Long-Run Determinant of the Sovereign CDS spread in emerging countries

Sy Hoa HO*

Abstract

In this paper, we study the long-run determinant of Sovereign CDS spread for eight emerging countries in the 2008.Q4-2013.Q2 periods. The determinant of sovereign CDS spread is estimated from three macroeconomic factors: the current account, the external debt and the international reserves. Using the Pooled Mean Group cointegration approach, our findings can be summarized as follow: i, the existence of cointegration between these variables indicated above; ii, the coefficients of the current account, the external debt and international reserves are significant in the long-run for all countries; iii, the short-run is significant just for the external debt and the international reserves, not for the current account.

Key words: Sovereign Credit Default Swaps, Panel cointegration, Pooled Mean Group.
JEL classification: F34, G15, C32, C33

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1 Introduction and Literature

Credit Default Swap (CDS) is an insurance contract between a seller and a buyer that allows investors to buy protection against default. The buyer pays a fee to the seller (called CDS premium or spread), in exchange, the buyer of the CDS receives compensation from the seller in the event of default. The aim of sovereign CDS is to insure the sovereign bonds buyer against the default of government bond. The larger the CDS’ spread on a government bond, the higher the risk of default on that bond by the issuing government. The short-selling of CDS can lead the sovereign bond downgrade, which led to disorder of the CDS market and the global financial crisis in 2007. Additionally, Chan-Laul (2003, 2006) demonstrates the relationship between the CDS spread and sovereign default probability. The default probability can be computed and predicted from the CDS spread. Therefore, the CDS spread has been a proxy of country risk since then.

We start by reviewing the various studies of the determination of sovereign risk (e.g the sovereign CDS or default probability of sovereign) by fundamental macroeconomics variables. Bulow and Rogoff (1988) show that exchange rate variations have a direct impact on a country’s terms of trade, which may affect the ability of the country to generate dollar revenue and make payments on its external debt. Hernandez-Trillo (1995) indicates that the default probability of sovereign depends on: the degree of openness, a degree of "unluckiness", international reserves and the risk-free interest rate. According to his model, he creates a spread index over LIBOR and debt service ratio to determine the sovereign default probability, and defines the default probability as a function of the cost of default. His results analyse for 33 debtor emerging countries in the period 1970-1988 that liberalization policies decreases the probability of default by both raising the GDP and increasing openness. A country default will induce a loss in access to future credit. The unluckiness is also important when explaining the probability of default. This model displays a negative effect of openness and international reserves on the default probability. Cantor and Packer (1996) regress a country’s ability and willingness-to-service its debt for a panel of developing countries. They find six variables affecting the sovereign credit rating which are per capita income, GDP growth, inflation rate, external debt, default history and an economic development indicator. Additionally, Mellios and Paget-Blanc (2006) determine two other factors that are government income and change in the real exchange rate. These variables have a positive impact on default probability except for the inflation rate. Baek et al. (2005) show the link between sovereign risk in emerging countries and macroeconomic variables such as government budget balance and current account balance. Georgievska et al. (2008) use the Bayesian approach to study a panel of 124 emerging countries during the 1981-2002 period. Their results report three classified variables explaining sovereign default: total debt to GDP ratio and Export to GDP ratio represent solvency variables, international reserves to GDP express liquidity and currency account balance to GDP ratio and imports to GDP ratio variables represent macroeconomic variables. Ramos-Francia and Rangel (2012) create a sovereign spread index as the difference between the long-term government bonds yield and the 10-year US Treasuries yield. They test the relationship of this index with macroeconomic variables such as inflation, economic growth, fiscal and current account deficits, international reserves and nominal exchange rate variations. These results illustrate that the international reserves and exchange rate appreciations are associated with lower default risk in emerging markets. IMF-Report (2013) introduces the determinant of the CDS spread by regressing it on various economics and financial explanatory variables. There are two variables that would be expected to increase the spread; debt-to-GDP ratio and GDP growth.
rate whereas international reserves would reduce it. Additionally, this report suggests global or region-specific explanatory variables such as VIX (S&P 500 index), global equity return (1-month US Treasury) and Funding cost (3-month LIBOR-OIS). Delatte et al. (2012) use a vector error correction model (VECM) in order to test the long-run cointegration between the CDS premia and the bond spread for the European countries in the 2008.M9-2010.M7 period. The limitations of previous papers have not examined this subject for emerging countries in the long-run and short-run.

Figure 1, the sovereign CDS 5-year spread of eight emerging countries is fairly homogeneous in 2008.Q4-2013.Q2 period. In other word, the country risk for all countries of this panel is homogeneous in this period. Furthermore, the sovereign CDS 5-year spread is the most traded in the CDS market. That is why we use this proxy in the paper to determine long-run sovereign CDS spread.

In this paper, we contribute the empirical results of the long-run and the short-run relationship between the sovereign CDS spread and fundamental macroeconomics for this panel group. We propose the explanatory variables in this paper are the current account to GDP ratio, the external debt to GDP ratio and the international reserves to GDP ratio such as in the article of Georgievska et al. (2008) and IMF-Report (2013).

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2 Econometric approach and Empirical results

Data Description

In this paper, we use quarterly data from 2008.Q4 to 2013.Q2 for eight emerging countries: Brazil, Malaysia, South Korean, Thailand, Turkey, South Africa, Indonesia and Mexico. Sovereign

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1 We focus on the 2008q3-2013q4 periods for reason of data availability.
CDS 5-year spread in log denoted LCDS is taken from Reuters covered from daily data. CA is the ratio of the current account to GDP, ED is the ratio of the external debt to GDP. The two are found in Central Bank of each country. RES is the international reserve to GDP ratio (IMF International Financial Statistic).

In order to test the long-run and short-run relationship between the sovereign CDS spread and the explanatory variables for the emerging panel, we apply the panel unit root and the panel cointegration test. The panel unit root aims to verify that all variables are integrated with the same order. The panel cointegration test is to study the existence of cointegration between all variables. These tests are the necessary condition to test the panel long-run estimation.

### 2.1 Panel unit root

Before testing cointegration, we verify that all variables are integrated with the same order. We employ the first generation panel unit root tests of Levin et al. [2002], Im et al. [2003] which are denoted LLC and IPS and the second generation one of Pesaran [2007] which is denoted CIPS. The null hypothesis is that the series contains a unit root. Levin et al. [2002] assumes that all panels have the same autoregressive parameter, but Im et al. [2003] allows each panel to have its own autoregressive parameter. The panel unit root of Pesaran [2007] takes into account cross-sectional dependence. The panel unit root test of all variables and the first difference its report in Figure 2.

#### Figure 2: Panel unit root for sovereign CDS, current account, external debt and exchange rate

<table>
<thead>
<tr>
<th>Series</th>
<th>Levin, Lin, Chu</th>
<th>Im, Pesaran, Shin</th>
<th>Pesaran (CIPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCDS</td>
<td>-9.2466*** (0.0000)</td>
<td>-3.4171*** (0.0003)</td>
<td>-1.671 (0.564)</td>
</tr>
<tr>
<td>CA</td>
<td>-0.9600 (0.1685)</td>
<td>-1.3269* (0.0923)</td>
<td>-2.008 (0.222)</td>
</tr>
<tr>
<td>RES</td>
<td>-0.2669 (0.3948)</td>
<td>-0.7367 (0.2306)</td>
<td>-1.888 (0.332)</td>
</tr>
<tr>
<td>ED</td>
<td>-1.3043* (0.0961)</td>
<td>0.0450 (0.5179)</td>
<td>-1.918 (0.303)</td>
</tr>
<tr>
<td>ΔLCDS</td>
<td>-5.1157*** (0.0000)</td>
<td>-4.7774*** (0.0000)</td>
<td>-2.559** (0.011)</td>
</tr>
<tr>
<td>ΔCA</td>
<td>-6.8535*** (0.0000)</td>
<td>-6.5774*** (0.0000)</td>
<td>-2.944*** (0.003)</td>
</tr>
<tr>
<td>ΔRES</td>
<td>-4.3401*** (0.0000)</td>
<td>-6.4481*** (0.0000)</td>
<td>-2.817*** (0.001)</td>
</tr>
<tr>
<td>ΔED</td>
<td>-0.5025 (0.3076)</td>
<td>-6.6663*** (0.0000)</td>
<td>-3.339*** (0.000)</td>
</tr>
</tbody>
</table>

Notes: $\Delta$ is first difference, ***, **, * means that we reject the null hypothesis of unit root at the 1%, 5%, 10% level. P-value in parentheses

For the first generation of panel unit root: The variables LCDS is stationary, do not include a unit root with the LLC, IPS test at the 1% level. Concerning the variables CA, this variable is stationary with IPS test at the 10% level, but not with LLC test. The variable RES is not stationary with the both LLC, IPS test. The variable ED is stationary with LLC test at the 10% level, but not IPS test. The first difference of all series is stationary for LLC, IPS, CIPS test.
The second generation CIPS test solves the biased results in the first generation. Focusing on the CIPS test, all variables in level are integrated with the same order I(1). Therefore, we can test the existence of cointegration relationship among LCDS, CA, RES, ED.

2.2 Panel cointegration Test

The test of panel cointegration proposed by Pedroni (1999) and Kao (1999). Pedroni (1999) presented seven statistics: Panel-$v$, Panel-$\rho$, Panel-PP, Panel-ADF (the four statistics are based on within-dimension), and Group $\rho$-statistic, Group PP-statistic, Group ADF-statistic (the three statistics are based on between-dimension). Kao (1999) tested the residual estimation based on Augmented Dickey-Fuller test. The null hypothesis of the both tests is no cointegration. The results are shown in Figure 3 and Figure 4 in below:

![Figure 3: Panel cointegration test: Pedroni test](image)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel-$v$</td>
<td>0.7316</td>
<td>0.4977</td>
</tr>
<tr>
<td>Panel-$\rho$</td>
<td>-1.3928</td>
<td>0.1267</td>
</tr>
<tr>
<td>Panel-PP</td>
<td><strong>-2.300</strong>*</td>
<td>0.0030</td>
</tr>
<tr>
<td>Panel-ADF</td>
<td><strong>-1.5619</strong>*</td>
<td>0.0026</td>
</tr>
<tr>
<td>Group $\rho$-statistic</td>
<td>0.1727</td>
<td>0.5686</td>
</tr>
<tr>
<td>Group PP-statistic</td>
<td><strong>-2.9813</strong>*</td>
<td>0.0014</td>
</tr>
<tr>
<td>Group ADF-statistic</td>
<td><strong>-3.1012</strong>*</td>
<td>0.0010</td>
</tr>
</tbody>
</table>

![Figure 4: Panel cointegration test: Kao test](image)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF</td>
<td>1.4535*</td>
<td>0.0730</td>
</tr>
</tbody>
</table>

***, **, * means that we reject the null hypothesis of non-cointegration at the 1%, 5%, 10% level

Figure 3: Regarding the Panel-PP, Panel-ADF (within-dimension) statistic and Group PP-statistic and Group ADF-statistic (between-dimension), the results show that we have 4/7 tests that reject the null hypothesis of no cointegration at the 1 % level, except Panel-$v$, Panel-$\rho$ and Group-$\rho$ which are not significant. More that, the results in Figure 4 confirm that we reject the null hypothesis of no cointegration with ADF statistic at the 10 % level. Therefore, we can conclude that there exists cointegration among the sovereign CDS and the current account, the external debt and the international reserves.
2.3 Panel cointegration Estimation: Pooled Mean Group estimation

In order to test Panel cointegration estimation, we use Pooled Mean Group (PMG) estimation approach. Pooled Mean Group estimates the presence of dynamic long-run, short-run based on the methodology of Pesaran et al. (1997, 1999). We analyse the role of the current account, the external debt and the international reserves with sovereign CDS spread for all countries in this panel. The techniques of PMG are used in the recent article of Martinez-Zarzoso and Bengochea-Moracho (2004); Bangake and Eggoh (2012).

The approach we adopted here is the determination of long-term relationship among LCDS, CA, RES, ED, LER. Here, we investigate cointegration estimation using an empirical formalization using panel data.

We assume that the long-run sovereign CDS function is given by:

\[
LCDS_{it} = \alpha_0 + \alpha_1 CA_{it} + \alpha_2 RES_{it} + \alpha_3 ED_{it} + \mu_i + \epsilon_{it}
\]  

Where LCDS is sovereign CDS spread in log; CA is ratio of the current account to GDP; RES is ratio of the international reserves to GDP; ED is ratio of the external debt to GDP; \(\mu_i\) is the group-specific effect; \(i = 1, 2, \ldots, 8\) is the number of countries; \(t = 1, 2, \ldots, T\) is number of periods.

We assume that all these variables are I(1) and co-integrated for individual countries, leading the error term an I(0) process for all \(i\).

The ARDL(1,1,1,1) dynamic panel specification of equation (1) is

\[
LCDS_{it} = \delta_{10i} CA_{it} + \delta_{11i} CA_{i,t-1} + \delta_{20i} RES_{it} + \delta_{21i} RES_{i,t-1} + \delta_{30i} ED_{it} + \delta_{31i} ED_{i,t-1} + \lambda_i LCDS_{i,t-1} + \mu_i + \epsilon_{it}
\]  

The error correction (ec) of equation (2) is:

\[
\Delta LCDS_{it} = \phi_i (LCDS_{i,t-1} - \alpha_0CA_{it} - \alpha_1CA_{i,t-1} - \alpha_2 RES_{it} - \alpha_3 ED_{it}) + \delta_{11i} \Delta CA_{it} + \delta_{21i} \Delta RES_{it} + \delta_{31i} \Delta ED_{it} + \epsilon_{it}
\]  

Where

\[
\phi_i = -(1 - \lambda_i), \quad \alpha_0 = \frac{\mu_i}{1 - \lambda_i}, \quad \alpha_1 = \frac{\delta_{10i} + \delta_{11i}}{1 - \lambda_i}, \quad \alpha_2 = \frac{\delta_{20i} + \delta_{21i}}{1 - \lambda_i}, \quad \alpha_3 = \frac{\delta_{30i} + \delta_{31i}}{1 - \lambda_i},
\]

The error-correction of adjustment parameter is \(\phi_i\), the long-run coefficient is \(\alpha_{1i}, \alpha_{2i}, \alpha_{3i}\) for CA, RES, ED respectively. In long-run equilibrium, the coefficient of error-correction \(\phi_i\) must be negative and significant (Pesaran et al., 1997, 1999). PMG allows for heterogeneous common long-run for all countries, and short-run dynamic the sovereign CDS, the current account to GDP, the external debt to GDP and the international reserves to GDP.

The results of the long-run and short-run of the current account to GDP, the external to GDP, the international reserves to GDP and the error correction coefficient report in Figure 5.
Figure 5: Panel cointegration estimation: Pooled Mean Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Long-run coef.</th>
<th>Variable</th>
<th>Short-run coef</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>-3.535***</td>
<td>ΔCA</td>
<td>3.148**</td>
</tr>
<tr>
<td></td>
<td>(1.139)</td>
<td></td>
<td>(1.237)</td>
</tr>
<tr>
<td>ED</td>
<td>2.470***</td>
<td>ΔED</td>
<td>1.779**</td>
</tr>
<tr>
<td></td>
<td>(0.319)</td>
<td></td>
<td>(0.817)</td>
</tr>
<tr>
<td>RES</td>
<td>-5.610***</td>
<td>ΔRES</td>
<td>-1.803*</td>
</tr>
<tr>
<td></td>
<td>(0.873)</td>
<td></td>
<td>(1.923)</td>
</tr>
<tr>
<td>constant</td>
<td>2.611***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.560)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ec</td>
<td>-0.437***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.112)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Standard errors in parentheses
***, **, * means that the coefficient is significant at the 1%, 5%, 10%, level

In long-run equilibrium, the estimated coefficient of error-correction is negative -0.437 and significant at the 1% level as expected.

The estimation results show: the coefficient of the current account to GDP ratio is negative -3.535 and significant at the 1% level for all countries. This result reflects that when all countries improve their current account, the sovereign CDS spread will decrease because the government has more money to repay its debt to lenders. The coefficient of the external debt to GDP is positive, 2.470 and significant for all countries at the 1% level as expected. This finding shows that evidently if the external debt increases, then sovereign default probability will increase. That affects badly the sovereign CDS spread because the sovereign CDS spread is a country risk indicator. When the economic situation is not good, or the external debt has risen, then sovereign CDS spread will rise. The coefficient of international reserve is negative, -5.610 and significant at the 1% level as expected. This coefficient implies that if the country faces "bad" economic situation, in order to prevent default, the government can use international reserves to repay its debt. Thus, if the government has more reserves, then the sovereign default probability will decrease. We could also go back to Figure 1, the homogeneous of the sovereign CDS spread of eight countries, and notice that we have a significant long-run effect of three important variables affecting the sovereign CDS spread, which are representative for the government’s solvency, liquidity and macroeconomics variables (Georgievska et al., 2008).

Our results suggest the long-run coefficient of the international reserve is the highest relatively to the two other coefficients. From the policy’s point of view, in order to reduce the country risk in the long-run, governments should focus more on increasing their reserves than on solving two factors: the external debt and the current account.

The estimation of the short-run coefficients are mentioned in Figure 5 for the global panel and in Figure 6 for each country.
For the all countries, three short-run coefficients are significant statistically. But in as expected, the external debt to GDP and the international reserves to GDP are significant as theoretical economics at the 5% and 1% level respectively. As Figure 6 show, the short-run coefficient of the international reserves is -3.918 significant as expected at the 1% level for Turkey. Likewise, the short-run coefficient of external debt is 2.218 significant at the 1% level for Malaysia as expected. The coefficient of the current account to GDP is not significant vis-à-vis theoretical economics for the global panel and each country also.

### 3 Conclusion

This paper provides the link between the sovereign CDS spread and the current account, the external debt and the international reserves for eight emerging countries by using the new technique of the Pooled Mean Group. Our results suggest a great long-run effect of the current account, the external debt and the international reserves on the sovereign CDS spread of the whole panel. The sign of explanatory variables is confirmed with the previous studies of Georgievska et al. (2008) and IMF-Report (2013). Our results also indicate that in the short-run, the external debt and the international reserves are significant for eight emerging countries. Especially, the short-run coefficient of the international reserves, the external debt is significant for Turkey, Malaysia respectively. The current account is not significant in the short-run for all countries.

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References


