Effect of Sovereign Rating Changes on Bond Market Returns

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ABSTRACT

Malaysia has just experienced another downgrade of the sovereign rating in July last year, our capital market and currency exchange rate reacted immediately with high loses in Bursa Malaysia couple with sharp depreciation of our currency against major foreign exchanges. Therefore, the main objective of this study is to investigate the effect of sovereign rating changes on bond market returns control for inflation. The importance of sovereign ratings and the growing bond marketsare the main motivation for this study. This paper analyse the risk and return relationship of 30 major bond markets which account for 80 percent of world GDP. This paper studiestwo categories of bond with different maturity period which are1year bond and 10years bond. This study collects Bond yield (YTM) for continuous five years (2007-2011) and the final sample consist of total number of 150 observations for each category of bond. The relationship between bond yields, inflation rates and real yields or inflation adjusted bond yields are examined based on individual observation and portfolio. Findings of portfolios analysis show that all the observations grouped into portfolio, there is negative relationship between sovereign rating and bond yield and positive relationship between inflation rate and bond yield. Finally, hypothesis thattest on the relationship between sovereign ratings and real yields is rejected.

Keywords: sovereign rating, sovereign rating changes, bond yields, inflation rates and real yields, portfolio analysis.
JEL Classification: G21

INTRODUCTION

International investors take the advantage of global diversification and invest in both developed and emerging countries. Consequently, investors need valuable information that represents the global marketplace and act as a benchmarking instrument for them to evaluate those markets. As a result, sovereign credit ratings start to play important role in assessing sovereign bond market. Greater dependency has been allocated on sovereign credit ratings by investors, regulators and relevant parties.

In the recent worldwide economic crisis, the negative influence in capital market and at the downgrading by the rating agencies had also adjusted the sovereign rating for countries. Significantly, financial and economic crisis since year 2008 until present has influence on the sovereign default risks in most countries. Announcement of sovereign credits ratings by rating agencies lately, especially in European Union countries, had become important motivation of this research. Therefore, it is important to identify the connection between changes of sovereign rating and yield to maturity (measure of bond market returns).

After Mexican economic downturn in year 1994, following with Asia financial crisis in year 1997 and worldwide financial crisisin year 2008. Sovereign rating has again influenced the capital market globally. President of World Bank, Robert Zoellick indicates that Eurozone crisis may deepen and threaten global economy with creation of ripple effect. Moreover, Li, Jeon, Cho and Chiang (2007) suggested that there is significant connection between sovereign rating changes and Asia economic crisis in 1997.

In the past, sovereign debt crisis rarely occur in developed countries (Reinhart, 2010); conversely sovereign rating changes does not preserve as an erratic issue nowadays. The most eye catching issue was sovereign rating of United States government bond downgraded by Standard & Poor's (S&P) on 5th August 2011 for the first time after almost 90years since United States ranked the top spot in 1971. One notch drop from AAA to AA+ mainly caused by failure of congress in budget tightening and government spending cut. According to S&P, this decision taken after they considered spending cut for US$2.1 trillion on 2nd August is unsatisfactory and this amount is not enough to stabilise its debt.

After US sovereign rating downgraded by S&P, more sovereign rating continuously being announced. After 13years, New Zealand faces its rating downgraded by both Fitch and S&P due to its high external debt on September. On 14th October 2011, Spain rating's downgraded by rating agencies due to its high unemployment, economic slowdown and high private sector debt. Moreover, countries such as Greece, Japan (one notch), and Portugal (become junk status) faced ratings cut by rating agencies and lastly Italy had being downgraded by three notches.

Generally, there are two alternatives capital market for investors to invest their extra income, which include stock market and bond market. According to Cheng and Ariff (2011), bond market capitalization consists of US$ 154 trillion whereas share market consists of US$ 45trillion. Obviously, this amount shows that bond markets is massive and act as an important platform for investors to generate income. The most precise proxy in measure bond returns goes to yield to maturity (YTM), which is bond yield, where it depends on maturity period and predominant interest rate (Ariff, Cheng and Neoh, 2008). There are plenty of literature that studied on ratings changes and bond spread (see Kraussl, 2005; Afonso et al, 2011; Ismailescu and Hossein, 2010), which said to be more ostensibly. However, previous researches do not include relationship between bond yields and sovereign rating changes in their studies. Therefore, the main purpose of this study is to investigate the effect of sovereign changes on bond yields.

Malaysia has just experienced another downgrade of the sovereign rating last months, our capital market and currency exchange rate reacted immediately with high loses in Bursa Malaysia couple with sharp depreciation of our currency against major foreign exchanges. The effect is still being felt until today of writing (22/8/2013). Our Bank Negara has revised the GDP forecast for this year (New Strait Time, 22/8/2013). The issue of sovereign rating change is very much at home, not something happening at other part of the world. Therefore it is important for us to study the link between sovereign ratings and rating changes to the bond yields and economic variables.

Therefore, the problems are to identify these reactions on the directions, magnitudes and duration of these effects. This preliminary study is a modest attempt to understand the behavior of investors' reactions in short term and long term on the bond yields control by inflation.

LITERATURE REVIEW

Determinants of Sovereign Rating

Saunders (1986) argued macroeconomic variables of countries treated as "new" information in examine sovereign default. Besides that, Cantor and Parker (1996a) examined eight economic variables from 49 countries as determinants of ratings encompassed by S&P and Moodys. Analysis proved that both agencies highly consistent in assigning sovereign rating by watching the macroeconomic fundaments and there are six macroeconomic factors show significant result by applying ordinary least square as techniques of analysis.

This area is revised by Bheenick (2005) to assess the determinants of sovereign rating in economic aspect mentioned by both rating agencies. However, method used by Bheenick (2005) is ordered response model, which claimed as higher accuracy and more appropriate. This implication supported by Bheenick et al (2006) as this study ll. Extension research had been conducted by Bheenick et al (2006), which includes three rating agencies, S&P, Moodys and Fitch ratings. Bheenick (2005) appraisal the most relevant economic variables are GNP per capital and inflation. Furthermore, additional vital indicators for emerging market include current account balance and level of foreign reserves. Therefore, results suggest that large range of indicators should be added in emerging market.

Alternatively, Baek et al (2005) assessed country risk by including economic fundamentals variables as well as market's attitude toward risk, which consider as non-country specific indicators. Results submitted that solvency, economic stability and liquidity have impact on ratings where measurement for each indicator provided in table 2.1. Critically, risk appetite index (measurement of market's attitude toward risk) are important in define market assessed country risk premium.

Effect of Sovereign Changes on Bond Market Return

There are limited research on sovereign changes in relation to bond market returns. One of the earlier stud by Cantor and Parker (1996) found that ratings changes give impact on bond return (yield) follow by Kaminsky and Schmukler (2002) that supported sovereign rating announcements have relationship with bond market returns. However, the authors silent on it magnitude and explanation given in brief since the main purpose of the research focused on determinants of sovereign rating.

On the other hand, Pukthuanthong-Le et al (2007) studies the relationship ofsovereign rating changes and return of stock and bond market. Measurements of bond market return used in mentioned research are daily price indexes and interest rate data. Authors claimed that taking both data as measurements of market return helps in maximize the supremacy and accuracy in hypothesis testing. Study indicates that downgrades of ratings give negative impact on both bond and stock market, whereas positive returns only occur in bond market when there are upgrades announcements. Additionally, authors identified that downgrades of sovereign rating showed significant negative impact in countries which are high inflation and low current account.

The latest study by Cheng and Ariff (2011) conducted a study to examine the relationship between sovereign rating and bond market returns which focusing on bond yields, term spread and real yield in 33countries with high GDP. Authors had grouped the 33countires into portfolio and found that there is significant relationship between sovereign rating and bond market return based on Spearman rank correlations analysis.

METHODOLOGY

This study focuses on secondary data to determine the effect on bond market return by using yield to maturity, which estimated from government securities. Bond valuation method is important in this study where sovereign ratings and bond yields for five years period (2007-2011) of 30 countries, which representing 80 percent of world GDP is investigated. Data will be collected from Data stream' bond indices section, S&P Capital IQ, Asian Bond Online and each country's central bank website.

The process of the research begins with the development of the research framework which shows that bond market return is the dependent variable, independent variable is sovereign rating changes and macroeconomic factors is the moderating variable. Ratings for five years (2007-2011) provided by the Standard and Poor's this study are obtained in order to identify sovereign rating changes. Sample frame filtered by using country gross domestic product (GDP) where only high GDP countries this study re selected. Moreover, bond market return measured by yield to maturity which had been specified as the most accurate indicator. Additionally, moderating variable which is inflation rate was studies in order to analyse on inflation adjusted bond yields. Sovereign ratings had been assigned with ranking where highest rating (AAA) assigned as rank 21 and lowest rating (SD) assigned as rank 1. Data was analysed through correlation and regression analysis and sovereign ratings of 30 countries this study are grouped into portfolio in order to reduce effect of errors.

Hypothesis Development

The theoretical framework illustrates the relationship between variables and the relationship being identified. A hypothesis is a testable statement or can be defined as a logically conjectured relationship in this study with two or more variables expressed in the form of a testable statement (Malhotra, 2009). Hypothesis will be tested in order to find the relationship and solve the problem. The following is the hypothesis that is formulated to help to test the relationships between sovereign rating changes and bond market return.

> H1: There is a relationship betweensovereign rating changes and yield   to maturity.
> Ho: There is no relationship between sovereign rating changes and yield to maturity.

> H2: There is a relationship between inflation rate and yield to maturity.
> Ho: There is no relationship between inflation rate and yield to maturity.

> H3: There is a relationship between sovereign rating changes and inflation adjusted yield to maturity.
> Ho. There is no relationship between sovereign rating changes and inflation adjusted yield to maturity.

Sample of the Study

In this research, there are 127 countries in S&P sovereign rating list. This studysamplesfrom the rating list provided by S&P (Table 3.1). A final 30 countries filtered according to country's gross domestic product (GDP). These 30 countries representing of the largest bond market value in international bond market. Besides that, this sample composed about 80 percent of world's GDP where total GDP for 30 selected markets is US$ 56,430 billion and world's GDP is US$ 70,011 billion (International Monetary Fund, 2011). Table 3.2 shows the 30 countries and their GDP and the sovereign rating changes from year 2007 to year 2011. As a result, there are total 150 observations in this study.

Last but not least, Data stream's bond indices section, S&P Capital IQ, Asian Bond Online and each country's central bank website had been accessed to obtain yield to maturity for both short term and long term government bond from 2007 to 2011. Yield to maturity of government bond is the most important data which need to be collected. In order to increase reliability and precision of the findings, sources of data such as central bank of each country and others reliable database not only important for obtaining data but also vital to ensure data accuracy.

Data Analysis

Fundamentally, this research is a multicounty analysis of short term and long term government bond yields of 30 countries for most recent five years periods from 2007 to 2011. First and foremost, sovereign ratings of 30 countries had been retrieved from S&P. Next, government bond yields for three categories of bond which include 1year bond yields, 5years bond yields and 10years bond yields had been collected from Data stream's bond indices section, S&P Capital IQ, Asian Bond Online and each country central bank's. Essentially, bond market returns are measured using yield to maturity. Table 3.3 shows that 1-21 ranking had been assigned to each sovereign rating where highest quality (AAA) ranked as 21 and default (SD) ranked as 1. Moreover, bond yields had been filtered and eliminate all out linear by looking at the mean and standard deviation.

The number of qualify observations in each category after filtering is 118 observations for 1 year bond and 134 observations for 10 years bond. Data are then grouped into portfolio according to category of bond with different maturity period. Portfolio results are presented in this study since this study show that portfolio is able to lower disturbance term. Differences of bond yield and inflation rate before and after sovereign rating changes are presented and discussed as well.

Grouping sovereign ratings into portfolios:

According to Cheng and Ariff (2011), portfolio is important in diminishing disturbance term effect where it occurs when there is large number of data from diverse country. Moreover, Cheng, Ariff and Shamsher (2004) supported that errors in variables issue can be eliminated by grouping method.

Table 3.4, and 3.5show portfolios this study re formed according to the ratings assigned for the 150 observation based on the sovereign rating of 2007-2011. There are total 10-13 portfoliosare grouped and presented according to each category of bond which include 1year bond and 10years bond.

Pearson Correlation Analysis

This study determines the extent to which changes in the value of an attribute (sovereign rating 'rank and inflation rate) is associated with changes in another attributes (yield to maturity). Besides, correlation analysis in this study also assists in examining the association between yield to maturity and inflation rate.Inflation rate act as moderating variable, therefore, results of correlation between inflation adjusted yields to maturity and sovereign ratings this study re presented in chapter 4. The formula for inflation adjusted yield to maturity as:

Inflation adjusted yield to maturity = Yield to maturity – Inflation rate (3)

Regression Analysis

Multivariate analysis applied when there are two or more measurements on each element, variables will be analysed simultaneously. Multiple linear regressions are used to test the relationship between two or more independent variables and one dependent variable at the same time. It could perform regressions based on the following models:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$$

Where:

y = Bond market return (yield to maturity)

x_1 = Sovereign ratings

x_2 = Inflation rate

ε = Error term

All the methods above are used to increase the efficiency and the accuracy of data analysis of this study.

RESULTS

Descriptive Statistics of Bond based on Portfolio Results

Descriptive Statistics of 1 year Bond in Portfolio

After filteringsample, there are12 groups of descriptive statistics of 1 year bond. Table 4.1 shows that maximum ranking for 1 year bond portfolio is 21which mean the sovereign rating it has is AAA and the minimum ranking is 8 (B+). Then, the minimum yield designates 1.39 percent, maximum yield 9.31 percent, a mean value of 4.8933 percent and standard deviation of 2.85 percent. While the inflation for this category has a minimum value of 2.13 percent, a maximum value of 7.47 percent, a mean value of 4.30 percent and standard deviation of 2.07 percent. Furthermore, the inflation adjusted bond yield for 1year bond has minimum percentage of -0.74, maximum percentage of 2.57, mean value as 4.89 percent and 2.85 percent for standard deviation.

Descriptive Statistics of 10 years Bond in Portfolio

Another group selection process has been done for the sample; there are 10 groups of descriptive statistic for 10 years bond portfolios. From the results obtained, the minimum ranking rating grade is BB+ while the maximum is AAA. The portfolio's yield, it has a minimum of 2.77 percent while maximum yield has 11.06 percent, mean value 5.743 and standard deviation of 2.694. Subsequently, the minimum inflation rate is 2.01 percent while maximum is 8.54 percent. Then for mean value shows 3.864 percent and standard deviation 1.971 percent. Next, inflation adjusted bond yield shows minimum percentage of -0.33; maximum percentage of 6.42, mean value of 1.88 and standard deviation shows 1.82 percent in Table 4.2.

Descriptive analysis of changes of sovereign ratings and changes of bond yields

In table 4.3, it shows the changes of bond yields when there are sovereign rating changes (upgrades and downgrades). As mentioned in chapter 3, there are total 30 countries as the sample for this study. After filtered all countries which did not experienced any sovereign rating changes between years 2007-2011, there are 17 countries experienced sovereign rating upgraded or downgraded by S&P in the last five years.

From the table 4.3, it can be observed that there are total 28 changes of sovereign rating with 9 upgrades announcement and 19 downgrades announcement across 17 countries. Among the 17 countries, there are 13 countries that experienced downgrades of sovereign rating, three countries had upgrades of sovereign rating and one country had both upgrades and downgrades of sovereign rating in past five years. According to the theory, when there is downgrade, bond yield should increase since downgraded means higher of default risk. Therefore, changes of yields should show negative sign (yield of current year less than yield of previous year) when upgrades and positive sign (yield of current year higher than yield of previous year) when downgrades of sovereign rating. As a result, this section discussing on changes of bond yield when there are sovereign rating changes.

The only one country which experience both upgrade and downgrade of sovereign rating is Sri Lanka. Sri Lanka experienced one notch down in year 2008 from BB- (ranked as 9 in year 2007) to become B+ (ranked as 8 in year 2008). Refresh back that the higher the ranking, higher quality is the bond where AAA+ ranked as 21. Sri Lanka had experienced downgrades in year 2008 from BB- in year 2007 to become B+ in year 2008 and upgrades in year 2011 from B+ in year 2010 to become BB-

in year 2011. First, this study identified in table 4.11 show that there is a sudden jump in inflation rate from 1.99 percent in year 2007 to become 18.7 percent in year 2008. Refer to the upgrades in year 2011, this study identify that there is positive sign for changes of bond yield. Logically, the value of changes should provide negative sign when there is upgrade. Yet, when bond yields less the inflation rate, the real yield obtained will be in negative sign. Therefore, this study indicates that the bond yield changes of Sri Lanka are consistent with the theory.

Additionally, there are four other countries experience upgrades in past five years which include Brazil, China, Hong Kong and Turkey. Refer to the table 4.4, all of the four mentioned countries experienced two times of sovereign rating upgrades. This study observes that bond yields of Brazil have decrease once its sovereign rating upgraded by S&P. Besides, China experiences one notch upgrade in year 2008 (from A to A+) and the second time of one notch upgrade happened in year 2011 (from A+ to AA-). Same as China, Hong Kong has experiences two times sovereign rating upgrades in year 2008 (from AA to AA+) and year 2011(from AA+ to AAA). On the other hand, Turkey has experiences two times sovereign rating upgrades in continuous year which are in year 2010 (from BB to become BB+) and year 2011 (from BB+ to BBB-). Refer to the column of bond yield changes; this study observed that yield changes of Brazil, China and Hong Kong have supported the theory by showing negative sign. These values indicate that when sovereign rating upgrades, bond yield for investors will be reduced. Moreover, sovereign rating upgrades happened in Turkey do not support the theory, this might be due to the high inflation in Turkey where inflation rate reach 10.1 percent in year 2009 and about 7 percent in year 2010 and year 2011.

Other than the above mentioned countries (Sri Lanka, Brazil, China, Hong Kong and Turkey) above, the remained 12countries have had experienced sovereign rating downgrades which include Belgium, Greece, Italy, Japan, Malaysia, Mexico, New Zealand, Portugal, Spain, Thailand, United States and Venezuela. The most significant countries which involve in serious notches downgrade are Greece and Portugal. Obviously, Greece had experienced many notches downgrade last year from BBB+ (ranked as 14) to CC (ranked as 2) which can be classified as junk bond. This study can identify that inflation rate had decreased about 3 percent in year 2011 (5%) when compare with year 2010 (2%). However, the changes of bond yields had increased in a huge percentage. For instance, 3years bond yield is roughly 14 percent in year 2010 when Greece sovereign rating given as BBB+, however when sovereign rating had been downgrades as CC, 3years bond yield has increase to become 102 percent. Therefore, change of 3years bond yield is 88 percent. This phenomenon suggested that when there is downgrade of sovereign rating, bond yield offer by issuer need to be raised as its risk of default increase equivalently.

Additionally, Portugal had experienced serious sovereign ratings downgrade since year 2008. In year 2008, Portugal had been rates as AA- which falls in the category of high quality bond. However, in year 2011, sovereign rating of Portugal becomes BBB- that interpret as government that has adequate payment capacity (refer to table 1.1). As showed in the table 4.4, the changes of bond yields have increase about 7 to 10 percent once Portugal's sovereign rating had been downgraded by S&P. Follow with Mexico and Spain which had involve in sovereign downgrades since year 2008 to 2011. Mexico had been announced sovereign rating downgrade in year 2008 (from A+ to A) and year 2011 (from A to A-). Although there this study re two times of downgrade, this study can identify that sovereign ratings still fall under the same category which interprets as the government has strong payment capacity (refer to table 1.1). As a result, bond yields of Mexico at a decreasing rate and its changes of bond yields in table 4.11 are in negative sign. This value indicates that when downgrades of sovereign rating fall under the same category and bond issued by government still considered as high quality, investors might not perceive as high risk and do not request for higher return. This justification can be observed from the sovereign rating changes and bond yield changes happened in Spain as this study ll. Spain had experienced downgrades for three times in year 2009 (from AAA to AA+), year 2010 (AA+ to AA) and year 2011 (from AA to AA-). All the sovereign ratings fall under the same category where S&P given the interpretation as high quality bond.

Furthermore, the other countries had experiences minor notch downgrade are Belgium, Italy, Japan, Malaysia, New Zealand and Thailand. According to the table, these countries had experienced minor downgrade such as Belgium's sovereign rating had downgraded from AA+ to AA and Malaysia's sovereign rating had downgraded from A+ to A. In overall, this study identifies that government of these countries have increase the bond yields for short term and long term bond when sovereign ratings had been downgraded. Therefore, changes of bond yields column in table 4.4 show positive sign which means that there is an increase by using current year bond yield minus previous year bond yield. Last but not least, United States had been downgraded for one notch from AAA to AA+ after being as the top spot government which has the highest ability in paying their debt for

90years. From the changes of bond yield, this study indicates that this announcement give small impact since the cost of borrowing had decreased in year 2011 when compare to year 2010.

Pearson Correlations Analysis

Correlation analysis or bivariate analysis use to test the relationship in these two variables. Correlation is defined only when both of the standard deviation is finite and both of them are non-zero. In this research, Pearson correlation which under correlation test has been used to test the relationship be this study independent and dependent variables. There is signification relationship between variables when significant value, P is less than 0.1, 0.01 or 0,001. Additionally, r-value shows positive figure which mean the relationship between variables is positive correlated. On the other hand, when r-value show negative sign which mean there is negative correlation be this study variables.

Person correlation analysis for Portfolio results

Two tables (Table 4.4, 4.5) below in this section show the results of correlation coefficient after each observation in particular category of government bond with different maturity period had been grouped into portfolio. Label R is sovereign ranking for grouped observation; YTM is grouped yield to maturity and lastly is grouped inflation rate. Same as above, grouped bond yields is the dependent variable while independent variable is grouped as sovereign ranking, whereas grouped inflation rate is the moderating variable. In this section, results of bond yield in portfolio this study re presented first, follow by the inflation adjusted bond yield in portfolio.

Pearson correlation analysis for portfolio's bond yields

In this section, portfolio results this study re discussed and herewith this study had started the discussion as bond yield is the dependent variable whereas both inflation rate and sovereign ranking are independent variable. According to the table 4.4 obtained, it starts off with the 1year bond. The Pearson correlation for 1year bond yield and sovereign ranking, the r-value = -0.794 (p-value = 0.001) while Pearson correlation for grouped bond yield and inflation rate, r = 0.892 (p-value = 0.000). From here, it can be observed that bond yield and sovereign ranking show negative correlation. Next, the correlation between bond yield and inflation rate shows positive correlation. In this category, all the significance values is less than 0.001, therefore, this study can conclude that there is quite a high association between bond yield with sovereign ranking and inflation rate.

Last but not least, the final category of bond in portfolio will be 10years bond. From the results, the Pearson correlation for grouped 10years bond yield and sovereign ranking, r-value = -0.816 (p-value = 0.004) while the Pearson correlation for bond yield and inflations rate, r-value is 0.738 (p-value = 0.015). From here, it can be seen that both of the correlation significant at 0.01. As suggested in the theory, higher quality of sovereign ranking, lower is the bond yield. Whereas, there is positive correlation between yield and inflation rate, when increase in inflation rate, yield will increase as well.

Pearson correlation analysis for portfolio's inflation adjusted bond yields

After discussed on portfolio's bond yield in previous section, this section inflation adjusted bond yield is the dependent variable and discussion is focusing on the Pearson correlation for portfolio's inflation adjusted bond yield and grouped sovereign ranking. Refer to the Table 4.5, the Pearson correlation for grouped 3months inflation adjusted yield and sovereign ranking, r-value = -0.06 and p-value = 0.845. Although there is no significant relationship, this study still can conclude that there is negative correlation in this study en inflation adjusted bond yield and sovereign ranking. As proposed in the theory, higher quality of the bond, in this study r is the real yield.

Whereas, the Pearson correlation for grouped 1year inflation adjusted bond yield and sovereign ranking, r-value = -0.473 and p-value = 0.103. Table show not significant result for this grouped 1year bond's real yield. Again, it shows that there is negative correlation between real yield and sovereign ranking as supported by theory: higher quality of bond has lower real yield.

Continuously, portfolio of 10years bond will be discussed. From the table 4.5, correlation coefficient for grouped 10years inflation adjusted bond yield and sovereign ranking, r = -0.287 and p-value = 0.421. Therefore, this study can concludes that there is no significant result for this portfolio. From the result, negative correlation within variables can be observed.

Regression Analysis

Multiple regression is a principles use to test more than two variables at the same time. The hypothesis test was being conducted between two independent variables which are sovereign ranking and inflation rate as well as bond yield, which is the dependent variable. Same as previous section, results based on individual observation will be presented first continue with portfolio results. Table 4.6 shows regression analysis results based on individual observation and discussion flows started from 3months Treasury bill follow with 1year bond, 3years bond, 5years bond and lastly is 10years bond. Table 4.8 presents regression analysis results based on portfolio results and the discussion flow started from short term bond to long term bond.

Regression analysis for 1year bond based on portfolio result

The column labelled R shows the multiple regression correlation coefficient for 1year bond, R = 0.984 which suggest that when dependent variable is grouped 1year bond yield while the independent variables are grouped sovereign ranking and grouped inflation rate. Furthermore, value of R^2 explaining that all the independent variables accounts for 96.8 percent of the variance in dependent variable. The value of adjusted R^2= 0.961 and there is only 0.7 percent of differences when compare with value of R^2. Moreover, Durbin-Watson is 1.703 and it is consider quite closer to two, therefore this study indicate it as a good result. F-ratio for 1year bond is 135.262, value of VIF = 5.976 with small p-value (p<0.000) which suggesting that the model is highly significant.

The equation for portfolio of 1year bond in this research as below:

Portfolio of 1 year bond = 5.396 + (- 0.268 Sovereign ranking) + (0.798 Inflation rate)

The analysis shows that grouped sovereign ranking has unstandardized coefficient = -0.268, t-value = -2.909, p-value = 0.017. This value suggests that when sovereign ranking increase by one unit, bond yield would decrease by 0.268 units. Besides that, p-value is closer to 0.01; therefore, this study concludes that this predictor is significant at level 0.01 when other variables are held constant.

　　　　Grouped inflation rate has unstandardized coefficients = 0.798, t-value = 3.968, p = 0.003 which indicates that when inflation rate increase by one unit, bond yield would increase 0.789 units. Since the value of significant is closer to 0.001,this study accept that this predictor is significant at level 0.001 while all other predictors held constant.

Regression analysis for 10 years bond based on portfolio result

According to the Table 4.6, multiple correlation coefficients for the model, value of R is 0.820. Moreover, value of $R^2$is 0.637 which suggests that 63.7 percent of variance in dependent variable is explained by the predictors in the model. Besides that, value of adjusted $R^2$is 0.579 and the difference between value of $R^2$and adjusted R^2 is 0.06 which tells us that the model would account for 6 percent less variance in the outcome when this study take population as the object of study instead of sample. When Durbin-Watson is closer to 2 which means the result is superior. In this case, Durbin-Watson is 2.099 which considering asa superior results. F-ratio is 7.189 with significant value = 0.02and VIF is 3.59. As a result, this study can designate that the result is significant at 5 percent.

The equation for portfolio of 10years bond in this research as below:

Portfolio of 10years bond = 13.778 + (- 0.546 Sovereign ranking) + (0.224 Inflation rate)

Grouped sovereign ranking has unstandardized coefficients = -0.546, t-value = -1.650, p-value = 0.143whichsuggest that when sovereign ranking increase by one unit, bond yield will decrease by 0.546 units. Moreover, significant value is closer to 0.1 therefore this study indicate that this variable is significant at 10 percent. This explanation is true when other predictors are held constant.

　　　　Grouped inflation rate has unstandardized coefficients = 0.224, t-value = 0.4, p = 0.701which explain that when inflation rate increase by one unit, bond yield would increase 0.4. Moreover, this predictor is not significantand explanation is accurate when other predictors are held constant.

　　　　Table 4.7shows the results of the hypothesis in this model. Based on the table below, this study can indicate there are two hypothesis (H1, H2) supported in portfolio analysis and one hypotheses (H3) not supported in portfolio analysis.

CONCLUSION

Global economic crisis in year 2008 had threatened worldwide financial market. Follow with Eurozone crisis in year 2011 had again deepen the global capital market. S&P announced to downgrade United States sovereign ratings in August 2011, continue with downgrades announcement of few countries such as Italy, New Zealand and others. Moreover, Greece and Portugal sovereign ratings had been downgraded for many notches and classified as junk bond. Sovereign debt crisis has significantly place the financial market into a tension situation. Kaminsky and Schmukler (2002) indicated that sovereign rating changes have obviously give impact on bond returns. The concealment relationship between risk and return needed to be study. Sovereign debt issues become the main motive for this research to conduct in order to provide insight for all related parties to understanding the relationship between sovereign rating changes and bond yields.

The main objective of this research is to find out the effect of sovereign rating changes on bond market returns. Moreover, nominal bond yield, real yield and inflation rate this study re included into this research in order to study the risk and return relationship. After studied plenty of previous research which has been discussed in literature review, it provides insight and dimension about which area should be covered. Theories and finding of those researches are important and contributes in this study. This study have discovered that rarely has study focused on the relationship between sovereign rating and yield to maturity. Therefore, this research is important to provide new information and fresh idea regarding risk and return relationship in bond market.

As suggested by Cantor and Packer (1996), sovereign rating changes contain invisible information that gives impact on bond market which includes information for central government in decision making. Authors had indicated that government seek sovereign rating as an important tool for them to enter international market since most of the investors prefer rated bond. This study allows central government to understand that how sovereign rating changes affect investors' perception toward their default risk and likelihood to invest in their government securities. Significantly, this study allows central government to estimate their cost of borrowing during sovereign rating changes. For instance, when there is downgrade announcement, government is expected to increase the bond yield. However, this means that their cost of funding will be increased and this situation might effect on their account. High borrowing cost will give burden on government ability to pay their debt. In worst, huge government debt might cause collapse of a country's future and threaten its financial market. Besides, inflation rate and sovereign rating change are significant effect on government policy.

Descriptive analysis on sovereign rating changes and bond yield changes provide insight that when there is significant downgrade announcements such as Greece and Portugal, bond yields have been observed that increase in large percentage. However, different degree of downgrade and upgrade announcements give different impact on bond yields. For example, downgrades on Mexico did not brought any significant impact on bond yield. This reason might be due to the sovereign rating within class or across class will give different degree of impact. Besides that, sovereign rating downgrade of reputable country such as New Zealand and United States seek to have very minor impact on bond yield. This information is able to give different point of view for investors and related parties as other researchers who interested to study in deep regarding.

Last but not least, results found in this study would provide insight for regulators. As documented by Pukthuanthong-Le et al (2007), the information regarding sovereign rating helps regulator agents such as Basel Committee to design their regulatory. Moreover, this research serves as the gateway for further research to study on topic regarding sovereign rating changes and bond yield.

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TABLE 2.1: Measurement of Solvency Risk, Liquidity Risk and Economic Stability

Variables	Measurement
Solvency	Real GDP growth rate, total external debt to GDP ratio , government budget balance to GDP ratio
Liquidity	International reserves to imports ratio, current account balance to GDP ratio
Economic stability	Inflation rate, real exchange rate

Source: Baek et al, 2005

TABLE 3.1: Total Number of 127 Countries and Sovereign Rating as at 29th November 2011

Country	Sovereign rating	Country	Sovereign rating
Abu Dhabi	AA	Costa Rica	BB+
Albania	B+	Croatia	BBB-
Andorra	A	Curacao	A-
Angola	BB-	Cyprus	BBB
Argentina	B	Czech Republic	AA
Aruba	A-	Denmark	AAA
Australia	AAA	Dominican Republic	B+
Austria	AAA	Ecuador	B-
Azerbaijan	BB+	Egypt	B+
Bahamas	BBB	El Salvador	BB-
Bahrain	BBB	Estonia	AA-
Bangladesh	BB-	Fiji	B
Barbados	BBB-	Finland	AAA
Belarus	B-	France	AAA
Belgium	AA	Gabon	BB-
Belize	B-	Georgia	BB-
Benin	B	Germany	AAA
Bermuda	AA	Ghana	B
Bolivia	B+	Greece	CC
Bosnia and Herzegovina	B+	Grenada	B-
Botswana	A-	Guatemala	BB+
Brazil	A-	Guernsey	AA+
Bulgaria	BBB	Honduras	B
Burkina Faso	B	HongKong	AAA
Cambodia	B	Hungary	BBB-
Cameroon	B	Iceland	BBB-
Canada	AAA	India	BBB-
Cape Verde	B+	Indonesia	BB+
Chile	AA	Ireland	BBB+
China	AA-	Isle of Man	AA+
Colombia	BBB+	Israel	AA-
Cook Islands	BB-	Italy	A
Jamaica	B-	Philippines	BB+
Japan	AA-	Poland	A
Jordan	BB	Portugal	BBB-
Kazakhstan	BBB+	Qatar	AA
Kenya	B+	Ras Al Khaimah	A
Korea	A+	Romania	BB+
Kuwait	AA	Russia	BBB+
Latvia	BB+	Saudi Arabia	AA-
Lebanon	B	Senegal	B+
Libya	NR	Serbia	BB
Liechtenstein	AAA	Singapore	AAA
Lithuania	BBB	Slovak Republic	A+
Luxembourg	AAA	Slovenia	AA-
Macedonia	BB	South Africa	A
Malaysia	A	Spain	AA-
Malta	A	Sri Lanka	BB-
Mexico	A-	Suriname	BB-
Mongolia	BB-	Sthis study den	AAA
Montenegro	BB	Switzerland	AAA
Montserrat	BBB-	Taiwan	AA-
Morocco	BBB	Thailand	A-
Mozambique	B+	Trinidad and Tobago	A

Netherlands	AAA	Tunisia	BBB
New Zealand	AA+	Turkey	BBB-
Nigeria	B+	Uganda	B+
Norway	AAA	Ukraine	B+
Oman	A	United Kingdom	AAA
Pakistan	B-	United States	AA+
Panama	BBB-	Uruguay	BB+
Papua New Guinea	B+	Venezuela	B+
Paraguay	BB-	Vietnam	BB-
Peru	BBB+	Zambia	B+

Source: Standard and Poor's, 2011

TABLE 3.2: GDP (2011) and Sovereign Rating Changes from Year 2007-2011

Country	GDP 2011 USD Billion	2007 Rating	2008 Rating	2009 Rating	2010 Rating	2011 Rating
Australia	1507.40	AAA	AAA	AAA	AAA	AAA
Belgium	529.05	AA+	AA+	AA+	AA+	AA
Brazil	2517.93	BBB	BBB+	BBB+	BBB+	A-
Canada	243.05	AAA	AAA	AAA	AAA	AAA
Chile	1758.68	AA	AA	AA	AA	AA
China	6988.47	A	A+	A+	A+	AA-
Denmark	349.12	AAA	AAA	AAA	AAA	AAA
France	2808.27	AAA	AAA	AAA	AAA	AAA
Germany	3628.62	AAA	AAA	AAA	AAA	AAA
Greece	312.04	A	A	BBB+	BBB+	CC
Hong Kong	246.94	AA	AA+	AA+	AA+	AAA
India	1843.38	BBB-	BBB-	BBB-	BBB-	BBB-
Indonesia	834.34	BB+	BB+	BB+	BB+	BB+
Italy	2245.71	A+	A+	A+	A+	A
Japan	5855.38	AA	AA	AA	AA	AA-
Korea	1163.85	A+	A+	A+	A+	A+
Malaysia	247.57	A+	A+	A+	A+	A
Mexico	1,185.22	A+	A+	A	A	A-
New Zealand	168.82	AAA	AAA	AAA	AAA	AA+
Norway	479.30	AAA	AAA	AAA	AAA	AAA
Philippines	216.10	BB+	BB+	BB+	BB+	BB+
Portugal	241.92	AA-	AA-	A+	A-	BBB-
Spain	1536.48	AAA	AAA	AA+	AA	AA-
Sri Lanka	58.82	BB-	B+	B+	B+	BB-
Taiwan	504.612	AA-	AA-	AA-	AA-	AA-
Thailand	339.40	A	A	A-	A-	A-
Turkey	763.10	BB	BB	BB	BB+	BBB-
United Kingdom	2480.98	AAA	AAA	AAA	AAA	AAA
United States	15064.82	AAA	AAA	AAA	AAA	AA+
Venezuela	309.84	BB-	BB-	BB-	BB-	B+

Source: International Monetary Fund; Standard and Poor's, 2011

TABLE 3.3: Ranking Grade Assigned to S&P Sovereign Ratings

Interpretation	Standard & Poor's sovereign ratings	Ranking Grade
Highest quality	AAA	21
High quality	AA+	20
	AA	19
	AA-	18
Strong payment capacity	A+	17

	A	16
	A-	15
Adequate payment capacity	BBB+	14
	BBB	13
	BBB-	12
Likely to fulfil obligations, ongoing uncertainty	BB+	11
	BB	10
	BB-	9
High-risk obligations	B+	8
	B	7
	B-	6
Poor standing and subject to very high credit risk	CCC+	5
	CCC	4
	CCC-	3
Near default	CC	2
Default	SD	1

TABLE 3.4: Portfolio of 1 year Bond

Ratings	Ranking	No of observations
AAA	21	44
AA+	20	9
AA+	19	12
AA-	18	3
A+	17	15
A	16	7
A-	15	6
BBB+	14	1
BBB-	12	6
BB+	11	11
BB	10	1
BB-	9	1
B+	8	2
Total		**118**

TABLE 3.5: Portfolio of 10 years Bond

Ratings	Ranking	No of observations
AAA	21	46
AA+	20	10
AA+	19	12
AA-	18	9
A+	17	19
A	16	9
A-	15	6
BBB+	14	5
BBB-	12	7
BB+	11	11
Total		**134**

TABLE 4.1:Descriptive Statistics of 1year Bond in Portfolio

Type	N	Minimum	Maximum	Mean	Standard Deviation
Ranking	12	8.00	21.00	14.666	4.519
1 year bond yields	12	1.39	9.31	4.893	2.849

(portfolio)				
Inflation	12	2.13	7.47	4.299	2.071
Inflation adjusted 1 year bond yields (portfolio)	12	-0.74	2.57	0.594	0.989

TABLE 4.2:Descriptive Statistics of 10years Bond in Portfolio

Type	N	Minimum	Maximum	Mean	Standard Deviation
Ranking	10	11.00	21.00	16.30	3.335
10 years bond yields (portfolio)	10	2.77	11.06	5.74	2.693
Inflation	10	2.01	8.54	3.86	1.971
Inflation adjusted 10 years bond yields (portfolio)	10	-0.33	6.42	1.87	1.816

TABLE 4.3: Changes of Bond Yields When Sovereign Rating Changes

Country	Year	Rating	Rank	1year	10years	Inflation
Belgium	2010	AA+	20	1.529	3.971	3.38
	2011	AA	19	0.774	4.12	2.5
	Δ		-1	-0.755	0.149	-0.88
Brazil	2007	BBB	13	N.A	13.229	4.457
	2008	BBB+	14	N.A	12.56	5.902
	Δ		1	N.A	-0.669	1.445
	2010	BBB+	14	12.1	N.A	5.909
	2011	A-	15	9.78	N.A	6.302
	Δ		1	-2.32	N.A	0.393
China	2007	A	16	4.1	4.475	6.633
	2008	A+	17	1.1	2.865	2.533
	Δ		1	-3	-1.61	-4.1
	2010	A+	17	3.029	3.86	4.7
	2011	AA-	18	2.7	3.52	5.099
	Δ		1	-0.329	-0.34	0.399
Greece	2008	A	16	N.A	5.201	2.197
	2009	BBB+	14	N.A	5.764	1.987
	Δ		-2	N.A	0.563	-0.21
	2010	BBB+	14	N.A	12.544	5.079
	2011	CC	2	N.A	35.488	2.121
			-12	N.A	22.944	-2.958
Hong Kong	2007	AA	19	2.6	3.462	3.768
	2008	AA+	20	0.42	1.349	2.048
	Δ		1	-2.18	-2.113	-1.72
	2010	AA+	20	0.49	3.044	3.063
	2011	AAA	21	0.29	1.529	4
	Δ		1	-0.2	-1.515	0.937
Italy	2010	A+	17	2.016	4.871	2.807
	2011	A	16	4.024	7	2.093
	Δ		-1	2.008	2.129	-0.714
Japan	2010	AA	19	0.17	1.1	-1.672
	2011	AA-	18	0.12	0.99	-0.4
	Δ		-1	-0.05	-0.11	1.272
Malaysia	2010	A+	17	2.86	4.15	1.073
	2011	A	16	2.92	3.73	2.078
	Δ		-1	0.06	-0.42	1.005
Mexico	2008	A+	17	N.A	7.95	3.759
	2009	A	16	5.05	8	6.528

	Δ		-1		0.05	2.769
Mexico	2010	A	16	4.77	6.96	3.574
	2011	A-	15	4.65	6.51	4.402
	Δ		-1	-0.12	-0.45	0.828
New Zealand	2010	AAA	21	3.375	5.9	1.959
	2011	AA+	20	2.54	3.85	4.026
	Δ		-1	-0.835	-2.05	2.067
Portugal	2008	AA-	18	N.A	3.962	2.733
	2009	A+	17	0.766	4.078	0.843
	Δ		-1		0.116	-1.89
	2010	A-	15	4.698	6.682	-0.139
	2011	BBB-	12	7.152	13.557	2.161
	Δ		-3	2.454	6.875	2.3
Spain	2008	AAA	21	N.A	3.822	4.286
	2009	AA+	20	N.A	3.992	1.455
	Δ		-1	N.A	0.17	-2.831
	2010	AA	19	2.947	5.456	0.893
	2011	AA-	18	3.248	5.115	2.861
	Δ		-1	0.301	-0.341	1.968
Sri Lanka	2007	BB-	9	N.A	N.A	1.99
	2008	B+	8	19.08	N.A	18.733
	Δ		-1	N.A	N.A	16.743
	2010	B+	8	7.55	N.A	4.811
	2011	BB-	9	9.31	N.A	6.932
	Δ		1	1.76	N.A	2.121
Thailand	2008	A	16	1.98	2.691	3.249
	2009	A-	15	1.523	4.343	0.393
	Δ		-1	-0.457	1.652	-2.856
Turkey	2009	BB	10	8	N.A	N.A
	2010	BB+	11	6.65	8.61	6.526
	Δ		1	-1.35	N.A	N.A
	2011	BBB-	12	11.29	10	6.401
	Δ		1	4.64	1.39	-0.125
United States	2010	AAA	21	0.29	3.3	1.922
	2011	AA+	20	0.12	1.89	1.69
	Δ		-1	-0.17	-1.41	-0.232
Venezuela	2010	BB-	9	N.A	N.A	25.057
	2011	B+	8	N.A	N.A	27.184
	Δ		-1	N.A	N.A	2.127

TABLE 4.4: Pearson Correlation Analysis of Portfolio's Bond Yields

Bond Yields (YTM)	Number of groups in portfolio (N)	Sovereign Ranking (R)	Inflation
1year bond yield	13	-0.794*** P = (0.001)	0.892*** P = (0.000)
10years bond yield	10	-0.816** P = (0.004)	0.738** P = (0.015)

Note: Correlation is significant at the *0.1, **0.01 and ***0.001 level

TABLE 4.5: Pearson Correlation Analysis of Portfolio's Inflation Adjusted Bond Yield

Inflation adjusted bond yields	Number of groups in portfolio (N)	Sovereign Ranking (R)
1 year bond yield	13	-0.473 P = (0.103)
10 years bond yield	10	-0.287 P = (0.421)

Note: Correlation is significant at the *0.1, **0.01 and ***0.001 level

TABLE 4.6: Multiple Regression Analysis of Portfolio

Portfolio Model	1year bond yield	10years bond yield
Constant	5.396* t = 2.480 (0.035)	13.778** t = 1.877 (0.103)
Sovereign Ranking	-0.268** t = -2.909 (0.017)	-0.546* t = -1.650 (0.143)
Inflation rate	0.798** t = 3.968 (0.003)	0.224 t = 0.4 (0.701)
R	0.984	0.820
R Square	0.968	0.673
Adjusted R Square	0.961	0.579
Durbin-Watson	1.703	2.099
VIF	5.976	3.59
F	135.262 (0.000)	7.189 (0.020)

Note: Significant at the *0.1, **0.01 and ***0.001 level

TABLE 4.7: Hypothesis Testing Results

Hypothesis	Variables	Portfolio Analysis
H1	Sovereign ratings and Bond yields	Supported
H2	Inflation rate and Bond yields	Supported
H3	Sovereign ratings and Inflation adjusted bond yields	Not supported