

# 行政院國家科學委員會專題研究計畫成果報告

## 併購趨勢受總體經濟之影響—美國實證

### The Trend of Merges and Acquisitions with Macroeconomic Fundamentals: the U.S. Evidence

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#### **Abstract**

Using the US economy as the evidence, this paper finds that the macroeconomic fundamentals share the common trends with the M&A activities in the long run. In the short-run movement, GDP and M&A possess the strongest interrelationship. Moreover, the stock price seems play a second important role in describing the dynamic relationship with the M&A activities. The finding of the close relationship between M&A and GDP in the US economy argues that the policy makers should keep a keen insight toward the movement of M&A activities and make every endeavor to improve the economy..

**Key Words:** mergers and acquisitions,  
macroeconomic fundamentals

#### **I. Introduction**

With the growing popularity of liberalization and globalization around the world, mergers and acquisitions (M&A) becomes a major business phenomenon, especially in the late 1990s. The well-known M&A activities can be found widespread in all kinds industries, e.g., American On Line (AOL) merged Time Warner in June of 2000, MCI World Communication Inc. merged Sprint Corp. and Fleet Financial merged

Bank Boston Corp. in 1999. Dymski (1999) also argued that the banking merger wave in the past few decades in the US implies the evolution of banking and financial structures. It was symbolized that a new economy fantastically mates old economy to lead an advantaged competition in future business world. Entering the 20<sup>th</sup> century, the data show that the M&A activities of the US occupy two-fifth in the world and one-third among industrial countries.<sup>1</sup> The shoot-up M&A amount in the US reveals a hiding market power for the US under free multinational market. Figure1 shows the numbers and dollars amount of M&A in the USA for period 1985 ~2001(Q2). The upward diagrams commenced from 1990s show the growing trend for both the numbers and dollars amount.

<Insert Figure 1 about here>

What causes the growing trend of the M&A activities has been a hot issue for

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<sup>1</sup> At global point of M&A dollars amount in 1999, America had US\$315.3 billion, European counted US\$ 220.2 billion, British achieved US\$189.7 billion, and Asia only occupied US\$ 56.1 billion.

academic professionals and practitioners. Some factors assumed to relate M&A wave are investigated. For instance, Calomiris (1999) analyzed historic company gains from bank mergers by reducing operating costs and enhancing diversification benefit and strongly recommended the bank mergers waves. Sorensen (2000) argued that the 1990s merger movement has been motivated by different factors, e.g., financial ratios, leverage, and profitability. Blonigen and Taylor (2000) suggested that R&D intensity and acquisition activity might have inversely related. Moreover, literature has largely argued that there exists a dynamic relationship between M&A wave and macroeconomic fundamentals. Those fundamentals can be summarized as including GDP (Gross Domestic Product), stock price and interest rate. For example, Nelson (1959) found that M&A are positively related to stock price by viewing M&A as a private investment and using the quarter data from 1895 to 1956. It further discovered that the M&A shows a positive relation with business cycle. The positive relationship between M&A and stock price can also be found in Guerard (1985, 1989) and Becketti (1986) and positive relationship between M&A and GDP is further supported by Steiner (1975) and Guerard (1985, 1989). However, the relationship between the trend of M&A and stock price is found to be negative in Golbe and White (1988) by investigating Tobin's  $q$ .<sup>2</sup> This negative

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<sup>2</sup> Golbe and White (1988) used the same data source as in Becketti (1986) combining the time series

relationship are further supported by Beckenstein (1979) and Melicher, Ledolter and D'Antonio (1983). There are also a finding for the negative relationship between GDP and M&A, which can be found in Beckenstein (1979) and Becketti (1986). Study by Beckenstein (1979) forecasted the third hot wave of M&A after WW .<sup>3</sup> Besides the findings that M&A is negatively related to GDP and stock price, a positive relationship between M&A and interest rate was found. On the contrary, Steiner (1975), Melicher, Ledolter and D'Antonio (1983) and Becketti (1986) all found that M&A activity is negatively related to interest rate.<sup>4</sup>

Applying the newly developed time series methodologies, the long-run equilibrium and short-run dynamic relationship among variables of M&A and macroeconomic fundamentals are investigated. Among those, Granger causal relationship between American M&A and stock price is found in Geroski (1984) and Clark, Chakrabarti and Chiang (1988). By employing the same causality test for trivariate model, Haque, Harnhirun and Shapiro (1995) tested for Canada data and found that M&A, stock price, and interest rate are all shown to have pairwise two-way feedback relationships. The cointegration test for the long-run and

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methods for the multivariate testing.

<sup>3</sup> There are five waves mentioned in the literature, which are: (1) horizontal consolidation (1895-1904); (2) vertical integration (1922-1929); (3) conglomerate merger (1960-1969); (4) hostile merger (1981-1989); (5) strategy alliance (1992-present).

<sup>4</sup> Melicher, Ledolter and D'Antonio (1983) elaborated time series methodologies by Box and Jenkins (1970) to evaluate the interactions between fluctuation of M&A and macroeconomic variables under rational hypothesis.

VAR model for the short-run are employed in Cheng (1993) under different circumstances of the US and Japan for a comparison. It found that for both countries, there exists long-run relationship among M&A and macroeconomics. Besides, positive relationship between M&A and stock price in the US and negative relationship between M&A and GDP in Japan are found. For the causal relation, stock price and interest rate both show one-way direction and two-way feedback relation with M&A in the US and Japan, respectively.

The growing popularity and increasing importance of the M&A in the new era and the seemingly interactive relationships among M&A and macroeconomic variables make the issues of investigating the trend of M&A with macroeconomic variables more desirable. Several traditional methods are used during the past few decades, however, combining the newly developed time series methodologies, which including cointegration test, VAR and VECM models, Granger causality, impulse response function and variance decomposition, seems a more appropriate way to fully investigate the long-run and short-run relationships among M&A activity and macroeconomic variables. Moreover, the US data are investigated in this study according to its leading position in business world nowadays and the information showing that the M&A activities of the US occupy two-fifth in the world and one-third among industrial countries. Regarding the variables selected, besides the most adopting variables of GDP, stock price and interest rate, this study adds labor cost as

one more significant impact variable related to the M&A since the M&A activities usually cause a cut in the labor force in the economy. A trade-off of cutting the labor force is reducing the labor cost. This paper thus studies the trend of M&A with four macroeconomic fundamentals, using the US data as the evidence.

This paper unfolds as follows. Section II describes data sources. Section III briefly introduces various methodologies employed and analyzes the empirical results. Section IV concludes this paper.

## **II. Data Sources**

This study employs various time series methodologies to fully investigate the dynamic relationships between M&A activities and macroeconomic fundamentals. Basing on the US data, the total number of the M&A in each quarter is adopted as the proxy for the M&A activities. Those US macroeconomic fundamentals considered in this study include GDP, stock index, labor cost, and interest rate. Quarterly data are selected. The sample period runs from 1975:4 to 2001:2. A total of 106 accounts for each variable are collected. The number of M&A in the US is collected from Mergers and Acquisitions periodical. Dow Jones index is used to represent the stock price index. GDP contains consumption and investment expenditures, and government purchases of final goods and services. Interest rate adopts the US 3-month Treasury bill. Unit labor cost in manufacturing is based on year 1992 for deflation index. All the above four macroeconomic variables are

gathered from AREMOS database of Ministry of Education in Taiwan.

Since M&A can be influenced by some macroeconomic fundamentals, we can form M&A as function of those variables. Using symbols of MA, GDP, DJ, LC, and INT to represent merges and acquisitions, gross domestic product, stock index, labor cost, and interest rate, respectively, the function can be expressed as:

$$MA_t = f(GDP_t, DJ_t, LC_t, INT_t) \quad (1)$$

However, for a dynamic relationship among variables, they should be treated mutually endogenous. We, thus, form a Vector Autoregression (VAR) model to express relationship among variables considered.

$$X_t = A_0 + A_1 X_{t-1} + A_2 X_{t-2} + \dots + A_p X_{t-p} + \mu_t \quad (2)$$

where  $X_t$  is a 5\*1 vector, including variables of MA, GDP, DJ, LC, and INT;  $A_0$  is a 5\*1 vector of intercepts;  $A_1$  is a 5\*5 coefficient matrix and  $I=1,2,3,\dots,p$ ;  $\mu_t$  is 5\*1 vector of error terms.

### III. Empirical Results (略)

<Insert Table 1-5 about here>

<Insert Figure 2 about here>

### IV. Conclusion

This study employs various time series methodologies to profoundly investigate the dynamic relationships among M&A (Mergers and Acquisitions) and some macroeconomic fundamentals, using the US experience as the evidence. The fundamentals selected in this study are GDP, stock price index, unit labor cost and interest rate, which are found by the previous

literature that they share strong interrelations with the number of M&A.

By the cointegration test, mergers and acquisitions activities are sharing common trends with those macroeconomic fundamentals considered. Their long-run equilibrium relationship carries out two cointegration ranks and is suitable to be explained by the Johansen's third model, which indicates that their cointegration relationship is found in the presence of a linear trend but not the quadratic trend.

For the short-run dynamic relations, VECM exhibits that significant impact of the macroeconomic fundamentals upon the M&A activities can be found in GDP and stock index. There isn't too much link between M&A and other changeable macroeconomic circumstance. We thus conclude that the movements of stock price and GDP have stronger interactive relationships with current M&A in a short run. Moreover, The major findings of the Granger Causality are summarized as that the movement of GDP and stock price precedes the number of M&A. Among GDP and stock index, GDP and M&A have two-way "feedback" relationship, whereas stock index shows only one-way leading position, which precedes the trend of the M&A. Furthermore, the exogenous ordering among variables are found to be organized as the sequence of GDP, M&A, Dow Jones stock index, interest rate, and unit labor cost.

The impulse response shows that, to the shocks of GDP and stock price, the response of M&A is again found to be significant. On the other hand, the shock caused by M&A

merely affects the number of M&A itself and does not show any significant impact on the fundamentals except for possessing moderate impulse to unit labor cost and GDP in the long run. The interest rate is responded more to the shocks of unit labor cost and GDP. Moreover, most of the variables affect labor cost and GDP somehow and increase their influence power when time is passing by. The final findings from variance decomposition indicate that stock price and GDP possess a relatively stronger explaining power in describing the fluctuation of the M&A. On the other hand, the number of M&A has more persuasion in explaining the volatility of GDP.

The overall finding can be addressed on that the entire macroeconomic fundamentals share the common trends with the M&A activities in the long run. However, in the short-run movement, GDP and M&A possess the strongest inter relationship. Moreover, the stock price seems play a second important role in describing the dynamic relationship with the M&A activities.

Previous studies conclude that the waves of M&A are always based on the economic circumstance. This study obtains that GDP has close interactive relationship with M&A, which proves the real world outcome. The finding of the close relationship between M&A and GDP in the US economy argues that the policy makers should keep a keen insight toward the movement of M&A activities and make every endeavor to improve the economy.

## [References]

- Beckett, Seen (1986), "Corporate Mergers and the Business Cycle." *Economic Review*, Federal Reserve Bank of Kansas City, 71, 13-26.
- Beckenstein, Alan R. (1979), "Merger Activity and Merger Theories: an Empirical Investigation." *Antitrust Bulletin*, 24, 105-128.
- Blonigen, Bruce A. and Christopher T. Taylor (2000), "R&D Intensity and Acquisitions in High-Technology Industries: Evidence From the US Electronic and Electrical Equipment Industries." *The Journal of Industrial Economics*, Oxford; 48(1), 24-47
- Box, G.E.P. and G.M. Jenkins (1970), *Time Series Analysis, Forecasting, and Control*, Holden-Day, San Francisco, CA
- Calomiris, Charles W. (1999), "Gauging the efficiency of bank consolidation during a merger wave." *Journal of Banking and Finance*, 23, 615-621
- Cheng, S. R (1993), *The Empirical Studies of Mergers Activities in American and Japan*, Thesis of Institute of International Trade of National Chengchi University, Taiwan
- Clark, John J., Alok K. Chakrabarti and Thomas C. Chiang (1988), "Trend and Stochastic Movements in US Merger Activity." *Weltwirtschaftliches Archiv Review Of World Economics*, 124, 6-19
- Dickey, D. A. and W. A. Fuller (1981), "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root." *Econometrica*, 49, 1057-1072.

- Doldado, Juan, Tim Jenkinson, and Simon Sosvilla-Rivero (1990), "Cointegration and Unit Roots." *Journal of Economic Surveys*, 4, 249-73.
- Dymski, Gary A. (1999), *The bank merger wave: The economic causes and social consequences of financial consolidation*.
- Engle, R. F. and C. W. J. Granger (1987), "Co-integration and Error Correction: Representation, Estimation, and Testing." *Econometrica*, 55(2), 254-276.
- Geroski, P.A. (1984), "On the Relationship Between Aggregate Merger Activity and the Stock Market." *European Economic Review*, 25, 223-233
- Golbe, Devra V. and Lawrence J. White (1988), "A Time Series Analysis of Mergers and Acquisitions in the U.S. Economy." in Allan J. Auerbach ed., *Corporate Takeovers: Causes and Consequences*, University of Chicago Press, 265-302.
- Gonzalo, J. (1994), "Five alternative methods of estimating long-run equilibrium relationships." *Journal of Econometrics*, 60, 203-233.
- Guerard, John B., Jr. (1985), "Mergers, Stock Prices, and Industrial Production: An Empirical Test of the Nelson Hypothesis." in O.D. Anderson, ed., *Time Series Analysis: Theory and Practice*, Elsevier, 7, 239-247.
- \_\_\_\_\_ (1989), "Mergers, Stock Prices, and Industrial Production: Further Evidence." *Economics Letters*, 30, 161-164
- Granger, C. W. J. (1988), "Some Recent Developments in a Concept of Causality." *Journal of Econometrics*, 39, 199-211.
- Haque, M., S. Harnhirun and D. Shapiro (1995), "A Time Series Analysis of Causality Between Aggregate Merger and Stock Prices: The Case of Canada." *Applied Economics*, 27, 563-568.
- Hamilton, James D. (1994), *Time Series Analysis*, Princeton University Press, Princeton, NJ:
- Johansen, S. (1988), "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control*, 12, 231-254.
- \_\_\_\_\_ (1992), "Determination of Cointegration Rank in the Presence of a Linear Trend." *Oxford Bulletin of Economics and Statistics*, 54(3), 383-397.
- \_\_\_\_\_ (1994), "The Role of the Constant and Linear Terms in Cointegration Analysis of Nonstationary Variables." *Econometric Reviews*, 13(2), 205-229.
- Johansen, S. and K. Juselius (1990), "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money." *Oxford Bulletin of Economics and Statistics*, 52, 169-210.
- King, Rober., C. I. Plosser, J. H. Stock and M. M. Watson (1991), "Stochastic Trends and Economic Fluctuations." *American Economic Review*, 819-840.
- Melicher, Ronald W., Johannes Ledolter and Louis J. D'Antonio (1983), "A Time Series Analysis of Aggregate Merger Activity." *Review of Economics and Statistic*, 65, 423-429.

- Mueller, Dennis C. (1989), "Mergers: Causes, Effects, and Policies." *International Journal of Industrial Organization*, 7, 1-10.
- Nelson, Ralph L. (1959), *Merger Movement in American Industry, 1895-1920*, in *Merger Movements in American Industry, 1895-1956*,: Princeton University Press, Princeton, NJ, 3-6 and 33-70.
- Nieh, C. C. and C. F. Lee (2001), "Dynamic Relationship Between Stock Prices and Exchange Rates for G-7 Countries." *Quarterly Review of Economics and Finance*, 41(4), 477-490.
- Reimers, H. E. (1992), "Comparisons of Tests for Multivariate Cointegration." *Statistics Paper*, 33, 335-346
- Schwartz, G. (1978), "Estimating the Dimension of a Model," *Ann. Statistics*, 6, 461-464
- Sim, Christopher (1980), "Macroeconomics and Reality," *Econometrica*, 48, 1-49
- Sorensen, Donald E.(2000) "Characteristics of Merging Firms." *Journal of Economics and Business*, 52, 423-433
- Steiner, Peter O. (1975), *Mergers: Motives, Effects, Policies*, University of Michigan Press, Ann Arbor, MI
- Zhou, Su. (1996), "The Response of Real Exchange Rates of Various Economic Shocks." *Southern Economic Journal*, 936-954.

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