Do macroeconomic variables play any role in the stock market movement in Ghana?

Adam, Anokye M. and Tweneboah, George

2008

Do macroeconomic variables play any role in the stock market movement in Ghana?

By

Anokye M. Adam[1]

And

George Tweneboah[2]

[1] School of Management , University of Leicester, UK
E-mail: ano77chie@yahoo.co.uk / ma262@le.ac.uk

[2] School of Management , University of Leicester., UK
E-mail:opokutweneboah@yahoo.com /gt56@le.ac.uk

Abstract

This study examines the impact of macroeconomic variables on stock prices. We use the Databank stock index to represent the stock market and (a) inward foreign direct investments, (b) the treasury bill rate (as a measure of interest rates), (c) the consumer price index (as a measure of inflation), (d)Average crude oil prices , and (e) the exchange rate as macroeconomic variables. We analyse quarterly data for the above variables from 1991.1 to 2007.4. employing cointegration test, vector error correction models (VECM). These tests examine both long-run and short-run dynamic relationships between the stock market index and the economic variables. The paper established that there is cointegration between macroeconomic variable and Stock prices in Ghana indicating long run relationship. The VECM analyses shows that the lagged values of interest rate and inflation has a significant influence on the stock market. The inward foreign direct investments, the oil prices , and the exchange rate demonstrate weak influence on price changes. In terms of policy implication, the establishment of lead lag relation indicate that the DSI is not informational efficient with respect to interest rate, inflation inward FDI, Exchange rate and world Oil prices.

Keywords: Stock Market, Cointegration, Toatl derivative, Stock duration, partial differentiation

JEL Classification :G10, C32, C50

1.0 Introduction

The relationship between macro economic growth and stock market development has dominated academic both academicians' and practitioners literature in recent times . A significant research has been done to investigate the relationship between stock market returns and a range of macroeconomic variables, across a number of different stock market and over a range of different time horizon (Humpe and Macmillan, 2007). Most of these have shown interesting result. Else where for example, Modigliani and Cohn (1979) have shown that expected stock returns should equal the current earnings yield on stocks (defined as earnings over price) plus an inflation premium. Ho (1983) conducted a study for six 'far East Countries' namely Australia Hong Kong, Japan, the Philippines, Singapore and Thailand to test the impact of money supply to stock market using cointegration and causality test. He concluded that Japan and Philippines exhibit unidirectional causal flow running from measures of monetary supplies (M1 and M2). Australia, Thailand and Hong Kong exhibits unidirectional causal flow running from M1 only. Mayasami and Koh (2000) examined the dynamic relations between macroeconomic variables and Singapore stock market using Johansen vector error-correction model and report the sensitivity of Singapore stock market to interest rate and exchange rate. Humpe and Macmillan (2007) examine the influence of a number of macroeconomic variables on stock prices in two countries, the US and Japan using cointegration analysis. The study concludes evidence of single cointegration vector between stock prices, industrial production, inflation and long interest rate for the US. Normalised coefficient from the cointegration vector on stock prices suggested US stock prices were influenced, the industrial production impacted positively on stock prices and negatively by inflation and long interest rate. The influence of monetary supply is insignificant. Two cointegration vectors were found for the case of Japan. Normalising one of the coefficients on stock prices showed evidence of stock prices positively related to industrial production / output but negatively related to monetary supply.

In Africa, Jefferis, Okeahalam and Matome (2001) reported that, the real stock market index of the Johannesburg Stock Exchange (JSE) has a positive long-term relationship with real GDP and real exchange rate, and a negative relationship with real long-term interest rate over the period 1985 to 1995. Establishing such relationship would not only be very useful to policy makers and investors' alike but will also test the efficiency of the stock market because establishing a lead-lag relationship between stock prices and macroeconomic variables exposes the existence of arbitrage profit hence the inefficiency of the market. If the stock market is efficient, it would already have incorporated all the current and anticipated changes in macroeconomic variables. Consequently, a causal relationship between changes in macroeconomic variables and stock prices will not be established. With this important implication on stock prices, there have been a limited study on the dynamic linkage between the macro economy and stock prices in Ghana. Recognizing the importance of these studies, we have .widen our study to capture most of the key macro economic indicators for robust analyses.

The objective of our study is to establish the dynamic linkages between key macroeconomic indicators namely Consumer Price Index (CPI), exchange rate (ER), interest Rate(TB), Inward FDI(FDI) , Oil Prices (OP), and stock market in Ghana .

Engle and Granger (1987) and Granger (1986) suggest that the validity of long term equilibrium between variables can be examined using cointegration techniques. A number of studies have applied these techniques, for example Osei (2006) investigated the long run and short –run relationship between Ghana stock market and some selected macroeconomic variable (money supply, inflation, exchange rate and gold price) using cointegration techniques. The paper reported long run relationship between the macro economic variables and Ghana stock market.

We employ cointegration procedure to study the relationship between these key macroeconomic variables and stock prices in Ghana. The rest of the paper is organised as follows: The variable selection justification in Section 2, and Section 3 Data and methodology. The empirical results and discussion in Section 4, followed by conclusions in Section 5.

2.0 Variables selection Justification

The selection of relevant macroeconomic variables requires judgement and we draw upon both on existing theory and existing empirical evidence (Chen, Roll and Ross 1986) . The variables selection motivation is begin by considering Miller and Modigliani (1961) Dividend Discount Model (DDM) which provides a simple but useful framework for understanding the relationship between stock prices, the stream of future cash flows from the stock, and the discount rate. In DDM, the stock market price is set equal to the stream of forecast dividend, D, discounted at the required rate of return, r:

....2. 1

This becomes

$$P_t = \frac{D_{t-1}(1+g)}{r-g} \qquad \text{..2.2}$$

Where D_{t-1} is the dividend at time t= t-1, r is the discount rate and g, a constant growth rate

From 3.1b , $dp/dr=-\frac{1}{r-g}=-D_s$ where -Ds is stock duration (see Leibowitz, Sorensen, Arnott and Hansen 1989).

Th expected rate of return can be written as function of risk free interest rate I, an expected inflation component Π and risk premium, τ I.e. r = f(I, Π, τ)

We write $r=I+\tau+\Pi$ 2.3

Unlike (Tessaromatis,2003), risk premium, τ is time variate..

And growth rate as a function of interest rate ,I, expected inflation, Π and non -interest rate related growth Φ such that(see Tessaromatis,2003)

$g=\beta I+\lambda\Pi+\Phi$ 2.4

Where β captures the sensitivity of growth to interest rates and λ the sensitivity of growth to inflationary expectations.

(Leibowitz, Sorensen, Arnott and Hansen 1989) employed the total differential of stock price to determine the impact of changes in discount factor on stock prices. Similar total differential is being employed to arrive at the desired expression

$dp/p=\partial p/\partial r dr+\partial g/\partial g dg=-\frac{1}{r-g}(dr-dg)=-D_s(dr-dg)$ 2.5

$dr=dI+d\tau+d\Pi$ and $dg=\beta dI+\lambda d\Pi+d\Phi$ from equations (2.3) and (2.4) respectively.

Using these two expressions , equation (5) becomes

$$dp/p=-D_s[(dI+d\tau+d\Pi)-(\beta dI+\lambda d\Pi+d\Phi)]$$

$$dp/p=-D_s(1-\beta)dI-D_s(1-\lambda)d\Pi-D_s d\tau+D_s d\Phi \quad ....2.6$$

we can write that

It should be noted that the total risk accrue to a security is the result of the exposure to many sources of risk. These span from global to company specific source of risk. Such factors include but not limited to currency exchange exposure, world oil prices, inward FDI, etc.

$$\tau=f(\beta_1 f_1, ..., \beta_k f_k, \beta_u f_u) \quad ....2.7$$

where

β_i, ..., β_k , and u represent sensitivity of the total risk to each factor.

f_i...........f_k factors common to the security

f_u is sum of the factors that are unaccounted for

We write the total derivative as

$$d\tau=(\sum_{i=1}^{k}\beta_i\frac{\partial\tau}{\partial f_i}df_i)+u\frac{\partial\tau}{\partial f_u}df_u \quad \text{i=1, 2 ....k} \quad ....2.8$$

Assuming linear relationship between the risk factor (τ) and $f_{i.}$..........f_k such that $\partial\tau/\partial f_i$ is

constant, then $d\tau=(\sum_{i=1}^{k}\phi_i df_i)+\delta df_u$ 2.9

where i=1, ...k

Equation (2.6 and 2.9) can be written as

$dp/p=-D_s(1-\beta)dI-D_s(1-\lambda)d\Pi-D_s(\sum_{i=1}^{k}\phi_i df_i)+\varepsilon$ where ε random term 2.10

Integrating equation (2.10) gives

$\ln(p)=-D_s(1-\beta)I-D_s(1-\lambda)\Pi-D_s\sum_{i=1}^{k}\phi_i f_i+\varepsilon$ 2.11

$\forall$ $0\leqslant\beta\leqslant1$ and $0\leqslant\lambda\leqslant1$

The negative coefficients is well explain by economic intuition. The selection of $f_{i.}$..........f_k factors required good judgement and sound intuitive analysis. Base on existing literatures and country specifics we include exchange rate , Oil prices and Inward FDI.

Exchange Rate: Exchange rate affects stock market in several ways;

A depreciating currency causes a decline in stock prices because of expectations of inflation (Ajayi and Mougoue, 1996). Inflation is seen as negative news by the stock market, because it tends to curb consumer spending and therefore company earnings(*Dimitrova,2005).*

Depreciation of the Ghana cedi will lead to an increase in prices of imported goods which the economy heavily depend and thereby decreasing cash flows to the import companies. Although few export companies will increase their cash flow which will increase earning , thus high share prices . The impact will be determined by the relative dominance of import and export sectors of the economy. Ghana as a heavy importers will suffer from higher costs due to weaker domestic currency and will have lower earnings, thus lower share prices

Inward FDI: Inward FDI has been a source of technology and employment creation for most developing countries. It provide additional employment, increased output of goods and services, and overall increases in GDP. Many studies have shown that increase in inward FDI increases stock market growth. For example, Large investment inflows to SEE supported the economic growth rates and pushed up stock prices at the major equity markets in the region(SEE Investment Guide, (2006).The participation of of foreigners in emerging stock market is said to have reduced risk premium. Oyama (1997) documented that the risk premium for Venezuela stock market, Jordan and Pakistan declined sharply between 1990 and 1992 following liberalization of stock investment by foreigners in 1990 and increase of the amount of home currency and foreign exchange that could be taken abroad by residents and non-residents .Our interest in adding inward FDI stem from recent interest of foreign investors in Ghana stock Market.

oil Prices: According to the Bank of Ghana (2004), the dilemma of an oil price surge for central banks is that it is often problematic from a stabilisation policy perspective in the sense that higher oil prices not only push up inflation (thereby calling for a rise in interest rates), but also dampen growth (requiring rates to be lower than otherwise) .(Driesprong, Jacobsen and Maat July 2007) document evidence showing that changes in oil prices affects forecast stock returns, we therefore include in our discussion.

3.0 Data and Methodology

3.1 Data Description

The data for the study are quarterly from 1991.1 to 2007.4. All the macroeconomic data except Inward FDI and oil prices were extracted From IFS data base. The data on Inward FDI were extracted from UNCTAD while the data DSI were obtained from Databankgroup Research. The oil price were obtained from the World Bank World Economic Outlook data base . The FDI data were obtained in annually form and interpolated by the method proposed by Goldstein and Khan (1976).

The brief description for each variable used is presented in Table below

Table 1 : Description and source of data

Variable	Concept	Description	Units	Source
LogDSI	Stock prices	Databank stock Index	30 Nov. 1990=79.83	Databank research
FDI	Inward FDI	Volume of foreig capital invested in the economy	Millions of National currency	UNCTAD Database
CPI	Inflation	Consumer price index	Percentage per annum (2000=100)	IMF IFS Database

TB	Interest rate	91-day Treasury bill rate	Percentage per annum	IMF IFS database
OP	World Oil Prices	Average Crude prices	Millions of National currency	World Bank Commodity Prices
ER	Exchange rate	Nominal effective Real Exchange Rate	Index Number	IMF IFS series

3.2 Methodology

Cointegration tests look for linear combinations of I(d) time series that are stationary and the linear combination of I(d) which is stationary is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship between the variables as captured in Granger (1987). We employ the Johansen (1991) and (1995) maximum likelihood procedure,Which is based on a vector error correction model (VECM) and is represented in VECM form:

$$\triangle X_t = \mu + \sum_{t=1}^{p} \Gamma_i \triangle X_{t-i} + \Pi X_{t-p} + \Phi D_t + \xi_t \quad \text{...3.1}$$

where Δ is the first difference lag operator, $X\ t$ is a (kx1) random vector of time series variables with order of integration equal to one, I(1), μ is a (kx1) vector of constants, Γ_i are (k x k) matrices of parameters, ξ_t is a sequence of zero-mean p- dimensional white noise vectors, and Π is a (k x k) matrix of parameters, the rank of which contains information about long-run relationships among the variables. If the Π -matrix has reduced rank, implying that Π =αβ', the variables are cointegrated, with β as the cointegrating vector. If the variables were stationary in levels, Π would have full rank

In estimating the VECM we first consider whether each series is integrated (the order of difference before stationarity is achieved) of the same order, to do this we consider the standard Augmented Dickey-Fuller test and Alkaike Information Criterion as leading indicator for lag selection. The cointegration rank in this study is conducted with the maximum eigenvalue and trace test. The asymptotic critical values are given in Johansen(1990) and MacKinnon-Haug-Michelis (1999).

From the above theoretical , intuitive , and empirical discussion, we postulate the relationship between stock prices and selected macro economic variables as

$$lnDSI_t = \beta_0 + \beta_1 CPI_t + \beta_2 ER_t + \beta_3 TB_t + \beta_4 FDI_t + \beta_5 OP_t + \xi_t \quad \text{...3.2}$$

where

$lnDSI$ is databank stock index, CPI is consumer price index, ER is nominal effective exchange rate, TB is 91-day treasury -bill rate , FDI is inward foreign direct investment and OP is world crude oil prices

$\beta_1, \ldots\ldots, \beta_5$ are the sensitivity of each of the macroeconomic variables to stock prices.

β_0 is a constant and ε_t is error correction term.

All the coefficients of on the variables are expected to be negative except inward FDI

4. 0 Empirical Results and Discussion

4.1 Descriptive Statistics

Table 2 presents a summary of descriptive statistics of the the variable. Sample mean, standard deviation, skewness and kurtosis, and the Jacque-Bera statistic and *p*-value have been reported. The high standard deviation of LDSI with respect to the mean is an indication the high volatility in the stock market . From the p-values , the null hypothesis of that LNDSI and TB are normally distributed at 1% level of significance can not be rejected. All the variable are positively skewed except TB

Table 2: Descriptive Statistics

	LNDSI	ER	CPI	TB	OP	FDI
Mean	6.673750	267.3350	23.69500	28.67172	26.30188	34.03266
Median	6.840000	198.5900	18.57500	29.39000	20.22000	29.60500
Maximum	9.020000	873.1700	70.08000	46.00000	68.76000	126.4600
Minimum	4.330000	46.57000	7.900000	9.530000	11.64000	1.480000
Std. Dev.	1.413667	256.3345	14.57653	9.986343	14.13344	25.48906
Skewness	0.011348	1.148752	1.643429	-0.169336	1.661177	1.687130
Kurtosis	2.153272	3.067969	5.438478	2.107776	4.872909	6.347619
Jarque-Bera	1.913236	14.08838	44.66561	2.428699	38.78886	60.24584
Probability	0.384190	0.000872	0.000000	0.296903	0.000000	0.000000

Sum	427.1200	17109.44	1516.480	1834.990	1683.320	2178.090
Sum Sq. Dev.	125.9027	4139564.	13385.95	6282.804	12584.51	40930.60
Observations	64	64	64	64	64	64

4.2 Unit Root Test

Table 3 represent unit root test conducted to determine the stationarity of the variable. Augmented Dickey-Fuller (ADF) test were employed . The result indicate that all the data were non-stationary at levels but become stationary after first differencing at 5% significant level.

Table 3 : ADF Unit Root Test on Variables

SERIES	LEVELS	FIRST DIFFERENCE	ORDER OF INTEGRATION
LNDSI	-1.107392	-4.659090**	I(1)
CPI	-0.91869	-3.348457**	I(1)
OP	0.683195	-3.539432**	I(1)
FDI	-1.384954	-4.176360**	I(1)
TB	-2.123341	-5.464368**	I(1)
ER	-0.673583	-7.743717**	I(1)

[Note: ** denote significance at 5% , critical values are from Mackinnon (1999)]

4.3 Cointegration Test

The next step involves estimating the model and determining the rank of p to find the number of cointegrating relations in our model. The model lag selection is based on the lowest SIC (see appendix 1). The result of the cointegration test is represented in table 4. The trace statistic suggests two cointegrating vector , and the maximum eigenvalue statistic one cointegrating vector at the 5% significance level (see Table 4 and 5). Given the evidence in favour of at least one cointegrating vector, we normalise the cointegrating vector on the natural log of stock price (LNDSI)

Johansen Cointegration Test

Sample : 1991Q1-2007Q4
Trend assumption: Linear deterministic trend
Series: LNDSI TB CPI OP FDI ER
Lags interval (in first differences): 1 to 2

Table 4: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.620114	131.4750	95.75366	0.0000
At most 1 *	0.381455	72.43412	69.81889	0.0305
At most 2	0.248774	43.13065	47.85613	0.1294
At most 3	0.203878	25.68164	29.79707	0.1385
At most 4	0.175438	11.77346	15.49471	0.1681
At most 5	0.000105	0.006411	3.841466	0.9356

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.620114	59.04089	40.07757	0.0001
At most 1	0.381455	29.30348	33.87687	0.1596
At most 2	0.248774	17.44900	27.58434	0.5416
At most 3	0.203878	13.90818	21.13162	0.3726
At most 4	0.175438	11.76705	14.26460	0.1197
At most 5	0.000105	0.006411	3.841466	0.9356

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The normalized cointegrating coefficients for LNDSI is shown in table 6. We can therefore write our cointegrating relationship as

$LNDSI_t = 8.412054 \quad -0.061841TB_t - 0.007643CPI_t - 0.015069OP_t + 0.025463FDI_t - 0.000751ER_t$

All the coefficients of the variables are correctly sign with TB and FDI being significant. The negative and significant relationship between TB is expected . This because investing in treasury bill were more lucrative than stock market in the late 90's due to high T-bill rate . This slowdown the performance of the Ghana stock market . The opening of the market to non-resident Ghanaians and foreigners in June 1993 was a big boost to the development of the market. Exchange Control permission was given to foreigners and non-resident Ghanaians to invest through the Exchange without prior approval. This has attracted a number of top-rated foreign institutional buyers. Thus positive and significant relationship between FDI and stock market in Ghana. A negative relation between inflation and stock prices is expected as an increase in the rate of inflation is likely to lead to economic tightening policies, which in turn increases the nominal risk-free rate and hence raises the discount rate in the valuation model . This is consistent with Fama and Schwert (1977), Chen, Roll and Ross (1986) and Jaffe and Mandelker (1976). Ghana economy depends on imported goods and that the depreciation of the Ghana cedi makes increases prices of goods which pushes inflation up. The depreciation is also disincentive to non-resident investors in terms of repatriation of profit and earning.

Table 6: Normalized cointegrating coefficients (standard error in ( )and t-Statistics in [])

LNDSI	TB	CPI	OP	FDI	ER
1.000000	0.061841	0.007643	0.015069	-0.025463	0.000751
	(0.01957)	(0.00711)	(0.01117)	(0.00511)	(0.00050)
	[3.16080]**	[1.07467]	[1.34908]	[-4.98477]**	[1.48760]

** indicates significance at 5% level.

4.4 Vector Error Correction Model (VECM)

The existence of at least one cointegrating vector among the variables implies that an ECM can be estimated to investigate the short-run relationship. Table 7 reports the error correction model. The coefficient of the ECM has the right sign and are statistically significant as seen from the table 5. The extent to which pass value of the variable explain the stock market movement is significantly shown. For example a reduction in the growth of interest rate is largely significant in causing growth of stock prices.In terms of performance, the model perform well . The model passes all diagnostic , no serial correlation and no problem of heteroscedasticity. In addition, passes all stability test (see Appendices 2).

The estimated coefficient of the error correction term (-0.054) is statistically significant at the 5 per cent level and with the appropriate (negative) sign indicating existence of long -run relationship . About 5% of disequilibrium is corrected every quarter .

Table 7 : Error Correction Model

Dependent Variable: D(LNDSI)
Method: Least Squares
Sample (adjusted): 4 64
Included observations: 61 after adjustments
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNDSI(-1))	0.668506	0.199284	3.354535	0.0017
D(LNDSI(-2))	-0.074355	0.141987	-0.523676	0.6032
D(TB(-1))	-0.020520	0.008988	-2.283106	0.0274
D(TB(-2))	0.016922	0.007756	2.181734	0.0346
D(CPI(-1))	-0.012942	0.006083	-2.127378	0.0392
D(CPI(-2))	0.007783	0.004141	1.879263	0.0670
D(OP(-1))	-0.000890	0.006062	-0.146839	0.8839
D(OP(-2))	-0.006676	0.006727	-0.992378	0.3266
D(FDI(-1))	-0.000648	0.002134	-0.303683	0.7628
D(FDI(-2))	-0.000463	0.002351	-0.196866	0.8449
D(ER(-1))	0.000612	0.001582	0.386762	0.7008
D(ER(-2))	0.001952	0.001670	1.168768	0.2489
D(OP)	-0.009632	0.004509	-2.135899	0.0384
D(ER)	-0.002375	0.001056	-2.248534	0.0297
D(TB)	0.019606	0.009965	1.967521	0.0556
D(FDI)	0.003162	0.001937	1.632314	0.1099
D(CPI)	0.004206	0.004025	1.044932	0.3019
C	0.044989	0.033488	1.343419	0.1862
RESID(-1)	-0.054184	0.413052	-2.833270	0.4095

R-squared	0.452032	Mean dependent var	0.072295
Adjusted R-squared	0.235393	S.D. dependent var	0.143322
S.E. of regression	0.125324	Akaike info criterion	-1.075343
Sum squared resid	0.675359	Schwarz criterion	-0.452463
Log likelihood	50.79797	Hannan-Quinn criter.	-0.831230

Diagnostic Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.485655	Prob. F(7,42)	0.8395
Obs*R-squared	3.592711	Prob. Chi-Square(7)	0.8253

Heteroskedasticity Test: ARCH

F-statistic	13.34615	Prob. F(2,58)	0.0006
Obs*R-squared	11.22372	Prob. Chi-Square(2)	0.0008

5.0 Conlusion And Summary

This paper examined the relation between macroeconomic variables; Inflation , interest rate exchange rate, Oil prices , inward FDI, and the Ghana stock market represented Databank Stock from 1991.1 to 2007.4. Index using Johansen's (1990) VECM, a full information maximum likelihood estimation model. Our conclusions were that the Ghana stock market formed significant relationships with the macroeconomic variables identified.

The conclusions drawn from the study will be give hint to whether there exist opportunities for profit from the inefficiencies of stock market mechanisms in the transfer of information between stock market and the macro economy , The presence of a cointegrating relationship between macroeconomic variables and stock prices brings the conclusions of the efficient market hypothesis in doubt. Establishing the lead lag in the short- run through the ECM indicate that investors can use past values to reap abnormal profit.

REFERENCE

Ajayi, Richard A, and Mbodja Mougoue, 1996, On the Dynamic Relation between Stock Prices and Exchange Rates, *Journal of Financial Research 19*, 193-207.

Berlemann, M., Dimitrova, K. and Nenovsky, N., 2005, Assessing Market Expectations on Exchange Rates and Inflation: A Pilot Forecasting System for Bulgaria,*William Davidson Institute Working Paper No. 759*

Brown, S.J. and T. Otsuki, 1990, Macroeconomic Factors and the Japanese Equity Markets: The CAPMD project, in E.J. Elton and M. Gruber (eds.), *Japanese Capital Market*s, New York: Harper and Row.

Chen, N.F., R. Roll and S.A. Ross, 1986, Economic Forces and the Stock Market, *Journal of Business* 59, 383-403.

Cheung, Y. W. and K.S. Lai, 1992, Finite-Sample Sizes of Johansens's Likelihood Ratio Tests for Cointegration, *Oxford Bulletin of Statistics and Economics* 54, 313-328.

Cushman, D.O. and S. S. Lee, 1996, Maximum Likelihood Estimation of Cointegration in Exchange Rate Models for Seven Inflationary OECD countries, *Journal of International Money & Financ*e, 15, 337-368.

Darrat, A.F., 1990, Stock Returns, Money, and Fiscal Policy, *Journal of Financial andQuantitative Analysis* 25, 387-398.

Darrat, A.F. and T.K. Mukherjee, 1987, The Behavior of the Stock Market in a Developing Economy, *Economics Letters* 22, 273-278.

DeFina, R.H., 1991, Does Inflation Depress the Stock Market?, *Business Revie*w, Federal Reserve Bank of Philadelphia, 3-12.

Dickey, D.A. and W.A. Fuller, 1981, Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root, *Econometrica* 49, 1057-1072.

Driesprong, Gerben, Jacobsen, Ben and Maat, Benjamin, "Striking Oil: Another Puzzle?", 2007. *EFA 2005 Moscow Meetings Paper*

Dwyer, G.P. and M.S. Wallace, 1992, Cointegration and Market Efficiency, *Journal of International Money & Financ*e, 14, 801-821.

Engle, R.F and C.W.J. Granger, 1987, Cointegration and Error Correction: Representation, Estimation and Testing, *Econometrica* 55, 251-130.

Fama, E.F., 1981, Stock Returns, Real Activity, Inflation and Money, *American Economic Review* 71, 545-565.

Fama, E.F., 1990, Stock Returns, Expected Returns, and Real Activity, *Journal of Finance* 45, 1089-1108.

Fama, E.F., 1991, Efficient Capital Markets: II, *Journal of Finance* 46, 1575-1617.
10

Fama, E.F. and G.W. Schwert, 1977, Asset Returns and Inflation, *Journal of FinancialEconomics* 5, 115-146.

Geske, R. and R. Roll, 1983, The Fiscal and Monetary Linkage Between Stock Returns and Inflation, *Journal of Finance* 38, 7-33.

Granger, C.W.J., 1986, Developments in the Study of Cointegrated Economic Variables, *Oxford Bulletin of Economics and Statistics* 48, 213-27.
Gunasekarage, A. and D.M. Power (2001), ‘The Profitability of Moving Average Trading Rules in South Asian Stock Markets’, *Emerging Markets Review*, 2: 17–33.

Ho, Y., 1983, Money Supply and Equity Prices: An Empirical Note on Far Eastern Countries, *Economic Letters* 11, 161 – 165.

Humpe, A., and Macmillan, P.,2007, Can Macroeconomic Variables Explain Long Term Stock Market Movements? A Comparison of the US and Japan *CDMA Working Paper* No. 07/20

Hussain. F., and Mahmood.T., 2001, The stock Market and the Economy of Pakistan. The Pakistan development Review 40:2. 107-114

International Financial Statistics , various issues
Jaffe, J. and Mandelker, G., 1976, The ‘Fisher Effect’ for Risky Assets: An Empirical Investigation, Journal of Finance 31,447-58.

Jefferis,K., Okeahalam C. and Matome T., 2001 International Stock Market Linkages in south Africa, *AERC Research Paper 105*
Johansen, S., 1991, Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models, *Econometrica* 59, 1551-1580.

Johansen, S., 1995, *Likelihood based Inference in Cointegrated Vector Auto-Regressive Model*s, Oxford University Press.

Johansen, S. and K. Juselius, 1990, Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money, *Oxford Bulletin of Economics and Statistics* 52, 169-210. *Financial Research* 18, 223-237.

Johansen, S. and K. Juselius, 1994, Identification of the Long-Run and the Short-Run Structure. An Application of the ISLM Model, *Journal of Econometrics,* 64, 7-3*6.*

Lee, B.S, 1992, Causal Relationships Among Stock Returns, Interest Rates, Real Activity, and Inflation, *Journal of Finance,* 4*7,* 1591-1603.
Leibowitz, M. L. , Sorensen, E.H., Arnott, R. D. and Hansen, N. H., 1989, A total differential approach to equity duration, *Financial Analysts Journal.*

Lo, W., H. Fund, and J.N. Morse, 1995, A Note on Euroyen and Domestic Yen InterestRates, *Journal of Banking & Financ*e, 19, 1309-1321.

Lutkepohl, H. and H.E. Reimers, 1992, Impulse Response Analysis of Cointegrated Systems, *Journal of Economic Dynamics and Control* 16, 53-78.

Maysami, R. C. and Koh, T. S., 2000, A Vector Error Correction Model of the Singapore

Stock Market, *International Review of Economics and Finance* 9, 79 – 96.

Nishat. M., and M. Saghir, 1991, The stock Market and Pakistan Economy. Savings and Development 15:2. 131- 145

Nishat, M.,and Shaheen, R., 2004, Macroeconomic Factors and Pakistani Equity Market, *The Pakistani Development Review* 43:4

Osterwald-Lenum, M, 1992, A Note with Quantiles of the Asymptotic Distribution of the Maxi mum Likelihood Cointegration Rank Test Statistics, *Oxford Bulletin of Statistics and Economics* 54,

Oyama, Tsuyoshi, "Determinants of Stock Prices: The Case of Zimbabwe 1997,I*MF Working Paper No. 97/117*

Poterba, J.M. and L.H. Summers, 1988, Mean Reversion in Stock Prices: Evidence and Implications, *Journal of Financial Economics* 22, 27-59.

Quartey,P.,and Gaddah, M., (2007), Long Run Determinants of Stock Market Development in Ghana, *Journal of Africa Business* 8, 2

Sharma, J.L. and R.E. Kennedy, 1977, A Comparative Analysis of Stock Price Behavior on the Bombay, London, and New York Stock Exchanges, *Journal of Financial and Quantitative Analysis* 17, 391-413.

Tessaromatis, Nicholas, 2003, Stock Market Sensitivity to Interest Rates and Inflation . E*FMA 2003 Helsinki Meetings*

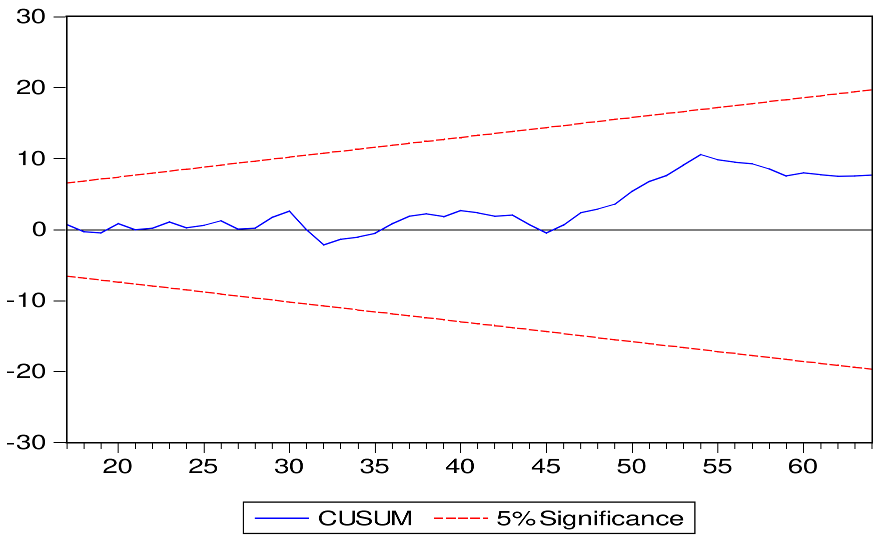
Appendices

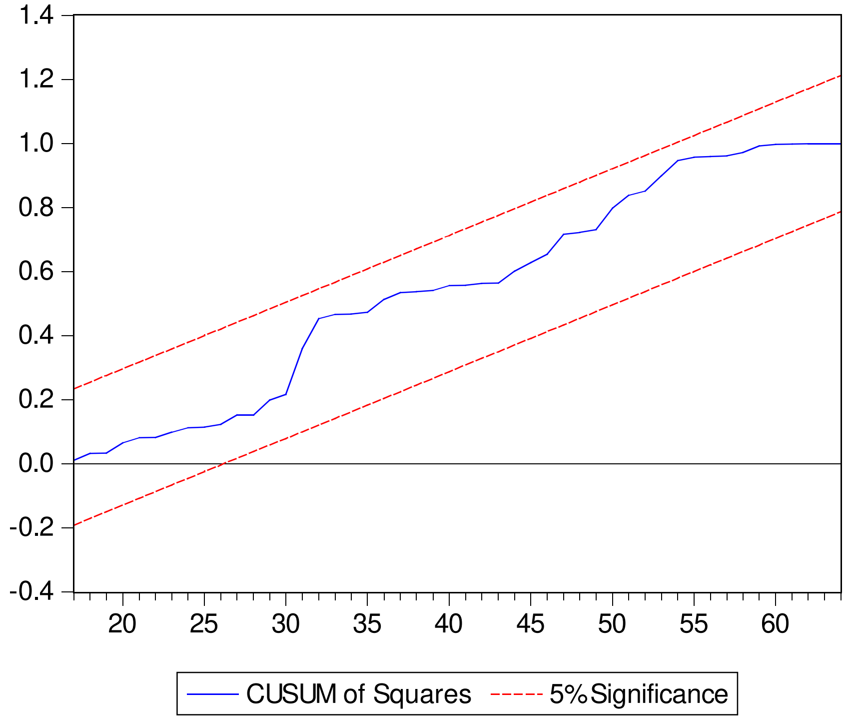
Appendix 1: VAR Lag selection

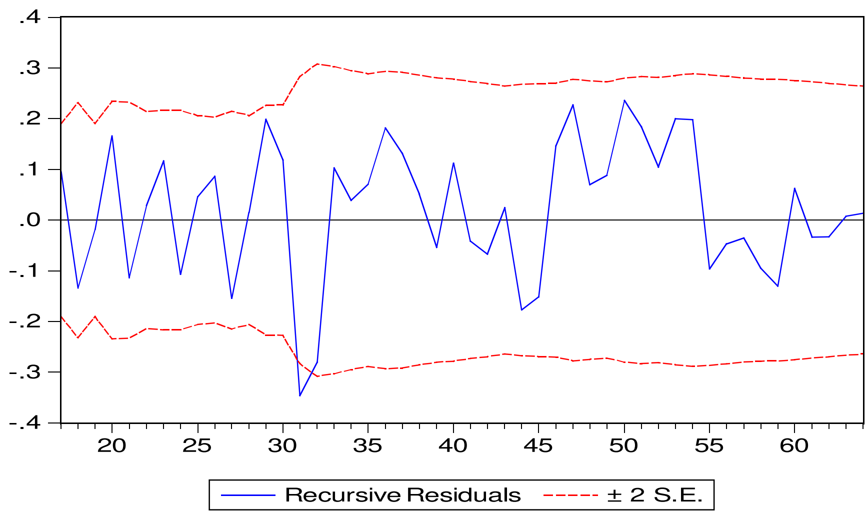
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1263.984	NA	9.07e+11	44.56083	44.77589	44.64441
1	-818.2908	781.9172	522226.5	30.18564	31.69105	30.77070
2	-749.0854	106.8435	169781.7	29.02054	31.61629*	30.10707
3	-716.5818	43.33810	214237.8	29.14322	33.22932	30.73122
4	-676.7737	44.69688	234469.7	29.00960	34.38605	31.09907
5	-609.1483	61.69332	116053.1	27.89994	34.56674	30.49089
6	-547.2718	43.42213	94904.90	26.99199	34.94914	30.08441
7	-436.5993	54.36541*	24069.22*	24.37191*	33.61940	27.96580*

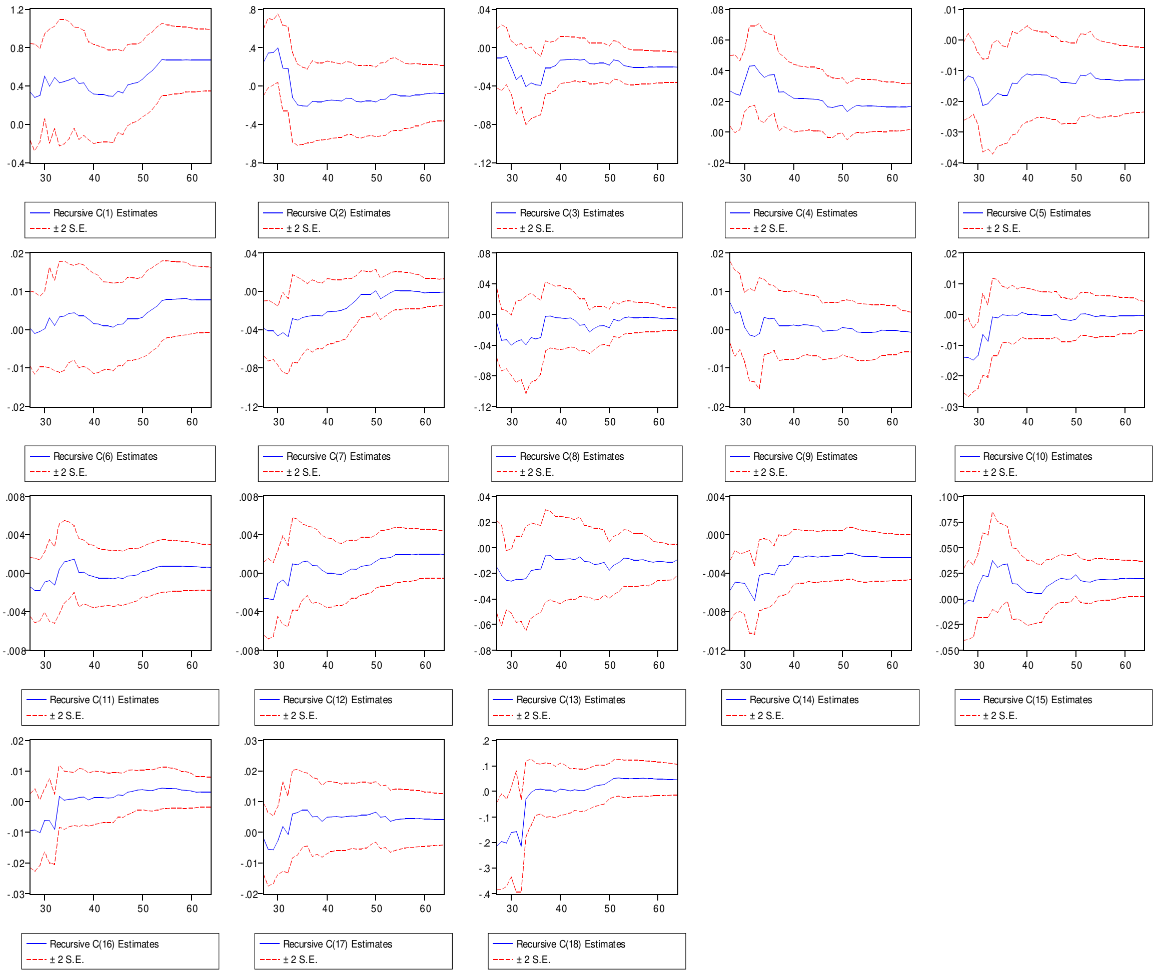
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 2 : Stability test




1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
20
25
30
35
40
45
50
55
60
CUSUM of Squares
5% Significance


.4
.3
.2
.1
.0
-.1
-.2
-.3
-.4
20
25
30
35
40
45
50
55
60
Recursive Residuals
± 2 S.E.


Recursive C(1) Estimates
± 2 S.E.
Recursive C(2) Estimates
± 2 S.E.
Recursive C(3) Estimates
± 2 S.E.
Recursive C(4) Estimates
± 2 S.E.
Recursive C(5) Estimates
± 2 S.E.
Recursive C(6) Estimates
± 2 S.E.
Recursive C(7) Estimates
± 2 S.E.
Recursive C(8) Estimates
± 2 S.E.
Recursive C(9) Estimates
± 2 S.E.
Recursive C(10) Estimates
± 2 S.E.
Recursive C(11) Estimates
± 2 S.E.
Recursive C(12) Estimates
± 2 S.E.
Recursive C(13) Estimates
± 2 S.E.
Recursive C(14) Estimates
± 2 S.E.
Recursive C(15) Estimates
± 2 S.E.
Recursive C(16) Estimates
± 2 S.E.
Recursive C(17) Estimates
± 2 S.E.
Recursive C(18) Estimates
± 2 S.E.