How South Asian Economies Managed Their Trade Risks Collaboratively ? A Study

Rohit Malhotra [1]

Abstract

South Asian economies, including India, witnessed a considerable GDP decline in the past few years. According to reliable published resources for the fiscal year Q4-2020, India's GDP growth was as low as 3.1% on average over the previous 11 years. This empirical work was built upon the fundamental volatility model (using a 2-asset portfolio case). It comprised the exponential decay function on annual figures from 1976–2019 of overall trade, exports, and imports from five South Asian countries, namely Bangladesh, India, Nepal, Pakistan, and Sri Lanka (Bhutan was excluded due to paucity of data). For empirical justification of spillover effects and shock persistence, two exogenous macroeconomic factors, namely, the inflation percentage (CPI) and population rates, were also taken into account. The broad outcomes were mainly two. Firstly, there was a greater positive impact on time-varying trade-volatility shock persistence levels due to time-varying exogenous factors like inflation and population volatility. The second outcome is that portfolio or joint probabilities "reduce" such an impact, that is, time-varying portfolio volatility of the inflation rate and population rate did not reduce the shock persistence of time-varying trade volatility across the nations studied.

Keywords : shock persistence, time-varying exogenous factor, time-varying inflation volatility, time-varying population volatility

JEL Classification Codes : C40, G10, G11

Paper Submission Date : April 25, 2022 ; Paper sent back for Revision : August 12, 2022 ; Paper Acceptance Date : November 1, 2022

According to *The Financial Express* (a leading economic newspaper) dated August 31, 2020, the COVID pandemic has impacted the Indian economy, which witnessed a decline of 23.9% points in growth in the first quarter of 2020. It goes on to say that this is the first time GDP growth has been negative in the last 40 years. Thus, one of the study's peripheral empirical outcomes (which may or may not be the main outcome) is to understand how trade relationships among lower middle-income economies (South Asia) fared (with collaborative standing) in the face of exogenous inflation and population effects. No substantive research existed in the past that took "portfolio theory" into account in international merchandise trade concerning "information asymmetries" emerging due to "large" economic disruptions (the Asian crisis, the global financial crisis of 2008, and alike). So, this study itself proves to be the first in a concrete understanding of time-varying shock behaviors of explicit trade figures due to the impact of inflation and population.

Literature Review

In international trade, the portfolio approach (across economies, particularly for longitudinal macroeconomic trade data) stands on a more opaque information structure, unlike domestic or international financial portfolio

[1] *Associate Professor,* JK Business School, JK Chawk, Gurugram - 122 102, Haryana. (Email : rohitnish@live.com ; rohit.malhotra@jkbschool.org) ; ORCID iD : https://orcid.org/0000-0002-4801-0916

DOI : https://doi.org/10.17010/aijer/2022/v11i4/172741

trading. The trading of financial assets in well-established markets can be defined under some theoretical, empirical models on pricing and volatility. However, trade data, inflation, and population are essentially non-tradable; therefore, using the portfolio approach for risk management does not have the same short-term risk management relevance. Usually, portfolio volatility models, as it is used in the present study, are aimed at discovering the long-term policy perspective in the area of streamlining trade that emerged due to an economic crisis that statistically disrupts the trade imbalances in the LMIE (low and middle-income economies) nations. It is also observed that the recovery mode due to some external shock is lengthier in slightly ill-informed international merchandise-trade markets.

Osei-Assibey and Dikgang (2020) categorically specified the role of exports and, in some cases, the role of imports in improving economic growth. The use of VECM based Granger causality test was advocated to ensure that mainly the export and growth figures are not influenced by exogenous shocks. However, the above arguments do not provide evidence on specific exogenous time-varying shocks, like inflation volatility and population volatility, despite claiming that a co-integrated feature insulates the exports-led growth. The essence of using exogenous variables in explaining their impact on time-varying trade volatility shocks was missed entirely.

In the same vein, Brainard and Copper (1968) explained that "trade risks aversiveness" did not encourage an "active portfolio strategy" in lower-income countries. Kose and Riezman (2001) used two important methods to demonstrate the external shocks (mainly trade shocks). In these variance decomposition methods, the variance was decomposed into fractions based on the natural ordering process and impulse response for the dynamic nature of shock propagation analysis. Bagella et al. (2004) explained the aspect of "export portfolio volatility" about compensating countries for the favorable or adverse effects of exchange rate movements.

Nguyen et al. (2020) identified the GDP growth corresponding to trade volatility and diversification (including HHI and Theil Index). The inflation rate was used as a control variable. Chow et al. (2018) also adopted inflation rate, GDP, and trade-related figures as capital structure or leverage component determinants.

Nayak and Barodawala (2021) used ARDL (autoregressive distributive lag) to identify the short and long-run dynamics of factors impacting the Indian stock market. Kothadia and Nayak (2020) also utilized the inflation rate time-varying properties as a univariate model. However, these models could not discover the relationship between trade growth volatility and inflation growth volatility over time.

Becchetti and Hasan (2008) presented the concept of trade portfolio risk (TPR) as a portfolio of exchange rate risks where the weights chosen were essentially the trade composition among nations. The paper also pointed out that countries with flexible exchange rates had a lesser effect on external shocks than those with fixed regimes. Interestingly, the paper, which emphasizes portfolio trade volatility risks, argues that compared to the cost of volatility and flexible regime, under portfolio (multilateral) weighted exchange rate regimes, such issues will cancel out each other (compensate each other). The paper also explained that MENA (Middle East and North Africa) (countries have lower trade portfolio volatility compared to other economically integrated countries. Aizenman et al. (2017) studied the adjustment to economic shocks in middle-income economies. One pertinent observation by the authors in this paper was that the flexible exchange rate mechanism improved growth post-crisis and reduced output volatility. The exchange rates and trade volatility relationships were again analyzed in the last two articles. However, the use of the inflation rate was not considered. Malhotra (2022) also emphasized the use of the inflation rate and its cyclical behavior by using the HP filter on the VAR series-based outcomes. Overall, the paper resorted to the decomposition of time and its consequences on the relationship among the macroeconomic variables.

In a similar context, the concepts of home bias and information search costs are of prime relevance to macroeconomic trade data, which stands on a more opaque information structure, unlike domestic or international financial portfolio trading. The trading of financial assets in well-established markets can be defined under some theoretical and empirical pricing and volatility models. However, trade data, inflation, and population are non-tradable; therefore, using the portfolio approach for risk management does not have the same short-term relevance. Usually, portfolio volatility models, as they are used in the present study, are aimed at discovering the long-term policy perspective in streamlining trade that emerged due to an economic crisis that statistically disrupts the trade imbalances in the LMIE (lower and middle-income economies) nations.

It is also observed that the recovery mode due to some external shocks is longer in slightly ill-informed international merchandise trade markets. Adam Smith and David Ricardo's theories of absolute and comparative advantages point in the direction of explaining why international trade should happen, but how to mitigate international trade risks in the wake of an economic crisis and with fiscal and other exogenous interventions has been very scarcely explained. Moreover, portfolio theories (from a risk mitigation standpoint) in international (regional) trade are generally scarce.

Use of Exogenous Variables in the Present Study

Nearly six decades ago, Myint (1958) advocated a critique of the classical trade theory, claiming that export volume and population growth have a strong relationship with upward trends. But it does mention the migration of labor from less productive sectors to more productive sectors. This can be further proved by Adam Smith's "vent for surplus" theory, which states that countries with the same advantage of having higher export possibilities end up having lesser exports due to higher population density leading toward internal consumption. In the same strand of research, Sayan (2005) used different population growth rate dynamics under international trade, relating them with the increase in wages and consumption patterns. So, indirectly, domestic migration within a country can impede export growth. However, the above two articles failed to explain any relationship between population volatility and its impact on trade volatility.

According to Kepaptsoglou et al. (2010), the population is sometimes used as a proxy for international trade movement. With the help of the gravity model, it was discovered in the article that GDP and population sometimes act as "mass variables" for defining the flow of international trade. According to Shachmurove and Spiegel (2004), large-population countries desire protectionism policies because duopoly profits are decreasing in large-population countries. Whereas, for small-population countries, there appears to be an increase in duopoly profits when protectionist policies in bilateral trade agreements between such different population-size economies are relaxed. Another viewpoint of population growth, relationships, and trade reduction is connected with the rate of rural-urban transition. Because opening trade for goods or resources (on which a large segment of the high population is heavily reliant) will deteriorate rather than improve trade terms (Haaparanta, 2004). Previous studies have shown that population rate has an endogenous relationship in terms of economic growth. Population growth (which includes strong correlations between fertility and mortality rates) is generally found to be somewhat dependent on economic growth. But traditional theoretical population studies claim that population growth puts pressure on technological improvement and thus contributes to improving economic growth (Boserup, 1981).

All the "demographic transition" theories discussed above-considered population endogenous to economic growth (not trade). Considering the previous empirical studies of Myint (1958), Sayan (2005), Kepaptsoglou et al. (2010), Shachmurove and Spiegel (2004), and Boserup and Ruttan (1981), it is understood that they used traditional theoretical models of the population representing endogenous relationships between population and economic growth. However, the use of statistical models, particularly inter-country comparisons on conditional population and inflation effects on international trade, has not been found.

To move further, let us focus on historical papers on the exogenous nature of inflation in international trade. In terms of inflation rates and their impact on international trade, the classic paper by Stockman (1985) is worth mentioning. Stockman (1985) took a sample of South Asian economies and empirically justified that the CPI (consumer price index) is highly correlated with food prices. We can find a similar situation in India, where, for instance, any rise in core inflation is balanced by controlled food prices. Any controlled money supply regime also determines the course of international trade in terms of patterns of consumption and exchange rates. Stockman's article further claimed that when fixed costs as a factor of production remain constant, any increase in the inflation rate or rate of monetary growth can have two implications. Either the volume of trade will rise or fall, or, on the contrary, the trade patterns may be reversed.

Further, the papers explained that if the income elasticities of exportable and importable products in the small open economy are different, then the production of exportable goods will fall more drastically in comparison to the production of non-traded goods. On one side, Stockman (1985) provided a utilitarian steady-state model of consumption under several relaxations or alternatives in terms of the marginal rate of substitution of factors of production. But on the other hand, his approach to the transaction model of money failed to address the impact of time-varying inflation risks on time-varying trade risks as an exogenous factor.

The Contribution to Theory

The present work further enlarges the understanding of methodological dimension and contribution to the preexisting theoretical underpinnings in terms of international trade and international trade-related risks.

From mercantilism to absolute and comparative advantages, further H-O trade theories, country similarity theory, and finally, the well-known Porter's model, classical trade theory has primarily provided the structure of reasons for international trade. The classical and neoclassical international trade theories stated that producers could shift their production to new products if there were better prices, favorable and cost-effective dimensions of trade, similar tastes and preferences, and competitive economic power. First, Brainard and Copper (1968) associated the reduction in international trade activities in the event of economic uncertainties with increased "information costs" and a higher price for diversification associated with less-developed nations. Secondly, as Brainard and Copper (1968) revealed, under economic uncertainties, international trade's private and social aspects do not respond equally in terms of their economic motives. Therefore, at times, this resists the formation of international trade due to the associated aversion to risk.

Predominantly, no such theory backs the mitigation of regional merchandise trade risks using conditional (EWMA)-based models. Therefore, I tried presenting my empirical contribution as an attempt to fill that gap.

Research Question and Objectives

After describing the contextual framework and background of the present work, it is imperative to discuss the main research question.

The research gap lies like this:

To understand the historical performance of trade volatility data at the portfolio level and compare it to individual nation-level trade volatility performance.

The study took the lower-middle-income economies (LMIEs) in the South Asian region as the sample for the present study, comprising six countries. Additionally, the "volatility spillovers," or to be precise, "trade volatility spillovers," in the time frame of two economic crises (i.e., 1998 and 2008) faced by emerging economies are also included.

For empirical analysis, the following objectives are formulated :

- Conditional volatility values are calculated using trade, inflation, and longitudinal population data.
- To measure the conditional trade volatility spillovers and related shocks under one empirical scenario :

- By including "inflation rate" and "population" as exogenous variables.
- To measure "portfolio trade volatility spillovers" and trade volatility shocks using the EWMA (Exponential weighted moving average) function.

Methodology

This research work is empirical and uses historical (secondary) data, and therefore the entire dataset was captured in a spreadsheet from the World Trade Organization (WTO) website database. The study employed three endogenous variables: trade merchandise figures, exports, and imports figures, all expressed in millions of US dollars. Here, the aggregate trade figures and disaggregated trade data (i.e., exports and imports figures) were taken separately.

The period chosen for this longitudinal study was from 1976 – 2019. The selection of this time frame was motivated by two factors: first, the WTO's historically available data in the public domain was limited and only available until 1976 for trade-related information. Secondly, since 1976, it has been possible to cover two different economic crises (the South Asian crisis of 1998 and the subprime crisis of 2008) with considerable possibilities for analyzing the after-effects of the crises. Therefore, inflation rate volatility and population rate volatility were used as exogenous variables. Their reasons have been stated in terms of being more "stable," less impacted by trade volatility, and controlled by the internal state's monetary and family welfare machinery.

In terms of time series and with regard to macroeconomic data such as trade (which will be used to remove heteroskedasticity and provide a monotonic transformation resulting in smoother movements), the entire growth rate series was converted into logarithmic series for model-building purposes. The logarithmic transformation of longitudinal data also supports the input of normality assumptions. For conditional volatility (on an annual basis), the use of an exponential weighted moving average (in short, EWMA, or "Exponentially Weighted Moving Average") was employed, where the decay rate was kept at 0.97. The EWMA model is a non-parametric method and a kind of distribution-free estimation.

The empirical model-building process comprises the following steps:

- Calculation of EWMA based on the volatility of trade, exports, imports, population, and inflation rates yields logarithmic growth rates.
- The pair-wise conditional covariance (EWMA-based) is based on the combination of two countries' longitudinal data on trade, export, import, population, and inflation rate logarithmic growth rates (from inputs in Step 1).
- Conditional portfolio variance (EWMA-based) is based on the combination of two countries' longitudinal data on trade, export, import, population, and inflation rate logarithmic growth rates (from inputs in Step 1).
- Vector auto-regression of EWMA-based volatility of trade, export, import, population, and inflation rate logarithmic growth rates (taken from Step 1).
- Vector auto-regression of EWMA-based portfolio volatility of trade, export, import, population, and inflation rate logarithmic growth rates (taken from Step 3).

For representation purposes, only the mathematical equations for export figures are depicted.

Step 1

For the EWMA model (conditional volatility), the following formulae will be employed:

$$\sigma^2_{ext} = c + \lambda\sigma^2_{ex\,t-k} + (1-\lambda)\,\mu^2_{ex\ \ t-k} \quad (1)$$

σ^2_{ext} = The T period (monthly) variance (the country-specific EWMA-based trade volatility) of the variable series (log growth rate observations),

c = constant,

λ = (decay rate, which is kept at 0.97)[1],

k = the yearly lagged component,

ex_t = export figures at time t,

μ^2 = logarithmic growth rate (squared),

$(1-\lambda)\,\mu^2_{ext-k}$ = here, this decay represents the log trade growth rate.

Hence, for all five South Asian LMI countries, the above EWMA model was employed.

Step 2

Conditional (EWMA-based) covariance:

$$\mathrm{Cov}_{exat\ exbt} = c + \lambda\,\mathrm{Cov}_{exa\ t-k\ exb\ t-k} + (1-\lambda)\,\mu^2_{exa\ t-k}\,\mu^2_{exb\ t-k} \quad (2)$$

here,

c = constant,

$\mathrm{Cov}_{exa\,t-k\ \ exb\,t-k}$ = lagged covariance (between the conditional yearly trade volatility series of the two specific South Asian countries),

$\mu^2_{exa\ t-k}\,\mu^2_{exb\ t-k}$ = product of lagged log growth/returns of two countries' trade series.

Step 3

For portfolio conditional covariance, use the following equations:

Portfolio variance is calculated as:

$$\sigma^2_{exatexbt} = \sigma^2_{exat} w^2_{exat} + \sigma^2_{exbt} w^2_{exbt} + 2w_{exat} w_{exbt} \mathrm{Cov}_{exatexbt} \quad (3)$$

---

[1] The idea is that the decay rate is affected by the time horizon and frequency of the data; decay rates are rarely found for yearly data. Hence, the author used 0.97 based on Araneda (2021).

Asset volatility forecasting: The optimal decay parameter in the EWMA model *arXiv preprint arXiv:2105.14382* and related papers for monthly frequency.

here,

$w_{exat} w_{exbt}$ = the static and equal weights of the two conditional trade volatility series ex_{at}, ex_{bt} used in the portfolio.

Step 4

Vector autoregression for country-specific EWMA trade volatility series:

$$Y_{exatexbt} = c + B_{exind} X_{exind\ t-k} + B_{exban} X_{exban\ t-k} + B_{exbhu} X_{exbhu\ t-k} + B_{expak} X_{expak\ t-k} + B_{exsrl} X_{exsrl\ t-k} + B_{exnep} X_{exnep\ t-k} + \varepsilon \quad (4)$$

here,

$B_{exind}, B_{exban}, B_{exbhu}, B_{expak}, B_{exsrl}, B_{exnep}$ = covariates matrix associated with the respective conditional volatility series of ex_{at} associated with five South Asian countries. Here, "*a*" represents a particular sample country,

$X_{exind\ t-k}, X_{exban\ t-k}, X_{exbhu\ t-k}, X_{expak\ t-k}, X_{exsrl\ t-k}, X_{exnep\ t-k}$ = matrix of lagged conditional trade volatility series with respect to the five South Asian countries,

Y_{exat} = vector of $n \times 1$ explained variable in the form of conditional volatility series of the respective country in the sample,

c = constant,

ε = vector error term.

Step 5

For, portfolio-specific EWMA trade volatility series :

$$Y_{exatexbt} = c + B_{exind,ban} X_{exind,ban\ t-k} + B_{exind.bhu} X_{exind,bhu\ t-k} + B_{exind,pak} X_{exind,pak\ t-k} + B_{exind,srl} X_{exind,srl\ t-k} + B_{exind,nep} X_{exind,nep\ t-k} + \varepsilon \quad (5)$$

$B_{exind,ban}$, $B_{exd,bhu}$, $B_{exind,pak}$, $B_{exind,srl}$, $B_{exind,nep}$ = the covariates matrix associated with the respective "2-asset portfolio" conditional volatility series of ex_{at},ex_{bt} associated with five South Asian countries. Here "*a*" represents a particular sample country.

$X_{exind,ban\ t-k}$, $X_{exind,bhu\ t-k}$, $X_{exind,pak\ t-k}$, $X_{exind,srl\ t-k}$, $X_{exind,nep\ t-k}$ = the matrix of lagged "2-asset portfolio" conditional export volatility series with respect to the five South Asian countries here,

here,

$Y_{exat,exbt}$ = vector of $n \times 1$ explained variable in the form of "2-asset portfolio" conditional trade volatility series of the respective country in the sample,

c = constant (drift),

ε = vector error term.

Analysis and Results

Unconditional Volatility Analysis

How did India's international trade data fair in the pre-1998, post-1998 (or pre-2008), and post-2008 phases? Under Table 1 and Table 2, it can be observed that India as an economy did comparatively well (considering the data, Bangladesh also witnessed consistent trade growth only in the first phase, unlike India, where the trade growth was better in the second and third phases).

In the pre-1998 phase, India's international trade was growing at the lowest rate on an average basis. Exports were almost showing the same trend as overall trade. The Indian economy has also seen good average growth momentum in the first two phases, i.e., from 1976 to 2007. In terms of inflation growth rates, India experienced the slowest growth in the first phase compared to the rest of the countries, but the average inflation growth momentum gradually increased from 6.05% to 8.80% after that. In the post-2008 phase, only Bangladesh stabilized its inflation growth rates (on average, reduced by 0.3%).

In per-capita estimation, the population growth seems relevant, except for Pakistan. India's population growth

Table 1. ***Historical Performance of Merchandise Trade and Other Macroeconomic Variables (in Growth Percentage) by South Asian Countries***

Country	Variable	Average (pre-1998) 1976–1997	Average (pre-2008) 1998–2007	Average (post-2008) 2007–2019	Average* (pre-1998)	Average* (pre-2008)	Average* (post-2008)
Bangladesh	Trade	13.17%	10.27%	10.50%			
India		9.46%	16.21%	7.94%			
Sri Lanka		11.12%	5.62%	4.14%			
Nepal		9.93%	9.17%	1.44%			
Pakistan		11.09%	7.67%	2.83%	10.95%	9.79%	5.37%
Bangladesh	Exports	13.02%	10.12%	10.43%			
India		9.91%	18.98%	7.90%			
Sri Lanka		11.57%	5.77%	6.42%			
Nepal		10.81%	3.35%	6.78%			
Pakistan		10.21%	9.09%	2.96%	11.10%	9.46%	6.90%
Bangladesh	Imports	11.43%	10.29%	10.85%			
India		12.35%	17.57%	8.12%			
Sri Lanka		12.28%	7.32%	7.46%			
Nepal		12.07%	7.77%	12.28%			
Pakistan		9.04%	11.47%	4.33%	11.43%	10.89%	8.61%
Bangladesh	Inflation	26.15%	15.16%	–0.30%			
India		0.17%	6.05%	8.80%			
Sri Lanka		70.01%	16.02%	8.86%			
Nepal		–0.63%	21.38%	26.53%			
Pakistan		7.06%	5.24%	16.71%	20.55%	12.77%	12.12%
Bangladesh	Population	2.49%	1.73%	1.12%			
India		2.17%	1.69%	1.21%			
Sri Lanka		1.32%	0.72%	0.79%			
Nepal		2.40%	1.57%	0.68%			
Pakistan		3.11%	2.50%	2.15%	2.30%	1.64%	1.19%

Note. Annual Data collected and processed from the WTO website (1976–2019).
*Average pre-1998, pre-2008, and post-2008 represents cumulative change in the five countries.

rate has seen comparatively larger fluctuations. On the contrary, Sri Lanka and Nepal comparatively stabilized their population figures in the post-2008 phase.

Trade volatility values are exhibited in Table 2, which shows whether the growth momentum was steady or fluctuating. The overall trade volatility (unconditional) was examined in three phases. They were found to be as high as 14.81% in the first, 10.94% in the second, and 12.1% in the third. Therefore, it shows the impact of the crisis on trade risks. Exports in South-Asian economies had remained more stable; throughout the three phases, the growth volatility on average was 10.81%, 10.19%, and 11.32%, respectively. Export volatility figures proved that despite the two economic crises, exports were slightly stable compared to the overall trade volatility figures.

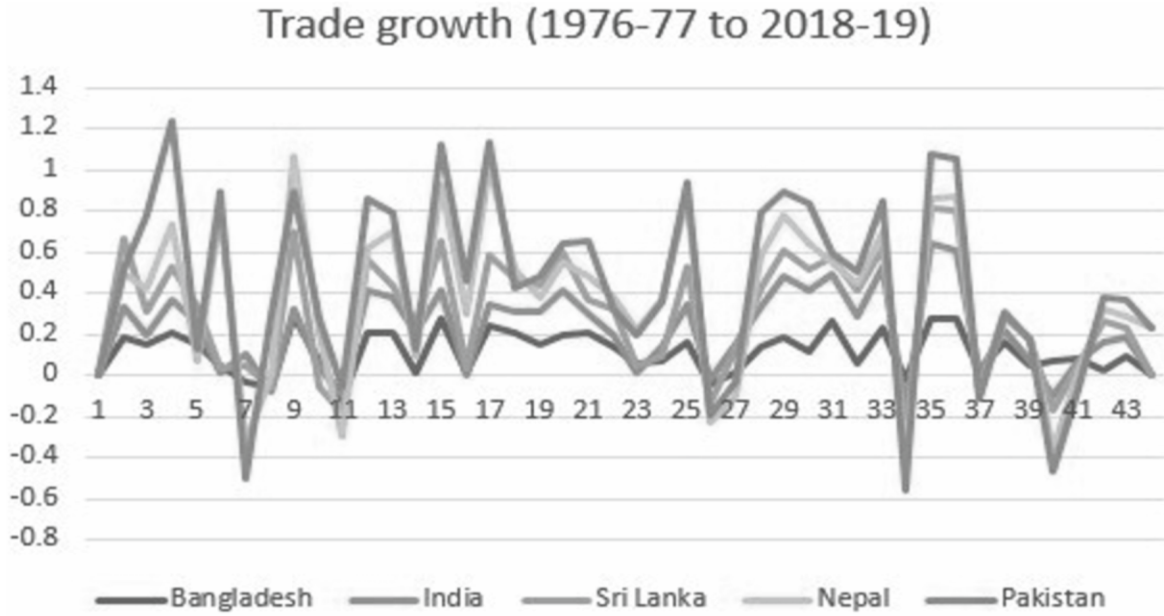
From the Indian context, the risk of volatility from trade merchandise seems to follow (on average) an increasing trend. In the second and third phases, India stood out as the nation with the second-highest and highest

Table 2. ***Historical Performance of Merchandise Trade and Other Macroeconomic Variables (in Volatility Terms) by South Asian Countries***

Country	Variable	Average (pre-1998) 1976 – 1997	Average (pre-2008) 1998 – 2007	Average (post-2008) 2007 – 2019	Average* (pre-1998)	Average* (pre-2008)	Average* (post-2008)
Bangladesh	Trade	11.46%	9.20%	10.44%			
India		8.10%	11.57%	17.78%			
Sri Lanka		12.24%	9.12%	10.18%			
Nepal		25.99%	17.00%	10.72%			
Pakistan		16.26%	7.80%	11.38%	14.81%	10.94%	12.10%
Bangladesh	Exports	11.98%	8.31%	10.16%			
India		7.47%	11.26%	14.55%			
Sri Lanka		11.05%	7.15%	10.82%			
Nepal		11.42%	14.61%	10.09%			
Pakistan		12.16%	9.61%	10.98%	10.81%	10.19%	11.32%
Bangladesh	Imports	14.95%	8.85%	11.80%			
India		12.17%	14.45%	16.34%			
Sri Lanka		14.00%	10.01%	18.69%			
Nepal		11.60%	14.67%	12.27%			
Pakistan		10.54%	15.93%	14.69%	12.65%	12.78%	14.76%
Bangladesh	Inflation	97.61%	44.35%	27.74%			
India		69.95%	38.21%	41.49%			
Sri Lanka		217.58%	54.45%	57.48%			
Nepal		132.47%	87.18%	100.22%			
Pakistan		32.48%	56.44%	64.31%	110.02%	56.13%	58.25%
Bangladesh	Population	0.22%	0.30%	0.04%			
India		0.17%	0.11%	0.15%			
Sri Lanka		0.35%	0.13%	0.28%			
Nepal		0.17%	0.32%	0.72%			
Pakistan		0.22%	0.22%	0.07%	0.23%	0.21%	0.25%

Note. Annual Data collected and processed from the WTO website (1976–2019).
*AVG pre-1998, pre-2008, and post-2008 represent a cumulative change in the five countries.

Figure 1. *Trade Merchandise Growth Across South Asian Economies*



Note. Growth figures are converted from million US dollar terms.

volatility among the other nations. Moreover, both export and import volatility figures have seen a continuous rise in value, particularly from 1998 – 2007 and then from 2008 – 2019.

Regarding exogenous variables, India's inflation risks were the lowest in the first and second phases (although it was still widely fluctuating at 70% and reduced sharply to 38.21%. Hence, comparatively, Indian inflation rates' volatility was less compared to other nations till 2007). Even post-2008, till 2019, the average volatility was the lowest compared to Pakistan, Sri Lanka, and Nepal. Population figures were also less fluctuating from the Indian perspective; only after 2008 did we witness a less stable scenario (as Pakistan and Bangladesh managed their population risks more reasonably than India).

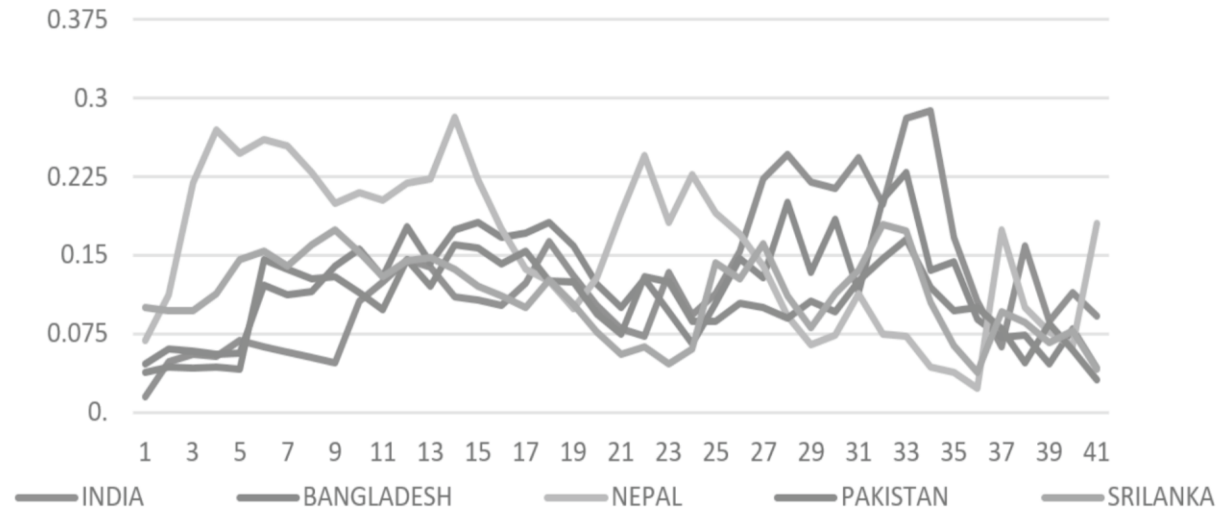
Figure 1 depicts the trend of trade merchandise growth in which India, from 1976 to 2019, kept its growth fluctuations under control and was found to be second only to Bangladesh on the majority of occasions. On the other hand, Pakistan saw maximum growth fluctuations during the same period. Only on one occasion, i.e., perhaps between 2013 and 2014, India saw a slightly reverse trend compared to Pakistan in the trade growth direction. Still, for the rest of the years, all the South Asian economies have seen a similar path for their trade values (in million-dollar terms as per WTO data).

Conditional Volatility Analysis

The EWMA volatility model was analyzed. Figure 2 shows that conditional volatility on an annual basis has been lowest in India (only during 2012–13 did it nearly touch 20%); the rest of the time, it ranged between 5–15%. Contrary to India's case, the rest of the nations, i.e., the lower middle economies, witnessed similar volatility trends. The only exception could be Bangladesh, where the conditional volatility figures hovered over 15–20% in the second phase. For Nepal, the first phase saw very high volatility (> 25% occasionally), but in the second phase, it suddenly nosedived, and in the third phase, it settled at comparatively lower levels. Finally, Pakistan and Sri Lanka ranged between 5% and 15% and generally remained range-specific in all three phases. But surprisingly, from 2012–2013 (i.e., in the tail end of the third phase), all the South Asian countries saw a sharp fall in the EWMA-based volatility; it was lying between 0% and 15%.

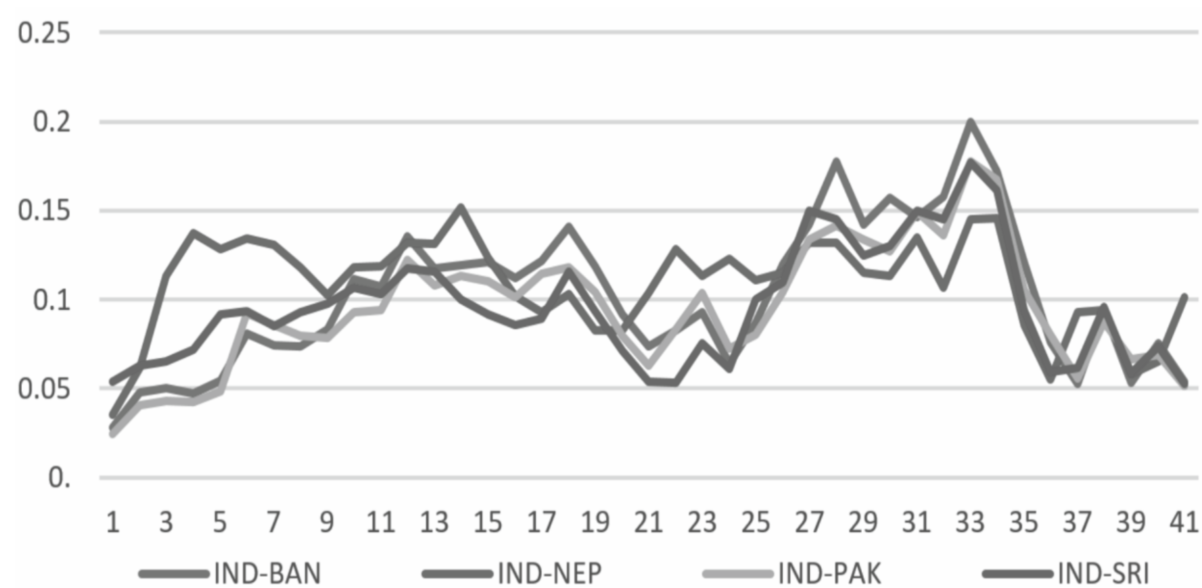
So far as an Indian perspective is concerned, EWMA volatility provides more “curved” or “smooth” volatility movements across the first and third phases, i.e., pre-1998 and post-2008 scenarios. Still, it picked up momentum and rose to nearly 30% during a pre-2008 phase, as shown in the graph (Figure 2). The conditional volatility, on average, was found to be 9.04%, 17.14%, and 15.55%, which is a less fluctuating transition from the unconditional volatility. Although for India, the unconditional volatility transitions from distinct phases were

Figure 2. ***EWMA (Conditional Volatility) of Trade Merchandise Data Across Five South Asian Countries for the Period (1976 – 2019)***



Note. Observe the three phases, 1– 20 (I-phase), 21– 30 (II-phase), and 30-beyond (III-phase) total (1976 – 2019).

Figure 3. ***EWMA (Joint-Conditional Volatility) of Trade Merchandise Data Across Five South Asian Countries for the Period (1976 – 2019)***



Note. Observe the three phases, 1– 20 (I-phase), 21– 30 (II-phase), and 30-beyond (III-phase) total (1976 – 2019).

56.87% and 53.67%, on an average basis, they were significantly reduced to 30.37% and 16.69%, respectively. This has been the case with other economies as well. Hence, there have been more accurate predictions of trade volatility and other macroeconomic volatility with the use of conditional models in comparison to unconditional models.

Now, as per the details in Figure 3, to visualize the impact of the pair-wise (portfolio) conditional volatility function with the non-pair-wise conditional volatility, we can witness a further decline in the volatility patterns. The highest peak, somewhere in 2008–09, was way lesser (20% less) than the earlier case of non-pair-wise movement. Furthermore, the portfolio trade volatility figures were more concentrated (less deviated) with each other throughout the study period. The third phase saw much higher concentrations compared to the earlier two phases. This explains why incorporating combined strategies to mitigate trade risks (in the face of exogenous shocks such as those experienced in 1997–98 and 2007–08) is important from a policy standpoint.

Conditional Trade Volatility Spillovers and India's Position

Table 3 explains the one-lag effects of spillover risks with exogenous effects (with respect to that of conditional inflation rate volatility), and India's EWMA volatility had some impact from its lag. The regression model has an *R*-squared value of 70.3%. The impact on Bangladesh EWMA figures was more oriented toward the lagged volatility of Nepal and Pakistan's conditional volatility of trade, with the additional impact of exogenous inflation conditional volatility of Bangladesh, Nepal, and Pakistan.

Table 3. ***Spillover EWMA Volatility Effect in Trade Merchandise Data (1979–2019)***

PART 1		
	VAR (with exogenous variables of inflation rate)	
	Significant Spillover coefficient (1-lag effect)	
India trade volatility *(INDIAT)*	India trade volatility (0.3992)	R^2 = 70.3%
Bangladesh trade volatility *(BANT)*	Pakistan trade volatility (0.5521), Sri Lanka trade volatility (0.5061), Bangladesh inflation volatility (0.0434), Nepal inflation volatility (0.2626), Pakistan's inflation volatility (0.1875)	R^2 = 72.77%
Nepal trade volatility *(NEPT)*	Nepal trade volatility (0.6042), India inflation volatility (0.1320), Nepal inflation volatility (–0.4186)	R^2 = 77.88%
Pakistan trade volatility *(PAKT)*	Nepal trade volatility (0.1838), Pakistan inflation volatility (0.1554)	R^2 = 66.04%
Sri Lanka trade volatility *(SRIT)*	Sri Lanka trade volatility (0.5219), Pakistan inflation volatility (0.2136)	R^2 = 70.86%

Note. R^2 = *R*- squared value.

PART 2		
	VAR (with exogenous variables of the population)	
	Significant spillover coefficient (1-lag effect)	
India trade volatility *(INDIAT)*	India trade volatility (0.3791), India population volatility (0.5487)	R^2 = 88.7%
Bangladesh trade volatility *(BANT)*	Sri Lanka trade volatility (0.3366), Bangladesh population volatility (0.3996)	R^2 = 75.79%
Nepal trade volatility *(NEPT)*	Nepal trade volatility (0.5617)	R^2 = 77.86%
Pakistan trade volatility *(PAKT)*	Bangladesh trade volatility (0.2666), India population volatility (–0.2852), Pakistan population volatility (0.1615)	R^2 = 73.76%
Sri Lanka trade volatility *(SRIT)*	Bangladesh trade volatility (–0.3121), Sri Lanka trade volatility (0.615)	R^2 = 69.53%

Note. R^2 = *R*- squared value.

Nepal's lag figures for conditional trade volatility and India's inflation volatility significantly contributed to the spillover effect. In addition, Pakistan's trade volatility saw an impact from the lagged conditional volatility of Nepal and Pakistan's own lagged inflation rate volatility. Finally, for Sri Lanka, its own lagged trade volatility, and the additional impact of the exogenous variable of Pakistan's inflation rate volatility were observed in terms of analyzing the spillover effects.

Overall, except for India's trade volatility, the rest of the nations have seen some impact of lagged exogenous inflation rate volatility in the movement of their trade. The overall regression coefficient (R^2) was not strong and was found to be below 80% for all the combinations taken into account.

To reduce the risk of error in the non-positive definite covariance matrix, the second exogenous variable, i.e., the population conditional volatility, was used separately for analysis purposes. As seen in Table 3, in the second part, while there is no statistical relationship between inflation rate volatility and trade volatility (in terms of spillover coefficients), India's trade volatility is influenced by lagged population conditional volatility. However, Nepal and Bangladesh were not found to have any impact from lagged population volatility. Except for India's trade volatility regression, the overall regression coefficient was at 88.7%; the rest were below 80%, respectively.

After relaxing the exogenous effects, we can compare the results of spillover risks with Table 4, primarily meant to show the impact without inflation and population factors as exogenous variables. It is observed that after excluding exogenous components (inflation rate and population rate EWMA volatility) from the VAR setup, the lag coefficients were more pronounced, but the overall explanatory power (*R*-squared values) declined. In the case of exogenous effects, the coefficient value of India's trade volatility improved to 0.6181 from 0.3997. However, the regression coefficient with inflation rate volatility as an exogenous variable and without an exogenous variable was almost the same. With population volatility as the exogenous effect, India's trade volatility coefficient increased substantially to 88.7%, impacting Bangladesh's and Nepal's trade volatility. India's trade volatility for Nepal had a negative coefficient in this case.

The influence of Pakistan and Sri Lanka's EWMA-based trade volatility has shown a significant relationship with Bangladesh's conditional volatility. However, the explanatory power (*R* - square reduced to 63.09%) was reduced once more. For Nepal's trade volatility figures, the spillover (contagion) risk was found to be significant (although with a negative coefficient) in relation to India's and the lag of Nepal's trade volatility. Again, however, explanatory power or *R*-square values decreased considerably.

For Pakistan, the impact of removing exogenous factors has reduced the explanatory power to significant levels. The explanatory power of Sri Lanka's trade volatility spillover had decreased. Its lag volatility as an independent variable significantly influenced Sri Lankan trade volatility. After comparing Table 3 and Table 4 spillover effects, it is worth noting that both exogenous factors, i.e., the conditional volatility of inflation rates and population rates, have impacted the explanatory power in the VAR model. This shows that for internal stability in trade balances, the influence of countermeasures like control of inflation rates and population rates is required or

Table 4. ***Spillover EWMA Volatility Effect of Trade Merchandise Data (1979–2019)***

VAR (without exogenous variables of the inflation rate and population) ; Significant Spillover coefficient (1 lag effect)		
India trade volatility *(INDIAT)*	India trade volatility (0.6181)	R^2 = 70.39%
Bangladesh trade volatility *(BANT)*	India trade volatility (0.2224), Pakistan trade volatility (0.4821), Sri Lanka trade volatility (0.4400)	R^2 = 63.09%
Nepal trade volatility *(NEPT)*	India trade volatility (–0.3291), Nepal trade volatility (0.6481)	R^2 = 70.19%
Pakistan trade volatility *(PAKT)*	Nepal trade volatility (0.1704)	R^2 = 60.42%
Sri Lanka trade volatility *(SRIT)*	Sri Lanka trade volatility (0.7585)	R^2 = 57.95%

Note. R^2 = *R*- squared value.

used in the present case of South Asian economies, particularly in the advent of two important economic crisis periods.

Shock Analysis in Terms of Conditional Trade Volatility Estimates

Table 6 is again divided into two parts. First, the results demonstrate the impact or shock response (impulse response of one-standard deviation) on EWMA-based conditional trade volatility and other macroeconomic variable conditional volatility series. This is further attributed to two terms—with and without the influence of exogenous variables.

It was observed that with shocks accounted for in the Indian trade volatility series (refer to Table 5), it took four years for the lag of the Indian trade volatility series to reverse for a moving average reversal under the influence of exogenous variables. In comparison, it extended to eight years when excluding the exogenous variables. Bangladesh, where the post-recovery convergence worsened due to the exogenous effect of inflation rate volatility, saw an improvement. However, Pakistan and Sri Lanka also saw the influence of exogenous inflation rate volatility, which delayed the shock recovery.

Table 5. ***Comparative Analysis of Shock Response With and Without Exogenous Variables (1979–2019)***

Shock Analysis (1 SD shock) with exogenous variables (inflation rate) Shock Recovery (No of years till MA turns zero)						Shock Analysis (1 SD shock) without exogenous variables Shock Recovery (No of years till MA turns zero)					
Shock Given to	**INDIA**	**BAN**	**NEP**	**PAK**	**SRIL**	**Shock Given to**	**INDIA**	**BAN**	**NEP**	**PAK**	**SRIL**
INDIA recovery	4	9	>10	8	9	INDIA recovery	8	9	>10	2	>10
BAN recovery	>10	8	>10	6	8	BAN recovery	6	7	>10	8	9
NEP recovery	8	4	7	2	2	NEP recovery	10	2	5	2	2
PAK recovery	>10	8	2	6	8	PAK recovery	2	6	9	7	8
SRIL recovery	8	2	7	4	5	SRIL recovery	3	3	8	5	6
SUM	>40	>31	>36	26	32	SUM	29	27	>42	24	>35

Table 6. ***Pair-Wise EWMA Volatility Spillover Dynamics of Trade Merchandise Data (1979–2019)***

VAR (for pair-wise conditional volatility against India's trade merchandise data) Significant Spillover coefficient* (1-lag effect) with inflation rate volatility and population volatility as exogenous variables		
India trade volatility *(INDIAT)*	India-Nepal portfolio inflation volatility (–1.407), India-Nepal portfolio population volatility (1.1259)	R^2 = 87.59%
Bangladesh trade volatility *(BANT)*	India-Nepal portfolio trade volatility (0.7147), India-Pakistan portfolio inflation volatility (–0.7652), India-Nepal portfolio inflation volatility (–1.108), India-Pakistan portfolio inflation volatility (0.8102)	R^2 = 67.75%
Nepal trade volatility*(NEPT)*	India-Nepal portfolio trade volatility (0.3460), India-Nepal portfolio population volatility (0.7464)	R^2 = 85.55%
Pakistan trade volatility *(PAKT)*	India-Nepal portfolio trade volatility (0.3552), India-Nepal portfolio population volatility (0.7691)	R^2 = 85.78%

Note. R^2 = *R*- squared value.

* Figures in brackets represent VAR coefficients.

Without the exogenous variables, the trade volatility shock in Bangladesh has experienced a delay in reversal. However, Sri Lanka's conditional trade volatility was an exception, where the recovery from the Bangladesh conditional trade volatility shock took one year less than it did in the non-exogenous part.

Similarly, improvement of exogenous inflation rate volatility was observed in Nepal, Pakistan, and Sri Lanka trade volatility post-shock recoveries with the influence of Nepal's trade-conditional volatility shock. On the contrary, for India and Bangladesh, the Nepal conditional trade volatility shock took more than 10 years to recover.

Pakistan trade volatility shocks (again, refer to Table 5) have also seen an improvement in post-shock recovery in terms of exogenous inflation rate volatility, as post-shock Bangladesh, Pakistan, and Sri Lanka saw an improvement. Nepal saw no change. Surprisingly, India's situation deteriorated as the inclusion of exogenous inflation rate volatility increased the post-recovery period from two to eight years. Finally, there was an improvement witnessed for the Sri Lanka trade volatility shock, including the inflation rate volatility effect in India, Bangladesh, and Sri Lanka. Nepal and Pakistan experienced no change. In continuation of the second part of Table 5, while giving India's population a shock, some impact was observed in India's conditional trade volatility. Pakistan's volatility figures saw no change (post-shock was intact for two years), and the rest of the four nations saw a drop in the post-recovery period. Except for Sri Lanka, there was no improvement in terms of post-shock reduction with Bangladesh's population volatility shock. Nepal, Bangladesh, Pakistan, and Sri Lanka, for example, saw significant improvement (particularly Pakistan) in terms of reduced conditional trade volatility following the recovery period.

In terms of shock on Pakistan's population time-varying (conditional) volatility, it was observed that India's trade time-varying volatility took the maximum time to reverse. While, Nepal had witnessed no change in the shock effects.

Furthermore, with the shock provided to Pakistan's population time-varying volatility, the conditional (time-varying) volatility time period of reversal was reduced for all the nations (except for Nepal and India's time-varying volatility shock responses reversals). At the same time, the rest of the countries saw a significant decline in the post-recovery period. Finally, there was no reduction in the post-recovery period for Sri Lanka's volatility shock due to the inclusion of exogenous population conditional volatility in the model.

Portfolio Conditional Trade Volatility Analysis

The next interesting piece of analytic inquiry was to compare the spillover effects, migrating from an individual's conditional trade volatility spillover effects to portfolio conditional trade volatility spillover effects.

It was specifically observed that any other portfolio volatility series did not influence the India-Bangladesh portfolio trade volatility series. It should be noted that portfolio weights were kept arbitrarily equal for unbiased estimation purposes. Referring to Table 6, out of four portfolio combinations, almost three, i.e., India and Bangladesh, India and Pakistan, and India and Sri Lanka, saw a regression coefficient above 85%. Furthermore, we found that besides the impact of the portfolio, the joint-volatility impact of exogenous factors, i.e., conditional volatility (lagged) of the inflation rate and population, showed significant coefficients. For instance, in the case of India and Bangladesh portfolio trade volatility, the impact of both India and Nepal portfolio conditional inflation rate and India and Nepal joint population conditional volatility was found to be significant. The same goes with India's and Nepal's portfolio conditional trade volatility (here, India's and Nepal's portfolio conditional inflation volatility and India's and Pakistan's conditional inflation volatility have contributed). Finally, the impact of exogenous factors was seen in the remaining two portfolio volatility combinations, namely India and Pakistan and India and Sri Lanka.

Finally, shock persistence was observed with a portfolio conditional trade volatility series in Table 7. India-Lanka's portfolio volatility series shock had witnessed the strongest influence since the moving average

Table 7. *Shock Analysis of Pair-Wise EWMA Volatility (1979 – 2019)*

Shock Analysis (1 SD shock) with Exogenous variables : Shock recovery (no of years till MA turns zero)				
Shock Given to	***INDIA-BAN***	***INDIA-NEP***	***INDIA-PAK***	***INDIA-SRIL***
INDIA-BAN recovery	5	8	3	9
INDIA-NEP recovery	3	6	2	8
INDIA-PAK recovery	5	2	3	2
INDIA-SRIL recovery	3	7	3	8
SUM	16	23	11	27

recovery in all the portfolio combinations was more or less eight years and above, except for the India-Pakistan combination, where it was only two years.

Exclusively from the Indian context, the fastest recovery witnessed among the different shocks at the portfolio level was (from lowest to highest intensity) like this:

The India-Pakistan portfolio trade volatility recovered the fastest twice in two years, from India-Nepal and India-Sri Lanka shocks. India-Nepal also recovered the fastest in two years from India-Pakistan volatility shocks. On the negative side, it took India and Bangladesh nine years to recover from the post-shock of trade volatility shock between India and Sri Lanka. Hence, the fastest shock recoveries (moving vertically) were from India-Pakistan, followed by India-Bangladesh, then India-Nepal, and at last, India-Sri Lanka (it was eight years, 16 years, 23 years, and 27 years, respectively). Even in terms of post-shock recovery across portfolio combinations (moving horizontally), the India-Pakistan volatility combination seems the most robust. It took 12 years, followed by 19 years for India-Nepal, 21 years for India-Sri Lanka, and 25 years for India-Bangladesh.

Moving vertically, without the influence of exogenous variables, the countries whose trade volatility shock was the most severe across LMI nations in consideration were Nepal, with a total of 42 years, and Pakistan, with 24 years. On the contrary, in terms of moving recovery period-wise (horizontally), the lowest time for recovery was in Nepal, while the highest time was in Bangladesh. Considering the inflation impact and the lagged conditional trade volatility of other LMI nations, India was the most influential nation in providing excessive post-recovery delay, while Pakistan was the least. While in terms of fastest recoveries (horizontally), it was Nepal, with 21 years, and Bangladesh, with 42 years, on the highest side. In the end, with the inclusion of population volatility, the country with the strongest shock influence was Sri Lanka, and the least was India. However, in terms of post-shock recoveries (horizontally), it was again a tie between Nepal and Sri Lanka with 22 years and the highest with India with 40 years.

Finally, in terms of the recovery scenario, Bangladesh and Nepal are two countries that have seen the benefit of population and inflation rate exogenous effects as interventions. In contrast, Pakistan and Sri Lanka have only benefited from exogenous population effects. India's post-shock trade volatility recoveries have worsened due to the inclusion of exogenous factors. In terms of shock influences, Nepal is the only country where the post-shock impact on other countries (Bangladesh and Nepal) was reduced due to exogenous factors (both). India only benefited from a lower post-shock impact compared to other countries with a population factor and Sri Lanka with an inflation rate.

Concerning the portfolio-level conditional trade volatility series, it is evident that they carried more information power, which helped reduce the "dependencies" or spillover tendencies among nations to some extent. Such risk-sharing arrangements have proven to be meticulously reasonable in mitigating the consequences of severe economic meltdowns.

Conclusion and Policy Implications

The overall theme of the paper was to closely investigate the internal rebalancing (through risk-sharing mechanisms) of South Asian economies in the phases of two important economic crises, the Asian Economic Crisis of 1998 and the International Financial Crisis of 2008. The major understanding in the paper was drawn from the influence of exogenous measures like inflation rate and population rate regimes and strategic trade partner selection. To be precise, out of these two "independent measures," as used by the author, the use of exogenous conditional macroeconomic volatility shocks and the use of a portfolio or risk-sharing approach in the present study must have built some resistance to withstand the negative impact of the economic crises of the past.

In addition, from the portfolio conditional trade volatility perspective (generally looking from a flexible trade policy structure perspective), it is worth noting that in certain cases, any delay in recovery after a shock lasting more than 10 years or more has some intuitive reasons. India and Pakistan appear to be viable portfolio volatility combinations that experienced the least impact due to shock injected into other pair-wise trade volatility. First and foremost, because of risk-sharing in terms of selecting the right partners (excluding the impact of internal policy measures such as inflation rate and population controls), the correlations among the conditional trade volatility series between 1979 and 2019 must have improved, delaying aftershock recoveries.

It is critical to understand that portfolio-trade volatility shock responses suggest that intra-regional trade helps reduce risk premia (due to lower information asymmetries associated with trade figures) and thus aids nations in "risk sharing." As a result, this study can be applied to portfolio-level trade volatility shock and persistence studies. The policy implication of the study is as follows:

In the case of countries subject to economic sanctions, they could consider how such strategic risk-sharing measures can be used more cautiously. Despite having strong, independently measured identical movements (positive correlations) of trade volatility among them or due to similar risk-sharing advantages, the nations can still develop some "policies" so that their shock persistence levels, with or without the influence of inflation rate volatility and population rate volatility, can be significantly minimized.

Limitations of the Study and Scope for Future Research

The current study does not employ any dynamic macroeconomic model approach, such as ARDL or GARCH family models. Moreover, the study is confined to only the top six nations. It thus has a scope, not in terms of implications for all countries, but in terms of modeling time-varying portfolio macroeconomic volatility. Under time-varying macroeconomic modeling, the scope is immense, as not many papers have been attributed to portfolio analysis to simultaneously determine the extent of the impact of inflation and population on trade figures, or trade volatility, to be precise.

Author's Contribution

Dr. Rohit Malhotra is the sole author of this paper. He conceived the idea and developed the research design for the empirical study.

Conflict of Interest

The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter, or materials discussed in this manuscript.

Funding Acknowledgement

The authors received no financial support for the research, authorship, and/or publication of this article.

References

Aizenman, J., Jinjarak, Y., Estrada, G., & Tian, S. (2017). *Flexibility of adjustment to shocks: Economic growth and volatility of middle-income countries before and after the global financial crisis of 2008* (Working Paper No. 23467). National Bureau of Economic Research. https://doi.org/10.3386/w23467

Bagella, M., Becchetti, L., & Hasan, I. (2004). The anticipated and concurring effects of the EMU: Exchange rate volatility, institutions and growth. *Journal of International Money and Finance, 23*(7–8), 1053–1080. https://doi.org/10.1016/j.jimonfin.2004.08.007

Becchetti, L., & Hasan, I. (2008). The effects of regional integration: Impact on real effective exchange rate volatility, institutional quality and growth for MENA countries. In, B. Guha-Khasnobis, & G. Mavrotas (eds.), *Financial development, institutions, growth and poverty reduction. Studies in development economics and policy.* Palgrave Macmillan. https://doi.org/10.1057/9780230594029_12

Boserup, E., & Ruttan, V. W. (1981). Population and technological change: A study of long-term trends. *Population and Development Review, 8*(1), 181. https://doi.org/10.2307/1972698

Brainard, W. C., & Cooper, R. N. (1968). Uncertainty and diversification in international trade. *Food Research Institute Studies, 8*(3), 257–285. https://doi.org/10.22004/ag.econ.134983

Chow, Y. P., Muhammad, J., Bany-Ariffin, A. N., & Cheng, F. F. (2018). Macroeconomic uncertainty, corporate governance and corporate capital structure. *International Journal of Managerial Finance, 14*(3), 301–321. https://doi.org/10.1108/ijmf-08-2017-0156

Kepaptsoglou, K., Karlaftis, M. G., & Tsamboulas, D. (2010). The gravity model specification for modeling international trade flows and free trade agreement effects: A 10-year review of empirical studies. *The Open Economics Journal, 3*, 1–13. https://doi.org/10.2174/1874919401003010001

Kose, M. A., & Riezman, R. (2001). Trade shocks and macroeconomic fluctuations in Africa. *Journal of Development Economics, 65*(1), 55–80. https://doi.org/10.1016/s0304-3878(01)00127-4

Kothadia, K. D., & Nayak, D. N. (2020). Modeling inflation in India: A univariate approach. *Arthashastra Indian Journal of Economics & Research, 9*(2–3), 25–38. https://doi.org/10.17010/aijer/2020/v9i2-3/155602

Malhotra, R. (2022). Empirical illustration of cyclical behaviours of fertility and inflation rates in context to Asian economies. *SSRN Electronic Journal.* https://ssrn.com/abstract=4193621

Myint, H. (1958). The "classical theory" of international trade and the underdeveloped countries. *The Economic Journal, 68*(270), 317–337. https://doi.org/10.2307/2227598

Nayak, D., & Barodawala, R. (2021). The impact of macroeconomic factors on the Indian stock market: An assessment. *Arthashastra Indian Journal of Economics & Research, 10*(2–3), 27–40. https://doi.org/10.17010/aijer/2021/v10i2-3/167172

Nguyen, T. N., Pham, T. H., & Vallée, T. (2020). Trade volatility in the association of Southeast Asian nations plus three: Impacts and determinants. *Asian Development Review, 37*(2), 167–200. https://doi.org/10.1162/adev_a_00153

Osei-Assibey, K., & Dikgang, O. (2020) International trade and economic growth: The nexus, the evidence, and the policy implications for South Africa. *The International Trade Journal, 34*(6), 572–598. https://doi.org/10.1080/08853908.2020.1737598

Reboredo, J. C. (2012). Modeling oil price and exchange rate co-movements. *Journal of Policy Modeling, 34*(3), 419–440. https://doi.org/10.1016/j.jpolmod.2011.10.005

Sayan, S. (2005). Heckscher – Ohlin revisited: Implications of differential population dynamics for trade within an overlapping generations framework. *Journal of Economic Dynamics and Control, 29*(9), 1471–1493. https://doi.org/10.1016/j.jedc.2004.08.008

Shachmurove, Y., & Spiegel, U. (2004). *Size matters in international trade and population size.* Available at SSRN. http://dx.doi.org/10.2139u

Stockman, A. C. (1985). Effects of inflation on the pattern of international trade. *The Canadian Journal of Economics, 18*(3), 587–601. https://doi.org/10.2307/135021

Sunil, N., Purswani, G., & Benny, N. R. (2019). Interrelationship and interdependence among macroeconomic variables in India. *Arthashastra Indian Journal of Economics & Research, 8*(1), 50–60. https://doi.org/10.17010/aijer/2019/v8i1/142714

About the Author

Dr. Rohit Malhotra is a PhD and an MBA, with 21 years of experience. He has published several research articles in applied portfolio analytics, empirical pricing, symbolic anthropology in finance, and so on. He is also a recipient of two best paper awards, including one from the Association of International Business (AIB), Michigan State University, and the IIM Vizag Conference held in the year 2020.