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Impact of Macroeconomic Factors on Stock Exchange Prices: Evidence from USA Japan and China

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Impact of Macroeconomic Factors on Stock Exchange Prices:

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Abstract

This paper investigates the long run relationship between macroeconomic indicators of terms of trade, oil prices, rate of interest, money supply (M3), index of industrial production and stock exchange prices indices for the USA Japan and China by focusing on the global financial recession. This study examines whether the same model can explain USA, Japanese and Chinese stock markets, while yielding consistent factors loading. Using monthly time series data of the respective variables of the range 2005-1 to 2010-5 Autoregressive Distributive Lag ARDL co-integration approach used for data analysis. Our results vary from one country to another. An explanation of the difference in behavior between the three stock markets may lie as USA economy is most affected by financial crises, 2007 and Japanese economy slump after 1990, china is least affected economy by financial crises, 2007. In the context of recent global financial recession, no study has so far been traced which explains the causal relationship between macroeconomic variables and stock markets of USA, Japan and China. Our results are helpful for investors, national policy makers and corporate managers etc.

Key words: Macro-economic indicators, co-integration, index of industrial production, money supply.
JEL Classification: G10, G14, G21

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INTRODUCTION

In July 2007, the global financial crisis started with the credit crunch as in USA investors lost confidence due to the value of subprime mortgages as the Subprime mortgage crisis has not only hampered the real estate stocks but also many other related sectors. This resulted in US Federal Bank inject a large amount of capital into financial markets. January 2008 was an especially highly volatile month in around the world's stock markets, some headline writers and a general news columnist called January 21, 2008 "Black Monday" and referred to a "global shares crash," though the effects were quite different in different markets. Shanghai Composite Index in China also affected by these events and lost by 5.14 percent, the largest drop in 10 years.

By September of 2008 the collapse of Lehman Brothers start a new phase in the global financial crisis as the crisis had worsened and stock markets not only in USA but around the globe crashed and became highly volatile. Therefore, investors start switches their investment from risky stock markets to gold, interest rate based bounds and US dollar or Euro currency as in these way investors can get higher risk free returns.

In Japan exports in June declined by 1.7% for the first time in about five years. The decline in exports and increase in imports cut Japan's trade surplus by $1.28 billion. Japan's economy declined by 0.6 percent in the second quarter of 2008 this was later revised to a decline of 0.7 percent. Japanese exports grew by 0.3 percent in August 2008 compared to a year before down from 8 percent the previous month. Exports to the U.S. fell 21.8 percent, the biggest decline on record, and exports to Europe fell 3.5 percent. However, because of reduced global demand for manufacturing products, between September of 2008 and March of 2009, in Japan industrial production has declined by 30 percent and GDP in the first quarter of 2009 dropped by 15.4 percent at an annualized rate.

Despite slumping global demand for US exports, the net effect of international financial channels was to support its activities, as money flowed into the dollar and US assets. GDP in the first quarter of 2009 fell by 5.7 percent in the United States, and is expected to shrink by 4 percent overall for the year. China is least affected by the global financial crises as its fiscal position is strong and is enjoying large surplus current account. While China is feeling the slump of diminished export demand, its equity and debt markets are substantially less exposed to foreign investors than other emerging markets.

Economist James D. Hamilton has argued that the increase in oil prices in the period of 2007-2008 was also significant cause of the recession. As from the mid of 1980s to September 2003, the inflation-adjusted price of a barrel of crude oil was generally under $25/barrel. During 2003, the price of crude oil rose by above than $30, in August 11, 2005 it reached $60, and in July 2008 it peaked at $147.30 and this consistently rise in oil prices affected the economies in many ways.

Above facts shows that the crisis started in one economy and then spread out to other economies through capital markets and financial channels, and eventually affected the countries' macroeconomic indicators. From above discussion, it seems that there may be a causality relationship between stock market and macroeconomic indicators of a country. Hence, this study will empirically examine the long run as well as short run relationship among stock markets and macroeconomic factors in the three major economies of the world during the global financial crisis period of 2005-1 to 2010-5. In addition the study examine can performance of the stock market be use as an important factor that shows the conditions of the economy of a country? Can macro-economic variables use to predict stock market returns in above said economies?

The results show that in USA and China, in long run (LR) as well as short run (SR) rate of interest, industrial production index and Money supply (M3) is positively related to the stock exchange prices. The results of Japan shows that rate of interest is positively and highly significantly in LR but in SR, at first lag it has positive but at second lag has negative relation with stock exchange prices. For Japan data, in LR industrial production index has positive and insignificant relation with stock exchange prices and in SR, at first lag it has positive but at second lag has negative relation stock exchange prices. For Japan, money supply (m3) in LR has positive but in SR has negative and significant relation with stock exchange prices. In all three economies USA, Japan and China, in long run term of trade (TOT) has positive relation with stock prices. But in USA and Japan, in sort run TOT is negatively related with stock exchange prices. For China's data, in short run TOT is positively related with stock prices. In all three economies, in long run oil prices are negatively related to the stock exchange prices but in short run, in USA oil prices have positive relation, in Japan oil prices have negatively related and in China at first lag it has positive but at second lag has negative relation with stock exchange prices. This study shows that the long run model, can explain USA, Chinese stock markets, yielding consistent factors loading, but not Japan's stock market. But the short run model, cannot explain USA, Japan and Chinese stock markets, yielding consistent factors loading. An explanation of the difference in behavior between the three stock markets may lie as USA economy is most affected by financial crises, 2007 and Japanese economy slump after 1990, china is least affected economy by financial crises, 2007.

The movement in stock exchange is an important indicator of an economy process and a clear understanding of stock exchange determinants is very important for investors, national policy makers, corporate managers and researchers. In this study we will use only five explanatory variables for the analysis of the behavior of the stock exchange returns but there are also many other factors which can influence the share prices thus future researches will be required to widely explore this issue. This study will use the data of the range 2005-1 to 2010-5 so there is possibility that it does not cover all fluctuations of the stock markets of the said countries.

The paper is organized as follows: In section 2, we review some empirical studies. Section 3 discuses data and methodology, while section 4 present empirical results. In last section, we provide concluding remarks.

2. SURVEY OF THE LITERATURE

Stock market plays an important role in the development of the economy of a country. A number of studies have been investigated on the causal relationship between macroeconomic variables and stock exchange returns as Linter (1975), Fema and Schwert (1977), Fama (1981, 1982), Geske and Roll (1983) and Caporale and Jung (1997) are find out that there is negative relationship between real stock returns and inflation in US and European stock markets. Chatrath and Ramchander (1997) and Hu and willett (2000) provide evidence from India and Ahmed and Mustafa (2004) provide evidence from Pakistan that there are negative and significant relationship between inflation rate and real stock returns.

In a period of rising oil prices, transportation index become decline as oil price increases will negatively impact transportation costs, and hence profits in that market sector. But the same price increase will favorably increase the energy sector. Not only will gas and oil companies show increased profits, the general increase in prices in oil make wind and solar enterprises more profitable, since they can now charge higher prices. Similarly, rising oil prices may negatively affect an emerging market economy that uses oil, but has no oil production facilities, yet positively affect an emerging market economy that produces oil. However, Chen et al. (1986) failed to find any relationship between the stock index and the oil price in US. Sadorsky's (1990) he draws attention to a negative relationship between stock returns and shocks in oil prices for US economy and his research also indicates a negative impact of shocks to real stock returns on interest rates and industrial production.

According to quantity theory of money as the money supply increase the general prices level also increase. Thus theoretically, as money growth increase, it is expected that the rate of inflation also increase, consequently the stock price should decrease. However, money growth also stimulate the economy and increase corporate earnings as Mukherjee and Naka (1995), Kwon and Shin (1999) and Maysami and Koh (2000), reported that there is a positive relationship between money supply and stock exchange prices.

Muhammad and Rasheed (2002) they use co-integration vector error correction modeling technique and Granger causality tests to investigates the association between stock returns and rate of exchange in Bangladesh, Pakistan, India and Sri- Lanka. They took monthly data of the period 1994-1 to 2000-12. The results of the study show that there is no short run relationship between these two variables in above said countries. The study also found that there is no long run association between these variables in Pakistan and India but for Bangladesh and Sri- Lanka evidence show a bi-directional causality between these two financial variables.

Chin-Hong and Jayaraman (2007) investigate causal relationship between capital stock prices and macroeconomic activities in Fiji. The findings of the study show that all macroeconomic variables have to contribute to the long-run equilibrium relationship as the estimation of the error correction model shows that the stock market price index is co-integrated with real economic activities in the long run, and it adjusts rather fast from short-run deviations towards long run equilibrium level. Except for rate of interest, M2, real output and rate of exchange do granger cause to the stock returns in the short-run. Finally, it is noted that potential macroeconomic variables could provide impetus to the Fiji stock market and by knowing the linkages between stock returns and macroeconomic variables, investors can obtain information to predict the movement in stock returns and government can play a more active role to stabilize fluctuations in the stock exchange market.

Tursoy, Gunsel and Rjoub (2008) used OLS technique and tested 13 macroeconomic variables against 11 industries portfolios to observe the influence of these variables on Istanbul Stock Exchange. The thirteen variables used in this study are: M2, crude oil price, consumer price index (CPI), import, export, gold price, exchange rate, interest rate, gross domestic product (GDP), foreign reserve, unemployment rate, market pressure index (MPI) and industrial production. The results of this study indicates that there is no significant relation between tested macroeconomic variables and stock returns in Istanbul Stock Exchange as a macroeconomic variable affect one industry positively but may affect other industry negatively so each portfolio affects different industry in different manner by macroeconomic variables and thus multifactor APT fails to explain the effect in stock market.

Mohammad, Hussain and Ali (2009) they try to examine the relationship between macroeconomic variables and stock prices of Karachi stock exchange. They took quarterly data from 1986 to 2008. They used foreign exchange rate, foreign exchange reserve, gross fixed capital formation, M2, call money rate, Industrial production index and whole sales price index variables for this paper and used ARIMA model for testing the impact of above said variables on stock prices. They used unit root technique to make data stationary. The result indicates that there is significant relationship between interest rate, M2, exchange rate, exchange reserve and the stock prices. Few variables like Industrial production index and gross fixed capital formation have neglect able effects to stock prices.

Robert D. Gay (2008). He used ARIMA modal in OLS technique to examine the relationship between macroeconomic variables and stock prices for four emerging economies India, Brazil, China and Russia. He used macroeconomics variables (explanatory variables); oil price, exchange rate and moving average lag values. The result shows that above macroeconomics variables has insignificant impact on stock price which shows market inefficiency. The final conclusion is, as these are emerging economies so other domestic and international macroeconomics factors has more influence on stock market returns.

Mahmood, Dinniah (2009) they used Error Correction Model to analyze the multivariate causality between foreign exchange rate, CPI, industrial production index and stock prices for the countries of Japan, Malaysia, Hong Kong, Thailand, Korea, and Australia. They took sample of monthly data from January 1993 to December 2002.The findings show that there is long run equilibrium relationship exist between variables only in four countries; Japan, Korea, Australia and Hong Kong and in the short run there is no interaction in the short run relation between all above mention variables in all selected countries except between real output and stock price in Thailand and between foreign exchange rates and stock price in Hong Kong.

Andreas Humpe and Peter Macmillan (2009) within the framework of a standard discounted value model and by employed co-integration analysis Humpe and Macmillan (2009) examined whether industrial production, CPI, long run interest rate and money supply influence to the stock prices in Japan and US. The findings shows that in US the data are consistent with a single co-integrating vector, where stock price is negatively related to CPI and long run interest rate but positively related to industrial production. The results also indicate that there is positive but insignificant relationship between US stock prices and money supply. For the Japanese data, research found two co-integrating vectors. For the first vector result indicated that stock prices are positively influenced by industrial production and negatively by the money supply. The results for second co-integrating vector shows consumer price index and a long-term interest rates negatively influenced to the industrial production.

Ali et al,(2010) They used Johansen's co-integration and Granger's Causality Test and data from June 1990 to December 2008 to examine relationship between various macroeconomic variables and stock market prices in Pakistan. They used inflation rate, balances of trade, exchange rate, and industrial production index as macroeconomic indicators. The results of the study show that there is no causal relationship between macroeconomic variables and stock exchange prices, only co-integration found between industrial production index and stock exchange prices. Finally finding suggests that performance of macroeconomic variables cannot predict stock exchange prices and stock market prices do not reflect the macroeconomic condition of Pakistan.

G. Kutty (2010) he employed Granger causality test to investigate the relationship between stock returns and rate of exchange in Mexico and found no long run relationship between these variables.

3. Research methodology

1. Variables Identification:

Stock Exchange Price Index (SPE): In this research, the adjusted closing stock price index of the month of the three economies (USA, Japan and China) stock market, which are NASDAQ Composite of USA, NIKKIE 225 of Japan and Shanghai Composite of China are employed as measurement of the countries' monthly stock market price movements.

Interest Rate(R): Interest rate is the price of borrowing money which is paid to the lender. There are many type of interest rates but here we will be used short run interest rate.

Broad money supply (M3): Broad money supply, in addition to currency in circulation plus sight deposits held by domestic non-banks also include time deposits as well as savings deposits at short-notice held by domestic non-banks.

Industrial production index (IP): An industrial production index consists on the production of mining, manufacturing and public utilities.

Cured oil prices(Fuel): All countries spot oil Price FOB of last week of the month which is weighted by estimated export volume (Dollars per Barrel).

Term of Trade (TOT): The ratio of exports (goods and services) and imports (goods and services) takes as term of trade for data analysis.

2. Data Collection:

We used monthly time series data of the range 2000-1 to 2010-5 for USA Japan and China. The data of the variables term of trade (TOT), rate of interest (R), index of industrial production (IP), broad money (M3) of the USA Japan and China obtain from Organization of Economic Corporation and Development (OECD) only the data of oil prices(OP) and the index of industrial production of USA obtain from Federal Reserve's Bank(FRB) and the data of Stock Exchange Prices(PSE) of NASDAQ, NIKKEI-225 and Shanghai for USA Japan and China respectively obtain from the Yahoo Finance. Data of the all variables take in natural logarithm from for the analysis.

3. Econometric Techniques

In order to find the long run and short run relationship between stock exchange prices and macro variables in the respective countries of the USA Japan and china, an appropriate econometric technique is required. Most of the studies used Johansen Juselius co integration test (JJ Test), Vector Error Correction model (VECM) and Enger Granger causality test to examine the long run and short run relationship between the variables. But these co integration techniques can be used only if all the variables are stationary at the same level. But Autoregressive distributive lag (ARDL) bounds testing approach to co integration has some merits over above stated co integration techniques as ARDL approach can be used irrespective of whether the variables are integrate at I(0), I(1) or mix order but no variable is integrated of I(2) or higher order.

The study uses an Autoregressive Distributive Lag (ARDL) approach to co-integration developed by Pesaran et al. (2001), to check the existences of the long run and short run relationship between the variables.

The general from of the Autoregressive Distributive Lag (ARDL) model can be written as:

$$\Delta LPSE_t = \alpha_0 + \sum_{i=1}^{n} b_i \Delta LIP_{t-i} + \sum_{i=1}^{n} c_i \Delta LR_{t-i} + \sum_{i=1}^{n} d_i \Delta LM3_{t-i} + \sum_{i=1}^{n} e_i \Delta LOP_{t-i}$$

$+\sum_{i=1}^{n} g_i \Delta LBOT_{0,t-i} + \delta_1 LPSE_{t-1} + \delta_2 LIP_{t-1} + \delta_3 LR_{t-1} + \delta_4 LM3_{t-1} + \delta_5 LOP_{t-1}$

$+ \delta_6 LBOT_{t-1}$ model (1)

Where α, b, c, d, e, g and δ are coefficients and Δ used for the difference of the variables and 'n' shows the number of lags used.

The error correction version of ARDL model has applied through two step procedure. **Firstly**, for checking the existences of long run relationship between variables of the model we test the null hypothesis

H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \ldots\ldots\ldots\ldots = \delta_n = 0$ (no long run relationship)

Against alternative hypothesis

H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \ldots\ldots\ldots\ldots \neq \delta_n \neq 0$ (There is long run relationship)

We test hypothesis by using the ARDL bound test. ARDL bound test is based on F-test which has a non-standard distribution irrespective of whether the variables are integrate at I(0) or I(1). Pesaran et al. (1996) give two critical bound values. The lower bound critical values assumes that all variables of I(0) and upper bound critical values assumes that all variables of I(1). If the computed F-statistic is greater than upper bound it reject H_0 in favor of H_1, showing co-integration. If the computed F-statistic is less than lower bound it reject H_1 in favor of H_0, showing no co-integration. If the computed F-statistic is fall between the upper bound and lower bound, the results are inconclusive. **Secondly,** after establish the co-integration between variables, the lag order of the variables is selected by using Akaike Information Criteria (AIC). After determine the lag order of the variables, the long run parameters of the model are estimated and then obtain short run co-efficient by estimating error correction model. This is specified as follows:

$\Delta LPSE_t = \alpha_0 + \sum_{i=1}^{n} b_i \Delta LIP_{t-i} + \sum_{i=1}^{n} c_i \Delta LR_{t-i} + \sum_{i=1}^{n} d_i \Delta LM3_{t-i} + \sum_{i=1}^{n} e_i \Delta LOP_{t-i} + \sum_{i=1}^{n} g_i \Delta LTOT_{0,t-I}$

$+ \varphi ecm_{t-1}$ model (2)

Here *α, b, c, d, e* and *g* are the short run dynamic coefficients of the model, which are convergent to the equilibrium and *φ* is the speed of adjustment.

4. Empirical Result

Table 1

Augmented Dickey Fuller Test (ADF) unit root test

Countries	Variables	level	1st difference	decision
USA	Lpse	-2.142061	-5.763582***	I(1)***
	Lip	-2.470276	-5.745863***	I(1)***
	Lr	-2.339568	-6.717834***	I(1)***
	Lbot	-3.288148	-4.020912***	I(1)***
	Lfuel	-2.695400	-5.246642***	I(1)***
	Lm3	-1.172954	-3.719612**	I(1)**
Japan	Lpse	-2.011385	-6.061642***	I(1)***
	Lip	-2.272286	-3.968801***	I(1)***
	Lr	-2.583981	-8.613015***	I(1)***
	Lbot	-1.671331	-11.17121***	I(1)***
	Lfuel	-2.695400	-5.246642***	I(1)***
	Lm3	-1.429029	-4.423576***	I(1)***
China	Lpse	-0.865322	-7.103590***	I(1)***
	Lip	-6.300622**	-------	I(0)***
	Lr	-1.631890	-3.941916**	I(1)**
	Lbot	-2.736950	-12.73121**	I(1)***
	Lfuel	-2.695400	-5.246642**	I(1)***
	Lm3	-1.227832	-3.340845*	I(1)*

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

Unit root test

The study used Augmented Dickey Fuller Test (ADF) unit root test for check the stationary level of the variable. This will make sure that all variables are stationary at I(0) or I(1) and no variable of I(2) or beyond. According to ADF unit root test (table 1) all variables are stationary of I(1) only industrial production index (lip) and balance of trade (lbot) of china are stationary of I(0). The results all shows that none of the variable is stationary at I(2) or higher order. So the appropriate technique of the data analysis is ARDL approach to co-integration.

Result of USA

Following the first step in ARDL co-integration based model of USA the study examines the long run relationship between the variables of the model. First of all we computed F-statistic for test the joint significance of the model (1) for USA. The computed f-statistic is

5.124496 which is greater than upper bound 4.57 and significant at 5% confidence level. Thus it indicates that there exists long run co-integration among the stock exchange prices (lpse), lr, lip, lm3, lbot and lfuel.

Given the existence of the co-integration between the variables we estimate ARDL model (1), to see the long run as well as short run dynamics of the variables of the model, by using Akaike Information Criteria (AIC) for lag selection. The long run and short run results are reported in table (2) and (3).

Table 2. Long Run Coefficients

ARDL (2,0,3,0,1,2) based on Akaike Information Criterion (AIC)

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LR	0.17265	.15152	1.1394[.260]
LIP	2. 2795***	.49131	4.6397[.000]
LM3	0.35432	.83663	.42350[.674]
LTOT	0.27157	.85111	.31908[.751]
LFUEL	-0.031084	.084975	-.36580[.716]
C	-4.3330	4.6745	-.92693[.359]

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

The results of long run co-efficient (dynamics) shows that in USA rate of interest positively but not significantly affected to the stock exchange prices. This result is unlike the previous researches for example, Chen et al. (1986), Mukherjee and Naka (1995) and Strohe (2002) reported negative relation between rate of interest and LPSE of NSDAQ. Industrial production index has positive and highly significant long run relation with stock exchange prices. Term of trade (TOT) is positive impact on PSE, indicates that if ratio of exports and import increase then PSE also increase. Consist the result of previous research as Mukherjee and Naka (1995), Maysami and Koh (2000), and Kwon and Shin (1999) this study shows that there is positive relation between Money supply (M3) and LPSE this positive relation shows that money growth is stimulate the USA economy. As expected, that oil prices are negatively related to the LPSE but this result is not significant.

After examining the long run dynamics of the variables the short run relationship examine by error correction model (ECM represented in table 3)

Table 3. Error Correction Representation for the Selected ARDL (2,0,3,0,1,2) Model based on Akaike Information Criterion

Regressor	Coefficient	Standard Error	T-Ratio	Prob
dLPSE1	0.32643**	0.14589	2.2374	0.030
dLR	0.08401	0.080253	1.0468	0.300
dLIP	1.1914	0.91651	1.2999	0.200
dLIP1	2.5256***	0.74754	3.3786	0.001
dLIP2	1.5499*	0.84121	1.7997	0.078
dLM3	0.17241	0.41656	1.7997	0.681
dLTOT	-0.46564	0.36148	-1.2881	0.204
dLFUEL	0.031691	0.066016	0.48005	0.633
dLFUEL1	0.14014**	0.068548	2.0444	0.046
dC	-2.1085	2.4026	-0.87757	0.384
Ecm(-1)	-0.4866***	0.12125	-4.0134	0.000
R-Squared= 0.55058 R-Bar-Squared= 0.42627 F-stat = 5.7580[.000] DW-statistic = 2.0619				

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

The results of ECM are represented in table 3. The lagged error correction term Ecm(-1) is negative and highly significant, indicating a rapid adjustment process to the equilibrium. The results of the short run indicates that the lag value of LPSE is positive and significant impact on stock exchange prices, shows that past stock exchange prices also influence the PSE. Rate of interest has positive but insignificant effect on LPSE. Lag value of industrial production index positively and highly affected to the PSE. Money supply (M3) has positive and insignificant effect on PSE. Lag value of the TOT is negatively related to PSE. Lag value of the oil prices have positive and significant effect on LPSE.

Results of Japan

Following the first step in ARDL co-integration based model 1 for Japan the study examines the long run relationship between the variables of the model. First of all we computed F-statistic for test the joint significance of the model (1) for Japan. The computed f-statistic is 5.681520 which is greater than upper bound 5.23 and significant at 1% confidence level. Thus it indicates that there exists long run co-integration among the stock exchange prices (lpse), lr, lip, lm3, lbot and lfuel. Given the existence of the co-integration between the variables we estimate ARDL model (1), to see the long run as well as short run dynamics of the variables of the model, by using Akaike Information Criteria (AIC) for lag selection. The long run and short run results are reported in table (4) and (5).

Table 4. Long Run Coefficients

ARDL (6,2,5,2,2,0) based on Akaike Information Criterion (AIC)

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LR	0.93171***	0.18817	4.9513[.000]
LIP	0.71774	0.45964	1.5615[.127]
LM3	-0.32825	1.1001	-0.29838[.767]
LTOT	2.6703***	0.86220	3.0971[.004]
LFUEL	-0.19551*	0.11476	-1.7037[.097]
C	7.9442	6.4970	1.2228[.229]

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

The results of long run co-efficient (dynamics) shows that in Japan rate of interest is positively and highly significantly affected to the stock exchange prices. This result is unlike the previous researches for example, Chen et al. (1986), Mukherjee and Naka (1995) and Strohe (2002) reported negative relation between rate of interest and LPSE.

Industrial production index has positive but insignificant long run relation with stock exchange prices. Term of trade (TOT) has positive and significant impact on PSE, indicates that in Japan if ratio of exports and imports increase the PSE also increase. Like the result of previous researches as Mukherjee and Naka (1995), Maysami and Koh (2000), and Kwon and Shin (1999) this study also shows that there is negative relation between Money supply (M3) and PSE, shows money growth inflation in economy, consequently the stock price and corporate earnings become decrease. As expected, that oil prices are negatively related to the LPSE and this result is also significant, indicates that increase in oil prices will lead to increase in cost of production and consequently the stock price fall. After examining the long run dynamics of the variables the short run relationship examine by error correction model (ECM represented in table 5)

Table 5. Error Correction Representation for the Selected ARDL (6,2,5,2,2,0) Model

based on Akaike Information Criterion

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLPSE1	.31745*	.16282	1.9497[.058]
dLPSE2	.10473	.16328	.64138[.525]
dLPSE3	.18327	.14989	1.2227[.229]
dLPSE4	.41229*	.15281	2.6980[.010]
dLPSE5	-.16364	.13886	-1.1784[.246]
dLR	.34636***	.10912	3.1742[.003]
dLR1	-.27924***	.10729	-2.6028[.013]

dLIP	.29462	.49800	.59160[.557]
dLIP1	-.96185**	.47522	-2.0240[.050]
dLIP2	.46680	.41350	1.1289[.266]
dLIP3	-.65697	.41204	-1.5944[.119]
dLIP4	-.92555**	.40944	-2.2605[.029]
dLM3	-1.6962	4.5357	-.37397[.710]
dLM31	-8.2770*	4.6861	-1.7663[.085]
dLTOT	-.046672	.24498	-.19051[.850]
dLTOT1	-1.0326***	.26348	-3.9190[.000]
dLFUEL	-.086356**	.051043	-1.6918[.098]
dC	3.5089	2.2936	1.5299[.134]
ecm(-1)	-.44170***	.15444	-2.8599[.007]
R-Squared = 0.73452 **R-Bar-Squared** = 0.57228			
F-stat = 5.5335[.000]			
DW-statistic = 2.2829			

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

The results of ECM are represented in table 5. The lagged error correction term Ecm(-1) is negative and highly significant, indicating a rapid adjustment process to the equilibrium. The results of the short run indicates that the lag value of PSE is positive impact on stock exchange prices, shows that past stock exchange prices also effected the PSE. Rate of interest is significantly effect to PSE. Lag value of industrial production index negatively and highly affected to the PSE. Money supply (M3) has negatively affected to PSE. Lag values of TOT is negatively related with PSE. Lag value of the oil prices have negative and significant effect on PSE.

Results of China

Following the first step in ARDL co-integration based model of China the study examines the long run relationship between the variables of the model. First of all we computed F-statistic for test the joint significance of the model (1) for China. The computed f-statistic is 7.904303 which is greater than upper bound 5.23 and significant at 5% confidence level. Thus it indicates that there exists long run co-integration among the stock exchange prices (lpse), lr, lip, lm3, lbot and lfuel.

Given the existence of the co-integration between the variables we estimate ARDL model (1), to see the long run as well as short run dynamics of the variables of the model, by using Akaike Information Criteria (AIC) for lag selection. The long run and short run results are reported in table (1) and (2).

Table 6

Long Run Coefficients

ARDL (2,5,0,0,5,2) based on Akaike Information Criterion (AIC)

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LR	4.3657***	.97086	4.4967[.000]
LIP	.32689	.99572	.32829[.744]
LM3	2.7761***	.37472	7.4086[.000]
LTOT	.97878	1.3675	.71575[.478]
LFUEL	-3.0039***	.73215	-4.1028[.000]
C	-3.0044	5.0892	-.59035[.558]

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

The results of long run co-efficient shows that in China rate of interest has positive and highly significantly affected to the stock exchange prices. This result is unlike the previous researches for example, Chen et al. (1986), Mukherjee and Naka (1995) and Strohe (2002) reported negative relation between rate of interest and LPSE. Industrial production index has positive and highly significant long run relation with stock exchange prices. Term of trade (TOT) has positive relation to PSE, indicate as volume of exports increases the stock exchange prices also increase. Consist the result of previous research as Mukherjee and Naka (1995), Maysami and Koh (2000), and Kwon and Shin (1999) this study shows that there is positive relation between Money supply (M3) and LPSE. As expected, that oil prices are negative and significantly related to the LPSE, shows that as china is a oil imported country and when price of oil increase the cost of production become increase and consequently PSE decrease.

After examining the long run dynamics of the variables the short run relationship examine by error correction model (ECM represented in table 7)

Table 7. Error Correction Representation for the Selected ARDL (2,5,0,0,5,2) Model based on Akaike Information Criterion

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLPSE1	-.21036	.13157	-1.5988[.117]
dLR	1.6709**	.71623	2.3329[.024]
dLR1	.70895	.63472	1.1170[.270]
dLR2	.54236	.68046	.79704[.430]
dLR3	3.2741***	.66021	4.9592[.000]
dLR4	1.0784	.73616	1.4649[.150]
dLIP	.085616	.26469	.32346[.748]
dLM3	.72710***	.19462	3.7360[.001]
dLTOT	.13457	.18174	.74045[.463]
dLTOT1	.20734	.39777	.52125[.605]

dLTOT2	.76173**	.36262	2.1007[.042]
dLTOT3	1.0948***	.28333	3.8640[.000]
dLTOT4	**.**60826***	.20675	2.9420[.005]
dLFUEL	-.31372**	.15631	-2.0071[.05]
dLFUEL1	.37617***	.15103	2.4906[.01]
dC	-.78690	1.4250	-.55222[.584]
ecm(-1)	-.26191***	.086129	-3.0409[.004]
R-Squared = 0 .69156		**R-Bar-Squared =** 0.54505	
F-stat = 5.6053[.000]			
DW-statistic = 1.9328			

*, ** and *** indicate that co-efficient is significantly different from zero at 10%, 5% and 1% probability level respectively.

The results of ECM are represented in table 7. The lagged error correction term Ecm(-1) is negative and highly significant, indicating a rapid adjustment process which shows that disequilibria of the previous period shock will rapidly adjusted to long run equilibrium. The results of the short run indicate that the lag value of LPSE has negative but insignificant impact on stock exchange prices. Rate of interest has positive relation with LPSE. Lag value of industrial production index positively and highly affected to the LPSE. Money supply (M3) has positive and significant effect on LPSE. Lag values of TOT is negatively related with PSE. Oil prices have highly significant relation with LPSE. In first period, oil prices have negative and significant effect on LPSE but in second period oil prices have positive and significant relation.

Conclusions

This study examines the relationships between the stock exchange prices and macroeconomic variables (term of trade, oil prices, rate of interest, money supply (M3) and index of industrial production) with particular attention of recent global financial crises. For deep analysis, monthly data of the all said variables of the period of January 2005 to May 2010 has employed.

Using the ARDL co-integration approach, this study examines whether the NASDAQ Composite of USA, NIKKIE 225 of Japan and Shanghai Composite of China Stock exchange price Index is co-integrated with above said macroeconomic variables in the long run as well as in short run.

The results show that in USA and China, in long run (LR) as well as short run (SR) rate of interest, industrial production index and Money supply (M3) are positively related to the stock exchange prices. The results of Japan shows that rate of interest is positively and highly significantly in LR but in SR, at first lag it has positive but at second lag has negative relation with stock exchange prices. For Japan data, in LR industrial production index has positive and insignificant relation with stock exchange prices and in SR, at first lag it has positive but at second lag has negative relation stock exchange prices. For Japan, money supply (m3) in LR has positive but in SR has negative and significant relation with stock exchange prices.

In all three economies USA, Japan and China, in long run term of trade (TOT) has positive relation with stock prices. But in USA and Japan, in sort run TOT is negatively related with stock exchange prices. For China's data, in short run TOT is positively related with stock prices. In all three economies, in long run oil prices are negatively related to the stock exchange prices but in short run, in USA oil prices have positive relation, in Japan oil prices have negatively related and in China at first lag it has positive but at second lag has negative relation with stock exchange prices. This study shows that the long run model, can explain USA, Chinese stock markets, yielding consistent factors loading, but not Japan's stock market. But the short run model, cannot explain USA, Japan and Chinese stock markets, yielding consistent factors loading. An explanation of the difference in behavior between the three stock markets may lie as USA economy is most affected by financial crises, 2007 and Japanese economy slump after 1990, china is least affected economy by financial crises, 2007.
The movement of stock exchange is an important indicator of an economy processes. The research explore that macroeconomic variables will affect Stock Exchange Prices in USA, Japan and China and, we can use macro-economic variables as a predictor to predict stock market returns in said countries.

In the context of the global financial recession, no decisive study has so far been traced which explains the causal relationship between macroeconomic variables and stock markets of USA, Japan and China and this study empirically examined long run as well as short run relation among stock markets and macroeconomic factors in largest economies of the world i.e., USA, Japan and China during recent global financial crisis period so this study will contribute in body of knowledge and will be very helpful for the investors, national policy makers and corporate managers etc.

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