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Effects of Sovereign Credit Ratings on Foreign Direct Investment Inflows: Evidence from Turkey

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Abstract

Foreign direct investment flows began to increase in the world since 1980s in parallel with the technological progress especially in transportation and communication, global competition and financial liberalization. Foreign direct investment inflows began to increase belatedly in Turkey in 2001 due to frequent economic and financial crises and political instability. This study examines the relationship between the sovereign credit ratings of Turkey and foreign direct investment inflows during the period from January 1995 to July 2013 in Turkey by using cointegration, VAR Granger causality, vector error correction model, vector autoregression and impulse-response analyses. We find that there is a positive relationship between foreign direct investment inflows and sovereign credit ratings and the sovereign credit rating by S&P is the predominant one on the foreign direct investment inflows. Moreover this study reveals that there is a two-way causality between sovereign credit ratings by S&P and Fitch and foreign direct investment inflows and a one way causality between sovereign credit ratings by Moody's and foreign direct investment inflows and a no causality between dummy variable which represents crises and the foreign direct investment inflows.

JEL classification numbers: F21, F23, G24
Keywords: Foreign direct investment, Sovereign credit ratings, Determinants of foreign direct investment

1 Introduction

Foreign direct investment (FDI) is one of the important factors of international economic integration. FDI reflects the objective of establishing a lasting interest by a resident enterprise in one economy in an enterprise which is resident in another economy. The

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lasting interest implies the existence of a long run relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the enterprise. Having a direct or indirect ownership of 10% or more of the voting power of an enterprise resident in one economy by an investor resident in another economy shows such a relationship (OECD, 2008:48-49). FDI began to increase as a consequence of technological progress in the transportation and communication, global competition and financial liberalization.

FDI inflows began to increase as of 1980s and reached US$ 2 trillion in 2007, but decreased to US$ 1,2 trillion with the negative effects of global financial crisis, and then have begun to increase. Turkey liberalized the financial sector and capital movements when Turkey began to implement export-oriented growth strategy in 1980. On the other hand the amount of FDI inflows to Turkey stayed at low levels in contrast to the trend in the world due to frequent economic and financial crises and political instability until 2001. FDI inflows to Turkey began to increase as of 2002 and reached about US$ 22 billion in 2007 with economic recovery, political stability and privatization.

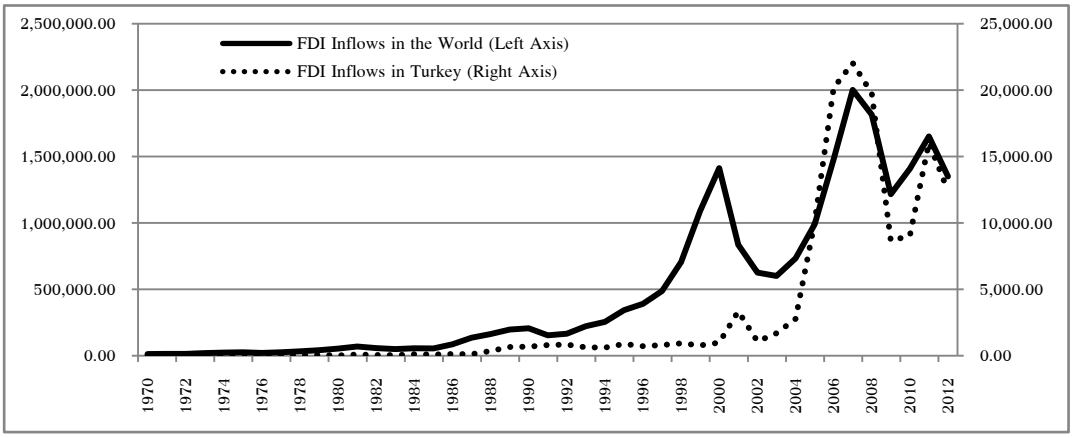

Chart 1: FDI inflows in the world and Turkey
(US dollars at current prices and current exchange rates in millions)
Source: UNCTAD, FDI Inflows, http://unctadstat.unctad.org/TableViewer/tableView.aspx

The objective of this paper is to examine the relationship between sovereign credit ratings and FDI inflows for the Turkey. The rest of the paper is organized as follows. Section 2 gives brief information about sovereign credit ratings and Section 3 outlines the previous literature. Section 4 gives information about data and method. Section 5 gives information about the empirical application and introduces main findings. Section 6 concludes the paper.

2 Sovereign Credit Ratings and Foreign Direct Investments

Sovereign credit ratings are the evaluations of credit rating agencies (CRA) on the future ability and willingness of sovereign governments to pay their debt obligations to the nonofficial sector in full and on time (S&P, 2013). There have been about 150 national,

regional and global credit rating agencies all over the world. However the share of Standard & Poor's (S&P), Moody's and Fitch in the credit rating industry has been about 94% (OECD, 2010:12). The share of S&P, Moody's and Fitch in the credit rating industry respectively is 40%, 39% and 15% (Iva and Vukašin, 2010:3).

Major CRAs S&P, Moody's and Fitch use similar criteria in sovereign credit rating. The essence of S&P's credit rating is based on 5 factors. These factors are political score reflecting the institutional efficiency and political risks, economic score reflecting economic structure and growth prospects, external score reflecting external liquidity and international investment position, fiscal score reflecting debt burden, fiscal performance and flexibility and monetary score reflecting monetary flexibility (S&P, 2012:3).

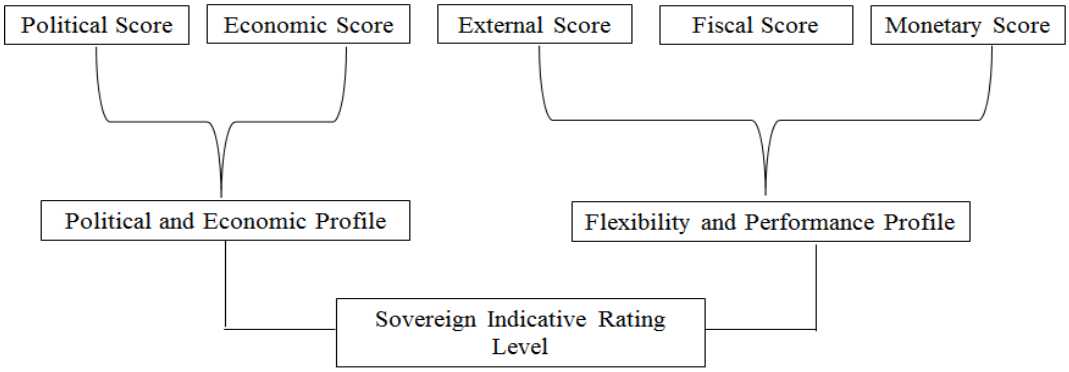

Figure 1: Sovereign credit rating approach of S&P

Source: S&P, 2012:3.

The sovereign credit ratings of Moody's are based on 4 basic factors. These are economic strength, institutional strength, fiscal strength and susceptibility of event risk. Economic strength depends on growth potential, diversification, competitiveness, national income and scale. The second factor institutional strength of the country depends on economic policies usage capacity of government which fuel economic growth and welfare. The third factor fiscal strength shows the general position of public finance. The last factor susceptibility to event risk shows the risk of sudden and extreme events which have potential to damage public finance (Moody's, 2013:7-20).

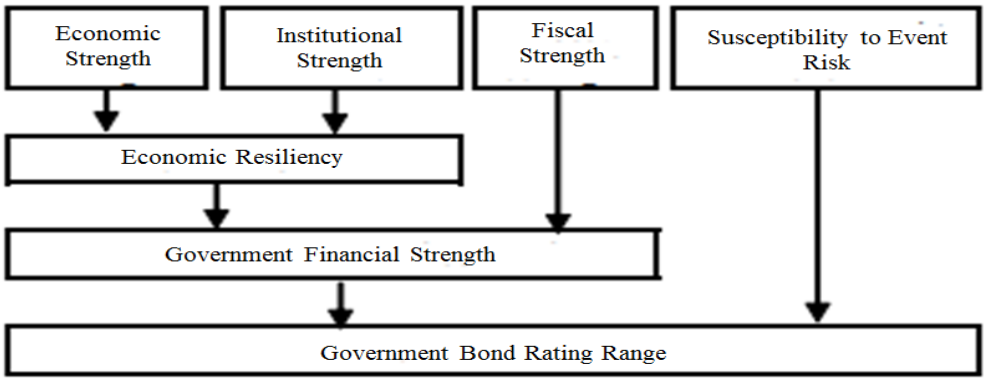

Figure 2: Sovereign credit rating approach of Moody's

Source: Moody's, 2013:4.

Fitch uses four main factors as macroeconomic performance, public finance, external financing and structural features of the economy in the sovereign credit rating process. Macroeconomic performance is reflected with the consumer price inflation, real GDP growth and the volatility of real GDP growth. Public finance is evaluated by budget balance, gross debt, interest payments and public debt in foreign exchanges. On the other hand external finances is evaluated by commodity dependence, current account balance plus net FDI, gross sovereign external debt, external interest service and official international reserves and structural features of the economy is evaluated by financial market depth, GDP per capita, composite governance indicator, reserve currency status and years since default (Fitch, 2012:18). Sovereign credit ratings given by S&P, Moody's and Fitch in the light of above mentioned criteria are showed by the symbols presented in the Table 1.

Table 1: Long term sovereign credit ratings used by S&P, Moody's and Fitch

Fitch	S&P	Moody's	Interpretation	Investment/ Speculative Grade
AAA	AAA	Aaa	Highest quality	Investment
AA+	AA+	Aa1	High quality	
AA	AA	Aa2		
AA-	AA-	Aa3		
A+	A+	A1	Strong payment capacity	
A	A	A2		
A-	A-	A3		
BBB+	BBB+	Baa1	Adequate payment capacity	
BBB	BBB	Baa2		
BBB-	BBB-	Baa3		
BB+	BB+	Ba1	Likely to fulfill obligations, ongoing uncertainty	Speculative
BB	BB	Ba2		
BB-	BB-	Ba3		
B+	B+	B1	High-risk obligations	
B	B	B2		
B-	B-	B3		
CCC+	CCC+	Caa1	Vulnerable to default	
CCC	CCC	Caa2		
CCC-	CCC-	Caa3		
CC	CC	Ca		
C	C	C	Near or in bankruptcy or default	
RD/D	SD/D			

Source: Fitch, S&P and Moody's.

Market size, growth prospects, labor cost, trade barriers, openness, trade balance, foreign exchange, inflation, institutional quality, infrastructure and taxes variables have been determined as possible determinants of FDI in the literature (Chakrabarti, 2001: 91–92). On the other hand major credit rating agencies S&P, Moody's and Fitch also use the most of these possible determinants of FDI in their sovereign credit rating process. So the investors possibly make use of sovereign credit ratings in their FDI decisions, thus sovereign credit ratings may have potential to influence the FDI decisions.

3 Literature Review

FDI inflows are generally accompanied with capital, technology and know, and so they contribute to the competitiveness, employment and trade of the host country and thus in turn economic growth and development of the host country (Derado, 2013:228). Several theories have been developed to explain FDI inflows since 1960s. These theories proposed some determinants including micro and macro considerations which may explain FDI flows. Macro dimension includes factors such as barriers to market entry, existence of sources, political stability, market size while micro dimension includes factors such as proprietary advantages, cost reduction and economies of scale (Dunning and Lundan, 2008). There have been many studies on the determinants of FDIs. The variables such as market size, growth rate, labor cost, trade barriers, openness, trade effects, foreign exchange effects, taxes, quality of institutions and infrastructure generally have been adopted as the possible determinants in the literature (Chakrabarti, 2001:91–92) (See Pillai and Rao (2013), Derado (2013), Lebe and Ersungur (2011), Turan-Koyuncu (2010), Ozcan and Arı (2010), Blonigen (2005) and Chakrabarti (2001).

There has been very limited number of studies about the effects of sovereign credit ratings on the FDI inflows in the literature. One of these studies by Emir et al. (2013) examined whether there was a relationship between FDI inflows to Turkey and country risk, macroeconomic variables during the period from January 1992 to April 2010 by using Johansen cointegration analysis and vector error correction model (VECM). They found that FDI inflows were affected positively by sovereign credit ratings which represent country risk. In another study Ozturk (2012) examined the relationship between FDI inflows and external finance of private sector for the 61 developing countries whose 30 countries have an investment grade by using panel regression during the past ten years. He found that having investment grade caused decrease in the FDI flows.

Walch and Wörz (2012) examined the effects of sovereign credit rating and integration status of European Union integration on the FDI inflows in the Central, Eastern and Southeastern European Countries by panel regression during the period 1995-2011. They found that effects of sovereign credit rating were nonlinear, in other words upgrades in the sovereign credit rating in the medium risk levels had the largest positive effect on FDI inflows and this effect was reduced in the upgrades in the highest risk levels.

Kanlı and Barlas (2011) examined trend of macroeconomic and financial indicators before and after upgrade in the countries whose sovereign credit ratings were upgraded to investment grade since 1990 by using Wilcoxon signed-rank test and they found that there was no significant trend variation in FDI inflows to these countries. In another study by Archer et al. (2007) examined whether changes in sovereign credit ratings affected portfolio flows in 50 developing countries during the period of 1987-2003 by using two stage Heckman model. They found that the countries which were under newer political institutions and faced economic problems were more likely to be preferred by the portfolio investors due to their larger risk premiums, but sovereign credit ratings and democracy had significant positive effects mostly in the countries having private equity inflows. Gande and Parsley (2004) examined the reaction of equity mutual fund flows to changes in sovereign credit ratings in 85 countries during the period 1996-2002 and they found that there was a strong relationship between downgrades and capital outflows and upgrades in the sovereign credit ratings did not cause a discernible change in capital flows.

4 Data and Method

The objective of econometric application is to analyze the effects of sovereign credit ratings by S&P, Moody's and Fitch on FDI inflows.

4.1 Data

Sovereign credit ratings of Turkey were taken from databases of major CRAs S&P, Moody's and Fitch, since their share in the credit rating industry is about 94%. Although CRAs use different scales, long term foreign currency ratings of CRAs have substantially comparable properties. The similarity in rating scales allows a simple linear transformation of the ratings on a scale of 1–21 for the S&P, Moody's and Fitch. If there is an upgrade or a downgrade by one notch (for example downgrade to AA+ from AAA or upgrade to AA from AA-), then the rating is changed by +1 or −1. If there is an outlook change from positive to stable or from stable to negative, then the rating is changed by −1/3. If an outlook changes from positive to negative, the rating is changed by −2/3.
S&P and Moody's respectively has begun to rate Turkey since April 1992 and May 1992 while Fitch began to rate Turkey since August 1994. So we determined our study period as January 1995-July 2013. Moreover we used a dummy variable representing November 2000, February 2001 and 2008 global financial crises for the 2000, 2001 and 2008 periods in the analysis. FDI inflows data were taken from electronic data delivery system of Central Bank of the Republic of Turkey.
S&P, Moody's and Fitch made a total of 77 changes in long term foreign currency debt ratings/ outlooks of Turkey. Changes in long term foreign currency debt ratings consist of 17 rating upgrades, 8 rating downgrades, 25 positive variations and 27 negative variations outlook.

Table 2: Changes in the long-term sovereign credit ratings of Turkey by Fitch, Moody's

Credit Rating Agency	Total Changes	Credit Rating		Credit Outlook	
		Upgrades	Downgrades	Upgrades	Downgrades
S&P Long term foreign currency rating	33	6	3	12	12
Moody's Long term foreign currency rating	17	4	1	6	6
Fitch Long term foreign currency rating	27	7	4	7	9
Total	77	17	8	25	27

Variables used in the econometric analysis and their symbols were presented in the Table 3.

Table 3: Variables used in the econometric analysis and their symbols

Variables' Symbols	Variables
FDI	Foreign Direct Investment Inflow
FIT	Fitch-Long term foreign currency rating
MO	Moody's- Long term foreign currency rating
SP	S&P- Long term foreign currency rating

All variables were deseasonalized by CENSUS X21 filters. Eviews 7.1 software package was used in the analysis of data set.

4.2 Method

Time series analysis was used in the analysis of relationship between sovereign credit ratings and FDI inflows. Firstly we made the stationarity tests of the series by augmented Dickey–Fuller test (ADF) and Phillips-Perron (PP) tests. Then we determined optimal lag length for the series to be estimated, long term relationship among the variables was analyzed by Johansen cointegration test. However short and long term relationships among the variables were tested by causality analysis, Vector Error Correction Model (VECM), Vector Autoregression (VAR) and impulse response analyses.

5 Empirical Application and Main Findings

5.1 Stationarity Test Results

The stationarity condition of time series is very important for the reliability of the estimates. If the variables in the regression model do not have stationarity property, standard assumptions which are necessary for the asymptotic analysis will be invalid and the estimates will be misleading (Vosvrda 2013; Akram 2012). This case is called as is called as spurious regression which was analyzed by Granger and Newbold in 1974 and proposed by Yule (1926) in the literature. Yule (1926) stated that estimating a regression model including non-stationary time series which have a diverging trend from long term average values will cause biased standard errors and unreliable correlations (Korap, 2007). There have been different unit root tests in the literature. The most popular unit root test are ADF test which was developed by Dickey-Fuller in 1979 and 1981 and PP test which was developed by Phillips and Perron in 1988. Although both test statistic seem essentially similar, they differ from the corrections for the eliminating sequential dependence problem. ADF test makes parametric corrections for the sequential dependence problem while PP test makes non-parametric corrections. We used ADF (1981) and PP (1988) tests to test the stationarity of the series in the study.

Table 4: Stationarity test results

Variable \ Test	Level		First Degree	
	ADF Test Statistic	PP Test Statistic	ADF Test Statistic	PP Test Statistic
FDI	-0.998 p=0.112	-1.009 p=0.231	-4.661 p=0.000*	-5.102 p=0.000*
FIT	-1.003 p=0.132	0.990 p=0.276	-5.843 p=0.001*	-6.223 p=0.002*
SP	1.445 p=0.323	1.561 p=0.102	-6.336 p=0.003*	-7.261 p=0.000*
MO	1.887 p=0.110	1.387 p=0.163	-5.990 p=0.000*	-6.885 p=0.000*

*MacKinnon (1996) one tail p-values, Series were deseasonalized by CENSUS X21 filters when stationarity analyses were conducted for the variables. Crisis and policy change periods were considered with regard to statistical significance and as long as their trend and fixed components were significant in the model selection, they were included in the model. Minimum lag length that eliminated the autocorrelation was selected in the lag length selection.

Since the first degrees of the variables in the model did not have unit root, this enables us to examine the long term relationship among the variables. All the variables were found to be stationary in the first degree I(1) given the ADF and PP stationarity test results of the variables. Therefore we used the co-integration test developed by Johansen (1988) in order to determine whether there was a long term relationship among the variables. But optimal lag length for the model to be estimated was determined before the co-integration test.

5.2 Determination of Lag Length

Statistical package program used in the analyses give results for the FPE (Final Prediction Error), AIC (Akaike Information Criterion), SC (Schwarz Information Criterion) and HQ (Hannan-Quinn Information Criterion) criteria. The analysis is directed with regard to lag length which most of these criteria give. 1 lag was determined for the all variables in the study as seen in Table 5.

Table 5: Determination of lag length in terms of FPE, AIC, SC and HQ criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2534.577	NA	12513.78	23.62397	23.70236	23.65564
1	**-1485.956**	**2038.715**	**0.916311***	**14.10191***	**14.57224***	**14.29195***
2	-1471.383	27.65354	1.010027	14.19892	15.06117	14.54731
3	-1445.265	48.34884	1.000508	14.18851	15.44271	14.69527
4	-1432.504	23.03058*	1.123105	14.30236	15.94848	14.96747
5	-1410.612	38.48890	1.159320	14.33127	16.36933	15.15474
6	-1396.104	24.83157	1.283523	14.42888	16.85887	15.41071
7	-1388.365	12.88699	1.515842	14.58944	17.41137	15.72963
8	-1379.794	13.87220	1.779835	14.74227	17.95614	16.04082

5.3 Cointegration Analysis

Co-integration is defined as the common movement among the economic variables in the long term. Engle-Granger (1987) stated that linear components of the series can be stationary even though the series are not stationary as the level if the each of the variables is integrated at the I(1) level. If the series are not stationary, but their linear components are stationary, since the standard Granger causality implications will be invalid, vector error correction models should be established. So we should test the co-integration properties of the original series before applying the Granger causality test. There were 2 cointegration equations which determined the long run relationship among the variables as seen in the Table 6.

Table 6: Co-integration analysis results

Hypotheses	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None *	0.299150	128.7747	69.81889	0.0000
At most 1 *	0.119614	50.21767	47.85613	0.0295
At most 2	0.056950	22.06353	29.79707	0.2950
At most 3	0.040207	9.105023	15.49471	0.3558
At most 4	0.000161	0.035599	3.841466	0.8503
Hypotheses	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.299150	78.55705	33.87687	0.0000
At most 1 *	0.119614	28.15414	27.58434	0.0423
At most 2	0.056950	12.95851	21.13162	0.4560
At most 3	0.040207	9.069424	14.26460	0.2804
At most 4	0.000161	0.035599	3.841466	0.8503

Trace and Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) p-values

The variables had long run relationship and co-movement. The co-integration equation which showed the direction and degree of this relationship was presented in the Table 7. There was a positive relationship between FDI and changes in the sovereign credit ratings and a negative relationship between FDI and the dummy variable representing crisis period as seen in the Table 7. S&P is the most influential CRA on the FDI, and then respectively Fitch and Moody's came given the degree of the coefficients. The share of S&P, Moody's and Fitch in the credit rating industry respectively is about 40%, 39% and 15%. So it is expected that the sovereign credit ratings of the S&P and Moody's for the Turkey have relatively more impact on FDI inflows. But our studies demonstrated that the long term foreign currency rating s of Turkey by S&P was the most influential on the FDI inflows and then the long term foreign currency rating of Turkey by Fitch was more influential on the FDI inflows. Long term foreign currency rating of Turkey by Moody's was the least influential on FDI inflows. We evaluate that this is probably arisen from that Fitch unlike the other CRAs has operated in Turkey as Fitch Ratings Financial Rating Services since 1999.

Table 7: Results of co-integration equation

FDI	FIT	MO	SP	D1
	- 364.0046	-80.51326	-500.5459	305.0797
1.000000	(130.523)	(152.570)	(106.733)	(191.120)

5.4 Vector Error Correction Model

Engle-Granger revealed that there is a vector error correction mechanism which eliminated the short term imbalances in the event that there is co-integration between two variables. A long term equilibrium model and a short term error correction model are generally proposed for the causality tests. Error correction models provide an opportunity for the integrating both long run relationships among the variables (equilibrium relations) and short term matching behavior (imbalance).

All variables except the crisis period dummy variable were found to be statistically significant as seen in Table 8. The condition for the short run relationship is that at least one of them is found to be statistically significant. Thus there is short run relationship among the variables and the equilibrium will be obtained in the short term due to negative coefficients. We find that the model was significant and there was no autocorrelation and heteroscedasticity problem, model form is significant (specification test) and normal distributed in the tests which aimed at testing the significance and assumptions of vector error correction model. Therefore we determined there was both long term and short term relationship.

Table 8: VECM results

Error Correction	D(FDI)	D(FIT)	D(MO)	D(SP)	D(D1)
	-0.803612	-0.000108	-0.800905	-0.771254	-134.5818
CointEq1	(0.08900)	(2.8E-05)	(0.09169)	(0.08278)	(260.137)
	[-9.02945]	[-3.78749]	[-8.73506]	[-9.31667]	[-0.51735]

Diagnostic Tests: R^2 =0.71, Adj. R^2 =0.69, F-Statistic=8.994, F-Statistic (Prob)=0.0013*, Breusch-Godfrey Serial Correlation LM Test: Prob. Chi-Square(2)= 0.2246*, Heteroscedasticity Test: Breusch-Pagan-Godfrey: Prob. Chi-Square(3)=0.1984*, Ramsey RESET Test: F-statistic=0.0103, (1 , 77), F-statistic (Prob)= 0.3421*, Wald test: Prob. Chi-Square(2)=0.0233*, Cusum path lies within the confidence interval bounds at %5; JB probability =0.1711*, *Expected result

5.5 Causality Analysis

Causality analysis is used to determine causation between two variables and also determine the direction of the relationship in the event that there is a relationship. We examined the relationship by the VAR Granger Causality/Block Exogeneity Wald Test after we determined that there was a short and long term relationship among the variables.

Table 9: VAR Granger causality/block exogeneity Wald test results

Dependent Variable	Excluded Variable	Chi-squared Statistic	Degree of Freedom	Prob.
	FIT	11.67205	2	0.0034
	MO	11.20779	2	0.0067
FDI	SP	10.75087	2	0.0046
	D1	1.438323	2	0.4872
	All	27.64845	8	0.0005
	FDI	2.169464	2	0.3380
	MO	6.243012	2	0.0441
FIT	SP	19.26026	2	0.0001
	D1	0.993870	2	0.6084
	All	33.75145	8	0.0000
	FDI	2.544925	2	0.2801
	FIT	7.334760	2	0.0255
MO	SP	9.561884	2	0.0078
	D1	0.569645	2	0.7521
	All	16.39115	8	0.0371
	FDI	0.265545	2	0.8757
	FIT	6.174642	2	0.0456
SP	MO	9.502929	2	0.0086
	D1	0.747491	2	0.6882
	All	16.19710	8	0.0396
	FDI	3.208271	2	0.2011
	FIT	0.677051	2	0.7128
D1	MO	0.647486	2	0.7234
	SP	0.685705	2	0.7097
	All	4.290307	8	0.8300

Fitch (FIT), Moody's (MO) and S&P (SP) is a Granger cause of FDI. The dummy variable (D1) representing the crises is not a Granger cause of FDI. FDI variable is not a Granger cause for the FIT variable. MO and SP variable are not a Granger cause for the FIT variable. D1 variable is not a Granger cause for the FIT variable. FDI and D1 variables are not a Granger cause for the MO variable. FIT and SP variable are not a Granger cause for the MO variable. FDI and D1 variable are not a Granger cause for the SP variable. FIT and MO variables are the Granger cause for the SP variable. None of the variable FDI, FIT and SP is not a Granger cause for the D1 variable. In other words none of the variables is not a Granger cause for the dummy variable representing crises.

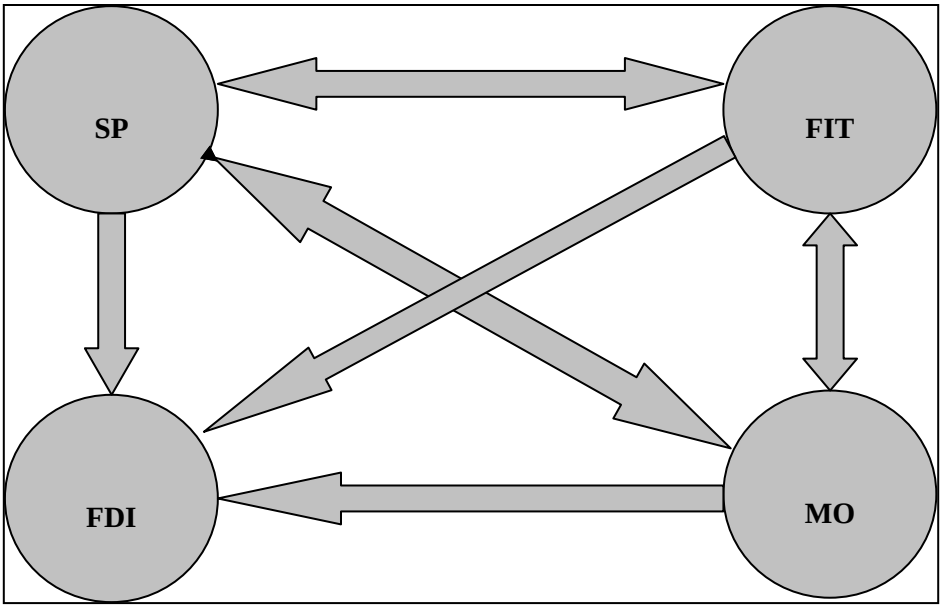

Figure 3: Causality relationship among the variables

5.6 VAR Analysis

We will analyze the relationships among the variables by variance decomposition and impulse response functions in this section. The sources of variations in variances of the variables and the responses of variations in the variables to each other were investigated by VAR model.

5.6.1 Variance Decomposition Analysis

Variance decomposition is an alternative approach to reveal the dynamics of Vector Autoregression model. Variance decomposition decompose the variation in one of the endogenous as separate shocks which affect all endogenous variables including itself variables and thus we get information about the dynamic structure of the system. Also this analysis shows that how much of a change as a percentage in one of the variables in the system is arisen from itself and how much of this change as a percentage is arisen from the other variables.

Most of the variations in the FDI variable was arisen from its own internal dynamics. About 4-5% of the variations in the FDI variable was explained by the SP variable in the last periods. The other variables had no contributions to the variations of the FDI variable.

Table 10: Variance Decomposition of FDI

Period	Standard Error	FDI	FIT	MO	SP	D1
1	826.3252	100.0000	0.000000	0.000000	0.000000	0.000000
2	834.9491	98.65148	0.745029	0.436785	0.155997	0.010704
3	841.0266	97.97088	0.739869	0.436557	0.735674	0.117017
4	844.0117	97.36042	0.747678	0.445425	1.237651	0.208824
5	846.9664	96.69216	0.763914	0.468924	1.787325	0.287674
6	849.9098	96.02381	0.777916	0.507787	2.340983	0.349500
7	852.8095	95.37212	0.786272	0.559420	2.887959	0.394230
8	855.6421	94.74235	0.789179	0.622004	3.422321	0.424142
9	858.4045	94.13441	0.788281	0.694352	3.940605	0.442348
10	861.0983	93.54726	0.785119	0.775321	4.440481	0.451823
11	863.7275	92.97947	0.780851	0.863893	4.920548	0.455236
12	866.2963	92.42973	0.776261	0.959139	5.379985	0.454882

Most of the variations (about 80%) in the FIT variable were arisen from its own internal dynamics. SP and MO ratings came with the increasing and equal weighted share in the last periods. FIT was influenced by about more than 10% and 20% in the last period from these two CRAs. The crisis and FDI had no effect on the variations of the FIT variable.

Table 11: Variance decomposition of FIT

Period	Standard Error	FDI	FIT	MO	SP	D1
1	0.263026	0.112796	99.88720	0.000000	0.000000	0.000000
2	0.357792	0.392287	99.02219	0.170835	0.374948	0.039742
3	0.418358	1.334845	96.32050	0.906666	1.408857	0.029130
4	0.463438	1.858585	92.89171	2.268461	2.944572	0.036670
5	0.499756	2.171287	88.85245	4.077246	4.845514	0.053507
6	0.531232	2.334171	84.34839	6.233257	7.015673	0.068507
7	0.560120	2.397459	79.56567	8.622949	9.338101	0.075816
8	0.587707	2.396062	74.68295	11.13719	11.70882	0.074975
9	0.614713	2.353993	69.85079	13.68308	14.04279	0.069354
10	0.641522	2.287412	65.18322	16.18811	16.27694	0.064308
11	0.668316	2.207217	60.75728	18.60040	18.36942	0.065687
12	0.695168	2.120672	56.61788	20.88639	20.29623	0.078822

Most of the variations in the MO variable were arisen from its own internal dynamics. About 4-5% of the variations in the MO variable were arisen from the FIT and a 2-3% of the variations in the MO variable were arisen from the SP. The crisis and FDI had no effect on the variations of the MO.

Table 12: Variance Decomposition of MO

Period	Standard Error	FDI	FIT	MO	SP	D1
1	0.136959	0.001257	0.449693	99.54905	0.000000	0.000000
2	0.191899	0.181966	3.156803	96.46055	0.192884	0.007798
3	0.232578	0.189026	4.035067	95.58981	0.132002	0.054095
4	0.268444	0.254485	4.540756	94.96413	0.146041	0.094590
5	0.300792	0.318001	4.849242	94.43093	0.256772	0.145053
6	0.330648	0.375428	5.012602	93.93804	0.466105	0.207824
7	0.358721	0.423407	5.077661	93.44983	0.766762	0.282336
8	0.385468	0.462758	5.074095	92.94606	1.148783	0.368309
9	0.411208	0.495101	5.021315	92.41649	1.601796	0.465302
10	0.436177	0.521793	4.932999	91.85712	2.115334	0.572757
11	0.460545	0.543908	4.819123	91.26768	2.679219	0.690067
12	0.484442	0.562277	4.687164	90.65015	3.283828	0.816585

Most of the variations in the SP variable were arisen from its own internal dynamics. Otherwise about 21% of the variations in the SP variable were arisen from the MO and a 2% of the variations in the SP variable were arisen from the FIT. The crisis and FDI had no effect on the variations of the SP variable.

Table 13: Variance Decomposition of SP

Period	Standard Error	FDI	FIT	MO	SP	D1
1	0.226074	0.091494	3.839968	3.749669	92.31887	0.000000
2	0.319720	0.251253	5.594889	8.936821	85.21642	0.000612
3	0.391413	0.279043	5.589286	11.15419	82.95893	0.018559
4	0.453201	0.384957	4.966525	12.87073	81.71189	0.065898
5	0.508436	0.434652	4.310260	14.40558	80.71020	0.139303
6	0.558738	0.457267	3.724742	15.77488	79.79832	0.244787
7	0.605251	0.464367	3.232895	17.01466	78.90599	0.382092
8	0.648689	0.463016	2.831473	18.14773	78.00818	0.549604
9	0.689544	0.457392	2.508206	19.18963	77.09982	0.744953
10	0.728171	0.449890	2.249329	20.15257	76.18295	0.965257
11	0.764842	0.441833	2.042240	21.04653	75.26202	1.207380
12	0.799767	0.433938	1.876263	21.87981	74.34187	1.468122

5.6.2 Impulse Response Analysis

It is very complicated to interpret the coefficients obtained by VAR analysis. Because of this impulse response analysis, which is a graphical representation of responses of the variables to shocks, is generally used to interpret the results of VAR model. The main objective of the impulse response analysis is to present the response of the other variable by periods to one standard deviation impulse (shock) in the error term of one variable.
SP and MO variables responded increasingly to 1 unit shock in the FDI variable. In other words these two CRAs upgrade sovereign credit rating of Turkey. The FIT variable also responded increasingly but its severity of the response was lower relative to the other two CRAs.

Table 14: Cumulative response of FDI variable to 1 standard error shock arising from the other variables

Period	FDI	FIT	MO	SP
1	826.3252	0.000000	0.000000	0.000000
2	70.18303	72.06870	55.18155	32.97756
3	72.34820	6.275901	6.547899	64.15678
4	24.06877	9.635513	9.226857	60.10714
5	8.411914	12.40265	13.81385	63.28454
6	1.234240	11.80239	17.43976	63.94217
7	1.177664	9.958904	20.01481	63.98167
8	2.184789	7.703069	22.02864	63.65491
9	2.494837	5.545153	23.71830	63.09563
10	2.563205	3.614461	25.15035	62.36234
11	2.552658	1.939423	26.38040	61.50441
12	2.528116	0.508936	27.44425	60.55249

FDI, MO and SP variables responded to 1 unit shock in the MO variable less severe but then increasingly severe.

Table 15: Cumulative response of FIT variable to 1 standard error shock arising from the other variables

Period	FDI	FIT	MO	SP
1	0.008834	0.262878	0.000000	0.000000
2	0.020595	0.240123	0.014788	0.021909
3	0.042826	0.204499	0.036989	0.044563
4	0.040688	0.175854	0.057317	0.062116
5	0.037830	0.149686	0.072877	0.076011
6	0.034122	0.126977	0.086067	0.087731
7	0.030569	0.107647	0.097275	0.097458
8	0.027465	0.091267	0.106839	0.105572
9	0.024882	0.077409	0.115051	0.112346
10	0.022776	0.065686	0.122138	0.118000
11	0.021086	0.055757	0.128281	0.122714
12	0.019745	0.047334	0.133631	0.126637

All variables responded to 1 unit shock in the MO variable less severe but then increasingly severe.

Table 16: Cumulative response of MO variable to 1 standard error shock arising from the other variables

Period	FDI	FIT	MO	SP
1	0.000486	0.009184	0.136650	0.000000
2	0.008172	0.032835	0.129802	-0.008428
3	0.005936	0.031940	0.127220	-0.000611
4	0.009008	0.033008	0.129330	0.005817
5	0.010214	0.033395	0.130398	0.011273
6	0.011079	0.033058	0.131392	0.016651
7	0.011593	0.032462	0.132482	0.021842
8	0.011948	0.031708	0.133612	0.026837
9	0.012231	0.030843	0.134778	0.031648
10	0.012471	0.029906	0.135974	0.036275
11	0.012686	0.028920	0.137193	0.040721
12	0.012882	0.027903	0.138425	0.044988

All variables responded to 1 unit shock in the SP variable less severe but then increasingly severe. As seen in Table 17.

Table 17: Cumulative response of SP variable to 1 standard error shock arising from the other variables

Period	FDI	FIT	MO	SP
1	0.006838	0.044301	0.043777	0.217218
2	0.014494	0.061291	0.084964	0.199814
3	0.013064	0.053328	0.089182	0.199968
4	0.019057	0.040470	0.096678	0.201824
5	0.018247	0.030684	0.103943	0.202021
6	0.017434	0.022043	0.109580	0.201195
7	0.016540	0.014657	0.114378	0.199836
8	0.015724	0.008470	0.118472	0.197993
9	0.015047	0.003318	0.121966	0.195781
10	0.014516	0.000954	0.124958	0.193289
11	0.014113	0.004479	0.127526	0.190585
12	0.013818	0.007372	0.129733	0.187727

6 Conclusion

The technological progresses especially in the computer, communications and transportation increased the globalization process and thus accelerated the financial liberalization in the 1980s. CRAs became key players in the global financial system as a consequence of increasing international capital movements together with financial globalization. So credit ratings of countries and corporations by CRAs became an important indicator for the international investors. The leading CRAs S&P, Moody's and Fitch use factors such as institutional efficiency, political risks and major macroeconomic indicators of countries, which are also determinants of FDI inflows, in their sovereign rating process.

We examined the relationship between sovereign credit ratings and FDI inflows by using time series analysis. We found that there was a positive relationship between sovereign credit rating of S&P, Moody's and Fitch and FDI inflows as a result of co-integration analysis. We see that the S&P was the most efficient CRA, later Fitch and Moody's came respectively in terms of influence. This is evaluated to be arisen from that the S&P is the leader in the credit rating industry and Fitch has operated in Turkey since 1999 unlike the other CRAs.

Moreover we find that there is a two-way causality between sovereign credit ratings by S&P and Fitch and FDI inflows and a one way causality between sovereign credit ratings by Moody's and FDI inflows and a no causality between dummy variable which represents crises and the FDI inflows in the Granger causality analysis. On the other hand VAR analysis demonstrated that most of the variations in the variables were arisen from their own internal dynamics. We see that FDI inflows responded to 1 unit shock in sovereign credit ratings less severe but then increasingly severe in the impulse response analysis. In other words foreign investors did not react to upgrades/downgrades in the sovereign credit ratings of Turkey instantly, but they increased/decreased their investments after seeing the stability of sovereign over time.

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