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Article

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THE CORRELATION BETWEEN ECONOMIC INDICATORS AND TAIWAN STOCK MARKET - A CASE STUDY OF LEADING AND LAGGING INDICATORS

Tzu-Yi YANG, PhD*

Abstract

This study investigates the correlation between economic indicators and Taiwan stock market, analysing the leading and lagging indicators from January 1995 to December 2016 to determine whether there is any significant correlation between the indicators and the stock market. With Large-cap Stock Price Index as dependent variable and the leading and lagging indicators as independent variables, and the correlation between the leading and lagging indicators and Taiwan Stock Exchange Corporation (TSEC) Large-cap are empirically analysed by multiple regression analysis in Eviews 9. It is concluded that there is both a significant and positive correlation between the leading indicator of the Index of Export Orders and the closing price of TSEC Large-cap Stocks and a significant and negative correlation between the lagging indicators of Unemployment Rate and Inventories to Sales Ratio for Manufacturing and TSEC stock price.

Keywords: TSEC Large-cap Index, leading indicators, lagging indicators

JEL Classification: D53, E44, G10.

1. Introduction

1.1. Background and motivations

Investment has become a universal money-making channel, with stocks being the most common and important investment vehicle. If the stock market of a country develops stably, the country's economy

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must be growing steadily. So how to make sound investment decisions? A lot of factors may affect stock trend. As far as long-term trend is concerned, economy plays a key role that influences investment decisions. Therefore, one has to know economic situations well to make financial investment. Economic indicators can reflect the economic climate profile of a country and their variation can serve as references based on which governments prepare financial and economic policies; in light of this, investors have to know the meaning and significance of economic indicators in order to be able to investigate and judge the trend of financial market in the future for the basis of their decision-making in investment. One is apt to make blunder(s) in investment without in-depth understanding of the implication of economic indicators.

In 1997, hi-tech sector replaced traditional industries and financial sector in stock market. Electronics-sector stocks drove the stock market rise in Taiwan--the turnover of electronics-sector stocks took up 80% of the total turnover of Taiwan stocks--and boosted stock market quotation to a new record height. However, the outburst of the Asian Financial Crisis in July 1997 dealt a devastating setback to Taiwan stock market. Thailand was forced to implement floating exchange rate system instead of its original fixed exchange rate system, the resultant abrupt free fall of THP to USE exchange rate and the uncontrolled depreciation of other Asian countries triggered the finance crisis. Taiwan was also caught in a financial turmoil in 1998 due to the impact of the Asian Financial Crisis. TSEC Large-cap Index dropped from 10000 points to 6500 points, a slump of 35%, as a result of the sluggish economy. With economy still not fully recovered, the 921 Earthquake in 1999 and the proposal of Two-State Theory by President Lee Tenghui sent Taiwan stock market to the brink of market crash, and investors' confidence in Taiwan stock market was smashed. Then, TSEC index climbed to 10328 points in 2000, but the burst of the Internet bubbles and the subsequent market crash once again slapped down the market to 5000 odd points. It is thus evident that economic outlook has significant influence on Taiwan stock market. If we can infer the correlation between relevant economic indicators and stock market performance, it is believed that in the future investors' prediction of price trend of the investment market and their invested stocks will be more accurate and their capability of stock trade will be improved.

Liu (2006) on the economic indicator data of 108 months from January 1997 to December 2005 to determine their influence on

Taiwan stock market, this study divides 39 variables into 3 categories, i.e., domestic macroeconomic indicators, supply side indicators and demand side indicators. Domestic macroeconomic performance is judged by Index of Export Orders, Direct Finance, Indirect Finance, Real Money Supply, M1A, M1B and M2, while supply side economic performance is judged by TAIEX, Export Orders, Indexes of Producer's Inventory, Average Monthly Overtime in Industry and Services, Building Permits, Real Imports of Semiconductor Equipment and Crude Oil Inventories, and demand side economic performance by Unemployment Rate. One of the conclusions suggests that “the leading indicators released by Council for Economic Planning and Development are usually predictive and directive, and it seems that business climate has influence on fundamentals of stock market to some extent”. From the first half of the sentence, it can be inferred that the leading indicators are predictive of business climate. The leading indicators proposed by National Development Council consist of 7 economic factors and predicts the variation of business climate in the future (see <http://index.ndc.gov.tw>). The last half of the sentence suggests that there is a correspondence between business cycle and the stock market, the showcase of economy. Both the stock market and the leading indicators are predictive of future variation of business climate.

The 39 variables can be divided into Domestic Macroeconomic Performance, Supply Side Economic Performance and Demand Side Economic Performance according to the orientation of economic performance. This study summarizes leading indicators related and lagging indicators related factors in Table 1 into the following orientations.

Table 1

Categorization of the 39 variables

Domestic Macroeconomic Performance	Supply Side	Demand Side
Index of Export Orders(leading)	TAIEX (leading)	Unemployment Rate (lagging)
Direct Finance(lagging)	Export Orders(leading)	
Indirect Finance(lagging)	Indexes of Producer's Inventory(leading)	

Financial Studies – 4/2020

Domestic Macroeconomic Performance	Supply Side	Demand Side
Real Money Supply (leading)	Average Monthly Overtime in Industry and Services (leading)	
M1A(leading)	Building Permits(leading)	
M1B(leading)	Real Imports of Semiconductor Equipment (leading)	
M2(leading)	Crude Oil Inventories (leading)	

Data Source: Chang et al. (2016) and this research arrangement.

As can be seen in Table 1, most of the 39 variables are combinations of leading indicators and lagging indicators. There are 7 Domestic Macroeconomic Performance indicators and 7 Supply Side indicators, 1 Demand Side indicators. It is found that 80% of them are leading indicators, meeting the business climate predicting characteristics of the leading indicators perfectly. Taiwan's leading indicators and lagging indicators have either consistent or opposite trend with the stock market. In light of this, this study will use leading indicators and lagging indicators that are representative of Taiwan's economy to explore the correlation between these indicators and TSEC Large-cap.

1.2. Objectives

Of the many business climate and stock market trends predicting methods available, a simple method is to observe business climate indicators. National Development Council selected from many influencing factors of the Taiwan's economy several ones that most influence the Taiwan's macroeconomics, and divided them into three categories, i.e., Leading Indicators, Lagging Indicators, and Coincident Indicators (see <http://index.ndc.gov.tw>). The leading indicators are the combinations of 7 business climate variation predictive indicators and one of the important prediction tools for forecasting short-term business climate in the future; the lagging indicators consist of six economic factors which usually lag behind business cycle variations. They have in nature a bias towards the testing of the correctness of the trend of leading and/or coincident indicators. The coincident indicators

consist of 7 indicators which, coinciding with business climate variation, can reflect current business climate.

This study aims to discuss the linkage between the economic indicators and the stock market, and it is hoped that the empirical results can serve as a reference for individual investors and institutional investors in their investment. This study will investigate the leading indicators that can predict business climate and the accuracy of trend prediction with the leading indicators is verified using the lagging indicators. When business climate is overheating or at low tide, the central bank may stabilize the business climate with monetary policy tools including Deposit Reserve Rate, Discount Window, Open Market Operation and Re-deposited Deposits of Financial Institutions, etc. The most frequently used approach is to increase or decrease the circulating money on market by open market operations such as bond trading or issuing fixed term deposit. This approach changes the Real Monetary Aggregates, a leading indicator. It is thus evident that the leading indicators have their significance.

Finally, the coincident indicators represent current business climate. They correspond to business climate reciprocally and cannot reflect business climate trend in advance or in retrospect. Therefore, the coincident indicators are excluded from the independent variables of this study.

1.3. Limitations of the study

There are three limitations, which are described one by one in this section:

(1). This study is to investigate the correlation between Taiwan stock market and economic indicators, which can be divided into Leading Indicators, Coincident Indicators and Lagging Indicators. Coincident indicators coincide with business climate variation, and their turning points usually emerge synchronously with the turning points of business climate cycle. Therefore, they cannot indicate the trend of business climate and are excluded from this study.

(2). Stock Price Index, a leading indicator, is a dependent variable of this study. Therefore, it is excluded from the leading indicators of this study and is not used as an independent variable of the leading indicators of this study.

(3). Multiple regression analysis is carried out in this study. In order to ensure the precision and accuracy of the analysis, 6 variables, i.e., Building Permits and Real Monetary Aggregates (leading

indicators), Regular Employees on Payrolls in Industry & Services, Manufacturing Unit Output Labour Cost Index, Interbank Overnight Call-Loan Rate, Loans and Investments of Monetary Financial Institutions (lagging indicators), are excluded from this study for their collinearity problem.

2. Literature Review

2.1. Correlation between economic indicators and stock indexes

In a world featuring frequent economic trading between countries, all countries' currency exchange rates, policies, and stock markets would influence their national economy. Chang (2005) pointed out that Ganger causality test results suggested that TSEC Index WAS influenced by international stock price indexes. It has been found that Dow-Jones Index, NASDAQ Index, S&P Index, Philadelphia Semiconductor Index, Paris CAC Index, London FT 100 Index, Frankfurt DAX Index, Korea Composite Stock Price Index, Tokyo NIKKEI 225 Index, Hong Kong Hang Seng Index have one-way causal relation with TAIEX, electronic-sector stocks index, finance-sector stocks index, and MSCI Taiwan Closing Index, suggesting that Taiwan's stock price indexes would be influenced by international stock prices. USD to TWD Exchange Rate has one-way causal relation with MSCI Taiwan, i.e., the fluctuation of USD to TWD Exchange Rate would have impact on Taiwan's stock price. It is conjectured that the elevated weight of MSCI Taiwan plus Taiwan government's loosening of restrictions on foreign investment in Taiwan stock market have enlarged the amount of foreign capital invested in Taiwan stock market. As a result, the fluctuation of exchange rate market becomes even more rapid.

Shen (2011) had probed into the influence of US stock market trend on Taiwan stock market. In his study, the complete data of TWSE Taiwan 50 Index were analysed first, then divided into 3 categories, i.e., electronics -sector stocks, finance-sector stocks, and non-electronics non-finance sector stocks. A total of 4 groups of samples were subjected to empirical analysis to determine whether the samples' accumulative abnormal return and normalized accumulative abnormal return are significant within five (5) days after the empirically analysed event. The results showed that a 3% or higher fluctuation of S&P 500 index has positive effect on TWSE Taiwan 50 Index. Whenever S&P 500 index rose by 3% or more, TWSE Taiwan 50 Index would

experience significantly positive accumulative abnormal return one day after the event. On the contrary, whenever S&P 500 indexes dropped by 3% or more, TWSE Taiwan 50 Index would experience significant negative accumulative abnormal return one day after the event. Moreover, when the samples were divided into electronics -sector stocks, finance-sector stocks, and non-electronics non-finance sector stocks for group tests, the empirical results showed most stocks except for finance-sector stocks would experience positive performance identical to those mentioned above. It is thus evident that a 3% or more rise/fall of S&P 500 index indeed has positive influence on the performance of TWSE Taiwan 50 Index on the following day. This finding can serve as a reference for investors in their investment.

The causal relation between U.S. stock market index and TAIEX was then analysed in terms of practicability, expectancy and non-expectancy. Granger causality tests were conducted on 3 U.S. stock market indexes and 3 weighed Taiwan stock market indexes. Whether from the perspective of practicability, expectancy or non-expectancy, we have adequate evidence that Dow-Jones index, S&P500 index and NASDAQ index have powerful one-way influence on weighed Taiwan stock market index, suggesting that Taiwan stock market is a follower of U.S. stock market. U.S. stock market as a leader of international finance has adequate influence and its trend has impact on international financial market. Taiwan is an export-oriented economic entity, and the United States is Taiwan's largest and most important trade partner. Therefore, the fluctuation and trend of U.S. stock market have substantial influence on Taiwan stock market. The study came to an important conclusion that TAIEX trends behind U.S. stock market index and has rational expectation from U.S. stock market index.

Wu (2003) explored the dynamic correlation between the stock markets of Taiwan, the United States and Japan with time-sequence approach. Their empirical analysis revealed that: the long position and short position of the stock price index would complete interaction within a short time, and they do interact with each other, but such interaction is not an all-round one because the OEM relation or correlation between countries would affect the short-term return of stock prices. Furthermore, it is known that there is only one-way causality between the ROIs of stock price indexes of the studies countries. Both Taiwan and Japan are under the influence of the ROI of U.S. stock price. In the meantime, Taiwan's stock price index ROI is affected by the ROI of

Japan's stock price index. The study found no causality with the United States.

In addition to Japan, the study also reviewed literature on the credit rating of Greece. National Policy Foundation (2012) described the burst of credit crisis on November 23, 2009 in Greece, one of the so-called PIIGS states. The crisis triggered devastating falls in European and U.S. stock markets. Taiwan stock market was also caught in and directly impacted by this crisis. Luckily, other capital markets such as bond markets and fund markets were less involved and affected, and therefore continue to operate properly. Furthermore, since Taiwan stock market is a so-called thin market¹, which means most securities transactions in capital market are stock trading and there is neither adequate transactions of bonds/alternative financial instruments for investors to select from nor other special resources like those of financial centres that can accommodate impact. Therefore, Taiwan stock market is susceptible to skyrocketing or crash or drastic market fluctuations. As a result, Taiwan stock market went so far as to suffer from an abrupt and devastating fall of 1,358 points with huge turnover in early August 2011, down 15.6% and breaking the strong points of 1-year MA, 2-year MA and even 5-year MA. After the crash, investors' confidence in the market was extremely low and the market took on a pattern featuring short-term oscillation and mid-term market correction. Moreover, the amount of oversold foreign capital increased rapidly since August 2. Taiwan stock market crashed on August 5 for 3 consecutive days under the influence of foreign markets. In the first week of August, the amount oversold exceeded NTD12.6629 billion, hitting a record of oversold amount of foreign capital within a week in the history of Taiwan stock market.

The policies of countries that are in current commercial intercourses with Taiwan may have impact on Taiwan's domestic stock market. Lee (2013) studied the Quantitative Easing (QE) monetary policy of the United States on the ROIs of electronics-sector stocks, finance-sector stocks and construction-sector stocks in Taiwan stock market by event study. His study covered 1430 entries of daily data from 2007 to 2012. The event days of his event study were the

¹ *Thin Market: An economic term, also referred to as thin economy, used to denote an economic system that has limited territory area and relatively scanty natural resources. A thin market like a shallow plate is susceptible to economic fluctuation when agitated due to its weak economic foundation.*

implementation days of the three QEs of Federal Reserve Board in 2008 (QE1), 2010 (QE2) and 2012 (QE3), respectively. Study procedures: First, the day and occurrence time of the events were determined; then abnormal returns were calculated and subjected to test to see whether they were significantly different from zero; finally, average abnormal returns were tested to determine the extent of the event's influence.

Based on the afore-mentioned content, the study results revealed that: the QE policy was implemented in the United States and the implementation period can be divided into QE1, QE2 and QE3. QE1 was implemented to solve the liquidity problem, which at the time of QE1 was not fully recovered. Taiwan's central bank had raised benchmark interest rate and implemented real estate curbing policy before QE2. This, together with the increase of NTD to USD exchange rate to more than 30, has significant adverse impact on OEMs and the construction sector because the rate of gross margin in these economic sectors was merely 3%. The implementation of QE resulted in the flooding-in of hot money and depreciation of NTD, giving rise to the skyrocketing trend of construction-sector stock index at the end of the Five Cities Election. During the QE3 period, which coincides with the finalization of capital gains tax, investors continuously sold their stocks amid the bullish financial news from both Mainland China and Taiwan, the appreciation of NTD and the soaring fuel price. As a result, the turnover and price of large-cap stocks were adversely impacted. The study finally came to a discovery that QE1, QE2, QE3 shared a common ground--the performance of finance-sector stocks were most excellent during the three periods.

Chang (2015) studies the interaction between interest rate, stock price and macroeconomic indicators and illustrated the long-term and short-term influence of the development of monetary policy and capital market in recent years on the macro-economic development of Taiwan. Samples from January 2002 to September 2014 were collected for this study for the observation of the short-term interactions between macro-economic environment indicators including interest rate and stock price trend, exchange rate, GDP, general exports, overall unemployment rate and production index of industries. Furthermore, the study found that exchange rate, a macroeconomic indicator, has one-way causal relation with stock price in the stock markets of Japan, Thailand and Malaysia. In the markets of Korea and Singapore, however, it was found that stock price is the result of the

causality of exchange rate. It is thus evident that the relation between stock price and macroeconomic indicators varies in different markets.

Lee (2015) studied the impact of Abenomics, which was implemented from 2012 to 2014, on Taiwan stock market by event study. The impact of Abenomics on the stock prices of listed/OTC listed businesses in 5 industry sectors, i.e., electrical machinery, automobile, electronics, plastics, and chemical industry were specifically studied. Three (3) event days of Abenomics were chosen and subjected to event study for providing a basis on which the influence of Japan on the average abnormal returns (AAR) and cumulative average abnormal returns (CAAR) of Taiwan stock market and the direction of such influence can be investigated. The first event day is the day on which Japan announced that it would utilize financial and monetary measures to boost economy; the second event day is the day on which Japan's central bank announced that it would release new finance policies in response to Abenomics; the third event day is the day on which Prime Minister Abe Shinzou published his latest economic measures. His study data included the AARs and CAARs of 1,557 listed or OTC listed Taiwanese companies in the 10 days before/after the studied events.

The results showed that the first event day has positive AARs on all listed or OTC listed companies as a whole; it was also found that first event day has positive AARs on electrical machinery, electronic, and automobile-sector stocks but has negative AARs on plastics-sector stocks and chemical-sector stocks. The second event day has positive AARs and CAARs on all listed or OTC listed companies as a whole and has positive AARs on five major sectors of stocks. The third event day has positive AARs on all listed or OTC listed companies, but its CAARs are negative, and its influence on the five categories of stocks yields positive AARs. All three event days have more or less positive influence on Taiwan stock market, with influence gain on electrical machinery sector stocks being the greatest, and influence gain on plastics-sector stocks and chemical-sector stocks being the smallest.

Tsai (2014) distinguished contraction periods and expansion periods of business climate with regression test to see whether the influence of business climate on the change of monitoring indicator score is consistent with the stock market's trend and the stock sectors' trend. The data used in the study cover a period from January 1984 to December 2012. A total of twenty sector stocks indexes, i.e., TAIEX, food industry, textile fiber, paper making, building materials &

construction, finance & insurance, cement, plastics, electrical machinery, electrical appliances & cables, chemical & biotech, glass & ceramics, rubber, steel, automobile, electronics, shipping, sightseeing, trading and general merchandise, and other sectors. The closing prices and monitoring indicator scores on the last business day of every month were subjected to tests. Her study results revealed that:

(1) There is significant positive correlation between current same-sector stocks index and monitoring indicator score variation.

(2) During contraction period and expansion period, monitoring indicator score variation has significant negative correlation with same-sector stocks index, suggesting that monitoring indicator score variation has poor interpretative force in expansion period for same-sector stocks index. The underlying cause might be that, during expansion period, economy develops prosperously, and the component economic indicators of the monthly released monitoring indicator score are changing rapidly. Therefore, they have poor interpretative force for lagging periods and their response has significantly negative correlation. In stock sectors that have significantly negative correlation with lagging periods, monitoring indicator score variation has insignificant and almost negligible response to the stocks sectors' lagging returns. Therefore, they can be used to distinguish the contraction period or expansion period of business climate but have poor predictive force for the trend of the stock sectors.

2.2. Summary

Taiwan stock market since 1953 to date has experienced a lot of events and has become an important investment vehicle in financial market in spite of its fluctuations. It can be readily inferred from other researchers' papers that Taiwan stock market is influenced not only by Taiwan's political and financial factors but also by volatile foreign factors. Taiwan is an island nation that has close economic links with other countries. A lot of events, may it be the QE policy of the United States or the Abenomics of Japan or the credit crisis of Greece, once impacting the economy of their country of origin would eventually affect Taiwan stock market indirectly more or less. There are numerous studies and papers on how foreign countries' economy would affect Taiwan stock market, however, only a few of these studies and papers are on how Taiwan's economic factors influence the stock market. In

light of this, this study aims to determine how representative economic factors of Taiwan affect Taiwan stock market.

3. Research method

3.1. Data description

Study period: from January 1, 1995 to December 31, 2016. Data Structure: monthly data. Dependent Variable: TSEC Large-cap Index. Data Source: Taiwan Stock Exchange Corporation (TSEC). Independent Variables: Leading Indicators--Index of Export Orders, Net Accession Rate of Employees on Payrolls of Industry and Services and Real Imports of Semiconductor Equipment. Lagging Indicators: Unemployment Rate, Inventories to Sales Ratio for Manufacturing. Data Source: National Development Council. The study period spans 22 years (264 months), long enough to support the empirical conclusions of the study.

3.2 Research model

Lin (2016) investigated the correlation between 7 variables (Customs-Cleared Exports, Sales Value in Manufacturing Industries--Business Turnover, Stock Price Index, Imports of Mechanical and Electrical Machinery, Non-agricultural Employment, Industrial Index) and monitoring indicators. Multiple regression analysis results revealed that 2 variables, i.e., Stock Price Index, Customs-Cleared Exports, have significant positive influence on monitoring indicators, with the influence of Stock Price Index being the most significant. In light of this, multiple regression model is used in this study to investigate the correlation between leading/lagging indicators and Taiwan stock market.

This study investigates the correlation between Taiwan stock market and leading indicators/lagging indicators with an empirical model defined by Formula (1):

$$SI_{i,t} = \beta_0 + \beta_1 EPO_{i,t} + \beta_2 ISE_{i,t} + \beta_3 Sem_{i,t} + \beta_4 Uem_{i,t} + \beta_5 IRM_{i,t} + \varepsilon_t \quad (1)$$

Wherein, $SI_{i,t}$ denotes the closing price i of TSEC Largecap Index in Month t ; $EPO_{i,t}$ denotes the Index of Export Orders i in Month t ; $ISE_{i,t}$ denotes Net Accession Rate of Employees on Payrolls of Industry and Services i in Month t ; $Sem_{i,t}$ denotes Real Imports of Semiconductor Equipment i in Month t ; $Uem_{i,t}$ denotes Unemployment Rate i in Month

t ; $IRM_{i,t}$ denotes Inventories to Sales Ratio for Manufacturing i in Month t ; $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ denote coefficients of independent variables; ε_t denotes the Error Value in Period t

4. Empirical analysis

For this study, the dependent variable is Closing Price of TSEC Large-cap Index, and the independent variables consist of 3 leading indicators, i.e., Index of Export Orders, Net Accession Rate of Employees on Payrolls of Industry and Services, and Real Imports of Semiconductor Equipment, and 2 lagging indicators, i.e., Unemployment Rate, and Inventories to Sales Ratio for Manufacturing. The research data are from Taiwan Stock Exchange Corporation (TSEC) and National Development Council, covering a period from January 1995 to December 2016. The correlation between Taiwan stock market and economic indicators is explored with formula (1) and these monthly data. Details of the empirical analysis are described below.

4.1. Descriptive statistics

Table 2 Descriptive statistics of the dependent variables and independent variables the closing price of Taiwan stock market reached 10066.35 points, its highest position in the study period, in July 1997, amid the economic boom. However, it crashed in the same year due to the Asian Financial Crisis. The closing price of Taiwan stock market fell to 3636.94 points, its lowest position in the study period, in 2001, because of the burst of the Internet bubbles. The average closing price of the stock market in the period from 1995 to date is 7166.11 points, with a standard deviation of 1511.378 points. All independent variables of the study have a positive average value. The maximum standard deviation 35.58555 appeared in Index of Export Orders (EPO), suggesting this index has significant fluctuation. The minimum values of all variables except for Net Accession Rate of Employees on Payrolls of Industry and Services (min. -1.41) are positive values.

Table 2

Descriptive statistics of the dependent variables and independent variables

	Qty.	Mean	SD	Min. Value	Max. Value
SI	264	7166.11	1511.378	3636.94	10066.35
EPO	264	67.98379	35.58555	18.21	145.69
ISE	264	0.0985985	0.360554	-1.41	1.16
Sem	264	0.9815075	0.1801417	0.44	1.46
UEM	264	3.931098	0.9943636	1.38	6.13
IRM	264	67.70731	7.705116	52.48	103.38

Notes: 1. SI: Closing price of TSEC Large-cap; EPO: Index of Export Orders; ISE: Net Accession Rate of Employees on Payrolls of Industry and Services; Sem: Real Imports of Semiconductor Equipment; UEM: Unemployment Rate; IRM: Inventories to Sales Ratio for Manufacturing; 2. Dependant Variable is SI; 3. Monthly data for the study period from January 1995 to December 2016.

4.2. Collinearity

According to Cooper and Schindler (2003), the upper limit for determining collinearity is 0.8, which is more rigorous than the collinearity upper limit (0.95) proposed by Grewal et al. (2004). Therefore, in this study, we use 0.8 as the independent variable for collinearity determination criteria. If the independent variable exceeds 0.8, variance inflation factor (VIF) will be tested to see whether the VIF is significantly greater than 10 or not. If the VIF of an independent variable is greater than 10, then it is confirmed that the independent variable has collinearity and will be excluded from the empirical analysis.

In this study, empirical analysis is carried out with Statistical Product and Service Solutions Version 22 (SPSS 22). It is found in the study that 6 independent variables, i.e., the 2 leading indicators of Building Permits and Real Monetary Aggregates and the 4 lagging indicators of Regular Employees on Payrolls in Industry & Services, the Manufacturing Unit Output Labour Cost Index, Interbank Overnight Call-Loan Rate, and Loans and Investments of Monetary Financial Institutions, are co-linear indicators. Therefore, these 6 independent variables are excluded from the study.

The collinearity test results of the independent variables in this study are as shown in Table 3 The maximum collinearity value, seen between Index of Export Orders (EPO) and Unemployment Rate (UEM), is 0.4387 and smaller than 0.8. It is therefore confirmed that

there is no collinearity between the variables and no additional VIF test must be carried out.

Table 3
Collinearity between the leading and lagging indicators

	EPO	ISE	Sem	UEM	IRM
EPO	1.0000				
ISE	0.1829	1.0000			
Sem	-0.0296	0.3050	1.0000		
UEM	0.4387	0.0850	-0.2762	1.0000	
IRM	-0.2458	-0.6824	-0.2627	-0.667	1.0000

Notes: See Table2.

4.3. Empirical analysis

Formula (1) is used in conjunction with SPSS22 for multiple regression analysis of the leading indicators of Real Imports of Semiconductor Equipment, Index of Export Orders, Net Accession Rate of Employees on Payrolls of Industry and Services, and the lagging indicators of Unemployment Rate and Inventories to Sales Ratio for Manufacturing to investigate the correlation between the leading and lagging indicators and TSEC Large-cap. The empirical results are as shown in Table 4.

Table 4
Results of empirical analysis of the correlation between the leading and lagging indicators and TSEC Large-cap

	EPO.	ISE.	SEM.	UEM.	IRM.
Coef.	30.30054*** (1.990761)	223.2613 (240.5941)	618.007 (387.1268)	-757.9664*** (73.95211)	-33.07051*** (11.36611)
R-Squared	0.5611	0.5611	0.5611	0.5611	0.5611
Observations	264	264	264	264	264

Notes: 1. See Table2; 2. The dependent variable is TSEC Large-cap; *, **, *** represent the 10%, 5% and 1% significant levels, respectively.

Of the leading indicators, the Index of Export Orders is significantly and positively correlated with Closing Price of TSEC Large-cap Stocks, while the influence of both the Net Accession Rate of Employees on Payrolls of Industry and Services and the Real Imports of Semiconductor Equipment on the Closing Price of TSEC Large-cap Stocks is insignificant. As for the lagging indicators, both the Unemployment Rate and the Inventories to Sales Ratio for

Manufacturing are significantly and negatively correlated to Taiwan stock price.

All of the above three significant variables have either positive or negative influence on the development of TSEC Large-cap. Booming export sales, low Inventories to Sales Ratio for Manufacturing, low Unemployment Rate, and stable National Income contribute to surplus money for consumption and investment, which naturally lead to prosperous consumption and investment markets. Otherwise, consumption and investment markets are sluggish, and overall consumption expenditure and economic prosperity are adversely affected.

5. Conclusion and managerial implications

As their name suggests, leading indicators have turning points emerging ahead of the turning points of business climate cycle. Of the leading indicators in this study, the Index of Export Orders is an important indicator of exports and business climate. Taiwan is an island nation lack of lands and natural resources. Many goods and materials from articles for daily use to industrial raw materials have to be imported from abroad. Autarky is impossible for Taiwan, a densely populated nation that has limited land, therefore the importance of export trade is self-evident. According to the Department of Statistics, Ministry of Economic Affairs (2017), Export Orders is an indicator prepared in accordance with the purchase orders taken by domestic manufacturers from foreign customers, covering raw materials, electronic parts, and semi-finished products. Index of Export Orders is an indicator of export trade prepared on the basis of monthly order variations. Taiwan's domestic business climate is susceptible to the influence of the trade with other countries and as a result other countries' development, policies, and economy will have impact on Taiwan. According to the empirical analysis results of this study, Index of Export Orders has very significant influence on the Closing Price of Taiwan Large-cap Stocks, and the Stock Price Index itself is a leading indicator of economy. In light of the definition of leading indicators of economy, a booming stock market is predictive of future business boom. An article on Financial Times² pointed out that the fluctuation patterns of Taiwan's Export Orders, Taiwan's Electronics Export and

² White, E. (2017) "Charts of the year: Taiwan - Apple nation". *Financial Times*, 13 December.

Apple's stock price are similar to each other to some extent. Therefore, our empirical analysis results suggest that Index of Export Orders may provide a strategic investment indicator to investors for their reference in stock market investment.

Index of Export Orders heralds business climate and relates to Inventories to Sales Ratio for Manufacturing. The demand shrinkage following the 2008 financial tsunami had at one time in the year 2009 sent the Inventories to Sales Ratio up to more than 90%. The sluggish business climate had once resulted in an unemployment rate higher than 5%, which is the peak value in recent years. The average of the Stock Price Index in the period from 1995 to 2016 is 7166.11. The averages for 2008 and 2009 are 6940.07 and 6487.86, respectively, both are lower than the average for the study period. This echoes with an empirical analysis result of this study that Unemployment Rate and Inventories to Sales Ratio for Manufacturing are negatively correlated with stock price.

Unemployment Rate is categorized as a lagging indicator; however, unemployment has significant and immediate effect on those who want to make investment. When it is impossible to broaden sources of income, one has to reduce expenditure. This applies to investors and ordinary people alike. When they are deprived of financial resources, their consumption desire and confidence would decrease, and they would prefer saving moneys over making investment. In contrast, when unemployment rate goes down and people can find a job, they would be more readily to make investment and would be more optimistic towards future.

Business climate is the sum of all industries and indicators, which means a slight move in one part may affect the whole situation (Lupu, 2018). This study reveals that the fluctuation of business climate in stock market is by no means the result of a single factor. For an economic entity that has high dependence on foreign trade, the influence of other countries should never be underestimated. Warren Buffett once said, "Risk comes from not knowing what you're doing." This study shows that Index of Export Orders is positively correlated and Unemployment Rate and Inventories to Sales Ratio are negatively correlated with stock market. All these three indicators are highly correlated with Large-cap Index. On the other hand, the ups and downs of stock market also affect business climate. It is hoped that the empirical results of this study can provide individual investors and institutional investors with a strategic reference in their investment. A

high Index of Export Orders can reduce Inventories to Sales Ratio for Manufacturing and improve business climate for lowering Unemployment Rate. The Executive Yuan (2016) in its investment expansion program pointed out that one reason that contributes to the slowdown of Taiwan's economic growth is the sluggish exports. This argument echoes with our study results without prior consultation. Investors are advised to take these three indicators into their investment decision-making for a perfect decision.

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