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Regional Macroeconomic Model for Pakistan

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In this study we estimated the regional Macro econometric-trading model for Pakistan. Where we defined the region by taking the countries as Pakistan, India, Sri Lanka and Bangladesh. We took China as the major trading partner in this study. Our query was to estimate the macroeconomietric model at the regional level and see if regional variables are playing a role in cross regional macroeconomic performance and should they be considered while making policies. We developed a number of variables by taking their regional weights. We constructed production, aggregate demand, trade and aggregate supply block respectively. We used GMM for estimating the model and since we have number of equations will use system GMM. Since we have time series data, we tested the time series properties through Panel ADF for the variables and saw that there was different order of integration, hence we proceeded to see the short and the long-term relationships by applying ARDL and ECM within system GMM. We took the data from 1971-2015. From the results in most cases Macro variables are affected by the regional variables. But in our model China, as a singular country did not affect regional variables, although gets affected by them. So, it could be deduced that policy makers do need to consider how regional variables act and should be considered by policy makers to create policies accordingly.

INTRODUCTION

Trade is basically the action of buying and selling of goods. Humans are limited in their capability of production and so are the countries. Thus, they need to rely on each other to fulfill their demands. In the beginning, barter trade system was used and then with the evolution came the usage of money. It has been seen the countries that have trade openness perform well e.g. South Korea in contrast to North Korea (Noland, 2012). Trade helps the developing countries in a lot of ways e.g. Increases choices and competition, reduces poverty, strengthen ties, enhances employment opportunities etc. There are many such examples; e.g. Kastelle and Liesch (2013) reflected on trade's importance for economic development in case of Australia and Belloumi (2014) estimated the impact of trade openness on FDI and economic growth for the case study of Tunisia.

Pakistan faced problems in trying to stabilize itself after getting independence in 1947.Pakistan being a very resourceful country relied and still does rely on its agriculture sector more than its industrial sector. During the 60's Pakistan had amazing economic growth with industrialization happening and other countries adapted its economic management plans such as South Korea adapted the five-year plan of Pakistan. There was trade openness and Pakistan had an amazing growth rate, but it declined after the war of 71 where Bangladesh got separated and there was a period of recession. After that with changing governments, the policies kept changing, e.g. first there was nationalization, which was followed by privatization and liberalization. But the ongoing political changes did impact the growth of Pakistan and not in a positive way and hence also the trade. The industrialization that was booming in the 60's slowed down a lot and again Pakistan's major export became low value-added agriculture-based goods. Pakistan has different preferential trade agreements besides being a member of WTO; like Pakistan-Afghanistan transit trade agreement, South Asian free trade Agreement which involves India, Bangladesh and Sri Lanka among many other countries. Most recently there is a talk of developing regional blocks like ASEAN as due to USA backing from WTO world is moving towards regional trade. We now live in a global village where everyone is connected to everyone. With the emergence of regional trade agreements, this question is not just limited to countries but has rather become a regional phenomenon that change in regions could affect a country and vice versa or not.

Different macroeconomic models are available which considers regional variables e.g. Regional trading models for Central America and Dominican Republic (Iraheta and Carlos, 2007). These can be used as to create regional macro econometric trade model. There are studies available such as Hanif et al. (2010) gave a small macroeconomietric model for Pakistan economy using OLS method. So work was done in this area keeping in mind the need for a regional trading model. This kind of model is important so that it could be known that if the shifts in other economies is really something to be looked upon. With CPEC investments in Pakistan, China has become of even more importance to us and hence it needs to be seen if its domestic macroeconomic shocks would affect Pakistan economy. This shock transmission could also be seen in the entire region, since we all are connected through trade so there could be indirect affects as well. Regional trade models are important because since we all are connected, so it's important to see whether the shock in a country would impact another country and the region. So that countries can create policies to prevent from going into a downfall. There have been enough huge economic catastrophes in the past like the great depression and the recent recession, to say that it is imperative for countries to know that whether it's the internal shocks only or the surrounding shocks too that can affect them and this is where the regional trade model steps in. Like China undermines its

currency which in turn increases its exports since it's cheaper and that impacts the exports of the other countries, since countries prefer to do trade with it rather than the others. Hence, we can see that policy of one country has a ripple effect on the rest of the countries and thus to see such that if this prevails and for which variables does it hold, there is a need for regional trade model.

Section following contains brief and pioneering literature review where we see the literature related to the same issue and the literature related to methodology. Then next section contains the theoretical framework followed by data and the methodology. The next section will contain the estimations and result followed by the conclusion.

LITERATURE REVIEW

Crow (1973) developed the annual macro econometric model of large open region i.e. the northeast corridor of the United States. It was constructed within the framework of income and product account. The model was compatible with national macro econometric models. The data was taken from 1949 to 1963 for north, central and southern regions and equation with endogeneity were estimated by using two stage least square method (TSLS). Simulations were then taken from 1952 to 1965. It became clear that one could never complete a large macroeconomic model but despite that for open regions, this model had a lot to offer as a tool to help and for research and shortcomings could be eradicated. Iraheta and Carlos (2007) studied the regions of Central America and Dominican Republic and gave a regional macro model. He took the data from 1960-2006. The approach adapted was Keynesian, thus it was demand oriented. He firstly checked the time series properties for them followed by applying Johansen cointegrtion and then applied ECM. After that made simultaneous equations and solved them to find a model which was used further for forecasting and to analyze the shocks. It was seen that the inflation in these regions declined in 2007 but picked up again in 2008.

Benedictow (2008) created a small macro econometric model of US economy which was made to work with FRISBEE (a model of international oil market). The aim was to facilitate the interaction between oil market and the surrounding macro environment for forecasting as well as historical comparison. It was seen that oil prices have significant effect on the model i.e. when oil prices were increased by 10% it led to higher inflation, lower household consumption and GDP and higher unemployment.

Sargent (1976) wanted to reject a model with classical assumption and tested a macroeconomic model with classic assumptions and Keynesian properties and evidence to reject model came but was too little. Kasimati (2006) examined the impact of Olympic games 2004 Athens on the Greek economy by using an aggregate macro econometric model. Rahman and Khatoon (2011) estimated a macroeconometric model for Bangladesh economy. Huang and Zhenxi (2014) saw that with globalization and integration in regions, regional markets erupted with a common ground for currency, through which investors could trade freely among markets. Belloumi (2014) saw that relationship between foreign direct investment (FDI), trade openness and economic growth. He examined this issue for Tunisia by applying the bounds testing (ARDL) approach to cointegration for the period from 1970 to 2008. The results indicated that there was no significant Granger causality from FDI to economic growth, from economic growth to FDI, from trade to economic growth and from economic growth to trade in the short run. Even though there was a widespread belief that FDI could generate positive spillover externalities for the host country, his empirical results failed to confirm this belief for the case of Tunisia. Allen et al. (2014) carried a study of volatility spillover effects from Australia's main trading partners, which were, Japan, US, China and the Korea, from 12th September 2002 till 9th September 2012.They used VAR.

RESEARCH METHODOLOGY

Theoretical Framework

Keeping in mind that we are going to work with the regional macro model we have taken the regional variables of Pakistan, Bangladesh, Sri Lanka and India. While have taken China as the major country with whom trade is being done by all these. Time period is taken from 1971-2015 with annual frequency of data. We have constructed a regional model for these countries using the methodology proposed by Iraheta and Carlos (2007). The equations (behavioral equations) that we are going to use are as following:

Production Block.

Output is defined as: $Y_t = f(y_t^*, RF_t, I_t)$

where

Y_t is regional GDP

y_t^* is GDP of china

RF_t is the regional broad money

I_t is the regional gross fixed capital formation

Aggregate Demand Block:

The investment function is given as: $I_t = f(y_t, i_t, RISK, RF_t)$

where

I_t is the regional gross fixed capital formation

y_t is regional GDP

i_t is the interest rate

$RISK$ is risk due to price changes

RF_t is the regional broad money

The consumption function is given as: $C_t = f(IND_t, i_t, RISK, RF_t)$

where

C_t is the consumption

IND_t is the disposable income

i_t is the interest rate

$RISK$ is risk due to price changes

RF_t is the regional broad money

Trade Block.

The export function is given as: $X_t = f(y_t, TI_t)$

where

X_t is exports at constant prices

y_t is regional GDP

TI_t is term of trade

The import function is defined as: $M_t = f(Y, TI)$

where

M_t is the imports at constant price

Y is regional GDP

TI is term of trade

Aggregate Supply Block: (using Phillips curve)

The price function: $P_t = f(p_t^*, TCN_t, Y_t^{gap})$

where

P_t is regional price

p_t^* is the prices of trading partners

TCN_t is region's nominal exchange rate

Y_t^{gap} is output gap

Data Description and Source

We took the data from World Bank, IMF, OECD and data stream for China, India, Pakistan, Sri -Lanka and Bangladesh. We took the annual data from 1971-2015 for our estimations.

The variables we used are as follows: regional GDP, GDP of China, regional broad money, interest rate, risk (international oil prices deflated by regional CPI), regional nominal exchange rate, regional CPI, Pakistan CPI, regional gross fixed capital formation, disposable income for China, current transfers for China, Consumption, regional Exports, Term of trade for China, real interest rate for China, imports for China, nominal exchange rate, regional prices and output gap.

We made the regional variables using aggregate data from Pakistan, India, Sri Lanka and Bangladesh. China was not taken as the part of the regional variable but rather an independent variable to create a regional trade model. The GDP deflator data was taken from WDI (for Pakistan, India, Sri Lanka and Bangladesh) and were converted into same base year (2010). Real GDP for each country was estimated using these deflators. To estimate the regional GDP weights of the economy size was used.

For inflation we took the CPI for each country from WDI and made their base years same i.e. 2010. Again, to create the regional CPI weights for respective economy was used i.e. for Pakistan, India, Bangladesh and Sri Lanka. We got the term of trade data from WDI. Again, same procedure was applied to obtain regional term of trade. Real exchange rates are taken from WDI and using each country CPI, the estimated regional CPI the real GDP weights regional nominal exchange rate is estimated.

To make regional broad money (for Pakistan, India, Sri Lanka and Bangladesh), we took the broad money data from WDI for each country. Then using the weights regional broad money is developed. Finally, for regional gross capital formation (for Pakistan, India, Sri Lanka and Bangladesh), we took the gross capital formation data from WDI and after converting them to common base years regional gross capital formation is calculated using the GDP weights.

Econometric Methodology

The next step after the creation of regional variables is to see unit roots in these time series data. This was mandatory so to see the order of integration, which would pave the way for further co integration testing. The unit root testing is done by Augmented dickey fuller test.

In ADF *p=0 is still tested and follow the same asymptotic distribution as DF statistic.* H_0*:* $p_1 = 0$*(p ~I(1)), against* H_a *:* $p < 0$*(p ~I(0)).*

From these tests we saw that all of our variables were either integrated of order I (0) and I(1) thus we proceeded to applying ARDL and ECM. Secondly, we also faced the problem of endogeneity, for which we used system GMM due to system of equations. We will be able to see the long and short run relationships of the variables. Endogeneity is a problem occurs when an explanatory variable is correlated with error term. Since we have the problem of endogeneity, we need to correct this, and for this we move towards GMM. Since we have number of equations, hence system GMM is used. In econometrics and statistics, the generalized method of moments (GMM) is a generic method for estimating parameters in statistical models.

Econometric Model

Here we will represent the econometric model by using the behavioral functions explained earlier. We will define their instruments and finally give a matrix representation for simplification.

Production block

$$Y_t = \phi_1 + \alpha_1 y_t^* + \beta_1 RF_t + \gamma_1 I_t + \varepsilon_{i1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

$$Y_{i1} = \phi_1 + \alpha_1 y_i^* + \beta_1 RF_i + \gamma_1 I_i + \varepsilon_{i1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

$$y_{i1} = z_{i1}'\delta_1 + \varepsilon_{i1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

$$z_{i1} = [1, y_i^*, RF_i, I_i]'\delta_1 = [\phi_1, \alpha_1, \beta_1, \gamma_1]' L_1 = [Y_{i1}, y_i^*, RF_i, I_i, Y_{i1}(-1), I_i(-1)]$$

$$y_1 = Z_1\delta_1 + \varepsilon_1 \dots\dots\dots\dots\dots\dots (4)$$

Where L_1 represents instruments.

The variables that are possible concern of endogeneity are regional GDP along with regional gross fixed capital formation. Due to same level of integration for this block we used ECM.

Aggregate Demand Block:

Investment function:

$$I_t = \phi_2 + \alpha_2 y_t + \beta_2 i_t + \gamma_2 RISK + \pi_2 RF_t + \varepsilon_{i2} \dots\dots\dots\dots\dots (5)$$

$$Y_{i2} = \phi_2 + \alpha_2 y_i + \beta_2 i_i + \gamma_2 RISK_i + \pi_2 RF_i + \varepsilon_{i2} \dots\dots\dots\dots (6)$$

$$y_{i2} = z_{i2}'\delta_2 + \varepsilon_{i2} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

$$z_{i2} = [1, y_i, i_i, RISK_i, RF_i]'\delta_2 = [\phi_2, \alpha_2, \beta_2, \gamma_2, \pi_2]'$$

$$L_2 = [Y_{i2}, y_i, i_i, RISK_i, RF_i, Y_{i2}(-1), y_i(-1), RF_i(-1)]$$

$$y_2 = Z_2\delta_2 + \varepsilon_2 \dots\dots\dots\dots\dots (8)$$

Where L_2 represents instruments. Interest rate here is the real interest rate. Regional gross capital formation and regional GDP are creating endogeneity here. The broad money RF is used and regional CPI in deflating oil prices and since it's used as dependent in price function, hence it's also creating endogeneity. Based on level of integration, we used ARDL.

Consumption function:

$$C_t = \phi_3 + \alpha_3 IND_t + \beta_3 i_t + \gamma_3 RISK + \pi_3 RF_t + \varepsilon_{i3} \dots\dots\dots (9)$$

$$Y_{i3} = \phi_3 + \alpha_3 IND_i + \beta_3 i_i + \gamma_3 RISK_i + \pi_3 RF_i + \varepsilon_{i3} \dots\dots\dots (10)$$

$$y_{i3} = z_{i3}'\delta_3 + \varepsilon_{i3} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (11)$$

$$z_{i3} = [1, IND_i, i_i, RISK_i, RF_i]'\delta_3 = [\phi_3, \alpha_3, \beta_3, \gamma_3, \pi_3]'$$

$$L_3 = [Y_{i3}, IND_i, i_i, RISK_i, RF_i, RF_i(-1)]$$

$$y_3 = Z_3\delta_3 + \varepsilon_3 \dots\dots\dots\dots\dots\dots\dots\dots (12)$$

Where L_3 represents instruments. Oil prices not used as a whole variable but rather as part of the function. Broad money is used as regional CPI and hence it is creating endogeneity. Interest rate is the real interest rate. Due to different level of integration, we used ARDL.

Trade block

Export function:

$$X_t = \phi_4 + \alpha_4 y_t^* + \beta_4 TI_t + \varepsilon_{i4} \dots\dots\dots\dots\dots\dots (13)$$

$$Y_{i4} = \phi_4 + \alpha_4 y_i^* + \beta_4 TI_i + \varepsilon_{i4} \dots\dots\dots\dots\dots\dots (14)$$

$$y_{i4} = z_{i4}'\delta_4 + \varepsilon_{i4} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (15)$$

$$z_{i4} = [1, y_i^*, TI_i]'\delta_4 = [\phi_4, \alpha_4, \beta_4]'$$

$$L_4 = [Y_{i4}, y_t, TI_i]$$

$$y_4 = Z_4\delta_4 + \varepsilon_4 \dots\dots\dots\dots\dots (16)$$

Where L_4 represents instruments. Due to same level of integration, we used ECM.

Import function:

$$M_t = \phi_5 + \alpha_5 Y + \beta_5 TI + \varepsilon_{i5} \dots\dots\dots\dots\dots\dots\dots (17)$$

$$Y_{i5} = \phi_5 + \alpha_5 Y_i + \beta_5 TI_i + \varepsilon_{i5} \dots\dots\dots\dots\dots\dots\dots (18)$$

$$y_{i5} = z'_{i5}\delta_5 + \varepsilon_{i5} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (19)$$

$$z_{i5} = [1, Y_i, TI_i]'\delta_5 = [\phi_5, \alpha_5, \beta_5]'$$

$$L_5 = [Y_{i5}, Y_i, TI_i, Y_i(-1), TI_i(-1)]$$

$$y_5 = Z_5\delta_5 + \varepsilon_5 \dots\dots\dots\dots (20)$$

where L_5 represents instruments. Term of trade has price effect, so in its place regional CPI is used. Therefore, this and Regional GDP both create endogeneity. Due to same level of integration, we used ECM.

Aggregate Supply Block

Price Function:

$$P_t = \phi_6 + \alpha_6 p_t^* + \beta_6 TCN_t + \gamma_6 y_t^{gap} + \varepsilon_{i6} \dots\dots\dots (21)$$

$$Y_{i6} = \phi_6 + \alpha_6 p_i^* + \beta_6 TCN_i + \gamma_6 y_i^{gap} + \varepsilon_{i6} \dots\dots\dots (22)$$

$$y_{i6} = z'_{i6}\delta_6 + \varepsilon_{i6} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (23)$$

$$z_{i6} = \left[1, p_i^*, TCN_i, y_i^{gap}\right]'\delta_6 = [\phi_6, \alpha_6, \beta_6, \gamma_6]'$$

$$L_6 = [Y_{i6}, p_i^*, TCN_i, y_i^{gap}, Y_{i6}(-1)]$$

$$y_6 = Z_6\delta_6 + \varepsilon_6 \dots\dots\dots\dots (24)$$

Where L_6 represents instruments. Instead of prices CPI are used, and so this and regional CPI create endogeneity. Based on same level of integration, we used ECM. So, its matrix representation would be as follows:

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \end{bmatrix} = \begin{bmatrix} Z_1 & & & & & \\ & Z_2 & & & & \\ & & Z_3 & & & \\ & & & Z_4 & & \\ & & & & Z_5 & \\ & & & & & Z_6 \end{bmatrix} \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix}$$

DESCRIPTIVE AND EMPIRICAL ANALYSES

Time Series Properties of Variables

Here we applied the augmented Dickey Fuller test, to check the order of integration of the variables. GDP-China(Y), regional GDP(RY), Regional gross capital formation (RK), regional broad money(RBM), international oil prices (ROP), exports (EX), term of trade (T), imports (M), regional consumer price index(RCPI), consumption(HHC), National disposable income (NDI), regional nominal exchange (RNE), CPI(Pakistan-PC), output gap(OG) have order of integration I(1), whereas real interest rate (RIR) and nominal interest rate have I(0).

The functions containing the I(0) and the I(1) order of integration among the variables would be used in ARDL method and the functions containing the variables of order of integration I(1) would use ECM. From there we would see that if problem of endogeneity also exists due to which we will move towards GMM, specifically system GMM due to system of equations used.

Results and Discussion

So, after examining the time series properties and concluding from there that production, trade (export, import) and aggregate supply block (price) were on same level of integration while aggregate demand block (investment, consumption) were on different level of integration. We used GMM to estimate the model and in it used system GMM due to number of equations. So, we used ARDL and ECM to see the short run and the long run relationships within the system GMM.

Production block

After running the equation as a system of equation in system GMM, we got the results as follows:

Table 1: Production block

List of variables	DLRY
Constant	0.04349 (0.00)
Trend	-0.000355 (0.174)
D(LRY(-1))	0.24457 (0.021)
D(LY)	0.0652 (0.4218)
D(LY(-1))	-0.0665 (0.219)
D(BM)	-0.000976 (0.1921)
D(BM(-1))	-0.0003577 (0.6461)
D(RK)	0.129 (0.00)
D(RK(-1))	0.281 (0.5361)
EC(-1)	-0.1545 (0.0085)

Parenthesis represent P-Values

In the first model the dependent variable is the regional GDP. Regional GDP has a positive and a significant relationship with a lag of itself which implies that there is an inertia. It can be seen in a way that if an economy is performing well for a period, then it would have a ripple effect and would perform better in the following years unless there was an unseen shock in the economy. However, the regional GDP has no significant relationship with GDP of china or its lag, implying that regional GDP is not effected by the GDP of China. So, if the GDP of China is good or bad, it doesn't affect the region (Pakistan, India, Bangladesh, Sri Lanka). E.g. It can be seen that when there are floods in China, it doesn't affect the GDP of Pakistan neither has the boost in the GDP of China effected our economy. The regional GDP also does not have a significant relationship with the regional broad money. This can be because there are no single currency and each country has its own dynamics for money supply. Regional GDP does have a significant and positive relationship with regional gross capital fixed formation i.e. more the investment in the region the more will be the regional GDP, as there will be more employment opportunities and more development. This also brings the spillover effects. However, it has no significant relationship with its lag, which means the usual long-term benefits of investments are lesser at the regional level. Our results are consistent with Bergh (2008). Regional GDP has a significant relationship with error correction term and with a negative sign thus fulfilling the property of self-correction.

Aggregate demand block

Investment function:

After running the equation as a system of equation in system GMM, we got the results as follows:

Table 2: Investment function

List of Variables	D(RK)
Constant	-50500 (0.0012)
Trend	12800 (0.00)
D(RK(-1))	-0.0382 (0.5005)
D(LRY)	83900 (0.007)
D(LRY(-1))	-1890 (0.2762)
D(LOP)	8000 (0.3143)
D(LOP(-1))	-777.0 (0.2197)
D(RIR)	835000.0 (0.8851)
D(RIR(-1))	-5070 (0.2278)
ECT(-1)	-0.158 (0.0082)

Parenthesis represent P-Values

In the Aggregate demand block first equation is for investment. Our results show that Regional gross capital formation does not have a significant relationship with its lag. This implies that the investment decision of the year, are not affected by the investments in the previous year in the region. This again is leading to a conclusion that investments are short term and doesn't create a long-term perspective. However, it does have a significant relation with regional GDP, but not with its lag. So, there is a kind of an accelerator relationship which exists. It may also be the fact that most of the investments are in consumer products and these are highly correlate with economic growth. This was also reiterated by Iraheta and Carlos (2007). International oil prices does not effect the regional GDP, since the investments or projects are not always the kind that are effected by oil prices, as it could be the software development investment or consumer products and also the profit brackets are seen before the investments which incorporate the oil fluctuations. Since we are talking about regional gross capital formation, so the region is effected by the oil prices changes differently as compared to a unit country, hence the reaction is also different. Similarly, the regional gross capital formation has no significant relation with China's real interest rate, as the regional investment decisions are not effected by a single country china which though is major but still the decisions are not impacted. So even though China is huge, its interest rate has no impact on the regional capital formation, meaning there is very less monetary integration. It has a significant relation with error correction term and a negative one thus fulfilling the property of self-correction.

Consumption function:

So, in system GMM, we get the following results.

Table 3: Consumption function

List of variables	D(LHHC)
Constant	16.6 (0.00)
Trend	0.153 (0.0002)
D(LHHC(-1))	0.821 (0.00)
D(LRCPI)	-0.671 (0.0002)
D(LRCPI(-1))	0.619 (0.0123)
D(NDI)	0.00103 (0.0315)
D(NDI(-1))	-0.0182 (0.1787)
D(RIR)	0.00580 (0.3038)
D(RIR(-1))	0.00250 (0.4031)
LHHC(-1)	-0.565 (0.00)
LRCPI(-1)	-1.56 (0.0002)
NDI(-1)	0.0394 (0.0128)
RIR(-1)	0.00470 (0.4492)

Parenthesis represent P-Values

So here we can see that the consumption has a positive and significant relationship with its lag, hence consumption is autoregressive, which is a standard result. Hence the consumption previous pattern defines the next consumption pattern as its also influences by the inflow of income i.e. if incomes change then consumption pattern changes and if you are consuming a certain way that habitually exists, that would prevail, which goes with Fuhrer (2000) work. The consumption also depends on regional consumer price index and its lag. However, with the regional consume price index it has a negative relation, which can be that more the fluctuations in the prices of the region, the more the consumer will be disheartened, so less consumption. However, with its lag it has a positive relationship, which shows that people adjust after the initial price shock. CPI is also considered as the measure of inflation and basically consumers do suffer from money illusion while making their decisions which is precisely what it is strengthening here. Branson and Klevorick (1969) have come out with same results. Consumption also has a positive and significant relationship with national disposable income, which goes with the theory that the more you must spend, the more will you spend and consume. Consumption here however is not effected by real interest rate, which is due to the fact that financial literacy in this region is very less and generally people are not borrowing or lending to banks for consumption smoothing.

Trade Block

Export function:

After running the equation as a system of equation in system GMM, we got the results as follows:

Table 4: Export Function

List of variables	EX
Constant	720.0 (0.7584)
Trend	11.05 (0.7574)
LRY	-255.0 (0.7603)
T	-0.216 (0.772)

Parenthesis represent P-Values

Here it is seen that exports of China do not have a significant relationship with regional GDP or with the term of trade. Higher income does not create the necessary export surplus in the economy. This is due to the very nature of these economies which are consumption driven. It's believed that more the term of trade more will be the exports but here since we are talking about China, its thriving on its export industry and hence its exports remain high with its currency rate downplay, so it's not effected by the term of trade. Also, the exports of China are not affected by regional GDP, since its economy is huge and hence operates as a unit effecting other rather than being effected. It has kind of export monopoly that it holds and thus cannot be affected in such situation. Import function:

After running the equation as a system of equation in system GMM, we got the results for import function as follows:

Table 5: Import function

List of variables	LM
CONSTANT	17.9 (0.0004)
TREND	0.2436 (0.0012)
LRY	-5.71 (0.0022)
LRCPI	0.7645 (0.00)

Parenthesis represent P-Values

Here our results show that the imports of China are affected by the regional GDP but in a negative way. i.e. the more the regional GDP, the less would be the imports of China. This means that as the region grows the imports from china are diverted to other countries. This may be due to the reason that as the region improves in terms of its income lesser exportable surplus (imports of China) reduces. Imports of China also have a significant and positive relation with regional CPI, e.g. if regional CPI increases, so we could say become expensive prices, so inflation and hence the exports would be more expensive and the countries would rely more on the imports provided by some other source which are cheaper, which would be since there is inflation in the region not in the world.

Aggregate Supply Block

Price function:

After running the equation as a system of equation in system GMM, we got the results for Philips curve type supply equation as follows:

Table 6: Price function

List of variables	LRCPI
Constant	2.54 (0.00)
Trend	0.293 (0.00)
RNE	-0.0432 (0.00)
LPC	-1.35 (0.0003)
OG	-0.002.90 (0.8058)

In this model we see that regional prices are effected by the regional nominal exchange rate i.e. significant relationship but negative. So, with appreciation of regional nominal exchange rate less would be the regional prices to compensate for potential loss in exports due to expensive prices. This can be seen through example if Pakistani Rupee is stronger, then imported goods would be cheaper, so the domestic producer would lower their costs in order to attract buyers for exports as well as pass the benefit of lowered import prices to domestic consumers. Dornbusch (1987) also explained this. The regional price has a significant but negative relationship with Pakistan prices. So, if Pakistan prices are high, then that means it would want to import more and be able to sell less, so the regional countries would see it as a trading opportunity and lower the prices to attract buyers of Pakistan and increase their imports. However regional prices do not have relation with the output gap of China i.e. the output gap of China would not put demand gap pressure on the regional prices to increase the regional prices. Again, this show that China is integrated with the rest of the world but lesser with the regional economies.

CONCLUSION

We have estimated a regional macroeconomic model for Pakistan, where at first, we chose the countries as Pakistan, India, Bangladesh and Sri Lanka to form the region and China as the major trading partner. We took the data from 1971-2015. We first chose the variables to be used and made them regional accordingly. We have used GMM for estimating the model and since we have number of equations will use system GMM. Since we have time series data, we tested the time series properties through ADF for the variables and saw that there was different order of integration, hence we proceeded to see the long run and the short run relationships by applying ARDL and ECM within system GMM

The results showed that the regional GDP had a significant inertia relationship, it is also impacted by the regional gross capital formation and so does regional gross capital formation gets affected by regional GDP in return, a perfect accelerator model. The regional development in term of higher investment does effect the regional GDP. This means projects like OBOR does have prospects. Consumption has a significant relationship with its lag, so the Euler type relationship holds. It has a significant relationship with regional CPI and its lag, so consumption gets affected by the regional CPI and by national disposable income. Exports do not get effected by regional GDP nor by terms of trade, but imports get affected by regional GDP and regional CPI. The regional prices have a significant relationship with regional exchange rate, and Pakistan's prices. So, the results showed significant relationships. This can be used as the basis for policy makers to make their policies and this model can further be used in forecasting as well.

Policy Implications

China has not had a significant relationship with regional macroeconomic variables i.e.in terms of impacting the regional variables nor does China did get impacted by the regional variable. This means its integration with the rest of the world had been more significant. So, more steps towards a regionally integrated development can be worked out. This is in line with recent exploration of China to build the ASEAN as a regional trading block. CPEC was not fully operational earlier and after the early harvest programs now Long-term plan (LTP) will be implemented. Now it is expected that it will bring more economic synergies.

Since regional GDP and regional gross capital formation has positive and significant relation, hence the policy makers need to make policies where investments are done and not be shy of doing FDI within the region. The policy makers need to get more FDI for the region.

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