integration between the rates of inflation of Australia

Note,

North Asia = China, Korea, Japan, Taiwan  
 South Asia = Malaysia, Singapore, India, Pakistan  
 Middle East = KSA, UAE  
 Africa = S. Africa, Egypt, Angola, Algeria  
 Europe = UK, France, Germany, Spain  
 North America = USA, Canada  
 South America = Brazil, Argentina  
 Central America = Costa Rica, Panama  
 Australia = Australia, New Zealand

## Method of Data Collection

Average Annual Consumer Price Index of 26 countries were selected from China, Singapore, Japan, Taiwan, Malaysia, Korea, India, Pakistan, , UAE, KSA, South Africa, Egypt, Germany, Angola, Algeria, Canada, UK, France, Spain, USA, Brazil, Argentina, Costa Rica, Panama, Australia and New Zealand. The countries were chosen randomly for the study and the secondary data was retrieved from the IMF database resource.

## Sample Criteria

The sample size is 780 observations from the past 30 years starting from 1981 to 2010.

## Research Model Developed

### South Asia

$$\alpha_{t, Mal} + \beta CPI_{t, Mal} + ET_{t, Mal} = \alpha_{t, Sng} + \beta CPI_{t, Sng} + ET_{t, Sng} = \alpha_{t, Ind} + \beta CPI_{t, Ind} + ET_{t, Ind} = \alpha_{t, Pak} + \beta CPI_{t, Pak} + ET_{t, Pak}$$

Note: Mal= Malaysia, Sng = Singapore, Ind = India, Pak = Pakistan

### North Asia

$$\alpha_{t, Chi} + \beta CPI_{t, Chi} + ET_{t, Chi} = \alpha_{t, Kor} + \beta CPI_{t, Kor} + ET_{t, Kor} = \alpha_{t, Jpn} + \beta CPI_{t, Jpn} + ET_{t, Jpn} = \alpha_{t, Twn} + \beta CPI_{t, Twn} + ET_{t, Twn}$$

$$\alpha_{t-1, Chi} + \beta CPI_{t-1, Chi} + ET_{t-1, Chi} = \alpha_{t-1, Kor} + \beta CPI_{t-1, Kor} + ET_{t-1, Kor} = \alpha_{t-1, Jpn} + \beta CPI_{t-1, Jpn} + ET_{t-1, Jpn} = \alpha_{t-1, Twn} + \beta CPI_{t-1, Twn} + ET_{t-1, Twn}$$

Note: Chi = China, Kor = Korea, Jpn = Japan, Twn = Taiwan

### Middle East

$$\alpha_{Ksa,t} + \beta CPI_{Ksa,t} + ET_{Ksa,t} = \alpha_{Uae,t} + \beta CPI_{Uae,t} + ET_{Uae,t}$$

$$\alpha_{Ksa,t-1} + \beta CPI_{Ksa,t-1} + ET_{Ksa,t-1} = \alpha_{Uae,t-1} + \beta CPI_{Uae,t-1} + ET_{Uae,t-1}$$

Note: Ksa = Kingdom of Saudi Arabia, Uae = United Arab Emirates

### Africa

$$\alpha_{Rsa,t} + \beta CPI_{Rsa,t} + ET_{Rsa,t} = \alpha_{Egp,t} + \beta CPI_{Egp,t} + ET_{Egp,t} = \alpha_{Ang,t} + \beta CPI_{Ang,t} + ET_{Ang,t} = \alpha_{Alg,t} + \beta CPI_{Alg,t} + ET_{Alg,t}$$

$$\alpha_{Rsa,t-1} + \beta CPI_{Rsa,t-1} + ET_{Rsa,t-1} = \alpha_{Egp,t-1} + \beta CPI_{Egp,t-1} + ET_{Egp,t-1} = \alpha_{Ang,t-1} + \beta CPI_{Ang,t-1} + ET_{Ang,t-1} = \alpha_{Alg,t-1} + \beta CPI_{Alg,t-1} + ET_{Alg,t-1}$$

$$\alpha_{Rsa,t-2} + \beta CPI_{Rsa,t-2} + ET_{Rsa,t-2} = \alpha_{Egp,t-2} + \beta CPI_{Egp,t-2} + ET_{Egp,t-2} = \alpha_{Ang,t-2} + \beta CPI_{Ang,t-2} + ET_{Ang,t-2} = \alpha_{Alg,t-2} + \beta CPI_{Alg,t-2} + ET_{Alg,t-2}$$

Note: Saf = South Africa, Egp = Egypt, Ang = Angola, Alg = Algeria

### Europe

$$\alpha_{Uk,t} + \beta CPI_{Uk,t} + ET_{Uk,t} = \alpha_{Frn,t} + \beta CPI_{Frn,t} + ET_{Frn,t} = \alpha_{Ger,t} + \beta CPI_{Ger,t} + ET_{Ger,t} = \alpha_{Spn,t} + \beta CPI_{Spn,t} + ET_{Spn,t}$$

$$\alpha_{Uk,t-1} + \beta CPI_{Uk,t-1} + ET_{Uk,t-1} = \alpha_{Frn,t-1} + \beta CPI_{Frn,t-1} + ET_{Frn,t-1} = \alpha_{Ger,t-1} + \beta CPI_{Ger,t-1} + ET_{Ger,t-1} = \alpha_{Spn,t-1} + \beta CPI_{Spn,t-1} + ET_{Spn,t-1}$$

$$\alpha_{Uk,t-2} + \beta CPI_{Uk,t-2} + ET_{Uk,t-2} = \alpha_{Frn,t-2} + \beta CPI_{Frn,t-2} + ET_{Frn,t-2} = \alpha_{Ger,t-2} + \beta CPI_{Ger,t-2} + ET_{Ger,t-2} = \alpha_{Spn,t-2} + \beta CPI_{Spn,t-2} + ET_{Spn,t-2}$$

$$\alpha_{Uk,t-3} + \beta CPI_{Uk,t-3} + ET_{Uk,t-3} = \alpha_{Frn,t-3} + \beta CPI_{Frn,t-3} + ET_{Frn,t-3} = \alpha_{Ger,t-3} + \beta CPI_{Ger,t-3} + ET_{Ger,t-3} = \alpha_{Spn,t-3} + \beta CPI_{Spn,t-3} + ET_{Spn,t-3}$$

Note: Uk = United Kingdom, Frn = France, Ger = Germany, Spn = Spain

### North America

$$\alpha_{Usa,t} + \beta CPI_{Usa,t} + ET_{Usa,t} = \alpha_{Can,t} + \beta CPI_{Can,t} + ET_{Can,t}$$

$$\alpha_{Usa,t-1} + \beta CPI_{Usa,t-1} + ET_{Usa,t-1} = \alpha_{Can,t-1} + \beta CPI_{Can,t-1} + ET_{Can,t-1}$$

Note: Usa = United States of America, Can = Canada

### South America

$$\alpha_{Brz,t} + \beta CPI_{Brz,t} + ET_{Brz,t} = \alpha_{Arg,t} + \beta CPI_{Arg,t} + ET_{Arg,t}$$

Note: Brz = Brazil, Arg = Argentina

### Central America

$$\alpha_{Cos,t} + \beta CPI_{Cos,t} + ET_{Cos,t} = \alpha_{Pan,t} + \beta CPI_{Pan,t} + ET_{Pan,t}$$

Note: Cos = Costa Rica, Pan = Panama

## Australia

$$\alpha_{t, Aus} + \beta CPI_{t, Aus} + ET_{t, Aus} = \alpha_{t, Nzl} + \beta CPI_{t, Nzl} + ET_{t, Nzl}$$
$$\alpha_{t-1, Aus} + \beta CPI_{t-1, Aus} + ET_{t-1, Aus} = \alpha_{t-1, Nzl} + \beta CPI_{t-1, Nzl} + ET_{t-1, Nzl}$$

Note: Aus = Australia, Nzl = New Zealand

## Statistical Technique

Augmented Dickey–Fuller (ADF) Unit root test is applied to identify the stationarity or non-stationarity in the countries outlined at level and at first difference for the different lags of rates of inflation. Co-integration was used by applying Johansen co-integration test between the rates of inflation of the selected countries.

## Results

### Findings and interpretation of the results

#### Findings of ADF-Unit Root Test

The first step in investigating co-integration is to check stationary/ Non Stationary among all outlined time series variables. For the purpose ADF Unit root test is applied to investigate whether these outlined variables have a unit root.

The findings of the test revealed that China, Korea, Japan, Taiwan, Malaysia, Singapore, India, Egypt, UK, France, Spain, USA and Canada does not have a unit root, means they have stationary at the same order. The p-value of these countries is less than 5% means that the null hypothesis was rejected, also the test statistics value was higher than the MacKinnon critical values which shows the presence of stationary in these variables.

While in Pakistan, KSA, UAE, South Africa, Angola, Algeria, Germany, Brazil, Costa Rica, Panama, Australia and New Zealand had Non- Stationary at same order, their p-value was greater than 5% and Test Statistics were lower than the Mackinnon critical values, which confirms the presence of a unit root in these variables, but all these variables had stationary at 1<sup>st</sup> Difference.

Argentina was the only country which had Non-Stationary at same order and at 1<sup>st</sup> difference, but this variable had Stationary at 2<sup>nd</sup> Difference.

#### Findings of Johansen Co-integration Test

Since the presence of stationarity in inflation rates of the selected countries was observed, co-integration is investigated in different regions of the world by applying Johansen Co-integration Test.

### Results of Multivariate Co-integration

#### North Asia

For this region the findings indicated that there are 2 co-integrated equations, since the p-value is greater than 5%. So the null hypothesis is rejected that there is no co-integration of critical value 5%. But at 1%, the test showed that there is a 1 co-integration equation, the t-stats are found greater than the Mackinnon critical value.

### **South Asia**

The test did not find any co-integrated equation at 1% and 5%. The t-stats value is less than the Mackinnon critical value so the null hypothesis cannot be rejected. So there is no co-integration in this region.

### **Africa**

The t-stats value is greater than the Mackinnon critical value, so the null hypothesis is rejected; the test found 3 co-integrated equations at 5%. But at 1%, the test does not find any co-integration, the t-stats value is less than the Mackinnon critical value so the null hypothesis cannot be rejected.

### **Europe**

The test found 4 co-integrated equations, and the t-stats value was greater than Mackinnon critical value, so the null hypothesis is rejected at 5%. But at 1%, the test found 2 co-integrated equations.

### **Results of Bi-variate Co-integration**

#### **Middle East**

The t-stats value is greater than the Mackinnon critical value, so both null hypothesis is rejected at 5%, the test found two co-integrated equations. But at a 1%, the test found that there is 1 co-integrated equation, the t-stats value is greater than Mackinnon critical value, so the null hypothesis is rejected.

#### **North America**

The t-stats value was greater than Mackinnon critical value, so we can reject the null hypothesis. The test found 2 co-integrated equations at both 5% and 1%. So there is co-integration in this regions inflation rate.

#### **South America**

The t-stats value is lower than the Mackinnon critical value, so the null hypothesis cannot be rejected. The test does not find co-integration among the inflation rates in this region at both 1% and 5%.

#### **Central America**

The test found 1 co-integrated equation at both 1% and 5%, the t-stats is greater than the Mackinnon critical value, so the null hypothesis is rejected.

#### **Australia**

The test found 2 co-integrated equations in this region at 5%, the value of t-stats is greater than Mackinnon critical value, and so null hypothesis is rejected. But at 1%, the test found 1 co-integrated equation.

## Hypotheses Assessment Summary

**Table 1: Hypotheses Assessment Summary**

Hypotheses	Trace Statistics	Critical Value	Empirical Conclusion
<b>H1:</b> There is Co-Integration between the rates of inflation of North Asia	30.8639	29.7970	Co-integration is Present
<b>H2:</b> There is Co-Integration between the rates of inflation of South Asia	45.6851	47.8561	Co-integration is not Present
<b>H3:</b> There is Co-Integration between the rates of inflation of Middle East	5.8033	3.8414	Co-integration is Present
<b>H4:</b> There is Co-Integration between the rates of inflation of Africa	15.7756	15.4947	Co-integration is Present
<b>H5:</b> There is Co-Integration between the rates of inflation of Europe	5.5020	3.8414	Co-integration is Present
<b>H6:</b> There is Co-Integration between the rates of inflation of North America	12.2918	3.8414	Co-integration is Present
<b>H7:</b> There is Co-Integration between the rates of inflation of South America	15.3134	15.4947	Co-integration is not Present
<b>H8:</b> There is Co-Integration between the rates of inflation of Central America	59.7029	15.4947	Co-integration is Present
<b>H9:</b> There is Co-Integration between the rates of inflation of Australia	6.6006	3.8414	Co-integration is Present

## Discussion and Conclusion

The inflation rates of North America, Middle East, Africa, Europe, North America, Central America and Australia are co-integrated but inflation rates of South Asia and South America are not Co-integrated.

The findings give an understanding that there is presence of unit root in all the outlined country's inflation rates. There is presence of co-integration between the inflation rates of North Asia, Middle East, Africa, Europe, North America, Central America and Australia but co-integration among the inflation rates of South Asia and South America was not found. Different findings were observed during the study, Eun and Jeong (1999), concluded that internal inflation in the G7 countries after the Breton woods time had variations from external inflationary shocks in the long-run, whereas in Thams (2007) concluded that Europe did not have much effect from external price hikes after the mid 1980, it was also concluded that inflation in smaller country is not due to the bigger country but in Yang, Guo, and Wang(2004),concluded that inflation of America transmit to other countries and inflationary shocks from other countries also transmit to America. Sinicakova, Sulikova, Horvath, Gazda and Grof (2011), found that v4 countries were affected external price hikes but inflation in Poland was not affected by those shocks.

## Implications

Those regions where the inflation is co-integrated in terms of their CPI, it is suggested that the central banks of those countries can work together and adopt similar policies to combat inflation also in such countries the investors do not need to diversify their investment portfolio because overall conditions in those countries will be more or less same. However, regions where the inflation rates are not co-integrated, the investors can diversify their investment portfolio because it is possible that the investor lose money in one country but at the same time gain money in another country.

## References

- Akdi, Y., Berument H., & Cilasun, S.M. (2006). The relationship between different price indices: Evidence from Turkey. *Physica statistical mechanics and its applications*, 360 (2): 483-492.
- Beck, G. W., Hubrich, K., & Marcellino, M. (2009). Regional inflation dynamics within and across euro area countries and a comparison with the US. *Economic Policy*, 141-184.
- Cheung, Y. W., & Yuen, J. (2002). Effects of U.S. Inflation on Hong Kong and Singapore. *Journal of Comparative Economics*, 30, 603–619.
- Corhay, A., & Urbain, J., P. (1993). Common stochastic trends in European stock markets. *Economic Letters*, 42(4), 385-290.
- Eun, C.S., & Jeong, J. (1999). International Price Level Linkages: Evidence from the Post-Bretton woods Era. *Pacific-Basin Finance Journal*, 7, 331-49.
- Gregoriou, A., & Kontonikas, A. (2006). Inflation Targeting and the Stationarity of Inflation: New Results from an ESTAR Unit Root Test. *Bulletin of Economic Research*, 309–322.
- Karolyi, G. A., & Stulz, R.M. (1996). Why Do markets move together? An investigation of U.S. – Japan Stock Return Co-movements. *The Journal of Finance*, 51(3), 951-986.
- Mahieu, R. J., & F. A. de Roode. (2011). Inflation Matching in Europe with a Special Focus on the Dutch Case. Tilburg University and Netspar. Retrieved from <http://www.netspar.nl/files/Evenementen/2011-1111%20PD/alexander%20de%20roode.pdf>
- Nath, G., & Verma, S. (2003). Study of stochastic trend and co-integration in the emerging markets: A case study of India, Singapore and Taiwan. Retrieved from <http://www.nseindia.com>
- Pan, M., Liu, Y., & Roth, H. (1999). Common stochastic trends and volatility in Asian Pacific equity markets. *Global Finance Journal*, 10, 161-172.
- Pynnonen, S., & Knif, J. (1998). Common long-term and short-term price memory in two Scandinavian stock markets, *Applied Financial Economics*, 8, 257-65.
- Sinicakova, M., Sulikova, V., Horvath, J., Gazda, V., & Grof, M. (2011). Behavior of Inflation within V4 Countries. *International Research Journal of Finance and Economics*, 70, 59-67.
- Syriopoulos, T. (2004). International portfolio diversification to Central European stock markets. *Applied Financial Economics*, 14, 1253-1268.
- Subhani, M. I., Hasan, S. A., Mehar, A., & Osman, A. (2011). *Are the Major South Asian Equity Markets Co-Integrated?* *International Journal of Humanities and Social Science*, 1, 117-121.
- Thams, A. (2007). Inflation Transmission in the EMU: A Markov-Switching VECM Analysis. Free University Berlin, Collaborative Research Center, 1-126.
- Yang, J., Guo, H., & Wang, Z. (2004). International transmission of inflation among G-7 countries: a data-determined VAR analysis. Working Papers 2004-028, Federal Reserve Bank of St. Louis.