

Impact of country risk & sovereign credit rating on corporate bond yields of Singapore

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An empirical research submitted to the BRAC BUSINESS SCHOOL in partial fulfillment of the requirements for the degree of MBA

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Declaration

It is hereby declared that

1. The research submitted is my own original work for the completion of MBA degree at Brac University.
2. The research does not contain materials previously published or written by a third party, except where this is appropriately cited through accurate and full referencing.
3. The research does not contain material which has been accepted, or submitted, for any other diploma or degree at institutions or a university.
4. All main sources of help are acknowledged.

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Abstract

This research paper examines the impact of country risk and sovereign credit rating on corporate bond market yields of Singapore for a time frame of August 2010 to December 2019. A good composite country risk score & sovereign credit rating help better private capital inflow in a country. As sovereign bonds are less risky than corporate bonds, it is essential to perform respective risk analysis before investing in corporate bonds for better yield expectations by institutional & retail investors. Singapore being a good rated and less risky country for several consecutive years, has increasingly becoming popular as a first choice for private investments among Asian countries. For investigating the impact of country risk & sovereign credit rating on corporate bond yields of Singapore, moderating variables- GDP growth rate of Singapore, annual inflation percentage change, current account balance to GDP are added in the analysis. Previous studies found that bond yield holds negative correlation with sovereign credit rating, current account balances & inflation rate. However, as the rating didn't fluctuate for chosen time period of Singapore, conclusion couldn't be drawn in this regard. But negative correlation with current account balances has been found similar in case of Singapore. The data of inflation proved to be statistically insignificant to conclude any relationship. It has been also evident that GDP growth rate formed negative association with corporate bond yields in case of Singapore which implies that as GDP grew, corporate bond yields flattened. Finally, country risk has been found negatively correlated with corporate bond yields signifying that as the country becomes riskier (ratings go higher), bond yields fell. Among the variables, country risk and GDP growth rate data proved to be statistically significant to draw these remarks.

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Chapter 1

Introduction

At the very basic form, a debt default is when a person or entity cannot repay his debt on time. Now it becomes a sovereign default when we replace the entity with a country and it typically happens in the form of bonds. Now as a rational investor, an entity would like to make investments in a bond market where the country is less likely to default. But things don't go well as per plan all the time. That's why before making a bond investment, it is very necessary to do the homework of relevant risk features. While doing the homework, institutional and retail investors take the help of credit rating agencies. There are three renowned credit rating agencies globally, Moody's, Standard & Poor's & Fitch. These agencies carry out independent assessment of sovereign issuers on various key rating drivers like willingness & capacity to pay, structural features, macroeconomic performance, public finances, external finances etc. (Fitch Ratings, 2020). Through carrying out all these analyses, they provide letter grade ratings to sovereign entities which acts as a consideration pillar for investors. Now another feature which investors focus on while making fixed income investments, is country risk. While the sovereign risk is narrowly associated with sovereign default, country risk is a broad term associated with risks of doing business in a particular country. Most of the country risks rating ranges from economic risks, transfer risks, exchange rate risk, location risk, sovereign risks, political risks etc (Meldrum, 2000). Although it is observed that there is a positive association between sovereign risk and country risk, sovereign credit profile can improve without necessarily improving country risk. Similarly, a downgrading of sovereign risk does not necessarily imply a downgrading of sovereign credit worthiness. (Fitch Ratings, 2020). This paper will try to examine the impact of sovereign credit rating and country risk on the corporate bond market yield of Singapore over 10 years period. The reason to select country profile of Singapore is that it is among the handful of countries around the globe to get prestigious AAA

rating from all three major rating agencies. The country also experiences robust governance, strong economic foundations and stable political outlook. Also, Singapore govt bonds deliver attractive yields which has positive association with corporate bonds yields. Furthermore, the Singaporean bond market is one of the most attractive markets in Asia and international investors are making it a choice to raise funds than their domestic ones. This topic would be of interest to broader onlookers with respect to long term investments in corporate bonds in Singapore.

Chapter 2

Literature Review

Christopher, Kim & Wu (2012) examined the properties of sovereign credit ratings on stock & bond market correlations of different time frame with their respective regional markets over the period of 1994 to 2007 for a sample of 19 emerging countries. They found out that sovereign ratings & outlooks tend to be negatively related with regional bond market co-movement. (Christopher, Kim, & Wu, 2012). Yilmaz Bayar (2012) examined sovereign risk rating methodologies briefly to evaluate whether it acts as an early warning indicator for the investors in consideration of eurozone sovereign debt crisis. He concluded that CRAs were not capable of predicting financial crisis as the downgrades were never preceded by a crisis and sovereign risk ratings are not a good signal for investors investing in sovereign bonds while in global financial crisis. Although after the global financial crisis developed countries have made some changes in the regulations of CRAs, he insisted on giving right information to the CRAs by the governments to benefit the investors (bayar, 2012). Richard cantor & Frank Packer (1996) first conducted systematic analysis of the factors and impact of sovereign credit ratings. In their study six factors appear to play an important role in determining a country's credit rating: GDP growth, per capita income, external debt, inflation, default history & level of economic development. Furthermore, the authors found that sovereign ratings influence market yields (Cantor & Packer, 1996).

Bert Scholtens & Ramon Tol (1999) investigated whether bond yield spreads are suitable for analyzing country risk. In more than a dozen countries they studied, they found out that bond yields are a good reflection of country risk in the mid-1990s (Bert & Ramon, 1999). Larrain, Raisen & Maltzan (1997) observed a noteworthy declaration effect when sovereign bonds of emerging markets are reviewed with negative outlook. They also found out that sovereign

rating industry has the potential to slow down excessive private capital inflows in emerging countries with negative rating announcements (Larraín, Reisen, & Maltzan, 1997).

Moore (2016) reported in Financial Times UK that despite the decrease in credit rating of UK in July of 2016, benchmark yields decreased to a record low (Moore, 2016). But most of the previously discussed studies found the opposite. El-shagi & Schweinitz (2016) studied the joint dynamics of sovereign ratings and government bond yields on a data set of 46 countries from 1980 to 2015. They found out that if a shock can drive a country below a B rating, bond yield jumps up. They also found that impact of ratings are ignorable for better rated countries and down grading has the worst effect on developing countries (El-Shagi & Schweinitz, 2018). Imran Sahi & Abid Rasheed (2017) studied data of Pakistan government bond yields from a period of 1995 to 2015 and the impact of sovereign credit rating and composite country risk on those yields. They also included controlling variables inflation rate, GDP growth, current account to GDP and spot oil prices in their analysis. They found out negative correlation with bond yield & sovereign credit rating, inflation rate and current account balances and positive correlation with country risk rating (Sahi & Rasheed, 2017). This study will also try to investigate the relationship of corporate bond yield with country risk and sovereign credit rating of Singapore. For the purpose of the study, inflation rate change, GDP growth rate of Singapore and current account balance as a percentage of GDP will be used as moderating variables. The motivation to use corporate bond yields instead of sovereign bond yields is while sovereign bond yields acts as a benchmark, corporate bond yields better reflect investor's risk association with the economy.

Chapter 3

Methodology

As bond yields depend on changes in sovereign credit ratings and country risks, that's why it has causal relationships (Imran Sahi, 2017). For this reason, this study will try to determine the strength of those variables on corporate bond yields of Singapore from empirical evidence. Secondary data is used for the purpose of the analysis from a period of 2010 to 2019 on a monthly basis. Linear regression model is used to check the impact of variables on corporate bond yields of Singapore.

Variables & Data sources

For the purpose of the calculation, below variables are considered.

Table 1: Variables & their data sources

Variables	Sources
Dependent	
Singapore Corporate bond yield	S&P Singapore Corporate Bond Index
Independent	
Sovereign credit rating of Singapore	Fitch ratings of Singapore from www.countryeconomy.com
Country risk rating of Singapore	Country risk rating of Singapore from www.countryrisk.io
GDP growth rate of Singapore	World development indicators data from world bank website
Inflation (GDP deflator) of Singapore, annual % change	World development indicators data from world bank website
Current account balance in % of GDP	World development indicators data from world bank website

Regression Model

In this research, Linear multiple regression is used to analyze the impact of independent variables on the dependent variable. The regression equation is in the following:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon_i$$

Here, Y= Singapore Corporate bond yield monthly

α = constant

β = Regression co-efficient

X_1 = Country risk rating of Singapore (annual rating is assumed to be fixed monthly)

X_2 = Sovereign credit rating of Singapore (annual rating is assumed to be fixed monthly)

X_3 = GDP growth rate of Singapore (annual growth rate is assumed to be fixed monthly)

X_4 = Inflation (GDP deflator) of Singapore, annual % change (annual % change is assumed to be fixed monthly)

X_5 = Current account balance in % of GDP (annual % change is assumed to be fixed monthly)

ε_i = Error arising for other variables

Chapter 4

Analysis

The empirical approach for carrying out this study will forward us to descriptive data analysis of the variables in different periods. Based on the results generated by the model, we can see that corporate bond YTM has a mean value of 3.7259 percent with a standard deviation of 1.42056.

Table 2: Descriptive Statistics

Variables	Mean	Std. Deviation	N
Corporate bond YTM	3.7259	1.42056	113
Country risk rating	18.2819	1.02723	113
Sovereign credit rating	16.0000	.00000	113
GDP growth rate	4.2875	2.62960	113
Inflation rate	1.1658	1.32728	113
Current account to GDP	18.0334	2.03543	113

It is also observable that country risk rating has a mean value of 18.2819 with a standard deviation of 1.02723, sovereign credit rating has a mean value of 16 with no standard deviation as data from 2010 to 2019 shows no change in sovereign credit rating of Singapore. All these 10 years Singapore is awarded AAA credit rating by Fitch's rating. We can also see GDP growth rate has a mean value of 4.2875 with a standard deviation of 2.6296, inflation rate change has a mean value of 1.1658 with a standard deviation of 1.32728 and current account to GDP has a mean value of 18.0334 with a standard deviation of 2.03543.

Multicollinearity test

Before going into correlations, multicollinearity of the predictor variables should be tested.

Table 3: Multicollinearity test of independent Variables

Independent Variables	Collinearity Statistics	
	Tolerance	VIF
Country risk rating	.584	1.713
GDP growth rate	.401	2.494
Inflation rate	.989	1.011
Current account to GDP	.348	2.876

Note: variance inflation factors (VIF)

From the VIF (variance inflation factors) column, it is observed that none of the value exceeds 5 which is the threshold for multicollinearity. So, it is understandable that none of the predictor variables are multicollinear.

Correlation analysis

Table 4: Pearson Correlation analysis

Variables		Corporate bond YTM	Country risk rating	Sovereign credit rating	GDP growth rate	Inflation rate	Current account to GDP
Corporate bond YTM	Pearson Correlation	1	-.195*	. ^b	-.188*	.171	-.161
	Sig. (2-tailed)		.038		.046	.070	.089
	N	113	113	113	113	113	113
Country risk rating	Pearson Correlation	-.195*	1	. ^b	-.146	.075	.387**
	Sig. (2-tailed)	.038			.123	.429	.000
	N	113	113	113	113	113	113
Sovereign credit rating	Pearson Correlation	. ^b	. ^b	. ^b	. ^b	. ^b	. ^b
	Sig. (2-tailed)						
	N	113	113	113	113	113	113
GDP growth rate	Pearson Correlation	-.188*	-.146	. ^b	1	-.022	.643**
	Sig. (2-tailed)	.046	.123			.816	.000
	N	113	113	113	113	113	113
Inflation rate	Pearson Correlation	.171	.075	. ^b	-.022	1	.063
	Sig. (2-tailed)	.070	.429		.816		.506
	N	113	113	113	113	113	113
Current account to GDP	Pearson Correlation	-.161	.387**	. ^b	.643**	.063	1
	Sig. (2-tailed)	.089	.000		.000	.506	
	N	113	113	113	113	113	113

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

b. Cannot be computed because at least one of the variables is constant.

From the correlation matrix, it is observable that country risk rating has a negative moderate correlation of -.195 with corporate bond yield. As sovereign credit rating remains the same for the whole period, the correlation couldn't be computed. GDP growth rate has moderate negative correlation of -.188 with corporate bond yield. Inflation has moderately positive correlation of .171 and current account to GDP has moderately negative correlation of -.161

with corporate bond yield of Singapore. From the table, it can be stated that when the country risk increased, gdp increased, and current account balance to GDP increased, corporate bond yield of Singapore decreased. Only when inflation percentage increased, bond yield also increased.

Overall Model Fit

Table 5: Model Summary^b

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.361 ^a	.131	.098	1.34893	1.088

a. Predictors: (Constant), Current account to GDP, Inflation rate, Country risk rating, GDP growth rate

b. Dependent Variable: Corporate bond YTM

The above table represents the summary of the linear regression model. The results generated from the model represents that dependent variable has strong correlation with the explanatory variables at the level of 36.4 percent. The R-square here is .131 which indicates that 13.1 percent of the dependent variable is explained by independent variables. The standard error of the estimate in the model is 1.35 percent. The Durbin Watson correlation value may range from zero to four. When the value is close to zero, it is indicated that the data in the model have a positive serial correlation and when the value is close to four, it is indicated that the data have a negative serial correlation. In our study, the value is 1.088 which indicate the model might have a positive serial correlation between residual values. The model is better if the value is closer to 2.

Anova test

Table 6: ANOVA^a

	Sum of Squares	df	Mean Square	F	Sig.
Regression	29.496	4	7.374	4.053	.004 ^b
Residual	196.518	108	1.820		
Total	226.014	112			

a. Dependent Variable: Corporate bond YTM

b. Predictors: (Constant), Current account to GDP, Inflation rate, Country risk rating, GDP growth rate

From the Anova table, it is observable that F value is 4.053 with a significance level of .004 which is much lower than .05 alpha level. So, it is obvious that there is statistically significant difference between the means of different variables.

Parameter Estimates

Table 7: Coefficients^a

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	10.352	2.348		4.410	.000	5.699	15.006
Country risk rating	-.453	.162	-.327	-2.788	.006	-.775	-.131
GDP growth rate	-.187	.077	-.346	-2.439	.016	-.338	-.035
Inflation rate	.189	.097	.177	1.959	.053	-.002	.381
Current account to GDP	.124	.106	.177	1.165	.247	-.087	.334

a. Dependent Variable: Corporate bond YTM

From the coefficients table, the regression equation estimate stands as,

Corporate bond YTM, $\hat{y}_i = 10.352 + (-.453) \text{ country risk rating} + (-.187) \text{ GDP growth rate} + (.189) \text{ inflation rate} + (.124) \text{ current account to GDP}$.

Here coefficient of country risk rating is statistically significant as its p-value is .006 which is less than .05 alpha level.

Coefficient of GDP growth rate is statistically significant as its p-value is .016 which is less than .05 alpha level.

Coefficient of inflation rate is not statistically significant as its p-value is .053 which is greater than .05 alpha level.

Coefficient of current account to GDP is not statistically significant as its p-value is .247 which is greater than .05 alpha level.

Chapter 5

Discussions

From the analysis, it is found that sovereign credit rating of Singapore acted in a constant manner from time period of 2010 to 2019 as Fitch's rating given letter grade rating of AAA in all these years. That's why the impact of it couldn't be analyzed. However, fluctuating rating of such kind would provide more insights on bond yields of Singapore as previously done studies on other countries have been found. It is also found out from the analysis that as the country risk and GDP growth have negative correlation with bond yields of Singapore which implies that as the country becomes riskier and GDP increases, bond yield curve flattens. Negative correlation of GDP growth and bond yields are similar with many of the researchers but most of the studies found riskier countries with jumped bond yields. However, report of Moore (2016) found such evidence similar to this study in the case of UK. Negative correlation of current act to GDP with bond yield is similar to the study of Sahi & Rasheed (2017) but the evidence here is not statistically significant. Positive correlation of inflation with corporate bond yield is not also statistically significant in this case. The two variables which are statically significant found in this study – country risk rating and GDP growth are both formed negative association with corporate bond yields of Singapore.

This sort of study would appeal to a greater variety of audience with more impact in case of emerging and unstable economies. This could also shed some light on what steps could be taken to improve country risk scenario to attract more private capital inflows.

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Appendix A.

[Dataset]

Month	Corporate bond YTM	Country risk rating	Sovereign credit rating	GDP growth rate	Inflation rate	Current account to GDP
10-Aug	2.81	18.42	16	14.53	1.1	22.93
10-Sep	2.94	18.42	16	14.53	1.1	22.93
10-Oct	2.94	18.42	16	14.53	1.1	22.93
10-Nov	3.01	18.42	16	14.53	1.1	22.93
10-Dec	3.23	18.42	16	14.53	1.1	22.93
11-Jan	3.26	19.19	16	6.34	1.05	22.22
11-Feb	3.32	19.19	16	6.34	1.05	22.22
11-Mar	3.25	19.19	16	6.34	1.05	22.22
11-Apr	3.22	19.19	16	6.34	1.05	22.22
11-May	2.95	19.19	16	6.34	1.05	22.22
11-Jun	2.95	19.19	16	6.34	1.05	22.22
11-Jul	2.89	19.19	16	6.34	1.05	22.22
11-Aug	2.72	19.19	16	6.34	1.05	22.22
11-Sep	2.81	19.19	16	6.34	1.05	22.22
11-Oct	2.92	19.19	16	6.34	1.05	22.22
11-Nov	3.03	19.19	16	6.34	1.05	22.22
11-Dec	3.18	19.19	16	6.34	1.05	22.22
12-Jan	3.07	19.28	16	4.46	0.47	17.64
12-Feb	3.03	19.28	16	4.46	0.47	17.64
12-Mar	3.14	19.28	16	4.46	0.47	17.64
12-Apr	3.06	19.28	16	4.46	0.47	17.64
12-May	3.05	19.28	16	4.46	0.47	17.64
12-Jun	3	19.28	16	4.46	0.47	17.64
12-Jul	2.88	19.28	16	4.46	0.47	17.64
12-Aug	2.94	19.28	16	4.46	0.47	17.64
12-Sep	3.08	19.28	16	4.46	0.47	17.64
12-Oct	3.01	19.28	16	4.46	0.47	17.64
12-Nov	3.02	19.28	16	4.46	0.47	17.64
12-Dec	3.15	19.28	16	4.46	0.47	17.64
13-Jan	3.15	16.35	16	4.84	-0.45	15.71
13-Feb	3.03	16.35	16	4.84	-0.45	15.71
13-Mar	2.97	16.35	16	4.84	-0.45	15.71
13-Apr	2.93	16.35	16	4.84	-0.45	15.71
13-May	2.99	16.35	16	4.84	-0.45	15.71
13-Jun	3.17	16.35	16	4.84	-0.45	15.71
13-Jul	3.37	16.35	16	4.84	-0.45	15.71
13-Aug	3.4	16.35	16	4.84	-0.45	15.71

13-Sep	3.35	16.35	16	4.84	-0.45	15.71
13-Oct	3.22	16.35	16	4.84	-0.45	15.71
13-Nov	3.22	16.35	16	4.84	-0.45	15.71
13-Dec	3.27	16.35	16	4.84	-0.45	15.71
14-Jan	3.28	17.74	16	3.94	-0.27	17.95
14-Feb	3.21	17.74	16	3.94	-0.27	17.95
14-Mar	3.2	17.74	16	3.94	-0.27	17.95
14-Apr	3.09	17.74	16	3.94	-0.27	17.95
14-May	3.05	17.74	16	3.94	-0.27	17.95
14-Jun	3.03	17.74	16	3.94	-0.27	17.95
14-Jul	3.02	17.74	16	3.94	-0.27	17.95
14-Aug	2.99	17.74	16	3.94	-0.27	17.95
14-Sep	3.05	17.74	16	3.94	-0.27	17.95
14-Oct	3.07	17.74	16	3.94	-0.27	17.95
14-Nov	3.14	17.74	16	3.94	-0.27	17.95
14-Dec	3.31	17.74	16	3.94	-0.27	17.95
15-Jan	3.41	18.4	16	2.99	3.06	18.69
15-Feb	3.46	18.4	16	2.99	3.06	18.69
15-Mar	3.55	18.4	16	2.99	3.06	18.69
15-Apr	3.53	18.4	16	2.99	3.06	18.69
15-May	3.62	18.4	16	2.99	3.06	18.69
15-Jun	3.68	18.4	16	2.99	3.06	18.69
15-Jul	3.72	18.4	16	2.99	3.06	18.69
15-Aug	3.82	18.4	16	2.99	3.06	18.69
15-Sep	4.02	18.4	16	2.99	3.06	18.69
15-Oct	4.01	18.4	16	2.99	3.06	18.69
15-Nov	3.99	18.4	16	2.99	3.06	18.69
15-Dec	4.15	18.4	16	2.99	3.06	18.69
16-Jan	4.24	17.43	16	3.24	0.7	17.64
16-Feb	4.64	17.43	16	3.24	0.7	17.64
16-Mar	4.64	17.43	16	3.24	0.7	17.64
16-Apr	4.57	17.43	16	3.24	0.7	17.64
16-May	4.63	17.43	16	3.24	0.7	17.64
16-Jun	4.65	17.43	16	3.24	0.7	17.64
16-Jul	5.08	17.43	16	3.24	0.7	17.64
16-Aug	8.09	17.43	16	3.24	0.7	17.64
16-Sep	16.17	17.43	16	3.24	0.7	17.64
16-Oct	4.71	17.43	16	3.24	0.7	17.64
16-Nov	5.4	17.43	16	3.24	0.7	17.64
16-Dec	5.95	17.43	16	3.24	0.7	17.64
17-Jan	6.27	17.9	16	4.34	2.78	16.26
17-Feb	4.82	17.9	16	4.34	2.78	16.26
17-Mar	4.45	17.9	16	4.34	2.78	16.26
17-Apr	4.07	17.9	16	4.34	2.78	16.26
17-May	3.82	17.9	16	4.34	2.78	16.26
17-Jun	3.9	17.9	16	4.34	2.78	16.26

17-Jul	3.64	17.9	16	4.34	2.78	16.26
17-Aug	3.66	17.9	16	4.34	2.78	16.26
17-Sep	3.54	17.9	16	4.34	2.78	16.26
17-Oct	3.56	17.9	16	4.34	2.78	16.26
17-Nov	3.49	17.9	16	4.34	2.78	16.26
17-Dec	3.61	17.9	16	4.34	2.78	16.26
18-Jan	3.76	18.15	16	3.44	3.09	17.18
18-Feb	4.09	18.15	16	3.44	3.09	17.18
18-Mar	4.22	18.15	16	3.44	3.09	17.18
18-Apr	4.32	18.15	16	3.44	3.09	17.18
18-May	4.53	18.15	16	3.44	3.09	17.18
18-Jun	4.5	18.15	16	3.44	3.09	17.18
18-Jul	4.09	18.15	16	3.44	3.09	17.18
18-Aug	4.37	18.15	16	3.44	3.09	17.18
18-Sep	4.2	18.15	16	3.44	3.09	17.18
18-Oct	3.97	18.15	16	3.44	3.09	17.18
18-Nov	3.93	18.15	16	3.44	3.09	17.18
18-Dec	3.98	18.15	16	3.44	3.09	17.18
19-Jan	3.89	20.04	16	0.73	0.09	16.97
19-Feb	3.8	20.04	16	0.73	0.09	16.97
19-Mar	3.91	20.04	16	0.73	0.09	16.97
19-Apr	3.54	20.04	16	0.73	0.09	16.97
19-May	3.43	20.04	16	0.73	0.09	16.97
19-Jun	3.38	20.04	16	0.73	0.09	16.97
19-Jul	3.28	20.04	16	0.73	0.09	16.97
19-Aug	3.22	20.04	16	0.73	0.09	16.97
19-Sep	3.22	20.04	16	0.73	0.09	16.97
19-Oct	3.23	20.04	16	0.73	0.09	16.97
19-Nov	3.13	20.04	16	0.73	0.09	16.97
19-Dec	3.11	20.04	16	0.73	0.09	16.97
