

**EFFECTS OF DOW JONES AND USD ON BIST100 INDEX AND OBSERVATION OF  
THE RELATIONSHIP AMONG THEM****Yrd.Doç.Dr. Hakan YILDIRIM**Esenyurt University, Faculty of Business and Management Studies, Aviation Management  
Istanbul/Turkey**ABSTRACT**

Dow Jones and USD play an essential role in developing stock markets. Even macroeconomic announcements of FED have strong effects on stock markets of developing countries. Thus, stock index and macroeconomic announcements in terms of currency, inflation, and unemployment rate help individual and institutional investors with forecasting short and long term trend for their native stock markets. Snap and on-going volatility on USDTRY can lead in short and long run volatility on BIST100. Furthermore, Dow Jones which is accepted as an indicator in the World also can result in volatility at BIST100. Mortgage crisis is the best proof for relation between Dow Jones and BIST100 since both of them decreased owing to mortgage crisis. It is clear that crisis was felt all over the world. However, crisis starting in U.S was felt firstly U.S Stock Markets Indexes then jumped to nearly all over the world. That is, while developing stock markets are sensitive against to U.S Market Indexes, developed markets are not too much sensitive. Furthermore, USD is an important parameter for countries even they have strong economy and financial markets. For this reason, effects of Dow Jones and USD on BIST100 and relation among these variables will be observed through unit root test, heteroscedasticity test, Johansen Cointegration test, error correction and Granger Causality test.

**Key Words:** Investment, Finance, Stocks, USD, developing financial market**1. INTRODUCTION**

Institutional and individual investors follow the development of financial markets, macro-economic news and announcement in order to forecast future for their investments. By this ways, they have investment decision. To illustrate, household believe that when USD increases, exportation of companies which are traded in stock market will rise and it leads to increase of their foreign trade volume. Long story short cut, all activities result in increased at stock market. In other words, macro-economic announcement and decision by developed countries' Central Bank or volatility of developed stock markets play an essential role on trend of developing stock markets. Therefore, some important indicators in terms of USD and Dow Jones Index are very important for investment decision in short and long term. In this study, relation among USD, Dow Jones Index and BIST100 index will be examined by using data between 2000:1 and 2016:12 years.

**2. LITERATURE REVIEWS**

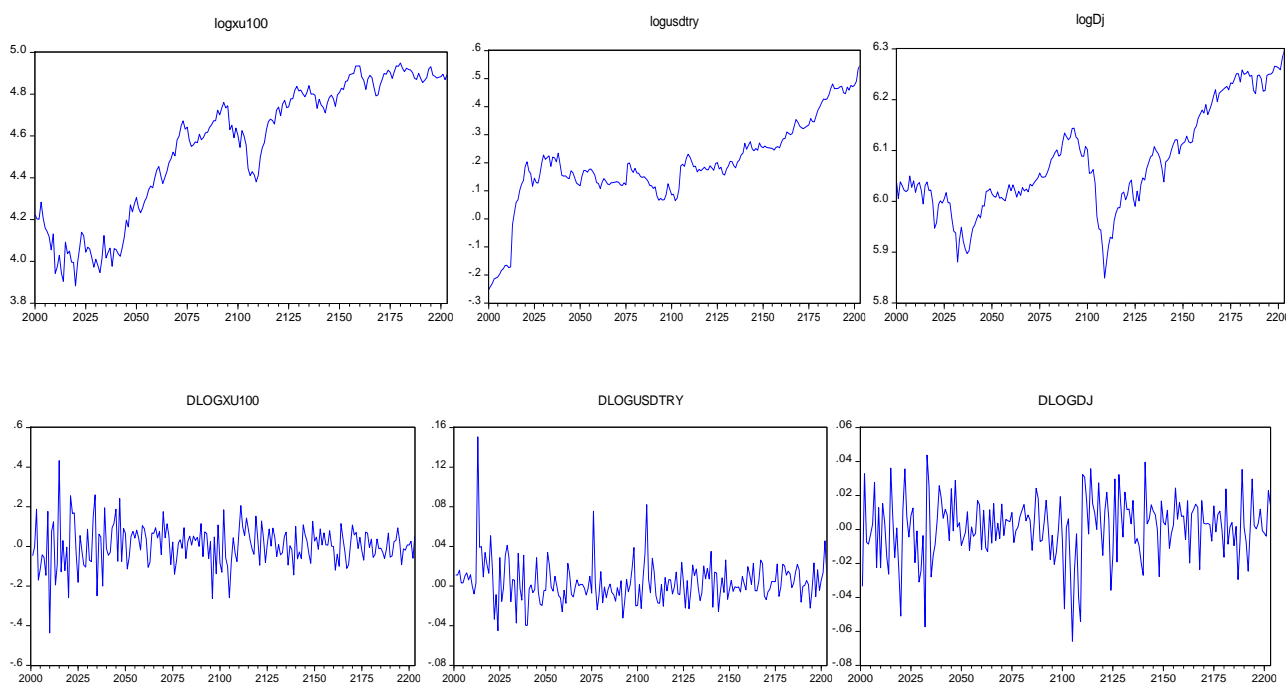
In this part, important studies will be shown about relation among indexes and parities by means of topics and chronology.

Baclay, Litzenberger and Warner (1990) focused on total volume and change of daily prices for New York and Tokyo indexes. End of the investigation findings were significant and positive. Becker, Finnerty and Gupta (1990) tested American and Japan index between 1985-1988. Results indicated American indexes had significant effects on Japan indexes. However Japan indexes did not have significant effect on American indexes. Hamao, Masulis and Ng (1990) tested relation among New York, London and Tokyo indexes. Findings of study indicated that New York and London indexes possessed significant effects on Tokyo indexes. Özdemir et. al. (2009) looked for relation between S&P 500 and developing stock markets by applying granger causality test. End of observation, causality from S&P500 to developing stock markets was founded. Su (2011), observed England, U.S, Japan and Hong Kong stock markets with VAR model. Finding indicated that there was a relation

among these four stock markets. Especially, U.S and Japan stock markets have strong effects on other two stock markets.

The Pioneer study about relation between stock prices and currencies is investigated by Franck and Young in 1972. The finding related with interaction between index and currency was no relation between variables. Aggarwall (1981) focused on American stock prices and USD between 1974-1978. Results indicated that long run and positive relation between American stocks and USD was founded. Nieh and Lee (2001) observed relation between currency and stock price for members of G7 countries such as U.S, England, Germany, Canada, France, Italy and Japan. While long run balanced relation could not be founded, short run relation could be founded for some countries. Maysami, Howe and Hamzah (2004) observed relation between currencies and stock returns. Result demonstrated that there was a positive relation between currencies and stock returns. Roll (1992) indicated that stock prices and foreign Exchange markets have positive interaction by being encouraged observation of Phylaktis and Ravazzolo (2000). Ramasamy and Yeung (2005) found stock prices and Exchange rate markets possess two way relation since change of exchange rate is macroeconomic announcement which have effects on business life. Ayvaz (2006) observed relation between USD and BIST100 via using time series analysis with monthly data. Results indicated that there was a two-way causality between BIST100 and USDTRY. Gay (2008) focused on Brazil, India, Russia, China stock index between 1999-2006 years by applying Box Jenkins time series analysis. End of the study, positive relation between stock prices and exchange price was founded.

Graph 1: Graphs of Variables



At first, variables should be stationary in order to apply Granger Causality Test. When graphs are checked, first three horizontal graphs possess trend and they are not stationary. After first difference, second horizontal graphs of all variables become stationary and Granger Causality test can be applied. However, root tests should be used in order to check whether there is stationarity or not. Therefore, root tests are applied for all variables.

Table 1: Unit Root for Variables and First Difference

	ADF Statistic	t-Statistic	p
<b>LOGXU100(-1)</b>		<b>0.970616</b>	0.9120
	1% level	-2.576.403	
	5% level	-1.942.399	
	10% level	-1.615.659	
<b>D(LOGXU100(-1))</b>		<b>-16.36105</b>	0.0000
	1% level	-3.462737	
	5% level	-2.875680	
	10% level	-2.574385	
<b>LOGUSDTRY(-1)</b>		<b>0.973379</b>	0.9124
	1% level	-2.576.403	
	5% level	-1.942.399	
	10% level	-1.615.659	
<b>D(LOGUSDTRY(-1))</b>		<b>-12.07987</b>	0.0000
	1% level	-3.462737	
	5% level	-2.875680	
	10% level	-2.574385	
<b>LOGDJ(-1)</b>		<b>0.990499</b>	0.9149
	1% level	-2.576.403	
	5% level	-1.942.399	
	10% level	-1.615.659	
<b>D(LOGDJ(-1))</b>		<b>-13.63440</b>	0.0000
	1% level	-3.462737	
	5% level	-2.875680	
	10% level	-2.574385	

Root tests indicate that XU100, USDTRY and Dow Jones have trend and they are not stationary since XU100 has p value greater than 0,05 ( 0,9120>0,05), USDTRY has p value greater than 0,05 ( 0,9124>0,05) and Dow Jones has p value greater than 0,05 ( 0,9149>0,05). For this reason, null hypothesis is accepted for all variables. That is, variables are not stationary. However, they become stationary and null hypothesis is rejected after the first difference.

Table 2: Heteroskedasticity Test (White)

F-statistic	5.307789	Prob. F(5,197)	0.0001	
Obs*R-squared	24.10053	Prob. Chi-Square(5)	0.0002	
Scaled explained SS	69.98490	Prob. Chi-Square(5)	0.0000	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000985	0.000267	3.688593	0.0003
DLOGUSDTRY^2	0.274722	0.203660	1.348927	0.1789
DLOGUSDTRY*DLOG				
DJ	2.866677	0.661359	4.334525	0.0000
DLOGUSDTRY	0.015002	0.015808	0.949020	0.3438
DLOGDJ^2	2.009535	0.515483	3.898351	0.0001
DLOGDJ	0.001381	0.015485	0.089155	0.9290
R-squared	0.118722	Mean dependent var	0.001359	
Adjusted R-squared	0.096354	S.D. dependent var	0.003332	
S.E. of regression	0.003167	Akaike info criterion	-8.642690	
Sum squared resid	0.001976	Schwarz criterion	-8.544763	
Log likelihood	883.2331	Hannan-Quinn criter.	-8.603073	
F-statistic	5.307789	Durbin-Watson stat	1.754989	
Prob(F-statistic)	0.000134			

Variables were checked for heteroscedasticity by using white test. Results indicates that p-value is less than 0,05 ( 0,0000) . For this reason, XU100, USDTRY and Dow Jones are homoscedastic and null hypothesis is rejected.

Table 3: Johansen Coentegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.122517	36.67482	35.01090	0.0328
At most 1	0.047092	10.40457	18.39771	0.4423
At most 2	0.003521	0.708947	3.841466	0.3998
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.122517	26.27024	24.25202	0.0267
At most 1	0.047092	9.695627	17.14769	0.4260
At most 2	0.003521	0.708947	3.841466	0.3998

It is seen that, trace and max-figen Statistic greater than 0,05 critical value. Therefore, at least one coentegration is accepted. That is, coentegration among USDTRY, Dow Jones and XU100 indicates that USDTRY and Dow Jones have effect on XU100.

Table4: Regression Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOGUSDTRY	-0.618874	0.138982	-4.452918	0.0000
DLOGDJ	0.956709	0.161398	5.927646	0.0000
C	0.004527	0.002690	1.682840	0.0940
R-squared	0.328781	Mean dependent var		0.003299
Adjusted R-squared	0.322068	S.D. dependent var		0.045105
S.E. of regression	0.037138	Akaike info criterion		-3.733701
Sum squared resid	0.275842	Schwarz criterion		-3.684737
Log likelihood	381.9706	Hannan-Quinn criter.		-3.713892
F-statistic	48.98257	Durbin-Watson stat		2.486841
Prob(F-statistic)	0.000000			

The regression model consists of dependent (XU100), and independent variables (USDTRY and Dow Jones). Equation results indicates that regression model is significant since p value is less than 0,05 ( 0,000000<0,05). That is, independed variable (USDTRY) equals 0,0000 and (Dow Jones) equals 0,0000. USDTRY and Dow Jones can explain 0.32 of XU100 (as R-square shows) and also Durbin-Watson statistic is close to 2, thus there is no autocorrelation in the model.

### 3. ERROR CORRECTION MODEL

Since there is a trend on the model, trend was added as a variable. As it is seen, variables and model are significant.

Table5: Regression Equation with Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGUSDTRY	-0.885198	0.076472	-11.57542	0.0000
LOGDJ	0.211912	0.104931	2.019538	0.0448
C	2.768311	0.623265	4.441627	0.0000
@TREND	0.006580	0.000251	26.26098	0.0000
R-squared	0.914940	Mean dependent var		4.551846
Adjusted R-squared	0.913664	S.D. dependent var		0.319680
S.E. of regression	0.093931	Akaike info criterion		-1.873089
Sum squared resid	1.764625	Schwarz criterion		-1.808028
Log likelihood	195.0551	Hannan-Quinn criter.		-1.846770
F-statistic	717.0934	Durbin-Watson stat		0.172981

Prob(F-statistic) 0.000000

Error term must be stationary. Therefore, error term was controlled by applying unit root test. As it is seen errors do not have unit root since p value of unit root is less than 0,05 ( $0,0155 < 0,05$  and null hypothesis is rejected).

Table6: Unit root Test For Error Term

		t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic		-2.416414	0.0155	
Test critical values:	1% level	-2.576460		
	5% level	-1.942407		
	10% level	-1.615654		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRORS(-1)	-0.069931	0.028940	-2.416414	0.0166
D(ERRORS(-1))	-0.190204	0.069530	-2.735580	0.0068
R-squared	0.077797	Mean dependent var		-1.28E-05
Adjusted R-squared	0.073186	S.D. dependent var		0.038963
S.E. of regression	0.037510	Akaike info criterion		-3.718543
Sum squared resid	0.281407	Schwarz criterion		-3.685788
Log likelihood	377.5729	Hannan-Quinn criter.		-3.705290
Durbin-Watson stat	1.962231			

The table which is given below is related to error handling. As it is seen, whole errors are adjusted and variables are significant by depending on 0,05 level. The table also shows one unit deviation is adjusted in next term. In this way, there is a balance in short term.

Table7: Error Correction

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGUSDTRY)	-0.712602	0.139445	-5.110266	0.0000
D(LOGDJ)	0.938041	0.158172	5.930498	0.0000
ERRORS(-1)	-0.086940	0.028142	-3.089360	0.0023
C	0.004945	0.002638	1.874903	0.0623
R-squared	0.359499	Mean dependent var		0.003299
Adjusted R-squared	0.349843	S.D. dependent var		0.045105
S.E. of regression	0.036369	Akaike info criterion		-3.770694
Sum squared resid	0.263218	Schwarz criterion		-3.705410
Log likelihood	386.7255	Hannan-Quinn criter.		-3.744283
F-statistic	37.23147	Durbin-Watson stat		2.382110
Prob(F-statistic)	0.000000			

Table8: Granger Causality Test Result

Way of Causality	F-Statistic	Prob
<b>USDTRY → XU100</b>	4.60240	<b>0.0111</b>
XU100 → USDTRY	0.48039	0.6193
DJ → XU100	2.42103	0.0915
XU100 → DJ	2.24546	0.1086
<b>DJ → USDTRY</b>	5.61401	<b>0.0043</b>
USDTRY → DJ	1.89455	0.1531

Granger Causality test results indicate that USDTRY granger cause to XU100 ( $0,0111 < 0,05$ ) and Dow Jones granger cause to USDTRY ( $0,0043 < 0,05$ ). Therefore, null hypothesis for two causality are rejected.

XU100 does not Granger cause to USDTRY ( $0,6193 > 0,05$ ), Dow Jones does not Granger cause to XU100 ( $0,0915 > 0,05$ ), XU100 does not Granger cause to Dow Jones ( $0,1086 > 0,05$ ) and USDTRY does not Granger cause to Dow Jones ( $0,1531 > 0,05$ ). That is, null hypothesis for these causalities are accepted.

#### 4. CONCLUSION

In this study, relation among developing XU100, developed DJI and their currency (USDTRY) were examined via applying Johansen Cointegration, error correction and Granger Causality test from beginning of 2000 to the end of 2016. Johansen Cointegration results indicates that there is cointegration among XU100, DJI and USDTRY in long term. In short term, error correction comes up with significant for variables. Furthermore, USDTRY granger cause to XU100 and Dow Jones granger cause to USDTRY. However, XU100 does not Granger cause to USDTRY, Dow Jones does not Granger cause to XU100, XU100 does not Granger cause to Dow Jones and USDTRY does not Granger cause to Dow Jones. These results show that developing index of XU100 possess strong structure against developed DJI which has great effect on developing indexes. That is, XU100 is not sensitive and weak against developed countries indexes and it demonstrates Turkish economy and financial markets improve every passing day. On the other hand, while XU100 does not have effect on USDTRY parity and it proves important index for Turkey is not strong as well as it can affect USDTRY parity, DJI has strong structure as well as it can have effect on USDTRY parity. USDTRY has effect on XU100 index. This effect demonstrates that movement of USDTRY parity cause to XU100. This effect can occur since U.S announces numerous news which results in volatility at USD parities in terms of retail sales, unemployment rate, FED interest rate decision, gross domestic product and so on. In this way, not only USDTRY and XU100 index are affected, but also every developing and developed countries' parities and indexes can be affected by announcements of U.S.

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## DATA

Dow Jones	XU100	USDTRY	Dow Jones	XU100	USDTRY	Dow Jones	XU100	USDTRY
1012831	15945,93	0,57	759193	8842,24	1,66	1019251	23591,64	1,39
1092192	15920,10	0,59	839703	10251,92	1,68	1046748	25236,48	1,36
1073391	19205,71	0,61	889609	13300,40	1,54	1027497	26957,32	1,33
1052233	16206,42	0,62	834163	10369,92	1,66	1064091	29615,29	1,33
1044789	14466,12	0,62	805381	11032,03	1,65	1048160	30908,02	1,35
1052198	13870,23	0,64	789108	11574,44	1,60	1056870	33333,23	1,35
1121510	13132,06	0,66	799213	9475,09	1,72	1044007	31963,99	1,35
1065092	11350,30	0,66	848009	11509,95	1,57	1080587	38088,65	1,36
1097114	13538,44	0,68	885026	11381,42	1,43	1071750	39777,70	1,35
1041449	8747,68	0,68	898544	10884,43	1,42	1086486	44590,22	1,32
1078799	9437,21	0,67	923380	10572,04	1,42	1099341	47015,88	1,31
1088736	10685,07	0,68	941582	11611,84	1,40	1110932	42911,32	1,34
1049528	8791,60	0,96	927506	13055,90	1,39	1136714	43880,43	1,32
987878	8022,72	1,05	980112	15754,34	1,48	1116831	38132,21	1,57
1073497	12367,36	1,15	978246	14617,53	1,46	1115022	35453,31	1,58
1091194	10879,83	1,17	1045392	18625,02	1,40	1118568	36067,92	1,50
1050240	11204,24	1,27	1048807	17259,25	1,34	1138115	37285,94	1,46
1052281	9914,61	1,33	1058392	18889,20	1,33	1167907	36924,86	1,51
994975	9878,88	1,37	1035770	20190,83	1,31	1208073	40582,25	1,46
884756	7625,87	1,54	1022557	18022,69	1,42	1222193	38168,53	1,45
907514	9848,76	1,60	1018845	17081,08	1,49	1246315	39117,46	1,42
985156	11633,93	1,48	1043548	17967,60	1,49	1262169	41182,55	1,41
1002157	13782,76	1,45	1013971	19380,86	1,47	1226863	41430,99	1,41
992000	13252,32	1,31	1017392	20218,37	1,50	1235435	43661,12	1,39
1010613	11055,67	1,40	1008027	21953,52	1,50	1306291	44984,45	1,36
1040394	11679,43	1,35	1002747	22899,89	1,47	1362764	47081,49	1,32
994622	11441,50	1,34	1042802	22486,20	1,43	1340862	47093,67	1,31
992525	10413,70	1,44	1078301	24971,68	1,35	1321199	52824,89	1,28
924326	9379,92	1,58	1048994	27330,35	1,34	1335774	50198,60	1,30
873659	10236,46	1,69	1076623	28396,17	1,28	1389563	54044,22	1,21
866350	9547,30	1,63	1050376	25557,76	1,35	1393001	57615,72	1,16

Dow Jones	XU100	USDTRY	Dow Jones	XU100	USDTRY	Dow Jones	XU100	USDTRY
1337172	54213,82	1,18	1241434	63269,40	1,62			
1326482	55538,13	1,17	1214324	62295,68	1,69	1782307	85721,13	2,33
1265036	42697,56	1,17	1161353	53946,09	1,72	1716495	88945,82	2,45
1226639	44776,88	1,22	1091338	59693,43	1,86	1813270	84147,51	2,51
1226289	39015,44	1,33	1195501	56061,47	1,77	1777612	80846,03	2,60
1282013	43468,12	1,27	1204568	54517,76	1,83	1784052	83947,04	2,67
1263832	39969,63	1,22	1221756	51266,62	1,89	1801068	82981,15	2,66
1135001	35089,53	1,22	1263291	57171,34	1,78	1761951	82249,53	2,68
1137802	42200,75	1,16	1295207	60721,23	1,75	1768986	79909,68	2,77
1154355	39844,48	1,18	1321204	62423,04	1,78	1652803	75210,37	2,91
1085066	36051,30	1,28	1321363	60010,42	1,76	1628470	74205,47	3,03
932501	27832,93	1,54	1239345	55099,33	1,87	1766354	79409,00	2,92
882904	25714,98	1,57	1288009	62543,49	1,81	1771992	75232,79	2,91
877639	26864,07	1,54	1300868	64259,54	1,80	1742503	71726,99	2,92
800086	25934,37	1,64	1309084	67367,95	1,82	1646630	73481,09	2,96
706293	24026,59	1,70	1343713	66396,71	1,80	1651650	75814,41	2,97
760892	25764,83	1,66	1309646	72528,97	1,79	1768509	83268,04	2,82
816812	31651,81	1,60	1302558	73058,51	1,79	1777364	85327,80	2,80
850033	35002,99	1,54	1310414	78208,44	1,78	1778720	77803,41	2,95
844700	36949,20	1,54	1386058	78783,47	1,76	1792999	76817,19	2,88
917161	42641,26	1,47	1405449	79333,67	1,80	1843224	75405,53	2,99
949628	46551,19	1,50	1457854	85898,99	1,81	1840088	75967,63	2,96
971228	47910,30	1,48	1483980	86046,04	1,79	1830815	76488,38	3,00
971273	47184,71	1,51	1511557	85990,01	1,88	1814242	78536,17	3,09
1034484	45350,17	1,53	1490960	76294,51	1,93	1912358	73995,20	3,44
1042805	52825,02	1,50	1549954	73377,45	1,94	1976260	78138,66	3,53
1006733	54650,58	1,50	1481031	66394,41	2,04	<b>Resource :</b> <a href="http://www.investing.com">www.investing.com</a>		
1032526	49705,49	1,55	1512967	74486,56	2,02			
1085663	56538,37	1,52	1554575	77620,37	2,00			
1100861	58959,10	1,49	1608641	75748,27	2,02			
1013663	54384,94	1,57	1657666	67801,73	2,15			
977402	54839,46	1,59	1569885	61858,21	2,26			
1046594	59866,75	1,51	1632171	62553,32	2,21			
1001472	59972,59	1,53	1645766	69736,34	2,14			
1078805	65774,37	1,45	1658084	73871,54	2,11			
1111849	68760,46	1,43	1671717	79289,80	2,10			
1100602	65350,85	1,50	1682660	78489,01	2,12			
1157751	66004,48	1,54	1656330	82156,87	2,14			
1189193	63278,07	1,60	1709845	80312,94	2,16			
1222634	61283,87	1,60	1704290	74937,81	2,28			
1231973	64434,51	1,55	1739052	80579,66	2,22			
1256979	63046,02	1,59	1782824	86168,66	2,22			