*Full Length Research Paper*

# Macroeconomic factors and stock returns: Evidence from Taiwan

## Tarika Singh[1]*, Seema Mehta[2] and M. S. Varsha[3]

Prestige Institute of Management, Gwalior, B25 Colour Valley Coatings India Ltd., Maharajpura Industrial Area, Pinto Park, Gwalior (M.P.) India.

**Increasing attention is being paid to the relationship between share prices and the macroeconomic variables by both economists and finance specialists. In the present-day scenario, where there is an increasing integration of the financial markets and implementation of various stock market reforms, the activities in the stock markets and their relationships with the macro economy have assumed significant importance. Economic agents use information in forming their expectations of future returns from holding stock securities. This study is an attempt to examine for Taiwan the casual relationship between index returns and certain crucial macroeconomic variable namely employment rate, exchange rate, GDP, Inflation and money supply. The analysis is based on stock portfolios rather than single stocks. In portfolio construction, four criteria are used: Market capitalization, price/earnings ratio (P/E ratio), PBR and yield. The purpose was to make a finer point with respect to the relationship between economic growth and stock market especially in terms of stock prices. Empirical findings revealed that exchange rate and GDP seem to affect returns of all portfolios, while inflation rate, exchange rate, and money supply were having negative relationship with returns for portfolios of big and medium companies.**

**Key words:** Macroeconomics, GDP, inflation, exchange rate, employment rate, money supply.

## INTRODUCTION

An efficient capital market is characterized by one in which security prices adjust rapidly to the arrival of new information. Therefore, the current prices of securities reflect all information about the security.

Championed by Fama (1970), the semi strong form of efficient market hypothesis states that stock prices must contain all relevant information including publicly available information. This has important implications for policy-makers and the stock-broking industry alike. Policy makers should feel free to conduct national macro-economic policies without the apprehension of influencing capital formation and the stock trade process. In addition, economic theory suggests that stock prices should reflect expectations about future corporate performance. Corporate profits generally reflect the level of economic activities. If stock prices accurately reveal the underlying fundamentals, then the stock prices should be employed as leading indicators of future economic activities. Therefore, the causal relations and dynamic interactions among macroeconomic variables and stock prices are important in the formulation of the nation's macroeconomic policy.

### Money supply

Money is a collection of liquid assets that is generally accepted as a medium of exchange and for repayment of debt. In that role, it serves to economize on the use of scarce resources devoted to exchange, expands resources for production, facilitates trade, promotes specialization, and contributes to a society's welfare (Thornton, 2000).

### Inflation

Inflation can also be described as a decline in the real value of money, a loss of purchasing power in the

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*Corresponding author. E-mail: singh.tarika@gmail.com. Tel: 91942534233.

medium of exchange, which is also the monetary unit of account. When the general price level rises, each unit of currency buys fewer goods and services. A chief measure of price inflation is the inflation rate, which is the percentage change in a price index over time.

## Employment rate

Employment rate is the percentage of the labor force that is employed. The employment rate is one of the economic indicators that economists examine to help understand the state of the economy. The employment rate shows a country's ability to put its population to work and thereby generate income for its citizens. Countries with higher employment rates are likely to have higher standards of living, other things being equal.

## Exchange rate

The charge for exchanging currency of one country for currency of another is the exchange rate. Exchange rate movements frequently focus on changes in credit market conditions, reflected by changes in interest rate differentials across countries, and changes in the monetary policies of central banks. The profit-maximizing investors in an efficient market will ensure that all the relevant information currently known about changes in macroeconomic variables are fully reflected in current stock prices, so that investors will not be able to earn abnormal profit through prediction of the future stock market movements (Chong and Koh, 2003). The conclusions drawn from the efficient market hypothesis (EMH) includes early studies by Fama and Schwert (1977), Nelson (1977), and Jaffe and Mandelker (1976), all affirming that macroeconomic variables influence stock returns. Concentrating primarily on the US stock exchanges, such early studies attempted to capture the effects of economic forces in a theoretical framework based on the Arbitrage pricing theory (APT) developed by Ross (1976). Chen et al. (1986) first illustrated that economic forces affect discount rates, the ability of firms to generate cash flows, and future dividend payouts, provided the basis for the belief that a long-term equilibrium existed between stock prices and macro-economic variables. Granger (1986) and Johansen and Juselius (1990), proposed to determine the existence of long-term equilibrium among selected variables through co-integration analysis, paving the way for a (by now) preferred approach to examining the economic variables-stock markets relationship. The majority, if not all, of such studies have examined the influence of the macro-economic variables on the composite stock indices of the markets under study. A void in the existing literature leads to examining the co integration between macroeconomic variables and stock market's sector

indices rather than the composite index.

The relationship between stock returns and macroeconomic factors is well documented for developed nations (Chen et al., 1986; Chen, 1991; Clare and Thomas, 1994; Mukherjee and Naka, 1995; Gjerde and Saettem, 1999; Flannery and Protopapadakis, 2002) and East-Asian (Bailey and Chung, 1996; Mookerjee and Yu, 1997; Kwon and Shin, 1999; Ibrahim and Aziz, 2003). There are cross-country studies (Cheung and Ng, 1998; Wongbangpo and Sharma, 2002). The studies have provided different results. This paper extends the literature by considering the effects of firm characteristics on this relationship within an emerging market context, namely Taiwan.

Taiwan is the 17th largest economy in the world, 14th largest exporter and 16th largest importer, and the third largest holder of foreign exchange reserves, with over US $180 billion. After 1949, Taiwan's productivity in agriculture had increased. This was a result of land reforms that were initiated by Chiang Kai-shek after his KMT government moved from Nanjing to Tai'pei. Taiwan has one of the world's highest standards of living. In addition, one of Asia's "Four Tigers", along with South Korea, Singapore and Hong Kong, Taiwan's per capita gross national product (GNP) rose from $1100 in the 1950s to approximately $11,600 in the 1990s. The gross domestic product during the 1990s was $216.5 billion, with manufacturing accounting for about 37% and services make up the largest portion with about 60%.

Taiwan has had one of the fastest growing economies for the past five decades, and its development has been praised as an "economic miracle." Taiwan has gradually high-teched its industries over the past two decades and currently has the fourth largest information hardware and semiconductor industries in the world. Innovative, high-quality "Made in Taiwan" products are sold worldwide. In January 2002, Taiwan joined the World Trade Organization (WTO), becoming an official partner in the world trading system. Today, the government is vigorously promoting a knowledge-based economy and industrial modernization to transform Taiwan into a "green silicon island" of high value-added production.

China may threaten Taiwan as No. 1 IT supplier. However for now its Taiwanese engineers who provide ever-more-ingenious solutions to manufacturing and design conundrums. The result is one of the deepest reserves of high-tech talent in the world.

The remainder of the paper is organized as follows. Extensive Literature review is followed by the development of methodology. Later part focuses on results and discussion and finally conclusion of the study.

## LITERATURE REVIEW

Cooper (2004) studied the relationship between macroeconomic variables and stock market return and

concluded that the Singapore's stock market and the property index form co-integrating relationship with changes in the short and long-term interest rates, industrial production, price levels, exchange rate, and money supply.

Chuang et al. (2007) determined whether macro-economic variables, in particular, money supply and budget deficit are important in predicting stock prices in Taiwan, Hong Kong, Singapore and South Korea. Quarterly data on stock price indices, money supply and budget deficits were employed in this study. The results are broadly consistent with the general economic literature on macroeconomics and suggest that there exists a long-run equilibrium relationship between macroeconomic policies and stock prices for the four countries studied; stock prices do not necessarily adjust quickly and fully to changes in either monetary or fiscal policies, in the short run.

Chen et al. (1986) tested the multifactor model in the USA by employing seven macroeconomic variables and found that consumption, oil prices and the market index are not priced by the financial market. However, industrial production, changes in risk premium and twists in the yield curve are found to be significant in explaining stock returns. Chen (1991) performed the second study covering the USA. Findings suggested that future market stock returns could be forecasted by interpreting some macroeconomic variables such as default spread, term spread, one-month t-bill rate, industrial production growth rate, and the dividend - price ratio. Clare and Thomas (1994) investigated the effect of 18 macroeconomic factors on stock returns in the UK. They found oil prices, retail price index, bank lending and corporate default risk to be important risk factors for the UK stock returns. Mukherjee and Naka (1995) used vector error correction approach to model the relationship between Japanese stock returns and macroeconomic variables. Co-integration relation is detected among stock prices and the six macroeconomic variables, namely exchange rate, inflation rate, money supply, real economic activity, long-term government bond rate and call money rate.

Gjerde and Saettem (1999) examined the causal relation between stock returns and macroeconomic variables in Norway. Results showed a positive linkage between oil price and stock returns as well as real economic activity and stock returns. The study, however, failed to show a significant relation between stock returns and inflation. A recent study by Flannery and Protopapadakis (2002) re-evaluated the effect of some macro announcement series on US stock returns. Among these series, six macro variables, namely, balance of trade, housing starts, employment, consumer price index, M1, and producer price index seem to affect stock returns. On the other hand, two popular measures of aggregate economic activity (real GNP and industrial production) do not appear to be related with stock returns.

Chen (2008) investigated whether macroeconomic variables can predict recessions in the stock market. Series such as interest rate spreads inflation rates, money stocks, aggregate output, and unemployment rates are evaluated individually. Empirical evidence from monthly data on the Standard and Poor's S&P 500 price index suggests that among the macroeconomic variables that are considered, yield curve spreads and inflation rates are the most useful predictors of recessions in the U.S. stock market according to in-sample and out-of-sample forecasting performance.

Bailey and Chung (1996) examined the impact of macroeconomic risks on the equity market of the Philippines. Findings of the study showed that, financial fluctuations, exchange rate movements, and political changes on owners of Philippine equities could not explain Philippine stock returns. Mookerjee and Yu (1997) investigated the effect of macroeconomic variables on Singapore stock market. Results suggested that stock prices are co-integrated with both measures of the money supply and aggregate foreign exchange reserves. However stock prices and exchange rates do not have a long-term relationship. Chung and Shin (1999) examined the role of macroeconomic variables in estimating Korean stock prices. Stock indices seem to be co-integrated with the combination of the four macroeconomic variables namely, trade balance, foreign exchange rate, industrial production and money supply. Ibrahim and Aziz (2003) investigated the relationship between stock prices and industrial production, money supply, consumer price index and exchange rate in Malaysia. Stock prices are found to share positive long-run relationships with industrial production and CPI. On the contrary, stock prices have a negative association with money supply and exchange rate.

Cheung and Ng (1998) investigated the relationship between stock prices and some macroeconomic factors namely, real oil price, total personal consumption, money supply and GNP in Canada, Germany, Italy, Japan and the USA. There appears a long-run co-movement between the selected macroeconomic variables and real stock market prices. Bilson et al. (2001) used value weighted world market index and some macroeconomic variables for explaining stock returns in selected emerging markets. Findings suggested that goods prices and real activity have limited ability to explain the variation in returns. Money supply has greater importance, while the most significant variables are the exchange rate and the world market return. Wongbangpo and Sharma (2002) investigated the relationship between stock prices and some macroeconomic factors in five ASEAN countries (Indonesia, Malaysia, Philippines, Singapore and Thailand). Results suggested that, in the long-run, stock prices are positively related to growth in output. In the short-run, stock prices are found to be functions of past and current values of macroeconomic variables.

Bilson et al. (1999) aimed to address the question of whether macroeconomic variables may proxy for local risk sources. They found moderate evidence to support this hypothesis. Further, they investigated the degree of commonality in exposures across emerging stock market returns using a principal components approach, and found little evidence of commonality when emerging markets were considered collectively. At the regional level, however, considerable commonality was shown to exist.

Maysami and Sims (2002, 2001a, 2001b) employed the error-correction modelling technique to examine the relationship between macroeconomic variables and stock returns in Hong Kong and Singapore (Maysami and Sim, 2002b), Malaysia and Thailand (Maysami and Sim, 2001a), and Japan and Korea (Maysami and Sim, 2001b). Through the employment of Hendry's (1986) approach which allowed making inferences to the short-run relationship between macroeconomic variables as well as the long-run adjustment to equilibrium, they analyzed the influence of interest rate, inflation, money supply, exchange rate and real activity, along with a dummy variable to capture the impact of the 1997 Asian financial crisis. The results confirmed the influence of macroeconomic variables on the stock market indices in each of the six countries under study, though the type and magnitude of the associations differed depending on the country's financial structure.

Islam (2003) replicated the above studies to examine the short-run dynamic adjustment and the long-run equilibrium relationships between four macroeconomic variables (interest rate, inflation rate, exchange rate, and the industrial productivity) and the Kuala Lumpur Stock Exchange (KLSE) Composite Index. His conclusions were similar: There existed statistically significant short-run (dynamic) and long-run (equilibrium) relationships among the macroeconomic variables and the KLSE stock returns. Ibrahim (1999) also investigated the dynamic interactions between the KLSE Composite Index, and seven macroeconomic variables (industrial production index, money supply M1 and M2, consumer price index, foreign reserves, credit aggregates and exchange rate). Observing that macroeconomic variables led the Malaysian stock indices, he concluded that Malaysian stock market was informational inefficient.

Chong and Koh's (2003) results were similar: They showed that stock prices, economic activities, real interest rates and real money balances in Malaysia were linked in the long run both in the pre- and post capital control periods.

Mukherjee and Naka (1995) applied Johansen's (1998) VECM to analyze the relationship between the Japanese Stock Market and exchange rate, inflation, money supply, real economic activity, long-term government bond rate, and call money rate. They concluded that a co-integrating relation indeed existed and that stock prices contributed to this relation. Maysami and Koh (2000) examined such

relationships in Singapore. They found that inflation, money supply growth, changes in short- and long-term interest rate and variations in exchange rate formed a co-integrating relation with changes in Singapore's stock market levels. Islam and Watanapalachaikul (2003) showed a strong, significant long-run relationship between stock prices and macroeconomic factors (interest rate, bonds price, foreign exchange rate, price-earning ratio, market capitalization, and consumer price index) during 1992 to 2001 in Thailand.

Kumar (2008) established and validate the long-term relationship of stock prices with exchange rate and inflation in Indian context. There were numerous studies on the relationship of stock indices with macroeconomic variables. This gave a strong subjective background to test the existence of any such relationship in India. The research primarily dealt with an empirical method by combining different statistical techniques to check the presence of co-integration between the stock index (Sensex) and other variables. Co-integration is a well accepted indicator of a long term relationship between more than one time series variables. The study took into consideration past ten years experience of Indian economy reflected into the stock index, wholesale price index and exchange rates. A causal relationship could not be established without the existence of co-integration between the selected macroeconomic variable.

DeStefano (2004) examined whether movements in economic factors dictated by the dividend discount model can explain broad movements in stock returns over the business cycle. As anticipated, stock returns decrease throughout economic expansions and become negative during the first half of recession. Returns are largest during the second half of recessions, suggesting an important role for expected earnings. These results are consistent with the notion that expected stock returns vary inversely with economic conditions, yet suggest that realized returns are especially poor indicators of expected returns prior to turning points in the business cycle. Flannery and Protopapadakis (2004) estimated a GARCH model of daily equity returns, in which realized returns and their conditional volatility depend on seventeen macro series' announcements. They found six candidates for priced factors: Three nominal (CPI, PPI, and a Monetary Aggregate) and three real (the balance of trade, the employment report, and housing starts).

Boucher (2004) considered a new perspective on the relationship between stock prices and inflation, by estimating the common long-term trend in real stock prices, as reflected in the earning-price ratio, and both expected and realized inflation. They studied the role of the transitory deviations from the common trend in the earning-price ratio and realized inflation for predicting stock market fluctuations. In particular, they found that these deviations exhibit substantial in sample and out-of-sample forecasting abilities for both real stock returns and excess returns. Moreover, they found that this

variable provides information about future stock returns at short and intermediate horizons that is not captured by other popular forecasting variables.

Gilbert (2008) analyzed the link between macroeconomic announcement surprises, intraday returns on the S&P 500 Index, and the subsequent revisions to the announced data. This showed that announcement-day returns contain information about the future revisions of the released figures. This information is unrelated to the initial announcement surprises and predicts the future revisions: Prices increase when the subsequent revisions will be positive. This observation is strongest for real activity and investment variables such as nonfarm payroll, industrial production, and factory orders. The results suggest that the release of noisy public information triggers the aggregation of more accurate private information.

Mookerjee and Qiao Yu (1998) used the techniques of co-integration and causality together with forecasting equations to test for informational inefficiencies in both the long and short run, respectively. The results indicated that three of the four macro variables are co-integrated with stock prices, suggesting potential inefficiencies in the long run. The causality tests and forecasting equations provide conflicting evidence on the informational efficiency of the stock market in the short run.

Humpe and Macmillan (2007) examined whether a number of macroeconomic variables influence stock prices in the US and Japan. A co-integration analysis was applied in order to model the long term relationship between industrial production, consumer price index, money supply, long term interest rates and stock prices in the US and Japan. For US, they found the data were consistent with a single co-integrating vector where stock prices were positively related to industrial production and negatively related to both the consumer price index and a long term interest rate. They also found insignificant (although positive) relationship between US and prices and the money supply. However, for the Japan they found two co-integrating vectors. For one vector prices were influenced positively by industrial production and negatively by the money supply. For the second co-integrating vector, they found industrial production to be negatively influenced by the consumer price index and a long term interest rate. These contrasting results may be due to the slump in the Japanese economy during the 1990s and consequent liquidity trap. Adam and Tweneboah (2008) examined the impact of macroeconomic variables on stock prices in the Databank stock index. To represent the stock market and (a) inward foreign directs investments, (b) the Treasury bill rate (as a measure of interest rates), (c) the consumer price index (as a measure of inflation), (d) verage crude oil prices, and (e) the exchange rate were used as macroeconomic variables.

They analyzed quarterly data for the above variables from 1991 to 2007 employing co-integration test, vector error correction models (VECM). The paper established that there is co-integration bet-ween macroeconomic variable and stock prices in Ghana indicating long run relationship. The VECM analyses showed that the lagged values of interest rate and inflation have 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.

McKinnon-Shaw (1973) theories on finance and development criticized the dominant neo-classical monetary theories and the Keynesian counter arguments. The neo-classical monetary growth models postulate that high-positive interest rate have a direct impact on savings and investment. Within this school of thought, money is regarded as a substitute for physical assets and productive investments. Keynesian economists on the other hand argue that low-interest rate increases invest-ment, income and eventually savings. McKinnon (1973) advanced an argument in favor of a complementary relationship between financial and physical assets as opposed to the substitutability theory by the neo-classical in a critique of the Keynesian theory. Paddy (1992) contended that macroeconomic and fiscal environment is one of the building blocks which determine the success of securities market. Conducive macroeconomic environ-ment promotes the profitability of business which propels them to a stage where they can access securities for sustained growth. Generally, the barometers for measuring the performance of the economy include real GDP growth rate, rate of inflation, the exchange rate, fiscal position and the debt position. Of these the exchange rate, interest rate and the rate of inflation can be singled out to affect stock market activity as they impinge directly on the state of corporate activity in the country.

Agenor (2000) captured these views by stating that high inflation, large fiscal deficits, and real exchange rate over-valuation are often key symptoms of macro-economic instability which constraints private sector investment and savings and thereby results in inefficient allocation of resources on the exchange affecting its performance. Empirically, Atje and Jovanovic (1993) found strong evidence to support the view that stock market development leads to economic growth. Using data from 1976 to 1993 on 41 countries including both developed and developing, Levine and Zervos (1996a, b) investigated the relationship between economic growth and stock market development. They found a strong positive correlation between the stock market develop-ment and long-run economic growth after controlling for the initial level of per capita GDP, initial level of investment in human capital, political instability, and measures of fiscal and monetary policies as well as exchange rate policy. Harris (1997) found evidence to support the view that stock market development explains economic growth applying two-stage least squares. In fact, the results indicated that for developed countries,

stock market development had some explanatory power on economic growth but not on developing countries. He concluded that the pool of literature that leads us to believe that the existence of stock markets might enhance economic growth is misleading or at best weak. Wai and Patrick's (1973) in their study argued that securities markets have generally not contributed to economic development of those countries that created them. Stiglitz (1989) also contend that the contribution of securities markets as a source of funds is limited because of fundamental problems of enforcement, adverse selection, and incentives undermining the protection of investors.

Aidoo (1989) also reported several factors such as political instability, low-growth rate, lack of entrepreneurship and inadequate demand for stocks as some of the factors that are likely to influence the performance of the GSE. The study projected massive growth of the stock exchange in terms of demand and supply provided the economic and political conditions remained favorable

## Objective

1. To investigate the cause and effect relationship of GDP with stock returns in Taiwan.
2. To investigate the cause and effect relationship of employment rate with stock returns in Taiwan.
3. To investigate the cause and effect relationship of exchange rate with stock returns in Taiwan.
4. To investigate the cause and effect relationship of inflation with stock returns in Taiwan.
5. To investigate the cause and effect relationship of money supply with stock returns in Taiwan.
6. To open new vista for further research.

### RESEARCH METHODOLOGY

The study was empirical in nature. The population of the study included all the companies listed in the stock index of Taiwan that is, Taiwan 50 Index. The sampling frame of the study was all the companies listed in Taiwan 50 Index. Sample size was of companies used in the formation of Taiwan 50 Index during the year 2003 to 2008. Individual company listed in Taiwan 50 Index during the study period 2003 to 2008 acted as sampling element. Purposive sampling technique was use.

The data used in the study may be divided into two sub-groups. First data set consists of stock index data. Second data set consists of data on macroeconomic factors. Secondary data of stock index was taken from 2003 to 2008 and was collected from official website of Taiwan Stock Exchanges. The data for macroeconomic variables was collected from the official website of Taiwan.

The analysis is based on stock portfolios rather than single stocks. In portfolio construction, four criteria are used: Market capitalization, price/earnings ratio (P/E ratio), PBR and yield. First, all the companies listed in Taiwan Stock Index were grouped into big, medium, and small companies based on market capitalization. Then in each big, medium, and small company, three sub-portfolios were made based on P/E ratio, yield and PBR. In all for big,

medium, and small companies, there were nine portfolios. The macro economic variables used in the study are employment rate, exchange rate, GDP, inflation and money supply. Annual portfolio returns were calculated for each year of study. Normality of data was checked through Kolmogorov-Smirnov D statistic normality test in SPSS16. Regression was applied to calculate the impact of macroeconomic variables on stock returns.

## RESULTS AND DISCUSSION

### Normality check

To assess the distributional properties of the average monthly stock returns of Taiwan 50 listed companies and macroeconomic variables, various descriptive statistics including mean, variance, and the Kolmogorov-Smirnov D statistic normality test. The hypothesis of normality was accepted by using Kolmogorov-Smirnov D statistics. As the data was found to be normal, regression was applied on the data.

### Regression analysis

Firstly linear regression was estimated for the three portfolios (that is, PE ratio, yield and PBR) each of big, medium and small companies listed in Taiwan 50 Index. Here, individual macroeconomic variables acted as the independent variable and the individual portfolio returns of the three portfolios acted as the dependent variable. The results for the same are represented below. The regression equation is $Y = a + bX$ (where a and b are parameters). Table 1 attached in the annexure shows the summary statistics of regression analysis. The table shows that employment rate, inflation and money supply have negative relationship with stock returns for all the six portfolios for big and medium companies. On the other hand GDP and exchange rate have positive relationship with stock returns.

For small size companies the results are slightly different. For P/E ratio portfolio, only exchange rate has positive relationship with returns. In yield portfolio, employment rate and exchange rate have positive relationship while for PBR portfolio returns; exchange rate and inflation have positive relationship with stock returns. Findings with regard to inflation rate are consistent with the bulk of empirical evidence. Chen et al. (1986), Mukherjee and Naka (1995), Wongbangpo and Sharma (2002), Flannery and Protopapadakis (2002) found that inflation rate negatively affect stock returns.

Change in exchange rate in general seems to influence all portfolio returns positively. The empirical evidence regarding the exchange rate is inconclusive.  While, Mukherjee and Naka (1995) found a positive relationship between exchange rate and stock prices, Ibrahim and Aziz (2003) report a negative one. The reason behind the finding of Ibrahim and Aziz (2003) is related to the affect of exchange rate on international trade of the countries,

**Table 1.** ANNEXURE Regression

| Cs no. | Hypothesis | F value | T value | Beta value | Significance level (%) | Relationship |
|---|---|---|---|---|---|---|
| | | | **Big companies** | | | |
| | | | **Portfolio 1 PE ratio** | | | |
| 1 | Regression between portfolio1 and employment rate+ | 1.404 | -1.185 | -.510 | 30.2 | Employment rate has negative relationship with PE ratio portfolio returns of big companies |
| 2 | Regression between portfolio1 and exchange rate | 3.510 | 1.874 | 0.684 | 13.4 | Exchange rate has a positive relationship with PE ratio portfolio returns of big companies |
| 3 | Regression between Portfolio1 and GDP | 0.378 | 0.615 | 0.294 | 57.2 | GDP has a positive relationship with PE ratio portfolio returns of big companies |
| 4 | Regression between portfolio1 and inflation | 3.638 | -1.907 | -0.690 | 12.9 | Inflation has a negative relationship with PE ratio portfolio returns of big companies |
| 5 | Regression between portfolio1 and money supply | 6.734 | -2.595 | -0.792 | 6.0 | Money supply has a negative relationship with PE ratio portfolio returns of big companies |
| | | | **Portfolio 2 yield** | | | |
| 1 | Regression between portfolio1 and employment rate | 1.346 | -1.160 | -0.502 | 31.10 | Employment rate has a negative relationship with yield portfolio returns of big companies on the bases of market capitalization. |
| 2 | Regression between portfolio1 and exchange rate | 3.624 | 1.904 | 0.689 | 13.0 | Exchange rate has a positive relationship with yield portfolio returns of big companies |
| 3 | Regression between portfolio1 and GDP | 0.300 | 0.547 | 0.264 | 61.3 | GDP has a positive relationship with yield portfolio returns of big companies |
| 4 | Regression between portfolio2 and inflation | 3.773 | -1.942 | -0.697 | 12.4 | Inflation has a negative relationship with yield portfolio returns of big companies |
| 5 | Regression between portfolio2 and money supply | 6.691 | -2.587 | -0.791 | 6.1 | Money supply has a negative relationship with yield portfolio returns of big companies |
| | | | **Portfolio 3 PBR** | | | |
| 1 | Regression between portfolio 3 and employment rate | 1.4 | -1.183 | -0.509 | 30.2 | Employment rate has a negative relationship with PBR portfolio returns of big companies |
| 2 | Regression between portfolio 3 and exchange rate | 3.653 | 1.911 | 0.691 | 12.9 | Exchange rate has a positive relationship with PBR portfolio returns of big companies |
| 3 | Regression between portfolio 3 and GDP | 0.286 | 0.535 | 0.258 | 62.1 | GDP has a positive relationship with PBR portfolio returns of big companies |
| 4 | Regression between portfolio 3 and inflation | 3.927 | -1.982 | -0.704 | 1.9 | Inflation has a negative relationship with PBR portfolio returns of big companies |
| 5 | Regression between portfolio 3 and money supply | 7.032 | -2.652 | -0.798 | 5.7 | Money has a negative relationship with PBR portfolio returns of big companies |
| | | | **Medium companies** | | | |
| | | | **Portfolio 1 PE ratio** | | | |
| 1 | Regression between portfolio 1 and employment rate | 0.544 | -1.116 | -0.487 | 32.7 | Employment rate has a negative relationship with PE ratio portfolio returns of medium companies |
| 2 | Regression between portfolio 1 and exchange rate | 3.973 | 1.993 | 0.706 | 11.7 | Exchange rate has a positive relationship with PE ratio portfolio returns of medium companies |

**Table 1.** continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Regression between portfolio 1 and GDP | 0.406 | 0.637 | 0.303 | 55.9 | GDP has a positive relationship with PE ratio portfolio returns of medium companies |
| 4 | Regression between portfolio 1 and inflation | 5.459 | -2.336 | -0.760 | 8 | Inflation has a negative relationship with PE ratio portfolio returns of medium companies |
| 5 | Regression between portfolio 1 and money supply | 5.923 | -2.434 | -0.773 | 7.2 | Money supply has a negative relationship with PE ratio portfolio returns of medium companies |
| | **Portfolio 2 yield** | | | | | |
| 1 | Regression between portfolio 2 and employment rate | 1.070 | -1.035 | -0.459 | 35.9 | Employment rate has a negative relationship with yield portfolio returns of medium companies |
| 2 | Regression between portfolio 2 and exchange rate | 3.228 | 1.797 | 0.668 | 14.7 | Exchange rate has a positive relationship with yield portfolio returns of medium companies |
| 3 | Regression between portfolio 2 and GDP | 0.398 | 0.631 | 0.301 | 56.3 | GDP has a positive relationship with yield portfolio returns of medium companies |
| 4 | Regression between portfolio 2 and inflation | 4.940 | -2.223 | -0.743 | 9.0 | Inflation has a negative relationship with yield portfolio returns of medium companies |
| 5 | Regression between portfolio 2 and money supply | 5.566 | -2.359 | -0.763 | 7.8 | Money supply has a negative relationship with yield portfolio returns of medium companies on the bases of market capitalization |
| | **Portfolio 3 PBR** | | | | | |
| 1 | Regression between portfolio 3 and employment rate | 1.643 | -1.282 | -0.540 | 26.9 | Employment rate has a negative relationship with PBR portfolio returns of medium companies |
| 2 | Regression between portfolio 3 and exchange rate | 4.972 | 2.230 | 0.744 | 9.0 | Exchange rate has positive relationship with PBR portfolio returns of medium companies |
| 3 | Regression between portfolio 3 and GDP | 0.459 | 0.677 | 0.321 | 53.5 | GDP has positive relationship with PBR portfolio returns of medium companies |
| 4 | Regression between portfolio 3 and inflation | 5.263 | -2.294 | -0.754 | 8.3 | Inflation has a negative relationship with PBR portfolio returns of medium companies |
| 5 | Regression between portfolio 3 and money supply | 6.888 | -2.625 | -0.795 | 5.9 | Money supply has a negative relationship with PBR portfolio returns of medium companies |
| | **Small companies Portfolio 1 PE ratio** | | | | | |
| 1 | Regression between portfolio 1 and employment rate | 0.544 | -0.737 | -0.346 | 50.2 | Employment rate has a negative relationship with PE ratio portfolio returns of small companies |
| 2 | Regression between portfolio 1 and exchange rate | 1.232 | 1.110 | 0.485 | 32.9 | Exchange rate has a positive relationship with PE ratio portfolio returns of small companies |
| 3 | Regression between Portfolio 1 and GDP | 5.143 | -2.268 | -0.750 | 8.6 | GDP has a negative relationship with PE ratio portfolio returns of small companies |
| 4 | Regression between portfolio 1 and inflation | 0.275 | -0524 | -0.254 | 62.8 | Inflation has a negative relationship with PE ratio portfolio returns of small companies |
| 5 | Regression between portfolio 1 and money supply | 0.292 | -0.540 | -0.261 | 61.8 | Money supply has a negative relationship with PE ratio portfolio returns of small companies |

**Table** 1. continued

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Portfolio 2 yield** | | | | | |
| 1 | Regression between portfolio 2 and employment rate | 1.872 | -1.368 | -0.565 | 24.3 | Employment rate has a positive relationship with yield portfolio returns of small companies |
| 2 | Regression between portfolio 2 and exchange rate | 25.098 | 5.010 | 0.929 | 0.7 | |
| 3 | Regression between portfolio 2 and GDP | 0.042 | -0.206 | -0.102 | 84.7 | GDP has a negative relationship with yield portfolio returns of small companies |
| 4 | Regression between Portfolio 2 and Inflation | 8.589 | -2.931 | -0.826 | 4.3 | Inflation has a negative relationship with yield portfolio returns of small companies |
| 5 | Regression between portfolio 2 and money supply | 4.756 | -2.181 | -0.737 | 9.5 | Money supply has a negative relationship with yield portfolio returns of small companies |
| | **Portfolio 3 PBR** | | | | | |
| 1 | Regression between portfolio 3 and employment rate | 1.375 | -1.173 | -0.506 | 30.6 | Employment rate has a negative relationship with PBR portfolio returns of small companies |
| 2 | Regression between portfolio 3 and exchange rate | 0.808 | 0.899 | 0.410 | 41.9 | Exchange rate has a positive relationship with PBR portfolio returns of small companies |
| 3 | Regression between portfolio 3 and GDP | 0.237 | -0.487 | -236 | 65.2 | GDP has a negative relationship with PBR portfolio returns of small companies on the bases of market capitalization |
| 4 | Regression between portfolio 3 and inflation | 0.009 | 0.092 | 0.046 | 93.1 | Inflation has a positive relationship with PBR portfolio returns of small companies |
| 5 | Regression between portfolio 3 and money supply | 0.538 | -0.733 | -0.344 | 50.4 | Money supply has a negative relationship with PBR portfolio returns of small companies |

since the country they examine is Malaysia, a country highly dependent on international trade. Ibrahim and Aziz (2003) maintained that, while currency depreciation encourages exports, at the same time it increases costs of production and intermediate goods. Therefore, they observe a negative relationship between exchange rates and stock returns. Mukherjee and Naka (1995), Cheung and Ng (1998) report a positive money supply impact on stock prices. As said before, changes in money supply would alter the money market equilibrium or would impact real economic variables, thus affect stock returns.

The relationship between Index returns and exchange rate changes is positive and one of the probable reasons can be continuous expansion of foreign trade, with a pronounced Increase in Taiwan's Trade Surplus. Taiwan's exports and imports rose to US$224.02 billion and US$202.71 billion, respectively, in 2006; these figures were both historic highs. The annual growth rates were 12.9% for exports and 11.0% for imports. Taiwan's trade surplus grew to US$21.31 billion, the third highest figure since 1991. A continuing loose money supply in Taiwan before 2006 can be reason for its negative relationship with portfolio index return. This was mainly

due to slower growth in bank lending and in investment. As a result of the Central Bank's continuing interest rate hikes, interest rates in Taiwan rose slowly. There was significant fluctuation in the Taiwan stock market index. Imbalance between energy and environmental needs and economic growth had caused GDP to have a negative relationship with portfolio returns.

**Conclusion**

A large number of previous studies indicated that there is a relationship between macroeconomic variables and equity market returns. In this study, linear regression employed to test the effects of macroeconomic factors on stock returns for the period January 2003 to December, 2008. Macroeconomic variables used in this study are GDP, employment rate, exchange rate, inflation and money supply and return on the 50 listed companies of Taiwan 50 Index. The analysis is based on stock portfolios rather than single stocks. In portfolio construction, four criteria are used: P/E ratio, yield and price to book value ratio. Three portfolios are formed

according to the ranks of the firms by each portfolio construction criteria.

In the regression models, stock portfolio returns used as dependent variables, while the macroeconomic variables used as independent variables. Empirical findings reveal that exchange rate and GDP seem to affect all of the portfolio returns, except the PBR portfolio of small companies. It is seen that exchange rate and GDP have great effect on the returns of companies listed in Taiwan 50 Index while inflation rate has significant effect only for PBR portfolios of small companies. On the other hand, employment rate and money supply do not appear to have any significant affect on stock returns.

For small companies, it is seen that often high financing ratio and internal financing are associated with higher firm growth, while firms using more bond or equity financing tend to experience lower growth. Moreover it is worth noticing that the net effects of equity financing of firms in traditional and basic industries are significantly positive and greater. The above findings have significant implications both for companies and investors. All the companies listed in the stock index have a sensitivity of firm returns to exchange rate movements between stock markets and exchange rates in most of the countries create the perfect conditions for investors in terms to diversify their portfolios. The investors have a chance to develop profitable investment strategies according to the changes in macroeconomic variables.

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