

## **The Impact of Non-Macroeconomic Events on Taiwan Electronic Industry Stock Index Returns**

Ming-Chang Cheng\*, Zuwei-Ching Tzeng\*\* and Wei-Ling Kang\*\*\*

*This paper applied multiple regressions to estimate the impact of non-macroeconomic variables on Taiwan electronic stock returns. The first regression results shows that the non-macroeconomic events were significant except the second presidential election, SARS disease, 88 floods and the 21<sup>th</sup> Summer Deaflympics, but the effects were almost the same with predictions. The second regression results indicate that the macroeconomic variables of industrial production ( $\Delta IP$ ), money supply ( $\Delta M2$ ), and exchange rate ( $\Delta EXR$ ) were significant and positive impact on stock returns. The third regression incorporated three significant macroeconomic variables into the first regression as robust test, the results didn't change. According to the regression result, the power of prediction for non-macroeconomic events was better than macroeconomic variables. It seemed the non-macroeconomic events had a relatively obvious influence on Taiwan electronic stock returns than macroeconomic variables did. The result can offer the investors and policy makers as references who are interested in Taiwan electronic industry.*

**Keywords:** Macroeconomic variables, non-macroeconomic variables, electronic stock returns, multiple regressions

### **1. Introduction**

In related literature to explore the factors of influencing on stock returns, there were many studies had investigated the topic around macroeconomic variables and stock prices in the past. However, there has existed a few literatures that discuss the effects of non-economic variables on the stock market, *Chen et al(2005)* pointed out that Studies regarding the exploratory power of non-macroeconomic variables in predicting stock returns were rare. In fact, some non-macroeconomic events had an even more dramatic impact on stock prices than macroeconomic variables did. In expected non-macroeconomic events such as the sport events and the presidential

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election, although one can predict the outcome in advance. However, when the outcome isn't consistent with market's predict, which may influence investor's portfolio. In unexpected non-macroeconomic events such as natural disaster, financial crisis and infectious disease, these events not only can't be predict in advance, but also always cause the negative impact on stock returns, this argument were confirmed by the following researches. *Chen et al(1986)* asserted that stock prices were affected by a variety of national and international events and some had an even more dramatic impact on stock prices than others do, such as political and sport events. *Chen et al (2007)* used macroeconomic and non-macroeconomic variables to investigate their impact on hotel stock returns listed on the Taiwan Stock Exchange. They found some variables had strong relationship with returns especially the non-macroeconomic variables did. *Chiang and Kee(2009)* also used the expected non-macroeconomic variables and the unexpected non-macroeconomic variables to examine the stock market return for Singapore hotel. The empirical results showed some of the macroeconomic variables were significant and the latter, such as 911terrorist attacks, the 2007 US subprime mortgaged event, affected the stock return more than the former, such as political elections.

In earlier, researches about the impact of non-macroeconomic variables always focused on the US, Europe, and the Latin America. Due to the rapid development in Asian market, many researchers have transferred their research target to Asian economies. Until now, the research papers toward Asian countries are still more than industries. Recently, a few literatures have discussed the relationship between the non-macroeconomic variables and stock returns in Asian hotels industry, but there was rare papers apply the method to the fast growing industries in Taiwan, such as electronic industry

In the light of Deloitte Technology Fast 500 Asia Pacific 2008 ranking, in Taiwan, 79 of the 123 high-tech companies were electronic companies. And according to the data from Taiwan stock exchange, the market value of electronic industry occupied the whole market around 55.02% in November 2009. Besides, Investors preferred to invest the electronic industries stock rather than invest other industries stock in Taiwan Securities Exchange (TWSE hereafter). The average trade value of electronic industries took 63.43 % in the trade value of TWSE from 2000 to 2008. However, this ratio raised to 70.94% in 2009. It showed it's importance of in Taiwan capital market. Although many studies have used electronic industry as sample till now, the scope are always focused on macroeconomic variables, but by the literature, there showed some non-macroeconomic events would had influence on stock prices. However, little of literatures investigated this issue in electronics industry. As a result, this paper aimed to examine the effect of non-macroeconomic events on Taiwan electronic industry stock returns and to compare their significance with macroeconomic variables.

We anticipate the contribution to the existing literature as follows: Firstly, This is the first paper to explore the non-macroeconomic variables impact on electronic industry stock return in Taiwan. Secondly, We are the first to examine the impact of expected events and unexpected events of the non-macroeconomic variables on industry stock returns at the same time. Thirdly, to offer the investor's an insight into investment and operation strategy on Taiwan electronic industry.

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The text of the paper is organized as follows: Section 2 is Literature and Hypothesis; Section 3 includes Data, Variables and Method; Section 4 shows our Models and Empirical results, then Discussion and Conclusion presented in Sections 5 and Sections 6 separately.

## 2. Literature and Hypotheses

### 2.1 Non-Macroeconomics

From previous empirical results, we can find the stock returns were affected by various non-macroeconomic variables.

#### 2.1.1 Expected Non-Macroeconomic Events

##### Sport events

*Krueger and Kennedy (1990)* showed that the outcome of Super Bowl game can affect the stock market. Over recent years there has been several academic research studying the sports hosting effect. It was believed that the hosting countries were associated with new money inflows and boosting the hosting countries' economy. *Veraros et al (2004)* and *Kasimati et al (2009)* examined the effect of the 2004 Olympic Games, they found winner country had significant positive impacts on the economic performance of all the industries, especially on the infrastructure industry. However, *Berman et al (2000)* studied the impact of 2000 Olympic Games on 23 industries in Australia and found not all the industries had significant positive impact but only particular industries related to infrastructure development did. Based on above argument we predict that : **H1**: sport event is positively related to stock returns.

##### Presidential Election

For many years, researchers have spent much time on the topic of presidential elections. *Bialkowski et al (2008)* examined whether national elections would cause higher stock market volatility. Their research results revealed the high volatility and correlation between stock returns and elections. *Wong et al (2009)* explored the Presidential Election Cycle that occurs every 4 years in the USA, it showed the stock prices would reach a trough significantly in the second year and reach a peak in the third year. We called this phenomenon as the economic theory of political business cycles (PBC hereafter). However, *Jorg (2006)* examined the movement of stock prices and elections. The empirical results differ from the literatures in the US; it had no PBC in Germany. Besides, the president election is not among the expected non-macroeconomic variables, if the outcome of president election is not in harmony with investor's expectation. Hence, which may affect investor's investment strategy, Based on above argument, we predict that: **H2** :The president election positively influences stock returns on the third and fourth year of PBC, or the outcome of president election is in harmony with investor's expectation, Otherwise instead.

### 2.1.2 Unexpected Non-Macroeconomic Events

#### Natural Disaster

Besides the expected events, there still existed unexpected events that can affect stock prices. In previous studies, it has been found that major catastrophes and disastrous events have a significant impact on stock market returns. Events such as hurricanes (*Lamb, 1995, 1998; Angbazo and Narayanan, 1996*), geomagnetic storms (*Krivelyova and Robotti, 2003*), and earthquakes (*Shelor, Anderson, and Cross, 1992*) are studied to some extent in the literature. Results from these studies suggest that unexpected disasters have a significant negative impact on stock returns across the market. Research finds that these catastrophes and disastrous events have an adverse effect on the stock prices of property and casualty firms. Specifically, *Lamb(1998)* and *Bertrand(1993)* thought the fall of growth rate of output wasn't as much as people thought and needed to take large effort for any year even in a natural disaster. *Toya et al(2007)* and *Noy(2009)* also investigated the impact of natural disasters. They found there was a negative GDP growth rate during the period of disaster. Based on above argument we predict that: **H3** : Natural disaster is negatively related to stock returns.

#### Financial Crisis

*Jang et al(2002)* and *Gong et al(2004)* analyzed stock market of financial crisis among the southeast Asian countries in 1997. They discovered before the crisis there had no relationship between main countries and neighboring countries, But in the period of crisis, granger causality was found out in some countries, especially in Hong Kong, Thailand, Indonesia, and Singapore. However, Japan wasn't affected in any way, and Taiwan was only affected on October 1997 temporarily. Besides, The global financial crisis of 2008, an ongoing major financial crisis, could have affected stock volatility, The crisis rapidly evolved into a global credit crisis, deflation and sharp reductions in shipping and commerce, resulting in a number of bank failures in Europe and sharp reductions in the value of equities (stock) and commodities worldwide. (*Wikipedia 2009*). Based on above argument, we predict that: **H4**: Financial crisis is negatively related to stock returns.

#### Infectious Disease

*Nippani et al(2004)* examined the impact of Severe Acute Respiratory Syndrome (SARS) on the stock markets of eight countries<sup>i</sup>, it showed only two(China and Vietnam) out of the eight countries had impacts due to the SARS. The countries without impacts still had positive index around the period. And the countries suffered negatively impact only with limited index, *Chen et al(2007)* used the similar period to examine Taiwanese stock performance. The results indicated that hotels performed badly in their earnings and stock prices. However, the banking, manufacturing, retail trade, and electronic industries were less affected during the SARS period. Based on above argument, we predict that: **H5**: An infectious disease is negatively related to stock returns.

In summary, according to some results from empirical papers, the stock price was deeply affected by non-macroeconomics. Public believe stock returns were sensitive to systematic and non-systematic news. And sometimes the non-system events can truly reflect the investor expectation. For the reason, financial market

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participants invest their portfolio following the policy changes and the adjustments of non-macroeconomic news.

### 2.2 Macroeconomics

Numerous empirical studies have investigated the relationship between stock prices and macroeconomic variables. *Chen et al(1986)* used monthly data to investigate the systematic event influence on US stock market return by several economic variables, they found some of the variables were significant in describing stock returns, and got a proof that the stock returns was exposed to systematic events. *Rapach et al(2005)* also used several variables in 12 industrialized countries<sup>ii</sup> to prove the predictability of macroeconomic variables, they got a result that most variables have the ability to predict the stock prices, Besides, *Abugri(2008)* studied the relationship in Latin American markets using local macroeconomic variables and global factors simultaneously to test significant level for market return<sup>iii</sup>. He found global factors were consistently significant in explaining returns in all the markets but local variables weren't. In Asia, *Wongbangpo et al(2002)* investigated the interaction of stock price and macroeconomic variables in five ASEAN countries stock market. It indicated that the past macroeconomic variables in these ASEAN countries were able to predict future changes in the stock price indices. *Liljeblom et al(1997)* analyzed the data from 1920 to1991 for Finland. The results indicated a predictive power from stock market volatility to macroeconomic volatility in Finland was higher than US. The results mentioned above revealed stock price were close to macroeconomics.

On the contrary, some papers exhibited very diverse opinion on the result. *Chan et al(1998)* used many variables for five classification<sup>iv</sup> to identify which factors were important in describing stock returns for Japan and the U.K.. All the five classifications were significant except macroeconomic variables. In addition, *Unro Lee(1997)* applied money supply and fiscal policies to investigate stock markets for the Pacific Basin countries. He found stock markets of these four countries were not efficient with macroeconomic policies. The result contradicted the past researches that support stock market return was informationally efficient with a respect to macroeconomic policies.

In stock prices or returns, Based on the financial theory, stock prices reflect investors' expectation about future corporate earnings.(*Choi et al,1999*). In industry level, some papers showed that firms at the same industry experience the same rates of returns. However, according to investors' portfolio and invest strategy, it reflects the rate of industry returns were significant difference.(*Choi et al,1995*). In risks factor, *Kavussanos et al(2002)* examined the long-run impacts of several variables of global risks on the returns of 38 international industries. The results showed the impact of a factor had a little similarity on industry returns. Furthermore, *Nguyen (2007)* adopted the variables of real GDP, exchange rate and interest rates to examine risk difference between domestic-oriented industries and export-oriented industries in Japan, It showed the former were more sensitive to GDP growth, and the latter were more sensitive to an appreciation in the Japanese currency. And the risks for the former were less than the latter.

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The following will illustrate the empirical results for the variables that used most in the past studies separately.

### **Inflation**

Most scholars used consumer price index (CPI) to substitute inflation. CPI was often used to reflect the products and prices about the general public.

Most studies reveals inflation had negative impaction on stock return. *Liljeblom et al (1997)* also found the Finnish data of stock market was affected by inflation. In the industries analysis, *Kavussanos et al(2002)* found there was a few industries have negative influence, such as electronic sectors.etc, In predictability, the inflation is limited. (*Rapach et al,2005*), (*Chen et al,1986*). On the contrary, They considered inflation had no ability in predicting stock return.(*Chan,1998*), (*Chen,2005*). Based on above argument, we predict that the variable of inflation has a negative impact on stock returns.

### **Industrial Production**

The industrial production takes the gross domestic product (GDP) approximately 50% and it was sensitive enough to the economic. Therefore, it made industrial production an important tool for forecasting future GDP and economic performance.

Several empirical studies have investigated the variables for industrial production (IP). *Fama(1981)* , *Chen et al(1986)* and *Choi et al(1999)* examined the relation between IP and lagged real stock returns. The results showed that stock markets enhance predictions of future . Some empirical demonstrated that industrial production was positive significantly to stock market.(*Liljeblom et al,1997*), (*Kavussanos et al,2002*). However, In predictability, *Chen et al(1986)* and *Rapach(2005)* found that the describing ability of IP was limited. On the contrary, *Chan (1998)* and *Chen et al(2005)* found that IP have no impaction on stock returns obviously. Based on above argument, we predict that the variable of IP has a positive effect on stock returns.

### **Money Supply**

Money supply is the total amount of money available in an economy at a particular point in time. Based on different definition, Money supply is classified into M1 and M2. *Wongbangpo et al(2002)* and *Abugri(2008)* found that monetary policy had significant negative impaction. And both *Chen et al(2005)* and *Chiang et al(2009)* showed M2 had positive significant effect toward Taiwan and Singapore hotel stock market. However, *Liljeblom et al(1997)* and *Lee (1997)* found that money supply had no obvious impact on stock market. Based on above argument, we predict that the variable of money supply has a positive impact on stock returns

### **Exchange Rate**

The exchange rate was the changing proportion of currency between countries. Traditionally, if an appreciation ( a depreciation) of currency in a country, it will reduces (enhance) the competition internationally, and benefit (affect) import-trade(export-trade) or affect(benefit) import-trade(export-trade) for specific

industry.

*Choi et al(1995) and Kanas(2000)* found that exchange rate changes didn't affect stock returns at all. However, *Abugri(2008)* showed that the stock return was deeply affected by exchange rate. In industries analysis, *Bodnar and Gentry(1993)* analyze Canada, Japan, and the USA, They found most of the industries were significant, however the electronic industries didn't have significance in Canada and the USA but had a negative significance in Japan. On the contrary, *Griffin et al(2001)* found there had a positive impact on the electronic industries in U.S. From *Boarder et al(1993)* researches, they even thought the same industry characteristics had both effects.

Through the empirical results above reveals exchange rate has a larger impact on smaller and more internationally-oriented (open) economies. Owing to the electronic products are one of the principle exports in Taiwan. We estimate exchange rate change has negative impact.

### Interest Rate

Interest rate is the price a borrower needs to pay. It plays an important role in monetary policy, The rate is used to control the investment, inflation and unemployment and to affect the performance of economy.

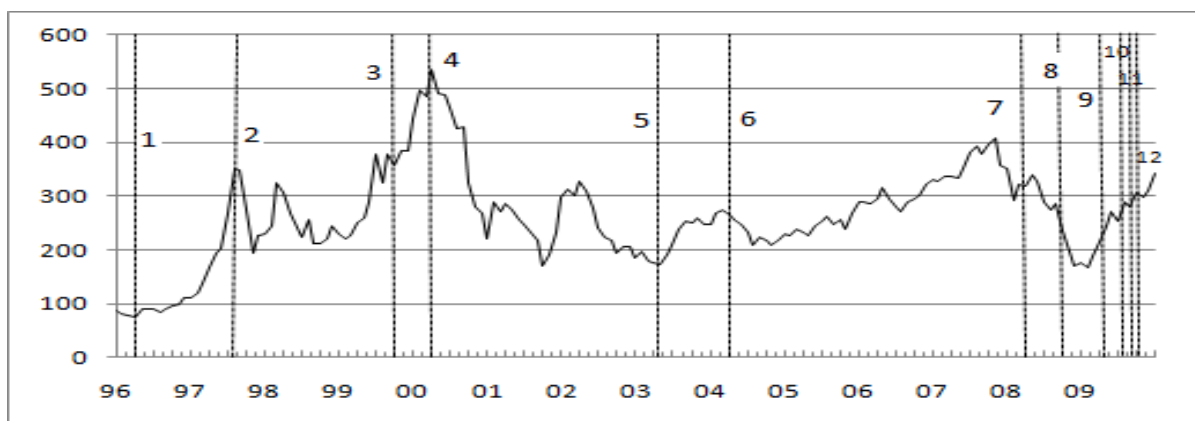
*Chen et al(1986)* indicated that interest rate had positive impact on stock return. *Wongbangpo et al(2002)* observed interest rate had a negative impact on southeast Asian countries. In the industrial analysis, *Nguyen(2007)* found interest rate spreads had a significant effect on the riskiness of capital-intensive industries. *Chiang et al(2009)* realized interest rate was negative toward Singapore hotel stock return. Specifically, *Rapach et al(2005)* pointed out the interest rate was the most reliable variable. However, *Chan et al(1998)* thought interest rate didn't have any relationship with stock return. Besides, *Chen et al(2005)* also found the interest rate was not significant for Taiwan hotel stock return. Based on above argument, we predict that the variable of interest rate has a negative impact on stock return.

## 3. Data, Variables and Method

### 3.1 Data

Owing to the issue of exchange traded funds (ETF) in recent years and the special function of hedge. In this paper, the monthly data from January 1996 to December 2009 for electronic of capitalization weighted stock indexes end of the month was obtained from Taiwan economic journal (TEJ). We choose the period as sample because the first event was happened in 1996 and the data of industrial production was obtained since 1996. The stock index involves eight categories of Taiwan electronic industry that list on Taiwan stock exchange, such as semiconductor, computer and peripheral equipment, optical-electronic, communications and internet, electronic parts/components, electronic part/components, information service and other electronic industries. The observed period of value-weighted stock price index was showed as Fig.1. And the monthly electronic stock returns ( $R_t$ ) was calculated as follows:

$$R_t = \ln(E_t) - \ln(E_{t-1}) \dots \dots \dots 3.1$$



**Fig. 1. The value-weighted stock price index and the non-macroeconomic forces**

Line 1=The 1<sup>st</sup> presidential election (1996/3). Line 2= The Asia financial crisis (1997/7).  
 Line 3= The Sept. 21 Earthquake (1999/9). Line 4= The 2<sup>nd</sup> presidential election (2000/3).  
 Line 5= The SARS disease (2003/4). Line 6= The 3<sup>rd</sup> presidential election (2004/3).  
 Line 7= The 4<sup>th</sup> presidential election (2008/3). Line 8= The global financial crisis (2008/9).  
 Line 9= The H1N1 (2009/4). Line 10= The World Games 2009 Kaohsiung (2009/7).  
 Line 11=The 88 floods (2009/8). Line 12= The 21<sup>st</sup> Summer Deaflympics (2009/9).  
 Data source: Taiwan economic journal (TEJ)

### 3.2 Variables

#### 3.2.1 Non-Macroeconomic Variable

In this study, we use the non-macroeconomic variables to investigate the relationship with stock return. This non-macroeconomic variables include presidential elections in Taiwan (the 1<sup>st</sup> (March 1996), 2<sup>nd</sup> ( March 2000), 3<sup>rd</sup> ( March 2004), the 4<sup>th</sup> ( March 2008)), financial crisis(the Asia financial crisis (July 1997) , the global financial crisis (August 2007)), sports events (the World Games 2009 Kaohsiung (July 2009), the 21<sup>st</sup> Summer Deaflympic (September 2009)), diseases (the SARS disease (April 2003), influenza A(H1N1)(April 2009)) and the natural disasters(the Sept. 21) Earthquake(September1999) and the 88 floods(August 2009)). The selecting time of president elections, sports events, and natural disasters were selected of the happening month; the financial crisis and the diseases were selected the announced month from international events.

#### 3.2.2 Macroeconomic Variable

In this study, we followed *Chen et al(2005)* and *Chiang et al(2009)* the methods and variables from their researches. The six-variables of customer price index (CPI), industrial production (IP), money supply (M2), exchange rate (EXR), 10-year government bond yield (LGB) and 3-month bank interest rate of the First commercial bank (STB) were included.

Before the formulation of regression model, multi-collinearity was a necessary



procedure to check if there exists co-linearity among variables. And unit root test of Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) were employed to test the data of time serial is stationary, According to *Granger and Newbold(1974)*, they suggest if the time series were non-stationary data and running the regression, it might got a result of spurious regression<sup>v</sup>. Besides, Ljung-Box Q-statistic and  $Q^2$ -statistic were used to examine if the residuals (  $e_t$  ) fit in with the Classical Normal Linear Assumptions: normality, non-autocorrelation and homoskedasticity. If the residual test didn't tallied with the classical normal linear assumptions, the estimated coefficient will not be effective.

## **4. Model and Results**

The ordinary least squares (OLS) method was used to compute the estimate of regression model. Multiple regression models were applied to examine the effects of non-macroeconomic and macroeconomic variables on Taiwan electronic stock return.

### **4.1. Regression Model with Non-Macroeconomic Variables**

$$R_t = \beta_0 + \sum_{i=1}^{12} \beta_i NV_{it} + \varepsilon_t \dots\dots\dots 4.1$$

Where,  $R_t = \ln(E_t) - \ln(E_{t-1})$ ,  $NV_{it}$  donates non-macroeconomic events, we set dummy variable for every event, the number 1 was the corresponding month for the event, and 0 was otherwise. The observed events were presidential elections in Taiwan from 1996-2008, the Asia financial crisis, the Sept. 21 earthquake, the SARS disease, the global financial crisis, H1N1, the World Games 2009 Kaohsiung, the 88 floods and the Summer Deaflympics.

In equation 4.1,  $VIF < 10$  for all variables, it indicates there is no existence of co-linearity among variables. Both of ADF and PP test also show that all data of time serial are stationary for no unit root. Besides, Ljung-Box Q-statistic and  $Q^2$ -statistic test also show that the residuals fit in with the Classical Linear Assumptions.

In table.1, it exhibited the correlation coefficient matrix of the electronic stock returns and non- macroeconomics variables over the entire sample period. It shows there are seven non-macroeconomic events are negative correlation to stock returns, while there are five non-macroeconomic events are positive correlation to stock return.

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**Table 1. Correlation coefficient matrix of non-macroeconomic events and stock returns**

	RETURN	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
RETURN	1.000	-.029	.197	-.049	.070	-.013	-.030	-.013	-.151	.087	.086	-.028	.061
D1	-.029	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006
D2	.197	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006
D3	-.049	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006
D4	.070	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006
D5	-.013	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006
D6	-.030	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006
D7	-.013	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006
D8	-.151	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006
D9	.087	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006
D10	.086	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006
D11	-.028	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006
D12	.061	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000

Note:

D<sub>1</sub>, D<sub>2</sub>, D<sub>3</sub>, D<sub>4</sub>, D<sub>5</sub>, D<sub>6</sub>, D<sub>7</sub>, D<sub>8</sub>, D<sub>9</sub>, D<sub>10</sub>, D<sub>11</sub>, D<sub>12</sub> denotes The 1<sup>st</sup> presidential election, Asia financial crisis, 921 earthquake, The 2<sup>nd</sup> presidential election, SARS disease, The 3<sup>rd</sup> presidential election, The 4<sup>th</sup> presidential election, Global financial crisis, N1H1, The World Games 2009 Kaohsiung, 88 floods and The 21<sup>th</sup> Summer Deaflympics respectively.

The regression results were showed in table2. It clearly shows that coefficient is positive and significant for the World Games 2009 Kaohsiung at 1% significant level, while the coefficient of The 21th summer deaflympics is positive but insignificant, the result is in line with *Berman et al(2000)*, *Veraros et al(2004)* and *Kasimati et al(2009)* , and support H1 we proposed. In regarding Presidential election, there are 3 out of 4 are negative impact on electronic stock returns, the result is inconsistent with *Bialkowski et al(2008)*, *Wong et al(2009)* but don't support H2 we put forward. In regarding Natural disaster, 921 earthquake is significantly negative impact on electronic stock returns, while 88 floods is negative but insignificant, the result is consistent with *Shelor, Anderson, and Gross(1992)*, *Lamb(1995,1998)*, *Angbazo and Narayanan(1996)*, *Krivelyova and Robotti(2003)*, and support H3 we proposed. In regarding Financial crisis, Asia financial crisis is significantly positively related to electronic stock returns, the result is inconsistent with *Wikipedia(2009)* and don't support H4 we put forward. While Global financial is significantly negatively related to electronic stock returns. The result is in harmony with *Wikipedia (2009)* and support H4 we proposed. In regarding Infectious disease, N1H1 is significantly positive impact on electronic stock returns, while SARS disease is positive but insignificant. The result is inconsistent with *Chen et al (2007)* and H5 we proposed.

**Table 2. Multiple regression results of the electronic stock return on non-macroeconomic variables**

Variables	Coefficient	t-statistics	Prob
Constant	-0.006	-0.544	0.590
The 1st presidential election	-0.072	-4.365	0.000***
Asia financial crisis	0.336	14.707	0.000***
921 earthquake	-0.055	-5.065	0.000***
The 2 <sup>nd</sup> presidential election	0.027	0.980	0.334
SARS disease	0.008	0.613	0.545
The 3 <sup>rd</sup> president election	-0.089	-6.540	0.000***
The 4 <sup>th</sup> presidential election	-0.086	-4.540	0.000***
Global financial crisis	-0.159	-9.647	0.000***
H1N1	0.065	3.943	0.000***
The World Games 2009 Kaohsiung	0.112	13.365	0.000***
88 floods	-0.009	-0.725	0.472
The 21 <sup>th</sup> Summer Deaflympics	0.027	1.496	0.139
Adjusted R square=0.020			
F-statistic=1.278			
Prob=0.237			
DW=1.737			

Note:1.\*\*\*, \*\*, \*, donates at 1%, 5% and 10% significant level respectively.

#### 4.2. Regression Model with Macroeconomic Variables

We used the multiple regression models to investigate the stock return and macroeconomic variables.

$$R_t = \beta_0 + \beta_1 \Delta CPI + \beta_2 \Delta IP + \beta_3 \Delta M2 + \beta_4 \Delta EXR + \beta_5 dSPD + \varepsilon_t \dots\dots\dots 4.2$$

Where,  $R_t = \ln(E_t) - \ln(E_{t-1})$ ,  $\Delta CPI$  is the growth rate of  $CPI$  and was measured as  $\Delta CPI = \ln(CPI_t / CPI_{t-1})$ ,  $\Delta IP$  is the growth rate of industrial production and was measured as  $\Delta IP = \ln(IP_t / IP_{t-1})$ ,  $\Delta M2$  is the growth rate of money supply and was measured as  $\Delta M2 = \ln(M2_t / M2_{t-1})$ ,  $\Delta EXR$  is the change rate of exchange rate and was measured as  $\Delta EXR = -\ln(EXR_t / EXR_{t-1})$ ,  $dSPD = LGB - STB$ ,  $LGB$  is the 10-year government bond yield,  $STB$  is 3-month bank interest rate of the first commercial bank.

In equation 4.2, It also meet the sufficient conditions about the variables, the data of time serials and the residuals are at the same with equation 4.1.

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In table.3, it exhibited the correlation coefficient matrix of the electronic stock returns and macroeconomics variables over the entire sample period. The mean return was 0.8%. Through the correlation matrix, the variable of  $\Delta EXR$  (0.331) was relatively high correlation with return among variables, while the level of relationship was still in an accepted area. And the variables of  $\Delta IP$  (0.106) and  $\Delta M2$  (0.165) also had a little correlation with returns. However, all macroeconomic variables are positive correlation to stock returns.

**Table 3.**  
**Correlation coefficient matrix of the electronic stock return and macroeconomic variables**

	RE URN	$\Delta CPI$	$\Delta IP$	$\Delta M2$	$\Delta X$	$dSPD$
RET RN	1.000	.069	.106	.165	.331	.038
$\Delta CPI$	.069	1.000	-.060	-.000	.040	-.124
$\Delta IP$	.106	-.060	1.000	-.237	.039	.022
$\Delta M2$	.165	-.060	-.237	1.000	.031	.016
$\Delta EXR$	.331	.040	.039	.031	1.000	-.077
$dSPD$	.038	-.124	.022	.016	-.077	1.000

The regression result was showed in Table4. From the result of table4, the coefficient of determination of  $\bar{R}^2$  was 13.6%. It meant the descriptive power for regression1 was 13.6%. It clearly shows that coefficient is positive for  $\Delta CPI$ , the result is inconsistent with *Liljeblom et al(1997)*, *Kavuaasnos et al(2002)* and don't support the hypothesis we proposed. In regarding  $\Delta IP$ , the industrial production is positive impact on stock returns at 10% significant level, the result is consistent with *Fama(1981)*, *Chen et al(1986)*, *Liljeblom et al(1997)*, *Choi et al(1999)*, and *Kavussanos et al(2002)* and support hypothesis we put forward. In regarding  $\Delta M2$ , the money supply is positively related to stock returns at 1% significant level, the result is in line with *Chen et al(2005)* and *Chiang et al(2009)* and hypothesis we proposed. In regarding  $\Delta EXE$ , the exchange rate is positive impact on stock returns, the result is inconsistent with *Bodnar and Gentry(1993)*, *Abugri(2008)* and don't support hypothesis we put forward. In regarding  $dSPD$ , the interest rate is positive influence on stock returns, the result is not in harmony with *Wongbangpo et al(2002)*, *Chiang et al(2009)* and don't support hypothesis we proposed.

**Table 4. Multiple regression results of the electronic stock return on macroeconomic variables Regression1:**

Variables	Constant	$\Delta CPI$	$\Delta IP$	$\Delta M2$	$\Delta EXR$	$dSPD$
Coefficient	-0.007	1.968	0.171	2.929	2.118	0.030
t-statistic	-0.699	1.152	1.920	2.621	4.436	0.938
p-value	0.486	0.251	0.057*	0.010***	0.000***	0.350
$R^2$	F-statistic=6.249		Prob.(F-statistic)=0.000025		DW=1.768	

Note:

1. \*\*\*, \*\*, \*, donate at 1%, 5% and 10% significant level respectively.,
2. DW is the Durbin–Watson (1950) statistic. Based on the Durbin–Watson bounds test in reality, the DW value was located on 1.5-2.5 when T=168, and there was no residual autocorrelation.

In this step, we will estimate the relationship between non-macroeconomic events, macroeconomic variables and stock returns. The significant variables of  $\Delta IP$ ,  $\Delta M2$  and  $\Delta EXR$  would be included in the regression to ensure the results to be our robust test to the regression1.

$$R_t = \beta_0 + \sum_{i=1}^{12} \lambda_i NV_{it} + \sum_1^n \beta_i V_{it} + \varepsilon_t \dots\dots\dots 4.3$$

In the regression  $V_{it}$  donates macroeconomic variable of  $\Delta IP$ ,  $\Delta M2$  and  $\Delta EXR$ , and  $NV_{it}$  donates non-macroeconomic events. The definition and measurement of the non-macroeconomic events and macroeconomic variables are at the same with Equation 4.1 and Equation 4.2.

In equation 4.3, It also meet the sufficient conditions about the variables, the data of time serials and the residuals at the same with equation 4.1.

In table.5, it displayed the correlation coefficient matrix of the electronic stock returns and non-macroeconomic event, macroeconomics variables over the entire sample period. It clearly shows that the signs of correlation coefficient don't be changed.

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**Table 5. Correlation coefficient matrix of non-macroeconomic events ,  
macroeconomic variables and stock returns**

	return	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12	dIP	dM2	dEXR
return	1.000	-.029	.197	-.049	.070	-.013	-.030	-.013	-.151	.087	.086	-.028	.061	.106	.165	.331
d1	-.029	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	.142	-.066	.048
d2	.197	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	.038	-.010	-.146
d3	-.049	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.061	-.022	.014
d4	.070	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	.227	.034	.048
d5	-.013	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.017	-.066	-.010
d6	-.030	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	-.006	.086	.023	.053
d7	-.013	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.006	.145	-.010	.092
d8	-.151	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	-.006	-.058	.023	-.088
d9	.087	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	-.006	.051	-.010	.102
d10	.086	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.006	.043	-.010	.004
d11	-.028	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	-.006	-.025	-.077	-.010
d12	.061	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	-.006	1.000	.050	-.022	.111
dIP	.106	.142	.038	-.061	.227	-.017	.086	.145	-.058	.051	.043	-.025	.050	1.000	-.237	.039
dM2	.165	-.066	-.010	-.022	.034	-.066	.023	-.010	.023	-.010	-.010	-.077	-.022	-.237	1.000	.031
dEXR	.331	.048	-.146	.014	.048	-.010	.053	.092	-.088	.102	.004	-.010	.111	.039	.031	1.000

The table 6 was the result of regression. The signs of coefficient don't be changed on the one hand, The regression reveals a half of event has negative impact on electronic stock returns on the other hand. To speak clearly, 3 out of 4 are presidential election. In the 1% significant level, 8 out of the 12. However, the 2<sup>nd</sup> presidential election, SARS disease, 88 floods and the 21<sup>th</sup> summer deaflympics were not significant at all. Moreover, the Adjusted R square is increasing from 20% of Table 2 to 17.10% of Table 6, It indicates that the regression 4.3 is consistent and robust to the regression 4.1 in descriptive power.

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**Table 6. Multiple regression results of the electronic stock return on non-macroeconomic events and macroeconomic variables**

	Coefficient	t-statistic	Prob.
Constant	-0.005	-0.543	0.588
The 1 <sup>st</sup> presidential election	-0.070	-4.364	0.000***
Asia financial crisis	0.334	14.704	0.000***
921 earthquake	-0.054	-5.062	0.000***
The 2 <sup>nd</sup> presidential election	0.024	0.976	0.331
SARS disease	0.006	0.611	0.542
The 3 <sup>rd</sup> presidential election	-0.087	-6.537	0.000***
The 4 <sup>th</sup> presidential election	-0.084	-4.537	0.000***
Global financial crisis	-0.157	-9.644	0.000***
H1N1	0.063	3.940	0.000***
The World Games 2009 Kaohsiung	0.111	13.362	0.000***
88 floods	-0.008	-0.724	0.470
The 21 <sup>th</sup> Summer Deaflympics	0.026	1.494	0.137
ΔIP	0.155	1.806	0.073*
ΔM2	2.835	2.217	0.028**
ΔEXR	2.306	3.427	0.001***
$\bar{R}^2 = 0.171$ F-statistic=3.296                      Prob.( F-statistic)=0.000089 DW=1.794			

- Note: 1. The regression model is adjusted for homoskedasticity.  
 2. \*\*\*, \*\*, \*donates at the 1% ,5% and 10% significant level respectively  
 3. DW is the Durbin–Watson (1950) statistic. Based on the Durbin–Watson bounds test in reality, the DW value is located between 1.5-2.5 when T=168, and there is no residual autocorrelation.

## 5. Discussion

From the regression result of non-macroeconomic events, we can further analyze by dividing it into five categories: sports, presidential elections, financial crisis, diseases and disasters.

In the sport events, the World Game 2009 Kaohsiung is significantly positive impact on stock returns, while 21<sup>th</sup> Summer Deaflympics is also positive impact but insignificantly. Especially, the World Game 2009 Kaohsiung was the first time to hold an international sport activity in Taiwan. The results was the same with *Veraros et al(2004)* and *Evangelia et al(2009)* . Specifically, the past papers revealed the positive impact were focused on infrastructure industry and building materials. However, The event of World Game 2009 Kaohsiung apply many electronic products

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in the activity. In this study, we found that hosting country not only the infrastructure industry was affected but also electronic industry could be affected by sport events.

Four times of presidential elections we selected from 1996-2009. Three out of four were significant. But the 1<sup>st</sup> (1996/3), the 3<sup>rd</sup> (2004/3), and the 4<sup>th</sup> (2008/3) were negative impact on stock return. Only the 2<sup>nd</sup> (2000/3) was positive impact on stock return. The first presidential election that vote by democracy was happened in 1996 but there was a military threat comes from China, It mad people suffered heavy stress during the elective period. Hence, it might affect the performance in the stock market. The second election was the first alternation of Political Power in Taiwan and it had a positive influence. It appeared people might be glad to see the result. However, between the 3<sup>rd</sup> and the 4<sup>th</sup> presidential election, there were many arguments happened during the period for these two parties. Especially, two magic bullet of 319 gunshot event influenced seriously on the outcome of the 3<sup>rd</sup> presidential election, so the result might be affected by expectation from public. From the result of election, we could make a conclusion that Taiwan was affected deeply by politics especially the presidential elections. *Koo et al (2003)* also agreed the idea.

In the financial crisis, no matter the Asia or global crisis the effect were significant. The 1997 Asia financial crisis was positive significance in Taiwan. It did little influence on Taiwan electronic industry. *Jang et al (2002)* also agreed the same result. We can infer the reason why it had positive impact on Taiwan electronic industry as follows: Firstly, Before Asia financial crisis, the state of U.S and Europe were the main areas for Taiwan electronic products exporting originally. Secondly, During Asia financial crisis period, the new Taiwan dollars was relatively stable than Asia countries. As a results, Taiwan electronic industry further substitute Asia country for their exporting to the state of U.S and Europe. While the global crisis was significantly negative impact on Taiwan electronic industry returns. Because of the origin of global financial crisis flared up from the U.S which was the major country trading with Taiwan electronic industry.

In infectious disease, no matter SARS disease or N1H1 were positive impact on stock return of electronic industry. But SARS was not significant. It was the same with *Nippani et al(2004)* and *(Chen et al(2007))*. In regarding SARS disease, Although the trading volume of stock market was deeply decreased in Taiwan when the disease spreading period, the electronic stock was affected limitedly. However, when the H1N1 disease broke out, the impact on returns was significantly positive, People might experience the SARS disease and knew how to prevent it, such as taking the injection of vaccine, so the impact didn't reflect on the electronic stock return insistently. Moreover, the parts of electronic products have not been used and touched by buyer directly. Hence, electronic industry is affected by infectious disease far less than other industries, such as tourism and food industries.

The disasters in Taiwan were negative impact on electronic stock return. The 921earthquake had a significant negative impact on return. The disaster damaged all over the Taiwan countries. Besides, the 88floods also caused a large loss for Taiwan people, but the affected area was only concentrated on southern part.



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However, most of the electronic factories were located in the midland and northern part. Hence, the impact on electronic stock return was not significant. Nevertheless, from the regression result we can know the disasters did have influence on Taiwan electronic stock return.

From the regression results of Equation 4.2, three of five variables were significant:  $\Delta IP$ ,  $\Delta M2$  and  $\Delta EXR$ . We will incorporate this variable into Equation 4.1 to conduct robust test,

The positive significance of industrial production were in line with *Liljeblom et al(1997)*, *Choi et al(1999)*, *Kavussanos et al(2002)* and the hypothesis we did. While the economy was prosperous or revived, the growth rate of IP would be raised and the figure of GDP would increase at the same time. The increased rate of GDP would promote the willing of people to invest and the stock return would increase.

And money supply had a positive significant impact on electronic stock return. When money supply was decreased, it meant interest rate was increased, public intent to save their money and reduce their desire for investing, then, the stock price will be low. Vice Versa, People are willing to invest their money in the stock market resulting in the price of electronic stock valuable. The results was in the same as *Chen et al(2005)* and *Chiang et al(2009)*, who found that money supply had a positive impact on Taiwan and Singapore hotel industry.

The exchange rate had a positive significant impact on Taiwan electronic stock return. The result was different from the most literatures and we expected. But in the line with *Boarder et al (1993)* and *Griffin et al (2001)*. The result in this paper was positive, it might be two reasons: (1) In Taiwan, it was short of raw materials and most of them relied on import. Besides, the lower reaches of electronic industries had to buy large amount of materials and machines aboard, when the currency was appreciated, it was time for companies to buy materials internationally to reduce the cost. For this reason, appreciation of currency might be benefit for some categories of electronic industry. (2) Electronic industries are deeply influenced by exchange rate fluctuating, many companies had adopted the method (ex. forwards) to hedge their foreign exchange exposure. As a result, they might increased their profit when the currency depreciated but unaffected when it appreciated.

## 6. Conclusion

In the past, literatures seldom investigated the non-macroeconomic and macroeconomic variables at the same time, especially for a specific industry. This paper applied multiple regressions to estimate the relationship with non-macroeconomic and macroeconomic variables. According to the regression result, the non-macroeconomic events were significant at Taiwan electronic stock return except the second presidential election, SARS disease, 88 floods and the 21<sup>th</sup> Summer Deaflympics but the effects were almost the same as predictions. Moreover, three macroeconomic variables of  $\Delta IP$ ,  $\Delta M2$  and  $\Delta EXR$  had significant impact on Taiwan electronic stock return. And the variable of  $\Delta EXR$  exist a relatively different result with the traditional concept about exchange rate. *Bodnar and Gentry(1993)* indicated a impact of exchange rate movements on industry returns

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was larger in small country(ex. Taiwan) than in big country(ex. U.S.). Therefore, Exchange rate played an important role to international trade in Taiwan, particularly the export oriented industry.

### 6.1 Major Findings and Implication

#### 6.1.1 Major Findings

According to the regression result, We can come to the conclusion as follows: Firstly, the power of prediction for non-macroeconomic events was better than macroeconomic variables. It seemed the non-macroeconomic events had a relatively obvious influence to Taiwan electronic stock returns than macroeconomic variables. Secondly, not all expected non-macroeconomic event such as Presidential election is positive impact on electronic stock returns. The sign of impact must depend on the political stability of nation, and whether the outcome of election conforms to the electorate expectation. Thirdly, Not all unexpected non-macroeconomic events such Asia financial crisis, N1H1,and SARS disease are negative influence on electronic stock returns, In regarding financial crisis , The sign of influence must depend on the area for products exporting and monetary system co-movement with major exporting country. In regarding infectious disease, It seems to have nothing to do with electronic products export, except the area which electronic factory located is announced as Quarantine area.

#### 6.1.2 Implication for Management

The result can offer the investors and policy makers as a reference. As non-macroeconomic event, especially unexpected events, firms must enhance the soft capability and infrastructure facilities to minimize the loss during natural disaster. As macroeconomic variables, For example, firm can use all the instruments of hedge to prevent loss from exchange rate changes. Moreover, when stock prices is overvalued, firm can increase equity financing if they need finance to meet growth opportunity, on the contrary, when stock price is undervalued or below the par value, firm can repurchase stock from stock market.

### 6.2 Limitation and Future Study

In the future, there are five points to make effort: (1) separates the categories of electronic industry and discusses the difference between the eight categories; (2) expand to other industries, i.e., financial industry; (3) expanding the sample period: a. in this paper, the set of dummy variable was the corresponding month, in the future it can be extended for more months. b. owing to the limitation of data obtaining, we select year of 1996 as the beginning year, in the future, it might be extend for more years; (4) adding the events and expanding the estimate range to global events i.e., the Europe Debt Crisis; (5) exploring the impact of 2010 Taipei International Flora Exposition on electronic industry index returns.

## Endnotes

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- <sup>i</sup> Canada, China, Hong Kong Special Administrative Region of China, Indonesia, Philippines, Singapore, Thailand and Vietnam
- <sup>ii</sup> Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, UK, and the US
- <sup>iii</sup> Benjamin A. Abugri(2008) used the local variables (nominal exchange rates, nominal interest rates, industrial production, money supply) and global variables of (MSCI) world index and U.S. 3-month T-bill yield.
- <sup>iv</sup> Five classification: Accounting characteristics(fundamental factors), past return (technical factors), macroeconomic variables (macroeconomic factors), factors extracted via principal component analysis (statistical factors), return on a market index (the market factor).
- <sup>v</sup> Spurious regression:

When we adopted the method of traditional regression analysis to estimate the variables which the variable are non-stationary time series. It might causes high description of  $R^2$  and significant of t-value, but make meaningless.

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