行政院國家科學委員會專題研究計畫　成果報告

股價浮動因素再驗—台灣的實證研究

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一、中文摘要

一般探討股價浮動傳遞，大多以傳統 Choleski 分解法為依據。但是如此方式完全忽略變數對其他系統變數之理論架構，因此變數模型所推論之結果可能不完整或是謬誤。本研究嘗試運用多變量向量結構自我迴歸 (SVAR) 及錯誤糾正 (Error Correction)等模式，藉以理論詮釋總體經濟變數及股票價格之關連性，並比較 1997 年金融危機前後期波動傳遞之差異，並探討多變數之間長短期動態關係與影響，期能彌補現行文獻之不足。另外，亞洲四國股價之波動來源於文中也有一番印證。研究證實變數間於金融危機後的確存在一個穩定長期均衡關係，而油價之起伏亦是造成台灣及樣本國家股價震盪之重要因素。

關鍵詞：股價波動，結構向量自我迴歸，錯誤糾正模型，變異數分解

Abstract

This paper investigates the role of macroeconomic variables, i.e., money supply, oil price, exchange rate and inflation on the stock price among four Asia stock markets (Taiwan, South Korea and Singapore and Hong Kong). Upon testing appropriate Structural VAR model, we use monthly data from January 1981 to December 2002 to observe the long and short term relationships between stock price and these macroeconomic variables. First, we find that our empirical variables do not have a cointegrating relationship during the pre-crisis period, but have one during the post-crisis period. For innovations in macroeconomic variables, generally, the stocks prices are positively related to inflation and negatively to the oil prices change and exchange rate. Moreover, the FEV of stock prices can be distributed among oil prices, exchange rate and inflation. It is shown that for each period, the real oil price have statistically significant and negative effect on stock price.

Keywords: Stock price fluctuations, SVAR, ECM, Innovation Accounting

二、緣由與目的

In recent year, many international researchers focused their attention on the emerging financial markets, especially in Asia. Asia stock markets provide attractive investment opportunities to foreign investors, and became a kind of investment icon in the world financial market. Although some Asia newly industrialized countries, for example Taiwan, South Korea, Singapore and Hong Kong, had gained exceptionally good marks in world stock market, these Asia countries' stock markets had stunned the investors from investment as their markets are suffering high level of volatility. Among the most famous events creating such market turmoil is 1997 Asian financial crisis, and it was rapidly escalated into the whole Asian economic disaster, accompanied by the devaluation of currencies, the collapse of stock markets and the application for the IMF bailout package by the government of South Korea. This disastrous phenomenon was quite contrary to the strong performance of Asia stock markets. During July, 1997 and November, 1998, the

financial crisis hit South Korea stock market (45.90 % decline), Singapore stock market (41.04 % decline), Hong Kong stock market (36.03 % decline) and Taiwan stock market(24.56 % decline) the most severely, while other Asian countries also suffered from the similar shock.

The most important question arises: what is the factors causing the stock volatility? Wongbangpo and Sharma (2002) investigate the explanatory power of various macroeconomic variables using monthly ASEAN (Association of Southeast Asian Nations) stock market returns and find that key macroeconomic factors, for example interest rate, exchange rate, GDP and CPI, affect stock market volatility. Maysami and Koh (2000) investigate the explanatory power of various macroeconomic variables in determining Singapore stock market volatility and find that the conditional volatilities of inflation and interest rates have large direct impacts on Singapore stock market volatility.

There is also evidence that oil price volatility shocks have asymmetric effects on economy. Hamilton (1983) showed that oil price increases are responsible for almost every post World War II US recession. Later other researchers extended Hamilton's base findings using alternative data and estimation procedures (Burbridge and Harrison, 1984; Gisser and Goodwin, 1986). Hamilton (1983) using Granger causality examined the impact of oil prices shocks and the US economy in 1949-1972. Hamilton finds that changes in oil prices Granger-caused changes in GNP whereas oil prices were determined exogenously. Gisser and Goodwin (1986) found that oil price shocks affect a set of macro variables and their results are similar to those of Hamilton (1983) and Burbridge and Harrison(1984). Sadorsky (1999) uses a vector autoregressive model with four variables and monthly data over the period 1947-1996 to show that oil prices and oil price volatility both play important roles in affecting real stock return. Especially after 1986, oil price movements explain a large error variance in real stock returns than do interest rates (Darby, 1982; Hamilton, 1983 Burbridge and Harrison,1984; Gisser and Goodwin,1986; Mork,1989;Ferderer,1996). Although the bulk of the empirical research has studied the relation between oil price changes and economic activity, it is surprising that little research has been conducted on the relationship between oil price shocks and financial markets. Besides, studies examining the effects of oil shocks on the stock market and economic activity focus mainly on a few industrialized countries such as the United States, United Kingdom, Japan and Canada (Lee, 1992; Jones and Kaul, 1996; Huang et al., 1996; Sadorsky, 1999).

The goal of this paper is to identify the sources of stock prices fluctuations for Taiwan, South Korea, Singapore and Hong Kong, and discuss whether there exist different structural of transmissions of fluctuations after 1997 crisis. Unlike most studies in the literature that only estimate the contemporaneous relationship among time series. This paper is the first to use theoretically motivated restrictions to identify the effects of several important macro shocks on stock prices in a structural VAR framework. In our paper, we build a long-run structural VAR model, developed by Blanchard and Watson (1986), to examine the macroeconomic determinants of stock market fluctuation, which includes stock prices inflation, money supply, real oil price and the real exchange rate. We also use impulse response analysis and forecast error variance decomposition to trace out the contributions made by the macro shocks to real shock price fluctuations.

三、結果與討論

The result of unit root test provided a foundation of cointegration test. Using Johansen cointegration estimation method, we apply trace test and maximal test to test the numbers of cointegration vector. First, we show whether the variables are non-stationary, and if they are, whether there is any cointegration relationship, in order to appropriately construct the VAR model. Engle and Granger (1987) demonstrate that a VAR in differences will be misspecified if

the variables are cointegrated. The differenced system would on longer have a multivariate time series representation with an invertible moving average. Thus, it is necessary to determine if the non-stationary level variables share common stochastic trends before employing the VAR techniques. If the level variables are non-stationary but shares a common trend, (in order words, there exists a linear combination of the level variables, which is stationary), then the VAR model should be replaced by an error correction representation (ECM). For this purpose, we apply the Johansen (1988) and Juselius (1990) maximum likelihood rank tests to the test the long-run equilibrium relationship(s) among the variables.

As for the pre-crisis period, the λ_{trace} test shows that we can not reject the null hypothesis of r=0 against the alternative of *r*=1 at the 95% critical levels for four countries. The $\lambda_{\max}$ test also can not reject the null hypothesis of *r*=0 against the null of *r*=1. The finding of no cointegration implies that there is no linear long-run equilibrium relationship between five variables for the pre-crisis period. Based on the findings that each individual series is an I (1) process, and there exists no cointegrating relationships, we proceed to apply the VAR representation in terms of the first-differenced variables of interest. We use the Sims-Bernanke procedure (1986) to retrieve the contemporaneous relationship among the variables.

For the pre-crisis period, the coefficients for the POIL and π are all statistically significant at the 1% level, but MS and INF are insignificant. This result suggests that for any country, the oil price and exchange rate are main factors that would significantly and negatively affect stock return. However, the test statistics show the existence of a cointegrating vector for Taiwan, South Korea, Singapore and Hong Kong for the post-crisis period. Therefore, we can use Johansen's vector error-correction model (ECM) to examine these variable in all countries.

For the post-crisis period, stock prices are negatively related to oil prices, exchange rate, but inflation is positively in Taiwan. There are positive relationship between inflation and stock price and negative relationship between oil price and exchange rate in Singapore and Hong Kong.

During the pre-crisis period. impulse response analysis results show stock price is sensitive to shocks from the stock prices themselves as well as from their oil price, exchange rate and inflation. Initially, stock prices respond intensively to a shock in itself. Over the 10-month period, the effect remains substantial for Taiwan, South Korea and Hong Kong, while decreasing in Singapore. For innovations in macroeconomic variables, we observe that in the long run, the stocks prices are positively related to inflation in all countries and negatively to the oil prices change and exchange rate during the pre-crisis period.

During the post-crisis period, there is a positive relationship between stock prices and inflation in Taiwan, Singapore and Hong Kong where exist negatively related in South Korea. Exchange rate variable is positively related to stock prices in Taiwan, yet negatively in other three countries. The competition in the world exporting market explains the positive stock price-exchange rate relation, yet the negative relation could be justified via the asset view of the exchange rate. We observe further that goods and money market variables are fundamental determinants of Asia countries' share price values, while the long run relationship between the exchange rate and stock prices in Hong Kong is facilitated by the adopted independent floating exchange rate policy. The negative sign of the oil prices may suggest that for countries which are heavily dependent on imported oil, an unexpected rise in the oil price would bring up the domestic price level and finally reflects domestic production decline.

The relationship between stock prices and inflation has been the focus in a few researches. The Fisherian relation between rates of return on assets or nominal interest rates and excepted inflation lead us to guess that one of people hold various assets is to hedge against the effect of inflation. Hence,

stock prices should be positively related to inflation. Fama and Schwert (1977) proposed that while government bonds and real estate were hedges against inflation, stocks can not serve the function. Fama (1981) found that the negative relation that inflation is the most important determinant of stock prices. A negative relationship existed between inflation and stock prices because the nominal quanity of money did not vary sufficiently with stock prices. As such, the negative relation between stock prices and inflation is a spurious one. This is a plausible explanation in our empirical countries' case for the pre-crisis period. However, for the post-crisis, a few investors lack confidence, so they did not invest in stock market.

Money supply changes and stock prices in Asia countries are positively related, and it also corresponds to the findings for the U.S. (Bulmash and Trivoli, 1991) and Japan (Mukherjee and Naka, 1995). There are a few possible explanations for this findings. First possibility, suggested by Mukherjee and Naka (1995), is that injections of money supply have an expansionary effect that boost corporate earnings. The explanation follows from Fama's (1981) comments on inflation: increases in real activity that drive stock prices also stimulate the demand for money via the simple quantity theory model, thus creasing the positive relation between money supply and stock prices. Another explanation is that an increase in money supply has a direct positive liquidity effect on the stock market.

The innovation accounting analyses is very sensitive to the ordering of the variables. Our empirical variables are arranged as followings: money supply is placed first since it is exogeneous to other variables, followed by oil prices, exchange rate, stock prices and inflation. Nake and Tufte(1997) consider this the most common ordering based on theory. The present placement may reflect our priors, and it should be noted that changes in this sequence did not affect results significantly. In this paper, we discuss the effect of macro shocks on stock prices.

The variance decomposition analysis is likely to reinforce the results of the impulse response analysis. Not surprisingly, the variances in all empirical countries stock prices are mainly attributed to STOCK itself. However, the effect drops as the horizon lengthens.During the pre-crisis period, at 5-month horizon, the portion of FEV explained by STOCK itself remains large in Taiwan and Hong Kong, but becomes less in other countries. For Taiwan, South Korea and Hong Kong, about 20 % or more of the variance of STOCK can be attributed largely to innovations in INF, and slightly to MS. Moreover, about 15 % of FEV of STOCK in Singapore can be equally split between MS and π.

During the post-crisis period, the FEV of STOCK can be distributed among POIL, π and INF. An innovation in POIL can explain the FEV of STOCK from a high of about 12 % in Taiwan, 10 % in Korea , 14 % in Singapore, and to a low of only 8 % in Hong Kong. It is shown that for each country, the real oil price is statistically significant and it affects the stock price negatively.

四、計畫成果自評

本一年期國科會計畫與原計畫進度大致相符，惟執行中最大問題是資料之收集出現障礙，導致模型需稍作調整。未來預計將研究成果改寫，並選擇相關學術期刊發表。

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