FIN617:ANALYTICS IN FINANCE
M&A ANALYSIS USING SAS

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Table I. Distribution of Merger Announcements and Deal Protection Provisions

Panel A: Temporal Distribution of Target Firms

Year	Number of Deals	Public Acquirers	Private Acquirers
2010	216	146	70
2011	183	117	66
2012	162	102	60
2013	165	102	63
2014	172	135	37
2015	198	152	46
2016	190	128	62
Total	**1,286**	**882**	**404**

- Looking at the year-wise distribution of the target firms, it is seen that the no. of M&A deals is more or less evenly distributed across the period of 7 years.

- The highest no. of transactions have taken place in the year 2010 which was also a period of recession in US. Difficult economic conditions often lower the valuations and makes a greater number of companies open to sale. Hence, this could be a possible reason for the number of transactions to be reasonably higher in 2010.

- However, only those companies which are established, financially strong can be a beneficial buyer in these situations, as the slow-down of economic activity can also mean lack of financial resources, greater uncertainty, higher risk etc.

- Next, important observation from the above classification would be the Public or private acquisition of a firm. Most of the target firms have been acquired by the public acquirers.

- We see that majority, close to 70% of the deals are acquired by public companies. The reasons could the industry nature of the target firm (explained below) or because public acquirers offer a greater premium to shareholders when compared to the private firms. Since a private firm does not have publicly traded equity to offer in an acquisition, it is not surprising that most acquisitions by private firms are cash deals.

- To understand the difference in these numbers better let us look at different characteristics and variables of target firms in the below section.

/*For industry definitions please see https://www.osha.gov/data/sic-manual
For example, Division A constitutes SIC codes from 0111 to 0971*/

Panel B: Industry Wide Distribution of Target Firms

Industry	Number of Deals	Public Acquirers	Private Acquirers
Agriculture, Forestry, And Fishing	3	1	2
Mining	50	45	5
Construction	4	3	1
Manufacturing	476	352	124
Transportation, Communications, Electric, Gas, And Sanitary Services	123	86	37
Wholesale Trade	23	16	7
Retail Trade	75	31	44
Finance, Insurance, And Real Estate	251	203	48
Services	278	142	136
Public Administration	3	3	0
Total	**1286**	**882**	**404**

- An interesting insight from the deals belonging to Mining industry is that more than 90% of the acquisitions were by the public companies. Publicly traded companies are financially strong, and they have a capacity to offer more financial resources if needed. The same may not be the case with all the private players. Mining's capital-intensive nature of the industry makes this point clear.

- A similar pattern is also observed with Transportation, Communications, electric , gas industries, which are again capital intensive in nature.

- A quite opposite trend is seen when we look at the deals belonging to a Retail Industry. Usually, the acquirers are the ones who are very familiar about the competition, customer demographics and with a well-established brand identity. Sometime, the size of the operations is an added advantage to the buyer. Hence, in retail most of acquisitions happen to cut down the competition, acquire a larger/new group of customers-these acquisitions are usually the horizontal mergers. Ex: Walmart's acquisition of Flipkart.

  Sometimes, the buyer wants to use the power it has in terms of size and reach and hence, would look for a unique business opportunity to expand leading to a conglomerate merger- Ex: Amazon's acquisition of Whole Foods.

- It is also seen that majority of the deals belong to Manufacturing Industry. The manufacturing industries often need resources, materials, services coming from multiple players. The advancement of technology is bringing so many changes to the way things were operated before. It could be reducing the wastage, increasing awareness of ESG factors, new supplies and supplier sources becoming more accessible all leading to the manufacturing acquisitions that would enable the firm to attain better efficiency and economies of scale.

- According to PwC, Buyers in manufacturing will likely look to centralize all stages of design and production, meaning B2B technology and materials companies that were once partners with manufacturers may find themselves looking at an acquisition deal.

- Most of the mergers in the Manufacturing are the vertical mergers.

- Seeing good number of M&As-251 deals in Finance and Insurance industry should not be a surprise, as this is one industry where the M&A deals are always prominent. A good proportion of M&A deals in finance industry are from banks that file bankruptcy. Insurance companies usually find the deals that help them diversify and grow ahead of competitors.

Table II. Summary Statistics

	Full Sample			Public Acquirers			Private Acquirers		
Variable	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**	**N**	**Mean**	**Median**
Assets ($mn)	1,286	$3,149.70	$750.83	882	$3,636.10	$977.60	404	$2,087.60	$461.10
Sales Growth	1043	0.114	0.046	679	0.124	0.052	364	0.096	0.040
Debt-to-Assets	1283	0.224	0.157	879	0.221	0.156	404	0.230	0.160
Operating Income-Assets	1041	0.077	0.104	682	0.062	0.102	359	0.105	0.108
Herfindahl Index	1057	0.063	0.037	693	0.059	0.036	364	0.071	0.042
Market Cap ($mn)	1283	2212.738	473.227	879	2678.288	607.399	404	1199.821	303.354
Stock Volatility (%)	1,286	2.80%	2.58%	882	2.71%	2.51%	404	2.95%	2.74%
Transaction Value ($mn)	1286	$3,484.20	$771.89	882	$4,294.27	$957.06	404	$1,715.74	$498.30
Tobins Q	1266	1.793	1.349	865	1.892	1.394	401	1.578993	1.286
Tender Offer (0/1)	1286	0.232	0	882	0.240	0	404	0.213	0
Auction (0/1)	1286	0.241	0	882	0.217	0	404	0.295	0
Same Industry (Two Digit)	1,286	47.30%	0	882	60.88%	100%	404	17.57%	0
Same Industry (Three Digit)	1286	36.93%	0	882	48.30%	0	404	12.13%	0
Same Industry (Four Digit)	1286	24.10%	0	882	31.86%	0	404	71.78%	0
Inst. Ownership (%)	1281	72%	77%	877	73%	79%	404	69%	73%
Friendly Deal (0/1)	1286	0.882	1	882	0.900	1	404	0.842	1
Cash Payment (0/1)	1286	0.855	1	882	0.796	1	404	0.985	1
All Cash (0/1)	1286	0.641	1	882	0.497	0	404	0.955	1
Completed Deal (0/1)	1284	0.856	1	882	0.880	1	402	0.803	1
Price Revision (0/1)	1286	0.118	0	882	0.111	0	404	0.134	0
Offer Premium (%)	1,286	51.70%	34.87%	882	55.78%	35.38%	404	42.48%	34.60%
CAR[-1,+1] (%)	1,286	26.80%	22.32%	882	27.72%	23.30%	404	25.13%	19.58%
CAR[-2,+2] (%)	1,286	27.40%	22.97%	882	28.40%	24.30%	404	25.34%	20.29%
Run Up (%)	1,286	2.80%	1.65%	882	2.06%	1.15%	404	4.53%	2.66%
Resolution Period (Days)	1,284	135.61	105	882	144.33	117.5	402	116.5	86.5

- **Assets:** Looking at the mean value of assets of the target firms, public acquisitions have an average value of $3636 million dollars in assets whereas, Private acquirers have a value $2078 million dollars of assets. It can be interpreted that the public acquirers where more likely looking at the value of the company post-merger and private acquirers were more inclined to synergistic and capital gains when evaluating a bid.

- **Market Capitalization:** This is a parameter that helps us to determine the value of target firm in the market. Looking at the mean value again the target firms acquired by public firms is reasonably higher when compared to private. Also, the median value of $607 million dollars compared to private acquirer's median

of $303 million dollars tells us that public acquisitions had a higher number of outstanding shares and thus greater market cap value.

- **Stock Volatility** defines the changes in stock prices over a given period of time, also giving a hint on amount of risk that particular stock will involve. The average stock volatility is more or less same for both public and private acquisitions, which could be due to the competition factor and other factors that impacts all the players of the industry, irrespective of the nature of business.

- **Institutional Ownership** tells us about the amount of the stock owned by institutions in a target firm. Again, there is no big difference in the percentage of institutional ownership and as the values are little above 70% the target firms are almost having a good level of institutional ownership.

- **Offer Premium:** The average offer premium offered by public firms are significantly higher than premium offered by private firms, close to 12-13% . Acquisitions by public firms generate more shareholder wealth because public firms are operating companies, so that such acquisitions would have synergy gains that are shared with the target. Similarly, private equity firms acquire firms for which synergy gains are nonexistent, and hence premiums for the acquired firms are not driven as high as the premiums that public firms pay.

- **Friendly Deal:** Friendly deals are the ones where the board negotiates and accepts an offer. From the values it is seen that a majority of the deals were friendly in nature. Friendly takeovers offer a better value deal, all parties working towards a common goal that is best for all parties involved, the target company not negatively being impacted by using tactics to fight off a bid, and the design of a more unified company post takeover.

- **Cash Payment and All Cash:** These variables talk about the cash percentage in a purchase and the deals that were paid in 100% cash respectively. The type of acquirer (public/private) can show a significant difference when evaluated using this measure. Private companies show a mean value of 0.985 when looked at the variable cash payment which translates into the major proportion of deal paid in cash by the private acquirer. On an average more than 95% of transactions made by private

- Since a private firm does not have publicly traded equity to offer in an acquisition, it is not surprising that most acquisitions by private firms are cash deals.

- **RunUp:** Stock price runups are often seen in target companies prior to the announcement dates. From the above table, the average runup percentage is seemed to be higher in private acquisitions. In Finance industry, studying the patterns of runup prior to announcement dates can help in identifying abnormal trading and possibilities of insider trading, can also signal acquisitions. Target stock price run-up before M&A announcements makes acquisitions much more expensive and imposes significant transaction costs to the market for corporate control.

Table III. Offer Premium and CARs – Full Sample Regression Analysis

Dependent Variable	Offer Premium		Offer Premium		CAR [-1,+1]		Completed Deal	
	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|	Parameter Estimate	Pr > |t|
Intercept	0.850	0.000	0.779	<.0001	0.320	<.0001	0.244	0.000
Lnat	-0.059	0.000	-0.053	0.001	-0.027	<.0001	-0.002	0.771
sales_growth	-0.061	0.070	-0.062	0.071	-0.045	0.002	-0.051	0.008
totaldebt_assets	0.126	0.131	0.147	0.083	0.100	0.004	0.018	0.731
oibdp_assets	-0.232	0.002	-0.223	0.003	-0.140	<.0001	0.049	0.231
Hhi	-0.233	0.365	-0.191	0.460	-0.078	0.463	-0.433	0.003
Tobinsq	-0.015	0.124	-0.019	0.067	-0.003	0.457	0.001	0.793
acq_public	-	-	0.005	0.961	0.084	<.0001	0.031	0.187
Tender_Offer	-	-	0.073	0.084	0.061	0.001	0.113	<.0001
Auction	-	-	-0.020	0.638	-0.020	0.254	0.064	0.006
sameindustry_threedig	-	-	0.055	0.167	0.018	0.280	0.017	0.447
Institutional_ownership	-	-	-0.004	0.961	-0.565	0.079	0.622	0.152
friendly_deal	-	-	-0.037	0.473	0.028	0.191	0.533	<.0001
Allcash	-	-	0.034	0.463	0.117	<.0001	0.043	0.100
Runup	-	-	-	-	-0.271	<.0001	-0.073	0.251
car3	-	-	-	-	-	-	0.093	0.028
N	1,023	1,023	1021	1021	1021	1021	1019	1019
Adj. R squared	0.036	0.036	0.036	0.036	0.173	0.173	0.308	0.308

- Based on regression analysis it is easy to understand the variables and how they influence offer premium. From the parameter estimates of Assets, sales growth, and operating income-assets, it can be said that an increase in these values will bring down the offer premium.
  Similarly, HHI an index used to measure the concentration in an industry and Tobinsq ratio which evaluates asset's market value vs. its replacement cost also has an inverse relationship with offer premium.

- From the second column, all cash nature of the deal, same industry, type of acquisition has a positive relationship with offer premium.

- When looked at deal characteristics that impact CAR (3-day period) asset value related variables, runup all bring down the abnormal returns when they go up and All cash deals, attitude of deal (friendly_deal), total debt asset ratio increases the CARs when they increase and decreases when they decrease.

- Net asset value, Acquisition type, operating income-assets, runup are few variables that are statistically significant in showing their relationship with CAR.

- An important relationship to analyze would be the factors that influence completion of a deal. Friendly nature of a deal, tender offer is statistically significant in establishing a relationship with deal completion. CAR, institutional ownership, operating income-asset, type of acquisition, same industry and all cash are variables that are directly proportional to deal completion. Whereas, net assets, HHI and runup show a negative relationship with the variable completed deal.

- However, further significance of these results is subjected to the R-square value generated by each of these regressions.

SAS CODE FOR FINAL DATASET:

```
Data E1286.Exam1_FinalDataset;
Set E1286.AddingVolatility;
Keep PermNo Deal_Id Announcement_Date Transaction_status Withdrawn_date
Completion_date strategic_buyer Attitude Tender_offer Auction pct_cash
pct_stock price_per_share price_per_share_change acq_public GVKEY Fyear
Assets Sic_Fourdig Sales_growth totaldebt_assets oibdp_assets hhi mktvalue_equity
transaction_value tobinsq sameindustry_twodig sameindustry_threedig sameindustry_fourdig
institutional_ownership cash_payment allcash price_Revision Public_Acquirer
Completed_deal
Friendly_deal Price_m42 Percent_Offerpremium CAR_RunUp
runup_Percent CAR3_Percent CAR5_Percent Resolution_period Volatility
Volatility_percent Lnat;
run;
```

COMPLETE SAS CODE FOR ATTAINING EXAM1 DATASET RESULTS

```
Libname E1286 base "C:\Users\bhavy\OneDrive\Desktop\FA-Exam_1\Library_E1286";

/*Deal classification year-wise*/

Data E1286.Deals_Y;
Set E1286.Deals_Dateset;
Year= Year(Announcement_date);
run;

Proc Sql; Create table E1286.Deals_Yearwise as Select Distinct Year, Count(Year) as
Number
      from E1286.Deals_Y
      Group By Year;
      quit;

      Proc Sql; Create table E1286.Deals_Yearwise_Public as Select Distinct Year,
Count(Year) as Number
      from E1286.Deals_Y
```

```
Where Acq_Public=1
Group By Year;
      quit;

      Proc Sql; Create table E1286.Deals_Yearwise_Private as Select Distinct Year,
Count(Year) as Number
      from E1286.Deals_Y
Where Acq_Public=0
Group By Year;
      quit;

/*Industry classification values*/

Data E1286.Deals_Industrywise;
Set E1286.Deals Dateset;
if sic_fourdig<1000 then ind = 'a';
    if sic_fourdig>=1000 & sic_fourdig <=1499 then ind = 'b';
    if sic_fourdig>=1500 & sic_fourdig <=1799 then ind = 'c';
    if sic_fourdig>=2000 & sic_fourdig <=3999 then ind = 'd';
    if sic_fourdig>=4000 & sic_fourdig <=4999 then ind = 'e';
    if sic_fourdig>=5000 & sic_fourdig <=5199 then ind = 'f';
    if sic_fourdig>=5200 & sic_fourdig <=5999 then ind = 'g';
    if sic_fourdig>=6000 & sic_fourdig <=6799 then ind = 'h';
    if sic_fourdig>=7000 & sic_fourdig <=8999 then ind = 'i';
    if sic_fourdig>=9000 then ind = 'j';
      run;

      Proc Sql; Create table E1286.Deals_IndustryClass as Select distinct Ind, Count(Ind)
as Ind_no
      from E1286.Deals_Industrywise
      Group By Ind;
      quit;

      Proc Sql; Create table E1286.Deals_IC_Public as Select distinct Ind, Count(Ind) as
Ind_no
    from E1286.Deals Industrywise
      Where Acq_Public = 1
    Group By Ind;
    quit;

      Proc Sql; Create table E1286.Deals_IC_Private as Select distinct Ind, Count(Ind) as
Ind_no
    from E1286.Deals_Industrywise
      Where Acq_Public = 0
    Group By Ind;
    quit;

/*Looking and replacing announcement date values to
next working day-we are checking for days falling on weekends and days falling on public
holidays*/

Data E1286.HolidayCheck1;;
Set E1286.Prices_added_AD;
Type_AD=weekday(Announcement_date);
run;

Data E1286.Change_Weekends;
Set E1286.HolidayCheck1;
If Type AD=1 then Announcement date=(Announcement date+1);
If Type_AD=7 then Announcement_date=(Announcement_date+2);
Else Announcement_date=Announcement_date;
Run;
```

```
Data E1286.CheckNewAD;
Set E1286.Change_Weekends;
NewAD= Weekday(Announcement_date);
Run;

/* The below statement should result in 0 observations meaning now we do not have any
announcement_dates falling on weekends*/

Proc Print Data=E1286.CheckNewAD;
Where NewAD=1 OR NewAD=7;
run;
/* Checking for Public Holidays*/

Proc SQL; Create table E1286.Check2dates as
Select distinct deal_id
from E1286.CheckNewAD
where Announcement_date=Date
Group by Deal_id;
Quit;

/*The above dataset resulted in 1275 rows which means we have 11 deals (1286-1275)
whose announcement_date is falling on a public holiday*/

/*After comparing the dataset with 1275 deals it was observed that the deal_ids mentioned
in below statement were the ones that were announced on public holidays*/

/*we are running the below code to change their announcement date to next working day-
value added based next working day of calendar*/

Data E1286.ChangeHolidays;
Set E1286.CheckNewAD;
If Deal_Id='533747MM' then Announcement_date=Announcement_date+1;
If Deal_Id='536482MM' then Announcement_date=Announcement_date+1;
If Deal_Id='566017MM' then Announcement_date=Announcement_date+1;
If Deal_Id='576627MM' then Announcement_date=Announcement_date+1;
If Deal_Id='587876MM' then Announcement_date=Announcement_date+1;
If Deal_Id='731631MM' then Announcement_date=Announcement_date+1;
If Deal_Id='737169MM' then Announcement_date=Announcement_date+1;
If Deal_Id='779650MM' then Announcement_date=Announcement_date+1;
If Deal_Id='737066MM' then Announcement_date=Announcement_date+2;
If Deal_Id='828782MM' then Announcement_date=Announcement_date+3;
If Deal_Id='864949MM' then Announcement_date=Announcement_date+3;
Else Announcement_date=Announcement_date;
Run;

Data E1286.Prices_ADFin;
Set E1286.ChangeHolidays;
Drop Type_AD New_AD;
Run;

/*Calculating returns*/

Data E1286.Returns;
set E1286.prices_ADFin;
LDeal_Id= lag (deal_id);
Lprice= Lag (price);
LMarket Price = Lag (Market price);
if deal id ne Ldeal Id then Lprice=.;
If deal id ne Ldeal Id then LMarket_Price=.;
Ret= price/Lprice-1;
Mret=Market_Price/LMarket_price-1;
```

```
run;

Data E1286.Price_Returns;
set E1286.Returns;
drop Market_price Ldeal_Id LPrice LMarket_price;
run;

Proc sort data= E1286.Price_returns;
by deal_id descending date;
run;

Data E1286.Returns_TempRow;
set E1286.Price_returns;
by deal_id descending date;
if first.deal_id and first.date then rowid=0;
rowid+1;
run;

/*Listing event date as Day 0 and accordingly assigning day number labels for each
deal_id*/

Data E1286.Event_Day;
Set E1286.Returns_TempRow;
if announcement_date=date;
RowDay= rowid;
Keep Deal_id RowDay;
run;
proc sort data= E1286.Event_Day;
by deal_id;
run;
Proc sort data=E1286.Returns_Temprow;
by deal_id;
run;
Data E1286.Ret_DayId;
merge E1286.Returns_Temprow(in=a) E1286.Event_day (in=b);
by deal id;
if a=1 & b=1;
run;

Data E1286.Ret_DayNum;
set E1286.ret_DayId;
Daynum=rowday-rowid;
run;

Data E1286.RegressionM;
set E1286.Ret Daynum;
if Daynum<-40 & DayNum>=-290;
by deal_id;
Run;

proc reg data= E1286.RegressionM outest=E1286.Regression_Result;
by deal_id;
model ret=mret;
quit;

/* Merging Regression values with dataset and calculation of Abnormal Returns with
regression values*/

Data E1286.RegressReT;
merge E1286.Ret_Daynum (in=a) E1286.Regression_Result (in=b);
by deal_id;
if a=1 & b=1;
```

```
Keep Deal_Id Date Ret Mret DayNum _RMSE_ Intercept;
run;

Proc Sql;
Create Table E1286.AbReturns as
Select distinct(deal_id),Date, Ret, Mret, Daynum, Ret-(Intercept+_RMSE_*Mret) as
AbReturns
from E1286.RegressRet group by Deal_Id;
quit;

/*Calculation of Cummulative Abnormal Returns for period -1 to 1-CAR3*/

Proc Sql;
Create Table E1286.Car3 as
Select distinct (Deal_Id),Sum(Abreturns) as CAR3
from E1286.Abreturns
Where Daynum between -1 and 1
group by deal_id;
quit;
/*Calculation of Cummulative Abnormal Returns for period -2 to 2-CAR5*/
Proc Sql;
Create Table E1286.Car5 as
Select distinct (Deal_Id),Sum(Abreturns) as CAR5
from E1286.ABReturns
Where Daynum between -2 and 2
group by deal_id;
quit;

Data E1286.Car3_5;
merge E1286.Car3(in=a) E1286.Car5(in=b);
by deal id;
if a=1 & b=1;
run;

Data E1286.Percent_Car3_5;
Set E1286.Car3 5;
Car3_Percent=Car3*100;
Car5_Percent=Car5*100;
Run;

Data E1286.Deals_CAR35;
Merge E1286.Deals_Dateset (in=a) E1286.Percent_Car3_5 (in=b);
by Deal_id;
if a=1 & b=1;
run;

Proc Univariate data=E1286.Deals_Car35;
Var Car3_percent Car5_Percent;
Run;

Proc Univariate data=E1286.Deals_Car35;
Var Car3 percent Car5_Percent;
Where Acq_Public=1;
Run;

Proc Univariate data=E1286.Deals_Car35;
Var Car3_percent Car5_Percent;
Where Acq_Public=0;
Run;

/*Similarly, for separating public and private acquirers from the whole data, we can
merge the data with deals data set having public acquisition column 0/1, and identify
```

```
summary statistics by mentioning where condition for that column-similarly for all the
variables*/

/*Public Acquirer classification Dataset-1286*/

Data E1286.Deals_PublicAcquirer;
Set E1286.Deals Dateset;
if Acq_Public=1 then Public_Acquirer='Public';
if Acq_Public=0 then Public_Acquirer='Private';
run;

/*Completed Deal Dataset-1286 and Summary Statistics*/

Data E1286.Deals_CompletedDeal;
Set E1286.Deals PublicAcquirer;
if Completion_date ne '' then Completed_deal=1;
if Withdrawn_date ne '' then Completed_deal=0;
run;

Proc Univariate data=E1286.Deals_CompletedDeal;
Var Completed_deal;
Run;

Proc Univariate data=E1286.Deals_CompletedDeal;
Var Completed deal;
Where acq_public=1;
Run;

Proc Univariate data=E1286.Deals_CompletedDeal;
Var Completed deal;
Where acq_public=0;
Run;

/*Friendly Deal Dataset-1286 and Summary Statistics*/

Data E1286.Deals_FriendlyDeal;
Set E1286.Deals CompletedDeal;
if Attitude='Friendly' then Friendly_deal=1;
else Friendly_deal=0;
run;

Proc Univariate data=E1286.Deals_FriendlyDeal;
Var Friendly_deal;
Run;

Proc Univariate data=E1286.Deals_FriendlyDeal;
Var Friendly deal;
Where Acq_Public=1;
Run;

Proc Univariate data=E1286.Deals_FriendlyDeal;
Var Friendly deal;
Where Acq_Public=0;
Run;

/*Stock_Volatality-Calculation*/

Proc Sql; create table E1286.Deals_volatility as
select distinct deal_Id, std(ret) as Volatility
from E1286.Ret Daynum
Where Daynum<-40 & DayNum>=-290
group by deal_id;
```

```
quit;
Data E1286.Deals_VolatilityPercent;
Set E1286.Deals volatility;
Volatility_Percent= Volatility*100;
Run;
Data E1286.OP1;
Set E1286.Ret Daynum;
M42=Rowday-42;
Where Daynum=0;
Run;
Data E1286.P42;
Set E1286.OP1;
Price_42=Price;
run;
Data E1286.P_42;
Set E1286.Ret Daynum;
where Daynum=-42;
Price_m42=Price;
run;

/*Merge with deals_dataset(using friendly deal dataset to add this variable to data) by
deal id on stock price
and then calculate offer premium and summary statistics*/

Data E1286.Deals_Price42;
merge E1286.Deals_Friendlydeal(in=a) E1286.P_42(in=b);
by deal id;
if a=1 & b=1;
run;
Data E1286.Deals_OfferPremium1;
Set E1286.Deals Price42;
If Price_per_share = ' ' then price_per_share=0;
Run;
Data E1286.Deals_OfferPremium;
Set E1286.Deals_OfferPremium1;
Offer Premium=(Price per share-Price m42)/Price_m42;
Percent_OfferPremium=Offer_premium*100;
Run;
Proc Univariate data=E1286.Deals_OfferPremium;
Var Percent_OfferPremium;
run;
Proc Univariate data=E1286.Deals_OfferPremium;
Var Percent_OfferPremium;
Where Acq_Public=1;
run;
Proc Univariate data=E1286.Deals_OfferPremium;
Var Percent OfferPremium;
Where Acq_Public=0;
run;
/*Run_Up% calculation and summary statistics*/

Data E1286.RRDaynum1;
Set E1286.Ret_DayNum;
if Daynum <-40 and Daynum >= -290;
run;

Proc reg data=E1286.RRDAYNUM1 outest=E1286.Runup_Reg noprint;
by deal_id;
model ret=mret;
quit;

Data E1286.MarketModel;
```

```
Set E1286.Runup_reg;
Slope=mret;
Keep Deal_Id intercept slope;
run;

Data e1286.Runup_1040;
Set E1286.ret daynum;
if Daynum>=-40 and Daynum<=-10;
run;

Proc sort data= E1286.Runup_1040;
by deal_id;
run;

Proc Sort data=E1286.MarketModel;
by deal_id;
run;

Data E1286.Ret_Runup1;
merge E1286.Runup_1040 (in=a) E1286.Marketmodel(in=b);
by deal id;
if a=b=1;
run;

Data E1286.Ret_Runup;
Set E1286.Ret_Runup1;
Pred_Return=Intercept+slope*mret;
AR=Ret-Pred_return;
Run;

Proc sort data=E1286.Ret_Runup;
by deal_id;
run;

Proc sql;
Create Table E1286.Runup_CARF as Select distinct(deal_id), sum(AR) as CAR_Runup
from E1286.Ret_Runup
group by deal_id;
run;

Data E1286.Runup_Percent;
Set E1286.Runup CARF;
Runup_Percent=CAR_Runup*100;
Run;
Data E1286.Deals_RunUp;
merge E1286.Deals_OfferPremium(in=a) E1286.Runup_Percent(in=b);
by deal id;
if a=1 & b=1;
run;

Proc Univariate data=E1286.Deals_Runup;
Var CAR_Runup Runup_percent;
run;

Proc Univariate data=E1286.Deals_Runup;
Var CAR Runup Runup_percent;
Where Acq_public=1;
run;

Proc Univariate data=E1286.Deals_Runup;
Var CAR_Runup Runup_percent;
Where Acq_public=0;
```

```
run;

/*Resolution period and summary statistics calculation*/

Data E1286.Deals_ResolutionPeriod1;
Set E1286.Deals_Dateset;
if Completion_date ne '' then Resolution_Period=(Completion_Date-Announcement_date);
if Withdrawn_date ne '' then Resolution_Period=(Withdrawn_date-Announcement_date);
run;

Proc Univariate data=E1286.Deals_ResolutionPeriod1;
Var Resolution_Period;
Run;

Proc Univariate data=E1286.Deals_ResolutionPeriod1;
Var Resolution Period;
Where acq_public=1;
Run;

Proc Univariate data=E1286.Deals_ResolutionPeriod1;
Var Resolution Period;
Where acq_public=0;
Run;

Data E1286.Deals_ResolutionPeriod;
merge E1286.Deals_Runup(in=a) E1286.Deals_ResolutionPeriod1(in=b);
by deal id;
if a=1 & b=1;
run;

Data E1286.Deals_AddedVar;
Merge E1286.Deals_ResolutionPeriod (in=a) E1286.Deals_Volatilitypercent (in=b);
If a=b=1;
run;

/*Summary Statistics for Stock Volatality*/

Proc Univariate data=E1286.Deals_AddedVar;
Var Volatility_Percent;
Run;

Proc Univariate data=E1286.Deals_AddedVar;
Var Volatility_Percent;
Where acq_Public=1;
Run;

Proc Univariate data=E1286.Deals_AddedVar;
Var Volatility_Percent;
Where acq_Public=0;
Run;

/*Estimating Summary statistics for remaining variables*/

Proc Univariate data=E1286.Deals_Dateset;
Var assets sales_growth totaldebt_assets oibdp_assets HHI mktvalue_equity;
Run;

Proc Univariate data=E1286.Deals_Dateset;
Var assets sales growth totaldebt_assets oibdp_assets HHI mktvalue_equity;
Where Acq_Public=1;
Run;
```

```
Proc Univariate data=E1286.Deals_Dateset;
Var assets sales growth totaldebt_assets oibdp_assets HHI mktvalue_equity;
Where Acq_Public=0;
Run;


Proc Univariate data=E1286.Deals_AddedVar;
Var transaction_value tobinsq Tender_Offer Auction sameindustry_twodig
sameindustry_threedig sameindustry_fourdig institutional_ownership
cash_payment allcash price_revision;
Run;

Proc Univariate data=E1286.Deals_AddedVar;
Var transaction_value tobinsq Tender_Offer Auction sameindustry_twodig
sameindustry_threedig sameindustry_fourdig institutional_ownership
cash payment allcash price_revision;
where acq_public=1;
Run;

Proc Univariate data=E1286.Deals_AddedVar;
Var transaction_value tobinsq Tender_Offer Auction sameindustry_twodig
sameindustry_threedig sameindustry_fourdig institutional_ownership
cash_payment allcash price_revision;
Where acq_public=0;
Run;
/* Offer Premium and CAR regressions */

Data E1286.Regression_Deals;
Set E1286.Deals_ResolutionPeriod;
Drop NewAD rowid rowday;
Run;

/*Offer premium: lnat sales_growth totaldebt_assets oibdp_assets hhi tobinsq*/

Data E1286.RegressionMain_Deals;
Set E1286.Regression_Deals;
Lnat=Log(assets);
run;

proc reg data= E1286.RegressionMain_deals;
model Offer_Premium=Lnat Sales_growth totaldebt_assets oibdp_assets hhi tobinsq;
quit;

/* Offer premium: lnat sales_growth totaldebt_assets oibdp_assets hhi tobinsq acq_public
Tender_Offer Auction sameindustry_threedig institutional_ownership friendly_deal
allcash*/

proc reg data= E1286.RegressionMain_deals;
model Offer_Premium=Lnat Sales_growth totaldebt_assets oibdp_assets hhi tobinsq
acq_public Tender_Offer Auction sameindustry_threedig institutional_ownership
friendly_deal allcash;
quit;

/*CAR3:lnat sales_growth totaldebt_assets oibdp_assets hhi tobinsq acq_public
Tender_Offer Auction
sameindustry_threedig institutional_ownership friendly_deal allcash runup*/

Data E1286.Regression_CAR3;
Merge E1286.RegressionMain_deals (in=a) E1286.Percent_Car3_5 (in=b);
by Deal id;
If a=b=1;
run;
```

```
proc reg data= E1286.Regression_CAR3;
model CAR3=lnat sales_growth totaldebt_assets oibdp_assets hhi tobinsq acq_public
Tender_Offer Auction
sameindustry_threedig institutional_ownership friendly_deal allcash CAR_Runup;
quit;

/*Completed Deal: lnat sales_growth totaldebt_assets oibdp_assets hhi tobinsq acq_public
Tender_Offer
Auction sameindustry_threedig institutional_ownership friendly_deal allcash runup car3*/

proc reg data= E1286.Regression_CAR3;
model Completed_Deal=lnat sales_growth totaldebt_assets oibdp_assets hhi tobinsq
acq_public Tender_Offer
Auction sameindustry_threedig institutional_ownership friendly_deal allcash CAR_Runup
CAR3;
quit;

/*Create a Final dataset with calculated and given variables*/

Data E1286.AddingCAR;
merge E1286.Regressionmain_deals (in=a) E1286.Percent_Car3_5 (in=b);
by deal_id;
if a=b=1;
run;

Data E1286.AddingVolatility;
Merge E1286.AddingCAR (in=a) E1286.Deals_VolatilityPercent (in=b);
by deal id;
if a=b=1;
run;

Data E1286.Exam1_FinalDataset;
Set E1286.AddingVolatility;
Keep PermNo Deal_Id Announcement_Date Transaction_status Withdrawn_date
Completion_date strategic_buyer Attitude Tender_offer Auction pct_cash
pct_stock price_per_share price_per_share_change acq_public GVKEY Fyear
Assets Sic_Fourdig Sales_growth totaldebt_assets oibdp_assets hhi mktvalue_equity
transaction_value tobinsq sameindustry_twodig sameindustry_threedig sameindustry_fourdig
institutional_ownership cash_payment allcash price_Revision Public_Acquirer
Completed_deal
Friendly_deal Price_m42 Percent_Offerpremium CAR_RunUp
runup_Percent CAR3_Percent CAR5_Percent Resolution_period Volatility
Volatility_percent Lnat;
run;
```