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REPLICATION OF SLOAN EXPERIMENT

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March, 2014

1 CONTENTS

2 INTRODUCTION

The accrual anomaly was defined in Sloan's research paper in 1996. His key finding was that the investors are not fully taking into account the different properties of the accrual and cash flow components in the earnings. The cash flow component is more persistent than accruals. Since accruals will reverse in the future periods, their relative weight of the earnings can be used as a measure for earnings quality: the higher proportion of earnings from accruals the lower the earnings quality. (Sloan 1996).

The objective of this term paper is to reproduce the main results of the Sloan (1996) accrual anomaly related study. The data used in the empirical study is the Compustat data from the years between 1970 and 2012. The SAS program is used to perform the statistical analysis.

There has been an extensive amount of research done on accruals, since Sloan (1996) published his results on accruals anomaly. The Sloan experiment has been successfully replicated - repeatedly. The accrual anomaly is found to provide robust tool for evaluating the earnings quality, and identifying earnings management. Additionally, the accrual anomaly continues to provide useful tools for the sophisticated investors to earn abnormal stock returns. Brief review of the relevant research is presented in the chapter two.

The Sloan method and hypothesis to be reproduced are presented in more details in chapter three. The first hypothesis is that accruals are less persistent component of earnings than cash flow component. The second hypothesis is that abnormal stock returns can be earned by exploiting the investors' inability to distinguish correctly between accrual and cash flow components of earnings.

The analyzed results of the Sloan experiment replication are presented in chapters four and five. The Sloan finding that the accruals is less persistent component of the earnings is confirmed both with the descriptive data and the regression analysis. It is also confirmed, that it is possible to earn abnormal returns with the accruals based hedge portfolio. Thus, both of the hypothesis are supported.

3 BACKGROUND AND RELATED RESEARCH

Sloan (1996) studied and developed theory which is thereafter called accrual anomaly. It was the first study assessing the magnitude of predictable stock returns based on naïve earnings expectations model. He corroborated that earnings are mean reverting and thus future earnings can be predicted from current ones. He also proved that different components of earnings, accruals and cash flow, have different characteristics and thus different affect to future earnings. However, market pricing of stocks is based on earnings as whole. This investors' fixation to earnings is called naïve earnings expectation model. Due to different persistence of accrual and cash components of earnings is not taken account in market pricing, it enables gaining abnormal stock returns by exploiting the mispricing. Trading strategy to utilize mispricing comprise from taking long position in the stock of firms having low accruals and short position in the stock of firms having high accruals. Because financial statement reporting corrects the mispricing, those abnormal returns occur mainly around financial statement announcements. (Sloan 1996.)

Since 1996 when Sloan published his research relating to the accruals anomaly and its´ capability to predict future earnings, it could be assumed that the investors would try to take advantage of it leading to disappearance of the accruals anomaly. Even though the accrual anomaly is widely known among investors it is not arbitraged away.

There has been an extensive amount of research done on accruals, since Sloan (1996) published his results on accruals anomaly. The Sloan experiment has been successfully replicated repeatedly, as we are to do in our term paper. The research has tried to evaluate geographical and industry level differences in acrrual anomaly. There have been studies to evaluate whether analysts, auditors and sophisticated investors fully utilize the accrual anomaly. There have been attempts to find broader definitions for accruals, and research papers to analyze the relative importance of the accrual components. Interestingly, Sloan himself continues to actively participate and contribute in several of the further research studies in this area. (Dechow, Khimich & Sloan 2011.)

The research shows there is variation in the strength of the accrual anomaly between countries and industries. According to Dechow et al. (2011), the accrual strategy is found to produce positive hedge returns in 85% of the researched countries. However, the accrual anomaly is stronger in common law countries compared to the civil law countries. Chan, Chan, Jekadeesh and Lakonishok (2006) find that the accrual anomaly varies between industries, and tends to be higher in industries requiring higher working capital.

Study by Lev and Nissim shows that institutional investors do react to the information of accrual levels. Institutional investors tend to have long position in low-accrual and short position in high-accrual levels. The reason why accrual anomaly still exists according to Lev and Nissim study is that the trading based on the accruals is relatively small which prevents accrual anomaly to vanish. The reasons behind the low trading volume can be found in the characteristics of high accrual firms such as small size which may cause liquidity concerns and thereby not meeting the requirements of potential investment added to the portfolio. (Lev & Nissim 2006.)

Hafzalla, Lundholm and Van Winkle (2011) claim the scaling of accruals by the firm total assets automatically results that only relatively small sizes of firms can have high level of accruals. It can be avoided by using net income as scaling factor, when focus is only on the composition of earnings. They notified that average market value of the firms in the first deciles was much bigger, which can result to smaller transaction costs. It also can successfully be applied to firms making losses. The measurement change leads to identify more extreme firms which also typically give higher abnormal returns than found with traditional accrual measure. (Hafzalla, Lundholm and Van Winkle 2011.)

Other reasons for the existence of accrual anomaly are lack of close substitutes and transaction costs. For example the accrual anomaly is related to the shares that have low prices and low trading volume. The conclusion is that accrual anomaly trading strategy would be more profitable in shares with low prices and low trading volume but the transaction cost related to them prevents taking advantage of the anomaly. (Mashruwala, Rajgopal & Shevlin 2006.)

Further investigation of the accrual anomaly has showed us that one of the main reasons explaining firm's abnormal returns is related to the inventory change. Thomas and Zhang (2002) introduce that firms with inventory increases face higher profitability and stock return performance in the past but in the future the reversals occur after the extreme inventory change. (Thomas & Zhang 2002.)

Chan et al. (2006) find that accruals are driven by the changes in net working capital, they are partly associated with the changes in sales volumes. When sales rise, the required working capital, especially inventories and accounts receivable are increasing. When the sales is slowing, the managers may keep on building up the inventories and other working capital items based on inflated expectations. This will lead to unusually high accrual levels, and smoothen the earnings.

Thus, accruals are a leading indicators of the company's future prospects. Since the stock market is fixated on earnings, the stock return reacts to the accrual growth with delay. Chan et al. (2006) divide the accruals into discretionary and non-discretionary components. They find that the discretionary component has more predictive power in regards of the stock returns. The company with slowing growth may try to delay the publishing of the bad news by resorting to creative accounting practices or earnings management, thus increasing the discretionary accruals. These companies are found to report unusually high write-offs due to extraordinary items in the following years, as an attempt to correct the impacts of the earlier earnings management.

Richardson, Sloan, Soliman and Tuna (2005) expand the definition of the accruals to include changes in current net operating assets, noncurrent net operating assets and net financial assets. The hedge portfolio returns using this broader accrual definition were higher compared to the original Sloan accrual portfolio returns. The broader definition contains accountants' estimates of the long term future benefits, which are missing from the original Sloan (1996) definition.

4 METHODS

As target of the term paper was to reproduce the main results of the Sloan (1996) study, the methodology Sloan used was followed. The financial variables used in the term paper were accruals, earnings, cash flow from operations and returns. Data provided for the term paper was based on Compustat files from years 1970 to 2012. The data included stock returns (ret) which were computed beginning 8 months before the fiscal year end. So the return data is from similar period than Sloan (1996) used. Industry specific regressions were conducted on two-digit SIC code level. The future earnings were computed reversing earnings of previous five years.

The accrual component was computed as Sloan did in his study, here marked with the Compustat items:

$$Accruals=\frac{(\Delta ACT-\Delta CHE)-(\Delta LCT-\Delta DLC-\Delta TXP)-DP}{AT_{t-1}}$$

where ΔACT is change in total current assets, ΔCHE is change in cash and short term investments, ΔLCT is change in total current liabilities, ΔDLC is change in total debt in current liabilities, ΔTXP is change in income taxes payable, DP is depreciation and amortization and AT_{t-1} is total assets of previous year. Difference here to Sloan's original study is in the scaling factor; Sloan used average total assets of the same year, in the term paper instead of it previous year total assets was used. Similar definition of earnings was used as Sloan, operating income after depreciation (OIADP) and scaled also with previous year total assets. Cash flow component (CFO) was formed simply by deducting accruals from earnings.

First hypothesis tested was that accruals are less persistent component of earnings than cash flow component. The persistence of earnings performance was studied using equation:

$$EARN_{t+1}=\alpha_0+\alpha_1 EARN_t+\vartheta_{t+1}$$

Persistence was estimated both for pooled and industry level regressions. Robustness was studied using deciles rankings of the variables (earnings, accruals and cash flows). Median values for deciles were used in the analysis instead of means used by Sloan.

When earnings was divided to accruals and cash flow components the relation is

$$EARN_{t+1} = \gamma_0 + \gamma_1 ACC_t + \gamma_2 CFO_t + \vartheta_{t+1}$$

If hypothesis is valid, coefficient of accruals γ_1 should be smaller than coefficient of cash flow γ_2. Testing was done similarly than for earnings persistence.

The second hypothesis tested was that abnormal stock returns can be earned by exploiting the investors' inability to distinguish correctly between accrual and cash flow components of earnings. The deviation from market efficiency was measured by computing the returns of a trading strategy based on having long position of firms having low levels of accruals and having short position of firms having high levels of accruals. Firms were ranked on the magnitude of accrual component of earnings and assigned to deciles. Abnormal returns of the lowest and highest deciles were computed for each 40 years in the sample.

5 DATA (DESCRIPTIVE STATISTICS, CORRELATIONS)

5.1 Descriptive Statistics And Correlations

The table 1 shows descriptive statistics for the main variables used in the empirical analysis. The main variables are returns (ret), earnings (EARN), accruals (ACC) and operating cash flow (CFO). The sample size is 146 856 company years. There are large differences in the extreme values of all the main variables, but the standard deviation is still relatively small. This means that the values of most of the companies are rather close to the mean and median values. The table 2 shows the median values of the main variables for ten portfolios of firms ranked to deciles based on accruals. The table shows how the returns are growing as the earnings grow. However, this correlation is no longer true in the highest accruals deciles. The table 3 presents the Pearson correlation coefficients for the main variables. There are statistically significant correlations between the other variables but not between the accruals and returns. This is consistent with the finding from the table 2, and with Sloan findings as well. In the regression models, the earnings, accruals and cash flows are used.

Table 1. Descriptive statistics for the main variables.

Simple Statistics						
Variable	N	Mean	Std Dev	Median	Minimum	Maximum
ret	146856	0.15934	0.86016	0.04208	-0.99925	116.00000
EARN	146856	0.03617	0.96633	0.08362	-278.00000	181.39181
ACC	146856	-0.03089	1.09242	-0.03693	-242.00000	322.02924
CFO	146856	0.06706	0.61702	0.11453	-140.63743	70.04430

Table 2. Median values of main variables for ten portfolios of firms ranked to deciles based on accruals.

	Decile									
Variable	*Lowest*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Highest*
Return	-0,09	0,02	0,05	0,06	0,06	0,07	0,07	0,05	0,04	0,04
Earnings	-0,03	0,05	0,07	0,08	0,09	0,09	0,09	0,10	0,11	0,13
Accruals	-0,21	-0,12	-0,09	-0,06	-0,05	-0,03	-0,01	0,01	0,05	0,16
Cash Flow	0,19	0,17	0,16	0,14	0,13	0,12	0,10	0,09	0,06	-0,04

Table 3. Pearson correlation coefficients for the main variables

Pearson Correlation Coefficients, N = 146856
Prob > |r| under H0: Rho=0

	ret	EARN	ACC	CFO
ret	1.00000	0.02894	0.00608	0.03456
		<.0001	0.0198	<.0001
EARN	0.02894	1.00000	0.82721	0.10157
	<.0001		<.0001	<.0001
ACC	0.00608	0.82721	1.00000	-0.47497
	0.0198	<.0001		<.0001
CFO	0.03456	0.10157	-0.47497	1.00000
	<.0001	<.0001	<.0001	

5.2 Time-series properties of earnings, accruals and cash flows

Sloan (1996) found that earnings and cash flows are more persistent than accruals. The time-series figures created using the Compustat data sample are consistent with the Sloan finding: the accruals are almost completely reversed wihin 5 years. In figures 1-3 the median earnings are used for the y-axis to eliminate the impact of the highly dispersed extreme values. Sloan used mean earnings in his research.

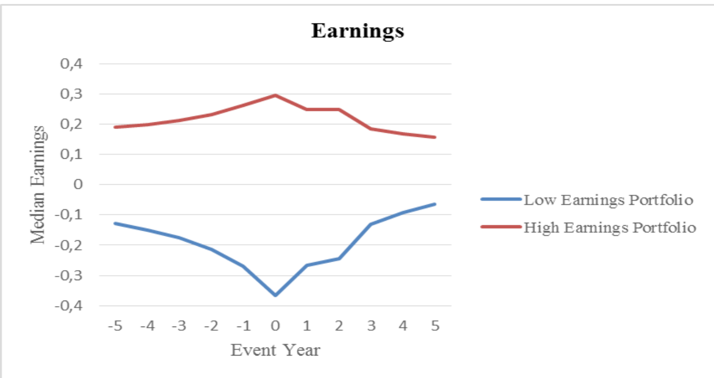

Figure 1. Earnings portfolio.

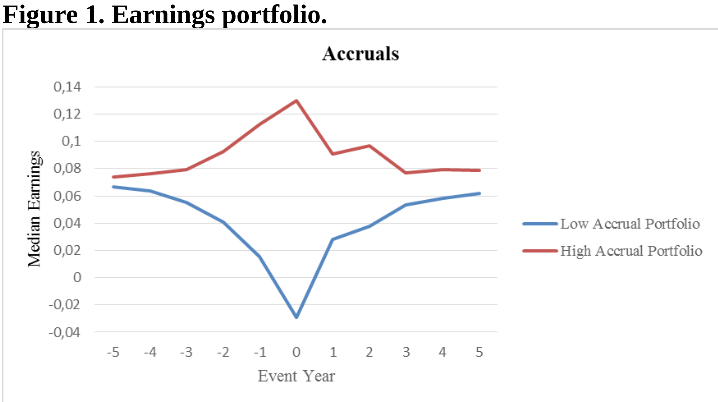

Figure 2. Accrual portfolio.

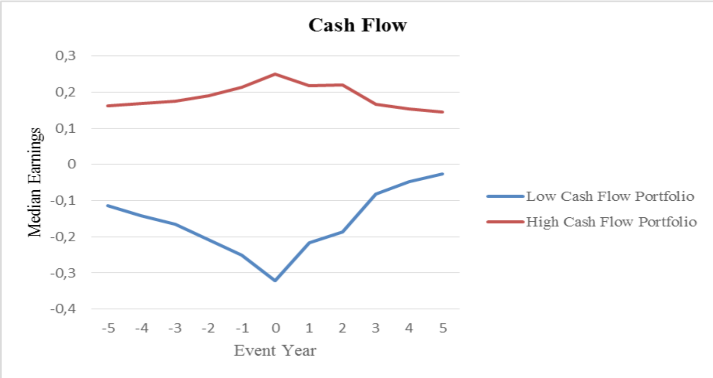

Figure 3. Time-series properties cash flows.

5.3 Accrual Strategy Portfolio Returns

The figure 4 replicates the Sloan (1996) test with the Compustat empirical data, and presents the returns by calendar year to a hedge portfolio taking a long position in the stock of firms in the lowest decile and an equal-sized short position in the stock of firms in the highest decile of the accruals. Sloan finds that the annual returns of such portfolio on the first year after portfolio formation are 10,4%. In our sample, the average annual portfolio return for years 1970-2010 is lower, 5,5%. In recent years the portfolio strategy exploiting accrual anomaly still produced quite strong abnormal returns.

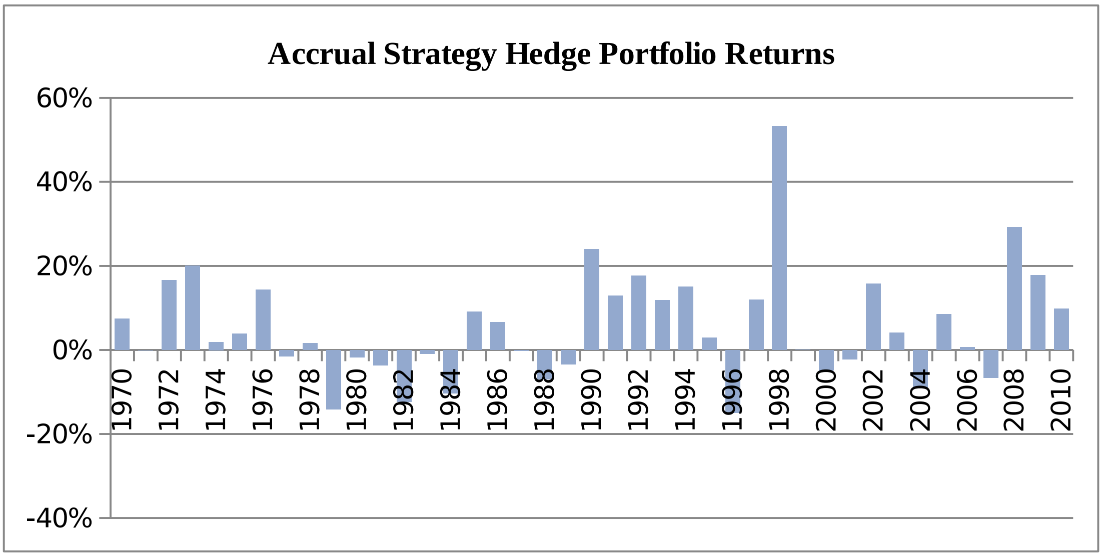

Figure 4. Accrual Strategy Portfolio Returns.

6 EMPIRICAL RESULTS (REGRESSION RESULTS)

In table 4 and 5 we provide evidence that is consistent with the findings of Sloan (1996) and supporting H1. In table 4 we perform regression results of how future earnings are dependent upon current earnings. Furthermore in table 5 we divide current earnings into two subcomponents of accruals and cash flows and deliver empirical evidence of how future earnings are more dependent upon cash flow component.

Table 4. Regression results of future earnings on current earnings

Parameter Estimates								
						Heteroscedasticity Consistent		
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	1	0.02009	0.00156	12.88	<.0001	0.00269	7.47	<.0001
EARN	1	0.53211	0.00482	110.31	<.0001	0.03976	13.38	<.0001

The MEANS Procedure

Variable	Label	N	Mean	25th Pctl	Median	75th Pctl	t Value	Pr > |t|
Intercept	Intercept	66	-0.0019066	0.0044925	0.0177283	0.0270286	-0.11	0.9111
EARN		66	0.6157795	0.5358304	0.6633736	0.7721233	20.49	<.0001
ADJRSQ	Adjusted r-squared	65	0.4340241	0.3276694	0.4650342	0.5837617	15.03	<.0001

Table 4 results illustrate that earnings are reverting towards to the mean. The parameter estimate of α_1 earnings has been 0.532 and the T-values implicate that the current earnings have explanatory value for future earnings. Sample consists of 66 industries classified by 2-digit SIC-codes where financial sector has been excluded. Regression results using the mean procedures we find that the mean value for earnings has been 0.616 while the range between 25th pctl and 75th pctl has varied between 0.536 – 0.772 and finding that the earnings are reverting and approaching to the median.

In table 5 the current earnings is divided into its´ subcomponents of accruals and cash flows from operations.

Table 5. Regression results of future earnings on accruals and cash flows of current earnings

Parameter Estimates								
						Heteroscedasticity Consistent		
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standard Error	t Value	Pr > |t|
Intercept	1	0.01859	0.00157	11.84	<.0001	0.00282	6.58	<.0001
ACC	1	0.49582	0.00652	76.06	<.0001	0.04845	10.23	<.0001
CFO	1	0.53834	0.00488	110.30	<.0001	0.04018	13.40	<.0001

The MEANS Procedure

Variable	Label	N	Mean	25th Pctl	Median	75th Pctl	t Value	Pr > |t|
Intercept	Intercept	66	0.0013968	-0.0023907	0.0123458	0.0230575	0.14	0.8876
ACC		66	0.6165700	0.5191567	0.6211344	0.7382588	7.04	<.0001
CFO		66	0.6545304	0.5857661	0.7306972	0.8243497	7.79	<.0001
ADJRSQ	Adjusted r-squared	65	0.4627540	0.3545982	0.4840552	0.5923954	17.17	<.0001

The pooled regression parameter estimate for accruals γ_1 and cash flows γ_2 has been 0.496 and 0.538 respectively. Furthermore the mean procedure table presents us that the level of coefficients for accruals are consistently lower than for cash flows. We can see that the range between 25th pctl and 75th pctl for accruals has been 0.519 – 0.738 and for cash flows it has been 0.586 – 0,824. The p-values for the regressions have been statistically highly significant and implicating that the results of the regression has explanatory of how future earnings´ dependent upon current earnings subcomponents accruals and cash flows.

Previous results deliver us empirical evidence supporting Sloan´s (1996) findings that future earnings performance is more dependent on cash flow component than accrual component of current earnings. Coefficients of the earnings components are closer to each other than in study of Sloan.

7 CONCLUSIONS

The objective of this term paper was to reproduce the main results of the Sloan (1996) accrual anomaly related study. The data used in the empirical study was the Compustat data from the years between 1970 and 2012. The research sample included 146 856 company years covering 66 different industries. The SAS program was used to perform the statistical analysis.

The relevant research findings were summarized in chapter two. The method used in the empirical part and the variables used in the analysis were explained in the chapter 3. The main difference to the original Sloan method was, that median earnings were used instead of mean values used by Sloan. The first hypothesis was that accruals are less persistent component of earnings than cash flow component. The second hypothesis was that abnormal stock returns can be earned by exploiting the investors' inability to distinguish correctly between accrual and cash flow components of earnings.

In the chapter 4 and 5 the analyzed results of the empirical study were presented, starting with the descriptive statistics and correlation analysis for the main variables. The time-series analysis of the earnings, accruals and cash flows confirmed the Sloan finding that accruals are less persistent than cash flows. The mean reversion characteristic of the earnings components were confirmed both by the time-series and the regression analysis. Thus, the first hypothesis is supported which is consistent with Sloan findings.

The results of the accrual strategy portfolio returns for the years 1970-2012 were found to be on average 5,5%. Thus, the second hypothesis is confirmed. However, the portfolio returns were much lower compared to Sloan's finding 10,4%. The earnings component coefficients for accruals γ_1 and cash flows γ_2 based on the empirical data were found to be both lower, and their difference smaller compared to Sloan's research. This may explain the lower portfolio returns. The high portfolio returns from the very recent years prove that the accruals anomaly is alive and well.

8 APPENDIX CONTAINING THE SAS CODE

```
libname mydata 'C:\Users\hkorkala\Desktop';
data sloan;
set mydata.sloan;
run;
*proc contents;
proc sort data=sloan;
  by firm year;
data aaa;
set sloan;
 * 2-digit SIC code;
 sic2=int(sic/100);
  if TXP=. then TXP=0;
 if CHE=. then CHE=0;
 if DLC=. then DLC=0;
  * delete financial sector;
  if sic=>6000 and sic=<6999 then delete;
  * scaling variable;
  scale=lag(AT); if scale=0 then scale=.;
  if firm^=lag(firm) then scale=.;
  * Sloan (1996) definition of accruals;
  ACC=(dif(ACT)-dif(CHE)-
  (dif(LCT)-dif(DLC)-dif(TXP))-DP)/scale;
  * accruals based on the statement of CF;
  *ACC=(IBC-OANCF)/scale;
  EARN=OIADP/scale;
  CFO=EARN-ACC;
  * t-1 variable;
  lagEARN=lag(EARN);
  if firm^=lag(firm) then lagEARN=.;
  * t-2 variable;
  lag2EARN=lag2(EARN);
  if firm^=lag2(firm) then lag2EARN=.;
  * t-3 variable;
  lag3EARN=lag3(EARN);
  if firm^=lag3(firm) then lag3EARN=.;
  * t-4 variable;
  lag4EARN=lag4(EARN);
  if firm^=lag4(firm) then lag4EARN=.;
  * t-5 variable;
  lag5EARN=lag5(EARN);
  if firm^=lag5(firm) then lag5EARN=.;
  *  keep sic2 year firm conm ACC EARN CFO
  lagEARN lag2EARN lag3EARN
  lag4EARN lag5EARN ret;
  run;
  proc sort data=aaa;
```

```
  by firm descending year;
  run;
   data aaa;
  set aaa;
  * t+1 stock returns;
  fRET=lag(ret);
  if firm^=lag(firm) then fRET=.;
 * t+ 1 earnings;
  fEARN=lag(EARN);
  if firm^=lag(firm) then fEARN=.;
  * t+2 variable;
  f2EARN=lag(EARN);
  if firm^=lag2(firm) then f2EARN=.;
  * t+3 variable;
  f3EARN=lag3(EARN);
  if firm^=lag3(firm) then f3EARN=.;
  * t + 4 variable;
    f4EARN=lag4(EARN);
  if firm^=lag4(firm) then f4EARN=.;
 * t + 5 variable;
    f5EARN=lag5(EARN);
  if firm^=lag5(firm) then f5EARN=.;
  run;
  proc sort data=aaa;
  by firm year;
  run;
  data bbb;
  set aaa;
  * delete missing observations;
  if EARN=. then delete;
  if ACC=. then delete;
  if ret=. then delete;
if CFO=. then delete;
run;
*descriptive statistics;
proc means n mean std median data=bbb;
title ‘descriptive statistics’;
var ret EARN ACC CFO;
run;
 proc corr data=bbb pearson;
title ‘Pearson correlations’;
var ret EARN ACC CFO;
run;
data reg1;
set bbb;
run;
proc reg data=reg1; title 'pooled regressions';
model fEARN=EARN / white;
run;
proc sort data=reg1;
```

```
 by sic2;
proc reg data=reg1 noprint adjrsq
outest=reg_ind;
model fEARN=EARN;
 by sic2;
run;
proc means n mean p25 median p75 t prt
data=reg_ind;
var Intercept EARN _adjrsq_;
run;
data reg2;
set bbb;
run;
proc reg data=reg2; title 'pooled regressions table 3';
model fEARN=ACC CFO / white;
run;
proc sort data=reg2;
 by sic2;
proc reg data=reg2 noprint adjrsq
outest=reg_ind;
model fEARN=ACC CFO;
 by sic2;
run;
proc means n mean p25 median p75 t prt
data=reg_ind;
var Intercept ACC CFO _adjrsq_;
run;
  proc sort data=bbb;
  by year;
  run;
  * form the ranks (10 deciles by each year);
  proc rank data=bbb out=ccc groups=10;
  var EARN ACC CFO;
  by year;
  ranks rank_E rank_ACC rank_CFO;
  run;
  data ddd;
  set ccc;
 * ranking based on accruals;
 rank_var=rank_ACC+1;
*descriptive statistics for 10 deciles;
proc sort data=ddd;
by rank_var;
proc means n mean median data=ddd;
title 'mean and median values by deciles test';
  var ret EARN ACC CFO;
  by rank_var;
  run;
proc sort data=bbb;
  by year;
```

```
  run;
  * form the ranks (10 deciles by each year);
  proc rank data=bbb out=ccc groups=10;
  var EARN ACC CFO;
  by year;
  ranks rank_E rank_ACC rank_CFO;
  run;
  data ddd;
  set ccc;
  * we want to keep only the extreme 1 and 10 deciles;
 * ranking based on earnings;
* rank_var=rank_E+1;
 * ranking based on accruals;
 rank_var=rank_ACC+1;
 * ranking based on cash flows;
* rank_var=rank_CFO+1;
 if rank_var>1 and rank_var<10 then delete;
  run;
proc sort data=ddd;
  by rank_var;
proc means n mean median data=ddd;
title 'mean and median values by extreme deciles';
  var lag5EARN lag4EARN lag3EARN
  lag2EARN lagEARN EARN
  fEARN f2EARN f3EARN f4EARN f5EARN;
  by rank_var;
  output out=fig
  (drop=_type_ _freq_)
  median(lag5EARN)=l5
  median(lag4EARN)=l4
  median(lag3EARN)=l3
  median(lag2EARN)=l2
  median(lagEARN)=l1
  median(EARN)=t0
  median(fEARN)=f1
  median(f2EARN)=f2
  median(f3EARN)=f3
median(f4EARN)=f4
median(f5EARN)=f5;
  run;
  proc export data=fig replace
/*outfile='C:\Users\kkukkola\Desktop\fig_earn2.xlsx'; */
/* outfile='C:\Users\kkukkola\Desktop\fig_cfo2.xlsx'; */
 outfile='C:\Users\kkukkola\Desktop\fig_acc2.xlsx';
  run;
data hedge1;
set ccc;
* ranking based on accruals;
rank_var=rank_ACC+1;
if rank_var>1 and rank_var<10 then delete;
```

```
* what if future stock returns is missing?;
keep year firm fret rank_var;
run;
* computation of hedge portfolio returns;
proc sort data=hedge1;
 by year rank_var;
proc means mean data=hedge1 noprint;
 var fret;
 by year rank_var;
 output out=hedge2 (drop=_type_ _freq_)
 mean(fret)=mean_ret;
run;
data high low;
set hedge2;
if rank_var=1 then output low;
if rank_var=10 then output high;
run;
data high;
set high;
 high_fret=mean_ret;
 drop rank_var mean_ret;
data low;
set low;
 low_fret=mean_ret;
 drop rank_var mean_ret;
data hedge;
merge high low;
by year;
 hedge_ret=low_fret-high_fret;
 if year=2012 then delete;
 drop low_fret high_fret;
run;
 proc export data=hedge replace
 outfile='C:\Users\hkorkala\Desktop\fig3.xlsx';
 run;
```

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