

Question 1

1) SGD c D(USD)

Dependent Variable: SGD

Method: Least Squares

Date: 01/30/19 Time: 19:56

Sample (adjusted): 2000M11 2018M12

Included observations: 218 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.791936	0.014737	121.5963	0.0000
D(USD)	0.729126	0.407924	1.787406	0.0753
R-squared	0.014575	Mean dependent var	1.792951	
Adjusted R-squared	0.010013	S.D. dependent var	0.218521	
S.E. of regression	0.217424	Akaike info criterion	-0.204800	
Sum squared resid	10.21104	Schwarz criterion	-0.173749	
Log likelihood	24.32317	Hannan-Quinn criter.	-0.192258	
F-statistic	3.194821	Durbin-Watson stat	0.025756	
Prob(F-statistic)	0.075274			

Conclusion: We noticed that there is a positive autocorrelation between sgd and d(usd) as the DW value is 0.025.

2) D(SGD) c D(USD)

Dependent Variable: D(SGD)

Method: Least Squares

Date: 01/30/19 Time: 19:53

Sample (adjusted): 2000M11 2018M12

Included observations: 218 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000835	0.001453	-0.574769	0.5660
D(USD)	0.865191	0.040209	21.51710	0.0000
R-squared	0.681878	Mean dependent var	0.000369	
Adjusted R-squared	0.680406	S.D. dependent var	0.037910	
S.E. of regression	0.021432	Akaike info criterion	-4.838757	
Sum squared resid	0.099213	Schwarz criterion	-4.807707	
Log likelihood	529.4245	Hannan-Quinn criter.	-4.826215	
F-statistic	462.9856	Durbin-Watson stat	2.124222	
Prob(F-statistic)	0.000000			

We noticed that there is no auto correlation between D(SGD) and D(USD) as DW is 2.12. Meanwhile, the sum of residuals is significantly reduced.

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3) Dlog(SGD) c dlog(USD)

Dependent Variable: DLOG(SGD)

Method: Least Squares

Date: 01/30/19 Time: 19:51

Sample (adjusted): 2000M11 2018M12

Included observations: 218 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000605	0.000792	-0.764365	0.4455
DLOG(USD)	0.600746	0.027417	21.91149	0.0000
R-squared	0.689706	Mean dependent var		0.000243
Adjusted R-squared	0.688269	S.D. dependent var		0.020912
S.E. of regression	0.011676	Akaike info criterion		-6.053485
Sum squared resid	0.029445	Schwarz criterion		-6.022435
Log likelihood	661.8299	Hannan-Quinn criter.		-6.040944
F-statistic	480.1135	Durbin-Watson stat		2.095053
Prob(F-statistic)	0.000000			

Further more, we use log to reduce the effect of inflation and residue. The DW value is more close to 2 and the sum squared residual is smaller

Question 2

Dependent Variable: SALES

Method: Least Squares

Date: 01/30/19 Time: 20:42

Sample (adjusted): 2001Q2 2006Q4













































Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	321.5894	23.16515	13.88246	0.0000
D(SALES)	0.419576	0.080892	5.186883	0.0001
PROM	3.612308	0.757381	4.769476	0.0002
ADV(-1)	3.222453	0.737244	4.370947	0.0004
D(INDEX)	-11.50961	5.572691	-2.065360	0.0536
R-squared	0.846749	Mean dependent var		453.3652
Adjusted R-squared	0.812693	S.D. dependent var		134.3372
S.E. of regression	58.13972	Akaike info criterion		11.15324
Sum squared resid	60844.08	Schwarz criterion		11.40008
Log likelihood	-123.2622	Hannan-Quinn criter.		11.21532
F-statistic	24.86362	Durbin-Watson stat		1.691350
Prob(F-statistic)	0.000000			

Substituted Coefficients:

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SALES = 321.589432269 + 0.41957580808*D(SALES) + 3.61230785433*PROM + 3.22245267929*ADV(-1) - 11.5096116494*D(INDEX)

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*
		1 0.148	0.148	0.5720	0.449
		2 0.099	0.079	0.8391	0.657
		3 -0.048	-0.075	0.9060	0.824
		4 0.178	0.194	1.8645	0.761
		5 0.081	0.041	2.0757	0.839
		6 -0.088	-0.155	2.3402	0.886
		7 -0.188	-0.149	3.6125	0.823
		8 0.022	0.081	3.6317	0.889
		9 -0.316	-0.382	7.7316	0.561
		10 -0.227	-0.169	10.017	0.439
		11 -0.197	0.014	11.875	0.373
		12 -0.000	-0.018	11.875	0.456
		13 0.144	0.241	13.075	0.442
		14 -0.095	-0.028	13.646	0.476
		15 -0.072	-0.076	14.023	0.524
		16 -0.045	-0.145	14.188	0.585
		17 0.054	-0.053	14.467	0.634
		18 0.046	-0.135	14.712	0.682
		19 0.027	-0.026	14.817	0.734
		20 -0.020	-0.027	14.890	0.783
		21 -0.002	-0.106	14.891	0.828
		22 -0.002	0.187	14.893	0.867

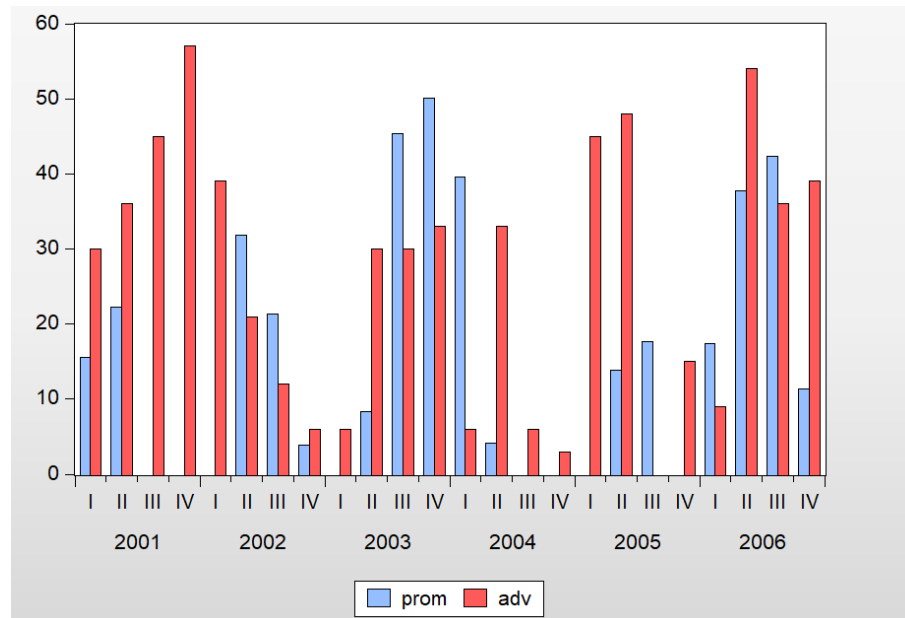
1) One thousand dollars spending

Based on equation above, Both Promotion and Advertisement will have 3 times effect to sales but promotion is slightly bigger than advertisement, and advertisement have lag effect. One thousand dollars for promotion will have 3600 dollars sales and one thousand dollars for advertisement will have 3200 dollars sales.

2) Sales VS counter-cyclic

Based on the equation above, $d(\text{index})$ p-value is 5%, which indicates that there is a negative correlation between index and sales. In conclusion, there is a “counter-cyclical” effect.

3) Promotion VS Advertisement



Based on graph above, there are some quarters that both promotion and advertisement are existing. Therefore, the policy is not followed strictly.

4) Seasonal effect

No. There is no significant seasonal effect. We have tried with sales(-4), but the result is not very good.

Dependent Variable: SALES

Method: Least Squares

Date: 01/30/19 Time: 21:04

Sample (adjusted): 2002Q1 2006Q4

Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	515.8811	117.0145	4.408693	0.0003
SALES(-4)	-0.144475	0.253507	-0.569906	0.5758
R-squared	0.017724	Mean dependent var		451.7250
Adjusted R-squared	-0.036847	S.D. dependent var		140.2468
S.E. of regression	142.8073	Akaike info criterion		12.85551
Sum squared resid	367090.5	Schwarz criterion		12.95508
Log likelihood	-126.5551	Hannan-Quinn criter.		12.87495
F-statistic	0.324793	Durbin-Watson stat		1.325368
Prob(F-statistic)	0.575786			