Econ 301-03 Assignment #2 (Prof. Hakan Berument)

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- Arçelik A. Ş.

1. Decide on the time period and definition of data that you like to work with. You should have at least 46 observations.

2. Gather monthly data of the price of the equity (of the firm) you choose.

- Y - Price of ARCLK equity monthly (50 observations):

*Data is given in New Turkish Liras (TRY). *Time period: August 2013 – September 2017.

Month	Close price	Month	Close price	Month	Close price	Month	Close price	Month	Close price
Aug 13	9,12	Jun 14	11,86	Apr 15	13,72	Feb 16	18,20	Dec 16	20,61
Sep 13	10,40	Jul 14	12,51	May 15	13,76	Mar 16	18,25	Jan 17	22,23
Oct 13	11,29	Aug 14	11,91	Jun 15	13,86	Apr 16	18,27	Feb 17	20,30
Nov 13	12,04	Sep 14	11,17	Jul 15	13,91	May 16	19,07	Mar 17	22,03
Dec 13	10,76	Oct 14	12,55	Aug 15	13,00	Jun 16	18,40	Apr 17	23,70
Jan 14	9,87	Nov 14	13,06	Sep 15	14,05	Jul 16	19,85	May 17	24,42
Feb 14	10,49	Dec 14	13,80	Oct 15	15,15	Aug 16	20,57	Jun 17	26,06
Mar 14	10,58	Jan 15	14,35	Nov 15	15,05	Sep 16	20,53	Jul 17	26,00
Apr 14	11,96	Feb 15	13,93	Dec 15	13,31	Oct 16	19,87	Aug 17	24,00
May 14	12,14	Mar 15	13,80	Jan 16	14,68	Nov 16	19,48	Sep 17	22,72

3. Gather monthly data of BIST100 (index).

- X - BIST 100 index monthly (50 observations):

*Data is given in New Turkish Liras (TRY). *Time period: August 2013 – September 2017.

Month	Close p.	Month	Close p.	Month	Close p.	Month	Close p.	Month	Close p.
Aug 13	66.394,41	Jun 14	78.489,01	Apr 15	83.947,04	Feb 16	75.814,41	Dec 16	78.138,66
Sep 13	74.486,56	Jul 14	82.156,87	May 15	82.981,15	Mar 16	83.268,04	Jan 17	86.295,72
Oct 13	77.620,37	Aug 14	80.312,94	Jun 15	82.249,53	Apr 16	85.327,80	Feb 17	87.478,33
Nov 13	75.748,27	Sep 14	74.937,81	Jul 15	79.909,68	May 16	77.803,41	Mar 17	88.947,40
Dec 13	67.801,73	Oct 14	80.579,66	Aug 15	75.210,37	Jun 16	76.817,19	Apr 17	94.655,31
Jan 14	61.858,21	Nov 14	86.168,66	Sep 15	74.205,47	Jul 16	75.405,53	May 17	97.541,58
Feb 14	62.553,32	Dec 14	85.721,13	Oct 15	79.409,00	Aug 16	75.967,63	Jun 17	100.440,39
Mar 14	69.736,34	Jan 15	88.945,82	Nov 15	75.232,79	Sep 16	76.488,38	Jul 17	107.531,44
Apr 14	73.871,54	Feb 15	84.147,51	Dec 15	71.726,99	Oct 16	78.536,17	Aug 17	110.010,49
May 14	79.289,80	Mar 15	80.846,03	Jan 16	73.481,09	Nov 16	73.995,20	Sep 17	102.907,73

4. Gather data for at least two variables that affect the profitability of the firm (say variable Z1 and Z2).

- Y - Profitability (Net income) of Arçelik A. Ş. quarterly (50 observations):

*Data is given in thousands of New Turkish Lira (TRY). *Time period: 2005 Q1 – 2017 Q2.

Quarter	Net Income	Quarter	Net Income	Quarter	Net Income	Quarter	Net Income	Quarter	Net Income
2005Q1	67.847	2007Q3	65.680	2010Q1	116.746	2012Q3	146.905	2015Q1	141.267
2005Q2	72.742	2007Q4	-15.417	2010Q2	168.260	2012Q4	104.427	2015Q2	326.351
2005Q3	99.914	2008Q1	52.191	2010Q3	157.653	2013Q1	134.121	2015Q3	213.601
2005Q4	71.649	2008Q2	72.783	2010Q4	106.588	2013Q2	154.447	2015Q4	211.774
2006Q1	75.775	2008Q3	-12.183	2011Q1	132.836	2013Q3	168.945	2016Q1	156.605
2006Q2	124.228	2008Q4	-106.235	2011Q2	145.156	2013Q4	165.182	2016Q2	653.055
2006Q3	161.998	2009Q1	51.295	2011Q3	160.337	2014Q1	134.505	2016Q3	264.127
2006Q4	-37.854	2009Q2	206.358	2011Q4	102.758	2014Q2	167.337	2016Q4	230.363
2007Q1	74.023	2009Q3	159.906	2012Q1	127.015	2014Q3	160.420	2017Q1	240.739
2007Q2	33.479	2009Q4	85.466	2012Q2	173.341	2014Q4	175.716	2017Q2	256.947

- Z1 - Net sales of Arçelik A. Ş. quarterly (50 observations):

*Data is given in thousands of New Turkish Lira (TRY). *Time period: 2005 Q1 – 2017 Q2.

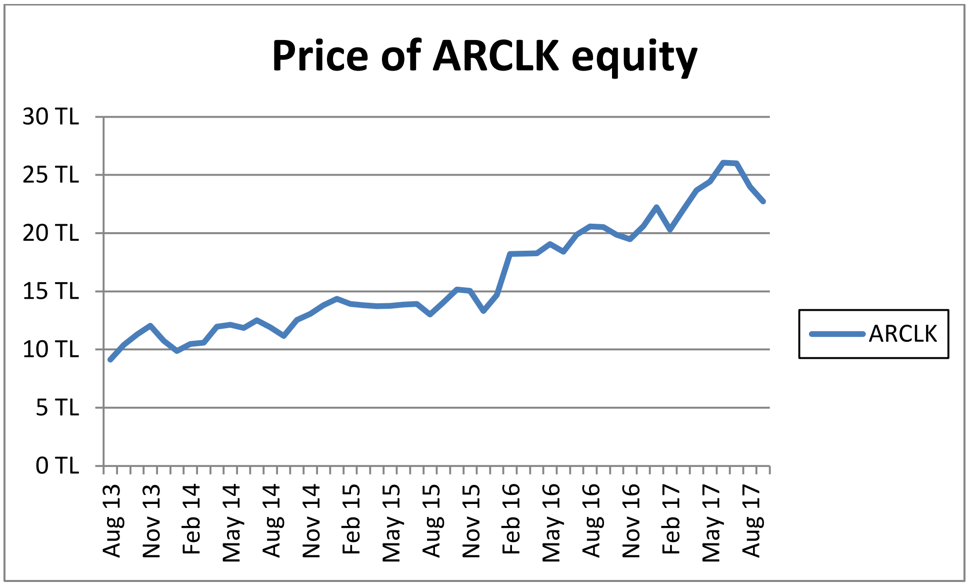
Quarter	Net Sales	Quarter	Net Sales	Quarter	Net Sales	Quarter	Net Sales	Quarter	Net Sales
2005Q1	1,145,087	2007Q3	1,745,467	2010Q1	1,486,923	2012Q3	2,727,693	2015Q1	2,866,760
2005Q2	1,272,139	2007Q4	1,464,476	2010Q2	1,766,858	2012Q4	2,644,380	2015Q2	3,355,093
2005Q3	1,384,757	2008Q1	1,535,313	2010Q3	1,846,727	2013Q1	2,430,171	2015Q3	3,877,286
2005Q4	1,300,924	2008Q2	1,803,003	2010Q4	1,835,912	2013Q2	2,665,460	2015Q4	4,066,961
2006Q1	1,204,590	2008Q3	1,755,134	2011Q1	1,699,386	2013Q3	2,902,476	2016Q1	3,527,449
2006Q2	1,610,519	2008Q4	1,682,088	2011Q2	2,029,061	2013Q4	3,099,604	2016Q2	3,959,556
2006Q3	1,658,830	2009Q1	1,317,980	2011Q3	2,314,570	2014Q1	2,802,266	2016Q3	4,083,238
2006Q4	2,484,744	2009Q2	1,734,060	2011Q4	2,394,222	2014Q2	3,075,965	2016Q4	4,525,929
2007Q1	1,635,675	2009Q3	1,748,674	2012Q1	2,405,985	2014Q3	3,234,067	2017Q1	4,634,254
2007Q2	1,776,926	2009Q4	1,791,181	2012Q2	2,778,803	2014Q4	3,401,735	2017Q2	5,061,077

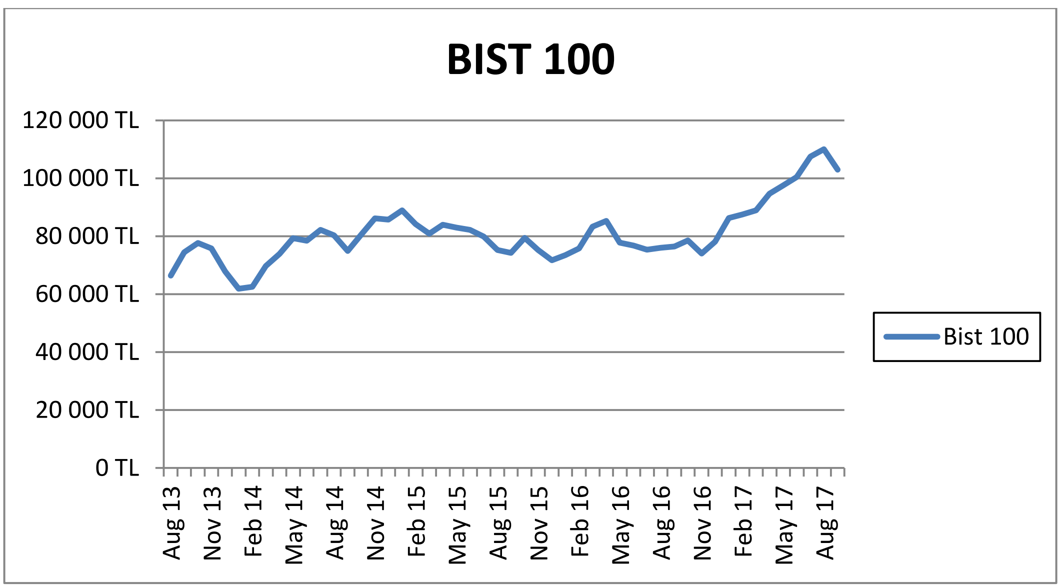
- Z2 - USD/TRY exchange rate at the end of each quarter (50 observations):

*Time period: March 2005 – June 2017.

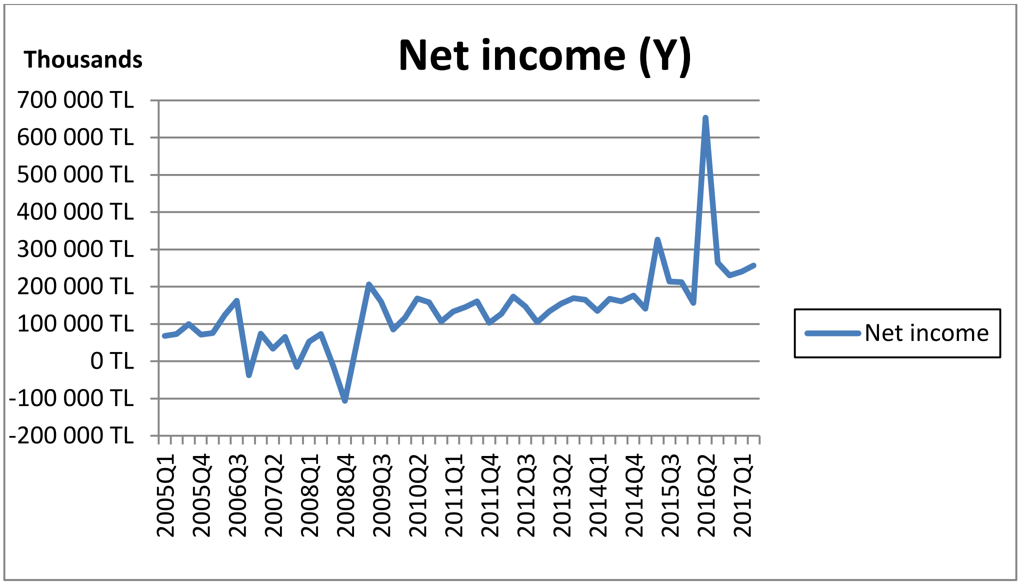
Month	Close p.	Month	Close p.	Month	Close p.	Month	Close p.	Month	Close p.
Mar 05	1.35	Sep 07	1.21	Mar 10	1.52	Sep 12	1.80	Mar 15	2.60
Jun 05	1.33	Dec 07	1.17	Jun 10	1.59	Dec 12	1.78	Jun 15	2.68
Sep 05	1.35	Mar 08	1.33	Sep 10	1.45	Mar 13	1.81	Sep 15	3.03
Dec 05	1.35	Jun 08	1.22	Dec 10	1.54	Jun 13	1.93	Dec 15	2.92
Mar 06	1.34	Sep 08	1.28	Mar 11	1.55	Sep 13	2.02	Mar 16	2.82
Jun 06	1.58	Dec 08	1.54	Jun 11	1.62	Dec 13	2.15	Jun 16	2.88
Sep 06	1.51	Mar 09	1.66	Sep 11	1.86	Mar 14	2.14	Sep 16	3.00
Dec 06	1.42	Jun 09	1.54	Dec 11	1.89	Jun 14	2.12	Dec 16	3.53
Mar 07	1.39	Sep 09	1.48	Mar 12	1.78	Sep 14	2.28	Mar 17	3.64
Jun 07	1.31	Dec 09	1.50	Jun 12	1.81	Dec 14	2.33	Jun 17	3.52

5. Plot the BIST100 and price of your equity.





6. Plot the Z1 and Z2 data.


Net income (Y)
Thousands
700 000 TL
600 000 TL
500 000 TL
400 000 TL
300 000 TL
200 000 TL
100 000 TL
0 TL
-100 000 TL
-200 000 TL
2005Q1
2005Q4
2006Q3
2007Q2
2008Q1
2008Q4
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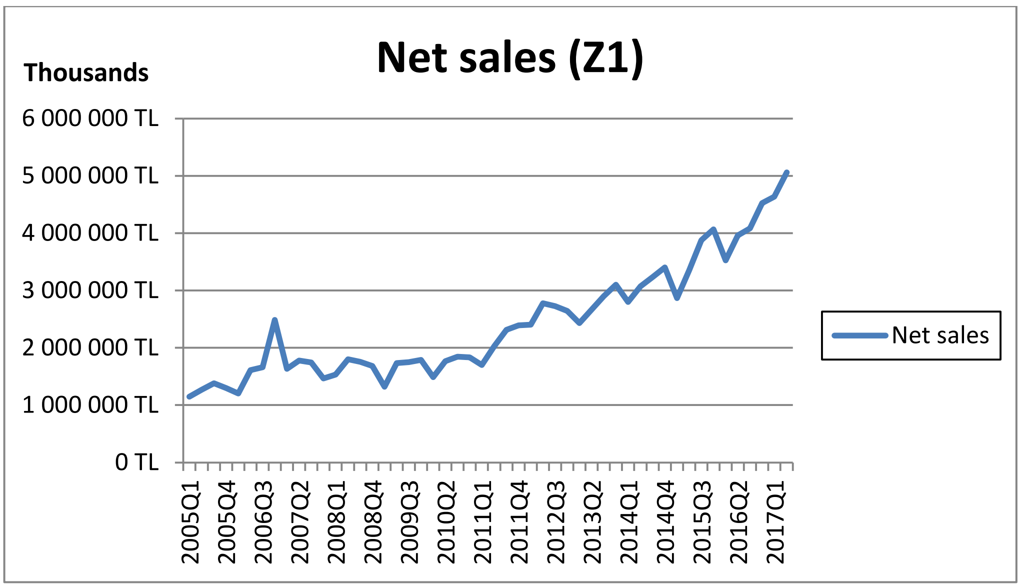
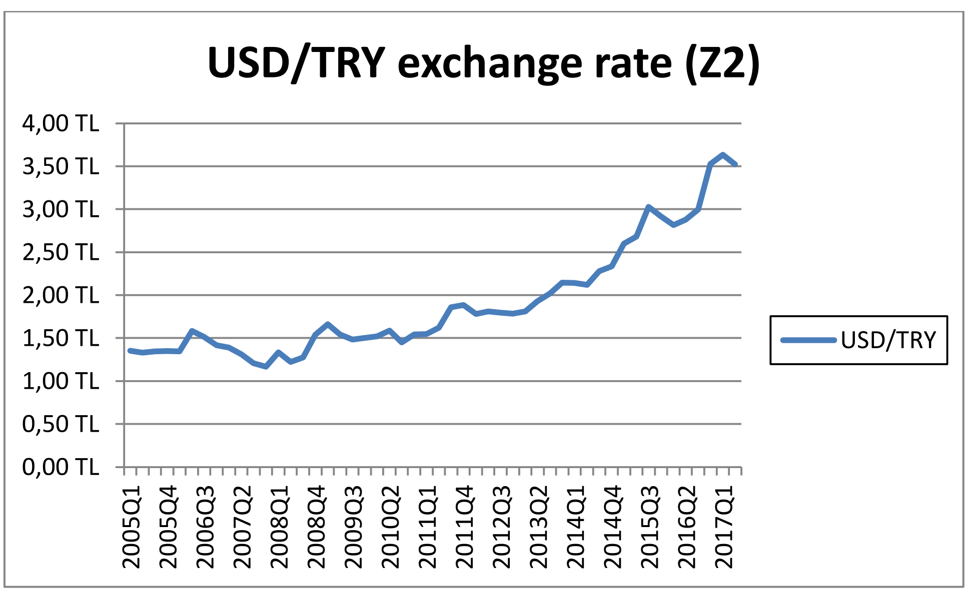
2016Q2
2017Q1
Net income


Net sales (Z1)
Thousands
6 000 000 TL
5 000 000 TL
4 000 000 TL
3 000 000 TL
2 000 000 TL
1 000 000 TL
0 TL
2005Q1
2005Q4
2006Q3
2007Q2
2008Q1
2008Q4
2009Q3
2010Q2
2011Q1
2011Q4
2012Q3
2013Q2
2014Q1
2014Q4
2015Q3
2016Q2
2017Q1
Net sales


USD/TRY exchange rate (Z2)
4,00 TL
3,50 TL
3,00 TL
2,50 TL
2,00 TL
1,50 TL
1,00 TL
0,50 TL
0,00 TL
2005Q1
2005Q4
2006Q3
2007Q2
2008Q1
2008Q4
2009Q3
2010Q2
2011Q1
2011Q4
2012Q3
2013Q2
2014Q1
2014Q4
2015Q3
2016Q2
2017Q1
USD/TRY

7. Calculate returns of stock of your picking and BIST100 index with the formula below. [Hint: you may use average or the end of period data]

Return = 100 * (Xt-Xt-1)/Xt-1

- Return of ARCLK equity monthly (50 observations):

*Data is given in percentages (%). *Time period: August 2013 – September 2017.

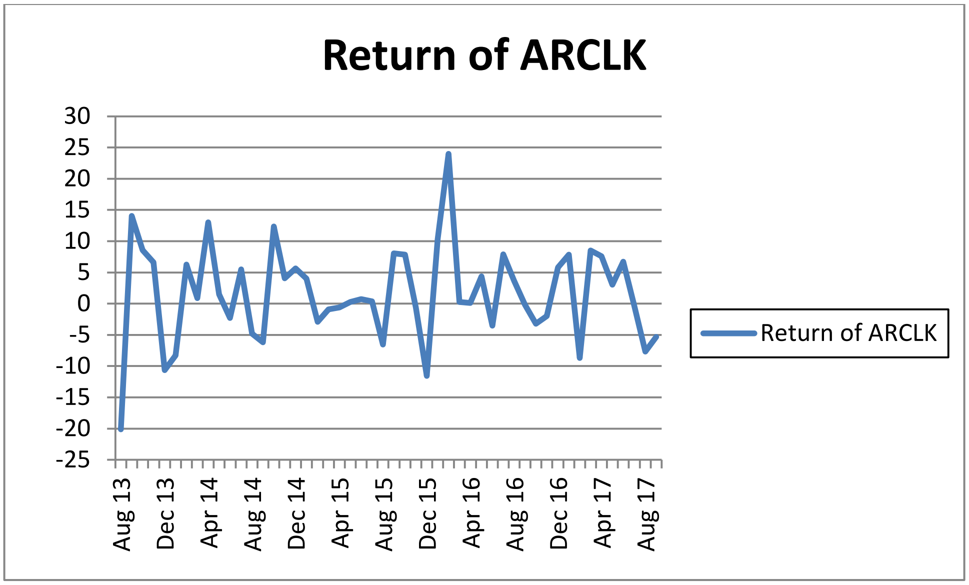
Month	Return of BIST 100	Month	BIST100 return	Month	BIST100 return	Month	BIST100 return	Month	BIST100 return
Aug 13	-9.52	Jun 14	-1.01	Apr 15	3.84	Feb 16	3.18	Dec 16	5.60
Sep 13	12.19	Jul 14	4.67	May 15	-1.15	Mar 16	9.83	Jan 17	10.44
Oct 13	4.21	Aug 14	-2.24	Jun 15	-0.88	Apr 16	2.47	Feb 17	1.37
Nov 13	-2.41	Sep 14	-6.69	Jul 15	-2.84	May 16	-8.82	Mar 17	1.68
Dec 13	-10.49	Oct 14	7.53	Aug 15	-5.88	Jun 16	-1.27	Apr 17	6.42
Jan 14	-8.77	Nov 14	6.94	Sep 15	-1.34	Jul 16	-1.84	May 17	3.05
Feb 14	1.12	Dec 14	-0.52	Oct 15	7.01	Aug 16	0.75	Jun 17	2.97
Mar 14	11.48	Jan 15	3.76	Nov 15	-5.26	Sep 16	0.69	Jul 17	7.06
Apr 14	5.93	Feb 15	-5.39	Dec 15	-4.66	Oct 16	2.68	Aug 17	2.31
May 14	7.33	Mar 15	-3.92	Jan 16	2.45	Nov 16	-5.78	Sep 17	-6.46

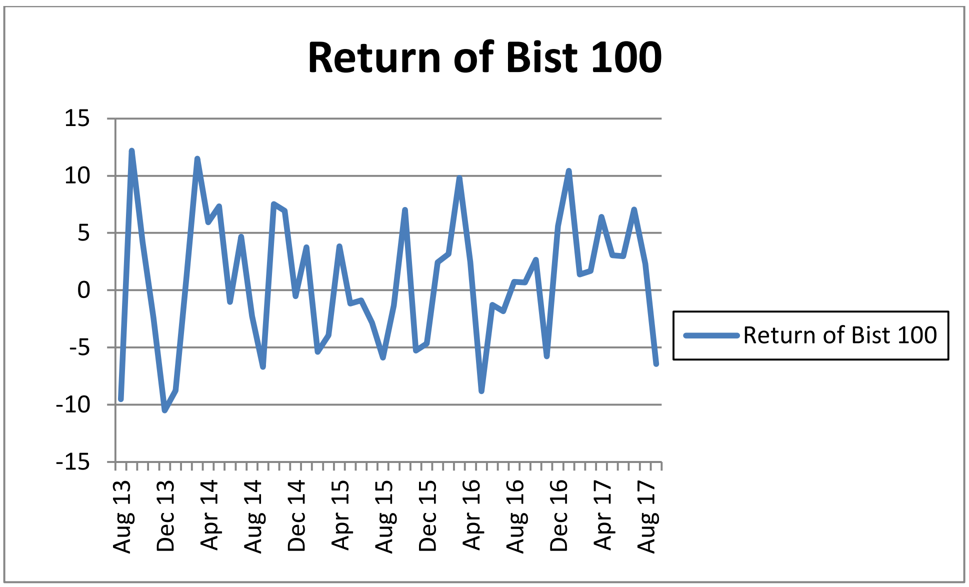
- Return of BIST 100 index monthly (50 observations):

*Data is given in percentages (%). *Time period: August 2013 – September 2017.

Month	Return of ARCLK	Month	ARCLK return	Month	ARCLK return	Month	ARCLK return	Month	ARCLK return
Aug 13	-20.14	Jun 14	-2.31	Apr 15	-0.58	Feb 16	23.98	Dec 16	5.80
Sep 13	14.04	Jul 14	5.48	May 15	0.29	Mar 16	0.27	Jan 17	7.86
Oct 13	8.56	Aug 14	-4.80	Jun 15	0.73	Apr 16	0.11	Feb 17	-8.68
Nov 13	6.64	Sep 14	-6.21	Jul 15	0.36	May 16	4.38	Mar 17	8.52
Dec 13	-10.63	Oct 14	12.35	Aug 15	-6.54	Jun 16	-3.51	Apr 17	7.58
Jan 14	-8.27	Nov 14	4.06	Sep 15	8.08	Jul 16	7.88	May 17	3.04
Feb 14	6.28	Dec 14	5.67	Oct 15	7.83	Aug 16	3.63	Jun 17	6.72
Mar 14	0.86	Jan 15	3.99	Nov 15	-0.66	Sep 16	-0.19	Jul 17	-0.23
Apr 14	13.04	Feb 15	-2.93	Dec 15	-11.56	Oct 16	-3.21	Aug 17	-7.69
May 14	1.51	Mar 15	-0.93	Jan 16	10.29	Nov 16	-1.96	Sep 17	-5.33

8. Plot the returns for both BIST return and equity return of your choice.





9. Report the mean, standard deviation (SD), coefficient variations (SD/mean) of two returns.

	Mean	SD	CV
ARCLK return	1,67	1,09	0,653 (65,3%)
BIST 100 return	0,84	0,81	0,970 (97,0%)

10. What do you observe? Write. Which mean is larger? Which SD is larger? Which Coefficient of Variation is larger? What do you think their reasons?

As seen above, both the <u>mean</u> and the <u>standard deviation</u> of ARCLK are larger than those of the BIST 100, however <u>coefficient of variation</u> of BIST 100 is larger than ARCLK's.

In other words, even though in the sample <u>expected return</u> of ARCLK equity and <u>expected difference from the average return</u> are greater than those of BIST 100, it has higher <u>variability</u> than

ARCLK equity. So, BIST 100 has higher risk in its return than ARCLK equity in relative terms. Moreover, it means that no matter what the raw numbers of standard deviation are, if to check the percentage variability in both returns the difference for comparison is seen (to decide in which one to invest depending on being risk taker or risk avoider/hater).

The reason for BIST 100 to have lower expected return and lower expected deviation from the average is that it has many firms included in it (100), and ARCLK has relatively higher return than an average firm. Similarly, due to the large number of firms in BIST 100, it has higher variability than ARCLK equity.