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The Impact of Real Exchange Rate and its Misalignment on Export Performance in Sri Lanka

Sunanda Obeysekera[1][2] and Hemantha K.J Ekanayake[1][2]

Abstract

This paper examines Real Exchange Rate (RER) misalignment and its impact on export performance of Sri Lanka using quarterly data from 2001 to 2016. The results suggest that the RER in Sri Lanka was misaligned in a wide range during this period, with the range narrowing to less than +/-7 per cent in recent years. Export functions estimated against several variables including RER and its divergence from equilibrium, separately for three main categories of exports -total exports, industrial exports and textile and garments exports -suggest that that RER undervaluation does not have a statistically significant impact on any of these export categories in the long run. However, there is evidence that the RER is a statistically significant determinant of exports in the short run. In the long run, the production capacity has been identified as the major determinant of industrial exports while the trading partner's income plays a significant role in the case of textile and garment exports. This leads to the conclusion that any policy direction pertaining to addressing the long run growth of exports needs to be associated with enhancement of production capacity though short run impulsion could be provided through RER undervaluation

***Key Words**: Real Exchange Rate, Misalignment, Export Volume, Error Correction Model*

***JEL Classification:** C51; F14; F53*

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[2] The views presented in this paper are those of the authors and do not necessarily indicate the views of the Central Bank of Sri Lanka

1. Introduction

Managing the Real Exchange Rate (RER) in a competitive horizon is one of the biggest conundrums faced by policy makers in developing open economies. According to the "Washington Consensus", RER plays a crucial role in the growth process and views that appropriate RER should be consistent with macroeconomic objectives in the medium term and "sufficiently competitive"[3] such that exports grow at a rate consistent with external balance. However, there have been contravening empirical results where relevant data reflect that a disequilibrium[4] situation, particularly when RER is more depreciated than the equilibrium, would have a positive influence on international competitiveness and consequently on economic growth. However, there is a limited discussion on the sustainability of RER undervaluation to promote exports in emerging economies, on which this paper attempts to revisit the phenomena in the context of Sri Lanka.

Economists arguing for RER equal or closer to equilibrium, find that any large misalignment of the RER from its equilibrium level hinders economic growth. These studies argue that the RER should be determined by market forces which are consistent with the simultaneous clearing of internal and external accounts. They argue that when it is misaligned, it would generate distortions, producing wrong signals to economic agents causing instability. Aguirre and Calderón (13) has found empirical evidence that both large RER overvaluation and large RER undervaluation hamper economic growth. Haddad and Pancaro (4) has found that in the long run, the effect of RER undervaluation on economic growth becomes negative; and on exports, it becomes insignificant. They further found that an unstable RER leads to more volatile relative prices, creates uncertainty, increases risk, and diminishes investment prospects. Large RER misalignments do not provide the right incentives for investment over time while they depress the quality of investment.

However, the economists in favour of RER disequilibrium argue that undervaluation facilitates growth among developing countries, sighting attainment of enhanced economic growth by East-Asian economies with undervalued currencies. They stress the role of relative prices of tradable and non-tradable goods as an instrument of industrial policy in the process of economic convergence (Hausmann et al. 15; Rodrik, 366). Korinek and Servén (40) showed that RER undervaluation can raise growth through learning-by-doing externalities in the tradables sector that are sub optimally produced in the absence of policy intervention. Aizenman and Lee (1) claim that activist exchange rate policies may generate competitive gains through keeping RER undervalued and the resultant increase in exports will promote

[3]However, an excessively competitive RER would not be appropriate since such a rate would enhance inflation and limit resources available for investment.

[4]Disequilibrium in RER refers to a situation in which a country's actual RER deviates from some notion of an implicit "equilibrium" RER. The RER is identified as "undervalued" when it is more depreciated than this equilibrium and "overvalued" when it is more appreciated than this equilibrium (Razin and Collins, 1997).

economic growth. On the contrary, any appreciation of RER increases the cost of production of goods (including tradable) compared to the rest of the world reducing the competitiveness (Bouoiyour and Rey 309, Rajan et al., 994, Pick and Vollrath, 563). A positive relationship between RER depreciation and exports performance has been revealed by Athukorala (21) for Thailand and by Jongwanich (29) in his paper for developing Asia. However, it would be important to note that Athukorala and Mennon (21) found that the exchange rate policy may be less effective in the determination of exports in countries where component trade is high and growing.

Despite arguments prevail for undervaluation or to keep RER closer to equilibrium, it is important to understand that most of the developing countries that have shown a positive co-movement between the RER undervaluation and growth have been developing nations with larger resource base such as China, India and South Korea. These have been the countries that have received a substantial portion of foreign inflow starting from 1990s through FDIs and exports. This led to a massive accumulation of foreign assets in these emerging economies which is reflected by an increased amount of international reserves. As a result, these emerging economies seem to have undertaken competitive measures to keep their currencies undervalued and hence, promote exports (Kubota, 1; Cheung et al., 770). Therefore, whether the same co-movement exists in other developing nations, which have not attracted substantial portion of inward capital movement, needs to be empirically validated. In this backdrop, this study aims at empirically validating the link between RER, its misalignment and export performance in the context of Sri Lanka.

Sri Lanka is a small open economy and its foreign exchange policy gradually evolved from a fixed exchange rate regime in 1948 to an independently floating regime by 2001. However, it has been noted that the Central Bank of Sri Lanka (CBSL) has been following a defensive policy on exchange rate against the dollar since very beginning. This has driven the exports share in GDP to decline while imports have increased disproportionately. The Sri Lankan exports have declined continuously as a share of global exports while as a share of GDP have declined from 33.3 per cent in 2000 to 12.7 per cent in 2016. Many analysts have sighted that the RER misalignment, as the fundamental issue associated with the decline in export share against the increasing trajectory of imports (Kalegama, 44). Meanwhile, certain other analysts' sight high and volatile interest rates, uneven trade policies, increase in wage rates in the domestic labor market and high energy cost as the fundamental reasons behind low performance in the trading sector. The abolition of Multi-fiber Arrangement (MFA) in 2005, which prohibited preferential access to the US apparel market, and loss of concessional access to the EU market under the preferential tariff system GSP+ from October 2010 are other factors that affected severely on the competitiveness of Sri Lanka's exports (Athukorale 26). However, the role of RER and its undervaluation on exports in Sri Lanka is yet to be revealed. In this backdrop, this study aims at investigating the importance of RER and its misalignment in enhancing export performance in Sri Lanka. Since the RER misalignment is an unobservable

variable, this study first explores the Equilibrium rate of RER (ERER)[5] using the Behavioral Equilibrium Exchange Rate (BEER) approach using macroeconomic fundamentals and derives the misalignment of RER pertaining to Sri Lanka. Then, it strives to determine the role of RER and RER misalignment on export performance.

The paper analyzed quarterly data from 2001 to 2016 using error correction model. The results suggest that the RER is misaligned in the range of -6.4 per cent to 23.9 per cent during the period 2001 to 2016. However, in recent years (2008 onwards) the misalignment has been less than +/-7 per cent. In order to assess the impact of RER misalignment on export performance, the export function has been estimated for three main categories of exports i.e. total exports, industrial exports and textile and garments exports. Contrary to the expectation, it has been found that RER and its undervaluation, a positive deviation from equilibrium values, does not play a significant role in any of the estimated export functions in the long run. Results reveal that Sri Lankan exports are mainly determined by the production capacity of the economy followed by the trading partners' income. As such, the paper suggests that in order to promote exports, it would be necessary to push the Production Possibility Frontier (PPF) outwards through adoption of more sustaining means, such as enhancing the production capacity of the economy rather than devaluating the currency, which would position Sri Lanka along the existing frontier. However, since it had been found that the RER is a significant determinant of exports in the short run, devaluation of currency would provide a short run impetus to the already ailing export sector.

A remainder of this paper is organized as follows. Section 2 explains the calculation of ERER and its misalignment for Sri Lanka while Section 3 explains the impact of RER misalignment on export performance respectively. Section 4 concludes the paper.

2. Estimating Real Exchange Rate Misalignment

In this paper, we strive to investigate the factors affecting exports in Sri Lanka focusing more on RER and its misalignment. Since RER misalignment is an unobservable variable, this study attempts to compute RER misalignment for Sri Lanka prior to estimating export functions.

Compiling RER misalignment consists of two steps. First, it is required to estimate the empirical model to derive equilibrium RER and to obtain model based equilibrium RER values. Next, the misalignment is calculated as the proportional deviation of RER from its predicted values.

[5] In order to obtain ERER, this paper also uses the HP filter method. Misalignment derived from the HP filter method shows a similar movement, albeit with different magnitudes (-9.2 per cent to 10.8 per cent).

2.1 Modelling the Equilibrium Real Exchange Rate

Deriving the Equilibrium RER is the most important step in the process of determining RER misalignment. Conceptually, a RER is misaligned when it deviates from the underlying RER that would have prevailed in the absence of price rigidities, frictions and other short run factors (Razin and Collins,1). Such underlying RER is referred to as "Equilibrium RER" (ERER). This, in technical terms, is referred to as theoretical RER, which would have prevailed if the economy is simultaneously in internal and external balance. Internal balance refers to the economy operating at full employment and full capacity output while the external balance refers to a sustainable current account position, given a country's desired capital position, as a net lender or borrower.

There are different views on the ERER expressed in literature. The Fundamental Equilibrium Exchange Rate (FEER) approach defines the ERER as the effective exchange rate that brings the current account at full employment level and the capital account in to an arbitrary equilibrium. Slightly contrastingly, the Behavioral Equilibrium Exchange Rate (BEER) approach expresses ERER as a function of other macroeconomic fundamentals. This study uses the concept of "behavioral equilibrium exchange rate" (BEER), which explains the behavior of real exchange rate in terms of economic fundamentals, using reduced form econometric equations to derive ERER for Sri Lanka.

Macroeconomic fundamentals that determine RER consist of vast sets, yet different studies concentrate on different small subsets. In application of the model based approach, Cottani et al. (1) used Edwards (1) model incorporating terms of trade, an indicator for trade policy openness, the net capital inflows as a ratio of GDP, the domestic credit creation in excess to devaluation, the foreign inflation and the real growth rate. Doroodian et al. (1808) employed a similar model to estimate RER misalignment in Turkey using the terms of trade, the ratio of investment to GDP, an indicator for trade openness, a proxy for technological progress, a proxy for capital control and the government consumption as a ratio of GDP. Yajie et al. (5) employed BEER on China using the Johansen co-integration technique with both long term and short term variables. The IMF consultative group on exchange rate assessment in 2006 applied a model based approach on a group of advanced and emerging countries using relative productivity, a proxy for openness, current account inflows, oil price, the terms of trade, and the government expenditure as variables. Following from the literature, this study uses fundamentals as given in the equation below to estimate the equilibrium RER.

$$ERER = f(PROD, TOT, OPEN, NFA, GEXP, INTDIFF, Net\_sales, D1, D2,) \quad (1)$$

ERER- Equilibrium real exchange rate

PROD- Productivity improvement representing the Balassa Samuelson effect

TOT- the terms of trade index

OPEN- a proxy for trade openness

NFA - the Net Foreign Assets

GEXP - Government Expenditure

INTDIFF.- Interest rate Differential

Net_sales - Forex sales (net) by the Central Bank

D1- dummy variable to represent post tsunami effect

D2 - dummy variable to represent the period during the civil conflict

Economic theory suggests that an improvement in productivity (PROD) will stimulate the demand for non-tradable goods, resulting in higher domestic prices and consequently real appreciation. Intrinsically, the impact is known as Balassa-Samuelson effect because the productivity improvement in the tradable sector will cause the increase in the wages of those employed in that sector; including higher wages in the non-tradable sector. If this is not accompanied with higher productivity in the non-tradable sector, then an increase in the overall price level will result and consequently real appreciation.

Theoretically, the Terms of Trade's (TOT) influence on the RER cannot be signed a priori, as this depends on whether income or substitution effects dominate. The former leads to real currency appreciation while the latter to real currency depreciation (Edwards 9). Trade openness (OPEN) is expected to have a negative sign, implying that higher the degree of openness results in higher degree of real depreciation as spending will be diverted to the tradable goods sector. Similarly, higher government expenditure (GEXP) is likely to appreciate RER as it falls more on non-tradable goods than tradable goods. However, it primarily depends on whether the increase in the government consumption is directed to the tradable (equivalent to real depreciation) or to non-tradable goods (equivalent to real appreciation). It is also assumed that countries with relatively high Net Foreign Assets (NFA) as well as higher real interest rate differential (INTDIFF) may afford more appreciated RERs. In addition to these fundamentals, the study also uses forex sales by the CBSL and two dummy variables to capture the tsunami period as well as the period under the civil war. The dependent variable, ERER is proxied by 24 currency basket based real effective exchange rate index compiled by the CBSL.

In addition to the model based approach (Equation 1), this study also uses a filter based approach (uni-variate analysis) to compile RER misalignment for Sri Lanka. In the literature filter based methods have been mostly used to estimate the potential output. This merely represents the trend component of the underline series. The extracted trend component of the actual RER is considered as the equilibrium RER.

Estimated parameters are then use to calculate ERER. In constructing ERER, original variables are filtered excluding the transitory components using the Hodrick-Prescott (HP) filter method. The model based ERER is then used to calculate RER misalignment for Sri Lanka.

2.2.1 Data and Methodology

The CBSL started to publish Real Effective Exchange Rate (REER) index based on 24 currency basket since 2001. The REER is computed using exchange rates and prices of Sri Lanka's 24 trading partner countries. The share of each country's bilateral trade with Sri Lanka has been taken into account in arriving at weights. REER is compiled using the equation below:

$$\text{REER} = \sum_{i=1}^{n} [(e / e_i)(P / P_i)]^{w_i} \quad (2)$$

where e : Exchange rate of the Sri Lankan Rupee against the US dollar (US dollars per Rupee)

e_i : Exchange rates of currency i against the US dollar (US dollars per currency i)

P : Consumer Price Index (CPI)[6] of Sri Lanka compared to the base period index

P_i : CPI of country i

w : Weights attached to the currency i in the index

Since the exchange rate is defined as above in computing REER index, appreciation (depreciation) of the Rupee relative to other currencies, ceteris paribus, is reflected by a rise (fall) in the REER index value (Central Bank of Sri Lanka, 2003). Consequently, rising REER[7] is favourable for imports yet negatively affects exports and vice versa. The index is revised regularly considering the trade patterns between Sri Lanka and partner countries. The most recent series of the index is based on 2010. Partner countries and associated trade weights are listed in Appendix 1.

Other fundamentals, such as terms of trade, net foreign assets, government expenditure and net forex sales are taken from the IMF-IFS data base and the CBSL. Following from the literature, the productivity improvement to represent the Balassa Samuelson effect is proxied by the ratio of Sri Lanka's per capita GDP to the OECD average per capita GDP. Similarly,

[6] Due to the non- availability of the producer price index (PPI) data for all countries in the currency basket, the CBSL was compelled to uses CPI (2006/07=100) in place of PPI in compilation of the REER.

[7] Due the formula used in compiling REER in Sri Lanka, when all else is held constant, a depreciation of the rupee against the dollar results in a decline in REER index and vice versa. Therefore, care must be taken in interpreting the appreciation and the depreciation of RER using REER index.

openness is proxied by the ratio of total trade i.e. export plus imports to GDP. Two dummy variables to represent tsunami related capital flows (from q1 2005 to q4 2005) and the civil war period (from q1 2001 to q2 2009) have also been used. Appendix 2 provides the descriptive statistics of data used in the analysis.

2.2.2 Results and discussion

The estimation process begins with the determination of the order of integration of the variables under concern. Both the Augmented Dicky-Fuller (ADF) test (table 1) as well as the Philips-Perron (PP) test have been used for this purpose and except for net forex sales all other variables are found to be integrated of order 1(I(I)).

Table 1: Unit Root Test (ADF) Results

Variable	Level	1st Difference	Order of Integration
REER(24)	-1.892	-4.089***	I(1)
Productivity Improvement (PROD)	2.148	-2.036**	I(1)
Net Foreign Assets (NFA)	-2.187	-4.880***	I(1)
Terms of Trade (TOT)	-0.611	-9.199***	I(1)
Trade as a per cent of GDP (OPEN)	-1.452	-4.705***	I(1)
Government Consumption to GDP (GEXP)	-1.963	-9.416***	I(1)
Interest rate differential (INT_DIFF)	-1.405	-6.627***	I(1)
Net forex sales (Net_Forex)	-4.097***		I(0)

Notes: The data are in levels. A time trend is included, when necessary, in these tests. The optimum lag length is suggested by SIC. The critical values for the ADF test are from Davidson and MacKinnon (1993, page 708, Table 20.1). ***,**,* suggest that the null hypothesis is rejected at the 1, 5 and 10 percent level respectively.

The Johansen co-intergration test confirmed that these variables are co-integrated in the long run (Table 2).

Table 2: Johansen Cointegration Test

Null Hypo-hesis	Alternative Hypoth-esis	Trace Stat	Critical Value (0.01)	Null Hypothesis	Alternative Hypothesis	Max-Eigen Statistics	Critical Value (0.01)
r=0	r>0	174.4275*	121.7433	r=0	r=1	55.72833*	48.65818
r≤1	r>1	118.6992*	92.71365	r=1	r=2	43.87688*	42.23332
r≤2	r>2	74.82231*	67.63668				

* denotes rejection of the hypothesis at the 0.01 level

Accordingly, the Vector Error Correction Model (VECM) is chosen to estimate the long run parameters of RER determinants, allowing for possible bidirectional causality among variables. Net forex sales I(0) and dummy variables have been used as exogenous variables to the system. The appropriate lag length is selected as one, considering the majority of the lag length selection criteria.[8]

Following the general to specific modeling procedure, the most insignificant variable is removed from the estimation under three stages. In the first stage the model includes all relevant variables explained above (Scenario1). However, it is observed that the dummy variable included representing the tsunami effect is found to be highly insignificant. Therefore, the second stage, the model (Scenario 2) consists of the entire variable set in Stage 1 except for the dummy variable that represents the tsunami impact on REER. In a similar vein, removing the next most insignificant variable from the estimation, i.e. the net forex sales of the CBSL, the final model (Specification 3) has been estimated in the Stage three.[9] Estimated parameters of the final model are reported in Table 3.

[8] Both Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) selected one lag.

[9] Test results for all three models are available in the Appendix 3.

Table 3: Relationship between REER and its Fundamentals

Variable	REER24	C	PROD	NFA	TOT	OPEN	GEXP	INT_DIFF	ECT
Coeff.	1.0	-3.34***	36.86***	.0003***	0.28***	-0.20	1.62***	1.17***	-0.31***
t stat.		[-4.22]	[-8.19]	[-4.61]	[-3.39]	[1.60]	[-3.16]	[-4.26]	[-4.87]

***,**,* suggest the significance level of 1, 5 and 10 percent respectively.

The estimation results are encouraging as estimated signs for all variables coincide with the theoretical and previous empirical findings. Estimated ECT shows that when the system is in disequilibrium it would take about three and a half quarters to come back to the equilibrium. The effect of productivity improvement on RER is found positive and significant, indicating that in Sri Lanka, productivity improvement is concentrated in the tradable goods sector and leads to an appreciation of RER. It is also evident that an improvement in terms of trade (TOT) will appreciate RER. An improving TOT provides a direct income effect, operating through demand for non-tradable goods as an increase in income raises the demand for all goods. Since the import prices are given, tradable good prices do not change but the price of non-tradable goods goes up, appreciating RER. On the other hand, an improving TOT provides more foreign income and suppliers in the non-tradable good sector utilize this income and increase production, leading prices of non-tradable goods to go down. This could lead to a depreciation of RER. The net impact depends on the magnitude of both income and substitution effects. This result shows that for Sri Lanka, the income effect dominates the substitution effect.

The increase in net foreign assets appreciates RER as given in the results. Edwards (2) shows that an increase in foreign inflow may lead to an increase in demand for non-tradable goods, which would in turn raise their prices and appreciate RER. The RER is negatively affected by the trade openness (OPEN). This is also consistent with the theory, as trade openness creates downward pressure on the price of tradable goods versus non-tradable goods (Ghura and Grennes, 2).

2.2 Compiling the Real Exchange Rate Misalignment for Sri Lanka

Once the ERER is derived using the estimated parameters in Table 3, the RER misalignment is computed as follows:

$$\text{Misal} = \frac{\text{RER} - \text{ERER}}{\text{ERER}}$$

RER- actual RER ERER – the model based Equilibrium RER

Consequently, positive values of Misalignment (*Misal*) implies RER overvaluation and vice versa. Undervaluation refers to that domestic prices are low by international standards and domestic producers are competitive. Similarly, overvaluation refers that domestic prices are too high and domestic producers are not competitive.

Figure 1: RER misalignment

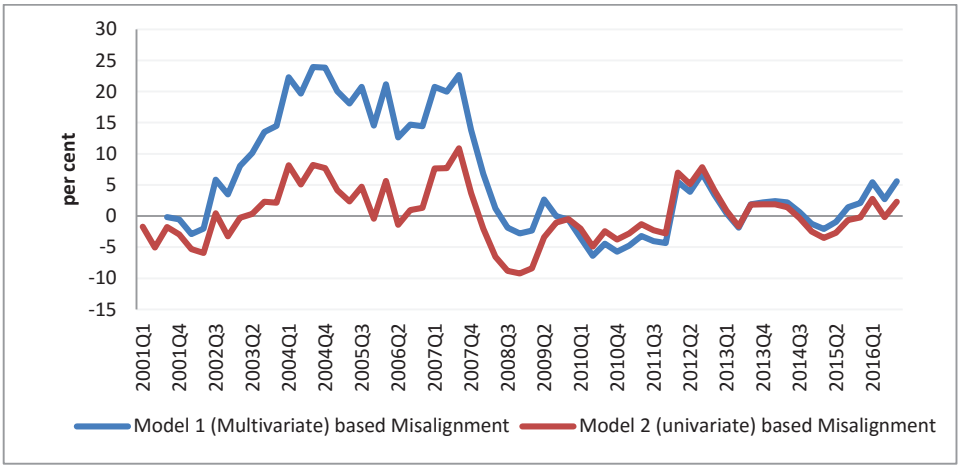

Figure 1 shows that the co-movement of RER misalignment is derived from the filter based method and equation based method. The overvalued RER relative to ERER is reflected by positive deviations and vice versa. Both methodologies indicate similar findings yet with different magnitudes. Based on the multivariate model, the RER misalignment ranged from -6.4 per cent to 23.9 per cent during the period under review. The RER has been highly overvalued during the period from 2002 to 2008. However, from 2008 onwards the RER misalignment has been +/- 7 per cent, implying the convergence of RER towards ERER in recent years.

3. Examine the relationship between RER misalignment and export performance

In general, the export performance is determined jointly by external as well as domestic factors. Following from the literature, we consider all those factors that can potentially play an important role in the determination of exports in a small open economy alongside RER and its misalignment. The trading partner's income is considered as the main demand side determinants of exports, while production capacity represents the key supply side determinant of exports. The relative price i.e. RER, and other international trade related policy concerns affect exports from both demand and supply sides.

$$X = f(RER, WD, PC, D\_RERmis, D\_mfa) \tag{3}$$

The dependent variable, *X,* is the export volume index for all selected categories of exports (total exports, industrial exports and textile and garments exports). The trading partner's income is derived by taking the trade weighted average GDP of Sri Lanka's major export trading partners. The production capacity is proxied by the potential industrial GDP while the RER is the quarterly average Real Effective Exchange Rate (REER 24) index. RERmis is the estimated RER misalignment in the previous section. In order to find out the impact of RER overvaluation and undervaluation on export performance, a dummy variable (D_RERmis) is created; one taking positive values of RER misalignment and zero otherwise (Schröder, 2013). In order to capture the positive impact of the Multi Fiber Agreement on exports, a dummy variable is included in the analysis taking 1 for the period up to 2005.

Theoretically, it is expected to have positive link between trading partners' income and export volume as well as between production capacity and export volume. Since the RER is used as an indicator of the country's external competitiveness, an appreciation of REER indicates loss of competitiveness, reducing export volume. Therefore, a negative relationship is expected between the real effective exchange rate and export volume. The dummy variable D_RERmis (overvalued period) is expected to have a negative coefficient, as the overvalued RER would reduce the export volume. D_mfa which indicates the availability of the MFA would enhance the textiles and garments exports, resulting in an increase of export volume.

3.1 Data and Methodology

The error correction version of the Auto Regressive Distributed Lag Model (ARDL) approach is chosen for analysis as it provided consistent estimators even when variables of the model are of different order of integration. Further the ARDL model allows for the inclusion of the dynamics of the variables in the analysis, thereby, mitigating the impact of the endogeneity of the explanatory variables to some extent. Besides, it is revealed that in the case of a finite sample, this methodology provides precise estimators and valid *t* statistics (Pesaran et al., 19; Hendry 64). This paper estimates the long run determinants of export performance by nesting the equation (2) into the ARDL model.

$$X_t = \sum_{k=1}^{p} \delta_k X_{t-k} + \sum_{l=0}^{q} \gamma_j Z_{j,t-l} + \varepsilon_t \tag{4}$$

In this model the dependent variable, export volume, (Xt) and explanatory variables such as REER 24, Trading Partner's income, production capacity and a dummy variable for RER mis alignment (Zt) are included in the regression with lag of order p and q. Appendix 4 provides the descriptive statistics of data used in the analysis.

The error correction version of the ARDL model can be then written as follows;

$$\Delta X_t = \gamma_1 \Delta Z_t - (1-\delta_1)[X_{t-1} + \eta_j Z_{j,t-1}] + \varepsilon_t$$

Where, $(1-\delta_1)$ provides the speed of adjustment towards the long run equilibrium while $\eta_j/(1-\delta_1)$, defines the long run relationship between the variables in the estimation.

3.2 Results and Discussion

Prior to estimating the above equations it is necessary to check the time series properties by testing the stationarity of the fundamental variables. This study employs the ADF test to determine the order of integration. As illustrated in Table 4, this study finds that the variables under concern are either I(0) or I(1).

Table 4: Unit Root Test (ADF) Results

Variable	Level	1st Difference	Order of Integration
Total Export Volume	0.032	16.46***	I(1)
Agriculture Export Volume	0.205	-4.511***	I(1)
Industrial Export Volume	-0.223	-7.884***	I(1)
REER(24)	-1.892	-4.089***	I(1)
Trading Partners' Income	0.408	-5.233***	I(1)
Production Capacity	-5.105***		I(0)
RER Misalignment	-1.691	-4.024***	I(1)

Notes: The data are in levels. A time trend is included, when necessary, in these tests. The optimum lag length is suggested by SIC. The critical values for the ADF test are from Davidson and MacKinnon (1993, page 708, Table 20.1). ***,**,* suggest that the null hypothesis is rejected at the 1, 5 and 10 percent level respectively.

As mentioned previously, the error correction version of the ARDL approach is employed to estimate the export demand function for Sri Lanka. As the first step of the analysis, it is necessary to test the existence of a long run relationship between the variables under investigation by using the Wald test. Then the Wald test statistic is compared with the bound test critical values tabulated by Pesaran et al. (2001). If the Wald test statistics are greater than

the upper bound of the critical value, the null hypothesis can be rejected to conclude that a long run relation exists between the variables of concern. If it is smaller than the lower bound critical value, the null hypothesis cannot be rejected. Finally, if it falls within the lower and upper bound, the results become inconclusive. The Wald F test statistics for both models exceed the upper bound critical value (Table 5) and, therefore, the null hypothesis can be rejected, confirming a long-run relationship among the variables of interest.

Table 5: Bound test results

Model	Wald test F statistic
Total Exports function	25.246***
Industrial Exports function	13.054***
Textile and garments exports function	11.974***

Notes: Critical Value for Bound Test (Pesaran et, al 2001, p 300)
intercept and no trend (k=4) :[3.74, 5.06] at 1% and [2.45, 3.52] at 10%
***, **, * indicate significance at 1%,5%, and 10% respectively

The export function has been estimated separately for total exports, industrial exports and exports of textile and garments. The results are reported in Table 6. To increase the reliability of the estimated results, diagnostic tests were carried out for each model and it is found that the models are free from autocorrelation and residuals are normal in distribution. Further, standard errors were obtained in consistence with heteroskedasticity. The results of the Ramsey test show that there are no signs of a mis-specified functional form. The cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) suggest that the estimates are stable (Appendix 5). Therefore, the long run relationship between exports and its determinants, as given in Table 6, is assured.

Contrary to the expectation, it is found that RER overvaluation does not play a significant role in any of the estimated export functions. Similarly, it is revealed that RER itself also does not affect exports significantly in the long run. Nevertheless, in the short run, RER was identified as a significant determinant of exports analyzed under three categories. Obviously, the exports during the previous period appear as the main determinant of total exports in the long run while in the short run, an increase in RER have reduced export volumes significantly. If we move to sub sectors of analysis, in the long run, industrial exports are explained by exports in the previous period and the production capacity whereas in the short run it is primarily dependent on the changes in RER. As expected, an appreciation of RER reduces the volume of industrial exports significantly in the short run.

In the case of textile and garments, the export volume is primarily dependent on exports in the previous period and trading partners' income. This finding is consistent with recent studies in the literature that find the significant positive link between trading partners' income and textile and garments exports. Athukorale (26) employs the Phillips-Hanses fully modified OLS method for the annual data from 1970 to 2015 and finds that world demand, which is proxied by real manufacturing exports from developing countries, is a significant determinant of the textile and garments exports. Similarly, Ekanayake (2013) estimates the export demand function for textiles and garments using world GDP as a proxy to trading partners' income and finds that the world income has a positive and significant impact on the demand for Sri Lankan textiles and garments. As in the case of other exports, in the short run, textile and garments exports are explained mainly by the changes in RER.

Overall, the results indicate that misaligned RER does not play a significant role in improving exports in Sri Lanka in the long run though it affects exports significantly in the short run. In the long run, the production capacity and trading partner's income play a significant role in improving export performance. The results in relation to textile and garments reflect very important and noteworthy characters of the sector.

The significant determinant in the long run in relation to this sector is the trading partner's income while there is no significant relationship between exports and production capacity. This could be mainly attributable to the quota system under which Sri Lanka operates for a longer period where the income of the trading partners matters for their import volumes. At the same time the contribution from capacity enhancement may matter less significantly owing to the very high standard of capacity the Sri Lankan garments sector maintained for a long period of time. However, when other export functions are considered, trading partners' income does not act as a significant determinant whereas production capacity in the economy plays a vital role.

Findings of this study also support the argument put forward by Haddad and Pancaro (4) which explain that a real undervaluation boost exports only in the medium term. Therefore, even though RER adjustment would enable to provide an impetus to the exports in the short run, an emphasis needs to be placed on enhancing production capacity of the economy to push the production possibility frontier outwards in order to enhance export performance in the long run.

Table 6: Determinants for Exports for Sri Lanka

Independent Variables	Dependent Variable		
	Log Difference of Total Export (Volume Index)	Log Difference of Industrial export (Volume Index)	Log Difference of Textiles and Garments export (Volume Index)
Constant	-5.93** (-5.46)	-7.43*** (-5.52)	-1.42 (-0.97)
log Dependent Variable (-1)	-0.93*** (-7.28)	-0.84*** (-6.04)	-0.92*** (-5.19)
Log Production Capacity (-1)	0.58** (2.2)	0.74** (2.58)	-0.004 (-0.009)
Log trading Partners Real GDP (-1)	0.69 (1.07)	0.61 (0.86)	1.59* (1.74)
Log RER (-1)	-0.13 (-0.73)	-0.22 (-1.14)	-0.33 (1.51)
Log Difference of Production Capacity	4.66 (0.67)	-1.76 (0.20)	-4.0 (-0.39)
Log Difference of trading Partners GDP	0.18 (0.18)	-0.39 (-0.36)	2.38 (1.68)
Log Difference of RER	-0.57** (-2.66)	-0.74*** (-2.99)	0.70** (2.57)
D_RERmis (1 when Misalignment is positive)	-0.01 (-0.71)	0.01 (0.54)	0.01 (0.57)
D_mfa	-0.001 -0.03	0.01 (0.27)	-0.04 (-0.84)
No of Observations	59	59	59
R-squared	0.56	0.52	0.53
Diagnostic Tests			
Serial Correlation(LM) Test	0.07[0.929]	1.49[0.475]	3.77[0.152]
Ramsey Test (1 Restrictions)	0.31[0.574]	2.41[0.101]	0.25[0.775]

Notes: ***,**,* indicate significance at 1% ,5% and 10% respectively,

Standard errors have been corrected for presence of heteroscedasticity.

t statistics are in ( )parenthesis.

Critical values for diagnostic tests are taken from F distribution table and p values are in [ ]

4. Conclusion

This study investigates the impact of RER and its misalignment on export performance in Sri Lanka using quarterly data from 2001 to 2016. First, it quantified the RER misalignment and then examined the effect of misalignment on export performance. Considering time series properties of data chosen for the study, error correction models have been used in the analysis. The estimated results suggest that the RER in Sri Lanka during this period is misaligned in the range of -6.4 per cent to 23.9 per cent during the period 2001 to 2016. Misalignment derived from the HP filter method shows a similar movement, albeit with different magnitudes (-9.2 per cent to 10.8 per cent). However, in recent years, from 2008 onwards, the misalignment has been less than +/-7 per cent.

In order to assess the impact of RER misalignment on export performance, the export function has been estimated for three main categories i.e. total exports, industrial exports and exports of textile and garments, including a dummy variable to represent the period where RER is undervalued. Contrary to the expectation, it is found that RER undervaluation does not play a significant role in any of the estimated export functions in the long run. However, in the analysis, there are evidences to support that the RER is a significant determinant of exports in the short run. As such Sri Lanka could gain from adjusting RER in favour of exports in the shorter horizon. In the long run, however, the production capacity and trading partner's income play a significant role in improving export performance. It is important to note here that the trading partner's income becomes a significant determinant only in the textile and garments exports while in other sectors it is mainly determined by the production capacity of the economy. Therefore, in order to improve the export performance in the long run, emphasis needs to be placed on enhancing the production capacity of the economy, thereby pushing the production possibility frontier outwards rather than moving along the frontier.

Overall, results suggest that a stable and undervalued RER is fundamentally important in determining the growth in exports sector in the short run, though the impact of maintaining the policy in the longer duration is insignificant. This may even cause adverse consequences according to Haddad and Pancaro (4), as real undervaluation led by nominal depreciation that is not supported by anti-inflationary policies such as wage moderation can cause high and destabilizing liquidity growth and inflation, which could cause financial instability. Moreover, the undervalued currency rate can destabilize the monetary policy, making it incapable of reaching domestic objectives. Such constraints may cause an artificial process of over-lending and over-investment, resulting in overheating of the economy. This artificial undervaluation may provide an incentive to the producers, but this may come at the expense of the consumers who may lose their purchasing power. Finally, it may be difficult to move from the status quo due to the lobbying of the tradable sector.

Finally, any future study pertaining to the RER misalignment and exports sector can be further strengthened through the following adoptions. First, this study focuses on assessing the impact

of RER misalignment on export performance rather than estimating the comprehensive export function for Sri Lanka. Therefore, in order to provide policy recommendations on improving the export performance of the country, a comprehensive study on exports would be vital. Secondly, this study involves anlaysing the export volumes in relation to the industrial and textile and garments exports against the same variables including RER and RER misalignment. However, it is generally accepted that variables that would impact different categories of exports would differ, warranting separate functions being developed for each sector. Thirdly, in estimating the export function for textile and garments, removing the portion of imported parts and components would be ideal as they are also been affected by the RER movement though to the contrary direction. Finally, it would be ideal if volatility in the movement of RER is also assessed in any further study apart from RER misalignment, as such movements have impacted more on the growth rather than RER misalignment in some empirical analysis done elsewhere.

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Appendices

Appendix 1: Trading Partner Countries and Trade Weights used by CBSL in REER (2010=100) compilation

Country	Weights (per cent)
United States	19.74
India	15.57
United Kingdom	9.86
China	6.41
Germany	5.88
Japan	4.99
Itally	4.83
Belgium	4.45
Hong Kong	3.63
France	2.93
Malaysia	2.36
Russia	2.18
Thailand	2.15
Netherlands	2.11
Canada	1.96
Pakistan	1.8
Singapore	1.79
Indnesia	1.73
Turkey	1.52
Taiwan	1.51
Korea	1.17
Australia	0.97
Bangladesh	0.36
Kenya	0.1

Appendix 2: Descriptive Statistics

	REER 24 (level)	Productivity Differential	Net Foreign Assets	Interest rate Differential	Government Consumption to GDP	Terms of Trade	Trade as a percent of GDP
Mean	88.7	1.5	118.9	9.0	21.8	112.6	51.9
Median	95.1	1.4	153.8	9.0	22.7	108.5	50.6
Maximum	107.2	2.8	235.4	12.1	26.1	134.0	73.3
Minimum	66.6	0.6	-206.2	6.3	18.1	94.1	34.7
Std. Dev.	13.8	0.7	116.6	1.4	2.6	15.6	12.1
Skewness	-0.2	0.3	-1.2	0.0	-0.2	0.2	0.2
Kurtosis	1.3	1.6	3.6	2.1	1.6	1.3	1.6
Jarque-Bera	7.8	5.8	15.7	2.1	5.6	7.8	5.4
Probability	0.0	0.1	0.0	0.3	0.1	0.0	0.1
Observations	63	60	60	61	62	62	62

Appendix 3: Long-run relationship between REER and its Fundamentals

	Dep. Var.: REER 24		
	Scenario 1	Scenario 2	Scenario 3
Productivity Improvement	29.95***	27.18***	36.86***
	[-6.98]	[-7.37]	[-8.19]
Net Foreign Assets	0.03**	0.03***	0.03***
	[5.07]	[-5.22]	[-4.61]
Terms of Trade	0.24***	0.19**	0.28***
	[3.31]	[-2.98]	[-3.39]
Trade as a per cent of GDP	-0.39***	-0.41***	-0.20
	[3.50]	[4.07]	[1.60]
Government Consumption to GDP	1.72**	1.55***	1.62***
	[-3.83]	[-3.86]	[-3.16]
Interest rate differential	1.08***	1.12***	1.17***
	[-4.15]	[-5.09]	[-4.26]
Constant	-14.41	-2.44***	-3.34***
	[0.27]	[-3.29]	[-4.22]
Dummy variable for civil war	3.57**	3.45***	4.76***
	[3.39]	[3.78]	[4.61]
Net forex sales	0.0003	0.0004	
	[0.31]	[0.48]	
Dummy Variable for Tsunami	-0.18		
	[-0.17]		
Error Correction Term	-0.34***	-0.37***	-0.31***
	[-3.98]	[-4.33]	[-4.87]
Number of observations	58	58	58

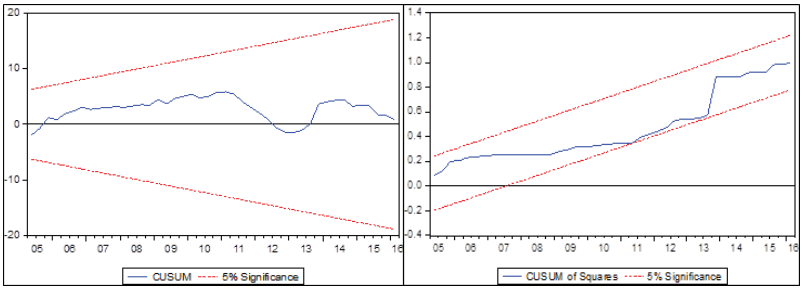
***,**,* suggest the significance level of 1, 5 and 10 percent respectively. t statistics are in [ ] parenthesis.

Appendix 4: Descriptive Statistics: Estimation of Export Demand Functions

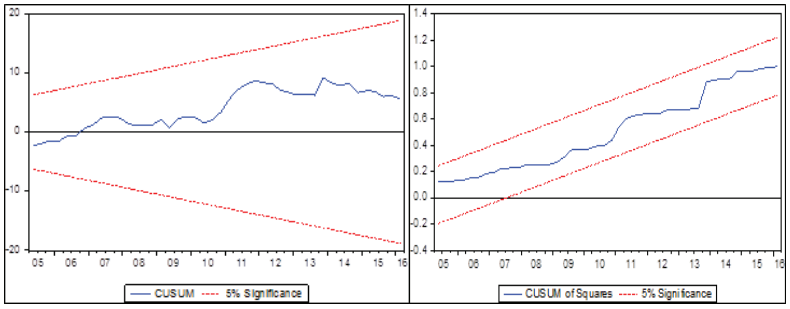
	Total Export Volume Index (log)	Industrial export Volume Index (log)	Agriculture Export Volume Index (log)	log REER 24	log Real GDP	Trading partner's real GDP (log)
Mean	4.5	4.7	4.6	4.5	14.2	4.6
Median	4.5	4.8	4.6	4.5	14.1	4.6
Maximum	4.9	5.0	4.7	4.7	14.6	4.8
Minimum	4.1	4.4	4.5	4.2	13.7	4.4
Std. Dev.	0.2	0.2	0.0	0.2	0.3	0.1
Skewness	-0.1	0.0	0.4	-0.3	0.0	-0.1
Kurtosis	1.8	1.6	2.3	1.4	1.6	2.0
Jarque-Bera	3.6	3.5	2.4	7.7	4.8	2.7
Probability	0.2	0.2	0.3	0.0	0.1	0.3
Observations	63	43	43	63	62	61

Appendix 5: Stability Tests

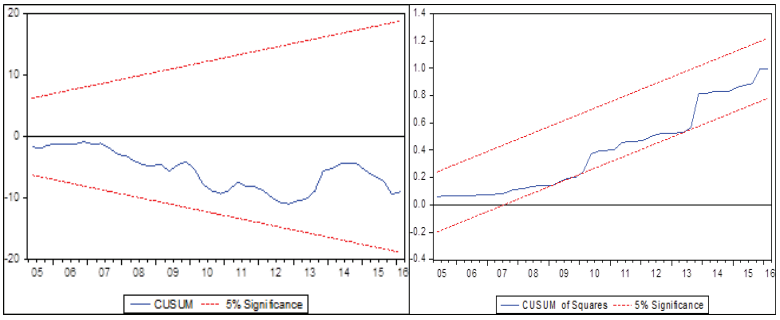
1. Total Export function



2. Total Industrial Export function



3. Textile and Garments Exports function



The Impact of Dividend Policy on Share Price Volatility: Evidence from Banking Stocks in Colombo Stock Exchange

W.G.R.Harshapriya[1]

Abstract

This paper examines the dividend policy related literature in order to find evidence by looking at the impact of dividend policy on share price volatility through an analysis of licensed commercial banks listed in Colombo Stock Exchange in Sri Lanka. The panel data least squares method was adopted with the fixed effect model. The impact of dividend yield on share price volatility of licensed commercial banks were found to be insignificant at a 5% significant level with positive correlation, whereas dividend pay-out had a significant negative correlation as expected with share price volatility, which was substantiated by the empirical evidence from different capital markets as well as dividend related theories. These results suggest that dividend policy has an impact on share price volatility in the Colombo Stock Exchange with regard to banking sector stocks.

Key words: *Dividend Policy, Share Price Volatility, Dividend Yield, Dividend Pay-Out Ratio, Panel Data*

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1. Introduction

The share market is a place where both companies and investors come together to fulfil two different objectives, borrowings and lending, respectively. The companies approach the share market in view of searching for finance and the investors in search for good investments that will yield sufficient return to their investment, to cover the risk that they are accepting by investing in companies that someone else is managing.

The managers of a company initially have to decide whether they should go for internal financing, if available, or external financing. The decision to finance from internally generated funds may affect the dividend payments of the company and investors see that as a signalling effect of the firm on the expected future performance of the company (Nizar Al-Malkawi, 44).

If internal financing is not possible or not sufficient to cover the entire financing need, it has to be financed from external sources, either from new equity or debt.

The companies' capital structure consists of either equity or borrowings, where firms have to balance the finance from equity and debt, as the investors and lenders are sceptic of the risk of the company. Therefore, firms have to keep their capital structure at the optimum level in order to avoid the risk of bankruptcy.

Miller and Modigliani, the cost of capital, corporation finance and the theory of investment, (261) stated that the value of the firm is independent of its capital structure, subject to some assumptions, and if the said assumptions are lifted it is doubtful on validity of theory.

On the other hand the investors put their money with the expectation of sufficient return by way of dividend and capital gain (price return) from the share market investments. The dividend return that is expected by shareholders (investors) is affected by the dividend policy of the firms, which is linked with financing decision of firms.

The preference for return, by way of dividend or capital gain, by shareholders was also studied by Hotchkiss and Lawrence (02) who have stated that investors who are in high tax brackets prefer low dividend yielding stocks that have more price appreciation potential. Therefore, dividend policy is important to shareholders in different significance levels depending on the tax circumstance that they face. Further, senior shareholders prefer high dividend yielding companies as they need continuous income from their investments, due to the fact that price appreciation is less important than current consumption income (Krieger et al.155).

Dividend Policy is a subject that has been examined during the last few decades by numerous researchers starting from Miller and Modigliani, the cost of capital, corporation finance and the theory of investment, (261), Miller and Modigliani, Dividend policy, growth, and the valuation of shares, (411).Miller and Modigliani, Dividend policy, growth, and the

valuation of shares (411) proposed the dividend irrelevance theory, whereas De Angelo, et al. Reversal of fortune, presented the evidence for its relevance to the shareholders (342).

Dividend policy is a policy of a company on how much of profit earned by them are going to distribute to their shareholders as the return for the investment that was made. Effect on decision of a company's dividend policy was explained by dividend related theories, which include birds on the hands theory, signalling effects theory, clientele effect, tax preference theory, agency cost theory, behavioural theory, and firm life cycles theory.

Share price volatility on the other hand is the systemic risk faced by investors who hold equity investments. Investors are naturally risk averse and being aware of the volatility of their investments is important as it measures the level of risk that they are exposed to by holding shares of the listed companies.

Although there are number studies have been done on developed capital markets (Hussainey et al. 57), emerging markets (Zakaria et al. 02) and also in frontier markets (Nazir et al. 132; Habib et al. 78; Masum 09-10) to find out the relationship between dividend policy and share price volatility, since the results of the studies done revealed different and contradictory results in different markets may be due to differences in efficiency in capital markets in terms of information availability.

When managers take decisions on the optimal capital structure of the firms, they need to decide whether to finance from internally generated funds (retained earnings) or from external financing (debt or equity). If internally generated funds are to be used to invest in new project, they will have an impact on dividend policy as the returns of the new investments are uncertain until they realize. This may lead to change the firms' dividend policy.

Investors and shareholders in the share markets also have different needs and level of return (Krieger et al. 151). Therefore if there is any change in dividend policy, as against the expectation their response in share market by way of buying and selling of shares also get affected thereby leading to volatility in share prices (Nazir et al. 132).

Hence, the continuous study on the impact of dividend policy on share price volatility is important to add to the academic literature with the present condition of the relationship between dividend policy and share price volatility as it helped to fill the time gap of empirical evidences.

Even though there are empirical studies that have been conducted on developed markets, emerging markets and in some frontier markets (Morgan Stanley Capital International) in Sri Lankan context empirical evidences is hardly available on the topic of "impact of dividend policy on share price volatility". Further, studies that have been conducted in the UK which is categorized as a developed market (Morgan Stanley Capital International) found that dividend pay-out had a negative relationship with price volatility (Hussainey et al. 57) while

emerging market like Malaysia evidenced that dividend pay-out had a positive the relationship with price volatility (Zakaria et al. 02). Further, Habib et al. found that in a frontier market like Pakistan relationship between dividend pay-out and price volatility is negative (78). In this context, the question is what is the impact to price volatility in Sri Lankan stock market from dividend policy?

Therefore, the author studied the "impact of dividend policy on share price volatility" in Colombo Stock Exchange (CSE), concentrating on banking sector stocks as the selected sector has been continuously paying the dividends.

The author aims to examine the relationship between dividend policy and price volatility due to the lack of literature in the chosen area in the Sri Lankan context by filling the empirical gap prevailing in the Sri Lankan stock market (CSE) and further to fill the time gap with the objective of using latest data. In this research to measure the changes in dividend policy Dividend Yield (D_YLD) and Dividend Pay-out (D_PO) ratios (Hussainey et al. 57; Habib et al. 78; Zakaria and Ahmadi 02; Masum 9-10) were be used. The dependent variable will be Price Volatility (P_VOL) (Hussainey et al. 57; Habib et al. 78; Zakaria et al. 02; Masum A, 09). In order to identify the relationship between independent variables and the dependent variable, the author decided to use the following research questions.

i. Is there any relationship between Dividend Yield and Price Volatility?

ii. Is there any relationship between Dividend Pay-out ratio and Price Volatility?

iii. What is the direction of relationship (positive or negative) between Dividend Yield and Price Volatility and Dividend Pay-out ratio and Price Volatility?

The guiding research questions of the study are "Is there any relationship between Dividend Yield, Dividend Pay-out and Price Volatility" as well as the directional impact of dividend policy on stock price volatility. In this study the effect of dividend policy on share price volatility in the banking sector stock listed in the Colombo Stock Exchange were investigated. The following hypotheses were tested in this study.

Hypothesis 1: Dividend Yield has an impact on Share Price Volatility

The above hypothesis was tested by Nazir et al. (132); Habib et al. (78); Masum (09) in their study to find out the relationship between dividend policy and share price volatility.

Hypothesis 2: Dividend Pay-out ratio has an impact on Share Price Volatility

Hussainey et al. (57); Zakaria et al. (02); Habib et al. (78); Lashgari (273) in their studies on the same question used the above hypothesis also to find out the impact of dividend policy on share price volatility.

Both hypotheses are related to testing the dividend related theories. Miller and Modigliani, the cost of capital, corporation finance and the theory of investment, (261); Dividend policy,

growth, and the valuation of shares, (411) in their theory on dividend irrelevance theory tested both hypotheses. Further birds in the hands theory elaborates that shareholders put more value on certain dividend income rather than uncertain capital gain suggesting a correlation between dividend policies with price volatility which will be tested in the two hypotheses of the study. Further, according to the agency cost theory La Porta et al. (04-07), differences of objectives could be minimized by the continuous or increasing dividend payment, which supports hypothesis 02 of the study.

The signalling effect theory Nizar Al-Malkawi, stated that dividend payment can be used to signal the expected performance of the company (62-63). Therefore, dividend pay-out signals the expected strong or bad performance, which leads to assume low or high risks to the firms by the investors, thereby affecting the volatility of the share prices. Hence, Hypothesis 2 was used to find out the theoretical implications of dividend policy.

This study attempts to fill the gap of a lack of empirical studies in the Colombo Stock Exchange concentrating on banking sector stocks, while investigating the direction of causality (positive or negative) between Dividend Yield and Price Volatility and Dividend Pay-out ratio and Price Volatility.

Share price volatility is the risk faced by the investors while the dividend policy affects the return of the investors by holding the shares of a company. As the investors prefer lower risk due to nature of risk averse, prefer lower volatility. Dividend policy is important to investors with different degree of significance, (Krieger et al. 156-157) depending on their tax bracket upon which the dividend income is liable to pay taxes and the need of current income from their investments in share market. The volatility of share prices affects the price return of the shares (capital gain), therefore the "impact of dividend policy on stock price volatility" is an important factor for investors when they make decisions on investing in the share market in Sri Lanka. Investments in the CSE by foreigners are an important factor for Sri Lanka as the country is running with savings investments gap (Central Bank of Sri Lanka) while the gap has to be filled by foreign investments.

In the case of Sri Lankan capital market, this is an area which needs more research since the literature is hardly available. Therefore by studying the dividend policy with reference to the Sri Lankan stock market, this research was able to add new updated knowledge to the literature while filling the time gap also since the author used up to date data for the study.

The scope of the study was to add value to the corporate finance literature by studying the "Impact of dividend policy on share price volatility" by studying the relationship of banking sector stocks of Colombo Stock Exchange. Section Two is devoted to remaining the existing literature on dividend policy and historical background. Section three is allocated to discuss the research, Section Four discusses the analysis and discussion of findings. Section Five concludes the paper.

2. Literature Review

2.1. Dividend Policy and Historical Background

Miller and Modigliani, the cost of capital, corporation finance and the theory of investment, (261); Dividend policy, growth, and the valuation of shares, (411) studied the issue of selecting suitable capital structure for a company. It is the proportionate amount of debt and equity financing by a firm. The shareholders, who own the firm, are the residual claimant for the profit that the firms earn. The objective of the managers of the firms is to maximize the shareholders' wealth by increasing the value of the firm's assets. Hence, Miller and Modigliani, the cost of capital, corporation finance and the theory of investment, proposed that with certain assumptions dividend policy does not have an impact on the value of the firm(261). This irrelevance theory was supported by Brennan (1116). Since the dividend irrelevance theory works in a perfect market with assumptions, question remains as to what extent this stands in the real world.

2.2. Theoretical Background of Dividend Policy

2.2.1. M & M Theory

Miller and Modigliani, the cost of capital, studied the dividend policy in a perfect capital market and rational behaviour of investors with certainty (261). Miller and Modigliani, the cost of capital, (261) were able to prove that in a perfect capital market, a firm's financing decisions do not have an impact on its value of the firm, thereby stating that dividend policy too does not affect the same. This is because the changes in the capital structure affects the dividend policy, since the changes in the borrowings plan has a direct impact on the increasing or decreasing of the money available to be distributed to shareholders. Brennan also supported the dividend irrelevance theory (1116).

In a world without tax, transaction costs, without market imperfections (no asymmetric information), Miller and Modigliani, the cost of capital (290) were able to demonstrate that the capital structure decision is not relevant to the shareholders' wealth of a firm. Whereas those simplified assumptions were interrogated by the empirical studies subsequently.

DeAngelo and DeAngelo, the irrelevance of the MM dividend irrelevance theorem (293) in their paper discussed the relevance of the dividend irrelevance theory of Miller and Modigliani, the cost of capital (290). There it was argued that not only pay-out policy is important, once the assumptions are relaxed, but also investment policy has a significant effect on the value of the firm (02-04). In order to optimize the pay-out policy of a firm, the present value of the dividend payment has to be equal to the present value of expected projects cash flow. DeAngelo and DeAngelo, the irrelevance of the MM, or the

shareholders' wealth will deteriorate as the present value of the dividend is higher than project cash flows (293-300).

The issue with the theory proposed by Miller and Modigliani, the cost of capital (261), is how to explain the real world complexities in a model with assumptions by the empirical researchers. Therefore these models with assumptions and simplicities might work only in a real world subject to conditions (Myers, 81).

Some of the empirical researchers suggested that more work to be done on synthesising to reconcile the debate on dividend irrelevance or relevance on the value of the firms (Elasas and Florysiak, 36-37).

2.2.2. Birds in the Hands Theory

The birds in the hand theory first presented by Linter (97) and Gorden (264) elucidated that dividends are relevant to determine the value of the firms, against the theory of Miller and Modigliani, the cost of capital (261). The model states that dividend and future growth of earning consist of the total value of equity. In a more simplistic way, the value of equity is equal to dividend and future capital gain. Future capital gain is dependent on future earnings and it is therefore uncertain as well. Sometimes firms may lose the value to the extent that it will go bankrupt. Hence, it is difficult to estimate, and accuracy also cannot be guaranteed. Therefore it is stated that dividends are more valuable than uncertain capital gain (Nizar Al-Malkawi, 62-63).

The birds in the hand theory has few assumptions, some of which are, zero debt capital structure, further financing from retained earnings, return from the investments are constant and cost of capital is also a constant Gorden (264).

The theory of birds in the hand is critiqued due to the assumptions that are unrealistic in the real world. Specifically, the total financing is to be fulfilled with internally generated funds for future investments cannot be achieved in the real world, due to the fact that when a firm is in its growth stage, it may require more funds than it is generating. When a firm's funding requirement is higher than the internally generated fund, it has to borrow from outside, which is a limitation of the theory.

Bhattacharya argued against the acceptance of dividends are more valuable than expected capital gain is misleading not only in the world of perfect capital markets, but also in real world markets (259). Brennan (1115-1121) evaluated the Miller and Modigliani, the cost of capital (261) model and the theory of birds in the hand and concluded that the issue is more intricate, and therefore suggested to consider more factors to find out a resolution to the birds in the hands theory.

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2.2.3. Agency Cost Theory

In a perfect capital market, under dividend irrelevance theory, it is assumed that there is no conflict of interest between shareholders and the management of a firm, which is the board of directors. Nevertheless, in real world markets, the validity of the said assumption is doubtful as the management of the firm is separated from the shareholders of the firm (Hussainey et al. 66-67). In such a scenario managers of firms have their own interest to satisfy while the owners' interests will be distracted. Therefore, shareholders has to get a burden on additional cost to monitor the behaviours of the management of the firm, and this cost is the implicit charge of agency cost, which is a result of conflicting self-interest between management and owners. The outcome of conflicting objective is, the managers' tendency to undertake investment options that are unprofitable, which leads to the erosion of the shareholders' wealth. The payment that is received via dividend can serve to reduce the impact of agency cost while dropping the unrestricted funds that are available to the managers (Rozeff, 249).

The Agency problem in firms was studied by La Porta et al. (27-28) found out that, with a sample of 33 countries data, countries that have better protection for minority shareholders pay higher dividends, enabling the reduction of the agency cost. Further, countries with high growth potential pay lower dividends than slower growing companies, which is in line with shareholders' interest, as they wait for higher dividends until returns are received from investments that firms made (La Porta et al. 27-28).

2.2.4. Signalling Effect

Nizar Al-Malkawi proposed that dividends are used to give a signal to shareholders about the performance of the firms, whether prospects of the companies are improving or deteriorating (55-62). Thus, continuous increasing or constant dividends were considered as a signal that a firm will do well in the future too. This signalling effect was studied by Lipson, et al. (36-38); Tse (12-13) and Nizar Al-Malkawi since the managers hold more information, than the owners of those firms performance (55-62).

Since there is a gap of information between management and the investors or the shareholders of firms, share prices of the firms may not represent the true value of the firms. Therefore, dividends carry some information to the market that can be used by shareholders to get some implicit information about firms' prospects. Companies have a tendency to pay increased dividends when the management believes that they can continue to stay in those levels (Lintner, 97), which in turn suggests that the Company has a sustainable long term growth potential. Lipson, et al. (36-38).

Tse found evidence to conclude that large cap companies used dividends to signal supporting empirical evidences that large cap firms are more likely to give signal to market

by dividends which are also trusted by shareholders too (24-29). Further, it was found that firms that have more diversified shareholdings have higher tendency to use dividends to signal in real world markets.

Nissim and Ziv found evidence to suggest that dividends had a positive correlation to expected future earnings (2111). Increased dividend payment is also linked to low systematic risk of the firms (Grullon et al. (31), while Dong, et al. stated that firms are paying stable dividends due to the fact that it helped to have positive corporate images of firms (121).

2.2.5. Clientele Effect

The clientele effect is important as the investors value their income after paying relevant taxes due to the income that they have earned. Investors of a firm may receive the return in the forms of dividend and capital gains. Since dividends and capital gains are taxed differently, different clients with different tax brackets would prefer either dividend or a capital gain, depending on their tax scenarios. Due to this effect, investors in the low tax category, who need regular streams of income, prefer to invest in high dividend paying firms, while those who are in the higher taxable income category will be attracted by firms, that do not pay much dividend or no dividend which concentrate on the growth of the earnings which result in future capital gain.

Krieger et al. studied the clientele effect with a senior clientele sample and found that there is no significant impact from senior investors on the firms to change their dividend pay-out policies (150) which was affirmation of the findings of Becker et al. (655). Therefore, it was concluded that the senior effect is unrelated to firms' dividend policy, also found that seniors too indifferent between dividend and repurchases Becker et al. (655).

Hotchkiss and Lawrence studied the characteristics of institutional investors' preference for dividend income using the analysis of their portfolios (23-24). It was found that those who hold high dividend yielding stocks in their portfolio tend to change the composition of stocks by removing lower dividend yield stock, if firms change their dividend policies. Further investment managers, who manage portfolios on behalf of their clients, who are taxable, are less likely to go for investments that pay higher dividends.

2.2.6. Tax Preference Theory

Miller and Modigliani, the cost of capital assumed that capital market is efficient and free from tax effects and further in their propositions, and it was assumed that there is no difference in tax policies for dividend and capital gain (261). Conversely, in real world capital markets, taxes have to pay for dividend and capital gain as well as tax treatments including tax rates are differ from each other.

The tax preference theory explains that paying low dividends would lower the cost of capital, hence increasing the value of the company. This was articulated with the fact that dividends are taxed at higher rates than that of capital gain in the real world scenario (Lindop & Holland, 203). Further, dividend tax has to pay immediately after payment of dividend, while capital gain taxes could be differed until the gains are realized. Therefore, capital gain has advantages over dividend in two different ways.

One more situation is in an estate, where beneficiaries are entitled to firms' shares after death of the donor; in such a scenario no capital gain is due until the heir gets the benefits of the estate. Dividend taxation and adjustments of share prices were tested by Bell and Jenkinson (1321), using data from the United Kingdom equity prices. The results showed that if dividends are taxed at higher rates than capital gain, the price impact of ex dividend price from cum dividend prices is different from dividend paid per share, as after tax basis, dividend income is at a disadvantaged position.

2.3. Dividend Policy and Colombo Stock Exchange

The Colombo Stock Exchange (CSE) was established in 1985 and is regulated by the Securities Exchange Commission (SEC) of Sri Lanka. Both equity and debt instruments issued by companies and unit trusts are traded in the CSE. There are two boards where a company can list its shares to trade in the CSE, Main board and Dirisavi board (secondary). Large cap companies with more frequent disclosure requirements need to adhere to list in the main board, while disclosure requirements and frequency are somewhat relaxed in the Dirisavi Board, until such companies grow to some extent.

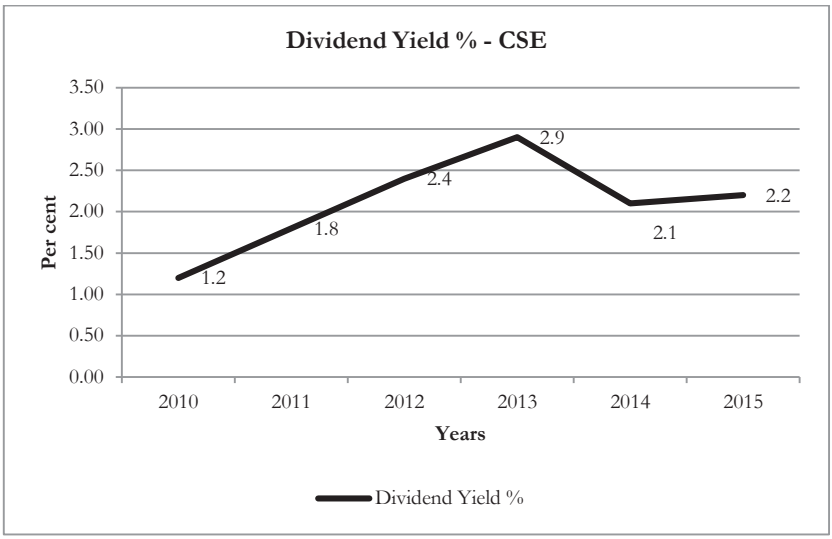
The transactions in the CSE are carried out in an electronic trading platform, while the securities are deposited in script less form in the Central Depository System. The All Share Price Index (ASPI) is the main index that tracks the performance of the market that includes all the listed companies in the CSE. Currently there are 294 companies listed in the CSE in 20 different sectors, with a total market capitalization of Rs. 2,591 billion (Colombo Stock Exchange).

Colombo Stock Exchange is classified as a frontier market (Morgan Stanley Capital International), and it has adopted the widely accepted industry classification of Global Industry Classification Standards (GICS®) in 2015, in order to be in line with global standards (Colombo Stock Exchange).

Since the end of the war in Sri Lanka in 2009, the ASPI had grown at a cumulative annual growth rate of 12.58% while from the 2009 to 2015 period, the average market dividend yield was in the range of 1.2% to 2.9% (Figure 01). The dividend yield of 1.2% is the lowest amount reported in the CSE during the last ten year period, which may be due to the fact

that the market had grown 96% during the year of 2010, while such a growth was not possible achieve via earnings of the companies in a year.

Figure 01: Dividend Yield of CSE from 2010 to 2015



Source: CSE Annual Report 2015

2.4. Dividend Policy and Share Price Volatility

The decision regarding dividend policy has a direct impact on a firm's capital structure as dividend payment reduces the funds available for new investments, which are required for the firm to grow. The relevance of capital structure on the value of a firm is a topic which has been studied for more than five decades (Miller & Modigliani, dividend policy 411; Hussainey et al. 66-67).

Dividend policy and share price volatility has been studied by different researchers in different time periods in different capital markets around the world (Hussainey et al. 66-67; Habib et al. 78; Nizar Al-Masum, 44), yet there is no consensus among them on the impact of dividend policy. Therefore, different theories have developed from dividend irrelevance theory (Miller and Modigliani, dividend policy 411), such as Birds in the hands theory (Gorden, 264), Agency cost theory, Signalling effect, Clientele effect, Tax preference, Firms life cycle theory and Behavioural theory.

Hussainey et al. studied the impact of dividend policy on stock price volatility using the price data from London Stock Exchange in United Kingdom (66-67). In their analysis dividend yield and dividend pay-out ratio were the main independent variables, while price volatility

was the dependent variable. In order to mitigate the impact from other unknown factors, firms' growth rates, leverage, size, earnings also were the other controlling variables of the study. Ten years' data was used in the analysis, Hussainey et al concluded that dividend pay-out has a negative relationship with price volatility (66-67) and the findings were in line with Baskin's (19) analysis on the same, whereas dividend yield has shown a positive but insignificant relationship with share price volatility. Allen and Rahim (175) too proposed a positive relationship between dividend yield and price volatility.

Further Hussainey et al. in their analysis found that company size had a negative significant impact on share price volatility, while the leverage of the firms had a positive correlation to share price volatility (66).

One of the emerging market (Morgan Stanley Capital International), the Kuala Lumpur stock exchange of Malaysia, was studied by Zakaria et al. (04-06), using data from construction and material sector companies during the period from 2005 to 2010. The study was similar to Hussainey et al. (66) which was done on the London Stock Exchange. Zakaria et al. found evidence to conclude that dividend pay-out ratio had a positive significant impact on share price volatility while there was no significant impact to price volatility from dividend yield in the Kuala Lumpur stock exchange (04-06). Further when a firm size increases there was more impact to price volatility with positive correlation, whereas the leverage of the companies witnessed a negative impact to price volatility as increasing leverage can cause disturbance to stable dividend policy. Investment growth had an insignificant influence on the share price of the firms, while the influence of leverage on the share prices of the firms were negative with significant effect, which is contrary to the findings of Hussainey et al. (66).

Empirical evidence from frontier markets published by Habib, et al. on their study done on the Pakistani's stock market, using cross sectional regression analysis, was carried out to analyse the relationship of share price with dividend yield and dividend pay-out ratio (78). By adding more evidence to the experience of the United Kingdom, (Hussainey et al. 66) it was found that dividend yield also positively correlated with share prices of the Karachchi Stock Exchange, with significant impact.

Nazir et al. selected a sample from financial sector firms in the Karachchi Stock Exchange in Pakistan to determine the impact of dividend policies in volatilities of share prices for a period of five years from 2006 to 2010 (136). Four controlling variables used to which are similar to Hussainey et al. (61-62) and Zakaria et al. (04). Using panel data fixed effect regression analysis results revealed dividend pay-out had a similar impact, which was evidenced by Habib et al. (80) in Pakistani stock market. A positive correlation between dividend yield and share price volatility was found for the first time in the Pakistan stock market, which was later confirmed by Sadiq (428), yet there was only an insignificant impact on share price volatility.

Sadiq found an insignificant impact from company size to its price volatility (429-431) similar to the fact found in the Malaysian stock market in 2012 by Zakaria et al. (04-05). Further Nazir et al. announced one significant contradictory evidence to prove that earnings volatility of the firms also have a positive significant impact on share prices (136-138).

The impact of dividend policy on price volatility in the Tehran stock exchange was studied by Lashgari and Ahmad (273) with a sample of stock selected covering a period of six years, using the fixed effect model. The same methodology used by Hussainey et al. (61-62); Zakaria et al. (04-05); Habib et al. (80); Sadiq (429-431) was used to study the correlation of the variables. No significant impact was witnessed from dividend yield to share price volatility during the period from 2007 to 2012, while a negative significant effect from pay-out ratio was established, confirming the empirical evidence from Habib et al. (80).

According to Nizar Al-Masum banks listed in the stock exchange of Dhaka in Bangladesh, which is a frontier market (Morgan Stanley Capital International), confirmed a negative correlation of dividend yield with share prices (09). In contrast to other researchers, Nizar Al-Masum used Retention ratio as against pay-out ratio (09), which is the opposite of pay-out ratio and the analysis revealed a negative, but insignificant correlation with share prices. In addition to the main variable of the study, out of the controlling variables, return of equity and earnings per share also proved to be significant to share price volatility with significant effect.

Pay-out policy was analysed by Al-Twaijry using a sample of stock from the Kuala Lumpur stock exchange of Malaysia and results suggested that pay-out ratio did not have a significant impact on companies' earnings growth (349). This finding was important as Nazir et al. found a positive correlation between earning volatility and share price volatility (132) and if it is valid for Malaysia, pay-out ratio could have an impact on price volatility, a fact that needs to be proved by studying relevant markets.

3. Methodology

3.1. Research Design

In order to find out the relationship of dividend policy with share price volatility, the author used a positivist paradigm to detect any impact of dividend yield and dividend pay-out ratio on share price volatility using a deductive approach. In this paper a longitudinal research design was assumed, due to continuous recurring data on the same set of variables for the same sample of firms over a period of time from 2008 to 2015 (Bryman & Bell, 39-70). The research design which was used in this research intends to find out the correlation of independent and dependent variables. Compared to the cross section research design, the adopted longitudinal research design enables the examination of deviations or changes over a period of time, whereas cross sectional design is used to examine one point of time

(Bryman & Bell 39-70), as with this study covers eight years period. The adopted design helps to study causal relationship between variables over time (Bryman & Bell 39-70).

The process of collecting data was designed based on the guidance of relevant existing literature and the findings of the research was compared with empirical evidences and checked the level of consistency of the study results with previous theories related to dividend policy and prior literature in order to comprehend the results of the study via inductive reasoning, existing theories can be advanced or refuted (Bryman & Bell 39-70).

Quantitative data was used since the research questions are answered via quantitative data analysis and testing. Since the secondary data was used, it helped to have good quality data with minimum cost while enabling longitudinal analysis (Bryman & Bell 149-155) being advantages to the study as well.

3.2. Population and Sample Selection

Financial and share market data from a sample of Licensed Commercial Banking (LCB) stocks listed in the Colombo Stock Exchange (CSE) were used for the quantitative analysis. There were ten licensed commercial banks (Central Bank of Sri Lanka) that were licensed by the Central Bank of Sri Lanka, that have been listed as at end 2015, which is the population of the study.

The banking sector stocks were selected as a research context for several reasons, such as, licensed commercial banks generally make continuous positive net income, which enable them to pay continuous dividend as the main analysis is on dividend policy, shareholdings of licensed commercial banks are diversified as the maximum limit for an individual is 10% of total issued capital or group holding is capped at 15% (Central Bank of Sri Lanka), which helps to increase the liquidity of the company in the CSE. It is important to mention that due to the ceiling on shareholding of licensed commercial banks in Sri Lanka, firms have high liquidity, which helps to adjust the prices with much less restriction on the information available to the market.

Out of the LCBs which have been listed as at the end of 2015 in CSE were the population for the study (10 LCBs). When selecting a sample for analysis, out of ten banks, there were seven licensed commercial banks, which have been continuously listed in CSE for the period from 2008 to 2015, that were selected as a sample of banks for the study. Therefore, the sample size covered seventy percent (70%) of the total licensed commercial banks listed in the CSE.

Since the sample size covers 70% of the licensed commercial banks, the author believes, with the sample selected, and was able to generalize the results to the population.

3.3. Data Collection

The data collection for this study was based on Secondary data, therefore the study had significant advantages. The use of Secondary data with minimum cost while enabling longitudinal analysis (Bryman and Bell, 311) is an advantage to the study. Conversely, the author has no control over the accuracy and quality of the data in the case of Secondary (Bryman and Bell, 311). In the case of current study, the author believes that the quality of the secondary data was high as the licensed commercial banks are subject to the supervision of the Central Bank of Sri Lanka.

In order to calculate share price volatility, historical market prices were retrieved from Bloomberg terminal, a reliable source to collect market information. The historical data needed to calculate dividend yield, pay-out ratio, company size, earnings volatility, leverage and growth of the companies were collected from respective banks quarterly financial statements, which were available on the CSE databases (Colombo Stock Exchange). Data collection was not problematic as the all the listed companies, which are in main board of the CSE, have to publish their quarterly financial statements within a period of three months from the quarter end which is a mandatory requirement in order to be listed in CSE. All the banks are listed in main board of Colombo Stock Exchange as well.

3.4. Variables Used in the Study

In the quantitative analysis one dependent variable and two main independent variables were used, along with another four controlling variables which, are defined and explained in the section below.

In the analysis, Price Volatility (P_VOL) was the dependent variable, while Dividend Yield (D_YLD) and Dividend Pay-out Ratio (D_PO) were the main independent variables (Habib et al. 80). Since the PV may be affected by further variables in addition to dividend related variables, assets size of the company (LSIZE), earnings volatility (E_VOL), Leverage of the firm (LEV), Growth of the company (GROWTH) will be used as controlling variables (Lashgari & Ahmadi 273).

Price Volatility (P_VOL)

Price volatility was used as the dependent variable of the study (Nazir et al. (136); Hussainey et al. (61-62); Zakaria et al. (03-04)). First, stock market prices as at the end of quarter for each bank were collected from the stock exchange market data (Colombo Stock Exchange) and from Bloomberg. Before the calculation of PV as the share price may have an effect from corporate action such as stocks splits and bonus issues were adjusted to reflect the effect of such corporate actions. Then the range of the prices traded during the quarter was calculated using the highest and the lowest price traded during the same period divided by

the average of the market prices of same quarter. Then PV was obtained from squiring the above answer. This method is supported by the research of Nazir et al. (136); Hussainey et al. (61-62) and Zakaria et al. (03-04) as this is identified as more accurate than using the difference between beginning and end of the period prices.

PV = $\{(MPS_{qh} – MPS_{ql})/ (MPS_{qh} – MPS_{ql})/2 \}^2$

Where,

MPS_{qh} = Adjusted highest market price of the stock during the quarter.

MPS_{ql} = Adjusted lowest market price of the stock during the quarter.

Dividend Yield (D_YLD)

Dividend Yield was calculated using the adjusted market prices of each stock and the dividend per share for the same quarter. D_YLD was arrived at by dividing dividend per share by average adjusted market prices of each stock during the particular quarter. The same calculation method was adopted by Zakaria et al. (03-04).

D_YLD = Dividend per share (DPS) / Adjusted average market price (AMP)

Where,

DPS = Dividend per share declared for the quarter

AMP = Adjusted average market prices of the stock for corporate actions

Dividend Pay-out Ratio (D_PO)

Dividend pay-out ratio is dependent on the company's financial performance in terms of accounting. In Sri Lanka, according to the Companies Act (Companies Act No 7 of 2007), a company has to pass the solvency test before declaring dividend to shareholders. The ratio was calculated using Dividend per share as numerator of the ratio and Earnings per share as the denominator.

D_PO = Dividend per share (DPS) / Earnings per share (EPS)

Where,

DPS = Dividend per share declared for the quarter

EPS = Quarterly earnings per share

Company Size (SIZE)

Company size is a controlling variable that was introduced to the analysis in order to measure the possible effect of such variables on price volatility (Zakaria et al. (03-04); Lashgari & Ahmadi (277-278)). This variable was calculated using the natural logarithm (Zakaria et al. (03-04); Lashgari & Ahmadi, (277-278)) of total assets of the banks.

LSIZE = ln (Total Assets)

Where,

Total Assets = Total assets of the bank at the end of the quarter

Ln (Total Assets) = Natural logarithm of total assets

Earnings Volatility (E_VOL)

Earnings Volatility was arrived at initially by dividing earnings before taxes by total assets (Lashgari & Ahmadi 277-278). Then the ratio obtained was squired for all the quarters, which was tested and used by Nazir et al. (136); Hussainey et al. (61-62); Zakaria et al. (03-04).

E_VOL = (Earnings before Taxes (EBT) / Total Assets) ^{2}

Leverage (LEV)

Leverage of the company is one of the factors that can have an impact on share price volatility (Hussainey et al. 61-62; Habib et al. 80-81). Leverage was calculated by Nazir et al. (136) in their study by dividing total debt from total assets of the company. The same formula to measure the leverage was also used for this study.

LEV= Total Debt/ Total Assets

Where,

Total Debt = Total long term and short term portion of debt

Total Assets = Total balance sheet size of the bank at the end of the quarter

Growth of the Company (GROWTH)

The growth of the company was calculated using the growth rate of the total assets of the banks (Nazir, et al. 136; Lashgari & Ahmadi 277-278). This ratio was obtained from taking the changes in total assets during the quarter as the numerator and beginning total assets of the quarter as the denominator.

GROWTH = Change in Assets / Total Assets

Where,

Change in Assets = Change in total assets of the bank during the quarter

Total Assets = Total balance sheet size of the bank at the beginning of the quarter

To test the relationship between dividend policy and share price volatility, the following equation was derived (Zakaria et al. 03-04).

$P\_VOL = a + ß_1 D\_YLD + ß_2 D\_PO + ε$

In order to avoid the problem that can be caused from multi-collinearity, as the dividend yield and dividend pay-out are closely correlated, for the panel data regression analysis, the following equation was used (Habib et al. 80-81) including four controlling variables.

$P\_VOL = a + ß_1 D\_YLD + ß_2 D\_PO + ß_3 LSIZE + ß_4 E\_VOL + ß_5 LEV + ß_6 GROWTH + ε$

Where,

a= intercept,

$ß_{1 \text{ to}} ß_6$ are the coefficients of each variable and ε is used as the error term of the equation.

3.5. Data Analysis

The data collection was consistent with existing literature (Nazir et al. 137; Habib et al. 81-82; Lashgari & Ahmadi 277-278).Since the frequency of the data was quarterly, they were more representative of the changes in company performance than annual data.

Since the data consists of seven different banks, covering on eight year period, with seven different variables, the collected data set has to be analysed using "panel data structure", which was created to analyse cross section multiple regression analysis (Nazir et al. 137; Lashgari & Ahmadi, 277-278).

The data collected from market sources was used to calculate the dependent variable, price volatility and then two main variables, dividend yield and dividend pay-out ratio were calculated from 2008 first quarter to 2015 fourth quarter. The other four controlling variables have also calculated for 32 quarters. In order to start the analysis, panel data set was created as mentioned below (Table 01).

Table 01: Panel Data Analysis Structure

Prd	Comp	P_Vol	D_Yld	D_PO	Lsize	E_Vol	Lev	Gro
2008Q1	COMB	0.0033015	0.02	62.50	5.44550	0.000041	86.29	3.85
2008Q2	COMB	0.0198392	0.02	30.01	5.44120	0.000045	86.49	-0.99
2008Q3	COMB	0.0589426	0.01	39.89	5.45063	0.000045	86.14	2.17

Source: Author compiled from using literature

Where,

Prd = period from 2008Q1 to 2015Q4

Comp = Name of the company

Other variable as explained in the above section.

Initially one company data was structured in the above format followed by the variables in six other banks, in order to create a panel database. The panel data is the most suitable structure for the analysis as the study involves analysing three dimensional database. The alternative to the panel data analysis is multiple regression analysis for each bank in the selected sample, where seven different regression analyses has to be carried out, in order to evaluate the results. In that case, individual bank's impact could be analysed, whereas impact from LCBs cannot be ascertained.

The panel data base that was created has 1,568 data points from seven banks, for seven variables, for 32 periods. Further, all variables were collected for the entire analysis period, which enabling "balanced panel data base".

The analysis required sophisticated statistical analytical software in order to analyse a panel data set which has 1,568 data points. Therefore, E-views software version 7 (E-views7) was used for data analysis of the study.

Unit Root Test

In order to analyse a variable, the stationarity of the same has to be checked and if the variable is not stationary, it has to be corrected and converted as stationary variables. Therefore for his purpose under two main methods, unit root test was carried out. First, the Levin, Lin & Chu t test, assuming a common unit root process for all variables, while in the second method it was assumed individual unit root process under Im, Pesaran and Shin W-stat test , ADF - Fisher Chi-square test , and PP - Fisher Chi-square test were carried out (Lashgari and Ahmadi, 278). All the tests were carried out at the significance level of 5 percent.

The hypothesis that was tested in unit root test was,

H_0: Variables have a unit root

H_1: Variables are stationary

Regression Analysis

The second step of the analysis is to run the multiple regression analysis using E-views7 for the equation designed for the analysis of the study.

$$P\_VOL = a + ß_1D\_YLD + ß_2D\_PO + ß_3LSIZE + ß_4E\_VOL + ß_5LEV + ß_6GROWTH + ε$$

Random Effect, Fixed Effect and Hausman Tests

The objective of the next test of analysis was selecting a method of analysis that is suitable to find out the correlation of price volatility and dividend policy. Therefore, Randon effect test was carried out as an initial step of the Hausman test (Lashgari and Ahmadi, 278. The hypothesis of the Hausman test are random effect is appropriate under null hypothesis and if the null hypothesis is rejected fixed effect model is appropriate. Under either of these two methods the heteroskedasticity error would be able to address with panel data analysis (Zakaria et al. 03-04).

H_0: Random effect model is appropriate

H_1: Fixed effect model is appropriate

Depending on the outcome of the Hausman test (Lashgari & Ahmadi, 278 an appropriate model will be used find out the relationship between price volatility and dividend yield, dividend pay-out, and other four controlling variables, company size, leverage, earnings volatility, and growth of the company.

The significant level for the Hausman test, random effect model and fixed effect model of the study are to be 5% according to Nazir et al. (136); Habib et al. (81-82); Zakaria et al. (03-04).

The expected results of the analysis would be a negative effect from dividend pay-out ratio to price volatility as per the empirical evidence provided by Nazir et al. (136); Habib et al. (81-82); Lashgari and Ahmadi (279-282) as per the frontier market empirical evidences. Correlation between dividend yield and price volatility was not in agreement on direction or the level of significant among the researchers (Nazir et al. 136; Habib et al. 81-82; Lashgari and Ahmadi, 279-282), as there were conflicting evidences from negative correlation to positive correlation, while other researchers suggested that relationship in not significant as

well (Hussainey et al. 63-66; Sadiq 429-431; Zakaria et al. 05-06; Lashgari and Ahmadi 279-282).

4. Analysis and Discussion of Findings

This section initially analyses descriptive statistics since before starting any statistical analysis all the variables have to be tested for stationarity as all the variables need to be stationary, if not has convert it to be stationary, for the statistical analysis. Then regression results are summarized and random effect model is evaluated before starting the Hausman test, which is used to select a model for panel data analysis. As the results suggested, using the fixed effect model, results are presented, analysed and evaluated referring to empirical evidences and related dividend theories.

4.1. Summary of Descriptive Statistics

Table 02: Summary of Descriptive Statistics

Description	P_VOL	D_YLD%	D_PO %	L SIZE	LEV %	E_VOL	GROWTH
Mean	0.19	2.84	53.12	5.32	85.11	5.51E-05	3.4
Median	0.15	2.67	35.67	5.29	86.09	3.37E-05	2.69
Maximum	0.71	9.43	485.4	5.95	150.09	0.00173	60.4
Minimum	0.04	0.00	0.00	4.79	60.71	1.13E-07	-52.26
Std. Dev.	0.12	1.56	57	0.28	6.82	0.00015	6.66

Table 02 depicts the descriptive statistics of all the variables used in the study covering a period from 2008 to 2015. Based on the adjusted share price, price volatility in licensed commercial banks in Sri Lanka has a mean of 19 percent while emerging markets like Malaysia reported a 94.4 percent (Zakaria et al. 05-06). Even in frontier markets Nazir et al. (137-138); Habib et al. (81-82); Lashgari and Ahmadi (279-282) have reported a mean price volatility of more than 50 percent.

The mean dividend yield reported by licensed commercial banks during the period from 2008 to 2015 was 2.84% while the overall market is in the range of 1.2% to 2.9% (Figure 01), confirming constantly stable dividend yield from banking stocks. Dividend pay-out ratios

stood at half of the earnings (53.12%), which represents a very high pay-out ratio, while emerging markets like Malaysia reported a very low dividend pay-out ratio of 18.24% (Zakaria et al. 05-06), which was substantiated by higher growth rate of 45.2%, whereas in frontier markets, in the same financial sector firms reported 38.10% dividend pay-out during the period from 2006 to 2010 (Nazir et al. 137-138). Even though LCBs listed in CSE had recorded 13% growth, Pakistan's financial sector firms had reported a growth rate of 19% due to the relatively low pay-out ratio, keeping a higher percentage to reinvest for growth. According to Nazir et al. (137-138) leverage of frontier market financial sector firms 58.45% was much less compared to that of stocks in CSE of 85.11%.

4.2. Results of Panel Data Unit Root Test

Table 03: Panel Unit Root Test Summary

Panel unit root test: Summary

Series: P_VOL

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.51102	0.0000	6	180
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.91489	0.0000	6	180
ADF - Fisher Chi-square	46.3936	0.0000	6	180
PP - Fisher Chi-square	69.6234	0.0000	6	186

Before starting any regression analysis, variables had to be tested for stationarity as non-stationary data would give spurious results of the regression analysis, unless variables are treated for non-stationarity. If the data are non-stationary, variables may move together indicating they have a strong correlation, even if the variables are unrelated. In other words the "t-ratio" of the analysis will not follow the assumed "t distribution", hence the validity of the hypothesis test is in question (Breitung & Das, 414).

Four tests were carried out using the statistical software E-views7 under two different methods, which are common and individual unit root process Levin et al. 02). Unit root test

was carried out under Levin, Lin and Chu assuming a common unit root process in order to test stationarity.

As shown in Table 03, test results of Levin, Lin and Chu revealed that at the significance level of 5%, the null hypothesis is rejected, as the p – value is zero. Therefore the alternative hypothesis is accepted and, all the variables stationary during the period in consideration for this study.

The same hypothesis was tested with the Im, Pesaran and Shin W-stat test , ADF - Fisher Chi-square test , and PP - Fisher Chi-square test, and it was found that the evidence to reject the null hypothesis with individual variable unit root processes also for supports the conclusion that all the variables are stationary.

Since all the variables are stationary, the same data set was used for analysis without any manipulations.

4.3. Results of Regression Analysis

After testing for stationarity of the data, basic regression analysis was carried out, in order to explore the relationship of price volatility with dividend yield and dividend pay-out. According to the panel data, regression analysis price volatility had a negatively significant relationship with dividend pay-out, which was in line with the findings of Nazir et al. (137-138); Hussainey et al. (63-64); Habib et al. (81). Even though there is a positive correlation witnessed between price volatility and dividend yield, is not significant, similar to the evidence found by Hussainey et al. (63-64). Out of controlled variables, company size also had a significant negative correlation with price volatility (Zakaria et al. 04-05). The model fit of the analysis R^2 and adjusted R^2, was 10% and 7.6%, respectively.

The analysis done in Table 04, panel data regression analysis, may contain the error caused by data clustering or grouping (Clark & Linzer 399). In order to account for the effect from clustering data, either fixed effect or random effect regression analysis has to be used. The objective of using either fixed effect or random effect model is to increase the model fit and to account for group level variation (Clark & Linzer, 399). If these effects are not corrected it would lead to the data poorly fitting the model and misleading estimates (Greene, 01-02). Therefore, the Hausman test was used to select the most suitable model to explain the relationship of price volatility to dividend policy variables.

Table 04: Summary of Regression Analysis

Dependent Variable: P_VOL

Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.547551	0.106662	5.133536	0.0000
D_YLD	0.006581	0.012627	0.521190	0.6028
D_PO	-0.000225	0.000106	-2.130603	0.0342
LSIZE	-0.064762	0.019821	-3.267368	0.0013
E_VOL	-25.01715	34.51488	-0.724822	0.4693
LEV	-0.001588	0.000880	-1.803323	0.0727
GROWTH	-0.000779	0.000845	-0.921832	0.3576
R-squared	0.101501			
Adjusted R-squared	0.076658			

4.4. Random Effect Model

In order to run the Hausman test, the initially random effect model was run, assuming cross section random effects and the summary of outcome is illustrated in Table 05.

Table 05: Summary of Random Effect Model

Dependent Variable: P_VOL

Method: Panel EGLS (Cross-section random effects)

Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.547551	0.103787	5.275723	0.0000
D_YLD	0.006581	0.012287	0.535626	0.5928
D_PO	-0.000225	0.000103	-2.189615	0.0296
LSIZE	-0.064762	0.019287	-3.357866	0.0009
E_VOL	-25.01715	33.58467	-0.744898	0.4571
LEV	-0.001588	0.000857	-1.853271	0.0652
GROWTH	-0.000779	0.000822	-0.947365	0.3445
	Weighted Statistics			
R-squared	0.101501			
Adjusted R-squared	0.076658			

4.5. Results of the Hausman Test

Table 06: Results of Hausman Test

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.187251	6	0.0058

As per Table 06 above, the level of significance (p- value) is less than 5 percent for the Hausman test, which is the significant level used for all statistical testing of the study. Therefore, the null hypothesis is rejected and accordingly the (H_1) alternative was accepted.

Since H_1 was accepted, the fixed effect model was the most suitable for the analysis of dividend policy impact to share price volatility in licensed commercial banks listed in the CSE.

4.6. Fixed Effect Model

Table 07 depicts the summary of the results of the fixed effect model where the hypothesis tested were,

H_{01}: Dividend Yield does not have an impact on Share Price Volatility

H_{02}: Dividend Pay-out ratio does not have an impact on Share Price Volatility

H_{11}: Dividend Yield has an impact on Share Price Volatility

H_{12}: Dividend Pay-out ratio has an impact on Share Price Volatility.

Table 07: Summary of Fixed Effect Model

Dependent Variable: P_VOL

Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.064456	0.169169	6.292272	0.0000
D_YLD	0.015416	0.012958	1.189666	0.2355
D_PO	-0.000271	0.000107	-2.540044	0.0118
LSIZE	-0.183095	0.035126	-5.212537	0.0000
E_VOL	-23.25006	34.06778	-0.682465	0.4957
LEV	-0.000279	0.001175	-0.237369	0.8126
GROWTH	-4.08E-05	0.000889	-0.045900	0.9634

R-squared	0.172802
Adjusted R-squared	0.125757

According to the fixed effect regression model, which is presented in Table 07, first null hypothesis (H_{01}) is accepted as the p-value related to dividend yield is 0.2355, which is more than 5%. Hence dividend yield does not have a significant impact on share price volatility with positive correlation. The same relationship was evidenced in developed capital markets during the period from 1998 to 2007 (Hussainey et al. 63-64) and merging capital markets like Malaysia also provides evidence to support positive significant effect on price volatility by Zakaria et al. (04-05). While in other studies done in frontier markets by Sadiq (428-430) proposed a negative insignificant correlation, whereas Nazir et al. (136-137) concluded that financial sector firms in Pakistan had a negative significant correlation during the five year period from 2006 to 2010. Moreover, findings of Nazir et al. (137) on correlation between dividend yield and price volatility were in line with Nizar Al-Masum's (14-15) findings on the Bangladesh capital market, where it was found that there is a significant negative relationship between dividend yield and price volatility.

Dividend pay-out ratio, as depicted in Table 07, negatively associated with share price volatility during the period from 2008 to 2015. Since the p-value of Dividend pay-out is 0.0118, which is less than 5%, the second null hypothesis (H_{02}) is rejected. As the null hypothesis is rejected, the alternative hypothesis "Dividend Pay-out ratio has an impact on Share Price Volatility" is accepted. Hence, it was concluded that dividend pay-out has an impact on price volatility in licensed commercial banks in the CSE, which is in line with the findings in developed capital markets like in UK (Hussainey et al. 63-64), and frontier markets like Pakistan (Nazir et al. 137); Habib et al. (81); Lashgari and Ahmadi, (04)). Specially Nazir et al. (137) carried out their analysis in the financial sector firms in Pakistan, which more similar to the author's analysis on Sri Lankan capital market in current study. In addition in their analysis by Lashgari and Ahmadi (04) covering a period from 2007 to 2012 evidenced the same strong negative correlation as found in author's analysis.

Zakaria et al. analysed emerging markets during the period from 2005 to 2010, found a weak positive correlation between Dividend pay-out and Price Volatility (01-03) which against the evidences found in developed market and frontier markets (Hussainey et al. 63-64; Nazir et al. 137; Habib et al. 81; Lashgari and Ahmadi, 04), though the relationship is weak.

Since the study revealed that dividend pay-out had a significant impact dividend irrelevance theory (Miller and Modigliani, the cost of capital, 261), was rejected and which was affirmed by DeAngelo and DeAngelo (293) in their study in real world capital markets while rejecting dividend irrelevance theory.

The author's finding on dividend pay-out and price volatility relationship was in line with the birds in the hands theory, where it says that shareholders put more value to dividend than uncertain future capital gain (Linter, 97; Gorden, 264). According to this theory, if a company pays continuous dividend or maintain healthy Dividend pay-out shareholders give

more value to the company reducing the risk of the firm. When a firm risk reduces, it leads to stable price movements with low price volatility was found. In this study a negative significant relationship between dividend pay-out, and price volatility, where higher the dividend payment of companies, lower the volatility due to lower risk.

Due to agency cost, shareholders value firms adding a premium to its risk due to the differences in the interest of shareholders and the managers of firms. According to the findings of Rozeff (249), the impact of agency cost could be reduced with increased dividend payments, thereby reducing the risk and increasing the value of the firm. As the increase in dividend pay-out leads to the convergence of interest of shareholders and managers, price volatility is reduced, which affirmed the agency cost theory.

Nizar Al-Malkavi (44) studied the signalling effect and found evidences to show that dividend payment is used to signal the expected performance of firms, as the managers hold more information than shareholders (Lipson et al. 36; Tse 12). It was stated that companies have a tendency to pay increased dividend, signalling their belief of continuous increases in the financial performance of such companies. If a company is expected to perform well in the future, its systematic risk will be lower, resulting in stable prices with lower volatility.

As per the empirical evidences from different financial markets as well as the some dividend related theories, like birds in the hands, agency cost, signalling effect were in line with the findings of this study on the relationship of dividend pay-out and price volatility.

Further, out of the four controlling variables, company size was found to be negatively correlated with price volatility with significant effect, Hussainey et al. (62); Habib et al. (80-81) also affirmed the same correlation between company size and Price Volatility. Company size is negatively correlated with price volatility as larger firms are subject to lower risk since they are well established in their capital markets (Habib et al. 80-81). All other three controlling variables are inversely correlated with price volatility, whereas earnings volatility, leverage, growth of the company is not statistically significant as the p-values are higher according to the results of fixed effect regression analysis.

The model fitness of the study is only 17%, which means the share price volatility explained by the dividend yield, dividend pay-out ratio and four controlling variables, size of the company, earnings volatility, leverage of the firm and growth are relatively lower compared to other countries studies like United Kingdom is 27%, Malaysia it is 43% and experience in Iran is 37%. Even though the model fitness is lower compared to other countries, the explanatory power of the variables was at a lower level in empirical studies as well. The model fitness was only 10% initial regression and based on the results of the Hausman test, the fixed effect model was selected for the analysis, which resulted an increase in model fitness to 17%.

5. Conclusion

The study was intended to explore the impact of dividend policy on share price volatility in Sri Lanka, while concentrating on LCBs listed in the CSE. The dividend policy is a subject that has been studied by numerous researchers and more than six decades (Miller and Modigliani, the cost of capital, 261; Lashgari and Ahmadi, 281), in different capital markets. The general empirical evidence in this subject matter in frontier market like Sri Lanka is inconclusive as even within the frontier markets results are contradictory. Further, in the Sri Lankan context, published literature on dividend policy and price volatility is hardly available and in order to fill the time and empirical gap, studying the subject matter was important.

The analysis included multiple variables for LCBs listed in the CSE for a period covering eight years; therefore the multivariate regression analysis (Bryman and Bell, 333) was adopted. Data analysis was started with testing the variable for stationarity, while after passing the test, panel data set was put in the regression analysis using E-views7 statistical software. Finally, Random effect test, Hausman test and fixed effect tests were carried out find out the relationship of price volatility and dividend policy.

According to the results of the study, there was no significance evidence to conclude that there was a relationship between dividend yield and price volatility of LCBs. Similar results were evidenced by Hussainey et al. (66) in a developed market (Morgan Stanley Capital International) in United Kingdom as dividend yield is calculated based on the current market prices, while different shareholders have a different cost per share depending on their time of purchase. Since different shareholders might have differences dividend yields, as they may have purchased the shares in different time periods (different cost basis). Therefore, shareholder may have reacted differently to changes in dividend yields which results in no significant impact to share price volatility. As evidenced by Zakaria et al. (06) and Lashgari and Ahmadi (281) in their studies done covering the period from 2005 to 2012 in emerging market and frontier market, like Iran and Pakistan (Morgan Stanley Capital International), also found similar evidence that dividend yield did not have a significant impact on share price volatility.

The theoretical cases for dividend yield related to the dividend starts with the dividend irrelevance theory by Miller and Modigliani, the cost of capital, (261), where it says that dividend policy does not have an impact on the capital structure of a firm and the value of the firm. Dividend yield is considered as a part of dividend policy, even though the results found in this study supports the dividend irrelevance theory which cannot be concluded in favour of dividend irrelevance theory as the assumptions of dividend irrelevance theory was not hold in real world capital market like in the CSE.

It was found a strong case to confirm significant relationship between dividend pay-out ratio and share price volatility of LCBs in CSE. Shareholders have responded to changes in dividend pay-out ratio as it affects the realized income received from the investments that

they made in LCBs. All three different capital markets, developed, emerging and frontier (Morgan Stanley Capital International) indicated the same impact of dividend pay-out on price volatility of respective capital markets (Hussainey et al. 66; Nazir et al. 138; Habib et al. 82; Lashgari and Ahmadi, 281).

The evidence from the study was also consistent with the theory confirming shareholders put more value to current income than capital gain as explained in birds in the hands theory. Further, Agency cost theory in terms of dividend policy also affirmed by the study, as higher dividend pay-out could lower the price volatility which leads to reduction of risk of the firm. The results support the agency cost theory in practice in LCBs listed in the CSE.

Even though the results of the study found a positive relationship between dividend yield and price volatility it was a not a significant relationship which was supported by the previous studies done in United Kingdom, Malaysia, Iran and Pakistan (Hussainey et al. 66; Habib et al. 82; Zakaria et al. 06; Lashgari and Ahmadi, 281), because different shareholders may react to the changes in dividend yield differently as each shareholder may have different dividend yield depending on their purchase prices.

The outcome of this study would be useful for the investors in the CSE and to economists/analysts who seek to understand the behaviour of capital markets. Hence, the results of this study enable the board of directors of companies to ascertain ways, to change the volatility of their share prices by altering the dividend policy.

The scale of this debate on the impact of dividend policy on share price volatility is therefore extensive and multifaceted, even in the Sri Lankan capital market context. Therefore, with regards to dividend policy studies in Sri Lanka, there are a need for more research in order to allow further assessment of different market sectors in the CSE, as this study was limited to Licensed Commercial Banks listed in the CSE.

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Appendix 01

Descriptive Statistics Detailed

	P_VOL	D_YLD	D_PO	E_VOL	LEV	LSIZE	GROWTH
Mean	0.052715	0.098549	53.11554	5.51E-05	85.10733	5.318117	3.395801
Median	0.023822	0.027580	35.66814	3.37E-05	86.08693	5.290193	2.694370
Maximum	0.497468	4.854369	485.4369	0.001729	150.0904	5.945559	60.39876
Minimum	0.001805	0.003751	0.000000	1.13E-07	60.71367	4.790292	-52.25533
Std. Dev.	0.079011	0.472805	56.99870	0.000152	6.823647	0.279643	6.657225
Skewness	3.063649	7.810617	3.570223	9.871305	3.278926	0.232961	0.631560
Kurtosis	13.48147	68.08780	22.45141	102.9675	38.78359	2.198832	48.44257
Jarque-Bera	1375.780	41817.49	4007.206	96910.63	12352.39	8.016900	19288.48
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.018162	0.000000
Sum	11.80818	22.07508	11897.88	0.012352	19064.04	1191.258	760.6595
Sum Sq. Dev.	1.392127	49.85052	724493.9	5.18E-06	10383.36	17.43861	9883.056
Observations	224	224	224	224	224	224	224

Appendix 02

Panel Unit Root Test

Panel unit root test: Summary

Series: P_VOL

Date: 08/07/16 Time: 10:02

Sample: 2008Q1 2015Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.51102	0.0000	6	180
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.91489	0.0000	6	180
ADF - Fisher Chi-square	46.3936	0.0000	6	180
PP - Fisher Chi-square	69.6234	0.0000	6	186

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 03

Results of Regression Analysis

Dependent Variable: P_VOL

Method: Panel Least Squares

Date: 08/05/16 Time: 20:21

Sample: 2008Q1 2015Q4

Periods included: 32

Cross-sections included: 7

Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.547551	0.106662	5.133536	0.0000
D_YLD	0.006581	0.012627	0.521190	0.6028
D_PO	-0.000225	0.000106	-2.130603	0.0342
LSIZE	-0.064762	0.019821	-3.267368	0.0013
E_VOL	-25.01715	34.51488	-0.724822	0.4693
LEV	-0.001588	0.000880	-1.803323	0.0727
GROWTH	-0.000779	0.000845	-0.921832	0.3576

R-squared	0.101501	Mean dependent var	0.052715
Adjusted R-squared	0.076658	S.D. dependent var	0.079011
S.E. of regression	0.075922	Akaike info criterion	-2.287466
Sum squared resid	1.250825	Schwarz criterion	-2.180852
Log likelihood	263.1962	Hannan-Quinn criter.	-2.244431
F-statistic	4.085647	Durbin-Watson stat	1.588855
Prob(F-statistic)	0.000663		

Appendix 04

Results of Random Effect Model

Dependent Variable: P_VOL
Method: Panel EGLS (Cross-section random effects)
Date: 08/05/16 Time: 20:21
Sample: 2008Q1 2015Q4
Periods included: 32
Cross-sections included: 7
Total panel (balanced) observations: 224
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.547551	0.103787	5.275723	0.0000
D_YLD	0.006581	0.012287	0.535626	0.5928
D_PO	-0.000225	0.000103	-2.189615	0.0296
LSIZE	-0.064762	0.019287	-3.357866	0.0009
E_VOL	-25.01715	33.58467	-0.744898	0.4571
LEV	-0.001588	0.000857	-1.853271	0.0652
GROWTH	-0.000779	0.000822	-0.947365	0.3445

	Effects Specification	
	S.D.	Rho
Cross-section random	2.29E-09	0.0000
Idiosyncratic random	0.073876	1.0000

	Weighted Statistics		
R-squared	0.101501	Mean dependent var	0.052715
Adjusted R-squared	0.076658	S.D. dependent var	0.079011
S.E. of regression	0.075922	Sum squared resid	1.250825
F-statistic	4.085647	Durbin-Watson stat	1.588855
Prob(F-statistic)	0.000663		

	Unweighted Statistics		
R-squared	0.101501	Mean dependent var	0.052715
Sum squared resid	1.250825	Durbin-Watson stat	1.588855

Appendix 05

Hausman Test Results

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.187251	6	0.0058

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
D_YLD	0.015416	0.006581	0.000017	0.0319
D_PO	-0.000271	-0.000225	0.000000	0.1107
LSIZE	-0.183095	-0.064762	0.000862	0.0001
E_VOL	-23.250064	-25.017149	32.683748	0.7572
LEV	-0.000279	-0.001588	0.000001	0.1035
GROWTH	-0.000041	-0.000779	0.000000	0.0288

Cross-section random effects test equation:
Dependent Variable: P_VOL
Method: Panel Least Squares
Date: 08/05/16 Time: 20:22
Sample: 2008Q1 2015Q4
Periods included: 32
Cross-sections included: 7
Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.064456	0.169169	6.292272	0.0000
D_YLD	0.015416	0.012958	1.189666	0.2355
D_PO	-0.000271	0.000107	-2.540044	0.0118
LSIZE	-0.183095	0.035126	-5.212537	0.0000
E_VOL	-23.25006	34.06778	-0.682465	0.4957
LEV	-0.000279	0.001175	-0.237369	0.8126
GROWTH	-4.08E-05	0.000889	-0.045900	0.9634

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.172802	Mean dependent var	0.052715
Adjusted R-squared	0.125757	S.D. dependent var	0.079011
S.E. of regression	0.073876	Akaike info criterion	-2.316576
Sum squared resid	1.151565	Schwarz criterion	-2.118578
Log likelihood	272.4565	Hannan-Quinn criter.	-2.236654
F-statistic	3.673158	Durbin-Watson stat	1.703550
Prob(F-statistic)	0.000050		

Appendix 06

Results of Fixed Effect Model

Dependent Variable: P_VOL

Method: Panel Least Squares

Date: 08/05/16 Time: 20:22

Sample: 2008Q1 2015Q4

Periods included: 32

Cross-sections included: 7

Total panel (balanced) observations: 224

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.064456	0.169169	6.292272	0.0000
D_YLD	0.015416	0.012958	1.189666	0.2355
D_PO	-0.000271	0.000107	-2.540044	0.0118
LSIZE	-0.183095	0.035126	-5.212537	0.0000
E_VOL	-23.25006	34.06778	-0.682465	0.4957
LEV	-0.000279	0.001175	-0.237369	0.8126
GROWTH	-4.08E-05	0.000889	-0.045900	0.9634

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.172802	Mean dependent var	0.052715
Adjusted R-squared	0.125757	S.D. dependent var	0.079011
S.E. of regression	0.073876	Akaike info criterion	-2.316576
Sum squared resid	1.151565	Schwarz criterion	-2.118578
Log likelihood	272.4565	Hannan-Quinn criter.	-2.236654
F-statistic	3.673158	Durbin-Watson stat	1.703550
Prob(F-statistic)	0.000050		

Appendix 07

Population and Sample Selected From LCBs in CSE

Population

No	Name of LCB
01	Amana Bank PLC
02	Commercial Bank of Ceylon PLC
03	DFCC Bank PLC
04	Hatton National Bank PLC
05	National Development Bank PLC
06	Nations Trust Bank PLC
07	Pan Asia Banking Corporation PLC
08	Sampath Bank PLC
09	Seylan Bank PLC.
10	Union Bank of Colombo PLC

Sample selected for the analysis

No	Name of LCB
01	Commercial Bank of Ceylon PLC (COMB)
02	DFCC Bank PLC (DFCC)
03	Hatton National Bank PLC (HNB)
04	National Development Bank PLC (NDB)
05	Nations Trust Bank PLC (NTB)
06	Sampath Bank PLC (SAMP)
07	Seylan Bank PLC. (SEYB)

Financial Intermediation Development and Economic Growth Nexus in Sri Lanka

M C Dilhan De Silva

Abstract

This paper investigates the causal relationship between financial development and economic growth in Sri Lanka for the period 1965 to 2013 using a trivariate vector autoregressive (VAR) framework that includes investment as an additional variable. This study utilized Per Capita Gross Domestic Product (GDP) and investment (as a measurement of indirect effect) as proxies for economic growth. Money supply, bank deposits and domestic credit to the private sector, each as a percentage of GDP were used as proxies for financial development. Data analysis involved Granger causality tests using the Johansen cointegration test and Vector Error Correction Model (VECM). Results show strong long-run Granger causality of financial development to economic growth in Sri Lanka. Furthermore, results suggest evidence of bi-directional short-run causalities between bank deposits and economic growth, and unidirectional causality from money supply to economic growth. The major implication of research findings is that enhancing financial sector development policies will improve productivity and drive long run economic growth in Sri Lanka.

Key Words: *Causality, Cointegration, Development, Financial Intermediation, GDP Growth, VECM*

JEL Classification*: C320, O110, O43*

1. Introduction

The causality behavior between financial development and economic growth has been a controversial issue. The debate focused on whether the economic growth leads financial development or vice versa. The aim of this study is to determine the causality behavior between the development of financial intermediaries and the economic growth in Sri Lanka, for the past five decades. This study employs Granger causality tests under the environment of cointegration and the Vector Error Correction Model (VECM).

In an economy, financial intermediaries perform an essential function of transferring surplus financial resources to the deficit. Finance plays a key role in driving innovation and entrepreneurship, which are the main forces of economic growth. Joseph Schumpeter (1911) emphasised this nexus of financial development and economic growth. According to Schumpeter, financial sector development mobilizes savings and allocates funds efficiently by alleviating frictions due to asymmetric information and by enhancing investors' risk taking capacity (as cited in Shin 2013). Later, the Schumpeterian theory was recast analytically by Goldsmith (1969) and Shaw (1973), indicating that the financial sector plays a major role in economic growth by making available an efficient credit line, better risk management processes, and minimizing adverse selection and moral hazards by reducing information asymmetries. In contrast to the view that the finance sector drives economic development, Robinson (1952) and Kuznet (1955) argued that growth of real economy leads while finance follows. Further, Levine (1997) also denotes that finance plays a minor role in economic development as financial output improves as a reaction to the high demand of economic growth.

Based on this causality debate, Wolde-Rufael (2009) make two hypotheses: 1. Supply-leading hypothesis (finance drives economic growth) and 2. Demand-following hypothesis (economic growth influences financial sector development). However, extensive empirical evidence show no consensus on the direction of causality since most economies show a bi-directional causality between economic growth and financial development (Abu-Bader & Abu-Qarn 2007; Greenwood & Smith 1997). Later, Abubaker and Gani (2013) added two new hypotheses; 1. Reciprocal hypothesis and 2. Neutral hypothesis.

The pattern of the causality between economic and financial development may vary among countries. Thus, variable factors such as economic structures, government controls (e.g., interest rate ceilings, mandatory or direct credit programs), strength of corporate governance, institutional structures and reserve requirement may have differing impacts on economic growth and financial development for different countries (Wolde-Rufael 2009). Hence, identification of the causality between finance-growth of a country is important to produce macro-economic and financial decisions, whether causality is uni-directional or bi-directional.

In the Sri Lankan banking sector, which represents 57.6% of total assets of the financial sector, risk and branch distribution are well managed (CBSL 2013). But, popular financial

development indicators have exhibited slow growth over the last two decades, which creates questions about the contribution of financial intermediaries to economic growth of the country. Therefore, the objective of this study is to empirically investigate the nexus between financial development and economic growth.

In the Sri Lankan case, Perera and Paudel (2009) found reciprocal causality of economic growth and financial development. Amarathunga (2010) found that demand followed causality in the long run.

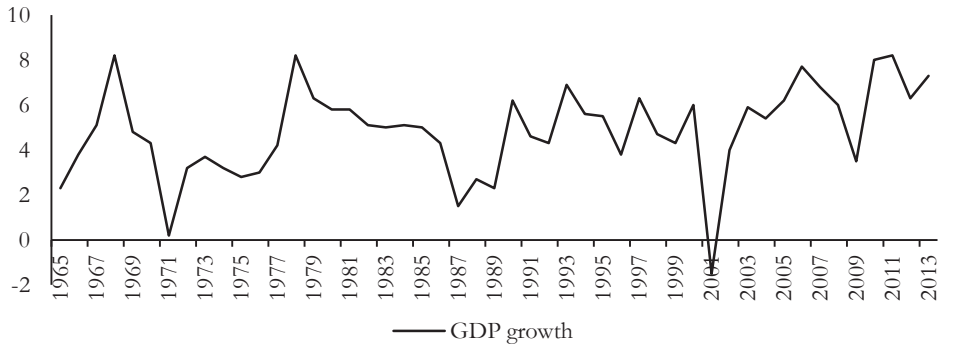
Singh (2008) and Abu-Bader and Abu-Qarn (2007) explain that a larger time series is more important rather than a larger number of observations in cross estimations, to identify the long-run cointegrations. This study uses a Sri Lankan time series data, set for the period of 1965 to 2013. Research methods involved utilization of the Granger causality test, Johansen cointegration test and VECM, all of which are popular methods to identify long-run and short-run relationships of financial development and economic growth.

This paper explores the nexus between financial development and economic growth with specific reference to the economy of Sri Lanka. In the following section, the financial development and economic growth of Sri Lanka is described. Section 3 examines the theoretical underpinnings of financial development and economic growth, while Section 4 presents the econometric methods utilized in this study. Empirical results of this study are presented in Section 5, followed by presentation of the empirical literature and discussion of this study's results in Section 6. Finally, Section 7 discuss the policy implications and concludes the topic of the nexus of financial development and economic growth in Sri Lanka.

2. A Review of Sri Lankan's Financial Development and Economic Growth

In order to examine the nexus between financial development and economic growth in Sri Lanka, it is first important to understand the key historical milestones, particularly of the past five decades, that have impacted Sri Lanka's economy. From independence in 1948 and until 1965, Sri Lanka maintained an inward-looking development approach. From 1966 to 1970, Sri Lanka changed policies due to partial liberalization. 1970 to 1977 was the second phase of inward-looking policies, characterized by import substitution and increased government intervention including the financial sector. Such economic policies resulted in domestic pressure, which led to the first civil war in the country after independence. However, implementation of the inward-looking policy of this time was hampered significantly, mainly due to the world oil crisis in 1973, which was followed by a food and fertilizer crisis. Between 1965 and 1977 the country maintained 4% annual growth with noticeable fluctuations (Figure 1). From 1977, Sri Lanka began an outward-oriented development policy. Considering trade as the engine of economic growth, the government made sweeping initial policy reforms in several sectors, including the financial sector (World Bank 2004).

Figure 1: Annual GDP growth (%) of Sri Lanka (1965-2013)



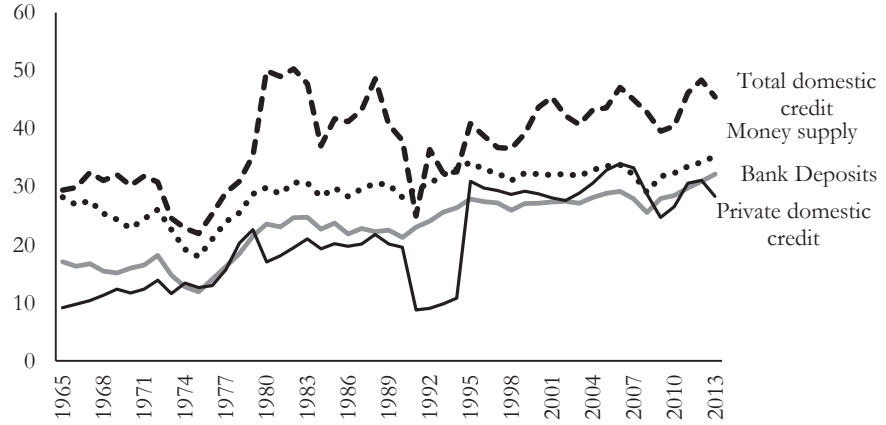
Source: Central Bank of Sri Lanka (2013)

After 1977, Sri Lankan financial reforms consisted of deregulating of interest rates, relaxing credit ceilings, reducing state bank authority by minimization of private bank entry constraints, introducing offshore banking units and systems for efficient payment and settlements. Furthermore, the Sri Lankan government introduced monetary authority reforms, involving the liberalization of the exchange rate and reduction in reserve requirements. Also, several reforms were implemented with regard to legal processes. After financial liberalization, market forces stimulated the arrival of foreign banks with developed financial products. This banking environment created an efficient fund channeling system with attractive and competitive products for savers and borrowers with less information cost (CBSL 1978). Figure 2 shows these changes in financial development indicators and Figure 1 shows a higher spike of economic growth after 1977.

During the 1977 to 2013 period, several noticeable economic downturns affected the economy. The Civil war began in 1983 due to the activities of a terrorist organization (LTTE[1]) and ended in 2009. In addition, the country faced similar violent political clashes during the 1987 to 1991 period. Parallel to these events, Figure 1 and 2 show noticeable downturns of growth and the decline of total domestic credit in 1983, respectively. Further, Figure 2 shows a significant decline of both private domestic credit and total domestic credit in the 1987 to 1991 period. In the year 2001, the country recorded negative growth for the first time following independence. The economic slowdown was mainly due to lower performances in manufacturing and trade, which had been adversely affected by the global recession, the impact of extended drought on agriculture and hydropower generation, and a drop in tourism and port aviation services due to terrorist activities (CBSL 2001).

[1] Liberation Tigers of Tamil Elam

Figure 2: Indicators of Sri Lanka's financial sector Development (as % of GDP)



Sources: Central Bank of Sri Lanka (2013), World Development Indicators (2013)

After financial reforms, the banking sector, as the pioneer of financial intermediation in Sri Lanka dramatically developed during the last 3.5 decades, from 1977. In 2013, the financial sector showed 8.7 percent contribution to the GDP, compared to only 1.5 percent in 1977. The major part of the financial sector is license banks, which make up 57.6 percent of total assets of the financial sector. When the assets of the Central Bank are included, the total assets of the Sri Lankan financial sector increase to 69.7 percent. While in 1977, the country had 22 banks, by 2013 the number of licensed banks had increased to 33, including 12 foreign bank branches. In line with this development in the banking sector, the number of bank branches in 2013 was 6487, compared to 768 in 1977. Further, banking density[2] in the country had increased to 16.8. These figures show the facilitation of present financial intermediaries for economic growth goals (CBSL 1977; CBSL 2013).

Presently, the Sri Lankan banking sector maintains risk management procedures in an integrated manner, in a well regulated environment. Sri Lanka is one of the pioneers in the region for adaption of Basel requirements, i.e. international regulatory frameworks for banks. At the end of 2013, the Central Bank issued Basel II- Pillar 2 directions on capital requirement for risks not covered in Basel II - Pillar I. Presently, the Sri Lankan banking sector complies with the Basel III capital requirement. Further, financial intermediaries are adapting well to the recently introduced International Accounting Standards (IAS) (CBSL 2013).

[2] Number of bank branches for 100,000 persons.

Sri Lanka's banking structure has developed systematically. However, financial development indicators show stagnating behavior or marginal growth during the last two decades. Figure 2 displays slow movements of the key indicators, money supply, banking deposits and credit granted to the domestic private sector, which are represented as a percentage of GDP. Despite low interest rates maintained by the banks, credit to the private sector is in a state of stagnation. Recently, the Central Bank of Sri Lanka introduced a Standing Deposit Facility (SDF) to absorb excess liquidity from the banking sector (CBSL 2014).

Table 1: Financial development in Sri Lanka (comparison with other regions): 2012

	Total Domestic credit (by financial sector) (% of GDP)	Domestic credit to private sector by banks (% of GDP)	Money and quasi money (M2) (% of GDP)	Interest rate spread (lending rate minus deposit rate, %)
Sri Lanka	48.43	31.09	38.66	4.62
South Asia	71.10	46.68	70.49	5.54
East Asia & Pacific	206.06	118.28	183.85	5.00
Middle East & North Africa	35.74	34.49	53.85	3.71
Sub-Saharan Africa	65.59	31.02	40.27	8.57
Latin America & Caribbean	73.62	44.12	55.83	7.00
World	167.11	88.32	125.06	5.95

Source: World Bank, World Development Indicators (2012)

World developments indicators (WDI) (2012) define the proxies of financial development stated in Table 1 as follows; *Domestic credit provided by the financial sector* refers to all gross credit grants to various sectors (except credit to the government). Financial sector is defined as monetary authority, banks holding deposits, insurance corporations, pension funds, foreign exchange companies and other finance companies. *Domestic credit to private sector by banks* denotes the allocation of financial resources by deposit taking corporations (except central banks) to the private sector. These credit schemes may refer to loans, buying of non-equity securities and trade finances. *The definition of the Money and quasi money (M2)* as per WDI (2012) is "the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government". *Interest rate spread* is the difference between the interest rate charge for bank loans to the private sector and the interest rate paid by the banks for deposits.

Table 1 shows that Sri Lanka lags far behind in most of the financial development measures in comparison with several regions of the world. While the interest spread remains low among

other regions except the Middle East and North Africa, credit to the private sector is low in the country.

3. Finance Development and Economic Growth –Theoretical Underpinning

This section develops the theoretical background for understanding how financial intermediary development impacts productivity and influences economic growth. In this section the causal relationship between financial development and economic growth is also explored.

Meon & Weill (2010) state that factor productivity is the main driver of economic growth, rather than factor accumulation. Consequently, productivity has become the determining factor for the country's income. Levine (2005) shows that financial development plays a major instrumental role in economic growth, by increasing productivity. A wide range of literature explains, with different arguments, how the financial intermediary can improve productivity. Odenarian and Udeaja (2010) and Meon and Weill (2010) clarify four major functions of the intermediation process:

The first function of the financial system is to provide information and reduce investment appraisal cost. Rajan and Zingals (1998) specifically highlighted that the reduction of information asymmetries minimizes adverse selection and moral hazard concerns of investors. Thus, capital allocation is efficient and less costly, leading to high productivity.

The financial intermediary's second function is monitoring capitalized firms. Financial systems use corporate governance practices to control borrowers (firms) and manage financial intermediation firms. Meon and Weill (2010) state that improved corporate governance practices and a controlled follow-up environment reduces the moral hazard problem by creating a framework that ensures managers in banks and owners in firms utilize invested funds appropriately. The overall result of improved governance and follow-up practices is increased productivity, which leads to economic growth.

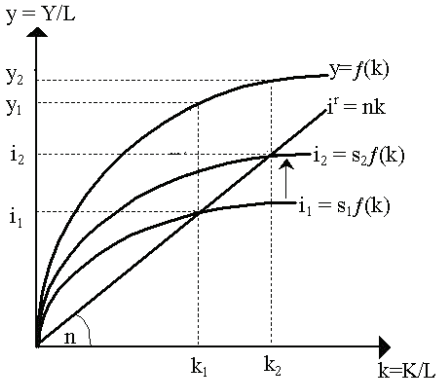
The third function of the financial intermediary is efficient savings mobilization, with reduced transaction cost and high transparency for savers. Hence, intermediation improves the allocation of excess funds towards investment.

The last function is to provide a platform to exchange goods and services in the economy. Financial intermediaries facilitate the function with a media of exchange and this specialization improves economic productivity and drives economic growth. Meon and Weill (2010) present the counterarguments of financial development, as it will tend to increase the likelihood of a financial crisis. These authors state that financial liberalization and incentives for banks to increase their lending may cause credit bubbles.

Aggregate production function, describes how real GDP is driven by total available inputs and as inputs increase, so do outputs. Similarly, in a financial system, conversion of inputs, namely savings and investments, are directly related to maximum output. The development of financial intermediary functions contributes to this process through the channels of technological change or capital accumulation (Williamson 2011).

Williamson (2011) used the Solow growth model to explain how a rise in the savings rate(s) increases capital (capital per worker) (k) and output per worker (y) with upturn of steady state level in a country. Figure 3 shows that when savings rate increases from s_1 to s_2, capital accumulation increases from k_1 to k_2. Hence, in the steady level, output will grow from y_1 to y_2 (Figure 3).

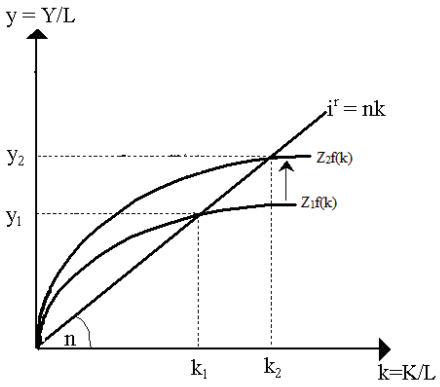
Figure 3: Change in savings rate in the Solow growth model



Source: Macroeconomics, Williamson (2011)

Further, the Solow growth model explains the effect of factor productivity (z) to the output per worker, when y= zf(k). According to Figure 4, change in factor productivity from z_1 to z_2 causes an increase in capital accumulation from k_1 to k_2 and GDP per worker from y_1 to y_2 (Figure 4). Thus, the model explains the increase in factor productivity due to technological change (may be due to financial intermediation effect) of an economy driving economic growth (Williamson 2011).

Figure 4: Change in factor productivity in the Solow growth model

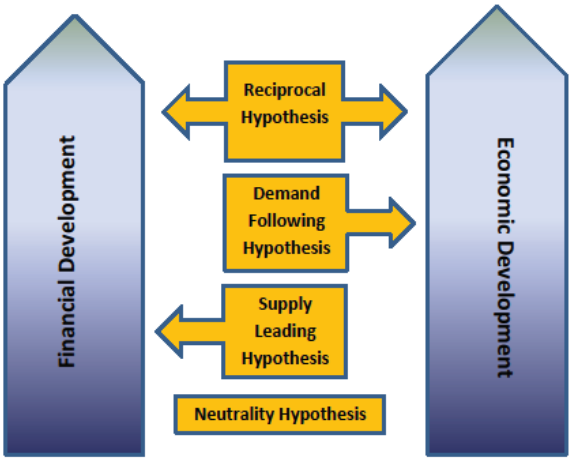


Source: Macroeconomics, Williamson (2011)

There is a positive correlation between financial development and economic growth (Shin 2013). According to Shin's (2013) theoretical analysis, the requirement of new capital allocation of a firm due to productivity changes occurs over time. But, the level of financial frictions is a controlling factor of capital generation. Thus, financial friction may cause not only capital misallocation, but may also waste entrepreneurial talents by delaying the firms' entry decisions. Further, financial friction distorts firms operating in both manufacturing and services sectors. Hence, Shin (2013) concluded that the development of the financial sector alleviates financial friction, promotes productivity and results in long run economic growth.

Literature on the finance-economic relationship covers the early 19th century to present. Wolde-Rufael (2009), Abubaker and Gani (2013) and many other researchers discussed four key hypotheses for the link or causality between the development of financial intermediation and growth of the economy; supply leading hypothesis, demand following hypothesis, reciprocal hypothesis and neutrality hypothesis (Figure 5).

Figure 5: Four key hypotheses for the causality between the financial development and economic growth



Schumpeter (1911) explained that banks in the financial market perform a major role in the process of real economic growth. This author observed that banks play a role in efficient fund mobilizing and credit channeling to entrepreneurs who invest in new technology. Schumpeter (1911) concluded that financial development causes growth of the economy, known as the *supply leading hypothesis*. While Schumpeter was the pioneer of this assumption, Goldsmith (1969) and Shaw (1973) later tested this hypothesis analytically. These authors show that a blocked financial situation, such as higher reserve requirement, implementing limits on interest rates and compulsory or regulated credit policies result in economic growth decline. In response to this situation, financial liberalization policies increase financial intermediary activities, resulting in economic growth (Abubaker & Gani 2013). Further, Rajan and Zingals (1998) similarly concluded that the supply of financial products is a lubricant to economic growth.

In contrast to the above hypothesis, Robinson (1952) and Kuznets (1955) emphasizes that finance is a byproduct of economic growth, where growth leads to financial development, and this is the *demand following hypothesis* (Abubaker & Gani 2013; Wolde-Rufael 2009; Amarathunga 2010). Further, Wolde-Rufael (2009) explains that new financial products arise in the market as a response to growth. Hence, developing countries usually lack the demand for new complex financial products compared to developed countries.

Further, research by Abu-Bader and Abu-Qarn (2007), Wolde-Rufael (2009) and Singh (2008) show a causality between financial development and economic growth as bi-directional, which is termed the *reciprocal hypothesis*. Abubaker and Gani (2013) point out that developing countries'

financial development become supply leading, whereas, in developed countries growth leads and financial development follows. But some empirical analyses (e.g., Abu-Bader and Abu-Qarn 2007) prove that developing countries display the demand following hypothesis. In some circumstances, there is no causality between finance development and economic growth, and this is called the *neutrality hypothesis*. Blum et al (2002) highlight that if the economy consists of perfect information and the transaction cost is zero (neo classical assumptions), indifference exists between the financial sector and internal or external fund sources. However, Abubaker and Gani (2013) explain that these assumptions are not realistic because the neutrality hypothesis cannot exist in an economy.

Abubaker and Gani (2013) state that economic comparisons of different countries, conducted with either panel data or cross sectional methods, depend on assumptions of homogeneity across compared economies. Furthermore, a comprehensive and comparative study requires consideration of specific economic conditions, financial structures, policies and institutions of each country. As such, time series analyses are more suitable for economic studies of individual countries.

4. Methodology

This econometric study measured financial development and economic growth in Sri Lanka over approximately five decades. This section describes methods used to measure economic growth and financial development, and presents the econometric methods used to determine finance-economic causality.

4.1 Measurement and Data Sources

This study utilized annual, financial data for the period of 1965 to 2013. Data was extracted from World Development Indicators online (2013) and various annual reports of the Central Bank of Sri Lanka.

According to the empirical literature, real GDP per capita (G) is used as the measurement of economic growth of a country. In addition to G, country investment (INV) is considered an economic variable to facilitate the measure of robust correlation of financial development and economic growth. Since financial development cannot be captured through a single proxy, three measures are used in this study to improve the robustness of the findings. Each measurement is defined in Section 2.

(1) Money Supply (M2) to GDP (M2G) ratio measures financial depth. Odenarian and Udeaja (2010) describe that M2G measures the monetization level and financial depth of the economy.

(2) Bank Deposits to GDP (BD) ratio is determined by M2 minus currency to GDP. Abu-Bader and Abu-Qarn (2007) and Odenarian and Udeaja (2010) show that BD determines the

capability of fund allocations between savers and borrowers, which indicate the degree of financial intermediation by the banking sector.

(3) Private Domestic Credit to GDP (PDC) ratio determines the opportunities for new investments. Wolde-Rufael (2009) and Abu-Bader and Abu-Qarn (2007) stated that PDC is an effective way to measure quantity and efficiency of fund allocations to new projects.

In the model FD (=M2G or BD or PDC), G and INV date series are converted to the logarithmic form[3] to reach stationary variance.

4.2 The Econometric Methodology

Granger causality in economics is the ability to forecast the future values of one variable's (v_1) time series, by using another variable's (v_2) time series. Granger causality tests are using to determine the statistical hypothesis of whether a time series of v_1 helps to predict v_2 at some stage in the future (Enders 2009).

Data analysis of the study occurred according to the following steps: unit root test, Granger causality tests under the environment of cointegration test and VECM.

Unit root test: The first step of analysis was to test the unit root and stationarity to determine stationary status (i.e., I(0) or I(1)) of the variables. Determination of the order of integration is important to cointegration analysis. This study used Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) unit root tests according to the following equation.

$$\Delta y_t = c_0 + \gamma y_{t-1} + c_1 t + \sum_{t=1}^{k} \Phi_i \Delta y_{t-1} + \varepsilon_t \qquad (1)$$

In the equation, c_0 is intercept, t represent linear time trend, k is the number of lagged first differences, y_t denotes time series variable, Δ shows the operator for first difference, and ε_t is the error term (Odenarian and Udeaja 2010). First, unit root tests were conducted on the variables are in level. If a variable did not reach stationary, then more differencing was done until stationary was reached. The null hypothesis of unit root existence was rejected if γ was significantly different from zero. Whenever the test confirmed the presence of a unit root in some of the data series, the questions arose regarding the existence of long-run relationships between variables, which are termed cointegration.

[3] Log(G)=lnG, Log(INV)=lnINV, Log(M2G)=lnM2G, Log(BD)=lnBD, Log(PDC)=lnPDC

The study used Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC) as lag order selection criteria. Lag length determination is required for the cointegration and VECM (Abu-Bader & Abu-Qarn 2007).

According to Engle and Granger (1987), determination of causality through VECM representation occurs as a two-step procedure, assuming that variable (y_t) is I(1). The first step is to test whether the data series is cointegrated through cointegration regression. Second, after rejecting the null hypothesis of the first regression, run the VECM.

Cointegration test: The next step is to measure cointegration between variables. The method determines cointegration as a system of equation in a single step, established on the *p* dimensional VAR, where p is the lag order (Johansen 1988).

$$\Delta y_t = \pi y_{t-1} + \sum_{i=1}^{p-1} \tau_i \Delta y_t + \delta X_t + \epsilon_t \qquad (2)$$

In the equation; Δ is a difference operator, y_t is a nx1 vector of non-stationary variables, π and τ are coefficients of nxn matrices, X_t denotes other deterministic variables like trend, dummies and constant and ϵ_t is the normally distributed error term. π matrix gives information about the cointegration vector (Bojanic 2012; Abu-Bader & Abu-Qarn 2007).

For determination of the rank (r) of π, Johansen (1988) and Johansen and Juselius (1990) proposed two tests: Maximum Eigen value test and Trace test. For both tests, the null hypothesis is no cointegration among variables and the alternative hypothesis is the existence of r≥1 cointegrating vector.

Determination of cointegration is via testing the rank (r) of the coefficient matrix π. If the rank is 0<r<n, then π can be decomposed into $\pi=a\beta$, where *a* and β represent (nxr) matrices. β represents the level of significance for the cointegrating relationship among variables. *a* is the adjustment coefficient, which is the speed of error correction (Acaravci et al 2007; Bojanic 2011).

Vector error correction model (VECM): In the model,y_t is a 3x1 vector, which is I(1). Variables in the matrix(y_t) include y_1= lnG, y_2=ln(FD), y_3=lnINV. Abu-Bader and Abu-Qarn (2007) developed a trivariate Vector Auto Regression (VAR) model consisting of three equations, with two economic growth variables consisting of y_1 and y_3 together and three different y_2s representing three financial development indicators. This paper uses this VECM approach to determine the nexus between financial development and economic growth.

$$\Delta y_{1t} = \mu_1 + \sum_{h=1}^{r} \alpha_{1,h}\, ECT_{h,t-1} + \sum_{k=1}^{p-1} \beta_{11.k}\, \Delta y_{1,t-k} + \sum_{k=1}^{p-1} \beta_{12.k}\, \Delta y_{2,t-k} + \sum_{k=1}^{p-1} \beta_{13.k}\, \Delta y_{3,t-k} + \varepsilon_{1t} \quad (3)$$

$$\Delta y_{2t} = \mu_2 + \sum_{h=1}^{r} \alpha_{2,h}\, ECT_{h,t-1} + \sum_{k=1}^{p-1} \beta_{21.k}\, \Delta y_{1,t-k} + \sum_{k=1}^{p-1} \beta_{22.k}\, \Delta y_{2,t-k} + \sum_{k=1}^{p-1} \beta_{23.k}\, \Delta y_{3,t-k} + \varepsilon_{2t} \quad (4)$$

$$\Delta y_{3t} = \mu_3 + \sum_{h=1}^{r} \alpha_{3,h}\, ECT_{h,t-1} + \sum_{k=1}^{p-1} \beta_{31.k}\, \Delta y_{1,t-k} + \sum_{k=1}^{p-1} \beta_{32.k}\, \Delta y_{2,t-k} + \sum_{k=1}^{p-1} \beta_{33.k}\, \Delta y_{3,t-k} + \varepsilon_{3t} \quad (5)$$

The error correction term (ECT) leads the variables of the system to restore back to equilibrium. After estimation, ECT should be negative. In the equation $ECT_{h,t-1}$ defines the *h*th ECT. The *h*th ECT explains the residuals of *h*th cointegration equation, which is one lag period. $\beta_{ij.k}$ is explained as *k*th lagged value of *j*th variable for the current value of *i*th variable (*i* and *j*=y_1, y_2, y_3).

The VECM indicates two features in the system as follows:

(i) Identification of causality direction between variables.

(ii) Differentiation of causality as short-run dynamics and long-run equilibrium adjustment (Enders 2009).

Existence of cointegration, as determined by the presence of long-run Granger causality of y_i toy_j, is measured by rejecting the null hypothesis (H_0): "$\alpha_{j,h}$= 0", where *h*=1∼*r*. The Existence of short-run Granger causality (jointly) of $y_i$to y_j can be identified by rejecting the null hypothesis (H_0):"$\beta_{ij,1}$=…$\beta_{ij,p-1}$=0" using the Wald test, compared against chi-square distribution (Lutkepohl & Kratzig 2004). The presence of Granger causality (y_i Granger cause y_j) can be finalized by rejecting at least one of the above two null hypotheses.

5. Empirical Results

The three step statistical analysis developed and utilized for this study generated empirical results. Table 2 shows results for unit root and stationary tests conducted using ADF and PP statistics. All five variables have unit root and are not stationary in level. But, each variable becomes stationary with no unit roots after first differencing. Then the null hypothesis can be rejected at 5% significance level. This implies that all variables are integrated in the same order I(1).

Table 2: Unit root test results

Variable	ADF probability value		PP probability value	
	level	1st difference	level	1st difference
lnG	0.99	0.00*	0.99	0.00*
lnINV	0.14	0.00*	0.13	0.00*
lnM2G	0.66	0.00*	0.58	0.00*
lnBD	0.82	0.00*	0.78	0.00*
lnPDC	0.24	0.00*	0.22	0.00*

* denotes rejection of null hypothesis of unit root

The next step was to test for cointegration among variables. Table 3 shows the optimal lag lengths (p^*) revealed from both AIC and SC from the unrestricted VAR model, as used for the Johansen cointegration test and subsequently in the VECM.

Table 3: Selection of lag order

	lnG, lnINV, lnM2G		lnG, lnINV, lnBD		lnG, lnINV, lnPDC	
Lag order (p)	AIC	SC	AIC	SC	AIC	SC
0	0.82	0.94	1.05	1.17	3.57	3.69
1	-7.59	-7.11	-7.32	-6.84	-4.68*	-4.20*
2	-8.12	7.14	-7.61	-6.77	-4.52	-3.68
3	-8.35*	-7.28*	-8.06*	-6.86*	-4.34	-3.13
4	-8.27	-6.70	-7.90	-6.33	-4.09	-2.53

* Indicates the lag order selected by the criterion

Table 4 shows test results of Trace statistics and Maximum Eigenvalue statistics. Both tests support the identification of a long-run relationship between economic growth and financial development.

Table 4: Johansen cointegration test results

		Variables		
		lnG, lnINV, lnM2G	lnG, lnINV, lnBD	lnG, lnINV, lnPDC
p^*		3	3	1
Trace Statistics (0.05 critical value)	r = 0	46.2	57.8	37.8
		(29.8)	(42.9)	(35.0)
	r = 1	19.5	25.7	15.9
		(15.5)	(25.8)	(18.4)
	r = 2	0.03	9.3	5.7
		(3.8)	(12.5)	(3.8)
	r^*	2	1	1
Maximum Eigen value statistics (0.05 critical value)	r = 0	26.7	32.1	21.9
		(21.1)	(25.8)	(24.2)
	r = 1	19.4	16.4	10.2
		(14.2)	(19.4)	(17.1)
	r = 2	0.03	9.3	5.7
		(3.8)	(12.5)	(3.8)
	r^*	2	1	0

p^* represents optimal lag length based on AIC and SC lag length criteria, r is the hypothesized number of cointegration, r^* is the number of cointegrations obtained from the test results. Values in the bracket are 0.05 critical values.

When critical value is higher than the cointegration test value, we can accept the existence of the hypothesized number of cointegration. Interpretation of the 1st model that used M2G as proxy for the financial development: when r = 0, Trace statistic value 46.2 is higher than the critical value 29.8 at 5% significance level. Hence, r = 0 was rejected. Then considering r = 1, again trace statistics value > critical value (19.5 > 15.5). Hence r = 1 was rejected. However, considering r = 2, critical value > trace statistics value (3.8 > 0.03). Hence, r = 2 can be accepted as the number of cointegration obtained from the test results (r* = 2) at 5% significance level.

Further, the 2nd model that used BD as proxy for financial development: considering r = 1, critical value > trace statistics (25.8>25.7). Hence r = 1 can be accepted as the number of cointegration. Finally the 3rd model that used PDC as the proxy for FD: r = 1 [critical value>trace value (18.4>15.9)] can be accepted as the number of cointegration. The r* for models using both cointegration tests could be obtained as explained above.

Maximum Eigenvalue statistics show cointegration for two cases, M2G and BD, used in the models as the financial development indicator, but not in the case of PDC. However, as per the results of Trace statistics, all cases show at least one cointegration and the null hypothesis of no-cointegration can be rejected 5% significance level.

Based on the results of cointegration tests, VECM was performed to determine the long-run and short-run Granger causality and relevant direction.

Table 5: Results of Granger causality test (long-run analysis)

FD indicators	r^*	Null Hypothesis[a] t(α_1= 0) t(α_1)	α_1
lnM2G	2	0.57 -0.36	0.00 -0.04
lnBD	1	-2.21*	-0.22
lnPDC	1	-2.92*	-0.22
		Null Hypothesis[b] t(α_2= 0) t(α_2)	α_2
lnM2G	2	2.60 0.49	0.02 0.07
lnBD	1	1.64	0.22
lnPDC	1	-1.48	-0.52
		Null Hypothesis[c] t(α_3= 0) t(α_3)	α_3
lnM2G	2	1.12 -4.30*	0.01 -0.84
lnBD	1	5.01	0.85
lnPDC	1	2.36	0.43

t(α_1 = 0) the t-statistic testing the null hypothesis, which is α_i= 0 in equations (3) – (5), (where i = y_1, y_2,y_3).

* Presence of long-run relationship (negative ECT is significant at 5% level).

[a] Financial Development (y_2) does not Granger cause economic growth (y_1).

[b] Economic growth (direct or indirect) (y_1, y_3) does not Granger cause financial development (y_2).

[c] Financial Development (y_2) does not Granger cause economic growth (indirect) (y_3).

In the VECM, Table 5 shows results that explain the long-run relationship. In the model, the null hypothesis is non-existing of long-run causality(H_0): "α_i= 0". In the VECM [three equations i.e. (3) – (5)], y_2 represents three financial indicators (M2G, BD, PDC) and shows 3x3 time of results of t statistics for the α_i (error correction coefficient). Results based on equation 3 revealed that long-run causality of financial development to economic growth can

be observed when financial development is measured by either BD or PDC. Hence, we can reject the null hypothesis of $\alpha_1 = 0$, at 5% significance level [-t(α_1) > 1.96].

Further, results of VECM (equation 5) shows long-run Granger causality from M2B to INV, meaning that there is indirect causality of financial development to economic growth. Thus, the null hypothesis of $\alpha_3 = 0$ can be rejected at 5% significance level. This result helps to maintain the robustness of the VECM.

In summary, the model has a strong one directional long-run causality from financial development (with all financial indicators) to economic growth. This means shocks made in the short-run can adjust towards equilibrium in the long-run. These results are in line with the supply leading hypothesis, and the long-run Sri Lankan economy behaves as per Schumpeter's assumption.

Table 6: Results of Granger causality test (short-run analysis)

Granger causality direction		Null Hypothesis	χ^2 value	Probability value (5% level)
y_2 Granger cause y_1	lnM2G →lnG	$\beta_{12} = 0$	12.04*	0.007
	lnBD→ lnG		7.97*	0.046
	lnPDC→lnG		0.00	0.988
y_1 Granger cause y_2	lnG→lnM2G	$\beta_{21} = 0$	3.64	0.302
	lnG→lnBD		10.73*	0.013
	lnG→lnPDC		1.94	0.803
y_2 Granger cause y_3	lnM2G →lnINV	$\beta_{32} = 0$	7.76	0.051
	lnBD→ lnINV		12.42*	0.006
	lnPDC→ lnINV		0.17	0.676
y_3 Granger cause y_2	lnINV→lnM2G	$\beta_{23} = 0$	1.18	0.756
	lnINV→lnBD		3.16	0.367
	lnINV→lnPDC		0.06	0.803

* Presence of short-run Granger causality

Short-run Granger causality between financial development and economic growth can be tested by using the Wald test (results in Table 6). The null hypothesis of the model is the non-existence of short-run causality (H_0):"$\beta_{ij} = 0$". When BD was used as the proxy to measure

the degree of financial development, results show bi-directional short-run Granger causality between BD and G. Further, another causality relationship was detected from BD to INV. Also, M2G as a measurement variable of financial development presence, short run causality from M2G to G, but PDC did not show significant relationships. Finally, results reveal that the null hypotheses(H_0): "$\beta_{12} = \beta_{21} = \beta_{32} = 0$" can be rejected at 5% significance level with the existence of short-run Granger causality between financial development and economic growth. Hence, in the short-run BD shows the reciprocal hypothesis and M2G shows the supply leading hypothesis.

In summary, development of the financial sector and economic growth in Sri Lanka has existed as a long-run relationship over the last five decades. By including investment as a proxy for economic growth measurement, results show that all variables measuring financial development indicate long-run causality with economic growth. The model that used BD to represent financial development resulted in strong bidirectional short-run causality, whereas M2G Granger cause to economic growth was uni-directional. The empirical results of this study are compared to empirical results found in the literature in the following section.

6. Discussion of Study Results and Empirical Literature

Arestis and Demetriades (1996) explain that causality directions of financial development and economic growth may depend on the measurement variables used, and policies and institutional behaviors of the particular country.

A study based on OECD countries, shows a strong relationship between financial development and growth in the initial phase of the development process, which shrinks as the country develops (Goldsmith 1969). Odeniran and Udeaja (2010) explain that the financial revolution was boosted by industrialization, as demonstrated by an analysis of the US and Japan before World War I. Furthermore, Abubaker and Gani (2013) state that the resolution of institutional and structural matters in the economies of underdeveloped countries requires focus on strong domestic financial intermediaries.

Shin (2013) identifies four types of economy, based on four legal frameworks: English, German, French and Scandinavian law. Considering law as an instrumental variable, it was found that the degree to which the financial sector developed correlated strongly with the application of commercial or company law, which subsequently caused growth of the economy (Shin 2013).

Hence, the above studies show that the causal relationship between financial development and growth can vary as a result of several conditions, such as the level of development and legal framework. There are several empirical theories regarding the causal relationship between different kinds of economic measurement variables. Apart from identifying the nexus between

finance and growth, selecting the indicators that determine financial development is a major task, as different indicators produce different results for different countries' economies.

The results of this study show that Sri Lanka's economy follows the supply leading hypothesis where all measurements of financial development, including domestic credit to the private sector, money supply and bank deposits, indicate a long-run relationship with growth. This finding was also reported by Odenarian and Udeaja (2010) in their study of the Nigerian economy. Furthermore, Perera and Paudel (2009) also found that domestic private credit had a causal effect in Sri Lanka, and recently, Alkhuzaim (2014) confirmed that domestic credit impacts GDP in the long-run in the economy of Qatar. However, Amarathunga (2010) concludes that the Sri Lankan economy shows only demand following hypothesis, where trade is taken as a financial development measurement and investment as the growth indicator.

Short-run Granger causality results of this study shows the supply leading hypothesis, where money supply is used as a financial development indicator. This result is in line with the findings of Kar & Pentecost (2000) in the Turkish economy, when the same proxy is used as a financial development indicator. However, for the same economy, these authors found that by using bank deposits and private domestic credit proxies as financial development measures, growth drives economic development. This finding is in line with Robinson's (1952) demand following hypothesis. Alkhuzaim (2014) argued for the same causality for growth to drive financial development in the short-run. Similarly, Perera and Paudel (2009) reported a uni-directional demand following causality hypothesis with economic growth, when narrow money, total domestic credit and private sector credit are used as financial development indicators. According to the results of this study, Sri Lanka's economy is not in line with the unique demand following hypothesis.

Some economic systems exhibit the causality of reciprocal hypothesis when mixes of indicators are used for financial sector development. In this study, the reciprocal causality hypothesis was identified in the short-run when bank deposits were used to represent financial development. Some economies show the same reciprocity with bidirectional causality between financial development and economic growth for both private domestic credit and total domestic credit. In line with the above conclusions, Perera and Paudel (2009) and Alkhuzaim (2014) found bi-directional causality with money supply and economic growth. Furthermore, using Egyptian data Abu-Bader and Abu-Qarn (2007) show all measurements for financial development, private domestic credit, ratio of private credit to total domestic credit, money supply and bank deposits, exhibit long-run bi-directional causality with growth. Similar to this study, these authors used investment as the second variable to measure economic growth, to achieve robustness of causality behavior.

In contrast to the above empirical findings, Acaravci et al (2007) found no evidence for long-run causality between financial development and economic growth. Furthermore, Alkhuzaim (2014) confirmed this neutrality hypothesis by using domestic private credit as a financial

sector indicator. Results of this study show same neutrality hypothesis in short-run when domestic private credit used as the proxy for financial development.

7. Conclusion and Policy Implications

The aim of this study was to determine the causality behavior between development of financial intermediaries and the economic growth in Sri Lanka for the past four and a half decades. This study employs Granger causality tests under the environment of cointegration and VECM.

Results revealed that financial development causes economic growth in the long-run in Sri Lanka, using the financial measures of money supply, bank deposits and private domestic credit. This evidence of a long-run causal relationship was supported by investment/GDP, which was taken as a proxy for measuring indirect economic growth. Further, these results suggest evidence of bi-directional short-run causalities between bank deposits and growth, and unidirectional causality from money supply to growth. Since financial intermediary indicators represent dynamic causality with economic growth, policy makers should actively develop policies to maintain sustainability of economic growth.

The role of the Central Bank in long run financial development: Keep the soundness of the financial system under both favorable and less favorable economic environments, influence the indicators of financial deepening through branch banking and ATM penetration, avoid the substantial disparities across the population of individuals and firms in the economy. i.e., allow poor and rural population comfortable access to finance, promote financial inclusion and regional integration, which will create a big, broad, deep, enough liquid and efficient financial market. It is also important to minimize the information gap between micro-prudential nature and macro prudential analysis which can arise from macroeconomic or financial development.

Policies should aim to enhance financial development through the consolidation of the financial-real sector long-run relationship, augmenting credit market competition, relaxing the legal environment to promote new investors and entrepreneurs, and ensuring a tough legal environment to discourage corruption. These measures will develop a better saver-investor relationship to improve the productivity of Sri Lanka.

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