Econ 301-03 Assignment #4 (Prof. Hakan Berument)

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Brief Report

analyzing the effects of Lead prices and August effect on Arçelik A. Ş.'s return.

Two other factors influencing the return of Arçelik A. Ş. firm besides the return of BIST100 index that could be gathered are the percentage change in Lead Futures prices and the August effect. Since lead is one of the metals used widely as an input in the production of household appliances, it affects the profitability of the firm and thus its stock returns. Another factor, August effect, as seen in the sample data has the most explanatory power on ARCLK return among all other months' effects. Having negative effect on the return of the equity, the reason for August month to have some influence may be that the demand for household appliances or Arçelik A. Ş.'s products decreases towards the end of the summer. In order to check and verify the particular effects that are present in such model, the regression analysis and various hypotheses testing have to be done.

The primary concern is to determine whether the overall model truly influences the return of ARCLK equity, i. e. to check if there is any relationship at all between the returns of Arçelik A. Ş. and variables such as the return of BIST100 index, percentage change in Lead Futures prices and the August effect. After performing the hypothesis testing for the significance of the model[1], it may be seen that having no relationship gets disproved with 5% acceptable error amount. Thus, in this model the above mentioned variables are assumed to have some effects on the ARCLK return.

Furthermore, it is important to check separately the effect of percentage change in Lead Futures prices on the firm return. The hypothesis testing conducted shows that lead prices fail to explain the ARCLK return at 5% significance level, however at the level of 5.5% or more the relationship can be proved. In addition, several other tests conducted to show the one-to-one relationship between the lead prices and the firm's return, i. e. for ARCLK equity to have the same increase or decrease in return as lead prices do, demonstrate that there is no one-to-one relationship and that lead prices have negative effect on ARCLK return.

Finally, checking whether the August effect[2] on ARCLK stock return holds is very essential. After performing the hypothesis testing, it can be seen that it truly affects the return of Arçelik A. Ş. Another test showed that the August effect has negative influence on the firm's return. Therefore, August effect is assumed to negatively impact the firm return.

In conclusion, according to all hypotheses testing performed, three main assumed conclusions drawn are that the overall model is significant, there is an effect of the percentage change in Lead Futures prices (with a negative effect) on the return of Arçelik A. Ş. firm proved at 5.5% acceptable error amount and August month negatively affects the ARCLK return.

[1] F-test here, but all subsequent hypotheses are done with t-test. The hypotheses testing are reported in the Appendix in the same order.

[2] It is a binary (dummy) variable.

Appendix

> Eviews output of the estimated equation of firm's return (ARCLK share), which is ARCLK Return = $\beta_1 + \beta_2$ BIST100 Return $+\gamma_3$ ln(LeadFuturesPrices) $+ \gamma_4$ AugustEffect + u, is given below[3].

[return_of_arclk = c(1) + c(2)*return_of_bist_100 + c(3) * log (lead) + c(4)*aug_effect]

Dependent Variable: RETURN_OF_ARCLK
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 11/21/17 Time: 16:08
Sample: 2013M08 2017M09
Included observations: 50
RETURN_OF_ARCLK = C(1) + C(2)*RETURN_OF_BIST_100
+ C(3)*LOG(LEAD)+ C(4)*AUG_EFFECT

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	111.1013	55.43005	2.004351	0.0509
C(2)	0.760105	0.151980	5.001346	0.0000
C(3)	-14.39776	7.297879	-1.972870	0.0545
C(4)	-6.053587	2.825093	-2.142792	0.0375

R-squared	0.458709	Mean dependent var	1.668680
Adjusted R-squared	0.423408	S.D. dependent var	7.623437
S.E. of regression	5.788754	Akaike info criterion	6.426330
Sum squared resid	1541.445	Schwarz criterion	6.579292
Log likelihood	-156.6582	Hannan-Quinn criter.	6.484578
F-statistic	12.99403	Durbin-Watson stat	2.528116
Prob(F-statistic)	0.000003		

> Various hypotheses testing for the above estimated equation (α=5%, if not otherwise mentioned).

Degrees of freedom (df) = n - k = n - 2 = 48 (for t-test).

* Testing the significance of the overall model:

1. H_0: $\beta_2 = \gamma_3 = \gamma_4 = 0$.
   H_A: Not H_0.

Model	SSR	n	k	df=n-k
Restricted	2847,722	50	1	49
Unrestricted	1541,445	50	4	46

[3] Monthly observations of time period between August 2013 and September 2017 were collected.

$$F = \frac{(\ 2847{,}722\ -\ 1541{,}445\ )\ /\ (\ 49\ -\ 46\ )}{1541{,}445\ /\ 46}$$

$$F = \boxed{12{,}99402876}$$

F-critical = $F_{3,\ 46,\ 0.05}$ ~= 2.84.

Since F-statistic = 12,994 > F-critical = 2.84, the null hypothesis is rejected.

* <u>For</u> γ_3:

2. H_0: $\gamma_3 = 0$.
   H_A: $\gamma_3 \neq 0$.

Test statistic = t = (-14.39776 - 0) / 7.297879 = -1.972870.

Critical value = $t_{48,\ 0.025}$ =~ 2.00.

Since | t | = 1.972870 is not > t-critical = 2.00, fail to reject the null hypothesis at α=5%.

However, p-value = 0.0545, as seen in the table above. So, the null hypothesis can be rejected at significance level (α) of 5.5% or more.

3. H_0: $\gamma_3 = 1$.
   H_A: $\gamma_3 \neq 1$.

Test statistic = t = (-14.39776 - 1) / 7.297879 = -2.1099.

Critical value = $t_{48,\ 0.025}$ =~ 2.00.

Since t-stat = | t | = 2.1099 > t-critical = 2.00, the null hypothesis is rejected.

4. H_0: $\gamma_3 = 0$.
   H_A: $\gamma_3 < 0$.

Test statistic = t = (-14.39776 - 0) / 7.297879 = -1.972870.

Critical value = $t_{48,\ 0.05}$ =~ 1.67.

Since t-stat = -1.972870 < -t-critical = -1.67, the null hypothesis is rejected.

* <u>For</u> γ_4:

5. Checking whether the model with an August effect is the same without it:

$\beta_1 + \beta_2$ BIST100 Return + γ_3 ln(LeadFuturesPrices) + γ_4*1 + u =
= $\beta_1 + \beta_2$ BIST100 Return + γ_3 ln(LeadFuturesPrices) + γ_4 *0 + u

$\gamma_4 * 1 + u = \gamma_4 * 0 + u$

$\gamma_4 = 0$

Hypothesis testing:

H_0: $\gamma_4 = 0$.

H_A: $\gamma_4 \neq 0$.

Test statistic = t = (-6.053587 - 0) / 2.825093 = -2.142792.

Critical value = $t_{48,\ 0.025}$ =~ 2.00.

Since t-stat = | t | = 2.142792 > t-critical = 2.00, the null hypothesis is rejected.

6. H_0: $\gamma_4 = 0$.
   H_A: $\gamma_4 < 0$.

Test statistic = t = (-6.053587 - 0) / 2.825093 = -2.142792.

Critical value = $t_{48,\ 0.05}$ =~ 1.67.

Since t-stat = -2.142792 < -t-critical = -1.67, the null hypothesis is rejected.

References.

1. www.investing.com was used for data collection of ARCLK, BIST100 and Lead Futures monthly prices.
2. The Eviews program was used to reveal the output of regression analysis.