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The Impact of Financial Globalization on Output Volatility: Panel Data Evidence for Asian Countries

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Abstract

This study is an endeavor to empirically examine the long run impact of financial globalization on output volatility in a balanced panel of selected 22 Asian countries (full sample) during 1998-2015. The disaggregated analysis is also conducted with respect to Central Asia, East Asia, South Asia and West Asia. The study uses System Generalized Method of Moments for estimation purpose. The results of the study reveal that in overall Asia and Central Asia, financial globalization has emerged as a significant and positive long run determinant of output volatility, whereas insignificance of financial globalization is reported in the context of three sub-samples i.e. East Asia, South Asia and West Asia during reference period. The empirical results appear to be strongly robust in terms of sign, significance and magnitude. To curtail Asia's output volatility this study calls for the use of selective and screened financial globalization during transition phase of building strong institutions. This study is noteworthy as it contributes to limited existing empirical literature on Asia's output volatility. It yields empirical estimates on subject matter in aggregated panel of Asia and in each disaggregated panel of Asia i.e. Central Asia, East Asia, South Asia and West Asia.

Keywords: output volatility, Asia, financial globalization, system GMM.

1. Introduction

The proliferation of economic crises across the world especially after 1990s has reinvigorated debate on output volatility and on a plethora of its potential determinants. The great moderation literature documents significant reduction in output volatility since 1980's mainly due to good macroeconomic policies and good luck (e.g. better terms of trade). Initially, this literature solely focused on U.S.A's aggregate economic variability

but subsequently it extended at panel dimension to investigate determinants of output variability beside financial globalization (Blanchard and Simon 2001; Stock and Watson 2000). The growth literature claims rise in output instability and empirically finds macroeconomic variables i.e. trade openness and inflation as significant determinants of output instability among other variables in case of developing economies (Kose, *et al*. 2003).

An extensive research on pitfalls of financial globalization has identified three major channels through which financial globalization can destabilize developing and emerging economies. Firstly, the global market imperfections that includes involvement of international investor in activities like speculative attacks, momentum trading and herding. Secondly, risk of financial contagion effect. Thirdly, tendency of over borrowing and resultant accumulated foreign debt which in turn exposed recipient economies to global interest rate shocks and output volatility.

Beside risks of financial globalization, it is also widely accepted that cross-border liberalization of capital flows foster growth in financial markets, promote innovation, better manage consumption volatility by hedging consumers in times of domestic shocks through lending and borrowing abroad, enable economies to diversify investment risk, allow capital deficient economies to diversify narrow production bases and thus reduce output volatility.

It is pertinent to state that share of developing countries in global GDP has significantly increased from 20 percent to 39 percent during 1990-2015 and Asia is leading contributor in this regard. The largest emerging economy of Asia is China whose performance with respect to economic growth is magnificent and its share in global GDP has increased from 2 per cent in 1990 to 15 per cent in 2015. The other titanic economies of Asia are India, Japan, Indonesia, Thailand, Republic of Korea and Malaysia. Asia's phenomenal growth registered over past decades is also characterized by abrupt or volatile output cycles. Many economic agents of this region have experienced substantial hardships during 2008-09 international financial crises and 1997-98 East Asia financial crises. But Asia has successfully overcome pitfalls attached to these crises after taking it as instructive lesson.

With this background, one of the fundamental questions needs to be empirically examined i.e. is financial globalization responsible for making countries vulnerable to economic disruptions in Asia? Therefore, dominant objective of undertaking this study is to examine Asia's output volatility with regard to its potential determinant i.e. financial globalization during 1998-2015 in a balanced panel of 22 Asian countries.

This study contributes in various ways. Firstly, it is an addition to limited existing empirical literature on Asia's output volatility. Secondly, it overcomes criticism related to previous studies that have ignored panel unit root checks. Thirdly, it utilizes more refine and composite measures of core research variables. Fourthly, it uses system GMM method to address potential endogeneity and heterogeneity. Fifthly, it yields empirical estimates in case of aggregated and disaggregated analysis of Asia. Lastly, it includes robustness analysis with respect to sign magnitude and statistical significance.

This research is useful for policymakers, financial economists, government officials and social scientists. This is a comprehensive empirical study to examine impact of financial

globalization on output volatility in aggregated and disaggregated panel of Asia. The findings of the study can be utilized to best insulate Asian economies from financial globalization shocks and to ensure sustained economic growth.

This study is organized as following introduction, section 2 reviews theoretical and empirical literature, section 3 presents trends of Asia's output volatility, section 4 includes data, model specification and methodology, section 5 is devoted to empirical results and discussions and lastly section 6 presents conclusion, theoretical and policy implications, limitations of the study and future prospects.

2. Literature Review

2.1 Theoretical Literature

Theoretical work is a mirror image of inconclusive predictions regarding the impact of financial globalization on output fluctuations. Neo-classical theorists claim positive role of financial openness in mitigation of output instability by enabling economies to allocate capital efficiently, to increase real and financial sector productivity (Grossman and Helpman 1991; Levine 1996; Stulz 1999), to smooth consumption and investment variability through the channel of international risk sharing (Obstfeld and Rogoff 1996) and to promote stable growth. Whereas, Real Business Cycle (RBC) theorists argue that in various open economy models financial openness makes economies prone to crisis and instability characterized by collapse in local production, comparative advantage based specialization that makes countries more prone to certain industry specific shocks, sudden loss with respect to accessing capital markets (internationally) and probability of capital flows reversal (for details see, Mendoza, 1991 and 1995; Arellano and Mendoza, 2002; Agenor, 2003). In line with Fleming (1962) and Dornbusch (1976) work, recent studies based on dynamic SSP models to investigate linkages between output instability and financial globalization suggests that nature of shocks plays a decisive role regarding influence of financial openness on consumption and output fluctuations as in times of shock related to monetary policy, the variability of consumption decreases and variability of output increases with increase in degree of financial globalization whereas in times of shock related to fiscal policy, instability of consumption increases and instability of output decreases with rise in degree of financial openness. Baxter and Crucini (1995) also support this finding that variability of consumption decreases; variability of output increases with rising cross-border financial liberalization, however, different impact of financial globalization on output and consumption is mainly due to risk sharing implications and wealth effects related to various asset market structures. Furthermore, economic theorist also believe that structural characteristics play a pivotal role in establishing impact of financial globalization on output fluctuations (Senhadji 1998; Kose, 2002) among others. According to Stiglitz (2000) core explanatory candidate of developing countries output instability is pro-cyclical nature of international capital flows, thereby, in real terms no benefits can be accrue from cross border allocation of capital. In a nutshell from theoretical perspective, we can decisively claim ambiguous impact of financial globalization on output

instability as this relationship is primarily based on type of shock, structural rigidities, and patterns of specialization and nature of cross border capital flows.

2.2 Empirical Literature

Rapid surge in financial globalization during past few decades has been observed in many Asian economies by lowering restrictions on cross border capital flows that in turn has generated potential effects on variability of aggregate output. It is pertinent to throw light on robust observation related to international macroeconomics that developing and emerging markets are found to be more volatile and unstable in terms of output especially during 1990's than developed markets (Aguiar and Gopinath, 2007). The frequently cited causative factor behind stated robust finding is the process of global financial integration pursued by developing economies (Agenor, 2003). However, empirical literature is replete with mixed evidences i.e. positive, negative, conditional and even insignificant impact of financial openness on output variability. Furthermore, empirical literature reviewed below is primarily based on two distinct classes of measures pertaining to financial globalization i.e. de-facto (outcome) measures and de-jure (legal/policy) measures.

2.2.1 Studies that Support Positive Impact of Financial Globalization on Output Volatility

The significant and positive impact of financial openness on increasing instability of output is reflected in various empirical studies. For example, Gavin and Hausman's (1996) work for the period 1970 to 1992 related to developing countries conclude that volatility of international capital flows is a potential source of output variability, Demirguc et al. (1998) empirical work also reports positive association between financial openness and likelihood of banking crises. Bekaert et al. (2006) study claims capital account openness as a candidate of output instability in emerging economies during 1980-2000. Kaminsky and Schmulkler's (2008) work confirms that financial globalization is followed by large swings (boom and busts) but only with respect to short run and lastly Levchenko et al. (2009) claim increase in real economy instability and financial market volatility due to foreign capital flows.

2.2.2 Studies that Support Negative Impact of Financial Globalization on Output Volatility

The significant negative relationship between output fluctuations and financial globalization is documented in empirical work of Prasad et al. (2004) in context to LFI (less financially integrated) and IE (industrial economies), whereas, Loayza et al. (2007) also claim that financial openness has substantially reduced output variability by enabling economies to absorb exogenous shocks through re-allocation of resources across geographic countries.

2.2.3 Studies that Support Conditional Impact of Financial Globalization on Output Volatility

The vast empirical literature has also documented conditional relationship of financial globalization with output instability and came up with various mediating causative factors that affect finance-output variability relationship as Calderón et al. (2005) identify that impact of financial openness on output variability conditionally depends on level of income. In case of very rich and very poor countries financial openness is a source of output

stability whereas in medium income economies it is less effective in mitigating variability of output, Bekaert et al. (2006) narrate that in presence of better economic, financial, and political institutions financial globalization significantly reduces output fluctuations. Bordo and Meissner (2007) find that financial credibility and financial development works as a mediating channel between financial openness and output instability. Countries with rise in global financial integration are likely to experience economic crises subject to poorly developed domestic financial sector and weak credibility. IMF (2012) acknowledges benefits of financial openness in mitigation of output instability but subject to effective macroeconomic management, efficient supervision of financial sector, ability to counter capital flows volatility and developed domestic financial sector. Broner and Ventura (2015) observe that positive or negative relationship of financial openness with economic instability is subject to various macroeconomic characteristics i.e. level of development, quality of institutions, structure of financial markets, and level of savings productivity and investment.

2.2.4 Studies that Support No Impact of Financial Globalization on Output Volatility

Another strand of empirical literature is that there is no significant relationship between financial openness and output variability as Razin and Rose (1992) examined insignificant impact of financial globalization on output fluctuations in context to 138 countries during 1950 to 1988. Easterly and Kraay (2000) also report insignificant association during 1960-1997 with respect to 74 countries and conclude that neither volatility of capital flows nor financial globalization has statistically significant impact on output instability. Buch et al. (2002) used sample of 24 OECD economies during 1960 to 2000. They find that period refer to 1970's is characterized by positive impact of financial integration in raising output fluctuations whereas this relationship is found to be insignificant in all other periods, therefore, instability of empirical association between output volatility and financial openness is confirmed. In order to have a bird's eye view summary of selective empirical literature on subject matter during 2000-2020 is summarized in Table 1.

Table 1: Summary of Selective Empirical Literature (2000-2020)

Investigator	Coverage & Analysis Level	Sample	Dependent Variable	Financial Globalization (FG) Measure	Covariates	Estimation Strategy	Empirical Findings
Kose, et al (2003)	76 Countries (55 Developing and 21 Industrial Economies) (International)	1960 to 1999	S.D (Standard Deviation) of real GDP growth S.D of growth rate of real income S.D of growth rate of private consumption S.D of growth rate of total consumption S.D (C+G) / S.D (income)	De-jure measure (Transaction restrictions pertaining to capital account) De-facto measure (Gross capital flows/GDP)	Trade openness Per capita income S.D of TOT (terms of trade) M_2/GDP Volatility (M_2 over GDP) Volatility of inflation Fiscal balance	Ordinary Least Square (OLS) Instrumental Variable (IV)	[Non-linear] FG (Financial Globalization) increases relative consumption volatility to income volatility. But this relationship is non-linear as financial openness measured by gross capital flows/GDP crosses threshold level of 50 percent, it decreases respective volatility.
Bekaert, et al (2006)	Sample I – 95 Countries (full sample: segmented + liberalized markets) Sample II - 40 Countries (liberalized markets) (International)	1980 to 2000	S.D of real consumption growth rate over 5-year interval	De-jure measures of capital account openness	Equity market liberalization Macro-economic and demographic measures Macro-economic reforms Financial sector measures Legal environment	Fixed effects estimations GMM (Generalized Method of Moments) SUR method (Seemingly Unrelated Regression)	[-] FG is robustly associated with lowering consumption growth variability thus supporting notion of risk sharing impact of FG. Results also suggest that countries those have open equity market and capital account experience 2% less consumption growth volatility than of closed economies.

Meller (2008)	26 Developed Countries 36 Developing Countries (International)	1980 to 2007	S.D of de-trended real GDP by Baxter Pass (BP) filter over 5 year window	(Total liabilities + total assets) over GDP Nature of capital flows	Monetary policy efficiency Fiscal policy quality Supply side volatility Trade openness	Fixed effects estimations Maximum Likelihood estimations	[Mixed] With respect to fixed effect regression FG is insignificant determinant of output variability. With respect to application of Hansen's (1999) threshold model, results reveal that FG decreases (increases) output variability in low financial risk (high financial risk), whereas in intermediate level of financial risk, output volatility increases but less severely.
Popov (2011)	53 Countries (International)	1963 to 2009	Industrial output growth rate Industrial output growth rate volatility Industrial output growth rate skewness	De-facto measure (Gross capital flows) De-jure measure (Dummy variable)	Private credit over GDP Constraints on executive powers Population growth rate Trade/GDP Years of schooling Inflation	Least Square (LS) (Single equation estimation) 3SLS (Three Stage Least Square) (Joint estimation)	[+] FG robustly increases output growth, its volatility and negative skewness, however, the cost of FG in terms of raising probability of disaster risk is mitigated by strong institutions and deep credit markets.
Niranjan	India	1989-2014	Output volatility	De-facto measure	Financial Development		[+]

(2017)			Consumption volatility Investment volatility	De-jure measure	TOT Trade Openness	Vector Error Correction Model	FG significantly impact output, consumption and investment volatility.
Sahoo, et al (2019)	60 Countries (International)	1971-2015	Five year average of GARCH (Generalized Autoregressive Conditional Hetro-skedasticity) variance of real GDP	Volume based measure (Total stock of assets and liabilities/GDP) Equity based measure (Sum of total stock of portfolio assets and stock of FDI assets and liabilities to GDP)	Financial Development Inflation TOT Government Consumption Expenditure Trade Openness	GMM	[Mixed] Financial globalization has positive impact in reduction of output volatility in developed countries regardless of its measurement. In developing countries, its impact on output volatility is sensitive to choice of measurement. In Asia panel, no significant impact is found.
Mokoto (2020)	Zimbabwe	2000 Q1 to 2016 Q4	Five year moving S.D GARCH based measure	Gross sum of capital flows	M3/GDP Trade Openness Government Expenditure Investment	ARDL	Financial Integration has positive significant impact on output volatility, whereas, insignificant impact on consumption volatility.

After reviewing empirical literature related to impact of financial globalization on output instability it can be decisively claimed that preceding work on subject matter diverge substantially in terms of theoretical assertions, measures used to approximate core variables for empirical analysis, sample selection, estimation strategies and empirical outcomes. With regard to impact of financial integration on output variability literature is found to be ambiguous which in turn demands extensive research on subject matter.

3. Trends of Output Volatility in Asia

Asia is a hub of heterogeneous economies consisting of prosperous, stable states and on other side fragile or post conflict states. They substantially differ in terms of development, income level, size, financial landscape, quality of institutions and industrial structure. In this study, Asia is disaggregated as Central Asia, East Asia, South Asia and West Asia. A brief review of economies along respective output volatility trends is given below. It is relevant to state that authors' constructed index of output volatility is used to show trends of output volatility.

3.1 The Central Asian Economies

These economies are largely resource driven land locked countries surrounded by fastest growing economies of China, Russia and India. However, uneven distribution of natural resources among member countries is seen. After gaining independence from Russia in 1991 these countries faced a bleak political landscape along with widespread corruption, ignored human rights, limited economic and financial diversification, insufficient trade facilitation, significant skills gap, macro-economic instability, hyper-inflation and severe output decline. But with the passage of time most of the Central Asian economies have achieved world's best growth levels given its significant endowments and policy reforms. In early 1990's Central and Eastern Europe were targeted for first wave of foreign investments in early 2000's South East Europe was targeted, but afterward FDI moved towards Central Asia although relatively smaller in scale. The largest beneficiary of FDI are Kazakhstan and Uzbekistan and these countries are blessed with abundant energy resources and with additive advantage of strategic location.

3.1.1 Visual Inspection of Output Volatility in Central Asia

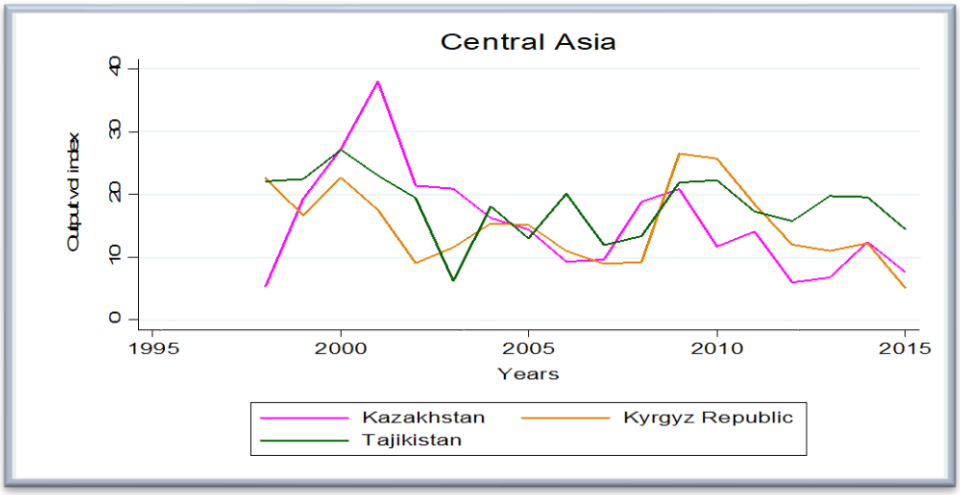

Figure 1: Central Asia's Output Volatility Index (1998-2015)

From Figure 1, it can be observed that during initial years of independence Kazakhstan is characterized by increasing trend of output volatility from 1998 to 2001, whereas, from 2002 to 2007, she has faced substantially declining trend of output volatility and then onwards till 2015 mixed trend of output volatility is observed, whereas, Kyrgyz Republic and Tajikistan are characterized by mixed trend of output volatility throughout the reference period. The event of global financial crises (2008-09) negatively impacted Central Asian economies beside other domestic factors by cutting levels of economic growth. But in post-crises period these economies tried best to recover and curtailed their increased output volatility.

3.2 The East Asian economies (ASEAN 5 + China, Japan and South Korea)

These economies are characterized by impressive growth rates that depend on export-oriented industries, good governance and stable macro-economic fundamentals. These economies relied on industrial form of development, successfully directed investment into high level equipment, selectively protected so called nascent industries, promoted research and development in society rather than just becoming residual result of fiscal balancing. However, East Asian economies are relatively more sensitive to foreign shocks due to their high degree of openness.

3.2.1 Visual Inspection of Output Volatility in East Asia

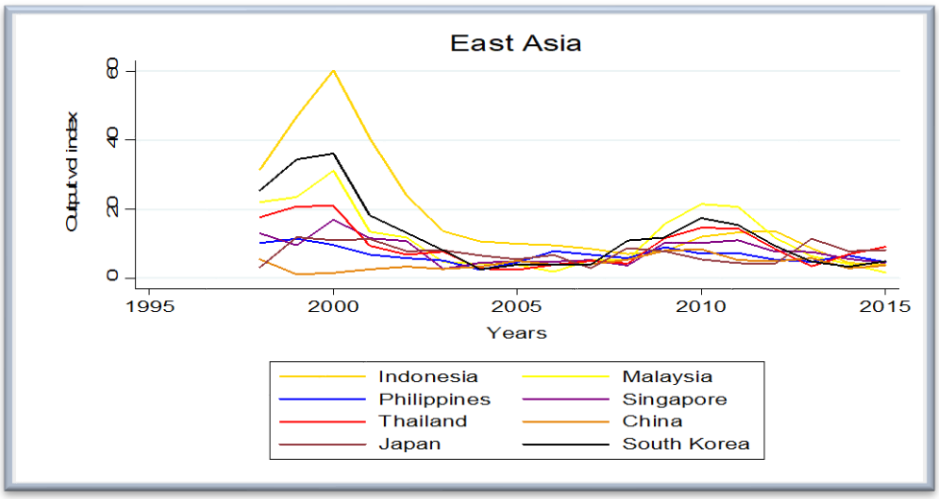

Figure 2: East Asia's Output Volatility Index (1998-2015)

From Figure 2, it can be concluded that on average, East Asia is characterized by high volatility periods from 1998 to 2000, then declining trends and once again increase in volatility is observed during 2008 to 2010. Afterwards decline in output volatility is registered with little variations. The high output volatility period (1998 to 2000) is mainly because of East Asia financial crises. During that time, ratio of non-performing loans was skyrocketed, fiscal costs related to bank recapitalization further led to larger deficits, economic growth significantly curtailed and spread of financial contagion was observed so

rapidly that it was titled 'Asian Flu'. Only china and Hong Kong successfully maintained their currency pegs.[10] Importantly, on average, China is least volatile country in terms of output, whereas, value of Indonesia's output volatility increased dramatically within just three years from 31.35 to 60.16 during 1998 to 2000. The East Asian economies do affect during global financial crises but impact was minor because of increased foreign liquidity, developed financial markets and better governance.

3.3 The South Asian Economies

South Asia (most densely populated sub-continent) consists economies of Pakistan, Bangladesh, India, Sri-Lanka (lower middle-income countries), Iran (upper middle income) and Nepal (lower income). This sub-continent is a hub of vast political, cultural, geographical and religious diversities. On average, all economies are facing poverty, infrastructure deficit, environmental and food security concerns. In addition to this, these economies suffer from border conflicts and also from religious disturbances. In South Asian countries, India is considered to be an exception given its relatively high growth performance over the past decades. Indeed, India is fastest growing and largest economy making up almost 82 percent of total South Asian economy (World Bank, 2015). Secondly, it has largest population and most popular democracy.

3.3.1 Visual Inspection of Output Volatility in South Asia

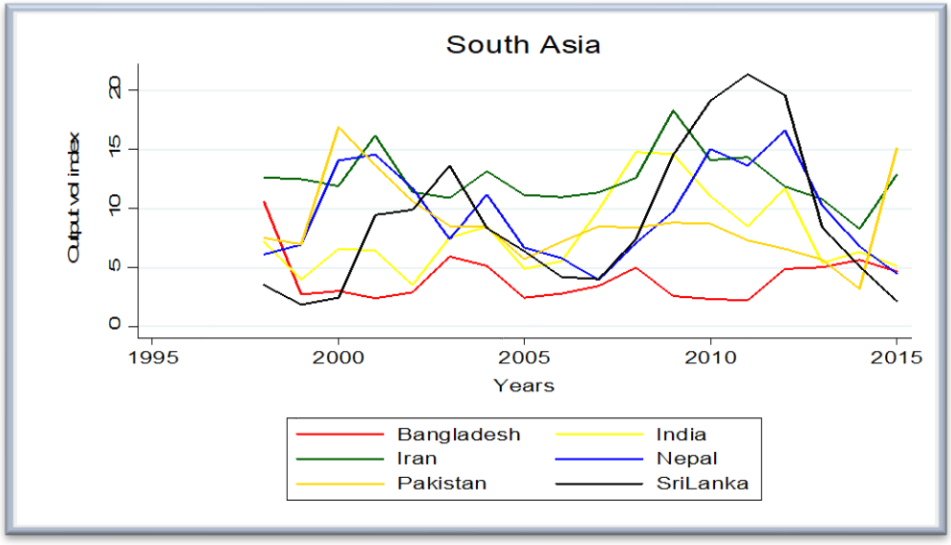

Figure 3: South Asia's Output Volatility Index (1998-2015)

Figure 3 shows mixed trend in South Asian output volatility; however, maximum value of output volatility index is 21.38 experienced by Sri-Lanka in 2011 over the entire sample. Whereas, Central and East Asia's maximum magnitude of output volatility index is quite

high in comparison to South Asia. It is also worth to state that Bangladesh remained less volatile in terms of output in comparison to other member countries of South Asia. Bangladesh's value of output volatility index ranged from 2.18 to 10.57. The Sri Lankan's economy had experienced sharp rise and fall movements in output volatility index and its value ranged from 1.86 to 21.38. Furthermore, Pakistan's value of output volatility index ranged from 3.18 to 15.11, India's value of output volatility index ranged from 3.52 to 14.77, Iran's magnitude of output volatility index ranged from 8.24 to 18.32, Nepal's value of output volatility index ranged from 3.94 to 16.64 during reference period.

3.3 The West Asian Economies

The West Asia particularly Arabian Peninsula (Saudi Arabia, Kuwait, Qatar, Oman and United Arab Emirates (UAE) - the rentier states) is a place of having ample absorptive capacity, excess savings, geopolitical conflicts and institutional fragility. The economy of West Asia is quite diverse and petroleum is considered to be a major industry of entire region. These high-income economies rely on primary exports with very little value added. However, they tried best to diversify their economies in last two three decades. As a result, beside petroleum industry major activities of West Asia are related to retail trade, insurance, finance and real state. In this regard, it is pertinent to mention that diversification has significantly raised share of non-oil sectors particularly in total GDP of UAE.

3.4.1 Visual Inspection of Output Volatility in West Asia

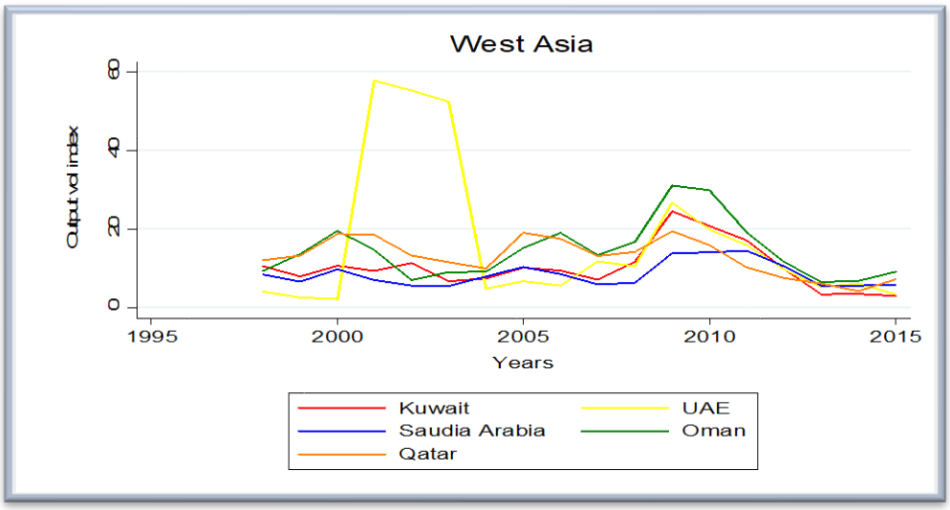

Figure 4: West Asia's Output Volatility Index (1998-2015)

It can be established from the Figure 4 that UAE has experienced sharp changes in output volatility during 2000 to 2004 as reaching to maximum magnitude of output volatility index i.e. 57.82 in 2001 and lowest magnitude of respective volatility index i.e. 2.19 in 2000. Furthermore, Kuwait's value of output volatility index ranged from 2.90 to 24.51, Qatar's value of output volatility index ranged from 4.13 to 19.47, Oman's value of output volatility index ranged from 6.99 to 31.06. The maximum value of output volatility index

in Oman for 2009 was somehow attributed to registered sharp decline in respective year's GDP owing to large fluctuations in oil prices beside other factors and global crises. However, the Saudi Arabia's value of output volatility index ranged from 5.50 to 14.46 during reference period.

4. Data, Model Specification and Methodology

4.1 Data

We eschew to approximate output volatility by single variable and an index is constructed to measure multi-dimensional nature of output instability. Principal component (PC) method is used to construct index. It is a linear multivariate data analysis statistical technique to compress dimensionality of data without compromising accuracy, to address redundancy in variables and to elucidate linear factor structure among variables. The O.Vol index with respect to each country used in this study is reported as follows and table 2 provides details of each variable.

$$O.Vol\text{index}_t = \alpha_1 \text{CEGvol}_{1t} + \alpha_2 \text{IEGvol}_{2t} + \alpha_3 \text{Ex. vol}_{3t} + \alpha_4 \text{In. vol}_{4t}$$

Where $\alpha' s$ refer to weights derived from PC (principal component) method. First Eigen vector is utilized for weights.

Table 2: Delineates of Dependent, Independent and Control Variables

Variable	Measures	Reference	Definition and Calculation	Data Source
Output Volatility Index ($O.Vol\ index_{it}$)	Household final consumption expenditure Volatility (CEGvol)	Norris and Srivisal (2013)	It refers to market value of purchased goods and services by consumers. Volatility is captured by taking 3-year moving S.D of growth in respective measure.	The World Bank and UAE annual economic reports, various issues
	Gross capital formation Volatility (IEGvol)	Norris and Srivisal (2013)	It consists of expenditures on additions to the fixed assets + net changes in the inventories. Volatility is captured by taking 3-year moving S.D of growth in respective measure.	The World Bank and UAE annual economic reports, various issues
	General Government final consumption expenditure Volatility (In.vol)	Bakeart, Harvey, and Lundblad. (2006)	It includes all current expenditures of goods and services made by governments but it excludes military expenditures. Volatility is captured by taking 3-year moving S.D of growth in respective measure. It approximates internal or fiscal policy volatility.	The World Bank and UAE annual economic reports, various issues

	Terms of Trade Volatility (Ex.vol)	Stock and Watson (2002), Coric and Pough (2013)	(Export value index/Import value index)*100 Volatility is measured as 3-year moving S.D of terms of trade. It approximates external volatility.	The World Bank
Financial Globalization	De-facto measure (Net inward FDI to GDP)	Hussin and Saidin (2012)	FDI = equity capital +short-term capital +long term capital+ re-investment of earnings Net inward FDI (NIFDI) =inflows (FDI) minus outflows (FDI)	The World Bank
	De-jure measure (Chinn-Ito index)	Alzer and Dadasov (2012)	Chinn Ito index approximates financial (capital account) openness. This index is constructed with four dummy variables by using first principal component method.	Chinn – Ito database
Control Variables	Real deposit rate (percent) (RD_{it})	Lynch David (1996)	Nominal deposit rate minus Inflation Approximate financial price.	Raw data is from IMF's IFS and Global Development Finance Indicators, World Bank Central Banks of countries profiled.
	Inflation (Inf_{it})	Barrell and Gottshalk (2004), Spatfora and Sommer (2007), Yang (2008).	$[(CPI_t - CPI_{t-1}) / (CPI_{t-1})] *100$ where CPI is consumer price index. Approximate monetary policy efficiency.	Raw data is from IMF's IFS and Global Development Finance Indicators, World Bank
	Real GDP pc Growth Rate (GR Real $GDPpc_{it}$)	Easterly and Kraay (2000) Mobarak (2004)	Real GDP per capita growth rate $[\{(\text{Real GDP } Pc_{(t)} - \text{Real GDP } Pc_{(t-1)})\} \text{ over } \{\text{Real GDP } Pc_{(t-1)}\}] * 100$ Approximate economic growth.	Raw data is from IMF's IFS and Global Development Finance Indicators, World Bank
	Trade Openness (TO_{it})	Karras and Sang (1996) Jansen (2004)	[(Exports + Imports) / (GDP)] * 100 Approximate country's xposure to trade	Data is from World Bank, and IMF's IFS

4.2 Model Specification

In order to empirically investigate the long run impact of financial globalization on output volatility in a balanced panel of selected 22 Asian countries (full sample) during 1998-2015, linear dynamic panel equation is reported below.

$$O.\text{Volindex}_{it} = \alpha_{1it} + \delta_1 O.\text{Volindex}_{i,t-1} + \delta_2 \text{DejureFG}_{it} + \delta_3 \text{DefactoFG}_{it} + \gamma C_{it} + \mu_{it}$$

(+) (+/-) (+/-) (+/-) Where,

$O.\text{Volindex}_{it}$ refers to measure of output volatility for country "i" in period "t"

$O.\text{Volindex}_{i,t-1}$ refers to lagged term of output volatility index for country "i" in period "t"

DejureFG_{it} refers to de-jure financial globalization measure for country "i" in period "t"

DefactoFG_{it} refers to de-facto measure of financial globalization for country "i" in period "t"

C_{it} refers to control variables for country "i" in period "t" and $\mu_{it}$is white noise error term.

The selection of one lag related to dependent variable is mainly dominated by limitation of small sample size. The lagged term of output instability is included in regression to capture changes that occur over the time period. Furthermore, geographically this study intends to use United Nations database classification of Asia's sub-regions i.e. Central Asia, East Asia, South Asia and West Asia.

4. 3 Methodology

4.3.1 Panel Unit Root Tests

In literature there is no single unit root test whose performance is regarded as the dominant one. For valid and direct comparability of results and the performance in terms of power and size, this study uses first generation panel unit root tests i.e. IPS and MW - Fisher type test.

4.3.2 System Generalized Method of Moments (SGMM)

After ensuring absence of unit root in data, proposed dynamic equation on subject matter is preferably estimated with one-step system GMM (SGMM) method. The increasingly favored instrumental estimator i.e. SGMM method successfully handles unobservable effects and emerging biases of joint endogeneity by considering additional orthogonality conditions. The GMM method can be broadly divided into difference and system GMM. However, weak empirical presentation of first difference GMM estimator is reported by Blundell and Bond (1998). They are of opinion that lagged levels of persistent explanatory variables yield weak instruments for subsequent regression in first difference because most of the variations are removed from the data. Therefore, instrument deficiency in turn influences finite small sample and asymptotic performance of difference GMM estimator towards biased and inefficient estimate respectively. Arellano-Bond auto-correlation test is utilized to assess whether orthogonality conditions used by SGMM estimator are valid or not. The Arellano-Bond (1991) diagnostic test is asymptotically distributed with chi-square having null hypothesis of no auto-correlation.

5. Results and Discussions

5.1 Panel Unit Root Test Results

The variables are checked with constant (c) and with constant and trend (c,t) in levels and from the tabulated panel unit root estimates it can be decisively claimed that all variables are integrated of order zero (stationary at levels).

Table 3: Panel Unit Root Estimates

Variables	Tests	H_o: Assumes panel specific unit root process	
		Level	
		Deterministic Components	
		c	c,t
O.Vol index$_{it}$	IPS	-6.28*	-5.68*
	Fisher ADF	115.14*	104.77*
	Fisher PP	82.61*	56.74*
De-facto FG$_{it}$	IPS	-6.32*	-6.70*
	Fisher ADF	119.81*	121.30*
	Fisher PP	101.49*	100.23*
De-jure FG$_{it}$	IPS	0.04	-2.46*
	Fisher ADF	14.75	35.64*
	Fisher PP	12.92	22.64
RD$_{it}$	IPS	-7.51*	-5.83*
	Fisher ADF	160.95*	108.84*
	Fisher PP	151.86*	113.35*
INF$_{it}$	IPS	-15.03*	-9.72*
	Fisher ADF	307.99*	179.78*
	Fisher PP	304.47*	204.81*
GR RGDPpc$_{it}$	IPS	-13.59*	-8.96*
	Fisher ADF	446.90*	145.24*
	Fisher PP	740.57*	218.90*
TO$_{it}$	IPS	-0.49	-1.43***
	Fisher ADF	48.87	54.39
	Fisher PP	51.20	90.64*

Notes:

IPS, Fisher ADF and PP Phillips	Im, Pesaran and Shin, Fisher Augmented Dickey Fuller and Perron
O.Vol index$_{it}$	Output Volatility Index
Defacto FG$_{it}$	De-facto FG approximated by FDI, net inflows as percent of GDP
Dejure FG$_{it}$	De-jure FG captured by Chin-Ito index of capital account restrictions
RD$_{it}$	Real deposit rate (percent)
INF$_{it}$	Inflation (percent)
GR RGDPpc$_{it}$	Growth rate of Real GDP per capita (percent)
TO$_{it}$	Trade as percent of GDP (percent)

a. Chi-square stat is reported for Fisher unit root results whereas W-stat (asymptotically normally distributed) is for IPS unit root results.
b. 'c' is used for constant whereas 'ct' is used for constant and trend.
c. *, **, ***, **** denotes highly significant even at less than 1per cent, at 3 per cent, at 7 per cent and at 9 per cent respectively.
d. AIC (Akaike information criterion) is used for lag length selection.

Source: Authors' calculations using STATA 11.0

5.2 Dynamic Panel System GMM Method Results

The linear dynamic panel equation pertaining to output volatility used in this study is estimated using annual observations employing one step SGMM method. The empirical estimates along with diagnostic checks and summary statistics are reported in Table 4 for Asia (full sample of 22 countries) and for each sub-regional level (with sub-samples) during 1998-2015.

Table 4: Panel SGMM Estimates (1998-2015)

Dependent Variable: Output Volatility Index					
Explanatory Variables	Asia	Central Asia	East Asia	South Asia	West Asia
O.Vol index$_{it-1}$	0.823	0.507	0.643	0.665	0.598
	[0.00]*	[0.00]*	[0.00]*	[0.00]*	[0.00]*
De-facto FG$_{it}$	0.40	0.255	-0.021	0.993	0.109
	[0.05]*	[0.00]*	[0.89]	[0.21]	[0.86]
De-jure FG$_{it}$	---	---	---	---	---
RD$_{it}$	0.557	0.389	1.194	0.125	0.220
	[0.02]*	[0.21]	[0.00]*	[0.29]	[0.45]
INF$_{it}$	0.485	0.348	0.258	0.161	0.273
	[0.05]*	[0.22]	[0.24]	[0.16]	[0.41]
GR RGDPpc$_{it}$	-0.279	-0.027	0.368	0.037	-0.342
	[0.10]*	[0.70]	[0.09]*	[0.70]	[0.01]*
TO$_{it}$	-0.043	0.037	-0.010	-0.129	-0.147
	[0.13]	[0.10]*	[0.58]	[0.00]*	[0.00]*
Intercept	3.07	0.280	1.595	6.299	18.47
	[0.32]	[0.95]	[0.33]	[0.09]*	[0.00]*
Diagnostic Tests					
AR$_1$	0.07	0.09	0.02	0.03	0.27
AR$_2$	0.40	0.54	0.91	0.55	0.47
AR$_3$	0.19	0.18	0.21	0.62	0.29
Summary Statistics					
No. of Observations	374	51	136	102	85
No. of Panels	22	3	8	6	5
Wald chi-square (p-value)	0.00	0.00	0.00	0.00	0.00

Notes:

a) P-values are reported in brackets below the estimated coefficients. * shows exact probability of significant estimate.
b) RSE (Robust Standard Errors) are used to address hetro-skedasticity and autocorrelation issue.
c) Sargan test of over-identification cannot be calculated with robust standard errors in one-step system GMM estimator.
d) In diagnostic tests, p-values are reported for auto-regressive term of order 1 to 3. P-value greater than 5 percent indicates absence of serial correlation at respective order.
e) All instruments are internal.

Source: Authors' calculations using STATA 11.0

In estimated regression of output volatility, we have consciously skipped one measure of core independent variable in order to use it for the robustness checks that will give epistemic support to our core research outcomes. We find five statistically significant relationships out of six in Asia, three in each of Central Asia, East Asia and West Asia and two in South Asia. The individual significance of the variables in most of the cases and overall significance of linear equation (indicated by p-value of wald statistic) in turn enhance reliability of estimated coefficients. Furthermore, on average, all empirical results are theoretically consistent and with experience of cross sections during the reference period. The SGMM necessitates 'the steady state assumption' over the analyzed period to assure validity of instruments (Roodman, 2009). This assumption is successfully supported by empirical results as estimated coefficient of lagged dependent variable (O.Vol $index_{it}$) is less than unity in absolute terms which confirms convergence.

The reported empirical estimates strongly support inclusion of lagged term of dependent variable in regression specification. The significance of lagged output volatility variable indicates that model suffers from endogeneity issue. To control endogeneity we have estimated model with SGMM method which gives strong instruments to address pitfalls of endogeneity and auto-correlation. The lagged term O.Vol $index_{it}$ indicates positive and highly significant impact on current levels of output volatility in long run given ceteris paribus with reported coefficients 0.83, 0.50, 0.64, 0.66 and 0.59 in Asia (full sample) and in four sub-samples i.e. Central Asia, East Asia, South Asia and West Asia respectively.

In Asia (full sample), financial globalization (measured by de-facto indicator i.e. net FDI inflows as percent of GDP) in baseline regression of output volatility and financial globalization (that do not include de-jure measure of financial globalization) is statistically significant at conventional level of 5 percent with reported coefficient 0.40 which indicates that one percent increase in financial globalization, on average, leads to raise output volatility index by 0.40 units in long run given ceteris paribus. The sub-regional empirical estimates also report significance of financial openness in raising output instability only in context to Central Asia with reported coefficient 0.25 which means 1 percent increase in financial openness, on average, leads to raise output volatility by 0.25 units in long run given ceteris paribus.

The positive impact of financial globalization on output volatility is consistent with empirical work of Bekaert et al. (2006) who find weak results in terms of dampening effects

of financial globalization on output volatility for developing countries. The results are also consistent with empirical work of Popov (2011) and Niranjan (2017). It is also relevant to state that this empirical finding contradicts with empirical finding of Sahoo et al. (2019) who supported insignificant impact of financial globalization on output volatility in Asia during 1971-2015. They also claimed that impact of financial globalization is sensitive to choice of measurement in developing countries.

One of the possible causes behind positive impact of financial globalization on output volatility is that on average most of the Asian economies including Central Asia are still suffering from various market imperfections and less developed financial sector. No doubt these economies have shown significant progress in improving health of financial sector but most of progress is seen in terms of financial deepening rather than financial efficiency and stability which makes impossible to gain fruits of financial globalization in terms of reducing output instability. Because primary channel through which financial integration dampens output variability is well developed financial sector that financial market imperfections can in turn lead to positive relationship between output volatility and financial openness. Secondly, during reference period most of Asian economies have experienced increased inflow of FDI but that was inconsistent except few economies including India and Japan among others. Thirdly, financial globalization also raises volatility of investment besides smoothing consumption variability which in turn increases output variability.

However, financial globalization appears to be statistically insignificant long run determinant of output volatility in East Asia, South Asia and West Asia. The insignificance of de-facto measure of financial globalization in terms of its impact on output volatility is consistent with the work of Kose et al. (2003) who claims absence of robustness in this regard after utilizing four different financial openness measures.

The vector of four control variables is used in this study to purge output volatility of extraneous impacts beside financial globalization. The first control variable is real deposit rate which is an important financial price variable. The study finds direct and statistically significant long run impact of real deposit rate on output volatility in overall Asia and East Asia (sub-sample) during 1998-2015. This indicates that high levels of real deposit rate (higher financial deepening) raises output volatility in long run given ceteris peribus. However, magnitude of impact is high only in East Asia as compared to overall Asia. Whereas, direct and statistically insignificant long run impact is supported by empirical estimates in three sub-samples i.e. Central Asia, South Asia and West Asia. This study consistently finds its direct long run impact of inflation in propagation of output fluctuations in Asia and in each sub-sample of Asia during reference period. However, statistical significance of inflation is only observed in full sample Asia. Our results are in line with the empirical findings of Beck et al. (2000), Mobarak (2005) and Rose and Spiegel (2009). The possible justification behind positive impact of inflation on output volatility is that higher levels of inflation refer to unstable monetary environment which is detrimental to proper functioning of financial markets and hurts economic growth

accompanied with increased output volatility. The coefficient of economic growth appears to be significant which negatively associated with output fluctuations during reference period in Asia (full sample) and West Asia (sub-sample). This result is consistent with the empirical work of Koren and Tenreyro (2004), Aghion et al. (2004) and Karras (2006) and it can be justified as lower growth is a mirror image of institutional weaknesses, political instability which in turn raises fluctuations in output or vice versa. However, positive impact of economic growth on output volatility is observed in East Asia (sub-sample) but it is marginally significant at 9 percent. In South Asia and Central Asia, we find insignificant long run association between output volatility and economic growth during reference period. The coefficient of trade openness reveals negative and significant long run impact on output volatility in two sub-samples i.e. South Asia and West Asia during 1998-2015. Furthermore, the insignificance of trade openness in Asia and East Asia is consistent with empirical findings of Razin and Rose (1992), Buch et al. (2002) and Imbs (2004) who report insignificant association between output volatility and trade openness. In Central Asia the study finds positive and marginally significant long run impact of trade openness on output variability which is consistent with the empirical findings of Karras and Song (1996); Easterly, Islam and Stiglitz (2000); Kose et al. (2003); and with Calderón and Schmidth-Hebbel (2008). One of the possible rationales behind this empirical finding is that Central Asian economies are landlocked economies accompanied with less diversification in exports and limited access which in turn raises their output volatility.

In Table 4 various summary statistics and diagnostic results are reported in lower part of estimated output. From the reported results it can be concluded that there is absence of serial correlation at second order and at higher order of three. Therefore, empirical results can be effectively used for policy purpose with precision.

5.3 Robustness Analysis

The robustness check is performed in Table 5 for strengthening the reliability of findings related to the impact of financial globalization on output volatility during 1998-2015.

Table 5: Panel SGMM Robust Estimates 1998-2015

Dependent Variable: Output Volatility Index					
Explanatory Variables	Asia	Central Asia	East Asia	South Asia	West Asia
$OV\ Index_{it-1}$	0.808	0.497	0.645	0.560	0.577
	[0.00]*	[0.00]*	[0.00]*	[0.00]*	[0.00]*
$Defacto\ FG_{it}$	0.364	0.284	-0.013	0.834	0.034
	[0.09]*	[0.00]*	[0.93]	[0.39]	[0.95]
$Dejure\ FG_{it}$	0.976	1.582	-0.350	2.416	3.339
	[0.18]	[0.10]*	[0.26]	[0.21]	[0.29]
RD_{it}	0.608	0.434	1.196	0.158	0.277
	[0.01]*	[0.15]	[0.00]*	[0.13]	[0.46]
INF_{it}	0.517	0.327	0.272	0.137	0.319
	[0.06]*	[0.23]	[0.24]	[0.11]	[0.42]
$GR\ RGDPpc_{it}$	-0.262	-0.007	0.347	-0.089	-0.304
	[0.11]	[0.93]	[0.10]*	[0.43]	[0.01]*
TO_{it}	-0.049	0.045	-0.012	-0.166	-0.159
	[0.12]	[0.00]*	[0.57]	[0.00]*	[0.00]*
Intercept	3.375	0.453	1.873	11.939	13.797
	[0.29]	[0.89]	[0.31]	[0.00]*	[0.00]*
Diagnostic Tests					
AR_1	0.07	0.10	0.02	0.03	0.26
AR_2	0.41	0.37	0.93	0.64	0.47
AR_3	0.20	0.18	0.21	0.54	0.28
Summary Statistics					
Observations	374	51	136	102	85
No. of Panels	22	3	8	6	5
Wald chi-square (p-value)	0.00	0.00	0.00	0.00	0.00

Notes

a) P-values are in brackets below the estimated coefficients. * shows exact probability of significant estimate.

b) RSE (Robust Standard Errors) are used to address hetro-skedasticity and autocorrelation issue.

c) Sargan test of over-identification cannot be calculated with robust standard errors in one-step system GMM estimator.
All instruments are internal.

d) In diagnostic tests, p-values are reported for auto-regressive term of order 1 to 3. P-value greater than 5 percent indicates absence of serial correlation at respective order.

Source: Authors' calculations using STATA 11.0

This study ensures insensitivity of empirical results with respect to sign, significance and magnitude of variables after augmenting linear dynamic panel equation of output volatility with another additional proxy of financial globalization i.e. Chinn Ito index besides our first and preferred measure i.e. net inward FDI as percent of GDP. Before discussing robustness results in detail pertaining to impact of financial globalization on output volatility, it is worth to mention that alternative de-jure financial globalization measure used for robustness analysis has appeared to be statistically significant only in sub-sample of Central Asia at 10 percent significance level during reference period with reported coefficient 1.582.

The robustness outcomes reveal that the impact of lagged dependent variable on current levels of output volatility remains insensitive with respect to sign and statistical significance. Furthermore, the magnitudes of lagged output volatility index do not greatly differ which leads us to decisively claim a positive and highly significant robust long run impact on current levels of output volatility in Asia and in its all sub-regions.

The robustness checks indicate that financial globalization is statistically significant in Asia (full sample) and Central Asia (sub-sample) as in estimated baseline regression. No doubt its significance in Asia has changed from 5 percent to 9 percent whereas it remains highly significant in Central Asia. The financial globalization consistently shows positive long run impact on output volatility in Asia and Central Asia as in initial results. It also remains insignificant long run determinant of output volatility in East Asia, South Asia and West Asia as previously in estimated baseline regression during reference period. The sign of financial globalization in East Asia, South Asia and West Asia also remains consistent when compared with baseline regression results but in terms of magnitude it slightly differs in robustness results as compared to baseline regression results. Furthermore, the results of this study reveal that financial globalization remains robust in determining output volatility even after augmentation of its alternative measure in baseline regression.

With respect to control variables, in Asia (full sample), real deposit rate and inflation appear to be robust, significant and positive long run determinant of output volatility during reference period and in Central Asia (sub-sample), trade openness is a robust, significant and positive determinant of output volatility. In East Asia (sub-sample), real deposit rate and economic growth are robust, statistically significant and positive long run determinant of output volatility. In South Asia (sub-sample), trade openness are robust statistically significant and negative long run determinant of output volatility. Lastly, in West Asia (sub-sample) economic growth and trade openness is robust, statistically significant and negative determinant of output volatility during reference period.

6. Conclusion

The result of this study reveals that the coefficient of past levels of output volatility is highly significant which carries positive sign and it appears to be robust long run potential determinant of current output volatility in overall Asia and in each sub-continent of Asia i.e. Central Asia, East Asia, South Asia and West Asia during 1998-2015. Financial globalization turns up positive and significant long run possible determinant of output volatility in overall Asia and in Central Asia during 1998-2015. However, insignificance

of financial globalization is reported in East Asia, South Asia and West Asia during reference period. The impact of de-facto financial globalization on output volatility is strongly robust in terms of sign, significance and magnitude after augmentation of baseline regression with de-jure measure of financial globalization i.e. Chinn Ito index.

6.1 Contribution of the Study

The ebb and flow of foreign capital particularly during Asian crises 1997-98 and worldwide financial crises 2008-09 demand empirical association of financial globalization with output volatility. Therefore, a cautious theoretical and empirical examination of output volatility in a balanced panel of 22 Asian countries (full sample) during 1998-2015 is carried out. The disaggregated analysis of Asia's output volatility with reference to Central Asia, East Asia, South Asia and West Asia (sub-samples) is also a contribution of this study. Furthermore, a special focus is directed to select refined measures of research variables. The composite measure is constructed to approximate multi-dimensional concept of output volatility with the application of principal component method. The proposed panel linear dynamic equation of output volatility is estimated with the help of most advocated method i.e. SGMM. The validity of empirical regression results is supported by relevant diagnostic tests (second order serial correlation test and steady state assumption). Beside diagnostic checks, robustness analysis is also carried out to assure correctness of empirical estimates.

6.2 Theoretical Implications

The main findings of the study in case of Asia (full sample) and Central Asia (sub sample) supports real business cycle theorists' prepositions as results indicate statistically significant and robust impact of financial globalization in increasing output volatility during reference period. The process of financial globalization has increased output volatility given presence of poor financial market development and macroeconomic instability as real deposit rate and inflation both variables also appeared to be statistically significant and having robust positive impact on output volatility. In case of South Asia and West Asia, impact of financial globalization on output volatility is theoretically consistent but it is statistically insignificant, therefore, no valid inferences can be drawn in this case. The negative impact of financial globalization on output volatility is only seen in case of East Asia (sub sample) estimates which is theoretically in aligned with neo classical theorists but it is also statistically insignificant, therefore, no valid inferences can be drawn.

6.3 Policy Implications

There is a need to prioritize diversification of FDI sources rather than concentration of FDI in energy extraction sectors as diversification of FDI in more fruitful and produce lesser fluctuations in output. Furthermore, diversification in exports is needed to minimize the negative impacts of trade openness on output volatility.

Excessive increase in financial deepening needs to be equipped with efficiency and stability of financial sector in order to ensure economic benefits attached with domestic financial market development.

For South Asian region it is suggested that adverse impacts of trade openness on output volatility needs to be minimized by focusing on diversification of exports and strengthening terms of trade. It is suggested that sustained economic growth must be assured in order to minimize output fluctuations. Furthermore, trade diversification is needed to minimize ill effects of trade openness on output volatility.

No research is inclusive in its all possible aspects. This research is also limited in terms of empirical examination of conditional relationship of financial globalization with output volatility. Given limitations of this research, further research can be extended on subject matter after incorporating mediating variable i.e. financial risk and institutional quality.

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