

# The Implication of Term Structure of CDS Spread in Emerging Markets

## 論文摘要

This paper discussed how the term structure of CDS spread in emerging markets impacting on the real economy and the return of stock index. We suggested that the term structure of CDS spread implied the different expectation of short-term and long-term. The country whose term structure of CDS spread was higher decreased its GDP growth rate with 0.0062% on average. On the other hand, term structure of CDS spread and stock index reflected the simultaneous default risk, which made the expected return of stock index positive. Buying high and selling low slope strategy could earn the return of 1.35% next month. We also found the mean and variance of the term structure decreased by American good news and increased by bad news.

**關鍵字:** *Credit Default Swap, Term Structure, Spillover Effect, EGARCH Model, Financial Crisis*

## 壹、簡介

In recent year, many crisis events occurred and the financial markets became more volatile, such as, technology bubble in 2000, subprime crisis in 2008, Eurozone debt crisis and bankruptcy in Greece in 2010, Brexit in 2017. We wanted to find some signals showing previously before the distress really happened, and investors could hedge or speculate in advance. Some researches showed that credit default swap was a quite good type of derivatives to understand the upcoming deterioration. Besides, the interest rate yield curve contained information about the future expectation of economy. For example, when the interest yield curve was inverted, the economy depressed after less than two years. We found that the quote of CDS spread varied with different time to maturity, and we wanted to confirm that any information hidden in the CDS spread curve.

We noticed that U.S. dominated the whole world, when America stocked excessive capital, it flew to other countries and traded the stock or exchange, and once the economy in America tended to deteriorate, the capital flew back to America rapidly and sometimes affected the economy of other countries severely, especially in emerging countries due to their fragile economic condition. Thus, we started this paper with the CDS data from 23 emerging markets, there were 6 in Asia Pacific, 5 in Americas, and 12 in Europe, Middle East, and Africa. We first defined the CDS spread slope following (Han, Subrahmanyam, & Zhou, 2017), which was the difference between 5-year and 1-year CDS spread with monthly frequency. Then, we calculated the good and bad U.S. macroeconomic news index following (Kim, Salem, & Wu, 2015) and used the EGARCH model to capture the asymmetric effect on variance of CDS spread slope and added U.S. macroeconomic news index as exogenous variables to observe how news index affected CDS spread slope. We found that good macroeconomic news from U.S. reduced the level and variance of CDS spread slope. Good news revealed a bright future and CDS buyers did not need to pay such more premium as before if they need a longer debt protection, making the CDS spread slope flatter. On the other hand, bad macroeconomic news from U.S. rose the level of CDS spread slope and reduced the variance of CDS spread slope. Bad news is usually announced in recession, and CDS buyers needed to pay more premium for longer debt protection.

Once we understood the relation between CDS spread slope in emerging markets and U.S. macroeconomic news, we were curious about the relation between CDS spread

slope and the real economy. If the CDS spread slope represents the difference between long-term and short-term premium, we suggested the steeper slope implied the long-term economy tended to worsen and the GDP growth rate declined. We found that in the same year, CDS spread slope and the GDP growth rate existed the negative relation, which was matched with our hypothesis. By our empirical result, the CDS spread slope increased by 1 bp, the simultaneous and next GDP growth rate declined 0.0062% and 0.0035% respectively. However, CDS spread slope cannot forecast the change of GDP growth rate. Thus, we assumed that the CDS spread can only reflect the GDP growth rate instead of forecasting the change of GDP growth rate.

We also wanted to know if there is forecast ability of CDS spread slope to stock index market. If higher CDS spread slope reflected the pessimism in the future, the stock index tended to go down. We regressed the CDS spread slope to its stock index market return and found that steeper CDS spread brought positive stock index return, which is 0.0029% in one month, 0.0104% in three months, 0.0202% in six months respectively. It was not matched our hypothesis. After looking up related literature, (Norden & Weber, 2009) demonstrated that the stock led the CDS spread but there was no significant evidence that CDS spread led the stock market. We suggested that the CDS spread slope and stock index adjust the price with the simultaneous default risk, and it made the expectation return positive. Stock market has drawn down in relatively low base and tended to expand in future several months. We constructed a portfolio based on the relation between CDS spread slope, dividing whole sample countries into three groups dependent on the CDS spread slope, and we bought high and sold low slope portfolio and calculated the return next month. The portfolio brought 1.35% per month with t-statistic 5.04. We adjusted the return by CAPM, Fama-French model, and Carhart model, and we still got significant positive alpha by these factor model adjustments, which is 1.50%, 1.60%, and 1.67% respectively.

Our sample period included the financial crisis and Eurozone debt crisis, and we shrank our sample period after 2008 to do robustness checks. The results were identical with empirical result in whole sample period. The good macroeconomic news from U.S. reduced the level and variance of the term structure of CDS spread and bad news rose the level and variance of the term structure of CDS spread in many emerging countries. Higher slope of CDS spread reflected the worse GDP growth rate in the same year and positive stock index return in one to six months later.

The paper is organized as below. Part 2 reviewed the relative literature about the term structure of CDS spread. Part 3 described the data. Part 4 interpreted the methodology. Part 5 showed the empirical results. Part 6 concluded the paper.

## 貳、文獻回顧

CDS (Credit Default Swap) is one of credit derivatives. CDS sellers provided the protection of loss from default once the reference entity could not afford the interest or principal before the maturity. The counterparty, CDS buyers, needed to pay premium continually during the contract period to get the protection. The amount of CDS buyers needed to pay is calculated as the CDS spread times notional amount. With different length of maturities, the spreads varied as well.

The mechanism of finance has changed because of the innovation of CDS. (Ismailescu & Phillips, 2015) found that the credit spread of sovereign bonds decreased with initiating sovereign CDS, especially for countries with high default risk. (Das, Kalimipalli, & Nayak, 2014) found that the corporate bond markets became less efficient and did not improve the liquidity after initiating CDS. CDS spread also implied the anticipation of the financial condition from markets, including the probability of default, and the proportion of creditors can acquire once the entity defaults. (Greatrex, 2015) found CDS market anticipates negative earnings surprises as prices begin to adjust prior to the actual earnings announcement date. (Chng & Wang, 2014) found that CDS trading became more informative for an increasing number of firms when they approached the global financial crisis. CDS does reflect the credit rating of one country and the financial condition of a firm, and some papers investigated the relation between CDS and other financial products. (Lee, Naranjo, & Sirmans, 2016) found significantly stronger stock return momentum if past stock and CDS returns are in congruence versus entities whose past stock and CDS returns disagree. (Norden & Weber, 2009) found that the stock return leads CDS spread but the leading relation does not exist in CDS spread to stock return. (Forte & Lovreta, 2015) found the stock market has stronger dominance in crisis but the contribution of CDS market to price discovery is equal or higher than that of the stock market. (Hassan, Kayhan, & Bayat, 2017) found that CDS spread drive the value of the Turkish lira against the U.S. dollar in the post crisis period.

U.S. has become the influential country in the world and some scholars considered the news from U.S. spill over to other countries or financial products. (Dooley &

Hutchison, 2009) referred that emerging markets responded very strongly to the deteriorating situation in the U.S. financial system and real economy. (Nikkinen & Sahlström, 2015) demonstrated that the implied volatility increased before the U.S. macroeconomic news announced and dropped after the announcement in stock markets in both U.S. and Finland. (Gurgul & Wójtowicz, 2014) found that the macroeconomic news from U.S. impact on large, middle, small stock differently in Poland. (Kilian & Vega, 2011) investigated the spillover effect from U.S. news to energy prices and found no compelling evidence at daily or monthly horizons. Based on the research about how U.S macroeconomic news spill over to other countries, there are some paper investigating the spillover effect on CDS from news. (Baum & Wan, 2010) found that not only the first moment but second moment of traditional macroeconomic factor uncertainty such as risk-free rate and Treasury term spread have significant explanatory power on CDS spread. (Candelon, Sy, & Arezki, 2011) focused on the news about credit rating in Eurozone. Greece, which is the relatively large economy, was downgraded to near speculative grade rating, and the spillover effect across the Eurozone was systematic. (Kim et al., 2015) used the EGARCH model to capture the spillover effect from U.S., Eurozone, and China. Good news reduced the CDS spread level and volatility from three major economies. Bad news increased the CDS spread level but the effect on volatility differed. Bad news from China and Eurozone generally increased the other sovereign CDS spread volatility but bad news from U.S. decreased the volatility due to the calming effect.

Based on the previous research about CDS spread, some papers discussed the term structure of CDS spread, which is defined as the difference between the long-term and short-term spread. (Pan & Singleton, 2008) explored the nature of default arrival and recovery implicit in the term structures of sovereign CDS spreads by reduced-form model. (Augustin, 2012) investigated the relation between the term structure of sovereign CDS spread and risks, and he found that when the CDS spread slope is upward, global shocks are the dominant force underlying changes in the price of sovereign credit risk. When the CDS spread slope is inverted, domestic shocks become relatively more important. (Han et al., 2017) used the term structure of CDS spread to investigate how the term structure of U.S. corporate CDS spread. They found that flatter term structure of CDS spread forecasts decreases in default risk and increases in future earnings surprises and predicts future stock returns negatively. (Calice & Zeng, 2018) used a sample of 29 countries and found a steeper term structure of CDS spread for a country predicts its currency appreciation against the US dollar. They also claimed that the level of sovereign CDS

spread can reflect the global risk, while the term structure of sovereign CDS spread revealed the specific risk in that country.

## 參、資料

### 一、CDS 價差與斜率

The CDS data were from Markit which was one of the common CDS databases. (Mayordomo, Pena, & Schwartz, 2014) compared five CDS databases and found that Markit gathered composite quotes making the daily quotes continuously. Our data period was from January 2001 to August 2013 with monthly frequency. The list of emerging markets followed the constituents of the MSCI emerging markets index excluding the country with less CDS quotes such as Taiwan, and we added PIIGS in our sample set. There were 23 sample countries totally, 6 were from Asia Pacific, 5 were from Americas, and 12 were from Europe, Middle East, and Africa. We selected the data with the filters below: a.) government sector which represented the derivatives of sovereign debt, b.) US dollar dominated quotes because CDS were mostly traded in United State and the US dollar dominated sovereign debts were more liquid than local currency dominated bonds, c.) old/full restructuring(CR) and senior unsecured debt(SNRFOR) tier due to the data were the most sufficient. We used daily quotes and filled the previous quote if the value was missing and transferred it into monthly data to keep the data complete.

There were some definitions about the term structure of CDS spread. (Han et al., 2017) defined the term structure of CDS spread as 5-year spread minus 1-year spread, and (Calice & Zeng, 2018) defined the term structure of CDS spread as log 5-year spread minus log 1-year spread. In this paper, we adopted the definition by Han et al. (2017).

Table 1 described the statistics of the CDS spread slope for each region. Panel A described the statistics of CDS spread slope in Asia Pacific. The minimum and maximum value were in Indonesia, which was -91 bps and 375 bps. The most volatile CDS spread slope was in Philippines, whose standard deviation was 93.61 bps, and the CDS spread slope in Korea was the most stable, whose standard deviation was 20.48 bps. All the CDS spread slopes in Asia were positive skew, positive kurtosis except Malaysia, Philippines, and Thailand. Panel B described the statistics of CDS spread slope in Americas. The standard deviations were greater than Asia Pacific, the

most volatile country was Brazil, with minimum CDS spread slope of -693 bps, maximum CDS spread slope of 698 bps, and standard deviation of 231.69 bps. It can be assumed that the economy in Americas was less stable in Asia Pacific, which made the change of CDS term structure severe. Most of CDS spread slopes were positive skew except Brazil, and the kurtosis were also positive except Colombia. Panel C described the statistics of CDS spread slope in Europe, Middle East, and Africa. The CDS spread slope of Greece was the most volatile in whole sample, with minimum of -16,261 bps, maximum of 71 bps, and the standard deviation of 4,951.98 bps. Other countries like Iceland, Portugal, and Russia, whose CDS spread slope also volatile than others, the standard deviation were 113.66, 104.12, and 107.19 bps respectively.

## 二、美國總經消息指數

We collected various macroeconomic news in United State and calibrated it to good news and bad news index following the approach of (Andersen, Bollerslev, Diebold, & Vega, 2007; Balduzzi, Elton, & Green, 2001; Kim et al., 2015). First, we adopted the U.S. macroeconomic news from briefing.com and the indicators below were selected, trade balance, unemployment rate, GDP growth, nonfarm payrolls, and leading indicators. Second, there were three different institutions providing the forecast value, so we took the average as the aggregate forecast value. Third, if the news indicator was expressed as percentage form like unemployment rate, we took the absolute difference between forecast and announced value. If the news indicator was expressed as numeric form, such as nonfarm payrolls, we took the log difference between forecast and announced value. Forth, we standardized each indicator to made them comparable, and divided each news indicator by its standard deviation in the sample period. Fifth, we separated the news variables to good news index and bad news index. If the announced value was greater than forecast value, then we considered it as good news. Oppositely, if the announced value was smaller than forecast value, then we considered it as bad news. If the announced value equaled to forecast value, we considered it neither good news nor bad news. However, the lower the unemployment rate was, the more prosperous the economy was, so we seemed lower announced value of unemployment rate as good news. For each macroeconomic indicator, we took the average as the good and bad news index in United State.

## 三、股價指數

Stock index can be proxy of one country's economy because it is always to be seemed as investors' expectation about economy. If investors forecast the economic

will go up in the future, the stock return tends to go up as well. There are many indices in one country, and we choose the main index which is usually used by foreigner institutions, for example, we choose Bangkok Set Stock Index in Thailand, Brazil Bovesp Index in Brazil, and EGX30 Index in Egypt. Our data about stock return is from Bloomberg and investing.com. The whole stock index is tabulated on table 2.

#### 四、GDP 成長率

Similar with stock index return, GDP growth rate reflects the real economy of one country. We collected the data of GDP growth rate from the world bank with yearly frequency.

#### 五、控制變數

VIX index is the most popular index which captures the investors' sentiment in U.S. market. When investors were worried, VIX index increased right away. For example, VIX index increased to 59.89 points on October 2008, and 42.96 points on September 2011, which matched the two most severe events in the sample period, financial crisis and European debt crisis. We collected the VIX index data with daily frequency from TEJ database.

We also adopted USD index as control variable because we filtered the CDS contract with USD dominated. CDS contracts dominated by USD dominated is the most common and liquid. The appreciation and depreciation of US dollar changed the quote of CDS spread. In our sample period, USD index went to 120.59 on January 2002 and dropped to 72.72 on January 2008. We collected the USD index data with daily frequency from TEJ database.

### 肆、實證方法

We used the EGARCH model which was adopted by (Booth, Martikainen, & Tse, 1997; Braun, Nelson, & Sunier, 1995; Kim et al., 2015) in their research as well. EGARCH was derived from GARCH model, which was the heteroskedasticity model and implied the positive effect and negative effect are equivalent, while EGARCH model captured asymmetric effect on variance of good news and bad news. We also wanted to see how good and bad news affect the mean and variance of the term structure of CDS spread in each country, so we seemed good news and bad news index as exogenous variables to check the effect on the mean and variance of CDS spread slope. We also added three control variables, which were momentum calculated as previous twelve months cumulative return, VIX index return and USD index return. The regression was



below.

$$Slope_t = \alpha + \alpha_l Slope_{t-1} + \alpha_g GoodNews_t + \alpha_b BadNews_t + \sum_{k=1}^K \alpha_k ControlVariables_t^k + \varepsilon_t \quad (1a)$$

$$lnh_t = \beta + \beta_h lnh_{t-1} + \beta_{\varepsilon 1} \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \beta_{\varepsilon 2} \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} + \beta_g GoodNews_t + \beta_b BadNews_t \quad (1b)$$

Where  $slope_{t-1}$  meant the lagged CDS spread slope in each country,  $lnh_{t-1}$  was the lagged error parameter,  $\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}}$  is the lagged conditional variance, and  $\frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}}$  was the asymmetric component.

## 伍、實證結果

### 一、美國總經消息與新興市場 CDS 斜率

First, we checked whether the macroeconomic announcement from U.S. affected the term structure of CDS spread in emerging markets. We used EGARCH model to capture the effect of mean and variance from U.S. good news and bad news index. The results presented in table 3. Panel A described the result in Asia Pacific region. In mean equation, Good news reduced the level of CDS spread slope, significant countries including Thailand(-2 bps), China(-3 bps), Indonesia(-9 bps), and Philippines(-5 bps), while bad news increased the level of CDS spread slope in Thailand(2 bps), Malaysia(3 bps) and Korea(3 bps). In Philippines, both good news and bad news reduced the level of CDS spread slope, and the average value were -5 bps and -2 bps respectively. When good news was announced, it represented the economy was better than expected, and the CDS buyers did not need to pay more premium as before, especially for long-term CDS, which urged the term structure of CDS spread to become narrower. On the other hand, if the bad news was announced, it might be explained with two conditions. First, it represented the economy was worse than expected, and the CDS buyers needed to pay more premium than before to get the protection, especially for long-term CDS, which urged the term structure of CDS spread to become wider. In variance equation, good news decreased the variance of CDS spread slope in Thailand, Indonesia, and Philippines. The CDS spread slope always changes dramatically in the shock time, if good news was announced, investors knew that the economy in U.S. was better than expected and made variance of CDS spread slope stable. While bad new increased the variance of Indonesia and Philippines and decreased variance of CDS spread slope in Thailand and China. Bad news represented the worst time was passed in some occasions and markets knew that

the panic will not exist for a long time and made the volatility of CDS spread slope stable. We could assume that the good news from U.S. made the premium of different maturities CDS contract stable, and bad news made the premium of different maturity CDS contract either stable or volatile in Asia Pacific.

Panel B described the results in Americas region. In mean equation, Good news increased the level of CDS spread slope in Brazil(3 bps) and Colombia(0 bps) and reduced the level of CDS spread slope in Peru(-2 bps). Bad news increased the level of CDS spread slope in Colombia(1bp), Peru(3 bps), and Mexico(2 bps). The empirical results were similar with panel A, and we found the effect of U.S. bad news on the level of CDS spread slope was consistent in Americas. In variance equation, good news from U.S. all decreased the variance of CDS spread slope in Colombia, Peru, and Mexico, while bad news from U.S. increased the variance of CDS spread slope in Brazil, Colombia, Chile, Peru, and Mexico. The effect of good news and bad news on the variance of CDS spread slope was stronger and consistent in Americas.

Panel C described the result in Europe, Middle East, and Africa region. In mean equation, the effect of good news and bad news from U.S. were inconsistent. For example, the positive effect of good news occurred in Egypt(5 bps) and Morocco(1 bp), the negative effect occurred in Czech(-1 bp) and Greece(-13 bps). The positive effect of bad news occurred in Greece(7 bps) and Spain(0 bp), the negative effect occurs in Egypt(-4 bps) and Czech(-2 bps). But we can discover that the country number of negative effect of good news was more than positive effect, which were 4 versus 2, and the country number of positive effect of bad news was more than negative effect, which are 6 versus 3. Thus, we can still suggest the good news from U.S. decreased the level of CDS spread slope and the bad news from U.S. increased the level of CDS spread slope. In variance equation, the effect of good news and bad news were inconsistent as well. Good news in 6 countries reduced the variance of CDS spread slope and increased the variance of CDS spread slope in 5 countries. Bad news in 2 countries reduced the variance of CDS spread slope and increased the variance of CDS spread slope in 5 countries. In conclusion, we can say that in general, good news decreased the level of the CDS spread slope and the variance of CDS spread level, and bad news increased the level of the CDS spread slope and the variance of the CDS spread slope, which was similar with (Kim et al., 2015).

## 二、CDS 斜率與 GDP 成長率

From part 5.1, we knew the macroeconomic news from U.S. affected the term structure of CDS spread in emerging market. Next, we wanted to confirm that how the CDS spread slope reflects the real economy. Table 4 presented the relation between the term structure of CDS spread and GDP growth rate.

$$GDP_{i,t} = \beta_0 + \beta_1 \overline{Slope}_{i,t} + \beta_2 \overline{CDS1}_{i,t} + \beta_3 VIX_t + \beta_4 USD_t + Fixed\ effect + \epsilon_{i,t} \quad (2)$$

$\overline{Slope}_{i,t}$  meant the average CDS spread slope per year in each country, and we added average 1-year CDS spread, VIX return, USD index return, and year effect and fixed effect as control variables. The reason we added  $\overline{CDS1}_{i,t}$  as control variable is that the greater CDS spread slope can be interpreted as two ways. When we fixed the short-term spread, higher slope resulted from greater long-term spread, which implied the deterioration in the future, while we fixed the long-term spread, higher slope resulted from lower short-term spread, which implied the short-term economy was expected better than the one with flatter slope. In column 1, we set the GDP growth rate per year in each country as dependent variable. The coefficient of CDS spread slope was significantly negative, which was -0.0062 with t-statistic -3.81. On average, the GDP growth rate in emerging markets declined 0.0062% when the CDS spread slope increased 1 bp. If the CDS spread slope was greater, it implied investors' needed to pay more premium to get longer protection, and it reflected the economy in emerging markets were expected a recession trend. This result was similar with (Han et al., 2017), who did the research on U.S. corporate, and found that the corporates with flatter CDS spread slope have more SUE in the next three months to one year.

Next, we wanted to know did the effect of CDS spread slope extend to GDP growth rate next year. In column 2, we changed the dependent variable as GDP growth rate next year and controlled the GDP growth rate this year. The result was still significantly negative, which was -0.0035 bp with t-statistic -2.21. Further, we wanted to confirm that the CDS spread slope can forecast the change of economy in the future. We replaced the dependent variable as the difference between GDP growth rate, which was  $\Delta GDP\ growth_i = GDP\ growth_{i,t+1} - GDP\ growth_{i,t}$ , and the result was tabulated on the third column of table 4. The coefficient of CDS spread slope was insignificantly positive, which was 0.0008 bp with t-statistic 0.42. We can conclude that the CDS spread slope can only effectively reflect the simultaneous economy but cannot forecast the change of future economic condition in the emerging markets.

### 三、CDS 斜率與預期股價報酬

From previous part, we found that the CDS spread slope can reflect the simultaneous real economy, and we wanted to know that it has similar effect on stock index. We ran the panel regression with the CDS spread slope to cumulative return of 1 month, 3 months, 6 months, and 1 year later, and the control variables which were 1-year CDS spread, VIX index return, USD index return, and momentum, which was cumulative return of previous 12 months. The regression was as below, where  $i$  represented each country,  $t$  represented time period, and  $j$  equaled to 1, 3, 6, 12, which meant the cumulative return.

$$IndexReturn_{i,t+j} = \beta_0 + \beta_1 Slope_{i,t} + \beta_2 CDS1_{i,t} + \beta_3 MOM_{i,t} + \beta_4 VIX_t + \beta_5 USD_t + Fixed\ effect + \epsilon_{i,t} \quad (3)$$

Table 5 presented the results. The dependent variables of each column were 1-month, 3-month, 6-month, and 1-year cumulative return. We found that the coefficient of the CDS spread slope were 0.0029%, 0.0104%, 0.0202%, 0.0087 respectively. The CDS spread slope can forecast the future stock index return up to 6 months effectively. Interestingly, the coefficient direction of CDS spread slope was inconsistent with part 5.2. The greater the CDS spread slope was, the better the stock index performed but the lower GDP growth rate was. We thought that the greater CDS spread slope occurred in the panic period, where the base period of the stock index was relatively low because stock index also reflected the current expectation of default risk, and it triggered the positive return next one to six months. Besides, the R-square was greater in the regression of 6-month cumulative return, and we thought that CDS spread slope has stronger explanatory power to further stock index return.

### 四、投資組合策略

From table 5, we understood the relation between future stock return and the CDS spread slope was positive in emerging markets. Then, we wanted to utilize this relation to construct a portfolio strategy. We divided all countries into three groups according to the CDS spread slope in every month, and we longed the high slope group and shorted the low slope group, and we calculated the return next month. The result was tabulated on table 6. The average of raw return of first(highest) group was 1.3092% with t-statistic 2.92, and third(lowest) group is -0.0454% with t-statistic -0.1. The buy high sell low strategy gained profit of 1.3547% with t-statistic 5.04 per month. Then we adjusted the return by risk factor, using the model of CAPM, Fama-

French three factors model, Carhart four factors model. After adjustment, each strategy took the excess profit of 1.5024% by CAPM, 1.600% by Fama-French model, 1.6672% by Carhart model. We found that in each risk adjustment, the coefficient of highest group was significantly different with zero while the coefficient of lowest group was not. Besides, all buy high sell low strategies brought us positive return, which is identical with the part of 5.3.

## 五、穩健性測試

Due to our sample period covered the financial crisis and Eurozone debt crisis, we would like to cut our time period after 2008 and to confirm that the U.S. macroeconomic news affected the CDS spread slope. The sample was reduced to 10 countries. Table 7 presented our robustness results. In mean equation, good news raised the level of CDS spread slope in 4 countries and lowered the level of CDS spread slope in 6 countries, and bad news raised the CDS spread slope in 5 countries and lowered the CDS spread slope in 4 countries after 2008. In variance equation, good news raised the variance of CDS spread slope in 4 countries and lowered the CDS spread slope in 5 countries, and the bad news raised the variance of the term structure of CDS spread in 5 countries and lowered the term structure of CDS spread in 5 countries after 2008. Compared the positive and negative effect, we found that good news decreased the mean and the variance of the CDS spread slope, and bad news increased the mean and the variance of the CDS spread slope in many countries, thus, we still confirmed that the effect persisted even we shrank the time period after 2008.

Next, we filtered the data after 2008 and ran the regression again to confirm the relation between the CDS spread slope and GDP growth rate and stock return. Table 8 showed the regression of the term structure and GDP growth rate simultaneously and next year after 2008. The coefficient was -0.114% with t-statistic -2.32, and the negative relation still existed in the simultaneous year. However, the coefficient of CDS spread slope to GDP growth rate was 0.0018%, which was not significant. We can assume that the higher CDS spread slope implied markets more worry about long-term economy and forecast the GDP growth rate in that year. Table 9 showed the relation between the CDS spread slope and future cumulative stock return in one, three, six, and twelve months later. Compared with table 5, the relation still existed as well. The steeper CDS spread slope forecast the significantly positive stock index return up to future six months. During the financial crisis, both stock index and CDS

spread slope reflected on the worse economy simultaneously, which forced the expected return greater. When the financial crisis ended, stock index recovered soon and resulting in the significant positive stock return.

## 陸、結論

The macroeconomic news from U.S. affected the CDS spread slope in emerging market. The good news better than expected reduced the mean and variance of the CDS spread slope. On the other hand, the bad news worse than expected increased the mean and variance of the CDS spread slope. Second, if the CDS spread slope tended to be flat, the GDP grew better in the simultaneous year, but the CDS spread slope can only forecast the GDP growth rate and cannot forecast the future change of the GDP growth rate. Third, the CDS spread slope can also estimate the trend of the future stock index return, basically, the flat CDS spread slope induced the negative return of stock index around six months, and the effect was stronger in long-term period. When the economy was awful, such as financial crisis and Euro debt crisis, the effect still existed.

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**【表 1】Statistic description**

	<b>N</b>	<b>Min</b>	<b>Q1</b>	<b>Me</b>	<b>Mean</b>	<b>Q3</b>	<b>Max</b>	<b>Sd</b>	<b>Skew</b>	<b>Kurt</b>
Thailand	149	16	25	51	49	68	96	23.09	0.177	-1.186
Malaysia	149	8	22	50	47	63	122	24.51	0.179	-0.672
China	152	6	17	28.5	34	43	93	21.39	1.031	0.441
Indonesia	139	-91	88	108	121	149	375	77.19	0.792	2.771
Korea	150	2	18	32	35	47	93	20.48	0.811	0.134
Philippines	150	-11	88	120	160	261	356	93.61	0.384	-1.151
Brazil	152	-693	66	87	168	326	698	231.69	-0.482	2.419
Colombia	150	45	71	102	174	295	535	131.21	0.919	-0.504
Chile	139	8	16	43	47	62	165	33.02	1.147	1.309
Peru	139	43	68	92	154	175	655	139.59	1.883	2.912
Mexico	152	15	55	70	85	102	266	48.44	1.474	2.194
Egypt	137	27	57	83	107	142	403	64.99	1.402	2.467
Czech	150	2	7	15	24	40	79	20.58	0.862	-0.343
Greece	151	-16261	-12	7	-1843	10	71	4951.98	-2.475	4.309
Morocco	149	24	45	82	99	110	299	70.07	1.227	0.385
Spain	146	-34	2	4	32	38	207	47.25	1.650	1.856
Iceland	112	-512	1	4	-4	67	214	113.66	-1.587	3.747
Italy	152	-34	5	8	34	37	227	48.64	1.804	2.609
Poland	152	2	14	29.5	40	55	149	33.18	1.324	1.212
Portugal	139	-594	3	5	-1	24	196	104.12	-2.428	10.548
South Africa	151	18	46	78	76	100	134	29.48	-0.174	-0.963
Russia	144	-352	40	90.5	94	125	528	107.19	-0.015	6.592
Qatar	144	6	22	35.5	39	52	98	21.58	0.448	-0.688

**【表 2】Stock index**

<b>APA</b>		<b>EMEA</b>	
<b>Country</b>	<b>Index</b>	<b>Country</b>	<b>Index</b>
Thailand	Bangkok Set Stock Index	Egypt	EGX30 Index
Malaysia	Kuala Lumpur-Stock Index	Czech	PX Index
China	Shanghai Synthesis Index	Greece	ASE Index
Indonesia	Indonesia JSX-Stock Index	Morocco	MASI Index
Korea	South Korea-KOSPI Index	Spain	Madrid Stock Indexes
Philippines	Manila Stock Index	Iceland	ICEX Main Index
		Italy	FTSE MIB Index
		Poland	WIG Index
		Portugal	PSI20 Index
		South Africa	Johannesburg Stock Index
		Russia	Russian RTS Stock Index
		Qatar	QE Index
<b>AME</b>			
<b>Country</b>	<b>Index</b>		
Brazil	Brazil Bovesp Index		
Colombia	COLCAP Index		
Chile	Chile IPSA Index		
Peru	BVL Index		
Mexico	Mexico IPC Index		



**【表 3】 EGARCH estimation of the slope of CDS spread**

**Panel A**

Mean	Mu	Ar1	Good	Bad	MOM	VIX	USD
Thailand	0.0067*** (8019.78)	0.9864*** (10696.91)	-0.0002*** (-1999.63)	0.0002*** (1807.5)	-0.0014*** (-9710.2)	0.0000*** (122.16)	0.0011*** (590.14)
Malaysia	0.0060*** (6.92)	0.9870*** (81.57)	-0.0001 (-0.73)	0.0003*** (2.68)	-0.0019** (-2.57)	-0.0000 (-0.12)	0.0015 (1.13)
China	0.0034*** (10.01)	0.9788*** (72.44)	-0.0003*** (-12.33)	0.0000 (1.11)	-0.0004** (-2.18)	-0.0001*** (-4.64)	0.0014*** (7.65)
Indonesia	0.0113*** (12.94)	0.8569*** (18.14)	-0.0009** (-2.02)	-0.0004 (-0.74)	-0.0001 (-0.04)	0.0016*** (3.17)	-0.0029 (-0.77)
Korea	0.0011** (2.2)	0.9932*** (57.74)	0.0000 (0.14)	0.0003*** (3.7)	-0.0009*** (-8.21)	-0.0001 (-1.55)	-0.0003 (-0.54)
Philippines	0.0272*** (162593.96)	0.9970*** (5624.55)	-0.0005*** (-12397.8)	-0.0002*** (-279.23)	-0.0019*** (-167.47)	0.0010*** (10762.73)	-0.0009*** (-259.51)

Variance	Omega	Alpha1	Beta1	Gamma1	Good	Bad
Thailand	0.3321*** (30674.94)	0.2643*** (16264.64)	0.9999*** (12297.9)	-0.1658** (-39166.38)	-0.7947*** (-73751.27)	-0.3412*** (-2034.37)
Malaysia	-0.6139** (-2.41)	0.2612*** (2.84)	0.9506*** (73.61)	0.3618** (2.11)	-0.2043 (-0.88)	-0.0898 (-0.41)
China	-0.7317*** (-4.41)	0.2415*** (4.37)	0.9434*** (66.75)	0.3195*** (6.14)	-0.0386 (-0.19)	-0.3367* (-1.83)
Indonesia	-1.1054*** (-3.49)	0.0497 (0.62)	0.9269*** (43.79)	0.2989*** (3.15)	-0.4073** (-2.00)	1.0779*** (3.63)
Korea	-1.1212* (-1.65)	0.1066 (0.89)	0.9312*** (25.96)	0.5935*** (4.52)	-0.1327 (-0.37)	0.4836 (1.35)
Philippines	-1.8589*** (-7806.31)	-0.1948*** (-3555.41)	0.8682*** (8213.22)	-0.4718*** (-3607.89)	-0.6208*** (-5807.73)	0.9550*** (5468.91)

**Panel B**

Mean	Mu	Ar1	Good	Bad	MOM	VIX	USD
Brazil	0.0073*** (129.92)	0.8985*** (29.18)	0.0003*** (8.16)	-0.0001 (-1.57)	-0.0019*** (-5.75)	-0.0004*** (-3.91)	0.0061*** (4.28)
Colombia	0.0074*** (6432.54)	0.6484*** (4237.96)	0.0000*** (225.09)	0.0001*** (176.38)	-0.0045*** (-41695.82)	0.0003*** (6.58)	0.0076*** (412.2)
Chile	0.0066* (1.86)	0.9942*** (77.24)	0.0001* (1.76)	0.0002 (1.34)	-0.0022*** (-2.88)	-0.0000 (-0.42)	0.0029 (1.3)
Peru	0.0166*** (4077.94)	0.9804*** (1345.96)	-0.0002*** (-5.09)	0.0003*** (12.42)	0.0002*** (10.59)	0.0001*** (8.8)	0.0077*** (32.95)
Mexico	0.0135*** (11.74)	0.9956*** (56.27)	-0.0000 (-0.13)	0.0002*** (3.17)	-0.0022*** (-4.13)	0.0003** (2.12)	0.0095*** (7.05)

Variance	Omega	Alpha1	Beta1	Gamma1	Good	Bad
Brazil	-1.1956* (-1.94)	0.3117* (1.73)	0.9171*** (18.53)	0.9023*** (6.69)	-0.4762* (-1.91)	1.4347*** (4.68)
Colombia	-1.269*** (-2768.7)	-0.2757*** (-60684.54)	0.9158*** (2895.98)	-0.3533*** (-2452.51)	-1.6718*** (-2761.2)	2.6618*** (7450.37)
Chile	-2.2385*** (-3.73)	0.1220 (1.27)	0.8800*** (27.15)	0.4410*** (2.87)	-0.1125 (-0.37)	1.7611*** (4.01)
Peru	-0.3151*** (-1696.54)	0.3736*** (12673.14)	0.9691*** (4239.65)	-0.1842*** (-84214.09)	-0.3240*** (-98585.69)	0.0164*** (481.94)
Mexico	-2.3942*** (-10.23)	0.4935*** (6.15)	0.8247*** (331.08)	0.3237*** (5.87)	-0.8257*** (-6.51)	0.9471** (2.22)

**Panel C**

Mean	Mu	Ar1	Good	Bad	MOM	VIX	USD
Egypt	0.0128*** (17263.19)	0.9518*** (5914.78)	0.0005*** (54.25)	-0.0004*** (-116.24)	0.0014*** (453.08)	0.0008*** (493.89)	-0.0084*** (-75.4)
Czech	0.0011*** (21.5)	1.0000*** (105.55)	-0.0001** (-2.21)	-0.0002*** (-5.7)	0.0003*** (7.68)	0.0001*** (2.69)	0.0006*** (3.67)
Greece	0.0009*** (302.41)	0.7862*** (843.74)	-0.0013*** (-451.24)	0.0007*** (105.12)	-0.0032*** (-361.77)	-0.001*** (-11088.26)	-0.01*** (-455.57)

Morocco	0.0213*** (524.4)	0.9921*** (2929.32)	0.0001*** (15.65)	-0.0002** (-2.56)	-0.0024*** (-20.68)	0.0005*** (7.74)	-0.0001 (-0.89)
Spain	0.0003*** (14.12)	0.8933*** (31.11)	-0.0000*** (-3.38)	0.0000*** (4.85)	-0.0002*** (-5.52)	-0.0000 (-0.48)	-0.0000* (-1.74)
Iceland	0.0009*** (9.45)	1.000*** (1362.78)	-0.0000 (-0.53)	0.0001*** (11.27)	-0.0001*** (-8.93)	-0.0000*** (-3.54)	-0.0003*** (-8.37)
Italy	0.0006*** (12.48)	0.9465*** (372.07)	0.0001 (1.18)	0.0000 (0.57)	-0.0001 (-0.41)	0.0002*** (4.28)	0.0008 (1.48)
Poland	0.0015*** (3.72)	1.0000*** (99.07)	-0.0001*** (-9.61)	0.0001*** (4.11)	-0.0002*** (-11.03)	-0.0001*** (-2.91)	0.0014*** (9.57)
Portugal	0.0004*** (80.45)	0.7709*** (73.18)	-0.0000*** (-115.86)	0.0001*** (57.12)	0.0001*** (22.81)	-0.0000*** (-13.18)	-0.0004*** (-6.22)
South Africa	0.0051*** (22.75)	1.000*** (505.83)	-0.0001 (-0.49)	0.0002 (1.09)	-0.0000 (-0.02)	0.0002 (1.11)	0.0032** (2.19)
Russia	0.0431*** (19.31)	0.9983*** (545.8)	-0.0000 (-0.17)	-0.0001 (-0.25)	-0.0019*** (-5.95)	-0.0004*** (-3.4)	0.0049 (0.88)
Qatar	0.0016*** (673622.57)	0.9965*** (12016.73)	-0.0003*** (-10940.72)	0.0000*** (12.25)	-0.0005*** (-6.96)	0.0003*** (23.81)	0.0006*** (53.08)

Variance	Omega	Alpha1	Beta1	Gamma1	Good	Bad
Egypt	-0.101*** (-4312.91)	0.4325*** (7011.76)	0.9726*** (368476.1)	-0.1885*** (-18065.84)	-0.6745*** (-13180.52)	-0.0829*** (-1755.35)
Czech	-2.9871*** (-2.94)	0.0113 (0.11)	0.853*** (16.37)	1.1369*** (6.53)	1.6761*** (3.58)	0.8533* (1.96)
Greece	-3.9509*** (-7673.95)	-2.1687*** (-96.68)	0.8317*** (301281.49)	0.3197*** (24.55)	3.5991*** (159.53)	2.9578*** (115.18)
Morocco	-0.8633*** (-165347.77)	0.2662*** (127.23)	0.95*** (261492.4)	-0.1603*** (-323.3)	-0.3328*** (-738.06)	0.9575*** (20760.56)
Spain	0.6467*** (3.13)	0.3254*** (3.33)	1.0000*** (143.05)	1.2081*** (9.45)	-1.6048*** (-5.25)	-0.0912 (-0.23)
Iceland	-2.326*** (-11.28)	0.2426** (2.11)	0.9648*** (201.86)	1.9669*** (12.68)	0.9826*** (3.01)	6.4194*** (15.72)
Italy	0.3321* (1.71)	0.0694 (0.63)	1.0000*** (206.86)	1.3555*** (7.93)	0.1736 (0.37)	-0.912*** (-2.77)
Poland	-2.5280*** (-3.26)	0.4263*** (3.9)	0.8629*** (20.81)	0.9679*** (5.13)	0.9432** (2.29)	0.6400 (1.56)
Portugal	0.0521 (0.11)	-0.1645 (-1.1)	0.9883*** (30.91)	1.9251*** (6.24)	-1.0682** (-2.51)	1.2025*** (4.99)
South Africa	0.1368*** (3.61)	0.2454*** (4.41)	0.9948*** (54760.03)	0.0296 (1.2)	-0.7683*** (-7.15)	-0.0554 (-0.59)
Russia	-1.3164*** (-3.16)	-0.0569 (-0.59)	0.8666*** (27.84)	1.3659*** (7.74)	-1.2516*** (-5.51)	0.2159 (0.55)
Qatar	-1.7155*** (-8603.66)	0.3975*** (8143.42)	0.9050*** (10514.32)	-0.3993*** (-8020.37)	0.0177*** (10157.82)	0.7522*** (14198.48)

**【表 4】 Regression on GDP growth rate**

	<b>GDP<sub>t</sub></b>	<b>GDP<sub>t+1</sub></b>	<b>Δ GDP</b>
Intercept	4.7571 (0.76)	4.7425 (0.78)	1.3747 (0.18)
Slope	-0.0062*** (-3.81)	-0.0035** (-2.21)	0.0008 (0.42)
CDS1	-0.0028*** (-4.1)	-0.00** (-3.33)	0.0005 (0.63)
GDP <sub>t</sub>		0.2920*** (4.82)	
VIX	0.0155 (0.07)	0.0673 (0.30)	0.0563 (0.2)
USD	0.059 (0.11)	0.0292 (0.06)	-0.0126 (-0.02)
Adj. R <sup>2</sup>	0.6618	0.6845	0.3463
Year effect	Yes	Yes	Yes
Country effect	Yes	Yes	Yes

**【表 5】 Regression on future stock return**

	<b>1 month</b>	<b>3 months</b>	<b>6 months</b>	<b>1 year</b>
Intercept	0.3582 (0.34)	2.2055 (1.19)	3.7654 (1.34)	7.2061* (1.75)
Slope	0.0029** (2.21)	0.0104*** (4.39)	0.0202*** (5.55)	0.0087 (1.62)
CDS1	0.0013** (2.32)	0.0047*** (4.69)	0.0092*** (6.08)	0.0053** (2.32)
MOM	0.0055 (1.21)	-0.0185** (-2.27)	-0.1224*** (-9.87)	-0.1930*** (-10.49)
VIX	-0.0562*** (-7.77)	-0.0054 (-0.42)	0.0423** (2.13)	0.0240 (0.82)
USD	-0.0250 (-0.46)	-0.3034*** (-3.16)	-0.2258 (-1.55)	1.1168*** (5.24)
Adj. R <sup>2</sup>	0.1174	0.2762	0.3606	0.4006
Year effect	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes

**【表 6】 Portfolio strategy**

	<b>1(High)</b>	<b>2</b>	<b>3(Low)</b>	<b>High-Low</b>
Average Return	1.3092*** (2.92)	0.5765 (1.43)	-0.0454 (-0.10)	1.3547*** (5.04)
CAPM Alpha	1.0528** (2.41)	0.3226 (0.83)	-0.3051 (-0.66)	1.5024*** (5.55)
FF-3 Alpha	1.2064*** (2.67)	0.4679 (1.16)	-0.2518 (-0.53)	1.6000*** (5.72)
Carhart-4 Alpha	1.2726*** (2.8)	0.5087 (1.25)	-0.2533 (-0.52)	1.6672*** (5.97)

**【表 7】 Robustness check: U.S. macroeconomic news index**

	Mean		Variance	
	Good	Bad	Good	Bad
Thailand	-0.0005*** (-2.59)	-0.0002 (-0.84)	0.8991 (1.2)	-1.8882** (-1.99)
Malaysia	-0.0001*** (-517.49)	-0.0001*** (-16.96)	0.4859*** (8581.57)	-2.2931*** (-5924.56)
China	-0.0003*** (-2537.48)	0.0000*** (1373.16)	0.0835*** (27.8)	-2.2461*** (-3264.31)
Brazil	0.0005*** (812.36)	0.0004*** (74.80)	-5.5713*** (-2541.67)	1.7291*** (3425.76)
Colombia	-0.0002*** (-2262.67)	-0.0005*** (-2493.99)	-0.4544*** (-4416.41)	0.1714*** (2670.97)
Egypt	0.0016*** (4699.99)	0.0007*** (1105.8)	0.7947*** (4635.48)	0.9207*** (4926.36)
Czech	0.0006*** (4692.62)	0.0006*** (3138.57)	2.2926*** (4861.82)	0.0708*** (2113.06)
Greece	-0.0181*** (-797.53)	-0.0125*** (-872.65)	-4.9461*** (-101.94)	-5.0716*** (-149.46)
Morocco	0.0002*** (388.03)	-0.0000*** (-20.67)	-0.3349*** (-3556.63)	-0.4935*** (-3643.12)
Spain	-0.0005*** (-2661.8)	-0.0005*** (-230.18)	-2.6267*** (-102.52)	4.0608*** (85.62)

**【表 8】 Robustness check: GDP growth rate**

	GDP <sub>t</sub>	GDP <sub>t+1</sub>
(Intercept)	6.7042*** (3.17)	0.3583 (0.16)
Slope <sub>t</sub>	-0.0114** (-2.32)	0.0018 (0.36)
CDS1 <sub>t</sub>	-0.0048** (-2.35)	0.0009 (0.43)
GDP <sub>t</sub>		0.3151*** (3.25)
VIX <sub>t</sub>	0.0075 (0.14)	-0.0404 (-0.75)
USD <sub>t</sub>	0.0933 (0.12)	0.0332 (0.04)
Adj. R <sup>2</sup>	0.7249	0.6849
Year effect	Yes	Yes
Country effect	Yes	Yes

**【表 9】 Robustness check: Stock index return**

	<b>1 month</b>	<b>3 months</b>	<b>6 months</b>	<b>1 year</b>
Intercept	-7.0049*** (-6.08)	-24.4525*** (-12)	-46.5784*** (-15.24)	-41.9889*** (-10.22)
Slope	0.0057** (2.24)	0.0195*** (4.31)	0.0372*** (5.46)	0.0028 (0.31)
CDS1	0.0025** (2.32)	0.0085*** (4.52)	0.0166*** (5.8)	0.003 (0.77)
MOM	-0.0061 (-0.98)	-0.064*** (-5.77)	-0.2382*** (-14.26)	-0.3411*** (-15.1)
VIX	-0.0855*** (-7.71)	-0.0025 (-0.12)	0.0855*** (2.83)	-0.0436 (-1.07)
USD	0.0727 (0.93)	-0.546*** (-3.98)	-0.7233*** (-3.49)	1.6334*** (5.95)
Adj. R <sup>2</sup>	0.1467	0.3343	0.4504	0.4486
Year effect	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes