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The impact of financial openness, trade openness on macroeconomic volatility in Pakistan: ARDL Co Integration approach

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The purpose of this paper is to investigate the relationship between trade openness, financial openness, and macroeconomic volatility in Pakistan. For this purpose, time-series data from 1970-to 2010 and the ARDL cointegration technique were used to find the long-run relationship. The results proposed that in the long run, trade openness generates volatility in output and investment, whereas financial openness has a significant effect only on investment volatilities. Furthermore, the error correction model suggested that in the short run, trade and financial openness significantly affect output, consumption, and investment volatilities..

Keywords: Macroeconomic Volatility, Trade openness, financial openness, Consumption, Investment

JEL Classification: E21, F41, F62,

INTRODUCTION:

In developing countries, economists have been concerned with growth promoting effect of trade and financial openness since the past few decades, but now attention is shifted toward the effect of economic volatility due to trade and financial openness (Abullahi and suardi, 2009). Pakistan is among the few developing countries that reallocate and distribute financial segments to private from public ownership. There are two major fundamental benefits of financial openness; risk sharing to help countries by lowering volatility of consumption and for better allocation of capital internationally. This paper undertakes a strong examination on the implication of trade and financial openness on macroeconomic volatility in Pakistan. The objective of this paper is to find out whether a more open trade and financial system increases the volatility in macroeconomic variables or not?

The impact of financial and trade openness on economic volatility is under consideration in case of Pakistan. This is one of the debatable topics since globalization. Recent contributions on trade and financial openness' effect on macroeconomic volatility include those of Kose et al. (2003), Ramey and Ramey (1995), Pindyck(1991), Laursen and Mahajan (2005), Barlevy (2004), Arrow and Hahn (1971), Mendoza (1994), Baxter and Crucini (1995), Sutherland (1996), Senay (1998), Buch et al. (2005), Krugman (1993), Razin and Rose(1992), Easterly et al. (2001), Svaleryd and Vlachos (2002), Bekaert et al. (2006), Ahmed and Suardi (2009), Drion (2011), Giovanni and Levchenko (2008), Loayza (2007), Ayhan et al. (2003), Pancaro (2010), Popov (2012), Kose et al. (2003), who suggested that the nature of association of growth and volatility differ amongst developing countries, it depends on the level of their financial integration into the international economy. Also, after trade and financial openness there is inclined to be a major shift in the volatility and growth. The future return due to income volatility raises vagueness which declines investments (Pindyck, 1991). Moreover, the sharp increase in economic volatility enlarged the uneven

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distribution of hardship between under developing and developed nations (Laursen and Mahajan, 2005).

Furthermore, the output volatility rose with the high level of financial openness (Mendoza, 1994). However, the extent of volatility of output and consumption rely on the fricht nature of the economy (Sutherland, 1996). In fact, increase in specialization within countries and huge amount of trade of intermediate inputs can reduce output volatility (Razin and Rose, 1992). Similarly, the high degree of the domestic financial sector development reduces volatility (Easterly et al., 2001). Moreover, financial development was closely related with the country's degree of openness Svaleryd and Vlachos (2002), also financial openness relates with volatility of consumption growth Bekaert et al (2006), and Ayhan et al. (2003). These days, in emerging markets, trade and capital openness correspond to each other Pancaro (2010).

The major objectives of this paper is to investigate the impact of financial and trade openness, in terms of trade volatility, inflation, fiscal policy and Institutional quality on income, consumption and investment volatility (macroeconomic volatilities) of Pakistan. The paper applies ARDL approach for estimating long run as well as short run relationship among macroeconomic variables and its determinants. The structure of this paper is as follows: section 2 presents the review of literature. Section 3 discusses theoretical framework and model specification of research issues. Section 4 comprises the data and econometric methodology, section 5 encloses the conclusion.

REVIEW OF LITERATURE

There are various studies on the consequence of financial openness on growth but few researches have been conducted on the study of the relationship of financial and trade openness on macroeconomic volatility. Razin and Rose (1994) proposed the effect of financial and trade openness on macroeconomic volatilities with a sample size of 138 countries and found no significant relationship between economic volatility and openness. Easterly et al. (2001) exhibited with a sample size of 74 countries over the time duration of 1960-97 the foundation of economic volatility and found that volatility can be reduced with greater degree of financial development and in developing countries, greater amount of trade openness increased the output volatility.

Buch et al. (2002) found the relationship among the financial liberalization and volatility of business cycle with data of 25 OECD countries and documented that there was no link between financial liberalization and output volatility. Moreover, Gavin and Hausmann (1996) exhibited developing countries data for the relationship between capital flow and output volatility and found a

positive relationship among them. In addition, O'Donnell (2001) exhibited the data of 93 countries over the period of 1971-94, the link of financial liberalization with growth volatility and reported that increase in financial liberalization reduced the output volatility. Furthermore, Bekaert et al. (2002) found the effect of equity market liberalization on output and consumption volatility over the period of 1980-2000 and reported the negative effect of equity market liberalization on output and consumption volatility and capital, and also the effect of equity market liberalization was greater than capital account liberalization. Mendoza (1994) found that the amount of change in output and consumption volatility is less than the change in financial openness and the output volatility increased with the level of financial openness. Baxter and Crucini (1995) found that financial openness can increase output volatility and reduce consumption volatility. The reason of increase in output volatility is linked with trade openness (Krugman, 1993) and the greater specialization within industries, across countries which direct greater amount of trade in intermediate inputs such that output volatility reduces (Razin and Rose, 1994).

There are a number of current studies that incorporate the effect of financial openness on economic volatility using the model from Buch et al. (2002), Senay (1998), Sutherland (1996) and Obstfeld and Rogoff (1995) suggesting its strength of nature, defined by the impact of financial openness on economic volatility. In addition, developing countries' characteristics affect the link between financial openness and economic volatility due to countries' little extent of trade diversification so they face greater volatility through terms of trade and international demand shocks (Rogoff 1995). Kose (2002), found that a substantial volatility is explained by the terms of trade shocks. In addition, in developing countries, the rapid change in capital flows' direction can give boom cycles, but few of them have profound financial sectors to manage the capital flows volatility. Moreover, Aghion et al. (1999), and Caballero and Krishnamurthy (2001) found the relationship among financial development and output volatility, also the overdrawn countries get high business cycle fluctuations only because of rapid change in international interest rates.

THEORETICAL FRAMEWORK

To study the impact of trade and financial openness on economic volatility, this study considers different income and consumption measures of volatility (Ahmed and Suardi, 2009). The paper considers three major components of macroeconomic volatilities; Income, Consumption and Gross Fixed Capital formation (Abdullah and Suardi, 2009 and Kose, 2006). Furthermore, two proxies of income volatility have been used; GDP per capita volatility and GNP growth volatility.

Table 1: Variable Description

No.	Variables	Description	Source.
1	LVC	Log Of Standard Deviation Of Final Consumption,	WDI Database
2	LVG	Log Of Standard Deviation Of GDP.	WDI Database
3	LVGNI	Log Of Standard Deviation Of Gross National Product	WDI Database
4	LVIN	Log Of Standard Deviation Of Fixed Capital Formation.	WDI Database
5	FO	Log Of Financial Openness Is Sum Of Foreign Direct Investment And	WDI Database
6	TO	Trade Openness; Ratio Sum Of Import And Export To GDP.	WDI Database
7	LGDP	Log Of GDP (Current LCU).	WDI Database
8	FP	Fiscal Policy Pro Cyclicalilty	Lane (2003)
9	LSDTOT	Standard Deviation Log Of Terms And Trade.	WDI Database
10	FD	Financial Development; Private Credit To GDP	WDI Database
11	LIN	Inflation, GDP Deflator.	WDI Database

The reason to use GNP proxy separately is that it includes the effects of global risk sharing on state income, gotten through market reforms. Moreover, total consumption measure is imperative in the sense of reform welfare assessments because it does not depend on only a few economic agents utility. Furthermore, cyclical performance of government consumption has sudden impact on private consumption due to economic fear, in addition government consumption to GDP ratio is high in developing countries which reflects the value of government consumption. In addition, trade and financial openness are used as economic reforms; trade openness is measured by the ratio of the sum of export and import to GDP and financial openness the sum of portfolio investment and FDI (Abdullah and Saurdi, 2009). This paper considers few other control variables in order to find the impact of financial and trade openness including terms of trade volatility which is proxy for international risks, inflation and its volatility, financial development and GDP per capita is the proxy of economic development. Therefore the model specification is as follows:

Macroeconomic volatilities = f (Trade openness, Financial openness, Terms of trade volatility, Fiscal policy pro cyclicalilty¹, Control variables)

DATA AND ECONOMETRIC METHODOLOGY

This paper will identify the long-run and short run relationship of financial openness, trade openness and economic volatilities of Pakistan, for this purpose this study examines the time series data from 1970-2010 (Detail data explanation in table 1). The present paper employs ARDL approach to estimate long run as well as short run relationship among macroeconomic volatilities and their determinants. The main difference between the two co integration techniques is that ARDL can be applied on small sample size and the order of integration can be different i.e. I(0) or I(1) whereas Johanson and Johanson Co integration technique can be applied on a large sample and the order of integration must be the

same. The error correction model for ARDL macroeconomic volatilities estimated as:

$$\Delta\sigma_i = \chi_0 + \sum_{i=0}^p \chi_1 \Delta TO_{t-1} + \sum_{i=0}^q \chi_2 \Delta FO_{t-1} + \sum_{i=0}^q \chi_3 \Delta LGDP_{t-1} + \sum_{i=0}^q \chi_4 \Delta LSDTOT_{t-1} + \sum_{i=0}^q \chi_5 \Delta FP_{t-1} + \sum_{i=0}^q \chi_6 \Delta Z_{t-1} + \sum_{i=0}^q \chi_7 TO + \sum_{i=0}^q \chi_8 FO_{t-1} + \sum_{i=0}^q \chi_9 GDP_{t-1} + \sum_{i=0}^q \chi_{10} TOT VOL_{t-1} + \sum_{i=0}^q \chi_{11} FP_{t-1} + \sum_{i=0}^q \chi_{12} Z_{t-1} + U_i \dots (1)$$

Fiscal policy pro cyclicalilty is captured by the Method of Lane (2003) using the following regression:

$$\Delta LGC = \alpha_1 + \alpha_2 \Delta LGDP_t + e_t$$

where GC is log of government consumption and LGDP is log of real GDP.

Where, σ_i represents macroeconomic volatilities i.e. GDP, GNI, Consumption and Investment, each volatility regress a separate regression with same endogenous variables, TO is trade openness, financial openness (FO), Term of trade volatility (SDTOT), fiscal policy pro cyclical (FP) and Z is a control variable including income, inflation, inflation volatility and institutional quality, Δ difference operator and q is for optimal lag length. However, F test is used for long run relationship in ARDL and the null hypothesis for no co integration is as follows:

$$H_0: \omega_7 = \omega_8 = \omega_9 = \omega_{10} = \omega_{11} = \omega_{12} = 0 \text{ and the alternative hypothesis is: } H_1: \omega_7 \neq \omega_8 \neq \omega_9 \neq \omega_{10} \neq \omega_{11} \neq \omega_{12} \neq 0.$$

The critical values are computed from Pesaran et al. (2001) which provide two sets, one measures all the variables, co integrated at I (0) and the other computed all the variables, co integrated at I (1), when the F-stats is greater than the upper bound of critical value, the null hypothesis is rejected and when F-stats less than the lower bound of critical value, the null hypothesis cannot be rejected Samreth (2008). Now for the ECM, the lag length is selected by AIC or SIC. From equation 2, the coefficients represent the short run dynamics whether they diverge or converge, a positive sign indicates

Table 2: Bound test Co integration Relationship

Dependent variable	F stats-Value	Bound Critical value (restricted no intercept and no trend)		
		Significance level	I(0)	I(1)
σ_g	180.693*	1%	-2.59	-5.07
σ_{gmi}	43.507*	5%	-1.95	-4.43
σ_c	172.6400*	10%	-1.62	-4.09
σ_{in}	144.753*			

Note: * represents at level of significance 0.01.

Table 3: Long run and Short run ARDL Regression for Gross Domestic Product Volatility:

Estimated Long Run Coefficients using the ARDL Approach			
ARDL(2,1,2,1,0,1,2,2) selected based on Akaike Information Criterion			
Dependent variable is LVG			
39 observations used for estimation from 1972 to 2010			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
TO	-1.4290	.25151	-5.6817[.000]
FO	.25581	.13085	1.9550[.065]
LSDTOT	-.14201	.076112	-1.8658[.078]
FP	-.85020	.42414	-2.0045[.059]
LGDP	.60780	.14104	4.3094[.000]
LIN	-.38046	.33773	-1.1265[.274]
FD	3.5370	1.4873	2.3782[.028]
Error Correction Representation for the Selected ARDL Model			
Dependent variable is dLVG			
39 observations used for estimation from 1972 to 2010			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLVG1	-.25169	.19501	-1.2907[.208]
dTO	-8.0061	3.1499	-2.5417[.017]
dFO	-.26780	.15989	-1.6749[.106]
dFO1	-.40186	.13922	-2.8865[.008]
dLSDTOT	-.084211	.052561	-1.6022[.121]
dFP	-1.1445	.39113	-2.9262[.007]
dLGDP	12.8984	5.1945	2.4831[.020]
dLIN	-.17615	.40401	-.43602[.666]
dLIN1	-.58657	.16202	-3.6203[.001]
dFD	3.4265	1.6350	2.0957[.046]
dFD1	-5.4540	1.7561	-3.1057[.005]
ecm(-1)	-1.3462	.39468	-3.4108[.002]
R-Squared	.95549	R-Bar-Squared	.91099

divergence from equilibrium whereas the negative sign indicates convergence to equilibrium. However, ECM is a calculation from the long run model by normalizing the equations.

Before using the ARDL model, the first step is to confirm the order of integration of all given variables that are not more than one through the unit root ADF test which has been tested. The second step is to find out if co integration exist among the variable with the help of Bound test. In table 2, F statistics for Bound test is presented with critical values, the values prescribed by

Persan et al., (2001). The results values of F-statistics are greater than upper bounds of critical values at significance level 0.01 and 0.05. Furthermore, third step is to estimate the ARDL equation, the maximum lag order is 2 selected as the data is annual (Persaran and Shin, 1999). So, the adjusted sample period becomes 1972-2010 with maximum lag selection, this process saves the degree of freedom. Furthermore, the fourth step is reveals the long run relationships, among GDP volatility through ARDL(2,1,2,1,0,1,2,1,2), the results (Table 3) suggest that trade openness and fiscal policy pro

Table 4: Long run and Short run ARDL Regression for Gross National Product Volatility

Estimated Long Run Coefficients using the ARDL Approach			
ARDL(2,2,0,2,1,0,0,2) selected based on Akaike Information Criterion			
Dependent variable is LVGNI			
39 observations used for estimation from 1972 to 2010			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
TL	-2.1080	.28195	-7.4763[.000]
FO	-.027703	.039531	-.70079[.491]
LSDTOT	-.33114	.13628	-2.4298[.024]
FP	-.026346	.14990	-.17575[.862]
LGDP	1.2370	.17092	7.2376[.000]
LIN	.19957	.092628	2.1546[.042]
FD	2.2194	.66557	3.3345[.003]
Error Correction Representation for the Selected ARDL Model			
Dependent variable is dLVGNI			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLVGNI1	1.2691	.68698	1.8474[.076]
dTL	-7.1832	4.4984	-1.5968[.122]
dTL1	-4.1094	3.3471	-1.2278[.231]
dFO	-.14744	.20951	-.70373[.488]
dLSDTOT	-.48871	.19886	-2.4576[.021]
dLSDTOT1	.55211	.19021	2.9026[.007]
dFP	4.3770	2.0752	2.1092[.045]
dLGDP	6.5835	1.3650	4.8231[.000]
dLIN	1.0621	.61065	1.7393[.094]
dFD	9.9983	3.3741	2.9633[.006]
dFD1	-10.7828	3.0460	-3.5400[.002]
ecm(-1)	-5.3220	1.3898	-3.8292[.001]
dLVGNI1	1.2691	.68698	1.8474[.076]

cyclicalities has negative and significant effect on GDP volatility, but income and financial development has positive as well as significant effect on GDP volatility in the long run.

The fifth step to estimate the short run results of the model which explains (Table 3) that trade openness, financial openness (Wald test Chi sq is 8.98), fiscal policy pro cyclicalities, income, inflation (Wald test Chi sq is 14.12), institutional quality and financial development (Wald test Chi sq is 9.88) have significant effects on GDP volatility in the short run, however the speed of adjustment in the long run is -1.3 and significant effect on GDP volatility. However, the long run and short results for GNI volatility represented in table 4 suggest that the terms of trade volatility and institutional quality has negative and significant effect on GNI volatility in the long run, but income, inflation and financial development has positive and also significant effect on GNI volatility in the long run. Furthermore, the short run results explain that terms of trade volatility (Wald test Chi sq is 8.42), fiscal policy pro cyclicalities, institutional quality, financial development and income have significant effects on GNI volatility in the short run, the speed of adjustment is -5.32

in long run and significant effect. However, the long run ARDL approach for consumption volatility results propose (table 5) that income has positive and significant effect at 0.1 significant levels. Moreover, short run results suggest that trade openness, terms of trade volatility (Wald test Chi sq is 8.34) have negative and significant effect on consumption volatility whereas income and financial development have positive and also significant effect on consumption volatility. The speed of adjustment in the long run is -1.61 and has significant effect on consumption volatility.

Now, ARDL (2,0,2,0,2,0,1,2,0) for investment volatility long run and short run results relationship among macroeconomic determinant and investment volatility represented in table 6 which suggests that in the long run, trade openness and financial openness have significant and negative effect on investment volatility, but inflation and income have significant and positive effect on investment volatility in the long run. In addition, short run results depict that trade openness has negative effect on investment volatility but financial openness (Wald test Chi sq is 8.59), fiscal policy pro cyclicalities (Wald test Chi sq is 12.31), income and institutional quality (Wald test

Table 5: Long run and Short run ARDL Regression for Consumption Volatility.

Estimated Long Run Coefficients using the ARDL Approach			
ARDL(2,1,2,2,0,1,0,2) selected based on Akaike Information Criterion			
Dependent variable is LVC			
39 observations used for estimation from 1972 to 2010			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
TO	-.66614	.40982	-1.6254[.119]
FO	.083983	.086421	.97179[.342]
LSDTOT	.29486	.17775	1.6588[.112]
FP	.053267	.20697	.25736[.799]
LGDP	.44749	.24906	1.7967[.087]
LIN	.011998	.18191	.065955[.948]
FD	-1.1626	.90691	-1.2820[.214]
Error Correction Representation for the Selected ARDL Model			
Dependent variable is dLVC			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLVC1	.44617	.098425	4.5331[.000]
dTO	-8.2734	2.7283	-3.0324[.005]
dFO	-.12564	.12808	-.98091[.336]
dFO1	-.25711	.12057	-2.1326[.043]
dLSDTOT	.13655	.093091	1.4669[.154]
dLSDTOT1	-.22903	.090359	-2.5347[.018]
dFP	.085945	.33472	.25676[.799]
dLGDP	10.3768	4.5569	2.2771[.031]
dLIN	.019358	.29383	.065883[.948]
dFD	.32134	1.4513	.22142[.826]
dFD1	2.1042	1.2113	1.7371[.094]
ecm(-1)	-1.6135	.17133	-9.4170[.000]
R-Squared	.88718	R-Bar-Squared	.79585

Table 6: Long run and Short run ARDL Regression for Investment Volatility.

Estimated Long Run Coefficients using the ARDL Approach			
ARDL(2,0,2,0,2,0,1,0) selected based on Akaike Information Criterion			
Dependent variable is LVIN			
39 observations used for estimation from 1972 to 2010			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
TO	-1.2562	.11431	-10.9896[.000]
FO	-.30243	.074135	-4.0794[.000]
LSDTOT	-.9480E-3	.020944	-.045263[.964]
FP	-.12496	.18278	-.68368[.501]
LGDP	.82527	.056555	14.5924[.000]
LIN	.19197	.086497	2.2194[.037]
FD	.60643	.41540	1.4599[.158]
Error Correction Representation for the Selected ARDL Model			
Dependent variable is dLVIN			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLVIN1	.40466	.20733	1.9517[.062]
dTO	-2.7605	.59048	-4.6750[.000]
dFO	-.15368	.13890	-1.1064[.279]
dFO1	.31536	.14840	2.1251[.043]
dLSDTOT	-.0020832	.046043	-.045245[.964]
dFP	-2.3930	3.0594	-.78219[.441]
dFP1	6.5718	3.2200	2.0409[.052]

Table 6. Cont.

dLGDP	1.8135	.30611	5.9244[.000]
dLIN	.097974	.12948	.75669[.456]
dFD	1.3326	.88907	1.4989[.146]
ecm(-1)	-2.1974	.35589	-6.1744[.000]
R-Squared	.86067	R-Bar-Squared	.75933

Chi sq is 10.36) have significant effect on investment volatility and the speed of adjustment is -2.19 in the long run.

Conclusion:

The paper focuses on the impact of trade and financial openness effect on macroeconomic volatilities which are divided into GDP, GNI, consumption and investment volatilities; however, recent empirical research shifted the attention on the output volatility due to trade and financial openness. The paper follows the ARDL approach for the long run and short run analysis and for co integration Pesaran et al. (2001) bound test. Our results support that in the long run, trade openness has significant and negative effect on GDP, GNI and investment volatility, as the trade openness increases, the GDP, GNI and investment volatility reduces in the long run. Whereas, financial openness has significant and negative effect on investment volatility reflecting that as the financial openness increases, it causes reduction in investment volatility in the long run. However income has significant effect on GDP, consumption and investment volatility in the long run. Also, financial development has significant effects on GDP and GNI in the long run.

In the short run analysis, ECM results proposed that trade openness, financial openness and income has significant effect on GDP and consumption volatilities. But only financial openness and income has significant effect on investment in the short run. Institutional quality has only significant effect on GDP, GNI, and investment volatility in short run. Also financial development has significant effect on GNI and consumption volatility. On the other hand, sound financial development and institutional quality can reduce the effect of trade openness and financial openness on macroeconomics volatilities. As a stable macroeconomic environment can create good intuitions, which result to low inflation and good maintenance of macroeconomic volatilities. In Pakistan policy makers should focus on better institutional development to reduce the macroeconomic volatilities, though basically institutions depend on country's history and culture which is hard to change in the short span, but recent empirical studies describe the role of policies to speed up for better institutions. Moreover, Institutions can be developed by more trade openness as market openness encourage institutions to

handle complex and risky range of transaction World bank (2002). For better financial development, policy makers should design such policies where the risk premium is adjusted according to the current security condition of country. Yet foreign banks likely to invest where the local markets are competitive and having quality financial services. So improved and secure domestic banking industries and regulatory framework can foster financial development

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