PRICE BEHAVIOR OF SELECTED UPCOUNTRY VEGETABLES IN SRI LANKA

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ABSTRAT

Vegetable marketing in Sri Lanka is mainly in the hands of the private sector. As a result of the over exploitation of the producer and the consumer by the private sector price fluctuations are frequent as well as severe. Under these circumstances, high retail and low wholesale prices are common. This study analyzed the behavior of lagged prices of selected upcountry vegetables; price spread and estimated functions to forecast prices. Time series prices of Beetroot, Cabbage, Carrot, Leeks and Tomato over a period of 27 years from 1985 to 2011 were analyzed. Price at the establishment and the previous year has influenced the current price of vegetables. During 1994 -1996, real prices of vegetables were high and have declined in 2008 – 2009. High prices of were reported in November- January and May – July except for tomato and, tomato prices were low in March – April and August – September. So adjusting the crop calendar to avoid harvesting during such periods is beneficial. Though the nominal prices of vegetables have increased, real prices have declined due to inflation. High marketing margins indicates the prevalence of over exploitation of the consumer and the producer. State intervention to enhance the efficiency in marketing channels and to monitor market prices would be beneficial to farmer and consumer. As farmers' knowledge about the price behavior is inadequate, state intervention in order to make farmers aware of prices and the way that information could be utilized should be done.

Key Words: Time Series Analysis, Wholesale price, Retail Price, Market Margin

1. INTRODUCTION

1.1. Vegetable Production in Sri Lanka

Many developed countries have taken steps to promote vegetable and fruit consumption (Ganry, 2009) because health authorities have prescribed that a person should consume more than 400 grams of vegetables per day. Vegetable is an important crop category because it generates income, provides nutrients and generates employments. As a result, vegetable has become a significant component of the daily diet of the people irrespective of their income levels.

Upcountry vegetables and low country vegetables are the two categories of vegetables grown in Sri Lanka and some of these vegetables are cultivated as commercial crops (Fernando, 2004). Due to the efforts of the government, vegetables production in Sri Lanka has been increased during last few years (CBSL, 2008). A major share of vegetables produced in Sri Lanka is consumed locally and less than one percent of is being exported (Sandika, 2011). Vegetable sector

contributed approximately 11% to the total agricultural production in 2007 and that accounted for nearly16.8percentage of the GDP in 2007 (Karunarathna, 2008). Though vegetables are grown in all parts of the country, few districts are popular for upcountry vegetable production (Dambulla Special Economic Centre, 2007). Small-scale production, perishability, high use of family labor and confining the production in to remote areas that suffer from infrastructure deficiencies are prominent features of the vegetable sector in Sri Lanka (Rupasena, 1999).

1.2. Vegetable Marketing in Sri Lanka

Private sector plays a major role in vegetable market in Sri Lanka because the government intervention is at a minimum level. However, the product price is associated with product quality and its supply local vegetable producers are not very particular about these aspects. According to Mahaliyanaarachchi (2004), vegetable farmers have adopted weak production processes and they possess low levels of farm management skills.

When Government's intervention in vegetable market is minimum private sector has to play the major role in purchasing, cleaning, grading, packing, storing, transporting and retailing. Vegetable is a bulky and perishable product that is should sell as quickly as possible after harvesting when cold storage facilities are not available. Under these circumstances, private sector traders and intermediaries overexploit the producer and the consumer to earn high profits. Different types of middlemen in Sri Lankan vegetable market are the assembly agents who purchase vegetables from farmers and sell to another buyer, mobile traders who purchase vegetables from assembly agents (trucker buyers), commission agents who links the whole seller, wholesaler and the intermediary and the retailer (Gunawardene,1982). As a result, vegetable prices are not determined purely by the demand and supply. At the same time, intermediaries in the vegetable market are shouldering a high risk in purchasing, transporting, loading, unloading, grading, and storage and selling. Different types of intermediaries find in the vegetable market in Sri Lanka are the assembling agents (collect products from farmers for the buyers), trucker buyer (mobile traders who buy products from farmers at the assembling agents), commission agents (sells produce to assembly agents as wholesalers) and retailers (Gunawardana, 1982).

Though the government has not fully engaged in vegetables marketing, in order to facilitate vegetable marketing, the government has constructed Special Economic Centers (SEC) in several parts of the country. Unfortunately, due to various managerial issues, SECs have failed to serve the purpose (Samarakoon, 2008). As a result, needs, preferences and behaviors of the consumers are inadequately addressed through the vegetables market in Sri Lanka and that demoralizes the marketing functions (Rohana, 2007). As such that, determination of market prices of vegetables is not done solely by demand and supply. Hence, it is beneficial to for the vegetable producer as well as the vegetable consumers to have an idea about the behavior of vegetable prices. This study analyzed time series of vegetable prices with the intension to explain price behavior of vegetables.

2. RESEARCH PROBLEM AND OBJECTIVES

As explained in the introduction vegetable prices in Sri Lanka are highly volatile. Vegetable producers make production decisions based on the price prevailed in the last season paying no attention to preferences of the consumer. These production decisions are irreversible after making them. This information sheds lights on the uncertain and constrained production and marketing environments where farmers have to perform. Due to above stated facts and lack of lateral communication among vegetable framers, gluts in production are common in Sri Lanka.

In order to identify periods with high and low prices, time series of vegetable prices are necessary to analyze. Once time trends in prices are available, forecasting of future prices is possible. Despite the high benefits of such empirical evidence, their availability is low. Thus, this study is an attempt to generate relevant empirical information.

The overall objective of this study was to analyze the past prices of selected upcountry vegetables and the spread of prices across different months of the years. Specific objectives were to analyze the behaviors of wholesale and retail prices during the period from 1985 to 2011 (27 years), forecast prices and identify months with low and high vegetable prices.

3. MATERIAL AND METHODS

Scope of this study was limited to five upcountry vegetables namely: carrot, cabbage, beetroot, leeks and tomato. This study used monthly retail and wholesale prices of selected upcountry vegetable over a period of 27 years (1985-2011). Nominal prices converted to real prices dividing nominal prices by the Colombo Consumer Price Index (CCPI). This is necessary to correct prices for inflation (Abdoul, 2009).

3.1. Time Series Analysis

In the presence of inflation,[2] time series of nominal prices need to transform to series of real prices (Abdoul, 2009). Nominal prices can be converted to real prices by multiplying the nominal price of the current year by the ratio between the CPI of the base year and the CPI of the current year.

The real price equals the nominal price divided by a factor of (1+ inflation rate). Time trend analysis is a collection of specialized regression methods and that incorporates information from the past observations and the past errors in observations into the estimations of predicted values.

Moving average is another method that highlights long-term trends and smoothen the short-term fluctuations. Presentation of time series data as graphical plot counts (of any statistical method used to transform data) report average percent change and

[2] Inflation is the difference between current period's CPI and next period's CPI divided by the previous period's CPI.

it is interpreted as a trend (Barratt, 2009). Forecasting is another method and Auto Regressive Integrated Moving Averages (ARIMA), Box- Jenkins Method and Vector Auto Regression (VAR) are different techniques used in forecasting.

ARIMA method analyzes the probabilistic properties of an economic time series as their own and, present value is explained by lagged values and a stochastic error term instead of current values. The VAR model considers several endogenous variables and each endogenous variable is explained by lagged values and lagged values of all other endogenous variables in the model. An Autoregressive process (AR) considers the lagged relationships. The first order Autoregressive model can be presented as:

$$(Y_t-\delta)=\alpha_1(Y_{t-1}-\delta) \quad \ldots\ldots (1)$$

Where Y_t = Current GDP, Y_{t-1} = Last year GDP, δ= Mean of Y, α_1 = Constant and U_t = an uncorrected random error term with E (U_t) = 0 and var $(U_t) = \delta^2$ when Y_t follows a first order autoregressive (AR1) stochastic process
The second order autoregressive model (AR2) can be presented as:

$$(Y_t-\delta) = \alpha_1 (Y_{t-1}-\delta) + \alpha_2 (Y_{t-2}-\delta) + U_t \quad \ldots\ldots (2)$$

The Moving Average process (MA) can be presented as:

$$Yt = \mu + \beta_0 Ut + \beta_1 U_{t-1} \quad \ldots\ldots (3)$$

Where μ is a constant and U is the white noise stochastic error term. Y_t is equal to a constant plus a moving average of the current and past error terms and this is a case of first order moving average or MA(1) process. The Autoregressive and Moving Average (ARMA) process is another method and an ARMA (p, q) implies 'p' autoregressive and 'q' moving average terms and ARMA(1,1) process can be presented as:

$$Y_t = \theta + \alpha 1 Y_{t-1} + \beta_0 U_t + \beta_1 U_{t-1} \quad \ldots\ldots (4)$$

Where, θ is a constant, α_1 is the parameter of autoregressive term and β_i's are parameters of moving average terms. The Autoregressive Integrated Moving Average (ARIMA) process is a further development of the above methods. Though it is assumed that the time series are weakly stationary that is, means and the variances are constant and covariance is time invariant, many economic time series are non-stationary. If a time series is need to be difference 'd' times to make it stationary and applied the ARIMA it is denoted as ARIMA (p, d, q). Therefore, it is an ARIMA time series with 'p' autoregressive terms 'd' times differenced and 'q' time moving average terms. Thus ARIMA (p, d, q) = ARMA (p, q) and ARIMA (p, 0, 0) means AR (P) is a stationary process. The Box – Jenkins (BJ) model is a one that could be used for the same purpose (Gujarati, 2004).

3.2. The Box- Jenkins (BJ) model

The BJ model identifies and estimates a model, which can be interpreted as having generated the sample data. When the model is used for forecasting, it is assumed that, the features of the model are constant through time in future periods. The BJ model is used to identify 'p', 'd' , and 'q' values of ARIMA models. In this process appropriate 'p', 'd' and 'q' values should be identified first and that should be followed the estimation of parameters of autoregressive and moving average terms. It is also necessary to check whether the chosen ARIMA model is appropriate (Gujarati, 2004). The Partial Autocorrelation function (PACE) and the Correlograms (plots of autocorrelation function and PACE against the lag length) can be used for this purpose. If AR terms at lags 1, 5 and 10 are significant, the identified AR model is presented as:

$$Y^*t = \delta + \alpha_1 Y^*_{t-1} + \alpha_5 Y^*_{t-5} + \alpha_{10} Y^*_{t-10} \quad \ldots\ldots (5)$$

Then estimated model should be tested for the appropriateness based on the significance of the test statistics estimated.

Real prices forecasted by the ARIMA model were checked for stationary applying the Augmented Dickey –Fuller Unit Root Test at level form with no trend and intercept. The Difference – Stationery Process (DSP) was used to Test the stationary of the first difference. The effect of previous year's price (P_{t-1}), price at the crop establishment (P_{t-1}) and rainfall were regressed on current price (P_t) using the OLS method. Graphical analyses of price data were also done.

4. RESULTS AND DISCUSSION

4.1. Price Forecasts

Stationarity in time series was tested using the Augmented Dickey – Fuller Unit Root test comparing the tau (τ) value at 5% significant level (Table 1). The estimates indicate that, price time series were non-stationary at the level form because estimated tan values were smaller than the critical tau values in absolute terms. The ADFUR test with first difference was applied to make the time series stationary and results indicated that, all price time series were stationary. As time series of wholesale and retail prices were stationary, the Correlogram test with first differences was done to find out the corresponding next month's vegetable price. Both ACF and PACF were estimated and results are presented in Table 2.

Table 1Tau (calculated and critical) Values of Vegetable Priced at Level Form

Vegetable	Critical (τ) values at 5% level	Estimated (τ) value	
		Whole sale price	Retail price
Beet root	-1.941840	-0.846143	-0.798527
Cabbage	-1.941840	-1.361086	-1.040797
Carrot	-1.941840	-0.786600	-0.949172
Leeks	-1.941840	-1.004162	-0.909692
Tomato	-1.941840	-1.238768	-1.040860

Based on the values presented in Table 2, equations to forecast wholesale and retail prices of vegetables can be written. If the wholesale and retail prices of vegetables for the months presented in Table 2 are available, it is possible to forecast the price in month T

Table 2 Summary of the Results of the ARIMA Model

Vegetables	Months with Impact on Current Prices	
	Wholesale	Retail
Beetroot	1,2,3,4,8,9,10,21,22,24,33,34,36	1,2,3,4,8,9,10,12,18,21,24,33,34,36
Cabbage	2,3,4,5.14,23,30	1,2,3,4,14,30,36
Carrot	1,2,3,4,8,9,10,14,15,21	1,2,,3,4,8,9,10,12,15,18,21
Leeks	1,2,3,4,8,9,10,16,21,24	1,2,3,4,6,8,9,10,36
Tomato	2,3,4,22,24,36	2,3,4,22,24,36

4.2. Wholesale Prices

Results of the analysis of wholesale prices are in Table 3. Beetroot is the crop that required more number of lagged prices to forecast wholesale price. Lagged prices of 1^{st} , 2^{nd} , 3^{rd},4^{th} ,8^{th} , 9^{th} , 10^{th} , 21^{st} , 22^{nd} , 24^{th} ,33^{rd} ,34^{th} and 36^{th} to forecast the wholesale price of Beetroot. Lagged prices of seven months (2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 14^{th}, 23rd and 30^{th}) are required to forecast wholesale price of Cabbage. Tomato requires the leas number of lagged price to forecast wholesale prices (Table 3).

Table 3 Coefficients of Wholesale Prices

Coefficient	Beetroot	Cabbage	Carrot	Leeks	Tomato
Intercept	1.7557	1.8822	2.3878	0.7839	3.3594
T-1	0.9658	-	1.0866	1.0261	-
T-2	-0.4517	0.5672	-0.5759	-0.3513	0.2056
T-3	0.1066	-0.2523	0.0498	0.0559	-0.1563
T-4	0.0279	-0.0694	0.0076	0.0959	0.1003
T-5	-	0.0638	-	-	-
T-8	-0.0844	-	-0.0329	-0.0935	-
T-9	-0.0024	-	-0.0212	-0.0477	-
T-10	0.1119	-	0.1146	0.1635	-
T-14	-	-0.0051	-0.0605	-	-
T-15	-	-	0.0813	-	-
T-16	-	-	-	-0.0059	-
T-21	-0.1347	-	-0.0451	-0.0635	-
T-22	0.0391	-	-	-	-0.0290
T-23	-	0.0367	-	-	-
T-24	0.0896	-	-	0.0664	0.2258
T-30	-	0.0595	-	-	-
T-33	-0.1043	-	-	-	-
T-34	-0.0758	-	-	-	-
T-36	0.0758	-	-	-	0.1231

4.3. Retail prices

Retail prices were forecasted the same way and results are presented in Table 4. Lagged prices of 13 months are required to forecast wholesale price of Beetroot

while lagged prices of 14 months are required to forecast retail price of Beetroot. Same number of lagged prices are required to forecast wholesale as well as retail prices of Cabbage but the number of months lagged are different (Table 4). In general, if lagged prices of months included in Tables 3 and 4 are available, it is possible to forecast wholesale and retail prices of these crops.

Table 4 Coefficients of Retail Prices

Coefficient	Beetroot	Cabbage	Carrot	Leeks	Tomato
Intercept	1.9766	1.7334	2.7458	1.2618	4.4025
T-1	1.0857	1.0126	1.0709	1.2457	-
T-2	-0.5044	-0.2797	-0.5102	-0.6918	0.3489
T-3	0.0994	-0.1336	-0.0308	0.2668	-0.1887
T-4	0.0768	0.1584	0.1181	0.0075	0.2018
T-6	-	-	-	0.0884	-
T-8	-0.0040	-	-0.0662	-0.1876	-
T-9	-0.0956	-	0.0913	0.0524	-
T-10	0.0407	-	0.0152	0.0887	-
T-12	0.1342	-	0.0939	-	-
T-14	-	-0.0071	-	-	-
T-15	-	-	0.0050	-	-
T-18	0.0098	-	0.0182	-	-
T-21	-0.0945	-	-0.0745	-	-
T-22	-	-	-	-	-0.0467
T-24	0.0507	-	-	-	0.2273
T-30	-	0.0595	-	-	-
T-33	-0.0793	-	-	-	-
T-34	0.0906	-	-	-	-
T-36	-0.0074	-	-	-0.0061	0.0893

The first four partial regression coefficients together have explained 32%, 64% and 76% of wholesale and retail prices of Beetroot respectively. About 31% and 75% of wholesale and retail prices of Cabbage were explained respectively by the first four partial regression coefficients. The cumulative explanatory power of the first four partial regression coefficients were 57% and 65% of the current wholesale and retail prices respectively of Carrot. Only 83% of the wholesale price and 83% of the retail price of Leeks were explained by the first four partial regression coefficients simultaneously. This information reveals that the majority of the wholesale and retail prices of Beetroot, Cabbage, Carrot and Leeks were explained by the prices of recent years. The minimum number of months to be considered in order to explain the current wholesale and retail prices of Beetroot, Cabbage, Carrot, Leeks and Tomato are presented, in Table 5.

However, first four partial regression coefficients of wholesale and retail prices of tomatoes have failed to explain the behavior of current prices of tomato.

Table 5 Minimum Number of Months to Be Considered in Forecasting Vegetable Prices

Crop	Wholesale price	Retail price
Beetroot	36	36
Cabbage	30	36
Carrot	21	21
Leeks	24	36
Tomato	36	36

Usually vegetable farmers do pay attention to prices at the establishment; prices in two months prior to the establishment; and prices prevailed one year and two years prior to harvesting. Therefore, present prices were regressed with those prices plus the rainfall in order to identify the impacts of those variables on vegetable prices and results were given below in Table 6.

Results revealed that, all five variables have significantly influenced on wholesale price of Beetroot while price at the establishment has no significant impact on retail price of Beetroot. Price at the establishment and rainfall were the factors that are important in determining wholesale prices of Cabbage while price at the establishment price one year prior to harvesting and price two years prior to harvesting were important variables in determining retail price of Cabbage.

Table 6: Factors Affect on Vegetable Wholesale and Retail Price at Harvesting Period

Crop	Price level	Price at establishment **P-1**	Price at one month before establishment **P-2**	Price at one year before harvesting P_{t-1}	Price at two years before harvesting P_{t-2}	Island wide rainfall **RF**
Beet	Wholesale	0553 (0.000)	-0.167 (0.012)	0.375 (0.000)	0.167 (0.001)	0004 (0.000)
	Retail	0.076 (0.080)	-0.361 (0.000)	0.348 (0.000)	0.887 (0.000)	0.004 (0.000)
Cabbage	Wholesale	0.950 (0.007)	0.169 (0.650)	0.134 (0.619)	0.512 (0.128)	0.007 (0.028)
	Retail	0.579 (0.000)	0.002 (0.984)	0.255 (0.000)	0.137 (0.003)	0.001 (0.260)
Carrot	Wholesale	0.341 (0.000)	-0.156 (0.070)	0.453 (0.000)	0.276 (0.000)	0.004 (0.001)
	Retail	0.400 (0.000)	-0.080 (0.394)	0.429 (0.000)	0.200 (0.000)	0.004 (0.260)
Leeks	Wholesale	0.305 (0.000)	0.212 (0.022)	0.343 (0.000)	0.131 (0.009)	-.001 (0.510)
	Retail	0.352 (0.000)	0.315 (0.003)	0.226 (0.000)	0.115 (0.012)	-.002 (0.104)
Tomato	Wholesale	0.187 (0.006)	0.061 (0.391)	0.227 (0.000)	0.371 (0.000)	0.007 (0.000)
	Retail	0.258 (0.000)	0.079 (0.294)	0.258 (0.000)	0.305 (0.000)	0.009 (0.000)

Price during the crop establishment, price in a year before harvesting, price in two years before harvesting and rainfall were important factors that have determined wholesale prices of Carrot, retail price of Carrot was determined by the price at the establishment, price in a year prior to harvesting and price in two years before harvesting.

Price at the establishment and prices in a year and in two years prior to harvesting are important factors that determine wholesale price of Leeks. All four prices are important in determining retail price of Leeks.

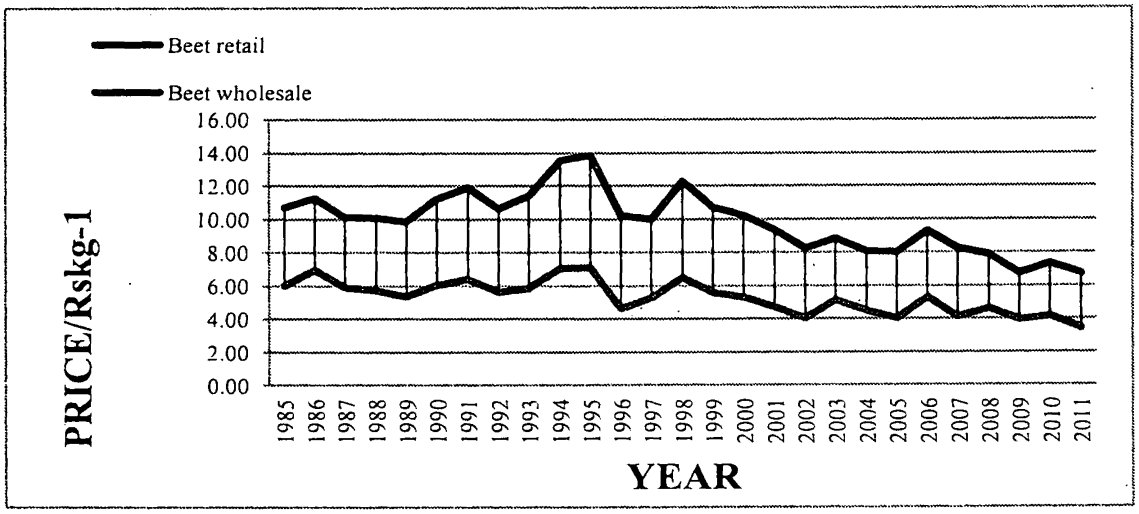
Price at the establishment and prices prevailed in a year and in two years before harvesting are important in determining wholesale as well as retail prices of Tomato.

4.4. Trends in Annual Real Prices

Trends in annual wholesale and retail price of selected five vegetables given in Figure 1.

4.4.1. Beetroot

Annual real wholesale and real retail prices of Beetroot were high in 1994 and 1995. Nevertheless, marketing margin of Beetroot has narrowed down over time (Figure 1.a). It is clear that retail price of Beetroot is relatively less stable than its wholesale price.

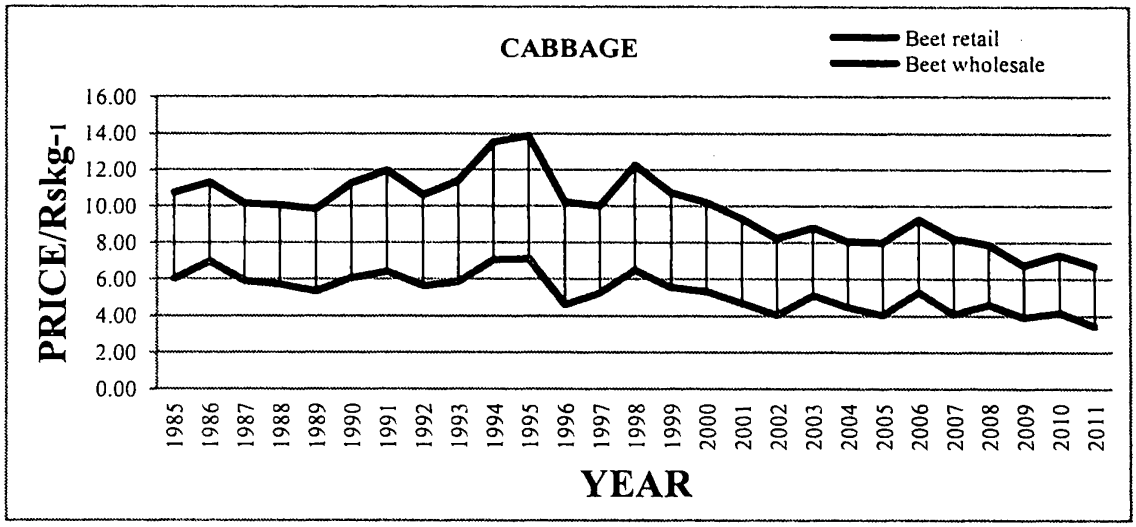


Source: Researcher generated (2013)

Figure 1.a Annul Price Difference of Beetroot- 1985-2011

4.4.2. Cabbage

Marketing margin of Cabbage has declined over time at a smaller rate. Wholesale prices were stable while the retail prices were subjected to severe fluctuations. Fluctuations in retail prices were more severe than that of the wholesale price and the profit margin has declined over time (Figure1.b).

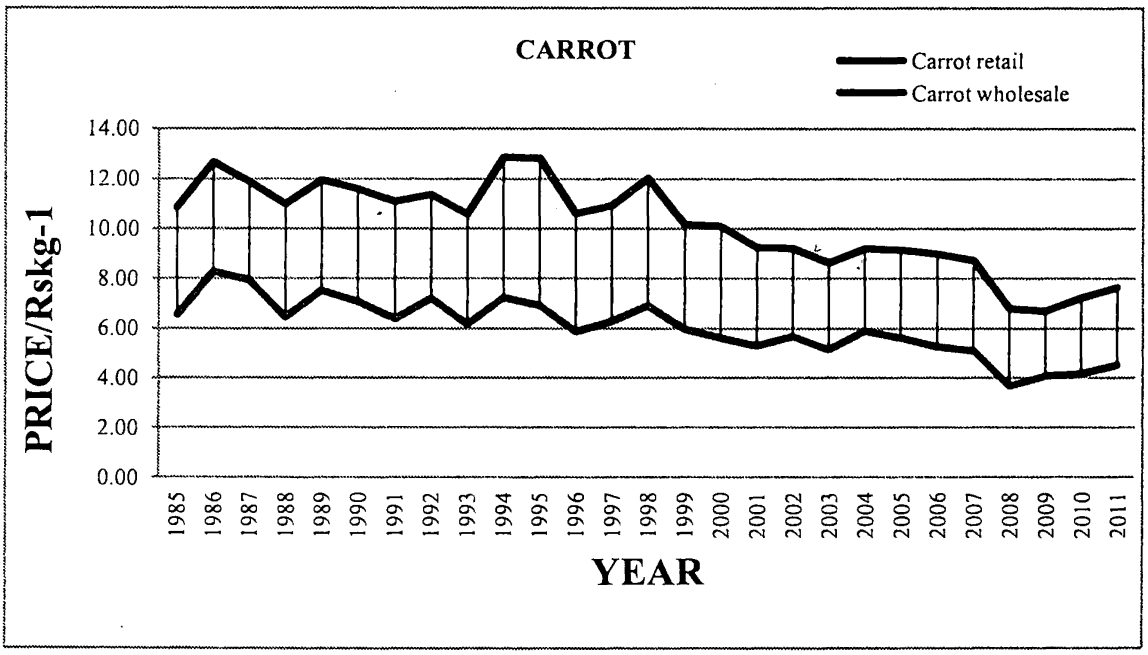


Source: Researcher generated (2013)

Figure 1.b Annul Price Difference of Cabbage 1985-2011

4.4.3. Carrot

Both prices were subjected to fluctuations and over time both real prices have declined, the profit margin has reduced over time (Figure1.c).

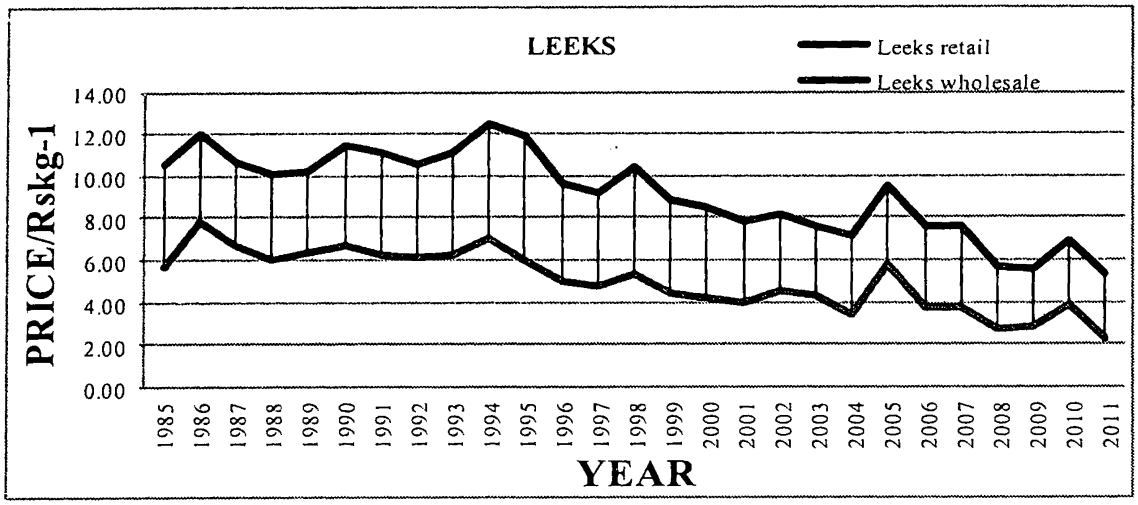


Source: Researcher generated (2013)

Figure.1.c. Annual Price Difference of Carrot 1985-2011

4.4.4. Leeks

Higher retail price was rescored at 1994-1995 but there is price fluctuation can be seen between years. Real price trend of leeks were decrease with time. The marketing margin between wholesale and retail price was decrease with time.

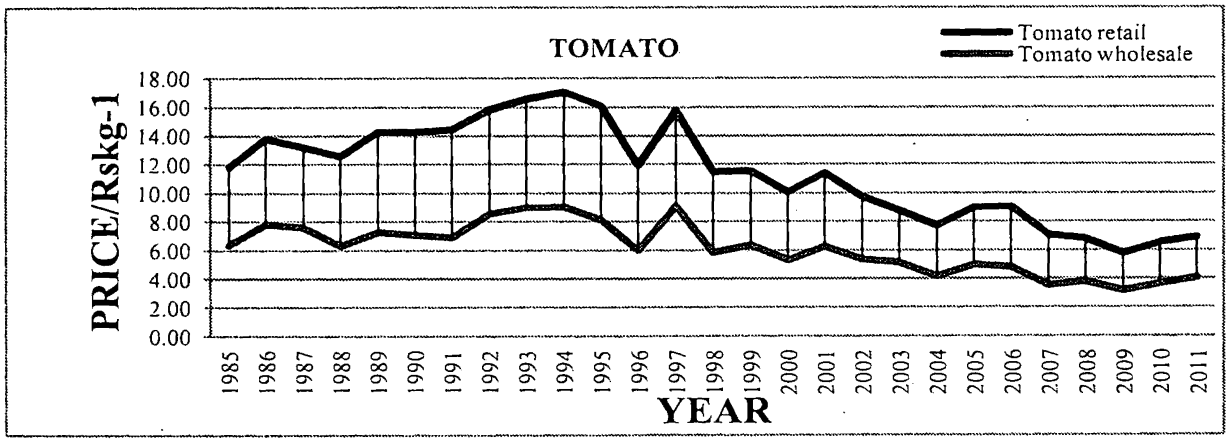


Source: Researcher generated (2013)

Figure 1.d Annul Price Difference of Leeks 1985-2011

4.4.5. Tomato

Both real wholesale and real retail prices of Tomato have declined overtime reducing the profit margin. Fluctuations observed in both prices were severe (Figure 1.e).



Source: Researcher generated (2013)

Figure 1.e; Annul price difference of tomato 1985-2011

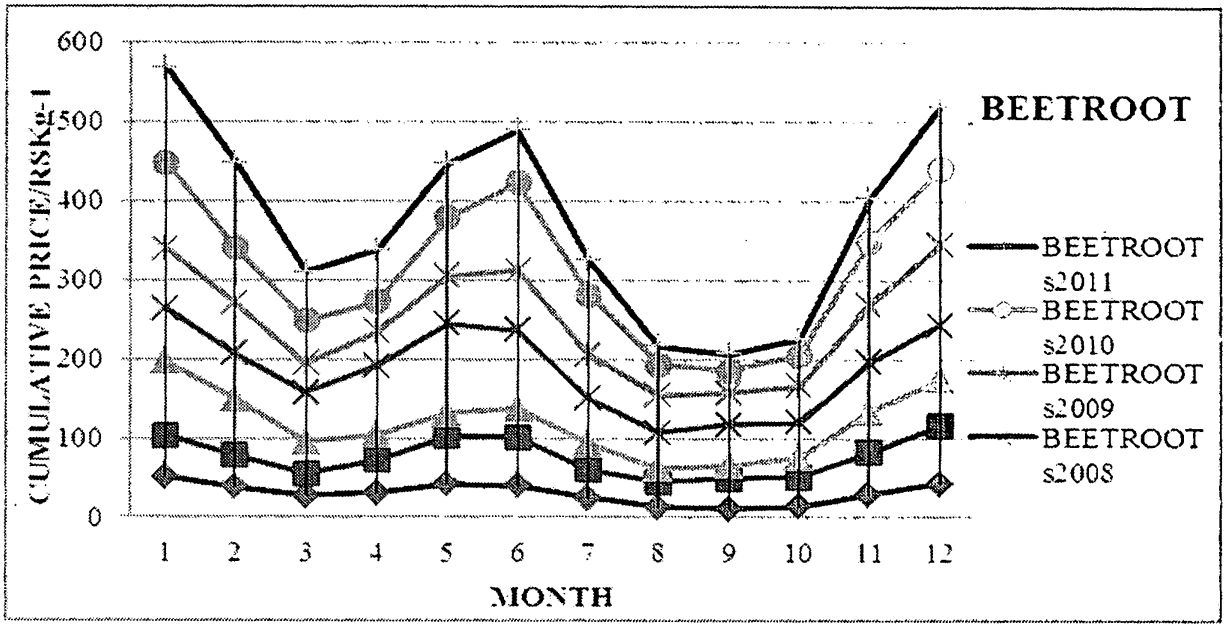
4.5. Spread of Annual Wholesale Prices

Behavior of wholesale prices during the period from 2005 to 2011 were analyzed using stacked times with markers graphs. The length of the period considered for this analysis was reduced to maintain this clarity of the graphs. Monthly price difference of selected five vegetables were (2005 - 2011) shown in Figure 2.

4.5.1. Beetroot

High wholesale prices were reported in January, February, May, June, November and December. There is a sharp decline in prices between January and March and has followed by an increase after March and has reached a peak in June. Prices have declined from June to August and low prices were prevailed until October. The

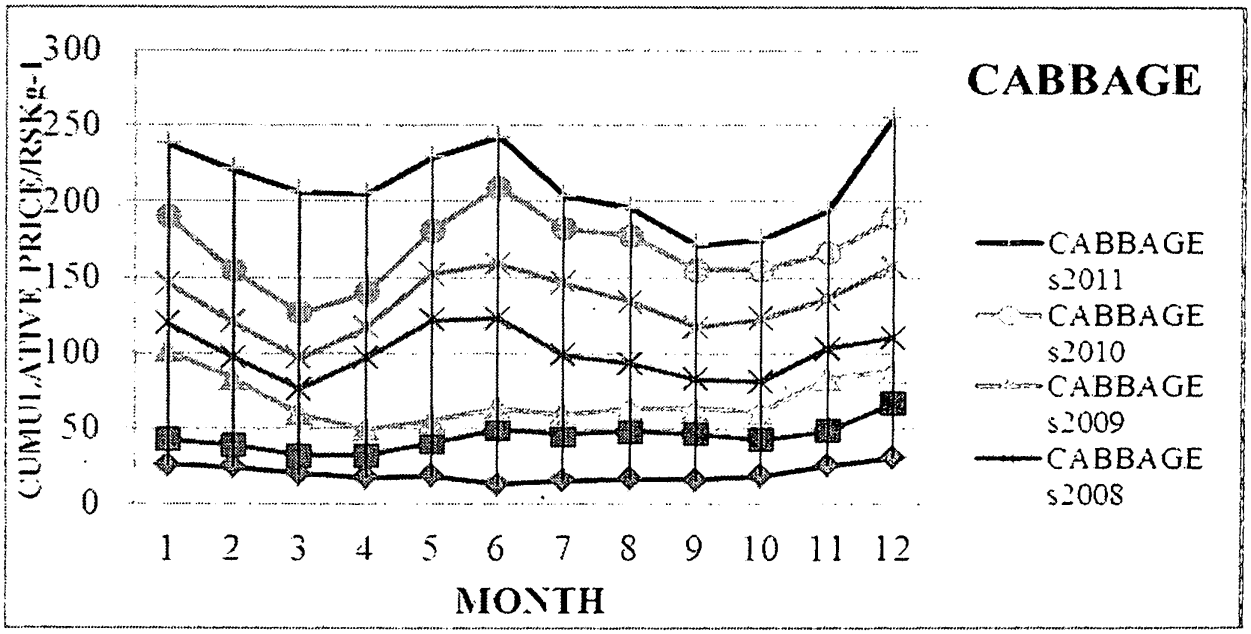
lowest prices were recorded in August, September and October (Figure 2.a).So, it is not advisable to cultivate Beetroot to harvest in March, April, July, September and October. December and January are festival seasons where there is a high demand for this vegetable. May and June are the months with religious festivals and the period in which the Buddhists practice large-scale alms giving and that could be a reason to prevail high prices during these months. Being Beetroot a vegetable that is convenient, there is a high demand for it. The severity in price fluctuations increased over time.



Source: Researcher generated (2013)

Figure 2.a Stacked Lines with Markers Graph of Beetroot Wholesale Prices (2005-2011)

4.5.2. Cabbage



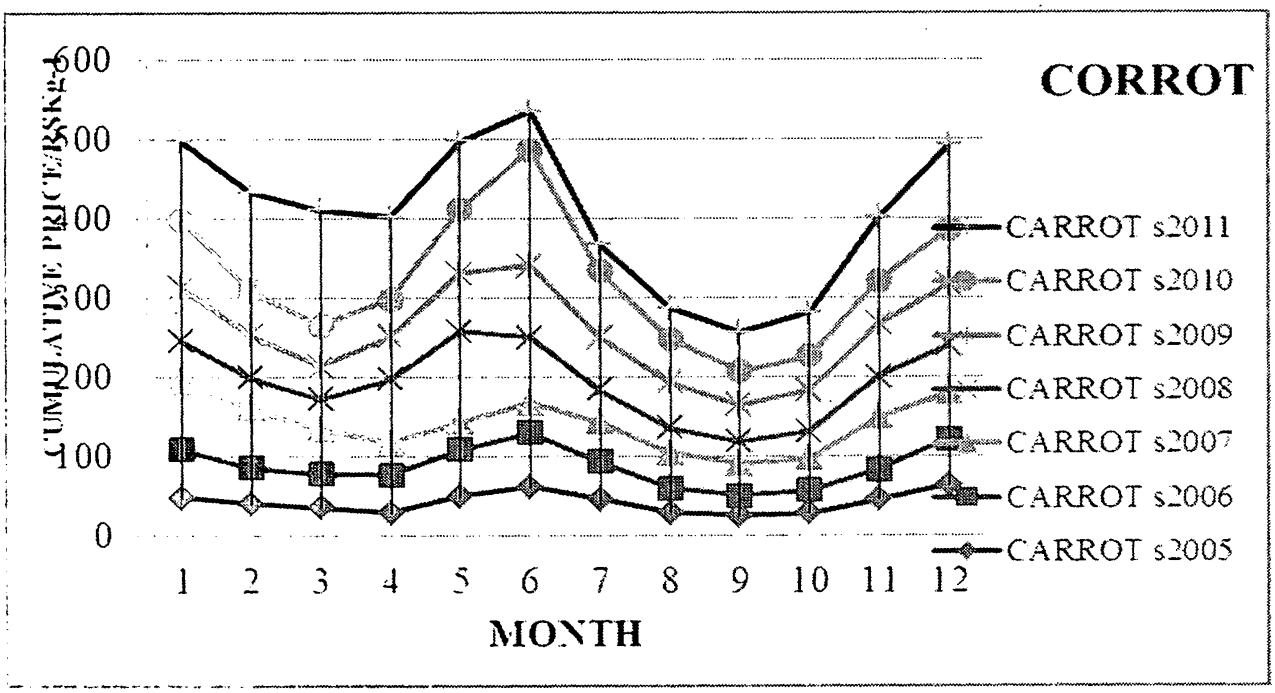
Source: Researcher generated (2013)

Figure 2.b Stacked Lines with Markers Graph of Cabbage Wholesale Prices (2005-2011)

Cabbage prices were high in January, February, May, June, July, November and December. The highest price was reported in December. Price fluctuations during the period from January to March were less severe. Almost same price were reported in March and April. Prices have increased after April and have reached a peak in June, and have declined sharply thereafter. The lowest price was reported in October (Figure2.b). Cabbage is not an expensive vegetable and thus, low-income people consume that throughout the year. As a result, there are no severe fluctuations in prices. However, May, June and December were the months with high demands. In 2005, price fluctuations were mild and it has become severe since 2006.

4.5.3. Carrot

Carrot prices were high in January, May, June and December. There was a drop in prices between January and April and has increased thereafter. Again, prices have declined between June and September and have increased thereafter. The highest prices were reported in January and December (Fig. 2.c). December- January is a festival season and that could be the reason for high prices. May -July is the period where a number of religious festivals are celebrated. Especially, Buddhists give alms in mass scale during this period and Carrot is a vegetable which is commonly used in these occasions and that could be the reason for the prevalence of high demand for Carrot, during May - July. The severity in price fluctuations has increased over time.

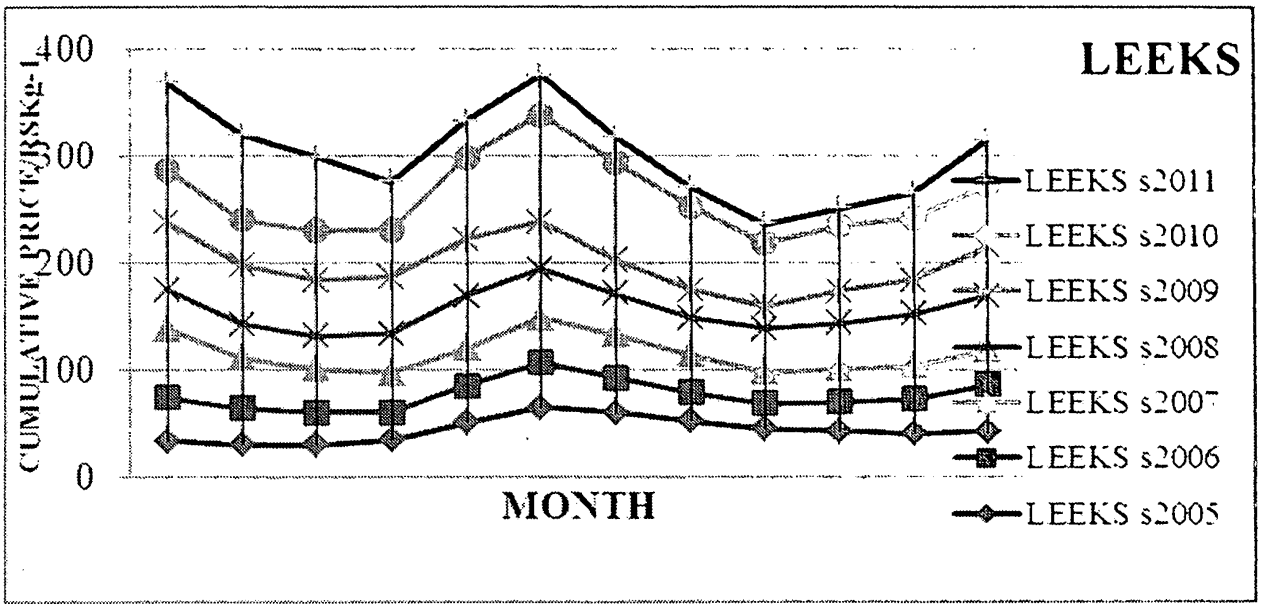


Source: Researcher generated (2013)

Figure 2.c Stacked Lines with Markers Graph of Carrot Wholesale Prices (2005-2011)

4.5.4. Leeks

In 2005 Leeks prices were high in May, June, July and August but, the price fluctuations were mild. The severity in fluctuations has increased gradually over time and at present; it is subjected to severe fluctuations with two peaks (Figure 2.d).

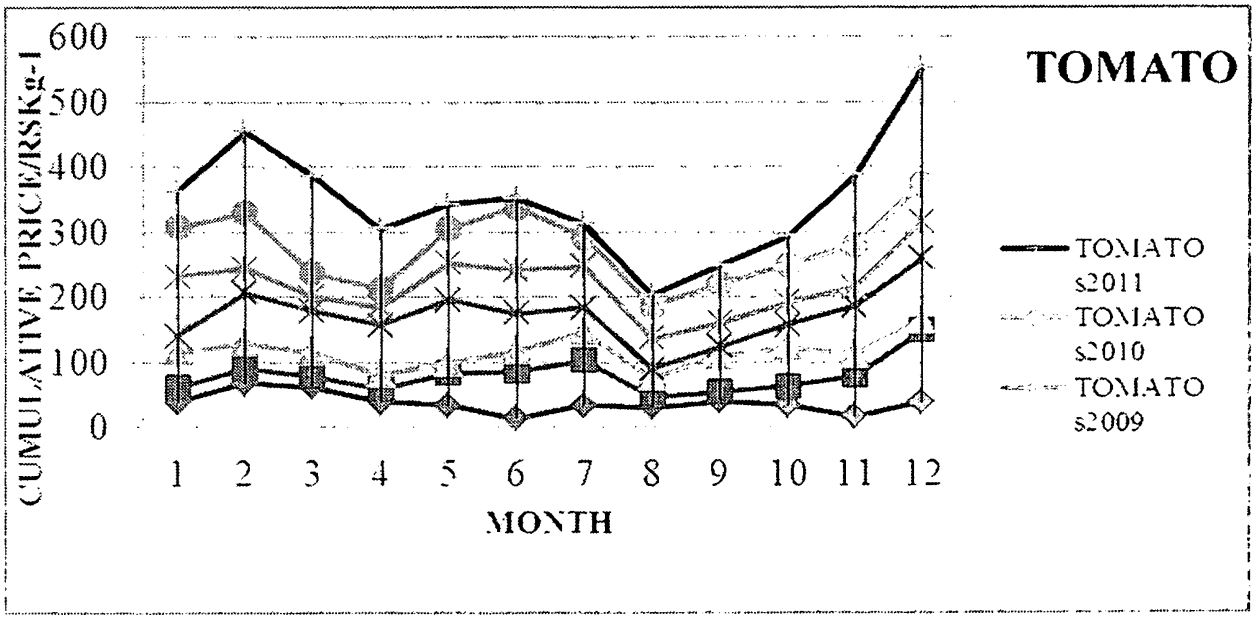


Source: Researcher generated (2013)

Figure 2.d Stacked Lines with Markers Graph of Leeks Wholesale Prices (2005-2011)

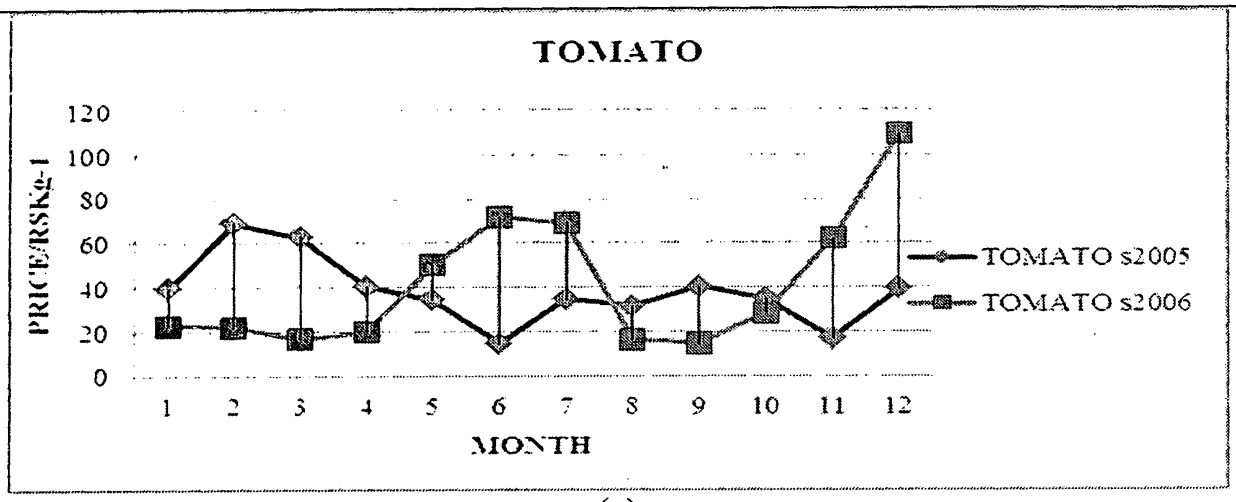
4.5.5. Tomato

Price fluctuations in Tomato were mild in the past and have become severe at present. The prices of tomato in recent years have reported peaks and drops despite the mild fluctuations reported in the past (Figure 2.e).

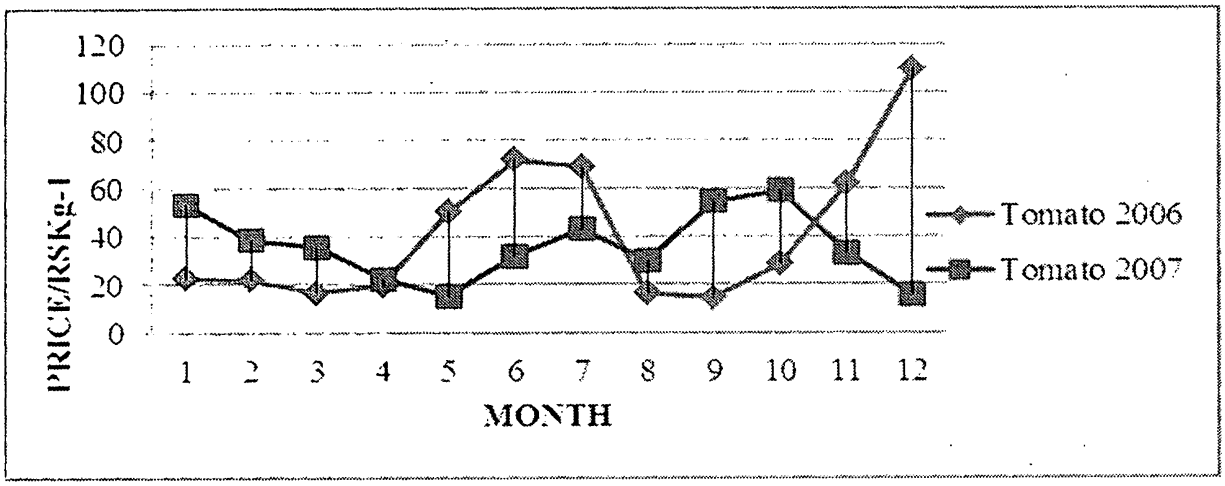


Source: Researcher generated (2013)

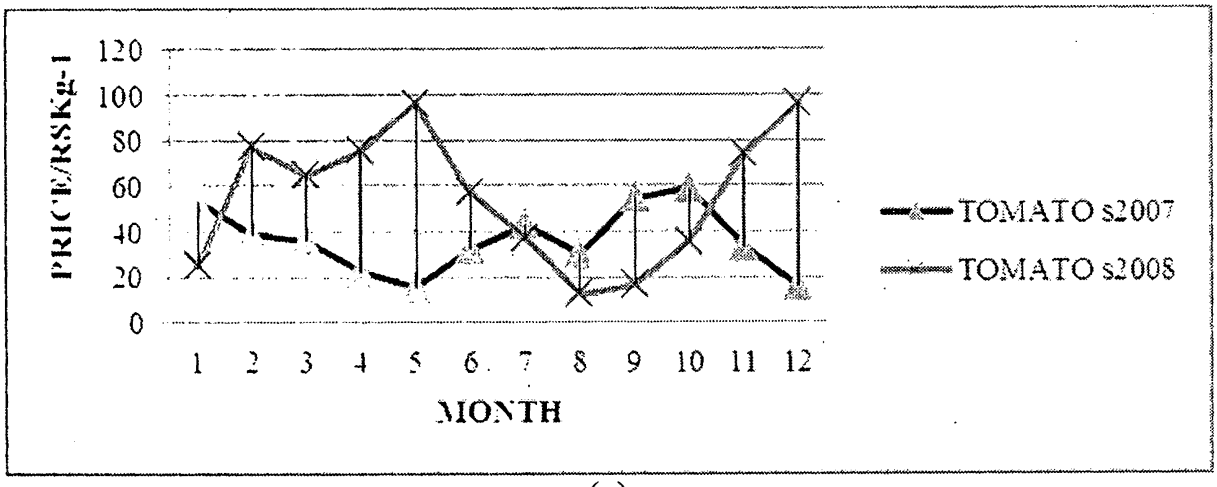
Figure 2.e. Stacked Lines with Markers Graph of Tomato Wholesale Prices (2005-2011)



(a)



(b)



(c)

Source: Researcher generated (2013)

Figure 2.f Lines with Markers Graph of Tomato Wholesale Prices (2005-2008)

According to Figure 2.f. the previous year's nominal wholesale price of tomato has affected negatively on current year tomato price.

5. CONCLUSIONS

Price at the establishment, price in one month before planting, price of the previous year and price in two years prior to harvesting have influenced the current price of vegetables while rainfall has not influenced neither the wholesale nor the retail price of vegetables. Possible reason for this is locating the production sites in areas that receive rainfall throughout the year.

During 1994 -1996 real prices of vegetables were high and have declined in 2008 – 2009. High prices of four vegetables were reported in November- January and May – July except of tomato while, Tomato prices were low in March – April and august – September. So adjusting the crop calendar to avoid harvesting at such periods is beneficial. Though the real prices of the vegetables have increased their nominal prices have declined due to inflation.

As marketing margins are high the consumer is being over exploited. So the state information to enhance the efficiency in vegetable marketing channels and monitoring prices would be beneficial to farmer and consumer.

As farmer's knowledge about the price behavior is inadequate state intervention order to create farmers awareness on price information and the way that information could be utilized are acts of paramount importance.

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EFFECT OF LEVERAGE ON PROFITABILITY AND MARKET PERFORMANCE IN THE MANUFACTURING SECTOR OF SRI LANKA: A PANEL REGRESSION ANALYSIS

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ABSTRACT

This paper presents an analysis which explains the impact of two distinct forms of leverage that arises due to the financing activities and operational activities, upon the profitability and market performance of a firm. The sample consists of twenty eight listed companies in the manufacturing sector of Colombo Stock Exchange, and data is gathered for the period 2008-2012. Study discusses the explanatory power of Financial Liability Leverage (FLEV), Operating Liability Leverage (OLLEV), and Total Leverage (TLEV) on Profitability and Market Performance. While profitability is measured by Return on Equity (ROE), Return on Assets (ROA) and Return on Net Operating Assets (RONOA), market performance is proxied by Price to Book value ratio (PB), Price Earnings ratio (PE), Market Capitalization (LGMCAP) and Tobin's Q. Panel regression analysis is employed where fixed effects and random effects are tested to select the best suited model. The findings revealed that relationship between leverage and profitability best describes by the RONOA model and where OLLEV and FLEV exhibit a positive significant impact on the RONOA. While FLEV affects the ROA negatively and significantly, there is a negative significant relationship between TLEV and ROE. Only LGMCAP is captured by OLLEV and TLEV positively and negatively respectively. Accordingly LGMCAP model is the best suited model to explain the relationship between leverage and market performance.

Key words: Leverage, Profitability, Market Performance, Manufacturing Sector, Sri Lanka

1. INTRODUCTION

When analyzing the capital structure of a firm an analysis of leverage plays a vital role. The leverage can be classified in to two specific categories as financial leverage and operating leverage. The financial leverage arises due to the use of funds with fixed- charge commitments. Any firm which employs financial leverage is intended to earn more return on the fixed charge funds than their costs. Such a surplus or deficit will increase or decrease the return on the owners' equity. Hence, the rate of return on the owners' equity is levered above or below the rate of return on the total assets.

The operating leverage arises due to the determination of a firm's cost as variable and fixed. If a firms cost structure includes a relatively higher proportion of fixed

expenses which may lead to an operating leverage. On the other hand, the total leverage of a firm is affected by both fixed operating expenses and fixed financial expenses. In fact, the variable cost is beyond the control of the management because it varies as per the volume of sales made or services provided. However, the fixed cost can be controlled, and relatively lower fixed cost is an indication of managerial efficiency. The firms with higher fixed cost are exposed to higher leverage, and ultimately it may affect the profitability as well. However, the degree of impact towards the profitability resulted by the leverage may be determined by the operational effectiveness of the firm. The empirical evidences in Sri Lanka emphasize that there is a Value Relevance for accounting information (Vijitha P. and Nimalathasan B, 2014, and Karunarathne W.V.A.D. and Rajapakse R.M.D.A.P, 2010). If there is such, investors would not demand for stocks of highly leveraged firms, and lower demand for shares will decrease the share prices. The declined share prices result in lower market performance. Accordingly, the objective of the current study is to examine the influence of leverage for a firm's profitability and its performance in the stock exchange.

The standard measure of leverage is total liabilities to equity. However, liabilities are taken in to account as a single amount in this measurement. Some of these liabilities arise because of the financing activities e.g. bank loans, bonds issued etc. and the others arise as a result of the operating activities e.g. trade payables, deferred revenues and pension liabilities etc. When considering the financing liabilities, they are traded in well-functioning capital markets. On the other hand, firms can add value in operations because operations involve trading an input and output that are less perfect than the above mentioned capital markets. Thereby, when analyzing the equity, there are significant reasons for distinguishing the operating liabilities from financing liabilities.

In this study it is questioned, whether a rupee of operating liabilities in the balance sheet is priced (effect on market performance) and contributed to profitability (effect on profitability) differently from a rupee of financing liabilities. In the standard equity analysis, operating liabilities are not distinguished from the financial liabilities. Therefore, in construction of specifications for the empirical analysis, this study presents an analysis that identifies the effects of both operating and financing liabilities on profitability and market performance using different proxies.

The leverage from operating liabilities typically levers profitability more than financial leverage. However, the operating liability leverage analyzed in this study should not get confused with the operating leverage; a measure which is used to indicate the proportion of fixed and variable costs in a firm's cost structure. Accordingly, the total leverage is formed by the aggregation of operating liability leverage and financial leverage.

2. REVIEW OF LITERATURE

The scholarly interest related, evolved with a variety of focuses and environments. Many of prior work concentrated on the fact of studying the impact of leverage or its subdivision upon the profitability, dividend policy and stock returns etc. And, the

other studies have conducted to discover whether the leverage or its subdivision become a determinant.

Among the vast literature, Chandrakumaramangalam, S and Govindasamy, P (2010) have studied the impact of leverage on profitability with reference to the selected cement companies in India. They have studied the relationship between Leverage (Financial leverage, Operational leverage and Combined leverage) and the Earnings per Share. The results suggested that the leverage as well as profitability and growth are related and the leverage is having an impact on the profitability of the firms. Also, It was suggested that the EPS of a company is not depended upon on the debt capital in capital structure and the profits can be increased by using debt capital structure due to tax advantage by Kharuna, S and Gupta, ML (2010) with their study on the impact of leverage on profitability of pharmaceutical companies in India. Further, they concludes that the optimal capital structure of companies is depended upon other factors like size, growth, uniqueness, profitability, collateral value of assets and not only on leverage.

Meanwhile, Yoon. E and Jang. SC (2005) studied the effect of financial leverage on profitability and risk of restaurant industry for the period of 1998-2003. The study presented on empirical insight into the relationship between return on equity, financial leverage and size of the firms. It was found that at least during the test period firm size had a more dominant effect on return on equity of restaurant firms than debt use, larger firms earning significantly higher equity returns. Returns also suggested that regardless of having lower financial leverage, smaller restaurant firms were significantly more risky than the larger firms. Further, it is proved that the debt in general don significantly affect the companies' profitability by Singapurawako. A and Wahid. MSME (2011). They arrived in to this conclusion, after studying the impact of financial leverage to profitability based on a sample of non financial companies from Indonesian stock exchange. The independent variable was the Return on Equity which is depended on Equity Multiplier, Total Asset Turnover, logistic of Total Assets and Bank Interest Rate.

In addition, Sachchidanand and Navindra (2012) carried on a study upon the influence of financial leverage on shareholders' return and market capitalization based on the automotive cluster companies of Pithampur, and it was concluded that there is no significant influence of financial leverage on shareholders' return and market capitalization. Also the study concludes that there might be other non-quantitative factors which may lead to nullify the impact of financial leverage on shareholders return like recession, saturation of auto industry, competition and government policy. It should be noted that financial leverage is a speculative technique and there are special risks and costs involved with financial leverage and specially noted that a financial leverage strategy will be successful during any period in which it is employed. With a similar study, Kose. E (2011) tested the effect of leverage on stock returns. The findings emphasize, that the higher short term leverage is associated with higher industry risk, lower investment, lower long term leverage, lower net long term debt issuance and higher current assets. Higher long term leverage and higher net long term debt issuance are associated with lower industry risk, higher investment, lower short term leverage and lower current assets.

On the other hand, Asif. A, Rasool. W and Kamal. Y (2011) tested the impact of financial leverage on dividend policy based on a sample selected (403 companies) from Karachchi stock exchange (year 2002-2008). Dividend Yield (DY), Debt Ratio (DR) and Change in Earnings (ΔE) had been used as the independent variables and Dividend per Share (DPS) used as the dependent variable. Panel data regression (fixed effect and random effect models) used for the analysis. The suggested model of this study is as follows.

$$DPS_{it} = \alpha_0 + \alpha_1 DR_{it} + \alpha_2 DY_{it-1} + \alpha_3 \Delta E_{it} + \varepsilon_{it}$$

It was found that change in earnings has no significant impact on dividend policy on case of Pakistani firms while the dividend yield has positive impact and vice versa. The fixed effect model supports only the significant effect of dividend yield on DPS. Besides, Franklin. J and Muthusamy. K (2010) found that the variables like growth in sales, price to book ratio, cash flow, leverage, liquidity and return on assets have a relationship with dividend payout ratio and EPS and PE ratio are negatively related to the dividend payout ratio by. A study conducted on leverage, growth and profitability as the determinants of dividend payout ratio based on a sample selected from the Indian paper industry derived this conclusion. The tested independent variables of the study include Growth in Sales, Earnings per Share, Price Earnings Ratio, Price to Book Ratio, Cash Flow, Leverage, Liquidity and Return on Assets.

With a completely different focus, Gill. A and Mathur. N (2011) studied on the factors that influence the financial leverage of the Canadian firms. The sample consisted with 166 Canadian firms listed on the Toronto stock exchange for a period of 3 years (2008-2010). The results showed that financial leverage of Canadian firms is influenced by the collateralized assets, profitability, effective tax rate, firm size, growth opportunities, number of subsidiaries and industry dummy.

Finally, the findings of Afza. T and Tahir. S (2012)'s study on the determinants of the price earnings ratio, being based on the chemical sector companies in Pakistan, can be summarized. In the study, PE ratio is the dependent variable which is depended on the Dividend Payout (DP), Tobin's Q (Q), Leverage (LEV), Market Return (Mktrtn), Variability in market price (VMP), Earnings Growth (Egrowth) and Corporate size (SIZE). They suggested the following model.

$$PE_{it} = \alpha + \beta_1 DP_{it} + \beta_2 Q_{it} + \beta_3 LEV_{it} + \beta_4 Mktrtn_{it} + \beta_5 VMP_{it} + \beta_6 Egrowth_{it} + \beta_7 SIZE_{it} + \varepsilon_{it}$$

Results demonstrated that the dividend payout ratio and Tobin's Q remain the most important determinants of the PE ratio for pooled as well as time series analysis.

3. METHODOLOGY

3.1 Sample Selection and Data Collection

The study carried out only on manufacturing companies which are listed in the Colombo stock exchange (CSE). Although there are several sectors in the CSE, the study focuses only on the manufacturing sector due to manufacturing sector has

relatively large investments on capital assets, and thereby those companies may access more to the debt market to finance those projects. Access more to the debt capital rather than equity may result higher financial leverage and large investments in property, plant and equipments affect the operating leverage as well. Furthermore there can be seen a clear distinction between the operating assets and financial assets as well as between the operating liabilities and financial liabilities on those firms.

Out of 37 listed manufacturing companies, only 28 companies are selected as the sample, and data will be gathered as panel data for a period of 5 years from year 2008 to year 2012. To address the study's issue three explanatory variables; Operating Liability Leverage (OLLEV), Financial Liability Leverage (FLEV) and Total Leverage (TLEV), are chosen, and Profitability and the stock market performance are the respond variables. While profitability is measured by using Return on Equity (ROE), Return on Assets (ROA), and Return on Net Operating Assets (RONOA), market performance is measured by Price-to-Book Value ratio (PB), Price Earnings ratio (PE), Market Capitalization (LGMCAP) and Tobin's Q.

3.2 Methods and Analytical Tools

Because of employing three proxies for profitability and four proxies for measuring market performance study tests seven panel regression models in total as follows.

Model 1: $ROE_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

Model 2: $ROA_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

Model 3: $RONOA_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

Model 4: $PE_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

Model 5: $PB_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

Model 6: $LGMCAP_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

Model 7: $TobinQ_{it} = \beta_0 + \beta_1 OLLEV_{it} + \beta_2 FLEV_{it} + \beta_3 TLEV_{it} + \varepsilon_{it}$

In overall, Coefficient of Correlation (R^2) is used to test the power of estimating of the models, and coefficients of each variable are tested at 5 percent significant level. If the respective P value of a variable is less than 0.05 it is considered as a significant variable in explaining the dependant variable.

Panel data models examine fixed and/or random effects of entity (individual or subject) or time. The core difference between fixed and random effect models lies in the role of dummy variables. If dummies are considered as a part of the intercept, this is a fixed effect model. In a random effect model, the dummies act as an error term. Park, Hun Myoung (2009) has distinguished between Fixed Effect Model and the Random Effect Model as follows (Table 1).

Table 1 Fixed Effect and Random Effect Models

	Fixed Effect Model	Random Effect Model
Functional form	$y_{it} = (\alpha + u_i) + X_{it}\beta + v_{it}$	$y_{it} = \alpha + X_{it}\beta + (u_i + v_{it})$
Intercepts	Varying across groups and/or times	Constant
Slopes	Constant	Constant
Estimation	LSDV, within effect method	GLS, FGLS
Hypothesis test	Incremental F test	Breusch-Pagan LM test

The fixed effect and random effect models are applied to estimate the effect of each independent variable on the dependent variables with an extension of least square process with no weights and white (diagonal) as the coefficient covariance method. Each model is tested with the fixed effect and random effect models separately, and R^2 supports the selection of either fixed effect model or random effect model. In the model selection process F test is also expected to be applied and where following hypothesis is to be tested at 5 percent significant level.

H_0: $\beta_1 = \beta_2 \ldots\ldots\ldots = \beta_k = 0$

H_1: at least one $\beta_i \neq 0$ (dependent variable depends on at least one independent variable)

4. DATA PRESENTATION AND ANALYSIS

4.1 Correlation Analysis

Pearson correlation was used to check the correlation among only independent variables and dependent variables. Table 2 shows that how the variables are correlated each other where only the significant correlations have been considered. However, Multi-colinearity among independent variables was ignored in the study.

Table 2 Correlation Analysis

Variables		ROE	ROA	RNOA	LGMCAP
OLLEV	Coefficient (Probability)	-0.19432 (0.02140)*	-0.2657 (0.0015)*	-	-0.23487 (0.00520)*
FLEV	Coefficient (Probability)	-	-	0.97419 (0.0000)*	-
TLEV	Coefficient (Probability)	-0.15351 (0.07020)**	-0.24461 (0.00360)*	-	-0.27063 (0.00120)*

*significant at 5 percent level
**significant at 10 percent level

Accordingly, ROE, ROA and LGMCAP are negatively correlated with OLLEV and TLEV. These correlations are significant at 5 percent significant level except the correlation between ROCE and TLEV. There is a positive and strong correlation between FLEV and RNOA.

4.2 Panel Regression Analysis

4.2.1 ROE against OLLEV, FLEV and TLEV (Model 1)

As per the Table 3, both models indicate that OLLEV and FLEV have not been significant in predicting ROE because respective P values are higher than 0.05 at 5 percent significant level accepting the null hypothesis. However, they have a positive relationship with ROE. In terms of TLEV, a similar result is given by the models showing a negative and significant relationship with ROE. As far as R^2 is concerned, comparatively fixed effect model is in a good position in predicting ROE than the random effect model because it explains nearly 72 percent from the model. Therefore the fixed effect regression model is the best fitting model for explaining ROE.

Table 3 ROE against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	0.139392	0.0000	0.137230	0.0000
OLLEV	0.029639	0.4039	0.016345	0.6831
FLEV	0.000325	0.8094	0.000116	0.9195
TLEV	-0.068317	0.0186	-0.060223	0.0114
R^2	0.721586		0.079111	
F-statistic (Probability)	8.004018 (0.000000)		3.894434 (0.010452)	

The F statistics also proves that the validity of the fixed effect model rejecting the null hypothesis at 5 percent significant level because its respective P value is less than 0.05. Accordingly, ROE depends on at least one independent variable of the model.

4.2.2 ROA against OLLEV, FLEV and TLEV (Model 2)

Table 4 ROA against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	0.073786	0.0000	0.080488	0.0002
OLLEV	0.009988	0.5989	0.005050	0.7945
FLEV	-0.001880	0.0236	-0.001717	0.0063
TLEV	-0.020886	0.2526	-0.029598	0.0855
R^2	0.663506		0.053636	
F-statistic (Probability)	6.089448 (0.000000)		2.569295 (0.056926)	

Table 4 illustrates that OLLEV and TLEV are not significant variables in both models to explain the changes in ROA because P values of both variables do not support to reject null hypothesis at 5 percent significant level. However ROA's relationship with OLLEV has been positive and with TLEV it is negative, and FLEV has significant negative relationship with ROA. R^2 ensures that the fixed effect model is the best suited model to cover up ROA having nearly 66 percent. Selection of this model is further supported by the P value of F-statistic rejecting the null hypothesis.

4.2.3 RONOA against OLLEV, FLEV and TLEV (Model 3)

Table 5 RONOA against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	-1.119221	0.0249	-0.935173	0.0310
OLLEV	5.846554	0.0000	7.002688	0.0000
FLEV	5.943503	0.0000	6.122823	0.0000
TLEV	-4.165755	0.0002	-4.920714	0.0000
R^2	0.975876		0.964658	
F-statistic	124.9288		1237.388	
(Probability)	0.000000		0.000000	

Table 5 indicates that all the variables in the both models have been significant at 5 percent significant level with equal sign. Accordingly, both OLLEV and FLEV have a positive relationship with RONOA and relationship between TLEV and RONOA has been negative. Either model can be applied to forecast the changes in RONOA because of higher R^2 values. However fixed model is the most appropriate one with relatively higher R^2. The same assurance is given by the results of F test.

4.2.4 PE against OLLEV, FLEV and TLEV (Model 4)

Table 6 PE against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	32.44346	0.2540	45.21850	0.0502
OLLEV	-49.20333	0.4837	-12.26830	0.8751
FLEV	-1.449309	0.4051	0.618837	0.3961
TLEV	62.76212	0.3353	29.25568	0.5733
R^2	0.198655		0.005666	
F-statistic	0.765577		0.258340	
(Probability)	0.811526		0.855281	

With regards to results reported in table 6, considering the significance of individual variable and their nature of relationship with PE is worthless due to neither fixed effect nor random effect models are fitting with poor R^2 values. The results of the F test have also revealed the invalidity of both models in forecasting PE.

4.2.5 PB against OLLEV, FLEV and TLEV (Model 5)

Table 7 PB against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	4.074759	0.0000	4.561492	0.0478
OLLEV	0.755740	0.4239	1.269049	0.1081
FLEV	0.004925	0.9000	0.000402	0.9837
TLEV	0.083863	0.9214	-0.849216	0.2508
R^2	0.887289		0.004161	
F-statistic	24.31141		0.189420	
(Probability)	0.000000		0.903456	

As per the Table 7, irrespective whether the nature of the model, all the explanatory variables have become insignificant in capturing the behavior of PB. Therefore it prevents validity of the explanatory power of R^2.

4.2.6 LGMCAP against OLLEV, FLEV and TLEV (Model 6)

According to the Table 8, only the fixed effect model can be adopted because of its higher explanatory power with regards to R^2, and where only OLLEV and TLEV are the significant variables and they have positive and negative relationships with LGMCAP respectively. The selection of fixed effect model is also evidenced by the F statistic.

Table 8 LGMCAP against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	21.06446	0.0000	21.08590	0.0000
OLLEV	0.322570	0.0116	0.337735	0.0012
FLEV	-0.001495	0.6738	-0.001203	0.8225
TLEV	-0.309449	0.0034	-0.348103	0.0001
R^2	0.964576		0.071359	
F-statistic	84.08986		3.483512	
(Probability)	0.000000		0.017693	

4.2.7 Tobin's Q against OLLEV, FLEV and TLEV (Model 7)

It can be observed in the Table 9 that the insignificance of the all independent variables in forecasting Tobin's Q at 5 percent significant levels. This leads to the omission of selecting either model ignoring the goodness of fit criteria.

Table 9 Tobin's Q against OLLEV, FLEV and TLEV

Variable	Fixed Effect Model		Random Effect Model	
	Coefficient	Probability	Coefficient	Probability
C	3.026991	0.0000	3.320031	0.0217
OLLEV	0.299817	0.6888	0.632242	0.3092
FLEV	0.002275	0.9376	-0.004405	0.7851
TLEV	-0.099512	0.8746	-0.668084	0.2588
R^2	0.869847		0.003602	
F-statistic	20.63955		0.163888	
(Probability)	0.000000		0.920520	

5. CONCLUSIONS

The main purpose of this study was to shed some light into the association between leverage and profitability and association between leverage and market performance, by employing a sample of companies listed under the manufacturing sector in the Colombo Stock Exchange for the period 2008-2012.

The study employed Operating liability Leverage, Financial Leverage and Total Leverage to measure the leverage. Profitability and market performance measured by utilizing Return On Equity (ROE), Return On total Assets (ROA), Return On Net

Operating Assets (RONOA), Price Earnings ratio (PE), Price To Book ratio (PB), Market Capitalization (LGMCAP) and Tobin's Q ratio. As a result, seven models were formed and tested. Panel data were utilized to verify the null hypothesis with the help of regression analysis while fixed effects model and random effects model, coefficient of correlation and descriptive statistics were applied, wherever needed.

It was found that there is a significant relationship between the total leverage and ROE. The total leverage of a manufacturing firm affects to the ROE of the firm. Although financial leverage and operating liability leverage subscribed for the total leverage, their individual effect on ROE is not significant. When considering the ROA, the regression results indicates that financial leverage affects to the ROA significantly and it was surprisingly negative. However OLLEV and TLEV are not significantly affecting to the ROA. The most interesting finding is the relationship between RONOA and the leverage. OLLEV and FLEV exhibit a positive significant impact on the RONOA where as that effect reduces by TLEV which demonstrates a negative significant effect on RONOA.

Surprisingly, price earnings ratio and price to book ratio of the manufacturing sector companies were not significantly affected by the leverage. However, market capitalization is significantly affected by the operating liability leverage and total leverage. Although there is an effect of FLEV, that is not significant. Finally, the regression results indicate that there is no significant relationship between the leverage and Tobin's Q ratio.

Among all the models, RONOA model become the best model which describes the relationship between the leverage and profitability of the manufacturing sector companies. When considering the market performance, market capitalization model best describes the relationship between the leverage and the market value of a firm. The best suited models can be suggested as follows for the profitability and market performance.

$$RONOA = -1.1192 + 5.8466\ OLLEV + 5.9435\ FLEV - 4.1658\ TLEV$$

$$LGMCAP = 21.0645 + 0.3226\ OLLEV - 0.0015\ FLEV - 0.3095\ TLEV$$

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ISSN 2386-1444

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