Relationship between Trade Openness and Inflation: Empirical evidences from Pakistan

Sehar Munir [1]

Adiqa Kausar Kiani [2]

ABSTRACT

This study empirically verifies the existence of significant relationship between inflation and trade openness for Pakistan using annual time-series data for the period of 1976 to 2010. The basic objective of this study is to examine the Romer's hypothesis for Pakistan with real agriculture value added, real exchange rate, real gross domestic product, financial market openness, money & quasi money and used trade openness, import openness and export openness ratios separately as explanatory variables with inflation rate as dependent variables. For this purpose, we have used multivariate Johansen (1998) and Johansen and Juselius (1990) Maximum Likelihood Cointegration Approach and a Vector Error Correction Model (VECM) and the expected empirical findings shows that there is a significant positive long-run relationship between inflation and trade openness, which rejects the existence of Romer's hypothesis for Pakistan.

KEYWORDS: Trade openness, Inflation, Unit root testing, Multivariate cointegration approach, Vector error correction model, Pakistan.

[1] Associate Professor, Head of Economics Department At Federal Urdu University of Arts, Science and Technology, Islamabad (FUUAST).
[2] M.Phil Fellow at International Islamic University, Islamabad (IIUI).

1. <u>Introduction</u>:

Inflation has always been an important issue for the policy makers as it creates uncertain situation in the economy that may badly affect economic growth. Therefore, high and stable economic growth in addition with low inflation is the main objective of macroeconomic policies. Strict monetary policy with fiscal consolidation appears to have contributed to low price levels. The concern with inflation has not only to balance whole macroeconomic situation, but also from the fact that increase in inflation rates hurts the poor severely as their consumption basket becomes significantly decreased.

A general rise in prices in the economy is usually called inflation. Inflation is occurred due to some demand and supply side factors. Inflation can be resulted due to supply shocks of different food items and world wide oil prices. Rising oil prices always increase prices of almost all other commodities for consumers. These supply shocks are volatile and can occur huge changes in food and oil prices.

There are following demand side issues which increase price level in Pakistan. Firstly, increased local demand due to foreign remittances and demand management policies outpaced the local production, establishing positive output gap, which in turn put burden on prices to increase. Growth in private consumption remained above 10 percent during 2003 to 2006, showing symptoms of demand side burdens on prices. [Khan, Bukhari and Ahmed 2007]

Secondly, the widening gap among local demand and production was filled by growth in total imports; it was increases above 40 percent in FY05 and by 24 percent in FY06 as compare to that gap of imports, exports increased by only10 percent in FY05 and 13 percent in FY06.[3] Which result into increase in trade deficit and high expected inflation in future?

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[3] Economic Survey 2005-06.

Thirdly, broad fiscal policy enhances local demand and add burden on current account deficit. This means, it increases gap among saving and investments, which has to be financed. Moreover, financing of fiscal deficit through money creation adds inflationary burden. On the other side, government borrowing from State Bank of Pakistan (SBP) also increased, which have serious effects on price level. Fourthly, broad monetary policy with high growth rate in money supply and loose credit policy was also contributing to large prices. [Khan, Bukhari and Ahmed 2007].

The extensive survey of International Monetary Fund, suggests that excessive credit growth in developing countries can have bad impacts on real variables. Increasing import prices is also a major reason in enhancing inflation and in this scenario the depreciating exchange rate can put upward pressure on prices.[4] Similarly, Khan and Qasim (1996) and Hasan et al (1995) suggested that indirect taxes are also the basic reason of inflation in Pakistan.

Trade Openness is defined as a "phenomena of sharp economic integration between countries capture through trade liberalization, investment and capital flows, as well as technological changes"[5]. Trade Openness association with falling prices is the most popular propositions found in international trade and there has been unique turn in favor of higher economic integration of world. Openness suggests the economic benefit from international trade, international capital transactions, and the international exchange of knowledge and information. The lower the hurdles to international trade transactions the higher level of integration and benefits.

The new growth theory suggests that openness widens the market, induct an increase in development, reallocates employment to new activities that need more human capital and enhances knowledge flow between countries. Other than benefits, some expenses are also attached with it. A main problem arises from decreasing trade hurdles is the loss in tariff revenue that is 10-20 percent of government revenue in developing

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[4] IMF (2004)
[5] Torres, R (2001)

economies. If tariffs are decreased or vanished, these economies will have to implement other taxes in order to keep their budgets at desire level.

1.1 History of Inflation and Trade Openness in Pakistan:

An acceptable rate of inflation is 3 to 6 percent which has positive impacts on Pakistan economy, it enhances investment, production and growth in wages. However, when inflation crosses limits it generates worse effects, it lowers the money value which serves as medium of exchange. Savings are discouraged because increases in prices hampers real rate of return on financial assets which further leads to lower investment and economic growth.

The early years of Pakistan's economy dominated by agriculture sector with weak industrial base, deficiency of well organized infrastructure and high political instability. The core focus of those years' policies was to strengthen the industrial base for this Pakistan followed restricted trade regime and protected its local infants industries with large tariff and non-tariff barriers. [Yasmin, Jehan and Chaudhary 2006]

In sixties with highly protected trade regime, some others policies were introduced to enhance industrial exports of Pakistan: an overvalued exchange rate, export bonuses, preferential credit access to industries with export potential and automatic renewal of import licenses increases industrial production and export during 1960s. [Yasmin, Jehan and Chaudhary 2006]

The mid-1970's was the most inflationary time in Pakistan with more than 15 percent annual inflation rates. The oil price hike, nationalization of economy and monetary broadness played a major role in increasing prices. [Jones and Khilji 1988]. The WPI and its components increased at an annual average rate ranging from 12 to 18 percent. The double digit inflation in 1970s has been the result of two major oil shocks, large currency devaluation and devastating floods damaging agricultural crops. [Hasan, Khan, Pasha & Rasheed 1995] Against faster expansion of trade to output in world, the

pace of openness into the world trade remained slow before 1970 as Pakistan's participation in world trade fell from 0.5 during 1953-55 to 0.2 during late 1970s. [Hanif and Batool 2006]

After the East-Pakistan debacle, the decade of 1970s came with new economic horizon for Pakistan. A number of decisions were taken in this period like devaluation of rupee by 47 percent in 1973, which vanished subsidy that industrialists were gaining in the form of overvalued exchange rate; liberalization of import policy by allowing all importers to obtain licenses for importable items; in 1973, State Bank of Pakistan started Export Refinance Scheme to facilitate exporters. [Hanif and Batool 2006]

In 1980's, Trade policies were modified continuously with deduction in tariff slabs from 17 to 10 and introduced tax in place of sales taxes. Tariff was decreased from 225 percent in 1986-87 to 70 percent in 1994-95. Similarly, the various custom duty slabs were decreased from 13 to 5. Further, the flexible exchange rate was introduced during this decade. [Yasmin, Jehan and Chaudhary 2006]

The major boost for exports came from the decision of depreciating Pak rupee against US dollar in early 1980s. By liberalized import policy, government introduced negative list with specification that everything not on this list was allowed to be imported. These measures were proved to be helpful for increasing our level of trade during 1980s. In 1988, Pakistan signed Structural Adjustment Programme (SAP) with IMF to question its balance of payments deficit problems which need greater emphasis on openness of imports and exports. [Hanif and Batool 2006] In addition to this the establishment of World Trade Origination (WTO) in 1995 uplifts the process of openness. It gives platform for negotiating trade disputes between different countries. The main focus of this organization is to facilitate the process of trade liberalization and other trade issues at world level.

The inflation rate in Pakistan was lower as compared to other developing nations in 1980's and early 1990's because of different steps in context of trade openness. The

average annual inflation from 1980 to 1993 was 7.4 percent, lower as compare to other countries of South Asian Region because State Bank has increased the money supply 15 percent annually among1970 to 1993. [Khan and Gill 2010]

In the era of 2001-08, trend in prices has shown mixed fluctuations. During 2001-04 inflation remained lower but in 2004-05 it reached to 9.3 percent. It dropped to 8 percent in 2005-06 but it again shoot up in 2007-08 and reaches to its historical high level of 20.77 percent in 2008-09.[6] Non-governmental borrowing and increase in import prices may be the reasons behind it. [Khan and Gill 2010] Today trade as percentage of GDP has risen from 26.7 percent in 1975 to 35.54 percent in 2009.

A review of economic indicators shows that Pakistan's economy has performed well after trade reforms. Due to exogenous shocks, economic growth show downward trend in late 1990's to 2002 after that GDP growth picked up an average of 6.8% from 2002-06, and reaching a highest of 8.6% p.a. in 2004-05 while, it fell to 2.5% in 2008-09 due to political instability and terrorism in Pakistan.[7] Per capita income rises at an average rate of 4.8% p.a. in early nineties. From 1996-97 to 2001-02, per capita income reduces by 3.1% per annum. In last ten years, per capita income in dollar has recorded phenomenal average growth rate of 13.6% p.a. rising from $582 in 2002-03 to $669 in 2003-04 and further to $742 in 2004-05.[8] The per capita income for the year 2005-06 is $847 which is 1046 in 2008-09.[9]

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[6] Pakistan Economic Survey
[7] Statistical appendix 2010 of SBP
[8] Economic Survey of Pakistan, 2005-06
[9]Statistical supplement 2008-09 of SBP

Inflation

Trade Openness
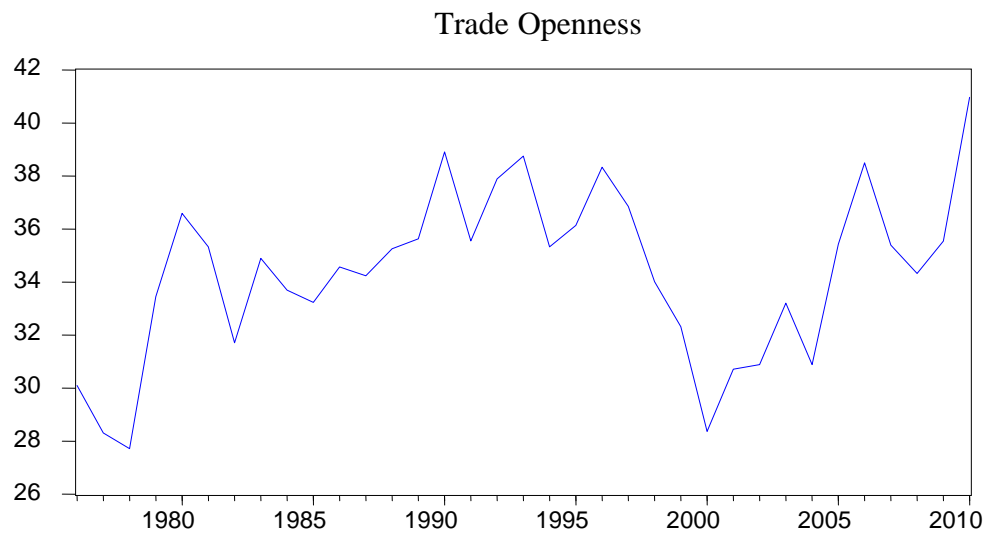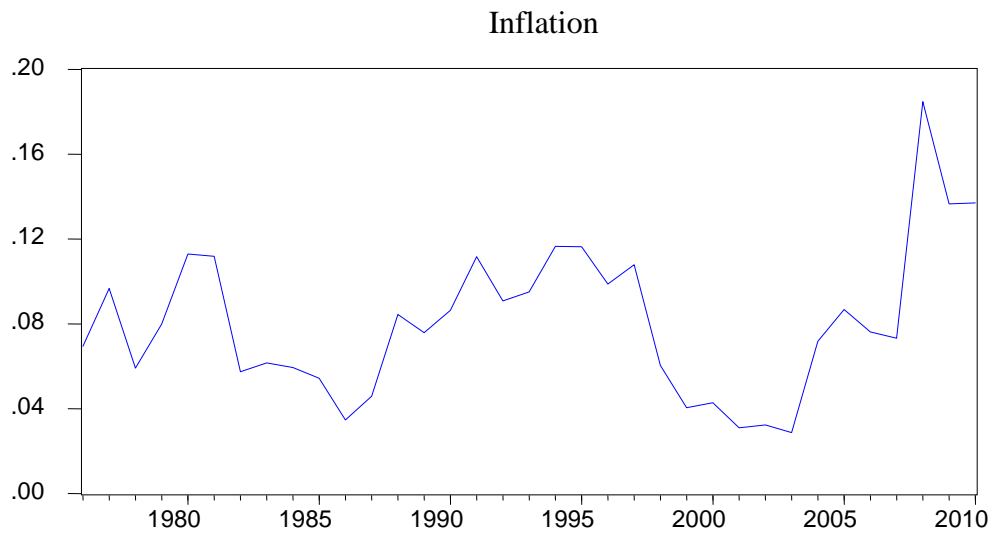
1.2 **Statement of Problem:**

Pakistan is an under-developed country which shows resilience against internal and external shocks during the last few fiscal years. Pakistan pursued an economic policy that was strongly interventionist later on Pakistan turned from inward looking policies toward trade liberalization and export promotion strategies. However, despite making

the economy steadily more open, inflation has not been maintained within desirable limits in Pakistan which is address in this study.

1.3 <u>Research Question</u>:

Then, the basic research question arises from problem statement is that "does trade openness reduces inflation in Pakistan?"

1.4 <u>Objectives of the Study</u>:

The main objective of this research is to determine the nature of the relation among inflation and trade openness for Pakistan. The core focus of this study is to apply the cointegration approach of Johansen (1998) and Johansen and Juselius (1990) in order to examine whether the Romer's findings (1993), that the negative link among inflation and trade openness, holds for Pakistan or not.

❖ To analyze the relationship between trade openness and inflation for Pakistan.

1.5 <u>Hypothesis</u>:

The null hypothesis (H_0) of this study is to estimate the existence of Romer's Hypothesis in Pakistan and alternative hypothesis (H_1) is otherwise.

2. <u>Review of Literature:</u>

Triffin and Grubel (1962) provided evidence that inflationary pressures were correlated across countries by using data from 5 European economic communities during 1950's.They concluded that broad economies observed low inflation and suggesting that openness acted as protected wall and diverted inflationary burden on balance of payments account away from local price increment, however that effect on balance of payments account was for short time period.

Iyoha (1973) analyzed openness-inflation relationship through 33 less developed countries by using OLS on both annually and 5-year average data from 1960-1 to 1964-5. He combined inflation[10] and openness in simple bivariate framework while, changes in income and money growth were significant independent variables when used separately. Negative relationship indicated that higher openness will increases total capital accumulation by decreasing inflation and hence enhancing domestic capital accumulation.

Barro and Gordon (1983) stated that discretionary regimes increases inflation at higher and inefficient levels than monetary regimes that followed rules. Broad monetary policy increases in local output and deterioration in terms of trade in time-consistent policy framework. As openness alters, the advantage faced by discretionary monetary policy makers changes because openness modifies the Phillips curve slope and effect of monetary policy on output[11].

Rogoff (1985) addressed the question of openness and inflation in time-consistent environment through first structural model by extending Barro and Gordon (1983) framework into 2 country Mundell-Fleming model. He proposed that increased inflation has an extra cost and the optimal rate chosen by monetary authorities was

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[10] Proxies by growth rate of WPI/CPI.
[11] Kydland & Prescott (1977) also work on this topic.

lesser as the deteriorating effect on exchange rate increases. He found inverse relation among openness and inflation, which becomes weaker in politically instable economies with independent central banks.[12]

Romer (1993) tested the hypothesis that there was negative relationship between trade openness and inflation. Romer's regressing inflation on openness for cross sectional data of 114 economies over the Post-Bretton Woods period.[13] He assessed the strong relationship between inflation and openness in politically unstable countries with independent central banks. He also found negative inflation-openness relationship when controlling for real income per capita and dummy for OECD membership included.

Lane (1997) emphasized on different channel through which openness and inflation related, especially the degree of imperfect competition, degree of central bank independence, political instability and price rigidity in the non-traded sector.15-years average annual data from 1973 to 1988 have undertaken for cross sectional analysis using OLS and finding cleared that openness was stronger when country size was control. He concluded that negative link between openness and inflation is statistically significant even for advanced industrial nations and his results better suited in describing cross country differences.

Montano and Philippopoulos (1997) presented a model in which inflation based on exchange-rate regime and time remaining till the next election to estimate simultaneous equation for unemployment, wage and price inflation. They found significant Barro-Gordon type bias after the decline in fixed exchange rate regime and no difference in inflation across different political administrations.

Campillo and Miron (1997) used variables of prior inflation experience, optimal tax considerations and time consistency issues in areas other than monetary policy and found significant negative relationship between openness and inflation. They concluded

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[12]Based on closed economy model of dynamic inconsistency of monetary policy.
[13] From 1973 to the early 1990s.

that it was mainly structural factors (openness, political stability and tax policy) that drive cross-country differences in inflation opposed to institutional arrangements.

Terra (1998) challenged Romer's empirical findings using regression on 20 sample countries which were dividing into 4 groups according to indebtness level. The time frames used in study were pre-debt crisis[14] and debt crisis period[15] for severely, moderately and less debted countries. He showed that negative but significant link between inflation and openness was found among severely indebted countries in Latin America but that was not exists in moderately and less debted countries. During 1970's and early 1980's,when countries were contracting their debt and did not have balance of payment problem then negative link between inflation and openness was very weak but during the debt crisis period openness and inflation had strong negative link.

Bleaney (1999) estimated relationship of inflation and trade-openness for 100 countries through regression from 1973-88 and 1988-98. Results indicated the negative correlation between inflation and openness for cross-sectional data of 1970's and 1980's that has disappeared in 1990's. The same results were obtained if per capita income levels, population, area and exchange rate regimes were control.[16] He concluded that shift from pegged to floating exchange rate was predicted to add at least 10 percent to inflation rate and in both periods land area and inflation was positively correlated.

Cavallari (2001) inserted the relation of trade openness and inflation in monopolistic production model and unionized labour market of domestic sector by adopting Game Theory Approach. Cross-sectional regressions for 19 OECD countries were estimated over the period of 1973-1988 as well as panel data for 1980, 1990 and 1994.The result of theoretical model showed that trade openness can affect inflation in a positive or negative way and final result depends on level of concentration of wage bargaining in

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[14] 1973-1980
[15] 1982-1990
[16] As a result of disinflation in industrial countries, the negative correlation between per capita GDP and inflation was strong in 1989-98, whereas it was weak in 1973-88.

country. Results indicated that in countries where wage bargaining concentrated there did not exists any relation among openness and inflation. However, in countries where wage bargaining decentralized, there exists negative link between openness and inflation.

Alfaro (2001) estimated panel data of 146 countries from 1973-1998 by using fixed effect of country and time effect regression among openness and inflation. Results indicated that in the short run, there was no influence of openness on inflation and fixed exchange rate was an important factor to reduce inflation. In the long run, she concluded that negative and statistically significant relationship existed among openness and inflation. She further argued that negative relationship may come from negative influence of fixed exchange rate regime on inflation.

Temple (2002) tried to establish relation of trade openness and the 'Phillips curve' for 44 countries from 1973-1990.[17] Regressions results indicated that Phillips' curve will be more inclined in open economies. Ashra (2002) used multiple regressions by taking panel data from 1980 and 1990 of 15 countries to discuss relation between inflation and openness. He concluded that inflation was effected by openness no matter either an economy possessing hyper-inflation or it is big.

Jin (2002) focused on the openness-growth and openness-inflation relations for "Korea" by applying variance decompositions (VDC's)[18] and impulse response functions (IRF's)[19] which were based on moving averages of quarterly data from 1960-1 to

[17] Phillips curve slope attached with openness is depend on small open economy system with nominal rigidity.

[18] Shows the quantity of information of each variable contributes to the other variables in a vector autoregression (VAR) models. It determines how much error variance of each variable can be explained by exogenous shocks to other variables.

[19] Impulse response functions show the effects of shocks on the adjustment path of the variables. It shows how an unexpected change in one variable at the beginning affects another variable with the passage of time. In time series analysis it is important in determining the effects of external shocks on the variables of the system.

1997-3. Analysis consist of 7 variables that were real output, prices, money supply, real government spending, foreign output shock, foreign price shock and openness before the economic crisis of 1997-98. Results of IRF's indicated that openness has inverse impacts on output growth but no long run effects, it further showed that financial market and trade openness has inverse effects on the output growth and prices. Results of VDC's showed that effects of openness were significant and increase in openness reduced tariffs and hence lower import prices.

Bowdler (2003) used cross sectional data of 20 countries to test the short term inclination of Phillips' curve relates positively with trade openness. He concluded that if cambial regime taken into consideration then degree of trade openness in a country exerted positive effect on inclination of Phillips' curve. The results of Bowdler supported by Taylor (2000) that negative relation among openness and inflation was due to moderate degree of exchange rate effect to the inflation.

Agarwal and Narayanan (2003) verified the existence of significant relationship between inflation and openness in context of developing countries. The dataset comprised of 53 developing countries located at five different regions for the period of 1975 to 2002 with money and quasi money growth, GDP in terms of SDR[20], different measures of degree of openness such as export ratio, import ratio, trade ratio, and dummies for country, years, regions and exchange rate regimes were estimated through GMM method. Findings showed that openness had significant negative effect on inflation, but this was clearly seen only in the period after 1989. The analysis of pre 1989 data showed that only fixed exchange rate regime had significant negative effect. In addition to panel data analysis, time series analysis of selected countries has been carried out using ARMA (1, 1) for two different time spans in which openness was different. The results supported the hypothesis that openness might enhance inflation inertia for India and not for other countries.

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[20] Special Drawing Rights

Sachsida, Carneiro and Loureiro (2003), used fixed and random effects model in order to verify the Romer's findings (1993). Data used in the study has been comprised of 152 countries for the period of 1950 to 1992. Inflation[21], degree of openness[22] and seven regional dummies were also used for geographic locations of Africa, North and Central America, South America, Asia, Europe, the South Pacific and OECD member economies. They concluded that negative relation among openness and inflation was neither specific to countries nor to certain period.

Cooke (2004) stated that inflation is declining in open economies because openness altered the Phillips curve slope and it also affects monetary authority's utility function. Inflation may increase and decrease as country becomes broader because foreign demand for local production and openness interrelates and changes the opportunities for authorities. With lower foreign demand the opposite relation holds but with higher foreign demand inflation increases and reduces with openness. He concluded that relation depends on level of export demand. Large export demand reduced terms of trade to such an extent that inflation may increase with openness

Gruben and McLeod (2004) used panel regression for controlling country specific effects and confirmed about negative relation among inflation and trade openness. Five year averages for inflation and import share were used from 1971-2000 possessing Romer's and Terra's 1973-89 cross country averages. The time varying coefficients suggested that countries with more openness to trade enjoyed greatest deduction in their inflation during the 1990s.Empirical specification also provided coefficient of variation for inflation, that after 1985 the more open economies have less volatile inflation. They concluded that correlation among inflation and openness appears to be strengthening in 1990s.

Kim and Beladi (2005) examined the relation among inflation and trade openness for 62 economies which consists of 28 OECD and 34 developing economies and selected

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[21] Natural logarithm of GDP deflator,
[22] Rate of imports to GDP.

on the basis of central bank dependency index form 1947 to 2002. Inflation[23], degree of openness[24] and set of control variables[25] were used in the study. Panel analysis indicated positive relation among prices and openness for advanced economies such as U.S., Belgium, and Ireland and inverse relation for developing countries as in line with Romer's (1993). They concluded that larger or smaller central bank dependency did not play any role in explaining (positive or negative) relation among prices and trade openness.[26]

Nunziata and Bowdler (2006) hypothesized negative relation among openness and probability of huge increase in prices using data from 19 OECD economies from 1961–93 on GDP volumes, consumer prices indices, nominal GDP and nominal import spending. A range of probit regressions shown empirical support for greater openness reduces the probability of an inflation start even after controlling variables. The openness impact on lagged GDP growth and inflation in U.S. were positive but statistically insignificant.

Bowdler and Malik (2006) suggested that openness may change structure of consumption and production of goods whose prices were more stable internationally by using panel data of 96 countries from 1961-2000.Results of ordinary least squares (With differenced GMM and system-GMM) suggested that opening of economy more sharply than the average has experienced huge deductions in inflation. They concluded the negative impact of openness on inflation was much weaker in sub sample of OECD countries than amongst developing and emerging market economies.

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[23] Natural logarithm of GDP deflator,
[24] Measured as imports to GDP.
[25] Real income per capita, long-term interest rates and money supply.
[26] Central bank dependency Index by Romer (1993)

Sachsida (2006) estimated relation among inflation and trade openness to verify Romer hypothesis (1993) for 152 countries with division in 7 different groups from 1950-1992.Inflation[27] and the degree of openness[28] were taken as dependent and independent variable respectively in the study. Fixed and random effect results given support to Romer (1993) that inverse relation among inflation and openness were restricting neither to subset of economies nor to time period. Study also tested Terra (1998) hypothesis that inverse relation among openness and inflation was due to severely indebted economies in debt crisis span from 1982-1990.Results indicated inverse relation among inflation and openness not just in severely indebted economies but in other economies also during debt crisis span as well as in the time span previous to debt crisis.

Daniels, Nourzad and VanHoose (2006) developed open economy model with two different sectors in which wages were market determined and with wage settings arrangements. Analyzing the data of 17 countries from 1970-1999 on inflation rates, degree of central bank independence[29], degree of openness [30] and 5 dummy variables. Ordinary Least Square analysis showed that wage setting arrangements primarily increases inflation at low degrees of wage centralization but as wage centralization rises it results into decrease in prices. They concluded that results were robust to considering potential change in inflation openness relation after 1988 and alternative exchange-rate regimes.

Chung-Shu Wu and Jin-Lung Lin (2006) investigated openness-inflation relationship using panel data of 13 countries that included Asian 4 Newly Industrialized Economies (NIE's) [31] and the G7[32] from 1973 to 2001 by using variables: imports shares

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[27] The natural logarithm of change in implicit GDP deflator.
[28] The imports to GDP ratio.
[29] This was weighted average of legal independence obtained from survey answers from individual of central banks.
[30] The ratio of imports to GDP.
[31] Hong Kong, Korea, Mexico, Philippines, Singapore, and Taiwan.
[32] Canada, France, Germany, Italy, Japan, U.K. and the United States.

(imports/GDP), and annual growth rate of GDP deflator. Panel regression results clear that models with or without constant constraint give different relationships between openness and inflation. If restricted constant terms, the results were similar to Romer's (1993) however, if relax that restrictions, empirical results does not show a certain relationship. They also employed VAR model, which shows the affects of money on real output were lower in more open economies. They concluded that openness has significant negative relationship with inflation for NIEs, but has mixed results for G7.

Daniels and Vanhoose (2006) examined open economy model with imperfect competition and incomplete wage rigidity that allows us to assessed openness inflation relation in time inconsistency framework, in this higher openness increases sacrifice ratio but decreases inflation bias. If an economy possessed by monopolistic competition, higher openness decreases pricing power of local firms and there were output inflation tradeoff which rises sacrifice ratio. At the same time, reduction in firms pricing power hampers the extent of monetary expansion that can enhanced output by creating unexpected increase in prices. They concluded that higher sensitivity of local spending with respect to real depreciation reduced the output-inflation tradeoff but increased the size of country should decrease inflation and enhances sacrifice ratio.

Aisen and Veiga (2006) analyzed panel data of more than 100 countries from 1975 to 1999 and found that less economic openness along with higher degrees of political instability generated more volatile inflation rates. Results indicated that higher openness was related to lower inflation but this cannot be found in all countries at all times and they also supported the existence of import price effect.

Pehnelt (2007) testing the hypothesis that process of globalization contributed to lower inflation in 22 OECD countries from 1980 to 2005 with simple inflation model by using annual inflation rate, difference between country's actual and expected GDP and different control variables[33]. Regressions results suggested that tremendous economic

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[33] Change in unemployment rate and change in nominal effective exchange rate.

integration have role in disinflation process of OECD countries since 1980s .He concluded that economic openness and degree of globalization were positively related to disinflation process and economic conditions became more vital in obtaining inflation rates for OECD countries.

Aron and Muellbauer (2007) applied innovative technique containing both observable trade policy[34] and unobservable trade policy[35], indicating latter through smooth non-linear stochastic trend for the imports share in home demand of manufactured goods, controlling for business cycle and exchange rate. Study also analyzes time-series movements in trade openness for imports and prices of manufactures of South Africa from 1971 to 2005. The evidences for South Africa suggested that openness has decreases mean inflation and has lowered the effect of exchange rate on wholesale prices in South Africa.

Gopal (2007) discussed the effect of openness on tariff structure, export competitiveness,prices and economic growth for 11 countries of Latin American region[36] during 1985-2003. Analysis focused on measuring openness inflation relationship through gross national product, imports, exports and consumption of goods and services, capital inflow, gross domestic investment, reserves of foreign assets, savings and growth rate of GNP.Ordinary least square results indicated the existence of significant positive relation and higher openness between Latin American countries would enhance to upgrade institutions.The opening up of markets could play vital role in decreasing economic rents atteched with economic and institutional arrangements.

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[34] Tariffs and surcharges
[35] Quotas and other non tariff barriers.
[36] Consist of various sub regional groups: Mexico, Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama), and the Caribbean 13 countries; South America contains the Andean Community (Colombia, Ecuador, Bolivia, Peru) and Mercosur (Argentina, Brazil, Uruguay, Paraguay and Venezuela) and Chile.

Evans (2007) focused on level of imperfect competition that affects the relation among openness and inflation both within a country and between countries by using 2 country overlapping generations (OLG)[37] model from 1982-2005. Results indicated that level of imperfect competition among the producers plays a substitute for market power enjoyed by country's monetary authority in obtaining monopoly rents available in international structure.[38] He concluded that greater openness associated with higher equilibrium inflation rate.

Badinger (2007) assessed the relation among inflation and openness measured in terms of financial openness using cross-sectional data of 91 countries from 1985-2004.He used Inflation rates[39], financial market openness[40], terms of population (POP), and area and control variables with 2SLS. Results indicated that larger trade and financial openness reduced central bank's independency which yield to less inflation that is attached with larger output-inflation tradeoff. Relation among openness and inflation does not hold for sub sample of 25 OECD countries[41] and suggested that highly developed countries has been successful in establishing an structure for central banks that eliminated distortions due to time inconsistency problem.

Wynne and Kersting (2007) provided preliminary review of literature on openness and inflation. They reviewed various channels through which greater economic integration might impact inflation of United States in recent years. There was negative correlation in cross-country data between openness and long-run inflation and also presented some tentative evidence that it was not just trade openness that correlated with lower inflation

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[37] In which agents live countable time span long enough to live one period at least with the next generations of agents.

[38] That is, greater level of imperfect competition among producers decreases the benefits from inflation generated by country's monetary authority.

[39] Log of average annual difference in GDP deflator and consumer price index.

[40] Total abroad assets and liabilities as percentage of GDP.

[41] The OECD established in 1948 with the name of **Organization for European Economic Co-operation** (**OEEC**), formed by Robert Marjolin of France. After that, non-European states were also included in it. In 1961, it was reformed as the Organization for Economic Co-operation and Development of 34 economies to stimulate economic performance and global trade.

but also openness to labor and capital flows. The theory confirmed the existence of inverse relation between openness and inflation; Phillips curve should be steeper in more broad economies. He also pointed inconsistency in results of various empirical studies.

Daniels and Vanhoose (2007*)* considered open economy with degree of income-tax progressivity influenced on the interaction between openness, central bank independence and prices by using data of 17 countries from 1979 to 1999. Regression analysis of cross-country inflation provided favor inverse relationship between inflation and income tax progressive system. OLS Results indicated that higher openness and central bank independency reduced the income-tax progressivity effects on price levels.

Razin and Loungani (2007), proposed that financial and trade broadness reduced the output gap in the household's utility function in new Keynesian open economy model. Model suggested that higher openness raises the sacrifice ratio but narrows inflation. They also provided empirical evidence by regressing the sacrifice ratios of Ball (1994) with capital and current account restrictions from Quinn (1997). They found positive link and remained unclear about the role of capital account restrictions because if it included along with current account restrictions, only the latter was significant.

Berument, Dogan and Tansel (2008) assessed the role of openness on inflation for 4 MENA countries[42] through EGARCH model[43] from 1952 to 2006 by using annual data on export and import openness separately, CPI and GDP. Results suggested that increase in export openness[44] reduces inflation volatility for all MENA countries. However, increment in import openness[45] reduces price level for Jordan and Morocco but increases for Algeria and Turkey. They concluded that export openness was reliable for those countries than import openness. The effect of inflation on openness was positive for Jordan, Morocco and Turkey and statistically significant just for Morocco.

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[42] Middle East and North African(Algeria, Jordan, Morocco and Turkey)
[43] GARCH models assumed that positive and inverse error terms effect on volatility. From empirical point exponential GARCH (EGARCH) volatility performs asymmetrically to the sign of shocks.
[44] Export-GDP ratio
[45] Import-GDP ratio

Daniels and Vanhoose (2008) developed simple theoretical model to investigate the extent of exchange rate effect that influence the relation among trade openness, inflation and output-inflation trade-off by using annual observation for 17 OECD countries from 1979 to 1999 on consumer price index (CPI), central bank independence (CBI) and trade openness. Regression results indicated that higher effect of exchange rate decreased sacrifice ratio while depressed inflation and degree of trade openness exerted an empirically ambiguous effect on sacrifice ratio.

Menghan (2008) estimated short and long run effect of openness on inflation through changes in productivity and interest rate by using industrial panel data of 20 industries in each of 6 OECD countries[46] from 1980 to 2006. He quantitatively verify the hypothesis by using; inflation[47], openness, real productivity, markup, wages number of enterprises, national GDP, real GDP, national CPI, country's and industry's dummy variables. Results indicated that openness reduced inflation rate, productivity and mark up in short run while; long run results were ambiguous.

Al Naseer and Sachsida (2009) explored relation among openness and prices for 152 economies from 1950-1992 by using modern panel data techniques to check validity of Romer's (1993) main result and Terra's (1998) criticism[48]. Fixed effect (with in) and Random Effects (GLS) were used with inflation, openness, real per capita GDP and seven regional dummies. Results cleared that Romer's still hold in 1990's however Terra's criticism failed to hold in 1990's as the inverse relation among prices and openness neither restrictive to subset of countries nor specific to time spans.

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[46] USA, Japan, Canada, Portugal, Finland and Australia

[47] Producer price index (PPI),

[48] The inverse relation among openness and prices was due to severely indebted economies in the debt crisis time span.

Furuoka and Mun Ho (2009) examined relation between openness, unemployment and inflation by choosing 3 Asian economies[49] with different degrees of openness from 1980 to 2005. OLS results indicated that as country opened up to world by rising the quantity of imports then coefficient of Phillips curve slope become smaller. They concluded that more open countries tend to have flatter Phillips curve with higher sacrifice rate.

Yi Lin (2010) investigated relation among trade openness and inflation of 106 countries using quantile regression from 1970-2007. Inflation, openness and GDP per capita growth rate were used to control country size. Results reflected inverse impact of openness on inflation when price level was larger but no effect when it was less. He concluded that relation among openness and inflation appeared to be strengthening in greater prices periods and was extremely robust to consider 1980s debt crisis and control the exchange-rate regime.

Evans (2011) proposed that trade openness enhanced country's incentive to create inflation by estimating data through regression from 1973 to 1987 and 1988 to 2002. Using two country overlapping generations model that described cycle through which openness and imperfect competition interacted on optimally selected inflation rates and gave results for more developed subset of countries in late 1980's.He concluded that openness was inflationary between developed countries in which monetary policy can roughly approximated by controlling for imperfect competition and inelasticity of labor supply within country.

Hanif and Batool (2006) tested Romer's hypothesis for Pakistan using time series data from 1973 to 2005. They found that real gross domestic product, monetary growth, interest rate, wheat support price and openness (the ratio of growth in trade to GDP) has inverse effect on inflation in Pakistan. Results from Regression Analysis clear that supply factors were important than monetary factors in the process of inflation.

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[49] Japan (9.8%), South Korea (32.9%) and Malaysia (77.2%)

Mukhtar (2010) applied multivariate cointegration approach and vector error correction model to examine the Romer's hypothesis for Pakistan. He estimated time series data from 1960 to 2007 on budget deficit (BD), GDP, trade openness (TO), exchange rate (ER) and inflation (CPI). The empirical findings show that there was significant inverse long run relation among prices and openness which confirmed the existence of Romer's hypothesis in Pakistan.

Zakaria (2010) empirically examined relation among trade openness and prices in Pakistan using annual time series data from 1947 to 2007. The dependent variable was inflation rate while, explanatory variables were openness[50], money supply, and fiscal deficit and foreign debt were taken as share of GDP, exchange rate, terms of trade[51] and democracy[52]. Generalized Method of Moments (GMM) results shown that positive relation holds among openness and inflation in Pakistan and the control variables i.e. money supply, fiscal deficit, exchange rate depreciations, foreign inflation, terms of trade, foreign debt and democracy significantly affect inflation.

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[50] The share of total trade (exports plus import) in GDP.
[51] Ratio of export price to import prices.
[52] Proxy by Polity2 score

3. <u>Theoretical framework and Methodology</u>:

Now, we designed the suitable model and explain how the variables are constructed and described the sources from where the data has been taken. After that explain the econometric methodology for estimation and interpretation of results.

3.1 <u>Methodology</u>:

Inflation is a complex phenomena and it is not easy to establish an empirical model for a country. However, it is possible to find the key variables effecting the inflation in Pakistan. The most common empirical methodology for examining the trade openness and inflation relation had been to apply single equation model for inflation, treating trade openness as an independent variable with others.

Solomon and deWet (2004) use four variable single equation model where budget deficit (BD), gross domestic product (GDP) and exchange rate (ER) were treated as independent variables and inflation (CPI) as an dependent variable. Solomon and de Wet (2004) model is also used by Mukhtar (2010) in his study. To this, we add real agriculture value added (Agr), financial market openness (FMO), money & quasi money (M_2), trade openness (TO) import openness (IO) and export openness (EO) as an independent variable with Gross Domestic product (GDP) and Exchange Rate (ER) are used in Real Terms. While, we doesn't take budget deficit (BD) in this study model.

We also include Two Dummy Variables of 1982 and 1990 in Solomon and de Wet (2004) model for changes in Exchange Rate Regimes and Financial and Structural Reforms respectively.

In order to obtain the objectives of a study, model is expressed as follows;

$$CPI_t = \beta_0 + \beta_1\,Real\,Agr_t + \beta_2\,Real\,ER_t + \beta_3\,Ln\,Real\,GDP_t + \beta_4\,TO_t + \beta_5\,FMO_t + \beta_6$$
$$Ln\,M_{2t} + D_1 + D_2 + u_t \text{--}Eq\,(a)$$

Where,

CPI$_t$ shows *Inflation rate*

Real Agr shows *Real Agriculture Value added*

Real ER shows *Real Exchange Rate*

Ln Real GDP shows *Real Gross Domestic Product*

TO shows *Trade Openness*

FMO shows *Financial Market Openness*

Ln M$_2$ shows *Money & Quasi money*

TO shows *Trade Openness*

$$CPI_t = \beta_0 + \beta_1\,Real\,Agr_t + \beta_2\,Real\,ER_t + \beta_3\,Ln\,Real\,GDP_t + \beta_4\,IO_t + \beta_5\,FMO_t + \beta_6$$
$$Ln\,M_{2t} + D_1 + D_2 + u_t \text{--}Eq\,(b)$$

Where, *IO* shows *Import Openness.*

$$CPI_t = \beta_0 + \beta_1\,Real\,Agr_t + \beta_2\,Real\,ER_t + \beta_3\,Ln\,Real\,GDP_t + \beta_4\,EO_t + \beta_5\,FMO_t + \beta_6$$
$$Ln\,M_{2t} + D_1 + D_2 + u_t \text{--}Eq\,(c)$$

Where, *EO* shows *Export Openness.*

3.2 Selection and Construction of Variables:

We have used data from 1976 to 2010 and various computational methods to generate useful knowledge from data generating system. Following are the variables used in this study.

*Dependent Variable***:**

Inflation rate is presenting through *Consumer Price Index* [annual percentage change in value of fixed basket of goods and services that may be fixed or changed after specified periods].

It is calculated for each year as the change in natural logarithm of price index in the present year from the price index in the previous year, where price index is in terms of *CPI* in the study.

Independent Variables:

Real Agriculture Value added includes forestry, hunting, fishing, cultivation of crops and production of livestock. Value added is whole sector growth after adding all outputs and subtracting inputs. It is estimated without reductions for depreciation or depletion of fabricated assets and degradation of natural resources. It is denoted by Agr in the study.

Real Gross Domestic Product is the market amount of goods and services produced by country in a given year. Real GDP is calculated by using production values of current year and dividing with that year prices. In the study natural logarithm of Real GDP is used and denoted by GDP.

Real Exchange rate is the rate at which one currency will be exchanged for another. It is also considered as value of one country's currency in terms of another currency. It is calculated through (Market rate)*Foreign Inflation ÷ Domestic Inflation.It is denoted by ER in the study.

In countries like Pakistan, exchange rate depreciation (appreciation) could increase (decrease) price of imported commodities. Pakistani markets are based significantly on

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imported commodities, implying that exchange rate depreciation would be rapidly reflected in an increase in the price of consumer's basket of commodities.

Financial Market Openness is the scenario where administrative and market restrictions on capital movement across borders have been vanished. When capital account liberalization implements, it should create 'Openness', then 'financial integration' will gradually be obtained. Financial markets openness performs important part in running trade deficit or surplus.[53]

Financial Market Openness is measured through FDI (Net Inflows) and it shows total inflows of investment to get management interest in an enterprises working in economy other than that of investor. It consists of equity capital, reinvestment of earnings, and other long and short term capital shown in the balance of payments. It is denoted by FMO.

Money & Quasi money includes currency outside banks, demand deposits other than those of government, the time, savings, and foreign currency deposits of resident sectors other than government. In the study natural logarithm of Money & Quasi money is used and denoted by M2.

Trade Openness it is the value to which countries allow trade with others. Broad economies generally have higher opportunities, at the same time they also face competition from others economies. In terms of financial development, openness enables an economy to get funds from other countries, and also invest its surplus funds in other countries. [Krishna Agarwal] The more broad local economy with less restriction in world trade and higher trade share as percent of GDP. It is calculated through (Exports + Imports) ÷ GDP. It is expressed with TO in the study.

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[53] Robert stehrer

Imports Openness is the value of all goods and services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude labour and property income (formerly called factor services) as well as transfer payments. It is calculated through (Imports of goods & services ÷ GDP) *100. It is expressed with IO in the study.

Exports Openness is the value of all goods and services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude labour and property income (formerly called factor services) as well as transfer payments. It is calculated through (Exports of goods & services ÷ GDP) *100. It is expressed with EO in the study.

3.3 <u>Data Sources</u>:

In this study we have taken annual time series data that covers the period of 1976 to 2010 from various sources including

- International Financial Statistics of International Monetary Fund (IMF's).
- World Development Indicators (WDI).
- Statistical Appendix 2010 of State Bank of Pakistan (SBP).

In independent variables, natural logarithms of real GDP and Money & Quasi Money are taken because the data is in Rs.millions while, all others variables are taken as % of GDP except exchange rate and inflation rate which are index numbers with base year 2005.

Table of Variables Descriptions:

Code	Variables	Definitions	Formula	Units	Source of Data and Definitions.
Agr	Real Agriculture Value added	Includes forestry, hunting, fishing, cultivation of crops and livestock production. Value added is whole sector output after adding all outputs and subtracting inputs. It is estimated without making reductions for depreciation or depletion of fabricated assets and degradation of natural resources.	All outputs -Intermediate inputs (Not deducting depreciation of fabricated assets and degradation of natural resources)	% of GDP	WDI, World Bank national accounts data, and OECD National Accounts data files.
ER	Real Exchange Rate	The rate at which one currency will be exchanged for another. It is also considered as the value of one country's currency in terms of another currency	(Market rate)*Foreign Inflation ÷ Domestic Inflation	Index Number with base Year 2005	International Monetary Fund, International Financial Statistics.
FMO	Financial Market Openness	Scenario where existing administrative and market restrictions on capital movement across borders have been vanished. When capital account liberalization implements, it should create 'Openness', then 'financial integration' will gradually be obtained.[Robert stehrer]	FDI (Net Inflows)	% of GDP	Statistics & DWH Department, SBP.
GDP	Real Gross Domestic Product	The market amount of goods and services produced by a country in a given year.	Nominal GDP ÷ Domestic Inflation	Rs.Million	International Monetary Fund, International Financial Statistics and data files.

TO	Trade Openness	Value to which countries allow trade with other countries. Broad economies generally have higher opportunities, at the same time they also face competition from others economies Trade Openness is the sum of exports and imports of goods and services measured as a share of gross domestic product.	(Exports + Imports) ÷ GDP	% of GDP	WDI, World Bank national accounts data, and OECD National Accounts data files.
Δ CPI	Consumer Price Index	The annual percentage change in the value of fixed basket of goods and services that may be fixed or changed after specified periods.	$Ln\ CPI_t - Ln\ CPI_{t-1}$	Index Number with base Year 2005.	International Monetary Fund, International Financial Statistics
M2	Money & Quasi money	Includes currency outside banks, demand deposits other than those of central government, the time, savings, and foreign currency deposits of resident sectors other than central government.		Rs.Million	International Monetary Fund, International Financial Statistics.
IO	Imports Openness	The value of all goods and services received from the rest of the world.	(Imports of goods & services ÷ GDP) *100	% of GDP	WDI, World Bank national accounts data, and OECD National Accounts data files.
EO	Exports Openness	The value of all goods and services provided to the rest of the world.	(Exports of goods & services ÷ GDP) *100	% of GDP	WDI, World Bank national accounts data, and OECD National Accounts data files.

3.4 <u>Estimation Techniques</u>:

Usually many macroeconomic variables are non-stationary for this purpose we can apply **unit root testing technique** in order to see that whether the variables are stationary or not. Then, the variables which are stationary at I (1) we have used Johansen (1998) and Johansen and Juselius (1990) **Maximum Likelihood Cointegration Technique** and **Vector Error Correction Model** in our study to check the long run relationships in between them.

3.4.1 <u>Univariate Analysis</u>:

(a) Unit Root Test:

It is a test for stationarity (or non stationarity) of time series statistical model, in which simply regress Y_t on its one period lag value Y_{t-1}. Many variables are non stationary for this we can use Unit Root Test in order to verify its order of integration. Then, only those variables are incorporated in the study which is stationary at 1st difference I (1).

(b) Augmented Dickey- Fuller Test (ADF):

When non stationary time series are used in model one may get significant relationships for unrelated variables which lead to spurious results. The choice of drift and trend will be made on basis of Sequential Testing Strategy, described by Ender (2004). The Augmented version of Dickey Fuller Test is used for larger and complicated models which adjust the DF test from serial correlation in the error term μ_t by putting lagged values of dependent variable ΔY_t.

Table 1:

Variables with Their expected Signs:

Variables	Expected Signs
Real Agriculture Value added	- ve
Real Exchange Rate	+ ve
Real Gross Domestic Product	+ ve /-ve
Financial Market Openness	+ ve
Money& Quasi money	+ ve
Trade Openness	- ve

Table 2:

Descriptive Statistics:

Variables	Mean	Standard Deviation
Real Agriculture Value added	26.193	3.534
Real Exchange Rate	46.919	13.829
Ln Real Gross Domestic Product	10.35244	0.59623
Financial Market Openness	0.951	0.907
Ln Money & Quasi money	13.2679	1.422302
Trade Openness	34.372	3.163
Inflation rate [ΔCPI]	0.08082	0.03492
Export Openness	13.923	2.462
Import Openness	20.449	2.800

Table 3:

Results of Unit Root Tests:

Variables	Level		1st difference		Order of
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Cointegration
Real Agriculture Value added	-1.084 (-2.95) 5% Lag (1)	-2.460 (-3.55) 5% Lag (1)	-5.518* (-2.95) 5% Lag (0)	-5.419* (-3.55) 5% Lag (0)	I (1)
Real Exchange Rate	-1.720 (-2.95) 5% Lag (1)	-0.764 (-3.55) 5% Lag (1)	-5.247* (-2.95) 5% Lag (0)	-5.530* (-3.55) 5% Lag (0)	I (1)
Financial Market Openness	-1.939 (-2.95) 5% Lag (2)	-3.380 (-3.55) 5% Lag (2)	-3.876* (-2.95) 5% Lag (0)	-3.826* (-3.55) 5% Lag (0)	I (1)
Real Gross Domestic Product	-0.947 (-2.95) 5% Lag (1)	-2.237 (-3.55) 5% Lag (1)	-5.790* (-2.95) 5% Lag (0)	-5.777* (-3.55) 5% Lag (0)	I (1)
Trade Openness	-2.757 (-2.95) 5% Lag (1)	-2.775 (-3.55) 5% Lag (1)	-5.824* (-2.95) 5% Lag (0)	-5.720* (-3.55) 5% Lag (0)	I (1)
Export Openness	-2.249 (-2.95) 5% Lag (1)	-2.298 (-3.55) 5% Lag (1)	-5.017* (2.95) 5% Lag (0)	-5.041* (-3.55) 5% Lag (0)	I (1)
Import Openness	-1.727 (-2.95) 5% Lag (1)	-1.622 (-3.55) 5% Lag (1)	-6.167* (-2.95) 5% Lag (0)	-6.110* (-3.55) 5% Lag (0)	I (1)
ΔCPI/Inflation	-2.416 (-2.95) 5% Lag (2)	-2.620 (-3.55) 5% Lag (2)	-8.529* (-2.95) 5% Lag (0)	-8.446* (-3.55) 5% Lag (0)	I (1)
Money & Quasi Money	-1.217 (-2.95) 5% Lag (1)	-2.940 (-3.55) 5% Lag (1)	-3.607* (-2.95) 5% Lag (0)	-3.766* (-3.55) 5% Lag (0)	I (1)

3.4.2 <u>Multivariate Analysis</u>:

In order to find the existence and number of long-run relationship(s) the econometric framework we used in the study for analysis is the **Johansen (1998) and Johansen and Juselius (1990) Maximum Likelihood Cointegration Approach**. Two or more series are cointegrated if they observe same kind of stochastic behavior. It is statistical property of time series variables and uses when all the variables are stationary at I (1).

The cointegration approach in a multivariate system is similar to the ADF test, but requires the use of vector autoregressive (VAR). A vector autoregressive (VAR) model with a lag length of 1 was used to test for the number of cointegrating relationships between the variables. When two series are cointegrated it suggests that even both processes are non stationary, there is some long run relationship linking both series so that it is stationary. The AIC or SBC is used to determine the number of lags in the cointegration test (order of VAR). [54]

There are two likelihood ratio test statistics in the Johansen (1998) and Johansen and Juselius (1990) Maximum likelihood Cointegration Approach; the trace and the Maximum Eigenvalue both can be used to determine the existence of number of cointegrating vectors and they don't always indicated the same number of cointegrating vectors. The distribution of both test statistics is non-standard. The Trace test is a joint test with null hypothesis of number of cointegrating vectors is less than or equal to r, against alternative hypothesis that there are more then *r* cointegrating vectors. The Maximum Eigenvalue test conducted separate tests on each eigenvalue with null hypothesis that there are r cointegrating vectors exist against the alternative hypothesis that there exists $(r + 1)$.

The Johansen's maximum eigenvalue and trace tests indicate the cointegrating vector (eq's) in model and reject the null hypothesis of no cointegration at 5% significance

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[54] Gujarati, N. Damodar, Basic Econometrics (Fourth Edition).

level. Then consider the 1st cointegrating equation having normalized coefficients of all variables with standard error (S.E) in parentheses and calculate T value by dividing coefficient with S.E. T value greater then 2 indicate the significance of those variables at 5% confidence level.

3.4.3 <u>Vector Error Correction Model</u>:

A main quality of cointegrated variables is that their time paths are effected by the extent of any deviation from the long-run equilibrium (Anders, 2004). The error correction mechanism (ECM) term presents the percentage of correction to any deviation in the long-run equilibrium price in a single period and also represents how fast the deviations in the long-run equilibrium are corrected. Depending on the presence of how many cointegrating vectors, we can then test for the short run dynamics using a vector error correction model. A vector error correction model (VECM) is a process with the quality of deviation from present state means its long-run link will put into its short-run dynamics i.e.; how changes in trade openness in short run contributed to its long run relation with inflation.

4. <u>Estimation Results:</u>

The first step in cointegration analysis is to test the stationarity of variables. Table 3 in theoretical framework and methodology section presents the Results of Augmented Dickey Fuller Test. It shows that all the variables incorporated in this study are found to be stationary at first difference I(1).

To obtain optimal lag length for cointegration analysis, basically two criteria are used namely the AIC and the SBC. The SBC has suggested lag length of 1 as optimal, while the AIC indicates 3 as an optimal lag length. However, we have selected optimal lag length 1 as suggested by the SBC because when we use the lag length 3 for cointegration analysis we find no cointegrating vectors under both Trace and Max-Eigen statistics. While with lag length 1, we may obtain same and different numbers of cointegrating vectors under both these statistics.

First, we explain the results of inflation rate with openness by using the proxy of Trade ratio (Expors + Imports) from equation (a). The cointegration relationships between inflation rate, Real Agr, Real ER, Real GDP, FMO, M_2 and TO has been investigated assuming linear trend in data with an intercept in cointegrating equation using the estimation technique. Table 4.1 reports Johansen (1998) and Johansen and Juselius (1990) Maximum Likelihood Cointegration Results. The Trace statistics (λ trace) and Maximum-Eigenvalue (λ max) statistics indicate that there is Four cointegrating vectors in seven time series under both statistics.

Table 4.1:

Results of Johensen Cointegartion Test:

Sample (adjusted): 1978 2010
Included observations: 33 after adjustments
Trend assumption: No deterministic trend (restricted constant)
Series: CPI AGR ER FMO GDP TO M2
Exogenous series: D1 D2
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.880748	215.8707	134.6780	0.0000
At most 1 *	0.746474	145.6958	103.8473	0.0000
At most 2 *	0.689734	100.4103	76.97277	0.0003
At most 3 *	0.593131	61.78952	54.07904	0.0088
At most 4	0.429886	32.11385	35.19275	0.1035
At most 5	0.258014	13.57053	20.26184	0.3200
At most 6	0.106674	3.722527	9.164546	0.4550

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.880748	70.17490	47.07897	0.0000
At most 1 *	0.746474	45.28554	40.95680	0.0153
At most 2 *	0.689734	38.62077	34.80587	0.0167
At most 3 *	0.593131	29.67567	28.58808	0.0362
At most 4	0.429886	18.54332	22.29962	0.1543
At most 5	0.258014	9.848002	15.89210	0.3484
At most 6	0.106674	3.722527	9.164546	0.4550

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

We can reject the null hypothesis of no cointegrating vector in favour of four cointegrating vectors under Trace and Maximum-Eigenvalue statistics at 5 percent level of significance.

Under the assumption of no deterministic trend in data and intercept and no trend in cointegration equation, we can obtain the equation which is normalized for inflation to obtain meanings from the coefficients are given below;

CPI_t = **-0.532275** + **0.046969** $Real\ Agr_t$ + **0.011581** $Real\ ER_t$ - **0.164388** $Ln\ RealGDP_t$
 T Val   (0.2212)   (2.84315)   (4.19565)   (0.60310)

        + **0.026124** TO_t + **0.119921** FMO_t - **0.023952** $Ln\ M2_t + D_1 + D_2 + u_t$
          (6.514713)   (6.32156)   (0.34168)

[Values in parenthesis showing t statistics values]

Normalized coefficients with T value shows that except two variables all the independent variables reflect significant and standarised relationships at 5 percent level of significance. The coefficient of Trade Openness carries a positive sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in trade openness brings about 0.02612 percent increase in inflation rate. This finding is supported by the empirical results of Kim and Beladi (2005), Pehnelt (2007), Gopal (2007), Evans (2007), Razin and Loungani (2007), Berument, Dogan and Tansel (2008) and Zakaria (2010). There is significant positive long run relationship among inflation and trade openness in Pakistan and coefficient cleared that 1 percent increament in trade openness increases the inflation by 0.02612 percent. Which confirms the rejection of our null hypothesis.

The coefficient of real GDP carries a negative sign but statistically insignificant at 5 percent level of significance and shows that a 1 percent increase in real GDP brings about 0.164388 percent decrease in inflation rate. This finding is in line with Agarwal and Narayanan (2003) which shows that GDP has a significant negative effect without

dummies for country, time and exchange rate regimes. Mukhtar (2010) also supported the significant negative relationship between inflation rate and GDP such that a 0.42 percent decrease in the inflation is associated with a 1 percent increase in GDP. While, Menghan (2008) found a positive long run relationship between GDP and prices.

The coefficient of real ER carries a positive sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in real ER brings about 0.011581 percent increase in inflation rate. This finding is not supported by the results of Agarwal and Narayanan (2003) that the fixed exchange rate regime has significant negative effect on inflation if the dataset is analysed in two different time spans indicating that it is a short-run phenomenon. But, Mukhtar (2010) found a significant positive relationship between inflation rate and ER such that a 0.388 percent increase in the inflation is associated with a 1 percent increase in ER. Rogoff (1985) proposed that increased inflation has an extra cost and the optimal rate chosen by monetary authorities was lesser as the deteriorating effect on exchange rate increases.

The coefficient of real Agr carries a significant positive sign at 5 percent level of significance and shows that a 1 percent increase in real Agr brings about 0.046969 percent increase in inflation rate. This finding is in line with Hanif and Batool (2006) that growth in support prices of wheat is found to be positive and significant. And, Ashra (2002) also supported that rate of growth of agricultural output have statistically significant impact on the local inflationary process.

The coefficient of money and quasi money carries a negative sign but statistically insignificant at 5 percent level of significance, which shows that a 1 percent increase in money and quasi money brings about 0.023952 percent decrease in inflation rate. But, Agarwal and Narayanan (2003) and Ashra (2002) found a significant positive robust effect of the money growth on inflation and supports the theoretical arguments of the monetarists. Broad monetary policy increases GDP and depreciates the exchange rate, and the latter adjustment puts up import prices and inflation in proportion to the openness of the economy [Romer (1993)].

The coefficient of FMO carries a significant positive sign at 5 percent level of significance and shows that a 1 percent increase in FMO brings about 0.119921 percent increase in inflation rate. Our results are not supported by Jin (2002) which shows significant negative short-run effects of financial market openness on the growth rates of the price level. And, Badinger (2007) also found that increase in financial openness by one percentage point leads to a decrease in inflation by 0.36 percent.

Table 4.2:

Vector Error Correction Estimates:

Sample (adjusted): 1978 2010

Included observations: 33 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(CPI)	D(AGR)	D(ER)	D(FMO)	D(GDP)	D(TO)	D(M2)
CointEq1	-0.028037	-0.935177	-27.50890	2.738435	-0.057268	29.00586	0.057424
	(0.08290)	(2.63073)	(7.52778)	(1.40009)	(0.11616)	(5.25239)	(0.16119)
	[-0.33821]	[-0.35548]	[-3.65432]	[1.95591]	[-0.49302]	[5.52241]	[0.35624]
R-squared	0.423517	0.348996	0.556352	0.351405	0.325431	0.700060	0.271009
Adj. R-squared	0.161479	0.053085	0.354694	0.056589	0.018808	0.563723	-0.060351
Sum sq. resids	0.017156	17.27705	141.4653	4.893570	0.033684	68.87007	0.064866
S.E. equation	0.027925	0.886183	2.535792	0.471630	0.039129	1.769310	0.054300
F-statistic	1.616244	1.179395	2.758887	1.191945	1.061340	5.134790	0.817869
Log likelihood	77.94690	-36.14735	-70.84150	-15.33331	66.81441	-58.96425	56.00213
Akaike AIC	-4.057388	2.857415	4.960091	1.595958	-3.382691	4.240258	-2.727402
Schwarz SC	-3.558552	3.356251	5.458927	2.094794	-2.883856	4.739094	-2.228566
Mean dependent	0.001223	-0.356636	0.960455	0.030909	0.057866	0.383545	0.135430
S.D. dependent	0.030496	0.910685	3.156682	0.485569	0.039503	2.678692	0.052732

Log likelihood	45.77413
Akaike information criterion	2.316719
Schwarz criterion	6.126011

Vector error correction mechanism (VECM) term represents the speed of adjustment back to the long run relationship among the variables. Table 4.2 presents the results of the error correction model for Pakistan under study for Inflation with Trade Openness.

The estimated coefficients show the immediate impact of different independent variables i.e.; (real agriculture value added, real exchange rate, financial market openness, real GDP, trade openness, money & quasi money) on Inflation Rate. The ECM term for Pakistan is -0.028037 which is negative but insignificant in the analysis at 5 percent level of significance and suggests that inflation is corrected by 2.8037 per annum. In the short run, it can be observed that fluctuation exists in general. While, all adjustments take place with in the same or following time periods, implying that the system settles down quickly.

The coefficient of the ECT of inflation variable carries the negative sign and statistically insignificant at 5 percent level with the speed of convergence to equilibrium of 2.8037 percent. This means that, whenever there is any disturbance in the system in the long run, in every short-run period, a 2.8037 percent correction to disequilibrium will take place. More specifically, ECT coefficient shows that a deviation from the long run equilibrium value in one period is corrected in the next period by the size of the coefficient. This indicates the stability of the model.

While, FMO and M2 are statistically insignificant and TO is statistically significant but they carry a positive sign. This means that, in case of any disturbance, divergence from the equilibrium path will take place and the whole system cannot be brought to equilibrium position in each case.

Then, we explain the results of inflation rate with openness by using the proxy of Import ratio from equation (b). The cointegration relationships between inflation rate, Real Agr, Real ER, Real GDP, FMO, M2 and IO has been investigated assuming linear trend in data with an intercept in cointegrating equation using the estimation technique. Table 4.3 reports Johansen (1998) and Johansen and Juselius (1990) Maximum Likelihood Cointegration Results. The Trace statistics (λ trace) and Maximum-Eigenvalue (λ max) statistics indicate that there is Five and Three cointegrating vectors respectively in seven time series.

Table 4.3:

Results of Johensen Cointegartion Test:

Sample (adjusted): 1978 2010

Included observations: 33 after adjustments

Trend assumption: No deterministic trend (restricted constant)

Series: CPI AGR ER FMO GDP IO M2

Exogenous series: D1 D2

Warning: Critical values assume no exogenous series

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.867646	224.8148	134.6780	0.0000
At most 1 *	0.764597	158.0797	103.8473	0.0000
At most 2 *	0.709751	110.3466	76.97277	0.0000
At most 3 *	0.565693	69.52506	54.07904	0.0012
At most 4 *	0.499353	42.00292	35.19275	0.0079
At most 5	0.366420	19.17173	20.26184	0.0701
At most 6	0.117143	4.111529	9.164546	0.3958

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.867646	66.73508	47.07897	0.0001
At most 1 *	0.764597	47.73309	40.95680	0.0075
At most 2 *	0.709751	40.82153	34.80587	0.0085
At most 3	0.565693	27.52215	28.58808	0.0679
At most 4 *	0.499353	22.83119	22.29962	0.0421
At most 5	0.366420	15.06020	15.89210	0.0672
At most 6	0.117143	4.111529	9.164546	0.3958

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

We can reject the null hypothesis of no cointegrating vector in favour of five and three cointegrating vectors under Trace and Maximum-Eigenvalue statistics at 5 percent level of significance.

Under the assumption of no deterministic trend in data and intercept and no trend in cointegration equation, we can obtain the equation which is normalized for inflation to obtain meanings from the coefficients are given below;

$$CPI_t = 5.861244 + 0.083002\ Real\ Agr_t + 0.051451\ Real\ ER_t - 1.356627 LnRealGDP_t$$
T Val   (1.30466)   (2.62664)   (7.24647)   (2.59487)

$$+ 0.078529\ IO_t + 0.226791\ FMO_t + 0.162824\ Ln\ M_{2t} + D_1 + D_2 + u_t$$
        (6.858427)   (4.760495)   (1.14500)

[Values in parenthesis showing t statistics values]

Normalized coefficients with T value shows that except M_2 all the independent variables reflect significant and standarised relationships at 5 percent level of significance. The coefficient of Import Openness carries a positive sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in import openness brings about 0.078529 percent increase in inflation rate and confirmed that if imports share rises in total trade then it positively effect inflation.

These results are not in line with the empirical results of Berument, Dogan and Tansel (2008) as coefficients of Import openness is negative which suggests that higher import openness decreases inflation volatility for Jordan and Morocco and this effect is statistically significant just for Jordan. However, it is positive for the other two countries but statistically significant just for Turkey. While, Chung-Shu Wu and Jin-Lung Lin (2006) supports positive relationships between import openness and inflation without constant constraint.

But, Agarwal and Narayanan (2003) shows the mixed results that before 1989 only fixed exchange rate regime had significant negative effect on inflation and after 1989 openness had significant negative effect on inflation. There is positive long run relationship among inflation and import openness in Pakistan and coefficient cleared that 1 percent increment in import openness increases the inflation by 0.078529 percent. Which reflects that imported inflation increases in Pakistan because of increase in demands of imports and confirmed the rejection of our null hypothesis.

The coefficient of real GDP carries a negative sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in real GDP brings about 1.356627 percent decrease in inflation rate. This finding is supported by Agarwal and Narayanan (2003) which shows that GDP has a significant negative effect without dummies for country, time and exchange rate regimes. And, Mukhtar (2010) also support a significant negative relationship between inflation rate and GDP such that a 0.42 percent decrease in the inflation is associated with a 1 percent increase in GDP. While, Menghan (2008) found positive long run relationship between GDP and prices.

The coefficient of real ER carries a positive sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in real ER brings about 0.051451 percent increase in inflation rate. This is not supported by Agarwal and Narayanan (2003) that the fixed exchange rate regime has significant negative effect on inflation if the dataset is analysed in two different time spans indicating that it is a short-run phenomenon. But, Mukhtar (2010) supports our results that there exists significant positive relationship between inflation rate and ER such that a 0.388 percent increase in the inflation is associated with a 1 percent increase in ER. Rogoff (1985) proposed that increased inflation has an extra cost and the optimal rate chosen by monetary authorities was lesser as the deteriorating effect on exchange rate increases.

The coefficient of real Agr carries a significant positive sign at 5 percent level of significance and shows that a 1 percent increase in real Agr brings about 0.083002 percent increase in inflation rate. This finding is in line with Hanif and Batool (2006)

that growth in support prices of wheat is found to be positive and significant. And, Ashra (2002) also supported that rate of growth of agricultural output have statistically significant impact on the local inflationary process.

The coefficient of money and quasi money carries a positive sign but statistically insignificant at 5 percent level of significance, which shows that a 1 percent increase in money and quasi money brings about 0.162824 percent increase in inflation rate. Our results are supported by Agarwal and Narayanan (2003) and Ashra (2002) that a significant positive robust effect of the money growth on inflation which also supports the theoretical arguments of the monetarists. Broad monetary policy increases GDP and depreciates the exchange rate, and the latter adjustment puts up import prices and inflation in proportion to the openness of the economy [Romer(1993)]. This shows that money remains an important factor of the inflationary process in pakistan.

The coefficient of FMO carries a significant positive sign at 5 percent level of significance and shows that a 1 percent increase in FMO brings about 0.226791 percent increase in inflation rate. Our results are not supported by Jin (2002) which shows significant negative short-run effects of financial market openness on the growth rates of the price level. And, Badinger (2007) also found that increase in financial openness by one percentage point leads to a decrease in inflation by 0.36 percent.

Table 4.4:

Vector Error Correction Estimates:

Sample (adjusted): 1978 2010

Included observations: 33 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(CPI)	D(AGR)	D(ER)	D(FMO)	D(GDP)	D(IO)	D(M2)
CointEq1	0.027670	0.223952	-4.571406	0.815417	-0.025212	7.818929	0.058026
	(0.02780)	(0.89074)	(3.07097)	(0.48254)	(0.03925)	(1.51724)	(0.05339)
	[0.99534]	[0.25142]	[-1.48859]	[1.68983]	[-0.64236]	[5.15338]	[1.08688]
R-squared	0.435245	0.349867	0.356825	0.328866	0.329130	0.655134	0.303403
Adj. R-squared	0.178538	0.054352	0.064473	0.023805	0.024189	0.498376	-0.013232
Sum sq. resids	0.016807	17.25394	205.0881	5.063619	0.033499	50.06104	0.061983
S.E. equation	0.027639	0.885590	3.053225	0.479755	0.039022	1.508477	0.053079
F-statistic	1.695496	1.183921	1.220533	1.078035	1.079322	4.179282	0.958211
Log likelihood	78.28604	-36.12527	-76.96935	-15.89694	66.90513	-53.70111	56.75213
Akaike AIC	-4.077942	2.856077	5.331476	1.630118	-3.388190	3.921279	-2.772856
Schwarz SC	-3.579106	3.354913	5.830311	2.128953	-2.889354	4.420115	-2.274021
Mean dependent	0.001223	-0.356636	0.960455	0.030909	0.057866	0.197667	0.135430
S.D. dependent	0.030496	0.910685	3.156682	0.485569	0.039503	2.129852	0.052732

Log likelihood	47.18286
Akaike information criterion	2.231342
Schwarz criterion	6.040634

Vector error correction mechanism (VECM) term represents the speed of adjustment back to the long run relationship among the variables. Table 4.4 presents the results of the error correction model for Pakistan under study for Inflation with Import Openness. The estimated coefficients show the immediate impact of different independent

variables i.e.; (real agriculture value added, real exchange rate, financial market openness, real GDP, import openness, money & quasi money) on Inflation Rate. The coefficient of the ECT of inflation variable carries the positive sign and statistically insignificant at 5 percent level and suggests that long-run equilibrium conditions of inflation does not influence the short-run dynamics in Pakistan with import openness which indicates the instability of the model.

While, the coefficients of the ECTs of import openness, FMO, Agr and M2 carries a positive sign but except import openness all others are statistically insignificant at 5 percent level of significance. This means that, in case of any disturbance, divergence from the equilibrium path will take place and the whole system cannot be brought to equilibrium position in each case.

Lastly, we explain the results of inflation rate with openness by using the proxy of Export ratio from equation (c). The cointegration relationships between inflation rate, Real Agr, Real ER, Real GDP, FMO, M2 and EO has been investigated assuming linear trend in data with an intercept in cointegrating equation using the estimation technique. Table 4.5 reports Johansen (1998) and Johansen and Juselius (1990) Maximum Likelihood Cointegration Results. The Trace statistics (λ trace) and Maximum-Eigenvalue (λ max) statistics indicate that there is same Five cointegrating vectors in seven time series.

Table 4.5:

Results of Johensen Cointegartion Test:

Sample (adjusted): 1978 2010

Included observations: 33 after adjustments

Trend assumption: No deterministic trend (restricted constant)

Series: CPI AGR ER FMO GDP EO M2

Exogenous series: D1 D2

Warning: Critical values assume no exogenous series

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.885132	240.9189	134.6780	0.0000
At most 1 *	0.806458	169.5078	103.8473	0.0000
At most 2 *	0.721359	115.3132	76.97277	0.0000
At most 3 *	0.637892	73.14469	54.07904	0.0004
At most 4 *	0.508247	39.62288	35.19275	0.0156
At most 5	0.282838	16.20021	20.26184	0.1652
At most 6	0.146544	5.229223	9.164546	0.2592

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.885132	71.41110	47.07897	0.0000
At most 1 *	0.806458	54.19465	40.95680	0.0010
At most 2 *	0.721359	42.16848	34.80587	0.0056
At most 3 *	0.637892	33.52182	28.58808	0.0107
At most 4 *	0.508247	23.42267	22.29962	0.0347
At most 5	0.282838	10.97099	15.89210	0.2540
At most 6	0.146544	5.229223	9.164546	0.2592

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

We can reject the null hypothesis of no cointegrating vector in favour of five cointegrating vectors under both Trace and Maximum-Eigenvalue statistics at 5 percent level of significance.

Under the assumption of no deterministic trend in data and intercept and no trend in cointegration equation, we can obtain the equation which is normalized for inflation to obtain meanings from the coefficients are given below;

CPI_t = -**1.186288** + **0.008447** $Real\ Agr_t$ - **0.007104** $Real\ ER_t$ + **0.158709** $LnRealGDP_t$

T Val   (0.74645)   (0.87443)   (3.01016)   (0.807602)

+ **0.039428** EO_t + **0.025796** FMO_t - **0.053897** $Ln\ M2_t$ + D_1 + D_2 + u_t

(9.00182)   (1.92107)   (1.03608)

[Values in parenthesis showing t statistics values]

Normalized coefficients with T value shows that only Real ER and EO reflects insignificant relationships at 5 percent level of significance. The coefficient of Export Openness carries a positive sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in export openness brings about 0.039428 percent increase in inflation rate. This finding is not supported by empirical results of Berument, Dogan and Tansel (2008) as export openness reduces inflation for all Middle East and North African (MENA) countries. While, Agarwal and Narayanan (2003) shows the mixed results that before 1989 only fixed exchange rate regime had significant negative effect on inflation and after 1989 openness had significant negative effect on inflation.

But, Ashra (2002) shows that openness has significant positive effects on inflation no matter either an economy is experiencing hyper-inflation or it is large. There is positive long run relationship among inflation and export openness in Pakistan and coefficient cleared that a 1 percent increment in export openness increases the inflation by 0.039428 percent.

The coefficient of real GDP carries a positive sign and statistically insignificant at 5 percent level of significance, which shows that a 1 percent increase in real GDP brings about 0.158709 percent increase in inflation rate. These results are supported by Menghan (2008) which shows positive long run relationship between GDP and prices. While, Agarwal and Narayanan (2003) shows that GDP has a significant negative effect without dummies for country, time and exchange rate regimes. Mukhtar (2010) also found a significant negative relationship between inflation rate and GDP such that a 0.42 percent decrease in the inflation is associated with a 1 percent increase in GDP.

The coefficient of real ER carries a negative sign and statistically significant at 5 percent level of significance, which shows that a 1 percent increase in real ER brings about 0.007104 percent decrease in inflation rate. This finding is supported by Agarwal and Narayanan (2003) that the fixed exchange rate regime has significant negative effect on inflation if the dataset is analysed in two different time spans indicating that it is a short-run phenomena. But, Mukhtar (2010) found a significant positive relationship between inflation rate and ER such that a 0.388 percent increase in the inflation is associated with a 1 percent increase in ER. Rogoff (1985) proposed that increased inflation has an extra cost and the optimal rate chosen by monetary authorities was lesser as the deteriorating effect on exchange rate increases.

The coefficient of real Agr carries a positive sign but statistically insignificant at 5 percent level of significance and shows that a 1 percent increase in real Agr brings about 0.008447 percent increase in inflation rate. This finding is in line with Hanif and Batool (2006) that growth in support prices of wheat is found to be positive and significant. And, Ashra (2002) also supported that rate of growth of agricultural output have statistically significant impact on the local inflationary process.

The coefficient of money and quasi money carries a negative sign but statistically insignificant at 5 percent level of significance, which shows that a 1 percent increase in money and quasi money brings about 0.053897 percent increase in inflation rate. While, both Agarwal and Narayanan (2003) and Ashra (2002) found a significant

positive robust effect of the money growth on inflation and supports the theoretical arguments of the monetarists. Broad monetary policy increases GDP and depreciates the exchange rate, and the latter adjustment puts up import prices and inflation in proportion to the openness of the economy [Romer (1993)].

The coefficient of FMO carries a positive sign but statistically insignificant at 5 percent level of significance and shows that a 1 percent increase in FMO brings about 0.025796 percent increase in inflation rate. Our results are not supported by Jin (2002) which shows significant negative short-run effects of financial market openness on the growth rates of the price level. And, Badinger (2007) also found that increase in financial openness by one percentage point leads to a decrease in inflation by 0.36 percent.

Table 4.6:

Vector Error Correction Estimates:

Sample (adjusted): 1978 2010

Included observations: 33 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(CPI)	D(AGR)	D(ER)	D(FMO)	D(GDP)	D(EO)	D(M2)
CointEq1	-0.153528	-4.233552	-39.13288	-1.464104	-0.085179	14.03171	-0.129073
	(0.10783)	(3.54291)	(9.65583)	(2.02344)	(0.15620)	(4.06751)	(0.21581)
	[-1.42377]	[-1.19494]	[-4.05277]	[-0.72357]	[-0.54534]	[3.44971]	[-0.59809]
R-squared	0.464447	0.351718	0.599227	0.256195	0.330313	0.521688	0.282571
Adj. R-squared	0.221013	0.057045	0.417058	-0.081898	0.025910	0.304273	-0.043533
Sum sq. resids	0.015938	17.20481	127.7938	5.611915	0.033440	22.67709	0.063837
S.E. equation	0.026915	0.884328	2.410147	0.505061	0.038987	1.015272	0.053867
F-statistic	1.907900	1.193586	3.289396	0.757764	1.085118	2.399505	0.866504
Log likelihood	79.16204	-36.07821	-69.16449	-17.59332	66.93427	-40.63496	56.26592
Akaike AIC	-4.131033	2.853225	4.858454	1.732928	-3.389956	3.129391	-2.743389
Schwarz SC	-3.632197	3.352061	5.357290	2.231764	-2.891120	3.628227	-2.244553
Mean dependent	0.001223	-0.356636	0.960455	0.030909	0.057866	0.186000	0.135430
S.D. dependent	0.030496	0.910685	3.156682	0.485569	0.039503	1.217203	0.052732

Log likelihood	75.79644
Akaike information criterion	0.497185
Schwarz criterion	4.306477

Vector error correction mechanism (VECM) term represents the speed of adjustment back to the long run relationship among the variables. Table 4.6 presents the results of the error correction model for Pakistan under study for Inflation with Export Openness. The estimated coefficients show the immediate impact of different independent variables i.e.; (real agriculture value added, real exchange rate, financial market

openness, real GDP, export openness, money & quasi money) on Inflation Rate. The ECM term for Pakistan is -0.153528 which is negative and insignificant at 5 percent level of significance in the analysis and suggests that inflation is corrected by 15.3528 per annum. In the short run, it can be observed that fluctuation exists in general. While, all adjustments take place with in the same or following time periods, implying that the system settles down quickly.

The coefficient of the ECT of inflation variable carries the negative sign and statistically insignificant at 5 percent level with the speed of convergence to equilibrium of 15.3528 percent. This means that, whenever there is any disturbance in the system in the long run, in every short-run period, a 15.3528 percent correction to disequilibrium will take place. More specifically, ECT coefficient shows that a deviation from the long run equilibrium value in one period is corrected in the next period by the size of the coefficient. This indicates the stability of the model.

While, the coefficients of the ECTs of export openness carries a positive sign and real ER carries a negative sign but they both are statistically significant at 5 percent level of significance. While, all others variables carries a negative sign and statistically insignificant. This means that, in case of any disturbance, divergence from the equilibrium path will take place and the whole system cannot be brought to equilibrium position in each case.

5. <u>Conclusion</u>:

The paper empirically explores the relationship between trade openness and inflation in Pakistan using annual time series data for the period of 1976 to 2010. Since Pakistan's economy has a considerable degree of trade openness, the local price level cannot remain immune from abroad shocks. The expected empirical findings shows that there is a significant positive long-run relationship between inflation and trade openness, import openness and export openness which rejects the existence of Romer's hypothesis in Pakistan.

The positive insignificant effect of money and quasi money on inflation with import openness proxy is somehow follows the monetarists who argue money to be the most important variable influencing the inflationary process. An increase in the development level of the country and a shift from fixed to flexible exchange rate regime are also found to put up the country's inflation rate.

The study also shows the significant positive effect of financial market openness (FMO) on inflation with trade and import openness proxy as capital account liberalization implements which should create openness, then 'financial integration' will gradually be obtained. As, Pakistan has rich agriculture base with large share of agri-products in exports and real agriculture value added also shows the significant positive effect on inflation with trade and import openness proxy.

The study shows the significant positive effect of Real ER on inflation with trade and import openness proxy. This implies that it is not advisable for policymakers to implement a flexible exchange rate system because that could lead to a major depreciation that would create inflationary problems. The challenges for the future is to find ways of combine flexible exchange rate with low inflation in Pakistan.

The positive relationship between openness and inflation is bound to have vast reaching implications for policy makers in Pakistan having some for the development purposes.

Specifically, it will have implications for the optimum trade policy (inward looking versus outward looking policies) and the optimal capital accumulation strategy. Large inflation discourages local capital accumulation, while high capital accumulation is needed for development. So, it will turn out that outward looking trade policy may not be reliable as it is inflationary.

Finally, the short-run analysis by using a VECM suggests that long-run equilibrium condition does not influence the short-run dynamics by using the Import Openness proxy. However, the result for Trade and Export Openness proxy confirms that the Inflation Rate has an automatic adjustment mechanism and that the economy responds to deviations from equilibrium in a balancing manner. Since, inflation is one of the hurdel on the way of development for the country, it should also be controlled by non monetary and non fiscal measures e.g. increase in volume of production, rationing policy, sound managerial and financial system, etc.

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