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The effect of domestic and foreign risks on an emerging stock market: A time series analysis

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ABSTRACT

This study investigates the effect of domestic factors – economic, financial and political risk – and foreign factors – global economic policy uncertainty – on the stock market index in Taiwan. To achieve the objective of this study, ARDL, DOLS and Markov Switching tests are employed. Quarterly data is used, covering the period 1997Q1–2015Q2. The findings reveal that the combination of domestic and foreign risk factors has a long-term effect on the stock market index. In addition, declining economic, political and financial risks are associated with the increasing stock market index in Taiwan.

1. Introduction

Early studies have mostly focused on the importance of the banking sector in economic development. However, over the last three decades this situation has been mirrored by accelerating capital flows in the global market and booming stock market investments, not only in developed countries but also developing ones. This factor has begun to encourage researchers to investigate stock markets comprehensively. Examinations of the impacts of stock market or share price are very common in the economic literature. In the existing literature, a well-functioning financial system is unquestionably central to the economic development process. More specifically, there is also consensus about the significant role of stock market developments on the development of any economy. The initial studies – Atje and Jovanovic (1993), Demirguc-Kunt and Levine (1996), Singh (1997), and Levine and Zervos (1998) – supported the phenomenon of the crucial role of the stock market development in economic growth. However, the question of what determines stock market development has received relatively less attention by researchers, especially in emerging markets (Figs. 1–4).

It is well known that raising any type of domestic or foreign risk is likely to increase stock market upheaval through heightening stock market investment risk. Therefore, understanding whether a country has a stable economic, financial and political environment is critical to stock market investors for minimising investment risk. It is clear that vulnerability in economic, political or financial components may result not only in a stock market bubble and collapse of one stock market but also may trigger a global financial crisis. Some scholars – Mei and Guo (2004), Chau, Deesomsak, and Wang (2014) and Mnif (2017) clearly underlined the fact that political instability seems to effects the volatility or efficiency of the stock market while the importance of economic factors on stock market return or stock market volatility is emphasized by Kwon and Shin (1999), Christiansen et al. (2012) Engle, Ghysels, and Sohn

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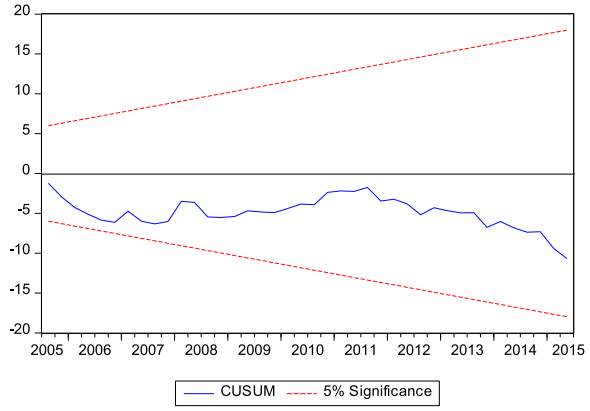

Fig. 1. CUSUM Test for the ARDL (2,8,3,0,1) model.

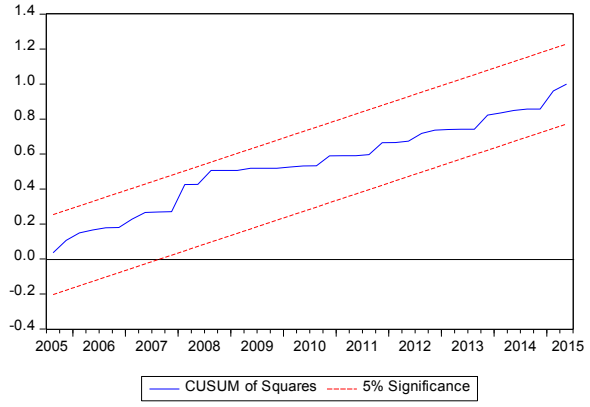

Fig. 2. CUSUM of Squares Test for the ARDL (2,8,3,0,1) model.

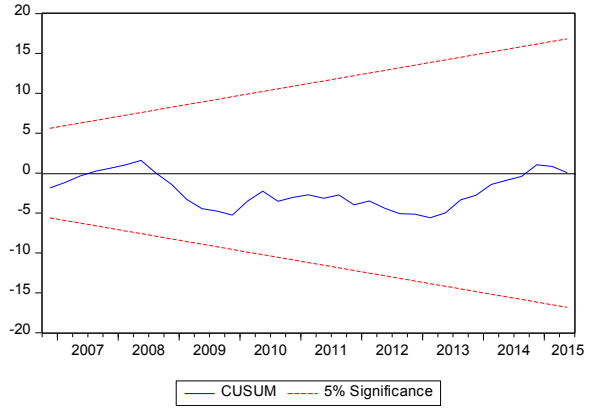

Fig. 3. CUSUM Test for the ARDL (2,6,5,1,2,3,1) model.

(2013), and Bekiros, Gupta, and Kyei (2016). Moreover, the financial risk within the framework of country risk is underlined also important for predicating expected stock returns (Erb et al., 1995 and Hassan, Maroney, El-Sady, & Telfah, 2003). For not only investors, but also perhaps for policymakers, it is crucial to understand which kinds of domestic risks have the most influence over the stock market. In addition, it is necessary to ask whether global uncertainty has a negative effect on the stock market.

Over the last two decades, total traded stock in the global stock markets has expanded dramatically. In East Asia and Pacific countries, stock markets grew from tiny markets with very little volume and limited global participation to large markets playing a significant role in the international financial system. In the same direction as the regional performance, Taiwan has also achieved a substantial growth rate in terms of the total traded stock over the last two decades. The total trading value of Taiwan‘s stock market increased from US$12 trillion in 1996 to US$20 trillion in 2015. Over the same time period, the stock market index of Taiwan

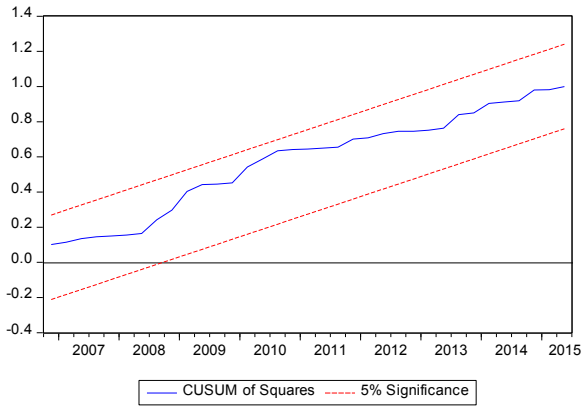

Fig. 4. CUSUM of Squares Test for the ARDL (2,6,5,1,2,3,1) model.

increased almost 50%. These factors have made Taiwan a more interesting country to investigate and opened new debate on the Taiwan stock market. However, there are very limited studies focused on the stock market of Taiwan. As its main innovation, this study constructs time-series models to investigate the effect of domestic and foreign origin risks on the stock market in Taiwan that have not yet been explored in depth, to the best of this study's knowledge. Thereby, the main aim of this study is to fill this gap in the economic and financial literature. The present study is likely to open up new debate and the outcome of the empirical results offer significant implications for investors and governors in Taiwan. At the post Asian crisis period- the period of 1999–2015-, Taiwan found itself in a position of the very low and low risk financial, political, and economic environments, except the global crisis period. From 2008 to 2010, the global crisis negatively affected its political and economic conditions, and moved itself from a low-risk environment to a moderate one.

This paper is organised as follows: Section 2 provides an overview of the literature on the concept; Section 3 describes the data and methodologies used in this study; Section 4 provides empirical findings based on time series modelling and Section 5 concludes the paper.

2. Literature review

Throughout the years, a number of theoretical and empirical studies have investigated the linkage between stock market and economic growth in order to find a better description for this relationship. The roots of this linkage go back to the finance led growth hypothesis of Schumpeter which supports the assertion that financial development facilitates economic growth by transforming resources from surplus units to deficit ones. This hypothesis in the following years has been supported by Goldsmith (1969) and King and Levine (1993). However, some scholars – Robinson (1952), Gurley and Shaw (1967), Fritz (1984), Jung (1986) and Ireland (1994) – support the reverse direction hypothesis, in other words the growth-led finance hypothesis.

Most of the earlier studies on the nexus between finance development and economic growth focus more on bank based financial indicators rather than the stock market. Using cross-country growth regression, Levine and Zervos (1996) conclude that stock market development is an important predictor for future long-term economic growth. The time series modelling based empirical finding of Arestis and Demetriades (1997) reports that stock markets allow investors to shift their savings from small and short-term projects to larger and reliable ones. The demand for capital goods is created by these kinds of alterations. The actualisation of large and long-term based projects, as a result of increasing demand, is likely to accelerate economic development and shift the country towards industrialisation. Caporale, Howells, and Soliman (2004) and Naik and Padhi (2015) argue that well organised and managed stock markets can increase the number of investment opportunities in a market. The realisation of profitable and large scaled investment projects then unquestionably promotes the growth and development of economies. It is widely accepted that the stock exchange is a market where short-term and long-term investment opportunities are realised by allowing financial securities to be traded. Therefore, the stock exchange gives investors a chance to efficiently diversify their financial resources.

It is well known that raising any type of domestic or foreign risk is likely to increase stock market upheaval through heightening stock market investment risk. Therefore, understanding whether a country has a stable economic, financial and political environment is critical to stock market investors for minimising investment risk. It is clear that vulnerability in economic, political or financial components may result not only in a stock market bubble and collapse of one stock market but also may trigger a global financial crisis. For not only investors, but also perhaps for policymakers, it is crucial to understand which kinds of domestic risks have the most influence over the stock market. In addition, it is necessary to ask whether global uncertainty has a negative effect on the stock market.

In the literature, changes in domestic factors, such as economic, political or financial, as well as global factors are likely to change stock market in emerging markets and there is consensus about the effect of these factors on the emerging stock markets. Some scholars – Erb et al. 1995, Mei and Guo (2004), Chau et al. (2014) and Mnif (2017) – argued that stock markets are likely to be negatively affected in case of domestic political vulnerability. As a global shock while, Saeed (2012), Balcilar, Gupta, and Miller

(2015), and Ewing and Malik (2016) underline the importance of energy prices, especially oil price, over the stock markets, some researchers underlined the importance of spillover from developed countries, especially US market to emerging stock markets. Li and Giles (2015) find significant unidirectional shock and volatility spillovers from the US market to the Asian emerging markets. In addition, Ko and Lee (2015) investigated the relationship between international economic policy uncertainty and stock price using wavelet coherence techniques and they conclude that there is negative linkage among them. More recent study of Das and Kumar (2018) reveals that emerging stock markets are less prone to both country-specific and international economic policy uncertainties. The importance of economic factors, especially economic growth, on stock market return or stock market volatility is emphasized by Kwon and Shin (1999), Christiansen et al. (2012) Engle et al. (2013), Bekiros et al. (2016) (Atje & Jovanovic, 1993; Levine and Zervos 1996, 1998; Minier, 2003; Adjasi & Biekpe, 2006; Masoud & Hardaker, 2012; Sehrawat & Giri, 2015). In the literature, several studies – Erb, Harvey, and Viskanta (1995) and Hassan et al. (2003) – aim to investigate the effects of country risk on stock market. Using a panel based model, Erb et al. (1995) find that country risk factors, namely political, economic and financial risks, are important for predicting expected stock returns. Meanwhile, Hassan et al. (2003) also aim to explore the effect of country risk on stock market volatility in the Middle East and Africa countries, covering the period of 1984–1999. Their findings indicate that country risk factors are important predictors of stock market return volatility.

Up to now, there are very limited studies focused on the stock market of Taiwan. Liu and Hsu (2006) aim to explore whether financial development promote economic growth and vice versa in Taiwan, Korea and Japan. Their findings reveal that Taiwan's economic growth is accelerated by stock market development. Using the vector autoregressive error-correction model, the empirical study of Hsu and Lin (2000) reveals that banking and stock market developments had positive effect on Taiwan's economic growth in the short-run and long-run. Chen et al. (2005) explored the effects of macroeconomic and non-macroeconomic variables on hotel stock returns in Taiwan. Money supply and the unemployment rate are important macroeconomic variables for predicting Taiwan stock market returns while the 921 earthquake, the 2003 Iraqi war, the outbreak of SARS, sports mega-events, the Asian financial crisis, and the 911 terrorist attacks significantly explained the movement of hotel stock returns. Using causality test Liu and Sinclair (2008) empirically investigate the causal links between stock prices and economic growth in Greater China, including Taiwan. They found that there is uni-directional causation from the stock prices to GDP growth in Taiwan. Chou, Lin and Wu (1999) examined the Taiwan stock market price and volatility linkages with those of the United States using ARCH and M-GARCH models. A substantial volatility spillover effect is found from the US stock market to the Taiwan stock market. Wu, Hou, and Lin (2018) propose to investigate the effect of economic news on the stock market returns in Taiwan from January 2008 to December 2014. They discovered that news reports provide useful information for predicting Taiwan stock market returns.

Since the 1980s and the beginning of globalisation, understanding domestic and foreign risks on the stock market has been a vital necessity for investors, as well as governors. To the best of this study's knowledge, the effect of both risks on the stock market in a single study has not been explored, neither theoretically nor empirically in economic and financial literature. This study proposes to go one step ahead of this research. Apart from the effect of domestic risks – political, financial, and economic risks on the stock market index in Taiwan, global policy uncertainty is also adopted into the models while using two important controlling variables – GDP and exchange rate.

3. Data and methodology

The time series variables used in the empirical techniques of this study consist of quarterly data from the period 1997Q1 to 2015Q2. As presented in Table 1, the variables of stock market index, GDP current ($US) and real effective exchange rate are collected from the World Bank, whereas political risk index, economic risk index and financial risk index are gathered from the Political Risk Services. In addition, the global economic policy uncertainty index is collected from the Economic Policy Uncertainty Index. According to the PRS Group, economic risk index and financial risk index takes values between 0 and 50, with 0 corresponding to the highest risk and 50 to the lowest, whereas political risk index ranges from 0 (maximum risk) to 100 (minimum risk). Therefore, increasing the economic risk, financial risk, and political risk indexes indicates more stable economic, financial and political environments, respectively.

In examining the effect of financial risk, political risk, economic risk and global risk on the stock market index of Taiwan, while controlling market size and exchange rate, the following is used: Eq. (1) (the model without control variables) and Eq. (2) (the model

Table 1
Data and descriptive statistics.

	Stock Market Index	Financial Risk	Political Risk	Economic Risk	Global Risk	GDP Current $	Exchange Rate
Code	SM	FR	PR	ER	GR	GD	EX
Source	World Bank	PRS Group	PRS Group	PRS Group	Economic Policy Uncertainty	World Bank	World Bank
Mean	89.760	45.301	78.065	41.773	100.267	6.483	112.936
Median	94.144	45.500	78.083	42.500	95.597	6.495	113.156
Maximum	131.833	47.500	82.000	44.500	185.779	6.625	139.859
Minimum	48.754	39.833	74.000	32.838	55.344	6.320	97.362
Jarque-Bera	3.502	128.112	1.225	111.276	6.709	3.343	6.020
Probability	0.173	0.000	0.541	0.000	0.034	0.187	0.049
Sum Sq.Dev.	33830.83	164.093	309.489	523.896	73299.47	0.458	11862.30

with control variables)[1]:

$$SM_t = \alpha_0 + \alpha_1 FR_t + \alpha_2 PR_t + \alpha_3 ER_t + \alpha_4 GR_t + \varepsilon_t \quad (1)$$

$$SM_t = \alpha_0 + \alpha_1 FR_t + \alpha_2 PR_t + \alpha_3 ER_t + \alpha_4 GR_t + \alpha_5 GD_t + \alpha_6 EX_t + \varepsilon_t \quad (2)$$

where SM_t is stock market index, FR_t is financial risk index which reflects a country's ability to pay its debts in general, PR_t is political risk index which reports a country's political environment stability, ER_t is economic risk index which indicates a country's economic weakness and strengths, GR_t is the global economic policy uncertainty Index with Current Price GDP Weights which is used as a proxy for global risk, and GD_t and EX_t are the natural logarithm of GDP at market prices, current LCU, millions and real effective exchange rate, respectively. The variables of GD_t and EX_t are used as control variables in the empirical models. In addition,ε_t is the residual term while α_{1-6} are elasticity coefficients in the equations. The empirical model of this study is constructed based on the model of Hassan et al. (2003) which aim to explore the effect of country risk, namely economic, financial and political, on the 10 stock markets of the Middle East and Africa (MEAF) countries over the period of 1984–1999. However, they did not take into account global risk in their study. However, the studies of Li and Giles (2015), Ko and Lee (2015), Das and Kumar (2018) clearly underlined the importance of the global vulnerability over the emerging stock markets.

As a first step in this study, the aim is to explore the order of integration of SM, FR, PR, ER, GR, GD and EX variables using the Ng-Perron Unit root test, developed by Ng and Perron (2001). The test involves four different test statistics: MZa, MZ_t, MSB and MPT. To develop the initial version of the Phillips and Perron unit root test, Ng and Perron (2001) use the GLS detrending procedure of ERS which was initially developed by Elliot et al. (1996).

Long-run cointegration linkage based on the models in Eqs. (1 and 2) is detected using the ARDL bound test of Pesaran et al. (1999) and Pesaran, Shin, and Smith (2001) after detecting the stationarity of the time series variables. The ARDL bounds testing approach is based on the estimation of an unrestricted error-correction model (UECM). To put it simply, the test has some strong advantages over the traditional cointegration techniques. The bound test provides more robust estimation results relative to traditional cointegration tests, especially when the size is small. In addition, unbiased estimates of the long-term model can be gathered (Harris & Sollis, 2003). The bound test methodology is principally dynamic rather than restrictive and allows this approach to be used whenever the variables in the model are the order of integration of one and zero – I(1) and I(0). The bound test also avoids the endogeneity problem, in other words, if some of the regressors in the model are endogenous, test statistics, F-tests and unbiased long run estimates are still valid. To check co-integration in Eq. (1) and Eq. (2), Pesaran et al. (2001) F-statistic value is used. The null hypothesis of co-integration is rejected if the computed F-statistic is less than the bound critical value and the null hypothesis is rejected if the F-statistic is more than the upper bound value, indicating a long run relationship among the variables. The equations of the models without (Eq. (3)) and with (Eq. (4)) control variables of the long-run ARDL models are show below:

$$SM_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} SM_{t-i} + \sum_{i=0}^{n} \alpha_{2i} FR_{t-i} + \sum_{i=0}^{p} \alpha_{3i} PR_{t-i} + \sum_{i=0}^{n} \alpha_{4i} ER_{t-i} + \sum_{i=0}^{p} \alpha_{5i} GR_{t-i} + \varepsilon_t \quad (3)$$

$$SM_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} SM_{t-i} + \sum_{i=0}^{n} \alpha_{2i} FR_{t-i} + \sum_{i=0}^{p} \alpha_{3i} PR_{t-i} + \sum_{i=0}^{n} \alpha_{4i} ER_{t-i} + \sum_{i=0}^{p} \alpha_{5i} GR_{t-i} + \sum_{i=0}^{p} \alpha_{6i} GD_{t-i} + \sum_{i=0}^{p} \alpha_{7i} EX_{t-i} + \varepsilon_t \quad (4)$$

The equations of the models without (Eq. (5)) and with (Eq. (6)) control variables of the short-run ARDL models also known as error-correction model are estimated and shown below:

$$SM_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta SM_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta FR_{t-i} + \sum_{i=0}^{p} \alpha_{3i} \Delta PR_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta ER_{t-i} + \sum_{i=0}^{p} \alpha_{5i} \Delta GR_{t-i} + \varphi ECM_{t-1} + \varepsilon_t \quad (5)$$

$$SM_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta SM_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta FR_{t-i} + \sum_{i=0}^{p} \alpha_{3i} \Delta PR_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta ER_{t-i} + \sum_{i=0}^{p} \alpha_{5i} \Delta GR_{t-i} + \sum_{i=0}^{p} \alpha_{6i} \Delta GD_{t-i} + \sum_{i=0}^{p} \alpha_{7i} \Delta EX_{t-i} + \varphi ECM_{t-1} + \varepsilon_t \quad (6)$$

where φ represents the speed of adjustment of short-run to reach the long-run equilibrium while ECM_{t-1} is the error correction term. The expected sign of this coefficient is negative and it is also expected significant.

After detecting the cointegration linkage in Eqs. (3 and 4), static and dynamic techniques – ARDL, DOLS and Markov Switching Regression – are preformed to investigate the effect of financial risk, political risk, economic risk and global risk on the stock market index in Taiwan.

In this paper, Dynamic Ordinary Least Squares (DOLS) is used to check the robustness of the long-run coefficients of the variables in the results of ARDL. DOLS is initially employed by Stock and Watson (1993); the method has the advantage of delivering efficient and unbiased estimates for small observation numbers, and eliminates simultaneity bias. In addition, Markov Switching regression is employed in this study. The technique provides superior results relative to other time series econometric techniques, especially when there is a sudden change in the variability of a series and nonlinear dynamics (Hamilton, 1989). Markov Switching regression is also used to check the robustness of the long-run coefficients of the variables in the results of ARDL The strongest advantage of this

[1] It is worth mentioning that, based on my aim in this paper, I use the outcomes of the model without a control variable as a main finding and our explanations of the models are based on this finding, although in all the outcomes from various techniques the model with and without control variables provides consistent results.

Table 2
Ng-Perron unit root test.

	C				C&T				
Variables	MZ_a	MZ_t	MSB	MPT	MZ_a	MZ_t	MSB	MPT	S. Breaks
SM	−6.48	−1.14	0.32	3.72	−12.25	−2.41	0.19	7.74	2000Q4
ΔSM	−31.87**	−3.99**	0.12**	0.77**	−34.07**	−4.12**	0.12**	2.69**	
FR	−4.83	−1.48	0.30	5.23	−10.58	−2.28	0.21	8.68	2001Q4
ΔFR	−35.80**	−4.22**	0.11**	0.68**	−35.80**	−4.23**	0.11**	4.03**	
PR	−7.25	−1.79	0.24	3.75	−16.24	−2.84	0.17	5.63	2008Q1
ΔPR	−33.84**	−4.09**	0.12**	0.77**	−34.72**	−4.16**	0.11**	2.62**	
ER	−2.43	−0.93	0.38	9.18	−7.11	−1.88	0.26	12.80	2010Q2
ΔER	−34.45**	−4.15**	0.12**	0.71**	−34.50**	−4.15**	0.12**	2.64**	
GR	−19.93*	−2.62**	0.188*	1.81*	−18.85*	−3.06*	0.16*	4.89*	2008Q3
ΔGR	−69.04**	−5.87**	0.08**	0.35**	−69.83**	−5.90**	0.08**	1.31**	
GD	1.69	2.41	1.42	153.20	−9.81	−2.21	0.22	9.28	2008Q3
ΔGD	−16.07**	−2.75**	0.17**	1.81*	−20.92**	−3.22**	0.13**	4.40*	
EX	0.41	0.42	1.01	63.15	−6.08	−1.50	0.24	14.80	2012Q2
ΔEX	−35.67**	−4.14**	0.11**	0.92**	−35.71**	−4.18**	0.11**	2.78**	

Notes: ** and * indicate statistical significance at the 1% and 5% levels, respectively. C and C&T denote constant and constant and trend, respectively. The symbol of Δ denotes the first difference of the variables. S. Breaks indicate structural breaks which are determined for the models with constant only using the Zivot-Andrews unit root test. In Table 2, the determined all structural breaks of the variables are statistically significant at the 5% levels.

technique appears in the flexibility of models which are subject to change against regime shifts. Saltoglu and Senyüz (2003) underline that the technique can be applied to cointegrated models which are dynamic, linear and non-stationary. As a last econometric technique, to obtain information about the causal linkage between stock market index in Taiwan and domestic and global risks, Granger causality test is employed. In general, the Granger causality test is a test to identify (i) whether Z variable Granger causes the H variable and (ii) whether H variable Granger causes the Z variable.

4. Empirical findings

Before checking the cointegration equation in Eqs. (1 and 2), the Ng-Perron Unit root test is employed to detect the stationarity of time series variables in the models. Table 2 reports the findings from the unit root result with the model with an intercept and the model with intercept and trend. The null hypothesis that SM has a unit root cannot be rejected at 5% level (the model with an intercept and the model with intercept and trend). As an initial difference, the variable seems stationary, indicating that the order of integration of SM variable is one, I (1). This situation is the same in the other time series variables used in the empirical models, except for GR which seems stationary at level. These findings allow an ARDL bounds test to be performed to check the cointegration relationship between the stock market index as a dependent variable and financial risk, political risk, economic risk and global risk, while controlling macroeconomic factors such as exchange rate and GDP.

To investigate the long-run co-integration relationship in Eqs. (1and 2), the ARDL Bounds test approach is developed by Pesaran et al. (2001). Table 3 shows the bound test for co-integration and the result for the Eqs. (1 and 2). based models. The calculated F-statistics of the model of Eq. (1) (10.462) are greater than the upper bound critical values at 1% and 5% significant levels. This situation does not change when the control variables, gross domestic product and real effective exchange rate, are added to the model (the model based on Eq. (2)). Therefore, the cointegration test of the model without control variables also provides a result consistent with the model with control variables. These results clearly demonstrate that the null hypothesis of no cointegration for the models can be rejected, implying that the variables share a long-term relationship. Since the variables were cointegrated, to obtain the long-term coefficients, the ARDL model can be employed.

To capture the static long-run spillover coefficients from domestic and foreign origin risks to the stock market index in Taiwan, the use of maximum six lags using Akaika criterion – the best fitted model for the estimation – is detected as ARDL (2,8,3,0,1) and ARDL (2,6,5,1,2,3,1) for the model without control variables and the model with the control variables, respectively. The long-term

Table 3
Co-integration test.

K	F – statistic	Critical value at %1 significance level		Critical value at %5 significance Level	
		Bottom Bound	Upper Bound	Bottom Bound	Upper Bound
4 [h]	10.462**	3.608	4.86	2.725	3.718
6[j]	10.214**	3.18	4.596	2.451	3.559

Note: K is the number of independent variables in the Unrestricted Error Correction model (UECM). Critical values are taken from Table C1. iii (Case III with unrestricted intercept and no trend) of Pesaran et al. (2001:300). [h]model is performed based on Eq. (1) without control variables while [j] model is performed with the control variables based on Eq. (2).

Table 4
ARDL model.

	The model without control variables ARDL (2,8,3,0,1)		The model with control variables ARDL (2,6,5,1,2,3,1)	
	Estimated long term spillover coefficients			
Ind. Variables	Coefficient	T-Statistics	Coefficient	T-Statistics
FR	1.149	4.471**	8.163	5.579**
PR	1.642	2.770**	4.706	4.709**
ER	0.652	1.991*	2.056	3.231**
GR	−0.208	−3.898**	−0.215	−4.204**
Con. Variables				
GD			283.825	5.296**
EX			−0.270	−0.764
	Error Correction Coefficient		Error Correction Coefficient	
	Coefficient	T-Statistics	Coefficient	T-Statistics
ECT(1)	−0.575	−2.012*	−0.594	−3.784**
	Diagnostic Check		Diagnostic Check	
X^2_{BG}(A)	1.656 (0.202)		2.089 (0.137)	
χ^2_{WHITE}(B)	0.887 (0.349)		0.648 (0.423)	
X^2_{RAMSEY}(C)	0.079 (0.286)		0.378 (0.707)	
	Stability Check		Stability Check	
Cusum Test	Stable at 5% level		Stable at 5% level	
Cusum of Squares Test	Stable at 5% level		Stable at 5% level	
R-squared	0.922		0.970	
Adj. R-squared	0.895		0.951	
F-statistic	31.540		51.765	
Prob. (F-statistic)	0.000		0.000	

Notes: ECT represents the error correction model. Cusum and Cusum square tests are used to test the presence of parameter stability. The Figures of the CUSUM and CUSUM of squares tests for the ARDL models are presented in the Appendix section. A) Lagrange multiplier test for residual serial correlation. (B) Based on the regression of squared residuals on squared fitted values. (C) Ramsey's test using the square of the fitted values. **Significant at 1%. *Significant at 5%. [b]Significant at 10%. The values within the () symbols represents the probabilities.

spillover and error correction coefficients are reported in Table 4, which reveals that at 5% significance level, domestic risk – political, financial and economic risk – has a statistically significant effect on the stock market in Taiwan in the long-term. In other words, financial instability should be minimized in the domestic market. This can be supportive evidence for the findings of Erb et al. (1995) and Hassan et al. (2003), who found that decreasing financial instability in a market increase stock market returns. Therefore, In order to accelerate stock market index in Taiwan, policymakers need to reduce domestic and foreign debt as a percentage of GDP, stabilize their exchange rates, and reduce liquidity problems. Table 4 also presents that domestic political risk in Taiwan appears to be an important predictor of the stock market. This finding is rational and in line with the newest empirical findings, such as Hassan et al. (2003), Kang and Ratti (2013), Chau et al. (2014) and Kelly, Pástor, and Veronesi (2016). As expected, economic risk in the long-term has a positive and significant effect on the stock market in Taiwan. This finding is also reasonable and in line with the theoretical findings of Robinson (1952), Gurley and Shaw (1967), Fritz (1984), Jung (1986) and Ireland (1994). The policymakers in Taiwan should aim to increase the standard of living and to minimize inflation in addition to the current account deficit so as to attack investors to invest in the stock market. Finally, the stock market in Taiwan is negatively affected by global economic turbulence, implying that rising global uncertainty is associated with the decreasing stock market index in Taiwan in the long-term. It is worth mentioning that this result is consistent in both models – with and without control variables. In Table 4, the estimated long-term spillover coefficient of the global risk – GR – variable is also significant and negative in both models, meaning that increasing 1 unit in the global risk index is associated with reducing the stock market index by 0.215 units (the model with control variables) and 0.208 units (the model without control variables). This result is also rational because it shows the importance of external economic policy shocks for Taiwan's stock market index. It is well known that investors are also very sensitive about external risks and vulnerabilities.

Table 4 also reports the estimated error correction terms of the models. As expected, the signs of the error correction terms are negative and statistically significant. The estimated error correction terms are 0.575 and 0.594 in the model without control variables and the model with control variables, suggesting that almost 60% of disequilibrium from the previous quarters' stock is eliminated in the current quarter. To check the diagnostics of the ARDL (2,8,3,0,1) and ARDL (2,6,5,1,2,3,1) models, the Breusch–Godfrey serial correlation LM test, the White heteroscedasticity test and the Ramsey's RESET test are employed. In addition, CUSUM and CUSUM of Squares tests are performed to explore the stability of the models. The findings of the stability and diagnostic tests clearly reveal that the models do not suffer from instable parameters, serial correlation, heteroscedasticity and misspecification.

In this study, as a robust check for the ARDL models, the DOLS technique is employed to detect the long-term coefficients for the Eq. (2). Consistent with the findings of the ARDL models in Table 4, better economic, financial and political environments in Taiwan contribute to the stock market in the long-term. In addition, the outcome of the DOLS model also reveals that global uncertainty has a negative effect on Taiwan's stock market as seen in Table 5.

As a next technique in this paper, Markov Switching Regression is performed to investigate the effect of domestic and foreign risks on Taiwan's stock market, while controlling GDP and exchange rate in two different regimes in Taiwan's stock market: as a low

Table 5
Robustness check with DOLS technique.

Ind. Variables	The model without control variables	The model with control variables
FR	8.016 ⟨3.323⟩**	9.607 ⟨3.805⟩**
PR	3.696 ⟨2.105⟩*	2.105 ⟨2.124⟩*
ER	3.605 ⟨2.904⟩**	2.151 ⟨1.891⟩[b]
GR	−0.230⟨− 2.154⟩*	−0.080 ⟨−1.860⟩[b]
C	−0.967⟨0.004⟩	1099.812 ⟨−1.208⟩
Control. Variables		
GD		214.256 ⟨1.870⟩[b]
EX		−0.095 ⟨− 0.130⟩
R-squared	0.760	0.825
Adj. R-squared	0.683	0.733
S.E. of Regression	11.915	10.933

* *Note:* Significant at 1%.
** Significant at 5%.
[b] Significant at 10%. The values within the ⟨ ⟩ symbols represent the T-Statistics.

volatility regime (Regime 2) and high volatility regime (Regime 1). The results of the Markov Switching Regression model are reported in Table 6. It is worth mentioning that the results are also in most cases in line with the results from the ARDL models. The first variable – financial risk – has positive and significant coefficients for both Regime 1 (High Volatile) and Regime 2 (Low Volatile), indicating that financial stability contributes to the Taiwanese stock market. This finding is in line with the static models. At 5% significant level, although the political risk coefficient in Regime 1 is detected as significant and positive, a non-significant and positive coefficient is observed in Regime 2. The sign of the estimated economic risk coefficient is based on the static findings and rationale, but in Regime 1, the coefficient is not statistically significant at 1%, 5% and 10% significant levels. Finally, for both regimes, the signing and significance of the coefficients of global risk – GR – are consistent with the static models.

To capture the short-run causal linkages between domestic and global factors and the stock market index in Taiwan, Granger causality test is employed in this study. The results regarding the short-term causal relationships are displayed in Table 7. As clearly seen in Table 7, there is a bi-directional causality running between financial risk and stock market index and between economic risk and stock market index in Taiwan, which interprets as the variation in economic and financial risks in Taiwan being significantly lead to changes in the stock market index and vice versa. In addition, at only 10% level an uni-directional causality has been detected running from political and global risk to the stock market index. As expected, the variation in the stock market index does not significantly lead to change in global risk.

5. Conclusion

In addition to a considerable amount of research on the relationship between financial development and economic growth, previous research has also investigated the importance of the banking sector in economic development. As far as this study is aware, however, no previous studies have explicitly investigated the effect of domestic and global risks on the stock market in Taiwan. Therefore, the present research fills this vacuum and is likely to open up new debate about the concept. In this study, multiple

Table 6
Markov switching regression model.

Variable	Regime 1: high volatility
FR	4.019 ⟨4.421⟩**
PR	1.051 ⟨1.991⟩*
ER	1.001 ⟨0.821⟩
GR	−0.390 ⟨3.652⟩**
C	252.230 ⟨2.110⟩*
	Regime 2: Low Volatility
FR	6.251 ⟨4.012⟩**
PR	0.888 ⟨1.214⟩
ER	2.118 ⟨3.252⟩**
GR	−0.132 ⟨2.031⟩*
C	250.338⟨1.920⟩[b]

** *Note:* Significant at 1%.
* Significant at 5%.
[b] Significant at 10%. Due to insufficient numbers of observations, Markov switching regression is performed without control variables only. The values within the ⟨ ⟩ symbols represent the T-Statistics.

Table 7
Granger Causality test.

			F-stat	P-value	Lag	Decision		
						1% level	5% level	10% level
SM	→	FR	3.652	0.002	8	√	√	√
FR	→	SM	2.584	0.019	8	X	√	√
SM	→	PR	0.421	0.657	2	X	X	X
PR	→	SM	2.742	0.071	2	X	X	√
SM	→	ER	10.314	0.002	1	√	√	√
ER	→	SM	3.783	0.050	1	X	√	√
SM	→	GR	0.387	0.883	6	X	X	X
GR	→	SM	2.146	0.062	6	X	X	√

Note: →indicates the direction of causality. The optimal lag of the causality models is determined by Akaike Information Criterion (AIC).

domestic risk indicators – Political Risk Index, Financial Risk Index and Economic Risk Index from the PRS Group, and a global risk indicator – global economic policy uncertainty from the Economic Policy Uncertainty Index – are used for the period from 1997Q1 to 2015Q2. Furthermore, two control variables – GDP and effective real exchange rate – are used. To achieve the objective of this study, ARDL, DOLS and Markov Switching tests are employed.

The findings of this study bring to light strong and rational evidence. It draws five conclusions about the effect of domestic and foreign risks on the stock market in Taiwan while controlling GDP and the real effective exchange rate. First, in this study, the combination of domestic and foreign risk factors has a long-term effect on the stock market index. This finding indicates how the political, financial, economic and global risks are important for predicting the stock market in Taiwan in the long-term. In other words, the stock market index in Taiwan is positively affected by the domestic stability. These results are in line with and provide supportive empirical evidence for the findings of Erb et al. (1995) and Hassan et al. (2003). Finally, the stock market in Taiwan is negatively affected by global economic turbulence, implying that rising global uncertainty is associated with the decreasing stock market index in Taiwan in the long-term. These outcomes provide important policy recommendations for policymakers and investors. In order to achieve growth in the stock market in Taiwan, governors need to minimise instability in Taiwan's financial, economic and political areas. Meanwhile, to minimise the effect of global economic or financial turbulences on the stock market in Taiwan, some forms of precaution should be taken to minimise possible vulnerability in advance. A weakness of this research is that I have been unable to use many other plausible determinants of stock market index. My near-term research agenda will be to expand the control variables and perform panel based models for the Asian region. Therefore, further research is certainly called for in order to investigate the effect of domestic and foreign risk on stock markets in other countries.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.najef.2018.11.005.

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