AN ECONOMETRIC EVALUATION OF COLOMBO STOCK EXCHANGE: EVIDENCE FROM ARMA & PCA APPROACH

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Abstract

Economic data analysis is the process of handling economic data revise beliefs about economic problems. These problems have common structure; Row data are given on the past behaviours and decisions or actions should be taken for predicting future results. Moreover, all the actions might involve under economic decisions and set of mathematical assumptions. The main goal of this study is to investigate the directions and movements of market prices and trade volume rates in Colombo Stock Exchange (CSE) during 2002 to 2011. The year 2009 was a landmark year for CSE. Many changes happened after the end of the civil war in north part of the country. As a result of their enormous growth, they won Marketplace with the best performance award in 2009. High volatile fluctuations with instability patterns are common phenomenon in the CSE. Principal component method and ARMA models were used to identify the stock market fluctuations. The results reveals that micro and macro-economic conditions, internal and local political changers, interest rates and oil prices in the world has a direct impact on generating high volatility fluctuations in CSE. In comparison with other markets, during a very short period, CSE has been reached to top level compared with other exchanges around the world.

Keywords: ARMA; CSE; Principal Component Analysis

1. Introduction

Economical Time series analysis is the discipline to make use of data revises beliefs about economic problems, especially questions about prediction and forecasting. This problem has common structure: Data are given on the past behaviours followed with a set of assumptions, economical behaviours and decisions or actions should be taken for predicting present and future results. Moreover, decisions or actions might involve public economic policy, a private and individual economic decision or between computing assumptions.

The demeanour of aggregate stock prices and trade volume behaviours play significant role in stock market fluctuations. In last few decades, equality markets all over the World have been advanced as main forms of

investment for numerous organizations and individuals arraying for large investments funds (Cai et al. 2008).

Moreover, stock market is the place where stocks and bonds are traded. Stocks are denoted as units of ownership for investors. Currently, companies offering their shares to general public and raise their money needed for restructuring, expansion and for new operations (Peiris et al, 2011). When the companies obtain the capital needed, the shareholders will benefit through dividends paid by companies. Also corporations issue stocks to expand their capitals. Furthermore, the shareholders have alternatives for transferring or selling their ownerships as their requirements (Abraham et al, 2002).

After 1980, many companies around the World have experienced phenomenal growth and invested huge funds from their capitals. Stocks are a long – term investment for companies as well as individuals (Campbell et al, 1997). Day by day many companies have been listed in stock markets rapidly. The global growth of the market prices and trade volume rates has been changed with highly volatile fluctuations. The price of the stocks are substance depend on previous prices, data volume and partially depend on variety of financial and macro level data (Conrad et al, 1973). All this factors are varying from market to market as well as country vice.

Rates of the Equity markets are highly volatile. Within very short period, the prices of the stocks move up and down with high fluctuations. So, the predictability and forecasting future patterns make the problems more complicated. It is common phenomenon that, when the company is running well, the prices of the stocks going up. Otherwise stocks prices go down. Not only company performance but also many other macro and micro economic factors also directly affect the prices and volume of stocks.

However, higher risk brings higher returns. The difference between risk and return indicates that the investment is good or bad. Correlations among stocks bestead for investors to identify the market risk easily (Kerby et al, 2001). Stock price patterns with long term and short term movements with respect to macro and micro economic factors are significantly related to identify minimum risk and maximum returns. Various kinds of methods have been used to identify the directions and behaviours of price movements (Kumar et al, 2011).

CSE is a main transaction dealing centre in Sri Lanka and has four regional branches in Kandy, Matara and Jaffna. According to 2011 annual reports, it has market capitalization over 4.9 billion US Dollars. It is approximately 24% of the country's GDP level (Samarakoon et al, 2004). Currently, CSE is dealing with 280 listed companies representing 20 business sectors (Gunasekerage et al, 2001).

Highly volatile fluctuations with instability patterns are common phenomenon in the CSE (Peiris et al, 2011). Because of innumerable micro and macro-economic conditions, market conditions, international and local political changes, oil prices and interest rates directly involves to generate high volatility fluctuations (Samarathunga et al, 2010). According to economic theory, higher volatility poses higher risk for investors. It means they can afford higher returns for their investments.

The rest of the paper is organized as follows. Section II explains about brief overview of existing solutions with pros and cons. Section III explains about proposed work with Principal component analysis. Section IV explains about experimental results and Section V ends up with conclusion and future work.

2. Literature Review

Macro and micro economic variables play a significant role in financial data analysis. As a result, researches have been doing miscellaneous kind of research based on financial markets around the world. Different models and methodologies have been developed to overcome this problem. After 1960, integrating both concepts of the mathematics with the pillars of modern Financial Theory, many theories and hypothesis has been developed. Random Walk Hypothesis and Efficient Market Hypothesis also developed in that period. This new hypothesis has many challenges with traditional concepts as well as practitioners and created vast disagreements.

In 2012, Poshakwele et.al investigated hedging effectiveness of constant and dynamic models. They gathered data from Malaysia equity market. According to their findings, market liquidity of the Malaysia is lower than developed equity markets liquidity such as New York and London. Daily market price values between 1995 to 2001 were used for their calculations. Moreover, GRACH (1, 1) and TGARCH with differing variance – covariance structural models are used for obtained hedging ratios. According to their suggestions, TGRACH based models carried out better hedging performances than other models (Poshakwele et al, 2012).

A.C Worthington and Higgs did comparative test and discussed random walk behaviours and market efficiency in developing equality markets in Asia (Worthington et al, 2004). In their studies, they have used daily returns for the ten developing markets in China, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Sri Lanka, Taiwan and Thailand and five developed markets in Australia, Hong Kong, Japan, New Zealand and Singapore (Worthington et al, 2004). In their research, they have examined random walks by using different type of mathematical and statistical concepts such as serial correlation coefficient, runs tests, Augmented Dickey-Fuller, Phillips-Perron and Kwiatkowski, unit root tests and multiple variance ratio tests (Worthington et al, 2004).

By using efficient market hypothesis with the random walk, Co-integration and Granger causality test statistics, Xiaoming Li and JianXu compared four price indexes (NZSE 10, NZSE 30, NZSE 40, and NZSE SC) in New Zealand stock Exchange (Li et al, 2006). The NZSE 30 index coves the top 30 largest and most liquid issuers with equity securities quoted on the New Zealand stock exchange. According to their findings, only top 10 companies listed in the market was stationary and not in weak-form efficient, while the other up to 40 companies weak form but not semi-strong form efficient. They observed 1832 sample values from January 1993 to April 2000(Li et al, 2006). Moreover, results proved that the small-firm Indies (first three) follows a random walk process, but it is not co- integrated with the large – firm indexes.

End of 2000,Mobarek et.al worked together in research to apply a random walk hypothesis to find the weak-form efficiency of Dhaka Stock Exchange (DSE) in Bangladesh. In their study, they described a flexible model and solution approached for find market efficiency. They used 2638 daily observations from listed companies made for entire sample period of 1988 to 1997.Different type of non-parametric tests (Kolmogorov Smirnov test. Runs test) as well as parametric test (Auto regressive models, ARIMA models) were used to analyze their results. The concluding remarks from the empirical analysis proposed that the DSE is not in week form efficient.

After 1980, Multivariate statistical models have been successfully applied to real-world problems. Newton et al. described the use of multivariate statistical methods for solving short –term strategies. They used different type of methods to solve and compare results at different stages. They have done multi comparison study between different type of markets, such as four Latin Americans (Argentina, Brazil, Chile, and Mexico), three Asian (South Korea, India, and Thailand) and three develop markets (US, Japan, and UK). Stock markets were selected based on their capitalization. Return of the monthly observations calculated using 241 monthly observations between 1979 to 1999. Correlation analysis with principal component techniques was used to discuss the results (Newton et al, 1980).

Kerby and James worked together to apply the multivariate statistical techniques for stock market fluctuations (Kerby et al, 2010). In their study, Principal component analysis and Discriminant analysis are mainly used to interpret results. Their study consists of two steps; under the first step they apply multivariate methods for classifying a company's stocks as good or bad. In next step, they enquired new techniques for reducing the dimensionality of a complex financial data sets. The data were obtained from Federal Reserve Bank of St Louis, big charts historical quotes as well as annual reports from the selected companies (Kerby et al, 2010). Four micro variables related to company specifics and six macro variables were used to discuss the results. They are; net revenue, net income, price per earnings ratio of stock, diluted earnings per share, consumer spending, consumer investment, unemployment rate, inflation rate, federal funds rate and the Dow Jones industrial average (Kerby et al, 2010).

After 2005, Gravity models have been successfully applied for solving economics and financial problems. They are predominantly models that propose to explain the connections between markets. Thomas and co-workers used gravity models for their research and explained the trade patterns in stock markets(Thomas et al, 2010). They used real stock market data from 27 countries. Stock market correlations were calculated from realized daily returns on each market. Cross-country equality return correlation was used to explain the gravity models. Also they found that more conventional variables highly influence the cross-country correlations. Their results were coincided with La Porta's findings in 1998.

Using the market index and sector indices from 1985 to 1995, Samarakoon has investigated the time series behaviours of the short-term (daily, weekly, monthly and quarterly) predictability stock return and inflation in Sri Lanka. Four categories of inflations were used to identify the relations. They are; contemporaneous, lagged, expected and unexpected inflations (Samarakoon et al, 2008). All these inflations were estimated using ARIMA procedures with Fishers hypothesis test statistic.

3. Methodology

3.1. Second Study Area

The current study is carried out on the basis of secondary data, which obtains from CSE, annual reports of Central Bank of Sri Lanka, the listed company's annual reports and other relevant sources.

The methodology can be described in two steps. First part of the research, Principal Component Analysis (PCA) is used to identify the relationship between macro-economic variables and stock market validations. Seven macro-economic variables which affect to the stock market fluctuations were used. They are; GDP rates, inflation rates, unemployment rates, Annual stock prices, consumer spending rates, PPT valuation per

country GDP (US dollars), crude oil important rates (US Dollar Billions) , net revenue and net income from the Sri Lanka.

As a second step, market validations were discussed using the 20 sector indexes data taken from the CSE. They are; Telecommunication (TLE), Stores supplies(S&S), Trading (TRD), Plantation(PLT), Services(SRV), Power and energy(P&E), Oil palms(OIL), Plantation(PLT), Motors(MTR), Manufacturing(MFG), land and property(L&P), Investment trust(INV), Hotels and Travels(H&T), Heath care(HLT), Footwear and textile(F&T), Information technology(IT), Diversified Holdings(DIV), Construction and engineering(C&E), Chemicals and Pharmaceuticals(C&P), Beverage food and tobacco(BFT), Bank and finance and insurance (BFI).

The study utilized All Share Price Index (ASPI) daily data taken from 2002-2011. Minitab and 'R' statistical packages were used for interpreted results.

3.2. Principal component analysis (PCA)

As a first step, check the normality using the Kolmogorov-Smirnov test under the 0.05 level of significance. Moreover, Q-Q plot and probability plots can be used as a graphical method to test the normality. If the variables which do not appear to be normally distributed, it can be transformed in order to reach normality by using the log function or square root functions. After that, independency of the variables can be check using the Correlation matrix, auto correlations and correlograms.

After checking normality and independency, PCA will be applied to find the patterns in data of high dimension. It reduces the dimensionality of the data set by linearly combing the original correlated variables into new variables, some of which are ignored. The new variables are linear independent of the one other, whereas the original variables may have been dependent.

3.3. Stationary/Non stationary Time series Models

Financial time series plays the significant role in the financial data analysis such as economic forecasting, stock market predictions. Currently, many financial institutions and organizations as well as individual investors often use different type of statistical models for analyzing various kinds of macro-economic indicators such as GDP rates, inflation levels, exchange rates and asset prices.

As a first step of the economic time series, it is important to test series is stationary or not. If the data series is non-stationary, then it often transformed to become stationary. If the mean and auto-covariance of the series do not depend on the time, then series is said to be stationary. According to the past experiences, economic data are depending on the non- stationary price levels. In the statistics, two statistical methods mainly used for measure the stationary and non-stationary demeanor of the return series. They are;

1. Augmented Dickey – Fuller Test (ADF)
2. Phillip and Perron Test (P-P)

By using Test statistics results, following hypothesis are tested under the 0.05 significance level for adjudge the stationary or non-stationary pattern of the data series.

H_0: Data series has a unit root

H_1: Data series has not a unit root

If the alternative hypothesis is accepted, then the series is stationary, otherwise series is not stationary. If the return series is not stationary, then different techniques such as 1st and 2nd differences were used to make the stationary series. According to the definitions, only stationary series can be used for developed the mean equations.

3.3.1. Accumulation and Test of Row Series: ARMA model

Autoregressive moving average (ARMA) models often used to discuss the behaviors in stationary data patterns. ARMA model are generally written as ARMA (p, q), where p and q represent the order of auto regressive process (AR (p)) and moving average process (MA (q)) respectively (Gujarati et al, 2010). The moving average process can be written as;

$$X_t = z_t + \theta_1 z_{t-1} + \theta_2 z_{t-2} + \cdots + \theta_q z_{t-q} \quad (1)$$

The auto regressive process can be written as;

$$X_t = \vartheta_1 x_{t-1} + \vartheta_2 x_{t-2} + \cdots + \vartheta_p x_{t-p} + z_t \quad (2)$$

Where; $z_t \sim WN(0, \sigma^2)$ $\theta_1, \theta_2; \cdots, \theta_n$ and $\vartheta_1, \vartheta_2; \cdots, \vartheta_n$ are constants. Considering properties of AR and MA processes, ARMA (p,q) can be written as;

$$\vartheta(B) X_t = \theta(B) Z_t \quad (3)$$

Where; $\vartheta(z) = 1 - \vartheta_1 z - \cdots - \vartheta_p z^p$ and $\theta(z) = 1 + \theta_1 z + \cdots + \theta_q z^q$ The likelihood estimation method is used for identification and estimation patterns.

4. Data Analysis and Discussion

The data analysis of this study was carried out in two major phases. In first phase, multivariate statistical analysis methods such as Principal Component Analysis were used to identify the relationships between macro-economic variables with market fluctuations.

In second phase, descriptive statistical analyses with ARMA models were used to discuss results. Under this section, monthly stock return values are used to check results (Peiris et al, 2011). Monthly stock returns are calculated by using following formula (Samarakoon et al, 2008).

$$R_{st} = \left(\frac{Index_{st} - Index_{s(t-1)}}{Index_{s(t-1)}} \right) * 100 \quad (4)$$

Where; R_{st} denote the market return index, $Index_{st}$ denote the index value at time t on the sector I and $Index_{s(t-1)}$ denote the index value at time t -1 on sector I respectively.

4.1. Multivariate Statistical Analysis: Principal Component Analysis (PCA)

Kolmogorov-Smirnov test results with Q-Q plot figures suggest that GDP rates, consumer spending rates, PPP valuation of country GDP level, crude oil important rates and unemployment rates were appearing to be normal under the 0.05 level of significance. However inflation rates (0.025), Annual stock price rates

(0.041), revenues (0.011) and net income (0.010) do not appear to be normal. Log transportations are used to convert skewed variables to normal.

Table 1: Eigen analysis of the Correlation Matrix

Eigenvalue	5.1756	1.7639	0.8560	0.1032	0.0625	0.0339	0.0047	0.0002
Proportion	0.647	0.220	0.107	0.013	0.008	0.004	0.001	0.000
Cumulative	0.647	0.867	0.974	0.987	0.995	0.999	1.000	1.000

According to the Table 1, the largest component is variance (5.1756) and accounts for 64.7% of the total variance. Interpreting the principal components values, the first two PC already explains 86.7% of the variance. So, most of the data can be captured in two dimensions. The coefficient list under PC2 was explained in below relationship.

PC2= 0.574 GDP Rates + 0.721 log Inflation + 0.059 Unemployment Rates + 0.025 log Annual stock Rates + 0.141 Log Consumer Spending Rates + 0.106 Crude oil Imports Rates + 0.046 log Revenue

Hence, the second PC is essentially the difference between GDP rates and log inflation variables.

Figure 1: PC Representation of individuals

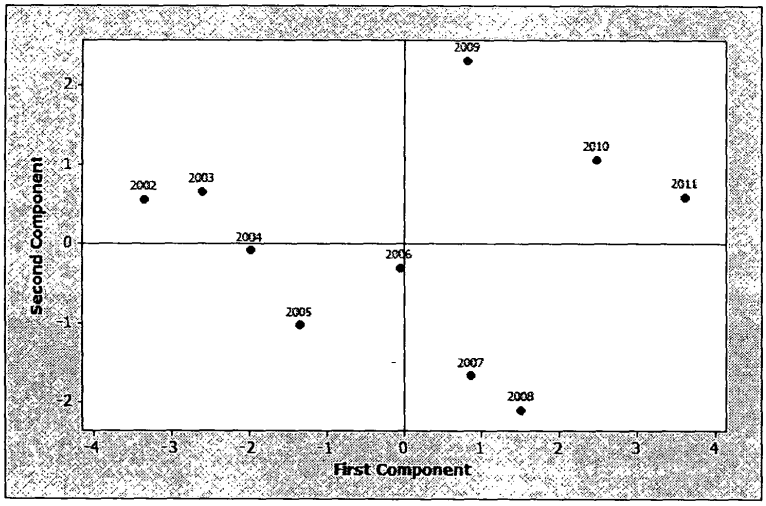

Figure 1, clearly shows that data points has appeared to be with three data patterns in the periods 2002-2005, 2006-2008 and 2009-2011. There were many political and economic reasons that directly involved changing these patterns. For example, after end of the civil war in the north part of the country on 18th May 2009, Colombo Stock indices were increased rapidly with high fluctuations. As a result end of the October in 2009, market capitalization reached over one trillion Sri Lankan Rupees for the first time of the CSE history. Moreover ASPI (3549.27) and MPI (4214.8) also come to their highest points on the 11th January 2010. Because of these performances, it become a best performing stock exchange in the world in 2009 with 125.2 present of positive jumped compared with 2008.

4.2. Sector Vice data analysis in CSE

Table 2 explains about the sector vice description for the CSE using the descriptive statistics such as mean, median, minimum, maximum, standard deviation, coefficient variation, skewness, kurtosis and MSSD. Data were gathered form the sector vice ASPI monthly return indices between 2002 to 2011.

According to Table 2, return indices of 20 sectors in CSE are asymmetrical and have positive and negative skewed. Moreover, Kurtosis values also suggested that, monthly return values for sectors distributed with

non-normal distributions except 8 sectors. They are; BFI, BFT, C&P, C&E, DIV, HLT, MFG and PLT. MSSD indicators also suggested that results.

Table 2: Descriptive Analysis Results

Variable	Mean	Median	St.Dev	CoefVar	Skewness	Kurtosis	MSSD	Minimum	Maximum
ASPI	0.01953	0.01246	0.07746	396.62	0.34	0.35	0.00516	-0.16151	0.23669
MPI	0.01509	0.00892	0.08662	574.11	0.89	2.11	0.00647	-0.16758	0.35308
BFI	0.02019	0.00848	0.09152	453.27	1.38	4.2	0.00745	-0.15618	0.43642
BFT	0.02174	0.02401	0.07016	283.55	-0.38	1.28	0.00445	-0.15801	0.25779
C&P	0.02068	0.01067	0.0996	481.55	0.81	1.27	0.00925	-0.20473	0.35335
C&E	0.02119	0.01407	0.10019	472.81	0.73	0.93	0.00888	-0.17069	0.37194
DIV	0.0235	0.00841	0.09649	410.53	0.94	2.59	0.0075	-0.20531	0.41556
F&T	0.0245	0.00613	0.1362	555.52	2.34	11.03	0.0173	-0.2844	0.7919
HLT	0.01573	0.00108	0.08344	530.5	0.68	1.29	0.00644	-0.20402	0.28548
H&T	0.0269	0.00257	0.1169	433.69	2.11	9.71	0.0121	-0.2085	0.7264
INV	0.0329	0.00631	0.1804	547.74	2.27	11.33	0.035	-0.4565	1.1236
IT	0.0164	-0.0134	0.197	1199.08	2.77	13.5	0.0397	-0.3063	1.2541
L&P	0.019	-0.002	0.1293	681.06	1.82	6.58	0.0185	-0.2332	0.711
MFG	0.01736	0.00914	0.07595	437.42	0.31	0.16	0.00537	-0.19371	0.21117
MTR	0.0387	0.0122	0.1308	337.51	1.8	5.37	0.0136	-0.1975	0.6944
OIL	0.0395	0.00414	0.1993	505.02	5.27	41.74	0.0389	-0.3382	1.731
PLT	0.01402	-0.0018	0.10861	774.76	0.7	1.34	0.01123	-0.28945	0.3716
P&E	0.00319	0	0.09685	3032.96	2.63	12.65	0.0088	-0.16241	0.5955
SRV	0.023	0.00134	0.1176	510.6	1.49	3.58	0.0143	-0.243	0.4949
S&S	0.0133	0.00257	0.148	1114.31	0.18	8.02	0.0209	-0.6036	0.7796
TLE	0.00854	0	0.09985	1168.83	1.42	5.59	0.00835	-0.21134	0.517
TRD	0.0324	0.0243	0.122	376.86	0.83	2.39	0.0105	-0.2592	0.5287

Stock prices of the CSE shocked by fundamental information's as well as macro variables such as GDP rates, inflation. Furthermore, they have been directly affecting to the mean- reversion effects due to the market participants.

4.3. *Stationary/Non stationary Model Checking*

Table 3: ADF and PP Test Results

Sector	*Significance Results*		*Sector*	*Significance Results*	
	ADF Test	PP TEST		ADF Test	PP TEST
ASPI	*0.0001*	0.0002	IT	*0.0000*	*0.0000*
MPI	*0.0000*	0.0000	L&P	*0.0021*	*0.0031*
BFI	*0.0002*	0.0001	MFG	*0.0034*	*0.0014*
BFT	*0.0012*	0.0000	MTR	*0.0002*	*0.0001*
C&P	*0.0003*	0.0002	OIL	*0.0003*	*0.0004*
C&E	*0.0001*	0.0002	PLT	*0.0001*	*0.0000*
DIV	*0.0012*	0.0021	P&E	*0.0002*	*0.0013*
F&T	*0.0004*	0.0003	SRV	*0.0000*	*0.0021*
HLT	*0.0005*	0.0000	S&S	*0.0000*	*0.0000*
H&T	*0.0000*	0.0001	TLE	*0.0001*	*0.0010*
INV	*0.0001*	0.0002	TRD	*0.0002*	*0.0021*

Table 4: Summary ADF and PP Test Results

Method		Statistic	Probability
ADF	Fisher Chi-Square	1682.87	0.0000
	Choi Z-Stat	-39.1661	0.0000
PP	Fisher Chi-Square	642.980	0.0000
	Choi Z-Stat	-21.9136	0.0000

According to the Table 3 and Table 4 results, all the sectors in CSE significantly accept the alternative hypothesis under the 0.05 level of significance described in the section 3.3. So that, all the sectors are CSE have stationary under the levels. Based on these results, we can suggest that ARMA model is suitable model for predicting future results.

Table3 represents the best fitted mean models for each section for CSE. Mainly, Standard error, log likelihood estimate, AICC and BIC were used for comparing models.

Table 3: ARMA model fittings Analysis

Sec	Fitted model	AICC (E+03)	BIC (E+03)	Error (Res. S)/N	Sec	Fitted model	AICC (E+03)	BIC (E+03)	Error(Res.S)/N
ASPI	ARMA (0,4)	-.28841	-.29102	.00544555	IT	ARMA (2,2)	-54.93549	-60.934	.0338131
MPI	ARMA (0,4)	-.26137	-.26360	.00674708	L&P	ARMA (0,2)	-.157391	-.15992	.0159755
BFI	ARMA (0,4)	-.24699	-.24942	.00756022	MFG	ARMA (1,0)	-.289396	-.29322	.005792
BFT	ARMA (2,2)	-.31949	-.32436	.00408124	MTR	ARMA (1,0)	-.157270	-.15872	.0162624
C&P	ARMA (2,2)	-.22383	-.22980	.00877856	OIL	ARMA (3,2)	-53.59653	-58.706	.0332440
C&E	ARMA (3,3)	-.22320	-.22912	.00854908	PLT	ARMA (0,5)	-.202745	-.20621	.0105164
DIV	ARMA (0,4)	-.23359	-.23597	.00841619	P&E	ARMA (0,4)	-.230276	-.23459	.00864655
F&T	ARMA (1,1)	-.14441	-.14697	.0176821	SRV	ARMA (4,0)	-.185566	-.18742	.0123123
HLT	ARMA (2,3)	-.27222	-.27604	.00602841	S&S	ARMA (2,2)	-.123799	-.12882	.0196529
H&T	ARMA (2,2)	-.19005	-.19155	.0118211	TLE	ARMA (1,4)	-.237415	-.24075	.00801183
INV	ARMA (0,1)	-71.704	-75.111	.0320800	TRD	ARMA (1,4)	-.180743	-.18165	.0125552

According to table.2, ARMA (2, 2) model is best fitted model for the BFT, C&P, H&T and S&S sections. Also ARMA (2,2) model is suitable for TLE and TRD sections. Only few sectors have only significantly high error values. They are; INV, IT and OIL sectors.

5. Conclusion

Statistical behaviors of the stock prices and trade volume are an important research direction. This study briefly target to determine the most suitable factors which influence to make the market fluctuations in CSE. Different type of factors and heterogeneous samples were used to interpret results.

Stocks from the manufacturing, hotel & travels, beverage, food & tobacco, plantation, IT, telecommunications and banking, finance & insurance are important in explaining the variations in the CSE. Principal component study results suggest that GDP rates, inflation and consumer spending rates directly involve changing stock market prices and trade volume rates. Furthermore, our results found that, political situation and political stability of the country also directly affected for the market fluctuations. Results are coinciding with the findings of Pries at al, (Pries at el, 211) and Abeysekara at el, (Abeysekara at al,2001) based on stock market volatility on CSE.

This study discussed that sector vice analysis relating to market index, macro-economic variables. However, if we can discuss the results based on the individual company data, it will generate accuracy between the market fluctuations and macro and micro variables.

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