Examining the Evolution of International Reserves of Three SAARC Countries: Bangladesh, India, and Pakistan

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Abstract

This paper investigates the trends, cycles, and irregular components in the international reserves of three South Asian Association for Regional Cooperation (SAARC) members: Bangladesh, India, and Pakistan. These countries were chosen because their economies, remittances, FDI, exports, and foreign investment are all growing fast. In this paper, the international reserve of each nation is decomposed using the unobserved components model, and the relationship between each component and these countries is investigated. The years 1971–2021 have been selected as the time frame for the research, and the statistical dataset used as World Bank Development website has been examined. The model is estimated using a maximum likelihood approach and the smooth trend plus stochastic cycle method developed by Koopman et al. (2009). The model will primarily be evaluated by the residual diagnostics, which will show that it has a good fit. In addition, the diagnostics of normality, auxiliary, prediction, and forecast all point to the fact that there is not a defect in the model. In perspective of irregular components, empirical research shows clearly that Pakistan has a positive correlation with India but a strong negative correlation with Bangladesh. Lastly, a stronger correlation can be found between the three countries during shorter cycles than longer cycles.

Keywords: SAARC, International Reserves, Unobserved Components model, Exchange Rate.

1. Introduction

International reserves are capital deposits that are maintained by central banks or monetary authorities for the purpose of accumulating a collection of reserve currency obligations; in addition, international reserves serve as an economic indicator. The reasons that different countries have for accumulating international reserves are different since their interests are different. Nonetheless, it might be argued that the primary purpose of accumulating reserves would be to support the stabilization of the purchasing power of the economy. As a result, international reserves are the mechanism by which the balance of payments compensates for the gap between capital inflow and outflow. Hence, foreign reserves help to compensate both internal and external macroeconomic imbalances. In addition, maintaining international reserves is

essential, specifically for underdeveloped countries, to decrease unfavorable external as well as internal shocks, maintain payments on external debt, and improve the country's national monetary stability with international capital. In periods of rising financial volatility and macroeconomic uncertainty, an international reserve has become a crucial variable in this area.

A high amount of foreign exchange reserves is not always indicative of strong overall economic growth, and a small amount of reserves is not always indicative of weak economic development. Furthermore, international reserves are utilized to balance excess supply and demand on the market for foreign exchange, reducing currency volatility and the exchange rate over time. A higher reserve level indicates that central banks are better able to maintain the stability of the exchange rate, reducing the likelihood of currency destabilization. Also, a significant level of reserve stock may support financing imports as well as repaying debts if foreign borrowing is impossible. If the tradable industry is capital-intensive, the accumulation of reserves encourages investment and, through improving economic development and the export to GDP ratio, increases capital productivity. In addition, fluctuations in the exchange rate may raise foreign direct investment by reducing the foreign currency prices of domestic investment, which may encourage growth in the economy. During a financial crisis, international reserves may also play a significant role as a monetary policy tool. In actuality, reserves serve as a liquidity buffer in the event of an international monetary system collapse, as a means to decrease the impact of external variables and enhance trust and stability in capital markets during a financial crisis. Yet there are costs associated with protecting and maintaining reserves. International reserves carry an opportunity cost because governments must make decisions about how to allocate their reserves. Countries should make a decision whether to maintain their financial reserves in high-liquidity, low-return assets to protect against balance-of-payments-related problems, or they may invest their reserves in growth-promoting productive areas.

The South Asian Association for Regional Cooperation (SAARC) was established on December 8, 1985, by seven countries in South Asia (SAARC). Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka are the founding members of SAARC. As Afghanistan joined SAARC in 2007, the organization now comprises eight members. The South Asian Association for Regional Cooperation (SAARC) is a regional intergovernmental organization and geopolitical union that aims to increase economic improvement and regional integration among its member countries. Since the economies of these countries are developing at a faster rate, this research aims to track how their foreign reserves have changed over time. Because they have higher frequencies of foreign direct investment, remittances, foreign investments, and exports, these three SAARC countries were chosen for this study of the evolution of their international reserves. Reserves rankings by Index Mundi placed India at number 5, Bangladesh at number 43, and Pakistan at number 60 in the world in 2021.

The goal of this research is to use the multivariate unobserved components (UC) model to the international reserves of the mentioned countries in order to model their evolution. The other purpose is identifying the trends, cycles, and irregular components in these three countries international reserves. To examine the international reserve relationship between Bangladesh, India, and Pakistan. To measure the influence of international reserves in short run cycles and long run cycles. This model indicates any defects in the predicted model. The unobserved component model also has the additional advantage of being simple to use in generating future forecasts. Moreover, the UC model helps investigate outliers and structural breaks.

2. Methodology of the study

2.1. Empirical Model

Using a multivariate UC model as detailed in a number of studies, including those by Harvey (1985), Carvalho and Harvey (2005), and Carvalho et al., 2007) this research provides insights into the evolution of the international reserves of three SAARC countries: Bangladesh, India, and Pakistan.

Maximum likelihood estimation can be used to estimate equations from 1 to 6, as discussed in Harvey (1990). A smoothing approach developed in Koopman (1993) can be used to extract the smooth trend and

two stochastic cycle components. Strong convergence is shown in the empirically obtained resultsusing the STAMP 8.2 software developed by Koopman et al. (2009).
The decomposition of international reserves into trends (μ_t), cycles (ψ_t), and interventions (w_t), according to the multivariate UC model, is as follows:

$$y_t = \mu_t + \psi_t + \Lambda w_t + \varepsilon_t \quad \varepsilon_t \sim NID(0, \sum_\varepsilon), \qquad t = 1, \dots \dots, T, \qquad (1)$$

Where$y_t$is a 3 ×1 vector whose component represent time series observations oflogarithm international reserves for each country examined, Pakistan ($lirp$), India ($liri$), and Bangladesh ($lirb$), with t = 1 for 1971 and t = T = 51 for 2021. This smooth trend component μ_t is a 3 × 1 vector, $\psi_t$is a 3 × 1 vector representing the stochastic cycle component, (w_t) is a 3 × 1 vector representing the interventions and ε_t indicates a 3 × 1 vector of unobserved irregular components terms that is distributed normally with a mean of 0 and a 3 × 3 covariance matrix $\sum_\varepsilon$.
The following is the definition of the smooth trend$\mu_t$component in y_t:

$$\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t \quad \eta_t \sim NID(0, \Sigma_\eta), \qquad t = 1, \dots \dots, T, \qquad (2)$$

$$\beta_t = \beta_t - 1 + \zeta_t \zeta_t \sim NID(0, \Sigma_\zeta), \qquad t = 1 \dots \dots, T, \qquad (3)$$

Whereß$_t$ is the trend components slopeμ_t, which is a 3× 1 vector, where t = 1 in 1971 and t = T = 51 in 2021. The level disturbance $\boldsymbol{\eta}_t$and the slope disturbance $\zeta_t$have no correlation with one another. The $\Sigma_\eta$and$\sum_{\boldsymbol{\zeta}}$ are both covariance matrices with variables of 3 × 3. The term y_t"random walk plus drift" is used to describe when $\sum_{\boldsymbol{\eta}}$is not 0 but $\sum_{\boldsymbol{\zeta}}$ is 0. Moreover, a stochastic liner trend is formed when $\sum_{\boldsymbol{\eta}}$and $\sum_{\boldsymbol{\zeta}}$ both are 0. The trend is referred to as a "smooth trend" when $\sum_{\boldsymbol{\eta}}$ is 0 but $\sum_{\boldsymbol{\zeta}}$ is not 0. That model is frequently called the integrated random walk (IRW). These studies apply the IRW smoother. This model, according to Carvalho and Harvey (2005), gives a clearer differentiation of trend and cycle.

Short-term movements are captured by the multivariate cyclical component (ψ_t), which is described as follows:

$$\begin{bmatrix} \psi_t \\ \psi_t^* \end{bmatrix} = \left\{ \rho_\psi \begin{bmatrix} cos\lambda_c & sin\lambda_c \\ -sin\lambda_c & cos\lambda_c \end{bmatrix} \otimes I_N \right\} \begin{bmatrix} \psi_{t-1} \\ \psi_{t-1}^* \end{bmatrix} + \begin{bmatrix} k_t \\ k_t^* \end{bmatrix}, \qquad t = 1, \dots \dots, T, \qquad (4)$$

Whereψ_t and ψ_t^* represent cycle components and 3 × 1 vectors, with t = 1 for 1971 ; t = T = 51 for 2021, where $k_t$and k_t^* is 3 × 1 vectors of disturbances that:

$$E(k_t k_t') = E(k_t^* k_t^{*\prime}) = \Sigma_k \qquad and \qquad E(k_t k_t^{*\prime}) = 0 \qquad (5)$$

Where Σ_k is a covariance matrix of 3× 3. The fluctuations of the cycle that fit $0 \leq \lambda_c \leq \pi$ are defined by the cyclical frequency. ρis the damping factor here on cycle amplitude that fulfills $0 \leq \rho \leq 1$. The cycle's crucial characteristic is its period, whichis connected to frequency. The formula $2\pi|\lambda_c$ is used to express the lengthof cycle. This research examines two stochastic cycles: cycle 1 may represent short-run cyclical dynamics, whereas cycle 2 may represent long-run cyclical dynamics. As each time series of data has a frequency λ_c and a damping factor ofρ, this is called this a similar cycle model. Take note that the equation for the covariance matrix of ψ_t is such as this:

$$\Sigma_\psi = (1 - \rho^2)^{-1} \Sigma_k \qquad (6)$$

In Equation 1, intervention dummies were included inw_t, which is 3 × 1 vector representing interventions, which represent outliers and structural breaks. It is possible to set specific components of the parameter matrix Λ to 0, which denotes the exclusion of specific variables from the given equations. A temporary event of irregular disturbance is referred to as an outlier in this context. The definition of an outlier is organized by denoting the value 1 at the time of the outlier and 0 at all other times. A structural break is a variation in the time series level that occurs permanently and shifts it upward or downward.

The maximum likelihood (exact score) method can be used to estimate the model of unobserved components. Standard time series data diagnostics are going to be applied to examine the fitted model for serial correlation, normality, as well as hetero scedasticity following estimation has been performed. Residual diagnostics, auxiliary residuals, prediction tests, and forecasting graphs are used for finding model defects.

2.2. Data

This dataset consists of yearly data on the logarithm of Bangladesh, India, and Pakistan's international reserves from 1971-2021; the information was obtained in January 2023 from the World Bank Development website dataset.

Figure 4.1 depicts the evolution of Bangladesh, India, and Pakistan's international reserves from 1971-2021. During 1973, 1974, and 1975, Bangladesh's international reserves (*lirb*) were on a downward trend (with fluctuations). Reserves later raised little, but have been at their lowest since 1981. Soon later, it picked upsubstantially again, peaking in 2021.

India's international reserves (*liri*) will be maintained on an increasing trend (with fluctuation) until 2021. Pakistan's (*lirp*) international reserves showed a decreasing trend until 1996, increased upward with significant variations, and then reached their highest level in 2021.

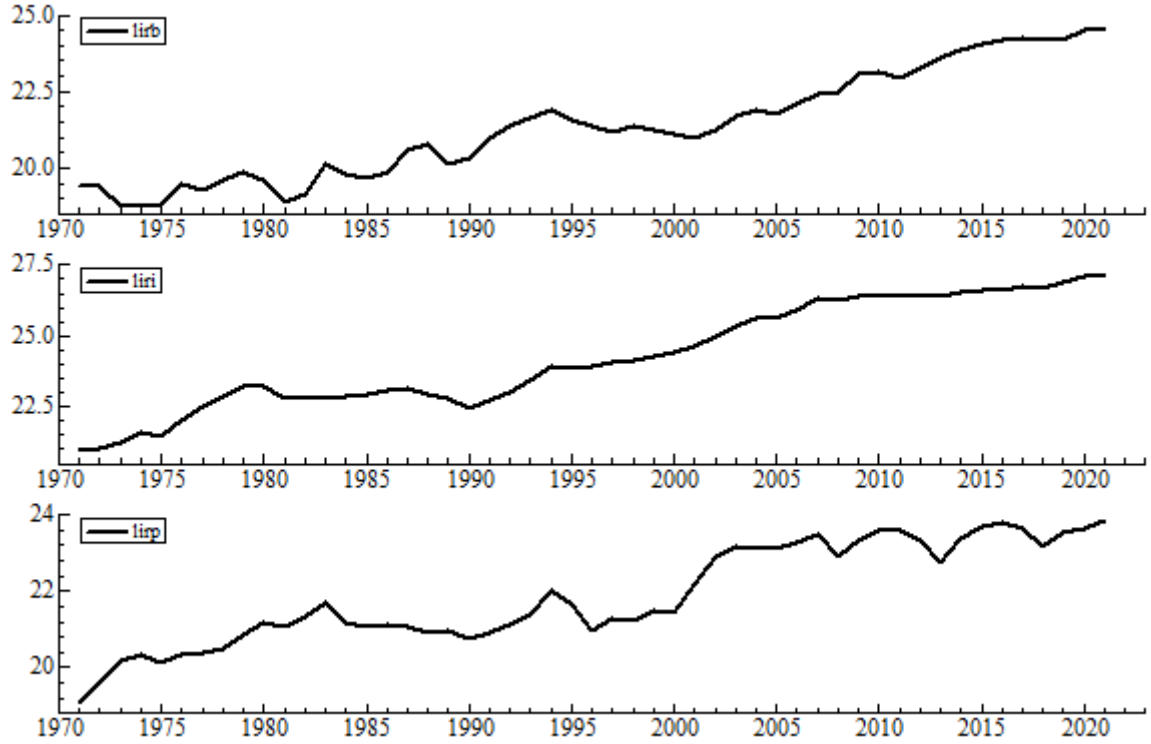

Fig 1: Evolution of World Development Indicators of *lirb*, *liri* and *lirp*1971-2021

Table 1: Descriptive statistics

Variables (logarithms)	Means	Standard deviation
lirb	21.37982	1.756830
liri	24.26919	1.866508
lirp	21.90316	1.306112

Note: *lirb*, *liri* and *lirp* represent logarithms of international reserves of Bangladesh, India, and Pakistan.

3. Empirical results

Table 2: Diagnostics and goodness-of-fit statistics

Statistics	$lirp$	$liri$	$lirb$
N(x_2^2)	0.54174 (0.76)	0.83315 (0.65)	0.70239 (0.70)
H(F12,12)	1.4216 (0.27)	0.64367(0.77)	0.30769 (0.97)
Q(11,5)	8.2326(0.14)	8.2151 (0.14)	6.0746 (0.29)
R^2	0.73552	0.67366	0.82264

Note: Value in parentheses are p-values

Diagnostic and goodness-of-fit statistics are presented in Table: 2, including the N (X_2^2) (the normality test), H_{12}(the heteroskedasticity test), Q (11, 5) (the Ljung Box statistics), and R^2 (the coefficient of determination). There are no indications of any defects in the predicted model from Table: 2.

Figure 2 contains the additional data that corresponds to the estimation model. This includes a diagram of the standardized residuals, the spectral density, the residual correlogram, and the density. The residuals are the standard one-step-ahead forecast error or innovation (Koopman et al. 1999), and it's obtained that they have a normally distributed and independent distribution when the model has been described correctly. Table 2 data and Figure 2 residual graphs are utilized to evaluate the reliability of the model. In addition, the spectral density and the correlogram are shown in Figure 2. According to Figure 2, there is no serial correlation between the residuals, indicating that they are randomly distributed.

Figure 3 shows the decomposing parts of the structural time series model for cycles 1 and 2 as well as the trends (level and interventions). Quick analyses of cycles 1 and 2 in Figure 3 reveal that $lirp$, $liri$, and $lirb$ cyclical activities in cycle 1 increase at a more rapid rate from year to year. Whereas the cyclical activities in cycle 2 indicate that variables were relatively less influential during the period of examination.

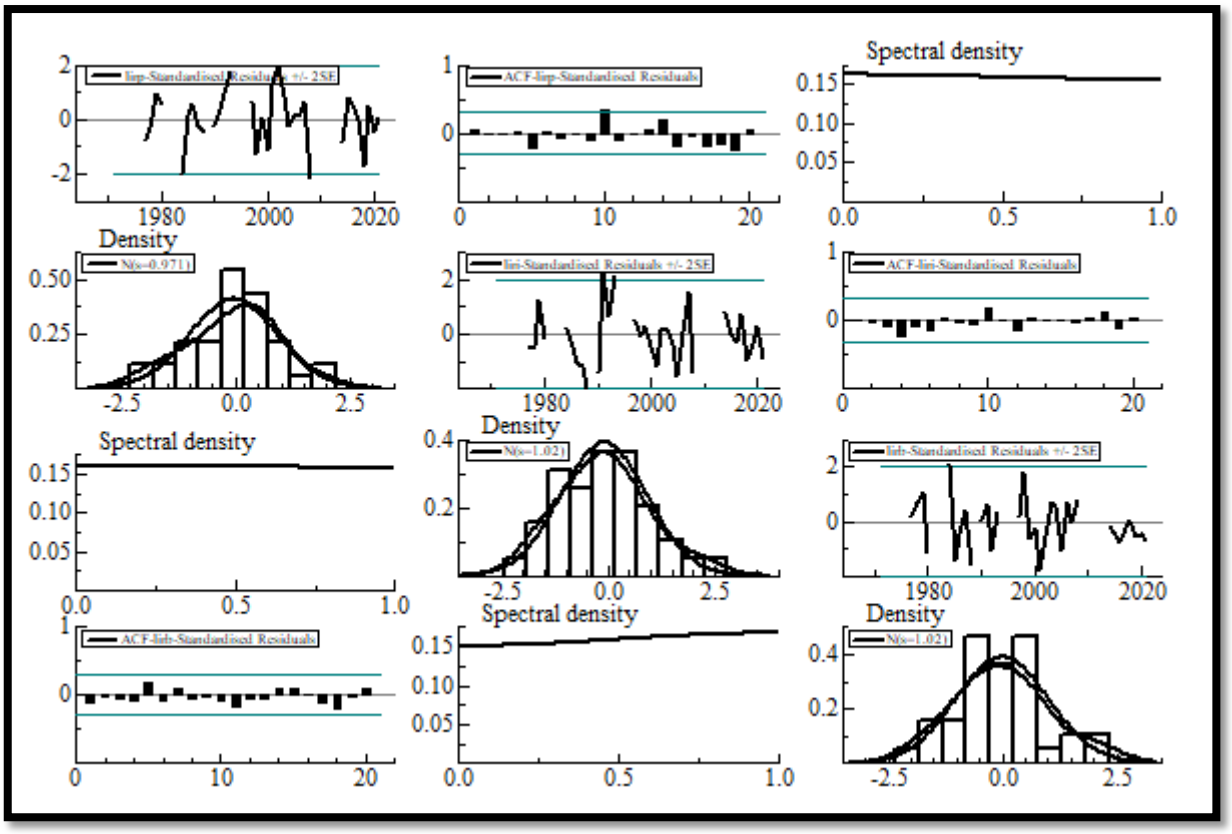

Figure 2: International Reserves index Residuals

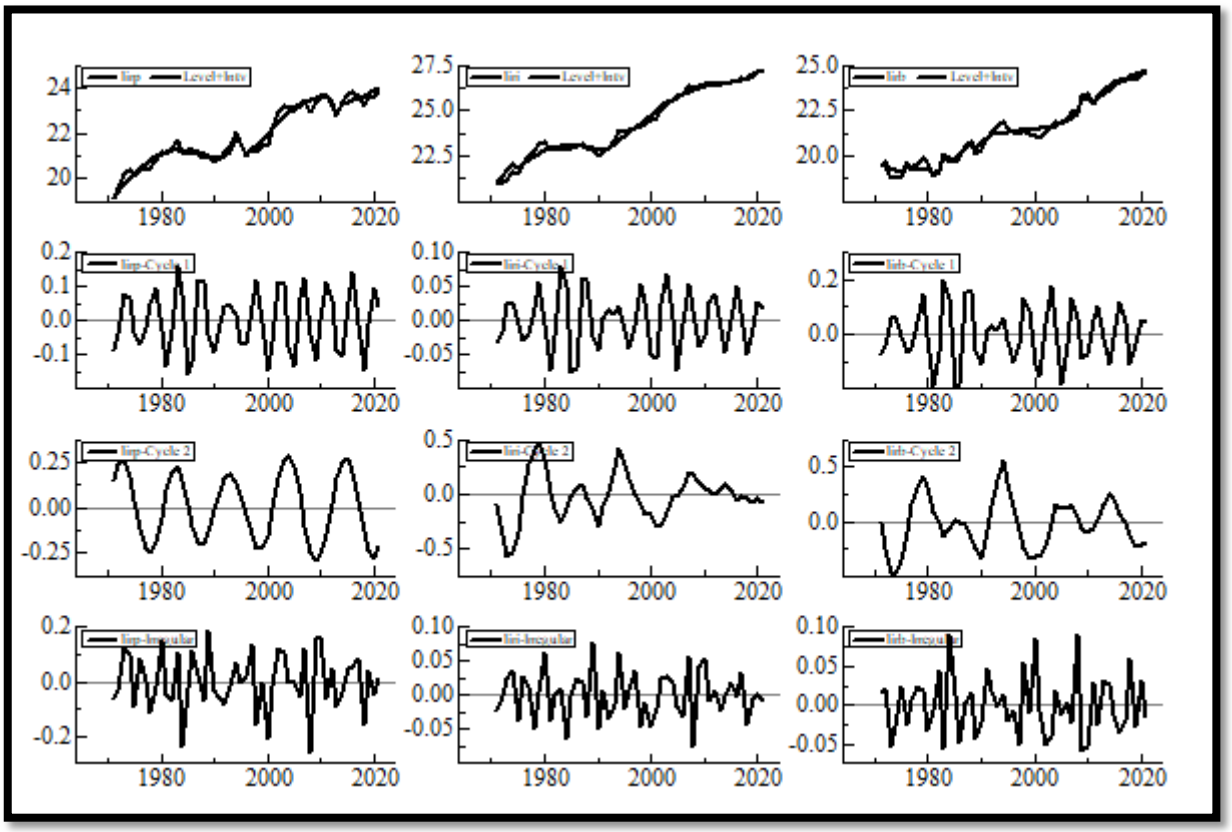

Figure 3: International reserves index decomposition

Table 3: Variance of disturbances: values and q-ratio

Variance of disturbances	*lirp*	*liri*	*lirb*
Level	0.000000 (0.00)	0.000000 (0.00)	0.000000 (0.00)
Slope	0.00300096 (0.17)	2.01677e-005 (0.00)	0.000000 (0.00)
Cycle 1	0.000991615 (0.05)	0.000707517 (0.04)	2.02497e-008 (0.00)
Cycle 2	0.000432111 (0.02)	0.220164 (13.15)	3.56686e-008 (0.00)
Irregular	0.0167369 (1.00)	0.00124804 (0.07)	1.20194e-009 (0.00)

Note: Numbers in brackets are q-ratio. The q-ratio compares each individual variance to the greatest one.

Table 3 displays the deterministic results of the q ratio over all three levels of variables as 0.The q ratio of *liri* indicates that the majority of variations are due to irregular components, followed by slope and cycle 1. When looking into *lirp*, the majority of the fluctuations come from irregular components, followed by slope and cycle 1. Contrarily, the q-ratio of *lirp* is derived from irregular components, which is then followed by cycle 2. The variables of *liri* that are caused by the irregular component are then followed by cycle 2. The q-ratio of slope *liri* is similarly zero, indicating that the majority of fluctuations in this variable come from irregular, cycle 1 and cycle 2. The variance of disturbance of *liri* indicates that irregular components, followed by cycle 1 and cycle 2, are responsible for the most of changes.

And looking at the q-ratio of the relevant variables, it can observe that the most significant reasons for fluctuation come from variations in the irregular components. Exchange rate fluctuations, the loss of the ability to pay external debt, natural disasters, and unexpected changes in economic policy are just some of the events that can cause unpredictable short-term fluctuations, which are responsible for the irregular components. Unpredictable events like this could be a major factor in the difference in the three countries total reserves.

Table 4: Parameters of cycle 1 and cycle 2

Parameters	Values
Number of order (n)	1
Period($2\pi \mid \lambda_{c1}$) in years	4.52579
Frequency (λ_{c1})	1.38831
Damping factor ($\rho_{\psi 1}$)	0.93437
Number of order (n)	1
period ($2\pi \mid \lambda_{c2}$) in years	10.64251
Frequency(λ_{c2})	0.59039
Damping factor ($\rho_{\psi 2}$)	0.99236

A detailed analysis of the model's cyclical parameters is provided in Table 4. The findings indicate that the damping factor for the short-run cycle is 0.934 and the period of the cycle is 4.5 years. The long-term cycle, on the other hand, has a period of 10.64 years and a damping factor of 0.992. According to Table 4 which shows that cycle 1 and cycle 2 damping factors are both smaller than 1, these data suggest that two cycles display a significant level of persistence, and the series appears to be stationary.

This final state vectors maximum probability estimates and the intervention dummies are shown in Table 4. There is a statistically significant variance between the level values of 25.274, 27.694, and 25.902 for $lirp$, $liri$, and $lirb$, respectively. The slope results in an annual average growth rate of approximately 12.895%, 13.7245%, and 12.385% for $lirp$, $liri$, and $lirb$, respectively. Pakistan and Bangladesh have statistically insignificant growth rates. In addition to this, it was discovered that the amplitude of cycle 1 determined by the percentage of the trend is 26.845% for $lirp$, 7.782% for $liri$, and 25.191% for $lirb$. There is a chance that India's rapid rate of growth is the result of actions taken by the Indian government, such as promoting exports and reducing imports, which help earn foreign currency and raise foreign exchange reserves. On the other hand, the measures implemented by the governments of Pakistan and Bangladesh, such as raising the money supply and cutting the cost of borrowing, could be a possible explanation for the modest rise of international reserves in Pakistan and Bangladesh. Pakistan's slowest response to short-run shocks in international reserves, as measured by the amplitude of cycle 1 as a percentage of the trend, and its slowest approach come closer to the equilibrium level and it compare with India and Bangladesh.

Table 5: State vector analyses in final state at time 2021

	lirp	*liri*	*lirb*
Level	25.27438(0.00)	27.69426(0.00)	25.90281(0.00)
Slope	0.12895(0.07)	0.13724(0.03)	0.12385(0.08)
Cycle 1 amplitude	0.26845	0.07782	0.25191
Interventions			
	outlier 2013	Level break 1975	Outlier 1983
Coefficient	-0.45668(0.00)	-0.44897(0.00)	0.69019(0.00)
	Level break 1996		Level break 1989
Coefficient	-0.78195(0.00)		-0.67692(0.00)
	Level break 2012		outlier 1976
Coefficient	-0.48766(0.00)		-0.51014(0.00)
	Outlier 1994		Outlier 1972
Coefficient	0.37888(0.00)		0.33623(0.00)
			Outlier 2009
Coefficient			0.82220(0.00)
			Outlier 2010
Coefficient			-0.70758(0.00)
			level break 1981
Coefficient			-0.48501(0.00)

Note: P-values are indicated in bracketed values.

Table 5: shows both positive and negative effects of the interventions; it is statistically significant and captures both increases and decreases in international reserves. The interventions can be categorized as either positive or negative. The outlier intervention for 2013 that corresponds to Pakistan reveals that there was a decline in the country's reserves, which may be related to the higher inflation rates that happened in Pakistan that year. The structural break that occurred in Pakistan in 1996 has a negative impact on the country's foreign exchange reserves due to the fact that Pakistan's external debt has rapidly grown this year. Repayments of IMF debt may influence the structure of Pakistan's reserves, resulting in long-term negative consequences on international reserves, which set a record during the structural break intervention in 2012. The outlier for Pakistan in 1994 corresponds to a rise in total reserves, which may be due to an increase in energy production. There may be a negative effect on India's reserves as a direct impact of the political crisis that happened in 1975, which is the year that corresponds to the structural break that occurred in India. A new exchange rate management policy was implemented in 1983; it may have affected Bangladesh's reserves and caused an increase in reserves this year. The fall in average trade volume that occurred in 1989 may have had a negative influence on reserves, which were recorded by

structural break interventions. Because of the exchange rate overshoot that occurred in Bangladesh in 1976, it may be that international reserves decrease throughout this year. The outlier in 1972 that corresponds to Bangladesh shows a positive impact on Bangladesh's reserves, which may be the cause of an increase in the GDP rate. A decrease in the inflation rate may increase reserves, which is captured by an outlier in 2009. The outlier intervention in 2010 may have been caused by higher interest rates, which led to a drop-in reserve that year. The decline in overall exports was due to the level break in 1981 that corresponds to Bangladesh, which shows a fall in the reserves.

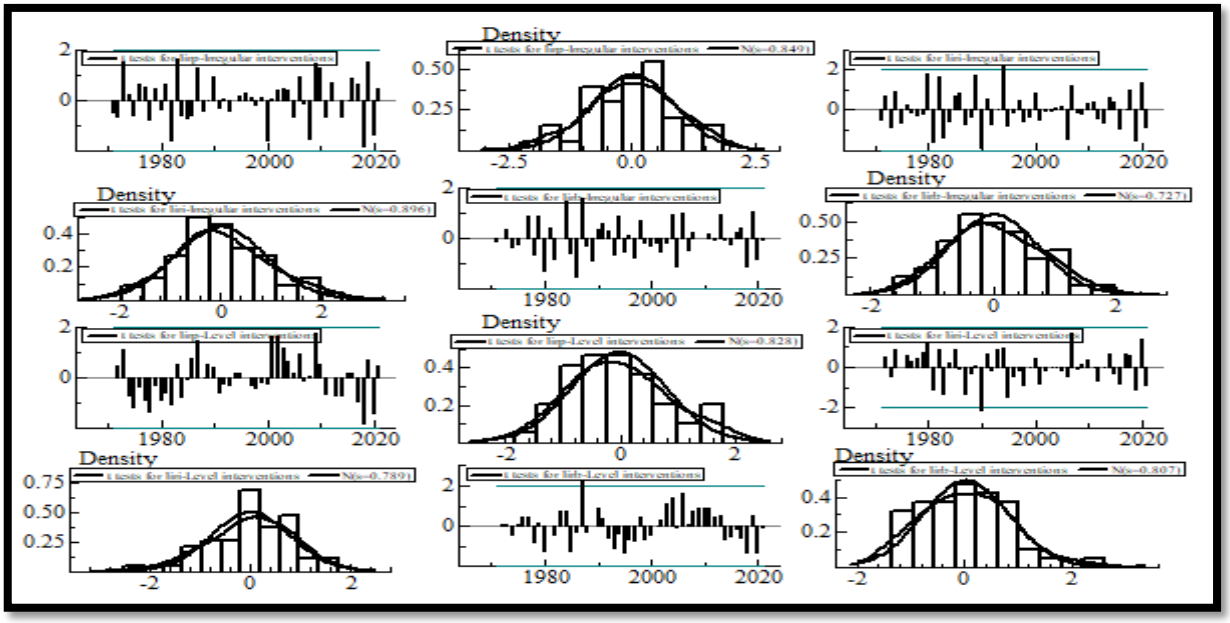

Figure 4: Auxiliary residuals: irregulars and level

Figure 4 presents a graphical representation of the t-values of estimated auxiliary residuals that correspond to these values. A quick examination of the graphs reveals that none of them have an absolute value greater than 3, indicating that the model includes the appropriate interventions.

Table 6: Normality tests for auxiliary residuals: irregular, level and slope

	lirp			*liri*			*lirb*		
	Irregular	Level	Slope	Irregular	Level	Slope	Irregular	Level	Slope
Skewness	0.19057 (0.66)	0.48185 (0.48)	0.87591 (0.34)	0.56541 (0.45)	0.90678 (0.34)	1.6811 (0.19)	0.1732 (0.67)	0.6025 (0.43)	5.1472 (0.02)
Kurtosis	0.38435 (0.53)	0.3197 (0.57)	3.2873 (0.06)	0.10819 (0.74)	0.028143 (0.86)	0.72762 (0.39)	0.55108 (0.45)	0.086218 (0.76)	0.19764 (0.65)
Bowman-Shenton	0.57492 (0.75)	0.80155 (0.66)	4.1632 (0.12)	0.67361 (0.71)	0.93492 (0.62)	2.4087 (0.29)	0.72428 (0.69)	0.68872 (0.70)	5.3448 (0.06)

Note: p-values are shown by the values in parentheses

The diagnostic test statistics of the auxiliary residual are presented in Table 6. These data represent a smoothed list of irregular, level, and slope disturbances. In general, these statistics indicate that the auxiliary residuals act properly.

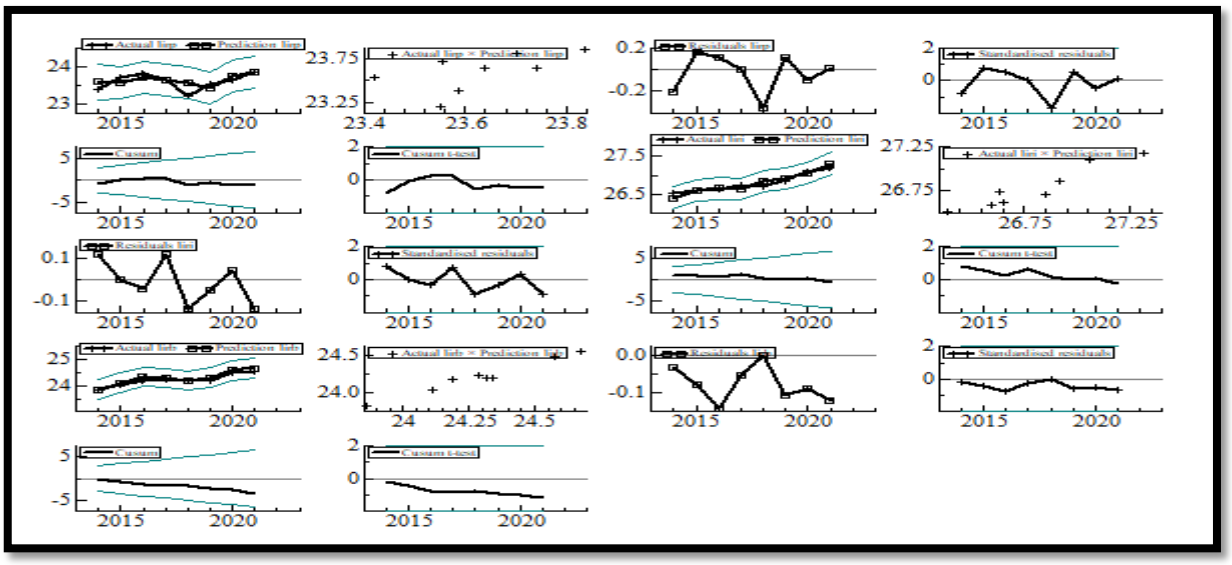

Figure 5: Prediction testing for the international reserves of *lirp*, *liri* and *lirb*

Figure 5 displays the prediction picture of the international reserve for lirp, liri, and lirb. These graphics were developed using the model's estimation from 1971-2021. The years 2014-2021 are designated for the out-of-sample forecast in this estimate. The initial predictions were created using the data from 2014, which is updated whenever additional observations are recorded. The figures show that the residuals of *lirp*, *liri*, and *lirb* and the estimated values are all within the prediction intervals, showing that the trend forecast is accurate to within two standard deviations. Validation of the specifications of the models present in this paper, as well as support for the accuracy of their forecasting, is accomplished through the use of CUSUM graphs in the evaluation of parameter stability and accuracy of forecasting.

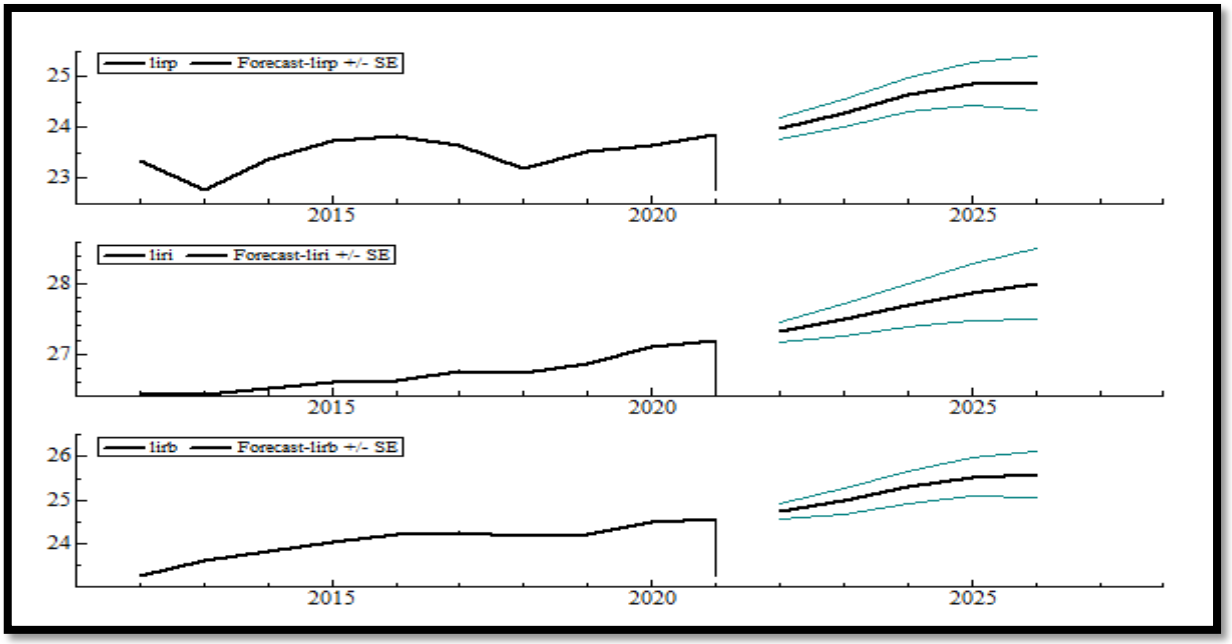

Figure 6: Forecasts of the *lirp*, *liri* and *lirb*

Figure 6 shows the forecast for the next five years of the international reserves of *lirp*, *liri*, and *lirb* (2022-2026). The forecasted values are presented as a range with a root mean square error (RMSE) of 1.

According to the *lirp* forecast graph, foreign exchange reserves will continue to rise in 2025 but will fall in 2026. Nonetheless, *liri* forecasts for high growth in 2026 suggest that India's foreign exchange reserves would keep growing and remain well above their average level through the end of the forecasting period. According to the *lirb* estimate, the rate of growth will remain high until 2025, but after that, it will drop.

4. Conclusions

This paper's objective was to analyze the evolution of the international reserves of Bangladesh, India, and Pakistan, three SAARC countries. There are eight countries in South Asia that are represented by the South Asian Association for Regional Cooperation (SAARC). Due to their substantial international relevance to the region, the aforementioned three SAARC countries were chosen. Bangladesh, India, and Pakistan's foreign reserves are decomposed into trends, cycles, interventions, and irregular components using the unobserved components model. Fixed level, stochastic slope, two stochastic cycles, and irregular components are taken into account for the specification of the model, along with the smooth trend plus the stochastic cycle component. This method presents a few significant details into how these three countries international reserves have evolved over the years. Additionally, shocks have been accurately recorded by the intervention dummies that have been included.

This paper's findings indicate that the correlation between countries for irregular components is not very strong. Pakistan and India have a very strong and positive correlation with one another. They share a lot of similarities, such as fluctuations in currency rates and an inability to service external debt. The connection between India and Bangladesh is weak but negative, which suggests that any unexpected short-term events that occur in either nation will have some negative effect on the other country, even if this effect is not very strong. The correlation between Bangladesh and Pakistan is highly negative, which suggests that the irregular component in the two countries has a small influence on the changing of their international reserves. This is supported by the fact that Bangladesh and Pakistan have very different levels of international reserves.

According to the slope, Bangladesh has a negative but strong correlation with India and Pakistan, indicating that Bangladesh's international reserves are becoming increasingly different from those of the other two countries over time. On the other side, India and Pakistan have a very strong positive correlation, which indicates that both of their international reserve trends will move in a positive direction over the long run. India has the highest growth rate, followed by Bangladesh and Pakistan, with the latter seeing significant growth. This may be an indicator that India's declining money supply is enhancing the growth of its international reserves; Bangladesh and Pakistan's low reserve growth may be due to their inability to repay external debt.

Pakistan has a strong correlation with both Bangladesh and India in the short cycle, while Bangladesh has a modest correlation with India. According to these findings, the shocks that are transmitted from India to Bangladesh are not very strong.

On the other hand, the shocks that are transmitted between Pakistan and India, as well as between Bangladesh and Pakistan, are transitory and very strong in short cycles. Pakistan has a weak and negative correlation with India and Bangladesh over the long cycle, but the correlation between Bangladesh and India is strong and positive; this indicates that transitory shocks are transmitted rapidly between these countries over the long cycle.

Finally, this research presents yearly forecasted values of the international reserves of Pakistan, India, and Bangladesh from 2022-2026. According to the predictions, India's reserves will keep growing at a faster rate until 2026; Pakistan's reserves will show an increase in growth in 2025, after which it will decrease; and Bangladesh's reserves will reach a plateau by the end of the forecasting period.

Recommendations

International reserves play a very significant role in the short-term and long-term development of a developing country such as Bangladesh, India, and Pakistan. These studies examine the issues of trend, cycle, and the irregular component of international reserves. This study identifies the following suggestions:

Pakistan must be developing alternative sources of financing to reduce its dependence on Indian loans and investment. Pakistan diversify its trading partners by expanding trade relationships with other countries. This could help to reduce its reliance on India for imports and exports. Bangladesh should work to strengthen trade ties with other countries in the region, such as Sri Lanka, Nepal, Bhutan, and the Maldives. This would help reduce its dependence on India for trade and foreign exchange. Bangladesh should focus on developing its local industries to reduce its dependence on imports from India. Bangladesh can focus on increasing its exports to earn more foreign exchange. By promoting other industries as well and expanding its export base, Bangladesh can increase its foreign exchange earnings. Pakistan can attract more foreign investment by improving its investment climate and providing incentives for foreign investors. This can increase the inflow of foreign currency; which will increase the country's foreign exchange reserves. India can create sovereign wealth funds to invest in international markets. This can help to earn higher returns on investment, which can help to increase the foreign exchange reserves.

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