

## Assignment 4

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```
library('tidyverse')
```

```
## -- Attaching packages -----
```

```
## v ggplot2 3.3.2      v purrr 0.3.4
## v tibble 3.0.3       v dplyr 1.0.1
## v tidyr 1.1.1        v stringr 1.4.0
## v readr 1.3.1        v forcats 0.5.0
```

```
## -- Conflicts -----
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
```

```
setwd('P:/')
```

```
dataset <- read.csv('dataset.csv')
```

### #add investment (IV) based on format codes

```
### I use ifelse here because it is much faster than dplyr since it does not need to resave the dataset
```

### although the codes look longer than dplyr and mutate

```
dataset$IV <- ifelse(dataset$SCF<4, dataset$CAPX+dataset$IVCH+dataset$AQC+dataset$FUSEO-dataset$SPPE-da  
dataset$CAPX+dataset$IVCH+dats
```

```
#add change working capital (CWC) based on format codes
```

```
dataset$CWC <- ifelse(dataset$SCF==1,dataset$WCAPC+dataset$CHECH+dataset$DLCC,
                      ifelse(dataset$SCF==2|dataset$SCF==3,-dataset$WCAPC+dataset$CHECH-dataset$DLCC,
                              ifelse(dataset$SCF==7, -dataset$RECCH-dataset$INVCH-data
```

```
#add Internal cash flow (ICF) based on format codes
```

```
dataset$ICF <- ifelse(dataset$SCF<4, dataset$IBC+dataset$XIDOC+dataset$DPC+dataset$TXDC+dataset$ESUBC+d,
                      ifelse(dataset$SCF==7, dataset$IBC+dataset$XIDOC+dataset$DPC+dataset$TXDC+dataset$
```

*#add Financing deficit (FD)*

```
dataset$FD <- dataset$DV+dataset$IV+dataset$CWC-dataset$ICF
```

```
#to subset the data
```

#Based on Notes on Assignment 2.2

```
subdata <- dataset %>% filter((SCF<4 | SCF==7 | is.na(SCF)) & COMPST != "AB") %>% filter (is.na(SICH) |
```

```
#further subset the data into the years required using dplyr
```

```
subdata <- subdata %>% filter(FYEAR %in% c(1971, 1974, 1979, 1984, 1988, 1990, 1995, 1999, 2002, 2005, 2008, 2012, 2015, 2019))
```

```

# to further subset the data based on variables in Table 10
# filter out where the denominators are zero or NAs
df <- subdata %>% filter((AT-LCT) != 0 & (DLTT+DLC+SEQ) != 0 & SALE > 0 & AT !=0) %>%
  mutate ("Cash dividend/net assets" = DV/(AT - LCT),
    "Investment/net assets" = IV/(AT - LCT),
    "Changing working capital/net assets" = CWC/(AT - LCT),
    "Internal cash flow/net assets" = ICF/(AT - LCT),
    "Financing deficit/net assets" = FD/(AT - LCT),
    "Gross LT debt issued/net assets" = DLTIS/(AT - LCT),
    "Net LT debt issued/net assets" = (DLTIS-DLTR)/(AT - LCT),
    "Net equity issued/net assets" = (SSTK - PRSTKC)/(AT - LCT),
    "Net external financing/net assets" = ((DLTIS-DLTR)+(SSTK - PRSTKC))/(AT - LCT),
    "Total debt/book capitalization" = (DLTT+DLC)/(DLTT+DLC+SEQ),
    "Tangibility" = PPENT/AT,
    "Market/book assets" = MKVALT/AT,
    "Log Sales" = log(SALE),
    "Profitability" = NI/AT) %>%
  select("FYEAR", "DATADATE", "Cash dividend/net assets":"Profitability")

```

###Descriptive Statistics

```

#The function to get the descriptive statistics
describe <- function(input) {
  desnames <- names(input)[-c(1,2)]
  ds <- NA
  for (c in desnames) {
    coln <- as.name(c)
    output <- input %>% summarize(
      year=mean(FYEAR),
      n=n(),
      m=mean(eval(coln), na.rm = T),
      min=min(eval(coln), na.rm = T),
      q25=quantile(eval(coln), probs=0.25, na.rm = T),
      median=median(eval(coln), na.rm = T),
      q75=quantile(eval(coln),probs=0.75, na.rm = T),
      max=max(eval(coln), na.rm = T),
      std=sd(eval(coln), na.rm = T))
    ds <- rbind(ds, output)
  }
  descriptive_table <- as.data.frame(ds[-1,])
  rownames(descriptive_table) = desnames
  colnames(descriptive_table) = c('Year', 'Non-NA N', 'Mean', 'Min', 'Q25', 'Q50', 'Q75', 'Max', 'SD')
  print(descriptive_table)
}

```

###To print out the descriptive table across years

```

for (yr in sort(unique(df$FYEAR))) {
  tp <- df %>% filter(FYEAR==yr)
  describe(tp)
}

```

##	Year	Non-NA N	Mean	Min
----	------	----------	------	-----

## Cash dividend/net assets	1971	508	0.01839219	0.0000000
## Investment/net assets	1971	508	0.20215137	-0.3589310
## Changing working capital/net assets	1971	508	NaN	Inf
## Internal cash flow/net assets	1971	508	NaN	Inf
## Financing deficit/net assets	1971	508	NaN	Inf
## Gross LT debt issued/net assets	1971	508	0.07521295	-0.4672093
## Net LT debt issued/net assets	1971	508	0.01658398	-0.5570075
## Net equity issued/net assets	1971	508	0.03298559	-0.2607675
## Net external financing/net assets	1971	508	0.05008127	-0.5570075
## Total debt/book capitalization	1971	508	0.35844247	0.0000000
## Tangibility	1971	508	0.36767273	0.0000000
## Market/book assets	1971	508	NaN	Inf
## Log Sales	1971	508	4.09620705	-2.3025851
## Profitability	1971	508	0.02981341	-1.0970811
##		Q25	Q50	Q75
## Cash dividend/net assets		0.00000000	0.0115336970	0.028714963
## Investment/net assets		0.05273085	0.1087157563	0.196934952
## Changing working capital/net assets		NA	NA	NA
## Internal cash flow/net assets		NA	NA	NA
## Financing deficit/net assets		NA	NA	NA
## Gross LT debt issued/net assets		0.00000000	0.0195312481	0.113636915
## Net LT debt issued/net assets		-0.02540498	-0.0003780645	0.047829763
## Net equity issued/net assets		0.00000000	0.0001312238	0.008320777
## Net external financing/net assets		-0.01754280	0.0091011949	0.089675319
## Total debt/book capitalization		0.18907287	0.3447316880	0.505597400
## Tangibility		0.20038025	0.3203801678	0.508973087
## Market/book assets		NA	NA	NA
## Log Sales		2.92975150	3.9585909445	5.165652365
## Profitability		0.01960996	0.0420832422	0.071156951
##		Max	SD	
## Cash dividend/net assets		0.2007500	0.02419717	
## Investment/net assets		2.8250898	0.36709027	
## Changing working capital/net assets		-Inf	NA	
## Internal cash flow/net assets		-Inf	NA	
## Financing deficit/net assets		-Inf	NA	
## Gross LT debt issued/net assets		1.5023941	0.13561714	
## Net LT debt issued/net assets		1.5023941	0.12784599	
## Net equity issued/net assets		0.8043912	0.10197955	
## Net external financing/net assets		1.4957643	0.15241859	
## Total debt/book capitalization		3.1662605	0.25255271	
## Tangibility		0.9649180	0.22769612	
## Market/book assets		-Inf	NA	
## Log Sales		9.8261099	1.71029592	
## Profitability		0.2349398	0.10086733	
##		Year	Non-NA	N
## Cash dividend/net assets	1974	817	0.0145708189	0.0000000
## Investment/net assets	1974	817	0.2254940595	-0.6646884
## Changing working capital/net assets	1974	817	NaN	Inf
## Internal cash flow/net assets	1974	817	NaN	Inf
## Financing deficit/net assets	1974	817	NaN	Inf
## Gross LT debt issued/net assets	1974	817	0.0977258296	-3.4916667
## Net LT debt issued/net assets	1974	817	-0.0068147995	-8.8421053
## Net equity issued/net assets	1974	817	0.0003582804	-4.1666667
## Net external financing/net assets	1974	817	-0.0070169535	-8.6047904

## Total debt/book capitalization	1974	817	0.4591099392	-3.0203562
## Tangibility	1974	817	0.3364711303	0.0000000
## Market/book assets	1974	817	NaN	Inf
## Log Sales	1974	817	3.6114891514	-5.5214609
## Profitability	1974	817	0.0174238123	-5.6872146
##		Q25	Q50	Q75
## Cash dividend/net assets		0.00000000	0.003237411	0.0237214995
## Investment/net assets		0.03888113	0.090251357	0.1778759324
## Changing working capital/net assets		NA	NA	NA
## Internal cash flow/net assets		NA	NA	NA
## Financing deficit/net assets		NA	NA	NA
## Gross LT debt issued/net assets		0.00000000	0.018883958	0.1262808486
## Net LT debt issued/net assets		-0.02183670	0.000000000	0.0614019449
## Net equity issued/net assets		0.00000000	0.000000000	0.0001535738
## Net external financing/net assets		-0.02611239	0.000000000	0.0727959698
## Total debt/book capitalization		0.22330097	0.403572538	0.5731915702
## Tangibility		0.16200904	0.292517624	0.4609321069
## Market/book assets		NA	NA	NA
## Log Sales		2.35032709	3.583574492	5.0082257268
## Profitability		0.01291702	0.044327488	0.0789038725
##		Max	SD	
## Cash dividend/net assets		0.1806637	0.02253802	
## Investment/net assets		22.5438596	1.18212008	
## Changing working capital/net assets		-Inf	NA	
## Internal cash flow/net assets		-Inf	NA	
## Financing deficit/net assets		-Inf	NA	
## Gross LT debt issued/net assets		8.7017544	0.37982407	
## Net LT debt issued/net assets		2.3161094	0.52307306	
## Net equity issued/net assets		2.2982456	0.18438446	
## Net external financing/net assets		2.3161094	0.54079584	
## Total debt/book capitalization		27.2500000	1.08485994	
## Tangibility		0.9630643	0.22956288	
## Market/book assets		-Inf	NA	
## Log Sales		10.1725373	2.10987706	
## Profitability		0.3268313	0.26314805	
##	Year	Non-NA	N	Mean
## Cash dividend/net assets	1979	804	0.02906354	-0.05885998
## Investment/net assets	1979	804	0.14546152	-3.03202479
## Changing working capital/net assets	1979	804	NaN	Inf
## Internal cash flow/net assets	1979	804	NaN	Inf
## Financing deficit/net assets	1979	804	NaN	Inf
## Gross LT debt issued/net assets	1979	804	0.08705797	-8.82352941
## Net LT debt issued/net assets	1979	804	0.01579435	-8.82352941
## Net equity issued/net assets	1979	804	0.01351438	-6.00629845
## Net external financing/net assets	1979	804	0.02674957	-8.82352941
## Total debt/book capitalization	1979	804	0.44729106	-10.92500000
## Tangibility	1979	804	0.35091659	0.00000000
## Market/book assets	1979	804	NaN	Inf
## Log Sales	1979	804	3.80290157	-4.60517019
## Profitability	1979	804	0.04050411	-5.10416667
##		Q25	Q50	Q75
## Cash dividend/net assets		0.00000000	0.006889930	0.026455224
## Investment/net assets		0.04956431	0.113140470	0.216071220
## Changing working capital/net assets		NA	NA	NA

## Internal cash flow/net assets	NA	NA	NA
## Financing deficit/net assets	NA	NA	NA
## Gross LT debt issued/net assets	0.00000000	0.030664858	0.130195651
## Net LT debt issued/net assets	-0.01643697	0.000000000	0.070529316
## Net equity issued/net assets	0.00000000	0.000000000	0.004126344
## Net external financing/net assets	-0.02072730	0.002575353	0.088540290
## Total debt/book capitalization	0.22276019	0.383593322	0.574660793
## Tangibility	0.17089015	0.307151567	0.489190308
## Market/book assets	NA	NA	NA
## Log Sales	2.28490198	3.853862894	5.388368111
## Profitability	0.01854705	0.055295663	0.096131510
##	Max	SD	
## Cash dividend/net assets	9.9600000	0.3582238	
## Investment/net assets	2.9129082	0.2844767	
## Changing working capital/net assets	-Inf	NA	
## Internal cash flow/net assets	-Inf	NA	
## Financing deficit/net assets	-Inf	NA	
## Gross LT debt issued/net assets	1.3144148	0.3630823	
## Net LT debt issued/net assets	5.5061728	0.4777297	
## Net equity issued/net assets	2.1788618	0.2819551	
## Net external financing/net assets	5.5061728	0.5570317	
## Total debt/book capitalization	11.7022282	0.8232126	
## Tangibility	0.9949256	0.2389863	
## Market/book assets	-Inf	NA	
## Log Sales	10.7234461	2.4206523	
## Profitability	4.0934579	0.2780389	
##	Year	Non-NA	N
## Cash dividend/net assets	1984	852	0.01417567
## Investment/net assets	1984	852	0.25878036
## Changing working capital/net assets	1984	852	0.02066657
## Internal cash flow/net assets	1984	852	NaN
## Financing deficit/net assets	1984	852	NaN
## Gross LT debt issued/net assets	1984	852	0.10337115
## Net LT debt issued/net assets	1984	852	0.08541289
## Net equity issued/net assets	1984	852	0.08989597
## Net external financing/net assets	1984	852	0.18348767
## Total debt/book capitalization	1984	852	0.28879759
## Tangibility	1984	852	0.36528686
## Market/book assets	1984	852	NaN
## Log Sales	1984	852	3.71247459
## Profitability	1984	852	-0.04496361
##		Q25	Q50
## Cash dividend/net assets		0.00000000	0.01994687
## Investment/net assets		0.05294969	0.1246587807
## Changing working capital/net assets		-0.07562417	0.0173704592
## Internal cash flow/net assets		NA	NA
## Financing deficit/net assets		NA	NA
## Gross LT debt issued/net assets		0.00000000	0.0207401232
## Net LT debt issued/net assets		-0.02023819	0.0000000000
## Net equity issued/net assets		0.00000000	0.0001877642
## Net external financing/net assets		-0.02209702	0.0089485459
## Total debt/book capitalization		0.12939681	0.3328240901
## Tangibility		0.16476844	0.3067736883
## Market/book assets		NA	NA
			Q75
## Cash dividend/net assets			0.01994687
## Investment/net assets			0.25794968
## Changing working capital/net assets			0.10440935
## Internal cash flow/net assets			NA
## Financing deficit/net assets			NA
## Gross LT debt issued/net assets			0.12228509
## Net LT debt issued/net assets			0.04868142
## Net equity issued/net assets			0.02032429
## Net external financing/net assets			0.13502063
## Total debt/book capitalization			0.52544228
## Tangibility			0.52446915
## Market/book assets			NA

## Log Sales	2.13450716	3.6760597095	5.59414573
## Profitability	-0.03841860	0.0385877777	0.07721786
##	Max	SD	
## Cash dividend/net assets	0.5279503	0.03714021	
## Investment/net assets	47.5155280	2.00574468	
## Changing working capital/net assets	50.7867173	2.31412849	
## Internal cash flow/net assets	-Inf	NA	
## Financing deficit/net assets	-Inf	NA	
## Gross LT debt issued/net assets	1.8318894	0.20589277	
## Net LT debt issued/net assets	53.1882353	1.90008718	
## Net equity issued/net assets	11.7577640	0.55348831	
## Net external financing/net assets	53.2072106	2.01004994	
## Total debt/book capitalization	6.0307499	2.19185812	
## Tangibility	0.9824248	0.24833926	
## Market/book assets	-Inf	NA	
## Log Sales	10.9427764	2.72456883	
## Profitability	6.5471448	0.41851023	
##	Year	Non-NA	N
## Cash dividend/net assets	1988	537	1.900683e-02
## Investment/net assets	1988	537	1.022991e-01
## Changing working capital/net assets	1988	537	-7.189349e-05
## Internal cash flow/net assets	1988	537	1.207616e-01
## Financing deficit/net assets	1988	537	7.957957e-03
## Gross LT debt issued/net assets	1988	537	5.383859e-02
## Net LT debt issued/net assets	1988	537	-4.824771e-02
## Net equity issued/net assets	1988	537	3.119824e-02
## Net external financing/net assets	1988	537	-2.385159e-02
## Total debt/book capitalization	1988	537	2.651338e-01
## Tangibility	1988	537	3.517670e-01
## Market/book assets	1988	537	NaN
## Log Sales	1988	537	4.310015e+00
## Profitability	1988	537	5.057737e-01
##		Q25	Q50
## Cash dividend/net assets		0.0000000000	0.02117194
## Investment/net assets		0.0125075594	0.16257296
## Changing working capital/net assets		-0.0826299769	0.09228013
## Internal cash flow/net assets		0.0385928886	0.18794282
## Financing deficit/net assets		-0.0499901891	0.03090986
## Gross LT debt issued/net assets		0.0000000000	0.09797359
## Net LT debt issued/net assets		-0.0433482250	0.02503469
## Net equity issued/net assets		-0.0006534207	0.00377421
## Net external financing/net assets		-0.0457616806	0.05289553
## Total debt/book capitalization		0.1340206186	0.55802829
## Tangibility		0.1650727577	0.49653034
## Market/book assets		NA	NA
## Log Sales		2.6347624053	6.10385529
## Profitability		-0.0305350684	0.07369868
##		Max	SD
## Cash dividend/net assets		1.2302995	0.07776819
## Investment/net assets		6.7395833	0.48760895
## Changing working capital/net assets		4.0104167	0.64843626
## Internal cash flow/net assets		41.0666667	2.05126861
## Financing deficit/net assets		1.3884771	0.26283648
## Gross LT debt issued/net assets		5.7247509	1.13609545

## Net LT debt issued/net assets	3.9583333	1.13171583	
## Net equity issued/net assets	3.7038414	0.22117674	
## Net external financing/net assets	3.9583333	1.16913067	
## Total debt/book capitalization	28.2857143	2.90683644	
## Tangibility	0.9426841	0.23921639	
## Market/book assets	-Inf	NA	
## Log Sales	10.8584989	2.60707601	
## Profitability	304.5000000	13.15173041	
##	Year	Non-NA	N
## Cash dividend/net assets	1990	471	0.015417322
## Investment/net assets	1990	471	0.077853317
## Changing working capital/net assets	1990	471	0.289547196
## Internal cash flow/net assets	1990	471	0.234121690
## Financing deficit/net assets	1990	471	-0.274111195
## Gross LT debt issued/net assets	1990	471	0.122955000
## Net LT debt issued/net assets	1990	471	0.005407082
## Net equity issued/net assets	1990	471	-0.005802359
## Net external financing/net assets	1990	471	-0.001387352
## Total debt/book capitalization	1990	471	0.757137208
## Tangibility	1990	471	0.360485840
## Market/book assets	1990	471	NaN
## Log Sales	1990	471	4.589089148
## Profitability	1990	471	-0.046736418
##		Q25	Q50
## Cash dividend/net assets		0.000000000	0.000000e+00
## Investment/net assets		0.019819011	8.226691e-02
## Changing working capital/net assets		-0.052926108	8.409440e-03
## Internal cash flow/net assets		0.031818670	1.164629e-01
## Financing deficit/net assets		-0.026084158	-2.458761e-16
## Gross LT debt issued/net assets		0.000000000	1.266117e-02
## Net LT debt issued/net assets		-0.027616794	-2.434393e-05
## Net equity issued/net assets		-0.002594655	0.000000e+00
## Net external financing/net assets		-0.035627333	-4.543802e-05
## Total debt/book capitalization		0.135584801	3.750076e-01
## Tangibility		0.169021377	3.128226e-01
## Market/book assets		NA	NA
## Log Sales		2.772118873	4.680676e+00
## Profitability		-0.039195205	3.044172e-02
##		Max	SD
## Cash dividend/net assets		0.5695364	0.09072873
## Investment/net assets		2.8536585	0.54865491
## Changing working capital/net assets		49.8292683	4.10933343
## Internal cash flow/net assets		64.7886179	3.40826868
## Financing deficit/net assets		0.4047359	1.75742144
## Gross LT debt issued/net assets		10.4707724	0.55627673
## Net LT debt issued/net assets		1.6205937	0.19514611
## Net equity issued/net assets		3.6345651	0.75139121
## Net external financing/net assets		4.6438970	0.74317281
## Total debt/book capitalization		144.4066265	7.06540365
## Tangibility		0.9171387	0.23826687
## Market/book assets		-Inf	NA
## Log Sales		10.9876596	2.60340972
## Profitability		0.5444905	0.39451028
##	Year	Non-NA	N
##			Mean
##			Min

## Cash dividend/net assets	1995	369	0.017651512	-0.006532428
## Investment/net assets	1995	369	0.104677132	-0.689655172
## Changing working capital/net assets	1995	369	0.100375649	-1.219512195
## Internal cash flow/net assets	1995	369	0.114476341	-4.909523810
## Financing deficit/net assets	1995	369	0.004273404	-1.956896552
## Gross LT debt issued/net assets	1995	369	0.128138115	-0.142744000
## Net LT debt issued/net assets	1995	369	0.001317505	-1.024841519
## Net equity issued/net assets	1995	369	0.033029638	-1.956896552
## Net external financing/net assets	1995	369	0.037720408	-1.956896552
## Total debt/book capitalization	1995	369	0.710967640	-9.566450971
## Tangibility	1995	369	0.346972088	0.004473869
## Market/book assets	1995	369	NaN	Inf
## Log Sales	1995	369	5.251675742	-2.154165088
## Profitability	1995	369	0.017507510	-3.083440308
##		Q25	Q50	Q75
## Cash dividend/net assets		0.000000000	2.777338e-03	0.024228819
## Investment/net assets		0.036539493	9.459542e-02	0.163544560
## Changing working capital/net assets		-0.009498147	3.025398e-02	0.138961936
## Internal cash flow/net assets		0.071537037	1.324223e-01	0.204678827
## Financing deficit/net assets		-0.028217713	-2.332769e-17	0.031759224
## Gross LT debt issued/net assets		0.000000000	9.759815e-03	0.097360762
## Net LT debt issued/net assets		-0.035878502	-1.167713e-03	0.018813721
## Net equity issued/net assets		-0.000821697	0.000000e+00	0.007471542
## Net external financing/net assets		-0.042548596	-2.318034e-04	0.045226131
## Total debt/book capitalization		0.122089833	3.234993e-01	0.488237488
## Tangibility		0.163027631	2.836767e-01	0.502411990
## Market/book assets		NA	NA	NA
## Log Sales		3.313895053	5.370782e+00	7.270507022
## Profitability		0.006519973	4.392906e-02	0.082836932
##		Max	SD	
## Cash dividend/net assets		0.4684179	0.03775884	
## Investment/net assets		0.7221394	0.15861549	
## Changing working capital/net assets		6.4051724	0.62358678	
## Internal cash flow/net assets		7.6724138	0.61806009	
## Financing deficit/net assets		0.8686869	0.33763791	
## Gross LT debt issued/net assets		7.0481884	0.45810437	
## Net LT debt issued/net assets		1.0684964	0.15289988	
## Net equity issued/net assets		5.2452381	0.33457258	
## Net external financing/net assets		5.0119048	0.36881355	
## Total debt/book capitalization		143.7500000	7.49511195	
## Tangibility		0.9816669	0.23809840	
## Market/book assets		-Inf	NA	
## Log Sales		11.2848824	2.57747629	
## Profitability		3.4666667	0.28838582	
##	Year	Non-NA	N	Mean
## Cash dividend/net assets	1999	291	0.02344829	-0.024571854
## Investment/net assets	1999	291	0.13950566	-2.128190142
## Changing working capital/net assets	1999	291	0.01324636	-1.564304462
## Internal cash flow/net assets	1999	291	0.05643521	-2.639976622
## Financing deficit/net assets	1999	291	0.20595364	-0.665105386
## Gross LT debt issued/net assets	1999	291	0.13093503	-3.032729398
## Net LT debt issued/net assets	1999	291	0.02160960	-0.944447703
## Net equity issued/net assets	1999	291	0.01559176	-1.978526472
## Net external financing/net assets	1999	291	0.03840149	-0.944447703



## Total debt/book capitalization	1999	291	0.35476648	-17.936073059
## Tangibility	1999	291	0.35312333	0.006325514
## Market/book assets	1999	291	1.43462632	0.014133402
## Log Sales	1999	291	5.72092193	-2.407945609
## Profitability	1999	291	-0.01329823	-1.447837150
##		Q25	Q50	Q75
## Cash dividend/net assets		0.000000000	0.001068567	0.022727540
## Investment/net assets		0.037596292	0.102879515	0.187869907
## Changing working capital/net assets		-0.063769934	0.008964773	0.065065182
## Internal cash flow/net assets		0.035809051	0.116468752	0.188471448
## Financing deficit/net assets		-0.017272439	0.000000000	0.093289989
## Gross LT debt issued/net assets		0.000000000	0.030719005	0.133581938
## Net LT debt issued/net assets		-0.016637339	0.000000000	0.043726578
## Net equity issued/net assets		-0.020954155	0.000000000	0.003356089
## Net external financing/net assets		-0.046718339	0.000000000	0.054333922
## Total debt/book capitalization		0.174676159	0.370012092	0.530374436
## Tangibility		0.162487440	0.288449444	0.536470499
## Market/book assets		0.400651738	0.741735568	1.724811885
## Log Sales		3.671478907	6.121850059	7.653582825
## Profitability		-0.005695184	0.038114635	0.072789823
##		Max	SD	
## Cash dividend/net assets		1.9300944	0.1189975	
## Investment/net assets		4.4881890	0.4160876	
## Changing working capital/net assets		2.6835443	0.3884590	
## Internal cash flow/net assets		2.4981385	0.4074535	
## Financing deficit/net assets		3.2861244	0.7355446	
## Gross LT debt issued/net assets		2.3982671	0.3744277	
## Net LT debt issued/net assets		1.1760823	0.1883985	
## Net equity issued/net assets		3.2861244	0.3280754	
## Net external financing/net assets		3.2861244	0.3572344	
## Total debt/book capitalization		7.2381242	1.1937395	
## Tangibility		0.9994071	0.2379039	
## Market/book assets		14.9935302	2.0259465	
## Log Sales		11.3333920	2.6628554	
## Profitability		0.6207170	0.2344012	
##	Year	Non-NA	N	Mean
## Cash dividend/net assets	2002	239	0.013103273	0.000000000
## Investment/net assets	2002	239	0.123076169	-0.348138179
## Changing working capital/net assets	2002	239	0.527845838	-0.237995664
## Internal cash flow/net assets	2002	239	0.252446809	-4.516049383
## Financing deficit/net assets	2002	239	0.064366493	-0.357786865
## Gross LT debt issued/net assets	2002	239	0.095534259	0.000000000
## Net LT debt issued/net assets	2002	239	0.006556126	-1.949964687
## Net equity issued/net assets	2002	239	0.005559052	-0.322843823
## Net external financing/net assets	2002	239	0.012211010	-2.224045200
## Total debt/book capitalization	2002	239	0.524956551	-11.273727648
## Tangibility	2002	239	0.326356217	0.000000000
## Market/book assets	2002	239	1.356243412	0.003341081
## Log Sales	2002	239	5.834995463	-4.710530702
## Profitability	2002	239	-0.373071547	-63.650000000
##		Q25	Q50	Q75
## Cash dividend/net assets		0.000000000	0.000000e+00	0.018669235
## Investment/net assets		0.0253211692	5.448220e-02	0.112263326
## Changing working capital/net assets		-0.0180917346	2.106012e-02	0.079620503

## Internal cash flow/net assets	0.0379361152	9.490720e-02	0.167879876
## Financing deficit/net assets	-0.0257423969	-2.051019e-17	0.010619837
## Gross LT debt issued/net assets	0.0000000000	8.131550e-04	0.082093968
## Net LT debt issued/net assets	-0.0357677692	-5.045298e-03	0.000000000
## Net equity issued/net assets	-0.0001404088	0.000000e+00	0.005286261
## Net external financing/net assets	-0.0426146348	-4.644945e-03	0.011627907
## Total debt/book capitalization	0.0935986634	3.119505e-01	0.505403369
## Tangibility	0.1400021082	2.560027e-01	0.487782087
## Market/book assets	0.3337061451	6.347019e-01	1.163137921
## Log Sales	3.8996385338	6.309022e+00	7.869327048
## Profitability	-0.0464292577	1.739777e-02	0.057865171
##	Max	SD	
## Cash dividend/net assets	0.1414201	0.02244897	
## Investment/net assets	5.4000000	0.48672070	
## Changing working capital/net assets	29.9000000	3.73423080	
## Internal cash flow/net assets	35.3000000	2.73775240	
## Financing deficit/net assets	2.1144674	0.40288829	
## Gross LT debt issued/net assets	5.7876543	0.41525172	
## Net LT debt issued/net assets	4.6172840	0.38172882	
## Net equity issued/net assets	0.5808345	0.07542706	
## Net external financing/net assets	4.6172840	0.39794167	
## Total debt/book capitalization	43.2272727	2.93119858	
## Tangibility	1.6666667	0.24282519	
## Market/book assets	47.1000000	4.08501833	
## Log Sales	12.0935812	2.92272051	
## Profitability	1.5273402	4.15686676	
##	Year	Non-NA	N
## Cash dividend/net assets	2005	200	0.016544759
## Investment/net assets	2005	200	0.104285144
## Changing working capital/net assets	2005	200	-0.009475250
## Internal cash flow/net assets	2005	200	0.090532971
## Financing deficit/net assets	2005	200	-0.018021840
## Gross LT debt issued/net assets	2005	200	0.091834045
## Net LT debt issued/net assets	2005	200	0.010482492
## Net equity issued/net assets	2005	200	-0.006092997
## Net external financing/net assets	2005	200	0.004252588
## Total debt/book capitalization	2005	200	0.286495377
## Tangibility	2005	200	0.280430332
## Market/book assets	2005	200	1.747799359
## Log Sales	2005	200	6.294116967
## Profitability	2005	200	0.150715728
##		Q25	Q50
## Cash dividend/net assets		0.000000000	0.0097709338
## Investment/net assets		0.022029486	0.0728525780
## Changing working capital/net assets		-0.010240978	0.0093953290
## Internal cash flow/net assets		0.062986597	0.1233364357
## Financing deficit/net assets		-0.013290471	0.0016674891
## Gross LT debt issued/net assets		0.000000000	0.0021776661
## Net LT debt issued/net assets		-0.021220830	-0.0007826053
## Net equity issued/net assets		-0.008317356	0.0007906310
## Net external financing/net assets		-0.052744734	-0.0016465118
## Total debt/book capitalization		0.084957223	0.2823296914
## Tangibility		0.121301451	0.2132980959
## Market/book assets		0.635914174	1.0757746168
			Q75
## Cash dividend/net assets			0.0249106188
## Investment/net assets			0.1657692736
## Changing working capital/net assets			0.0511703400
## Internal cash flow/net assets			0.1751792974
## Financing deficit/net assets			0.0062125367
## Gross LT debt issued/net assets			0.0782238026
## Net LT debt issued/net assets			0.0005102738
## Net equity issued/net assets			0.0091487410
## Net external financing/net assets			0.0161162029
## Total debt/book capitalization			0.4376663443
## Tangibility			0.4121890753
## Market/book assets			1.7245761510

## Log Sales	4.384048489	6.7500638500	8.5016871073
## Profitability	0.008932177	0.0508846466	0.0840053945
##	Max	SD	
## Cash dividend/net assets	0.1836687	0.02455060	
## Investment/net assets	0.8296366	0.18056113	
## Changing working capital/net assets	0.2662582	0.15215003	
## Internal cash flow/net assets	0.6134021	0.23703515	
## Financing deficit/net assets	0.1856807	0.09214027	
## Gross LT debt issued/net assets	3.6270903	0.33578950	
## Net LT debt issued/net assets	3.0969900	0.24556728	
## Net equity issued/net assets	0.2856412	0.06789467	
## Net external financing/net assets	3.1998328	0.26902864	
## Total debt/book capitalization	4.2814998	0.79173991	
## Tangibility	0.8761550	0.21799657	
## Market/book assets	56.3666667	4.47856182	
## Log Sales	12.4270739	2.72404992	
## Profitability	27.6666667	1.97186473	
##	Year	Non-NA	N
## Cash dividend/net assets	2008	169	0.02446113
## Investment/net assets	2008	169	0.08727691
## Changing working capital/net assets	2008	169	-0.02924506
## Internal cash flow/net assets	2008	169	0.16490550
## Financing deficit/net assets	2008	169	0.09731792
## Gross LT debt issued/net assets	2008	169	0.06417017
## Net LT debt issued/net assets	2008	169	0.08516799
## Net equity issued/net assets	2008	169	-0.02498799
## Net external financing/net assets	2008	169	0.05858238
## Total debt/book capitalization	2008	169	0.33238849
## Tangibility	2008	169	0.29079024
## Market/book assets	2008	169	1.62770713
## Log Sales	2008	169	6.52189889
## Profitability	2008	169	-0.04460893
##		Q25	Q50
## Cash dividend/net assets		0.000000000	7.464323e-03
## Investment/net assets		0.021249775	7.099063e-02
## Changing working capital/net assets		-0.066441653	2.107528e-02
## Internal cash flow/net assets		0.062421981	1.275952e-01
## Financing deficit/net assets		-0.025104575	-2.221681e-17
## Gross LT debt issued/net assets		0.000000000	2.719697e-02
## Net LT debt issued/net assets		-0.006168982	0.000000e+00
## Net equity issued/net assets		-0.024045966	0.000000e+00
## Net external financing/net assets		-0.031974252	0.000000e+00
## Total debt/book capitalization		0.041643059	3.213841e-01
## Tangibility		0.101693927	2.076869e-01
## Market/book assets		0.318345451	6.436703e-01
## Log Sales		4.695915417	7.019831e+00
## Profitability		-0.051355281	3.410339e-02
##		Max	SD
## Cash dividend/net assets		1.2514732	0.09826730
## Investment/net assets		0.3902965	0.13370260
## Changing working capital/net assets		0.2606229	0.22919493
## Internal cash flow/net assets		10.7882353	0.98352322
## Financing deficit/net assets		1.6348548	0.39156150
## Gross LT debt issued/net assets		1.5983072	0.58579926

## Net LT debt issued/net assets	9.3764706	0.74472083		
## Net equity issued/net assets	0.1173714	0.08984191		
## Net external financing/net assets	8.8529412	0.73322360		
## Total debt/book capitalization	7.2800467	0.95746620		
## Tangibility	0.9193504	0.23792498		
## Market/book assets	60.2160920	5.44938500		
## Log Sales	12.7970293	2.73695965		
## Profitability	1.3393768	0.44367694		
##	Year	Non-NA	N	Mean
## Cash dividend/net assets	2012	141	0.033115108	0.000000e+00
## Investment/net assets	2012	141	0.074040858	-3.959067e-01
## Changing working capital/net assets	2012	141	-0.012385778	-5.421359e-01
## Internal cash flow/net assets	2012	141	0.088345199	-1.397214e+00
## Financing deficit/net assets	2012	141	0.102256411	-9.960159e-02
## Gross LT debt issued/net assets	2012	141	0.089962653	-9.960159e-02
## Net LT debt issued/net assets	2012	141	0.007709615	-3.257360e-01
## Net equity issued/net assets	2012	141	-0.004653348	-2.604843e-01
## Net external financing/net assets	2012	141	0.002448464	-2.810389e-01
## Total debt/book capitalization	2012	141	-1.527541796	-2.875000e+02
## Tangibility	2012	141	0.281671325	1.249858e-03
## Market/book assets	2012	141	1.490658097	1.133803e-02
## Log Sales	2012	141	6.934804617	-3.912023e+00
## Profitability	2012	141	0.194432223	-9.925004e-01
##		Q25	Q50	Q75
## Cash dividend/net assets		0.000000000	0.012315993	0.0361285162
## Investment/net assets		0.024417644	0.069502559	0.1343142912
## Changing working capital/net assets		-0.067393131	0.005708849	0.0481435173
## Internal cash flow/net assets		0.080984335	0.123138588	0.1557994162
## Financing deficit/net assets		-0.030207986	-0.001562406	0.1146168248
## Gross LT debt issued/net assets		0.000000000	0.019154870	0.1351535945
## Net LT debt issued/net assets		-0.019863046	0.000000000	0.0212418569
## Net equity issued/net assets		-0.011723387	0.000000000	0.0008408493
## Net external financing/net assets		-0.044056661	-0.008655412	0.0080932521
## Total debt/book capitalization		0.080518532	0.302674075	0.4608330743
## Tangibility		0.091956267	0.209983068	0.4191930667
## Market/book assets		0.464035317	0.815360702	1.4321260269
## Log Sales		5.364381286	7.533620445	8.8422265384
## Profitability		0.008727627	0.046614949	0.0870866675
##		Max	SD	
## Cash dividend/net assets		1.1300531	0.10211061	
## Investment/net assets		0.4270239	0.11885936	
## Changing working capital/net assets		0.6616819	0.21392943	
## Internal cash flow/net assets		0.4760956	0.23857853	
## Financing deficit/net assets		0.9257143	0.25788338	
## Gross LT debt issued/net assets		0.7581445	0.14279730	
## Net LT debt issued/net assets		0.4868935	0.09427859	
## Net equity issued/net assets		0.9257143	0.10420902	
## Net external financing/net assets		0.9257143	0.13731536	
## Total debt/book capitalization		15.7761480	24.33253448	
## Tangibility		0.8772248	0.23338132	
## Market/book assets		30.2762500	3.15107507	
## Log Sales		12.8362268	2.81920816	
## Profitability		24.6000000	2.07708806	
##	Year	Non-NA	N	Mean
##				Min

## Cash dividend/net assets	2015	111	0.027380392	0.000000000
## Investment/net assets	2015	111	0.002903764	-3.906508876
## Changing working capital/net assets	2015	111	0.040708281	-0.426905235
## Internal cash flow/net assets	2015	111	0.107805284	-2.553846154
## Financing deficit/net assets	2015	111	-0.033937392	-0.261538462
## Gross LT debt issued/net assets	2015	111	0.139656134	0.000000000
## Net LT debt issued/net assets	2015	111	0.014886502	-0.304914568
## Net equity issued/net assets	2015	111	-0.038280052	-1.095916773
## Net external financing/net assets	2015	111	-0.030523276	-0.547656160
## Total debt/book capitalization	2015	111	1.723527710	-0.289864489
## Tangibility	2015	111	0.287706902	0.009987372
## Market/book assets	2015	111	1.162454334	0.037936242
## Log Sales	2015	111	7.551847841	0.087094707
## Profitability	2015	111	0.029446250	-1.226992888
##		Q25	Q50	Q75
## Cash dividend/net assets		0.002480033	1.725552e-02	0.0399434261
## Investment/net assets		0.021874704	6.964746e-02	0.1344264465
## Changing working capital/net assets		-0.030888637	8.674699e-03	0.0402739592
## Internal cash flow/net assets		0.089534781	1.281083e-01	0.1819253785
## Financing deficit/net assets		-0.047817994	-4.032606e-17	0.0056087228
## Gross LT debt issued/net assets		0.000000000	3.842705e-02	0.1361048793
## Net LT debt issued/net assets		-0.012818620	0.000000e+00	0.0211484760
## Net equity issued/net assets		-0.036466700	-1.840418e-03	0.0002276636
## Net external financing/net assets		-0.055676419	-1.181921e-02	0.0084238581
## Total debt/book capitalization		0.200858222	3.638903e-01	0.5221504840
## Tangibility		0.095715274	2.168124e-01	0.3954254601
## Market/book assets		0.468786683	9.112049e-01	1.4577080678
## Log Sales		6.298233551	7.888674e+00	8.8935432008
## Profitability		0.002761423	4.604428e-02	0.0757836917
##		Max	SD	
## Cash dividend/net assets		0.15468250	0.03243329	
## Investment/net assets		0.58098078	0.53155950	
## Changing working capital/net assets		1.09112426	0.25704882	
## Internal cash flow/net assets		0.92776524	0.33666379	
## Financing deficit/net assets		0.03360438	0.08585050	
## Gross LT debt issued/net assets		2.89691497	0.32934819	
## Net LT debt issued/net assets		0.54826061	0.11488676	
## Net equity issued/net assets		0.08387036	0.11986220	
## Net external financing/net assets		0.34988713	0.12575392	
## Total debt/book capitalization		148.17469880	14.03223584	
## Tangibility		0.92404650	0.23976121	
## Market/book assets		6.97487039	1.07062086	
## Log Sales		12.36185770	2.24148830	
## Profitability		0.34944323	0.14931236	
##	Year	Non-NA N	Mean	Min
## Cash dividend/net assets	2017	101	0.026714618	0.000000000
## Investment/net assets	2017	101	0.070734136	-0.31729388
## Changing working capital/net assets	2017	101	0.031946396	-0.08525608
## Internal cash flow/net assets	2017	101	0.108690464	-0.57012394
## Financing deficit/net assets	2017	101	-0.001381721	-0.09243376
## Gross LT debt issued/net assets	2017	101	0.179695318	0.000000000
## Net LT debt issued/net assets	2017	101	0.030106666	-0.19504240
## Net equity issued/net assets	2017	101	-0.024976792	-0.37565314
## Net external financing/net assets	2017	101	-0.000509474	-0.36066514

## Total debt/book capitalization	2017	101	0.434394263	-1.29616477
## Tangibility	2017	101	0.281379599	0.00000000
## Market/book assets	2017	101	7.543424220	0.04097372
## Log Sales	2017	101	7.504264040	-5.11599581
## Profitability	2017	101	-0.194327442	-23.23809524
##		Q25	Q50	Q75
## Cash dividend/net assets		0.0009951397	0.014375121	0.03671718
## Investment/net assets		0.0250124628	0.065300651	0.11869680
## Changing working capital/net assets		-0.0214236914	0.012273485	0.05936472
## Internal cash flow/net assets		0.0671473300	0.109743021	0.16344274
## Financing deficit/net assets		-0.0366791440	-0.001890764	0.02072630
## Gross LT debt issued/net assets		0.0000000000	0.060298925	0.16942534
## Net LT debt issued/net assets		-0.0038828841	0.001017409	0.04926105
## Net equity issued/net assets		-0.0187428740	-0.001779643	0.00000000
## Net external financing/net assets		-0.0471615617	-0.004723378	0.03387261
## Total debt/book capitalization		0.2177642628	0.354274957	0.53484581
## Tangibility		0.0900114303	0.196955074	0.41311729
## Market/book assets		0.6056822060	1.042958007	1.66230820
## Log Sales		6.1869737632	7.916369918	9.01037609
## Profitability		0.0093226177	0.035317702	0.07663422
##		Max	SD	
## Cash dividend/net assets		0.1860409	0.03447319	
## Investment/net assets		0.4004305	0.11013937	
## Changing working capital/net assets		0.2394932	0.08231916	
## Internal cash flow/net assets		0.4369847	0.13202794	
## Financing deficit/net assets		0.0921659	0.06182419	
## Gross LT debt issued/net assets		3.7181996	0.46286359	
## Net LT debt issued/net assets		0.4544710	0.09757893	
## Net equity issued/net assets		0.1339556	0.07163984	
## Net external financing/net assets		0.4546075	0.12072977	
## Total debt/book capitalization		5.5718709	0.70080759	
## Tangibility		0.9233110	0.24216235	
## Market/book assets		590.6714286	60.47507914	
## Log Sales		12.3892605	2.58697324	
## Profitability		0.2661198	2.31779865	
##	Year	Non-NA	N	Mean
## Cash dividend/net assets	2019		93	0.025940401
## Investment/net assets	2019		93	0.049714668
## Changing working capital/net assets	2019		93	0.007546078
## Internal cash flow/net assets	2019		93	0.109511418
## Financing deficit/net assets	2019		93	-0.014852509
## Gross LT debt issued/net assets	2019		93	0.136983082
## Net LT debt issued/net assets	2019		93	0.009309112
## Net equity issued/net assets	2019		93	-0.029819578
## Net external financing/net assets	2019		93	-0.017167906
## Total debt/book capitalization	2019		93	0.458151529
## Tangibility	2019		93	0.314637837
## Market/book assets	2019		93	1.324614423
## Log Sales	2019		93	7.699271119
## Profitability	2019		93	0.031082679
##		Q25	Q50	Q75
## Cash dividend/net assets		0.000000000	0.015445981	3.910082e-02
## Investment/net assets		0.021900996	0.037649544	8.062172e-02
## Changing working capital/net assets		-0.021881742	-0.013542964	2.477607e-02

## Internal cash flow/net assets	0.078515068	0.108614865	1.644849e-01
## Financing deficit/net assets	-0.034359567	-0.009005321	1.753630e-17
## Gross LT debt issued/net assets	0.000000000	0.032302189	1.474526e-01
## Net LT debt issued/net assets	-0.032271920	-0.002770360	1.515105e-03
## Net equity issued/net assets	-0.035870735	-0.004652664	0.000000e+00
## Net external financing/net assets	-0.061524095	-0.014920440	1.370798e-02
## Total debt/book capitalization	0.264789535	0.405305917	5.734341e-01
## Tangibility	0.102405987	0.246773651	4.493384e-01
## Market/book assets	0.458659859	0.876690126	1.725450e+00
## Log Sales	6.199315764	7.983167174	9.181632e+00
## Profitability	0.004693211	0.036706115	6.371401e-02
##	Max	SD	
## Cash dividend/net assets	0.14164429	0.03169418	
## Investment/net assets	0.24805827	0.05756056	
## Changing working capital/net assets	0.09107655	0.04093567	
## Internal cash flow/net assets	0.41741901	0.11966956	
## Financing deficit/net assets	0.02355355	0.03032488	
## Gross LT debt issued/net assets	2.51665253	0.31456186	
## Net LT debt issued/net assets	0.56554193	0.09334032	
## Net equity issued/net assets	0.14254565	0.06195860	
## Net external financing/net assets	0.49367880	0.11039241	
## Total debt/book capitalization	4.72871069	0.57360711	
## Tangibility	0.92737128	0.25185210	
## Market/book assets	8.90116125	1.45689544	
## Log Sales	12.53680343	2.35966145	
## Profitability	0.67655572	0.13035297	

###correlation table

```
cor(df[, -c(1,2)],
     use="pairwise",
     method="spearman") %>% print()
```

##	Cash dividend/net assets
## Cash dividend/net assets	1.00000000
## Investment/net assets	0.05468153
## Changing working capital/net assets	-0.04612174
## Internal cash flow/net assets	0.31406341
## Financing deficit/net assets	-0.06318576
## Gross LT debt issued/net assets	-0.04425501
## Net LT debt issued/net assets	0.03886253
## Net equity issued/net assets	-0.14334524
## Net external financing/net assets	-0.06123623
## Total debt/book capitalization	-0.11584992
## Tangibility	0.12080307
## Market/book assets	0.28464489
## Log Sales	0.51642023
## Profitability	0.37934459
##	Investment/net assets
## Cash dividend/net assets	0.05468153
## Investment/net assets	1.00000000
## Changing working capital/net assets	-0.26654568
## Internal cash flow/net assets	0.25277330

## Financing deficit/net assets	0.23521994
## Gross LT debt issued/net assets	0.32518188
## Net LT debt issued/net assets	0.35937392
## Net equity issued/net assets	0.18802035
## Net external financing/net assets	0.40616342
## Total debt/book capitalization	0.08058082
## Tangibility	0.24823637
## Market/book assets	0.13176813
## Log Sales	0.05265182
## Profitability	0.12145222
##	Changing working capital/net assets
## Cash dividend/net assets	-0.0461217429
## Investment/net assets	-0.2665456790
## Changing working capital/net assets	1.0000000000
## Internal cash flow/net assets	0.4355556748
## Financing deficit/net assets	0.1780853243
## Gross LT debt issued/net assets	0.0140455473
## Net LT debt issued/net assets	0.1384723393
## Net equity issued/net assets	0.1372575603
## Net external financing/net assets	0.2243825987
## Total debt/book capitalization	-0.1135116306
## Tangibility	-0.1229812642
## Market/book assets	0.1404317260
## Log Sales	-0.0004269491
## Profitability	0.2739812023
##	Internal cash flow/net assets
## Cash dividend/net assets	0.31406341
## Investment/net assets	0.25277330
## Changing working capital/net assets	0.43555567
## Internal cash flow/net assets	1.00000000
## Financing deficit/net assets	-0.10715411
## Gross LT debt issued/net assets	-0.10037477
## Net LT debt issued/net assets	-0.06259455
## Net equity issued/net assets	-0.10524926
## Net external financing/net assets	-0.18291358
## Total debt/book capitalization	-0.19749979
## Tangibility	0.08710141
## Market/book assets	0.42045454
## Log Sales	0.22898565
## Profitability	0.65603481
##	Financing deficit/net assets
## Cash dividend/net assets	-0.06318576
## Investment/net assets	0.23521994
## Changing working capital/net assets	0.17808532
## Internal cash flow/net assets	-0.10715411
## Financing deficit/net assets	1.00000000
## Gross LT debt issued/net assets	0.35872332
## Net LT debt issued/net assets	0.71251150
## Net equity issued/net assets	0.43972404
## Net external financing/net assets	0.99239282
## Total debt/book capitalization	0.01135119
## Tangibility	0.02814105
## Market/book assets	0.08937126
## Log Sales	-0.01622881



## Profitability	-0.06103689
##	Gross LT debt issued/net assets
## Cash dividend/net assets	-0.04425501
## Investment/net assets	0.32518188
## Changing working capital/net assets	0.01404555
## Internal cash flow/net assets	-0.10037477
## Financing deficit/net assets	0.35872332
## Gross LT debt issued/net assets	1.00000000
## Net LT debt issued/net assets	0.52853288
## Net equity issued/net assets	0.09323389
## Net external financing/net assets	0.46966180
## Total debt/book capitalization	0.46047689
## Tangibility	0.18467911
## Market/book assets	-0.16986995
## Log Sales	0.13287576
## Profitability	-0.09788003
##	Net LT debt issued/net assets
## Cash dividend/net assets	0.03886253
## Investment/net assets	0.35937392
## Changing working capital/net assets	0.13847234
## Internal cash flow/net assets	-0.06259455
## Financing deficit/net assets	0.71251150
## Gross LT debt issued/net assets	0.52853288
## Net LT debt issued/net assets	1.00000000
## Net equity issued/net assets	0.02427767
## Net external financing/net assets	0.79423370
## Total debt/book capitalization	0.11448333
## Tangibility	0.06549127
## Market/book assets	0.01653574
## Log Sales	0.02874097
## Profitability	-0.02170281
##	Net equity issued/net assets
## Cash dividend/net assets	-0.14334524
## Investment/net assets	0.18802035
## Changing working capital/net assets	0.13725756
## Internal cash flow/net assets	-0.10524926
## Financing deficit/net assets	0.43972404
## Gross LT debt issued/net assets	0.09323389
## Net LT debt issued/net assets	0.02427767
## Net equity issued/net assets	1.00000000
## Net external financing/net assets	0.43901106
## Total debt/book capitalization	0.01801153
## Tangibility	0.01842176
## Market/book assets	0.02307891
## Log Sales	-0.12817105
## Profitability	-0.05589343
##	Net external financing/net assets
## Cash dividend/net assets	-0.06123623
## Investment/net assets	0.40616342
## Changing working capital/net assets	0.22438260
## Internal cash flow/net assets	-0.18291358
## Financing deficit/net assets	0.99239282
## Gross LT debt issued/net assets	0.46966180
## Net LT debt issued/net assets	0.79423370

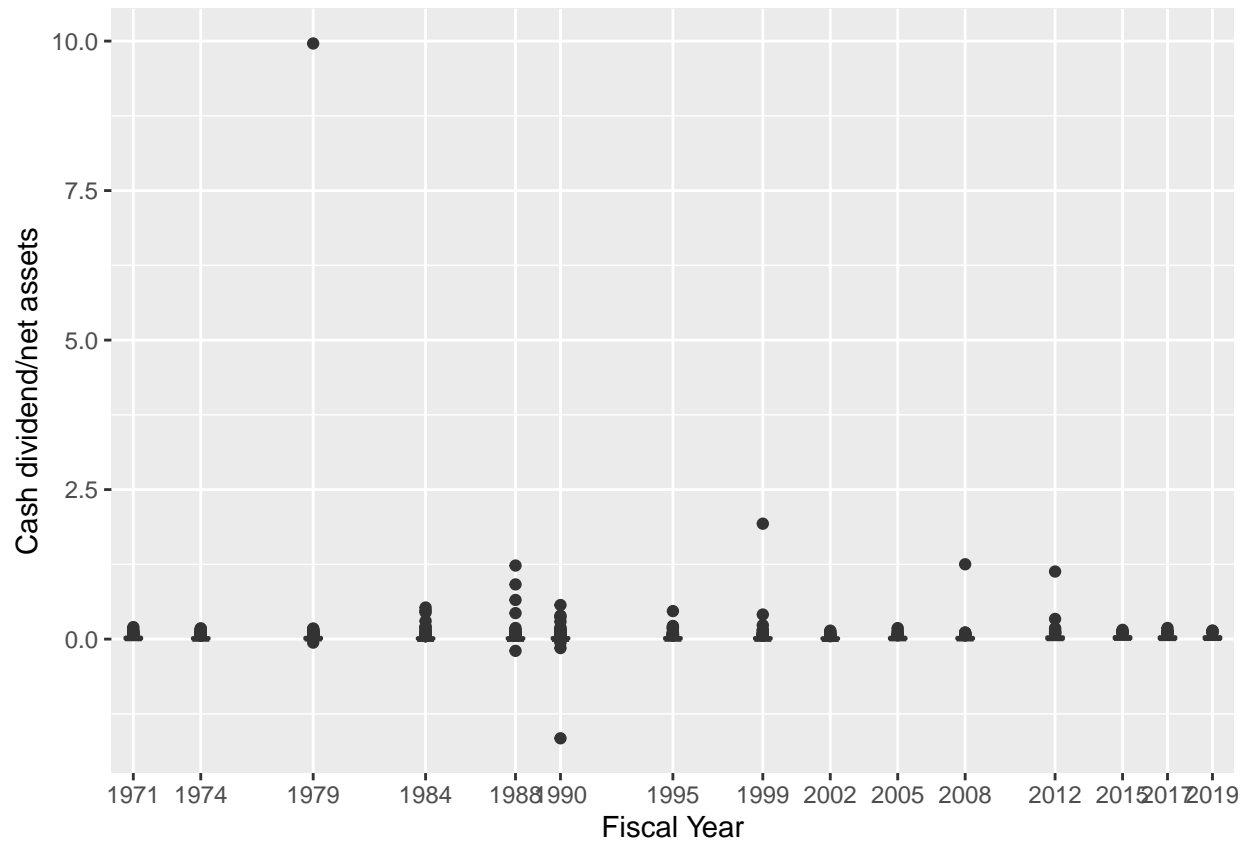
## Net equity issued/net assets	0.43901106
## Net external financing/net assets	1.00000000
## Total debt/book capitalization	0.10752560
## Tangibility	0.06646771
## Market/book assets	-0.03554020
## Log Sales	-0.08726536
## Profitability	-0.09495497
##	Total debt/book capitalization Tangibility
## Cash dividend/net assets	-0.11584992 0.120803071
## Investment/net assets	0.08058082 0.248236366
## Changing working capital/net assets	-0.11351163 -0.122981264
## Internal cash flow/net assets	-0.19749979 0.087101406
## Financing deficit/net assets	0.01135119 0.028141051
## Gross LT debt issued/net assets	0.46047689 0.184679112
## Net LT debt issued/net assets	0.11448333 0.065491274
## Net equity issued/net assets	0.01801153 0.018421762
## Net external financing/net assets	0.10752560 0.066467705
## Total debt/book capitalization	1.00000000 0.180315983
## Tangibility	0.18031598 1.000000000
## Market/book assets	-0.36157302 -0.182657607
## Log Sales	0.10115770 0.125207983
## Profitability	-0.31867869 -0.006862523
##	Market/book assets Log Sales
## Cash dividend/net assets	0.28464489 0.5164202348
## Investment/net assets	0.13176813 0.0526518238
## Changing working capital/net assets	0.14043173 -0.0004269491
## Internal cash flow/net assets	0.42045454 0.2289856490
## Financing deficit/net assets	0.08937126 -0.0162288136
## Gross LT debt issued/net assets	-0.16986995 0.1328757611
## Net LT debt issued/net assets	0.01653574 0.0287409692
## Net equity issued/net assets	0.02307891 -0.1281710459
## Net external financing/net assets	-0.03554020 -0.0872653626
## Total debt/book capitalization	-0.36157302 0.1011576970
## Tangibility	-0.18265761 0.1252079827
## Market/book assets	1.00000000 0.0288165483
## Log Sales	0.02881655 1.0000000000
## Profitability	0.48404019 0.2019987483
##	Profitability
## Cash dividend/net assets	0.379344594
## Investment/net assets	0.121452223
## Changing working capital/net assets	0.273981202
## Internal cash flow/net assets	0.656034812
## Financing deficit/net assets	-0.061036894
## Gross LT debt issued/net assets	-0.097880028
## Net LT debt issued/net assets	-0.021702810
## Net equity issued/net assets	-0.055893430
## Net external financing/net assets	-0.094954968
## Total debt/book capitalization	-0.318678694
## Tangibility	-0.006862523
## Market/book assets	0.484040194
## Log Sales	0.201998748
## Profitability	1.000000000

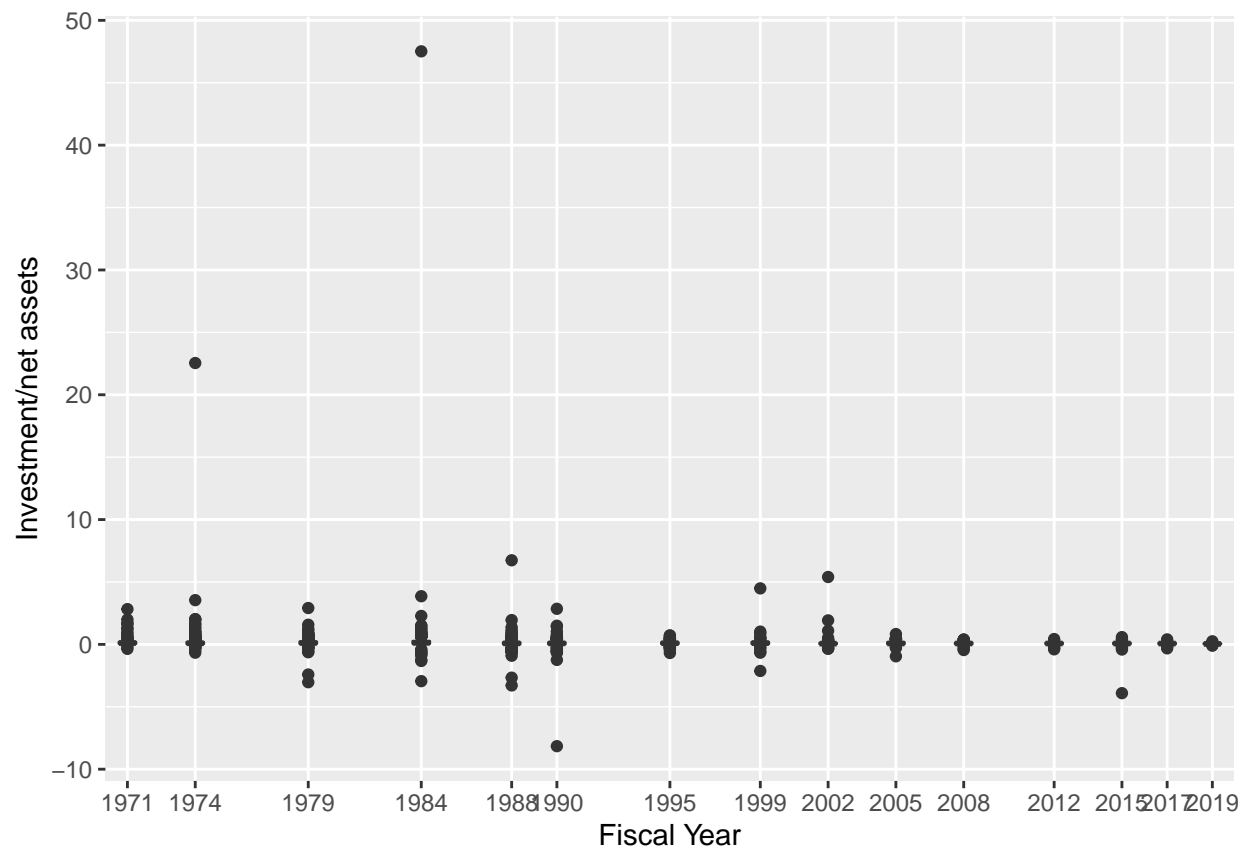
To plot the boxplots of the variables across years

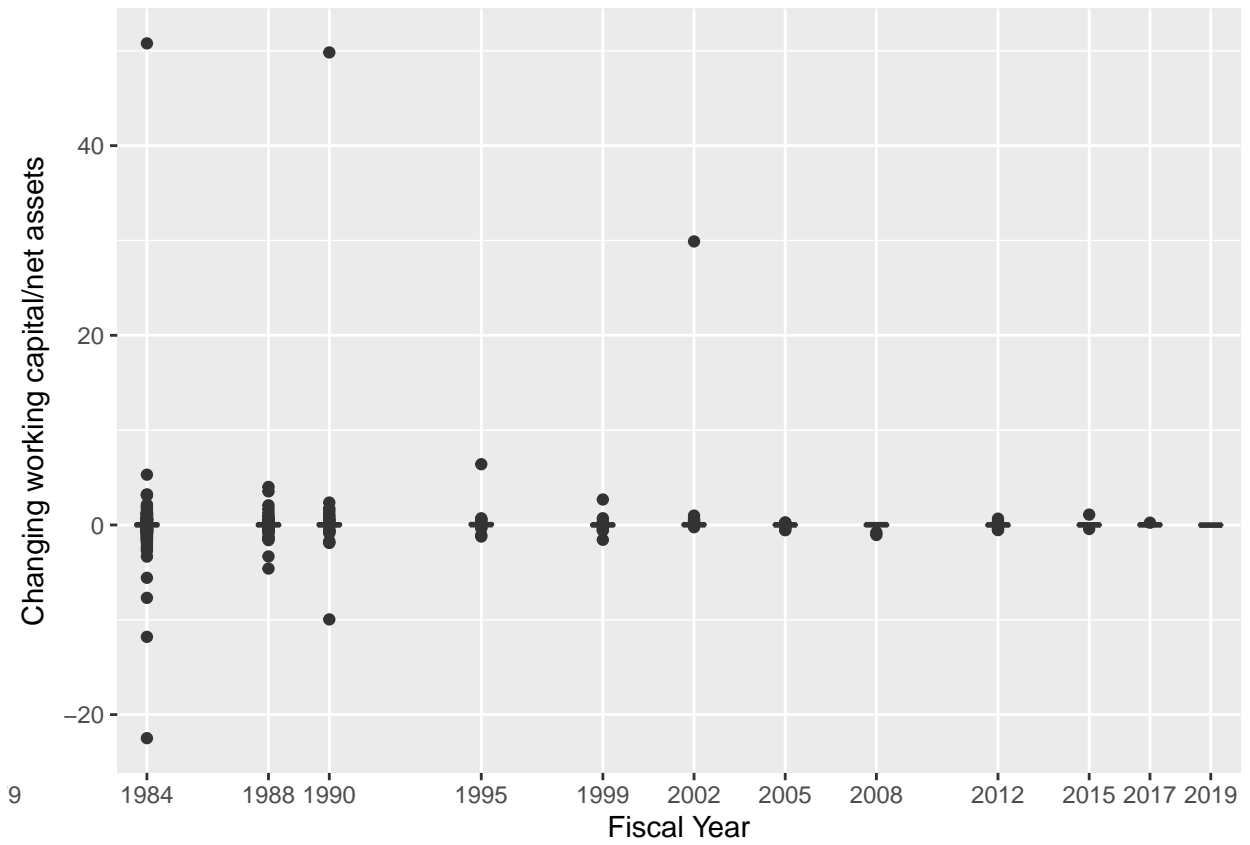
```

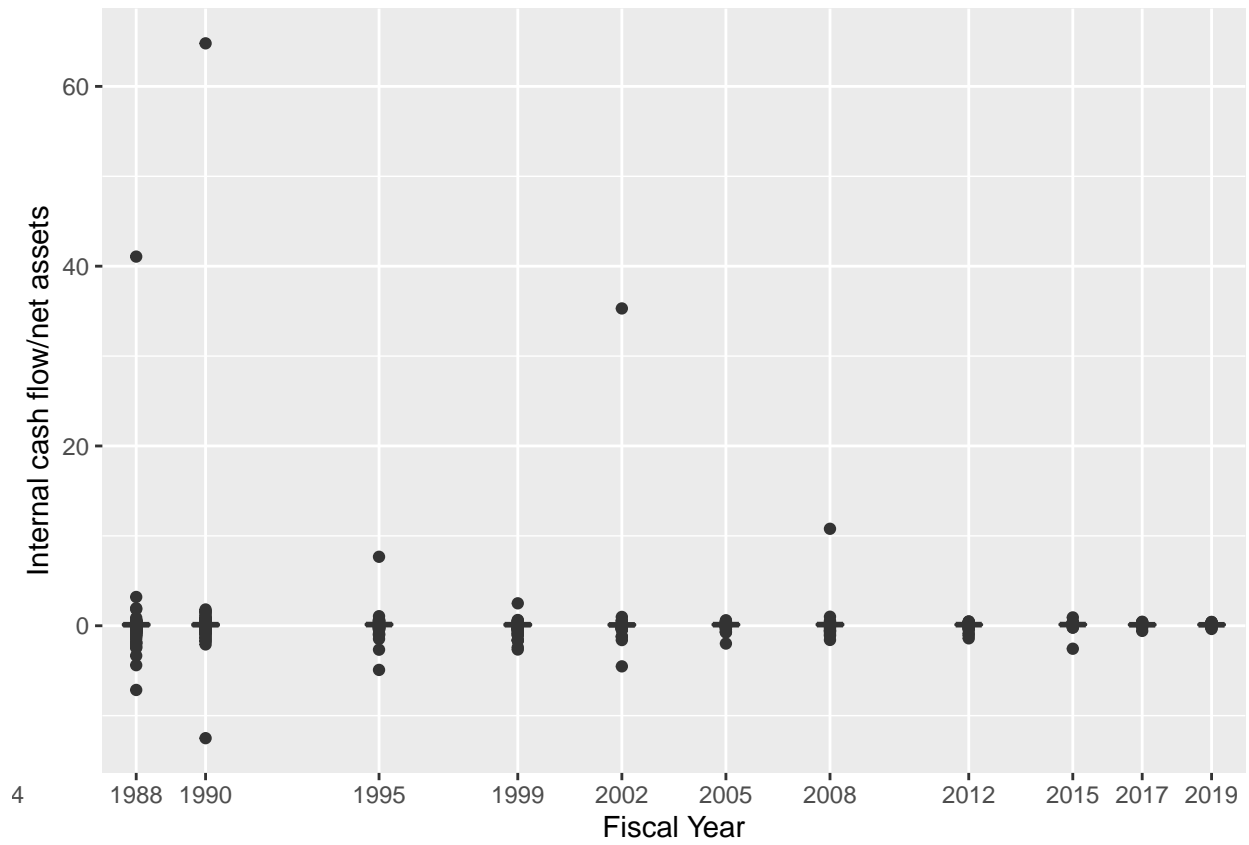
for (i in 3:16) {
  colns <- as.name(names(df)[i])
  plt <- df %>% select('FYEAR', colns) %>%
    ggplot(aes(x = 'FYEAR', y = eval(colns), group = 'FYEAR')) +
    geom_boxplot() + ylab(colns) +
    scale_x_discrete(name = 'Fiscal Year',
                     limits=c(1971, 1974, 1979, 1984, 1988, 1990, 1995, 1999, 2002, 2005, 2008, 2012, 2015,
                             2019))
  print(plt)
}

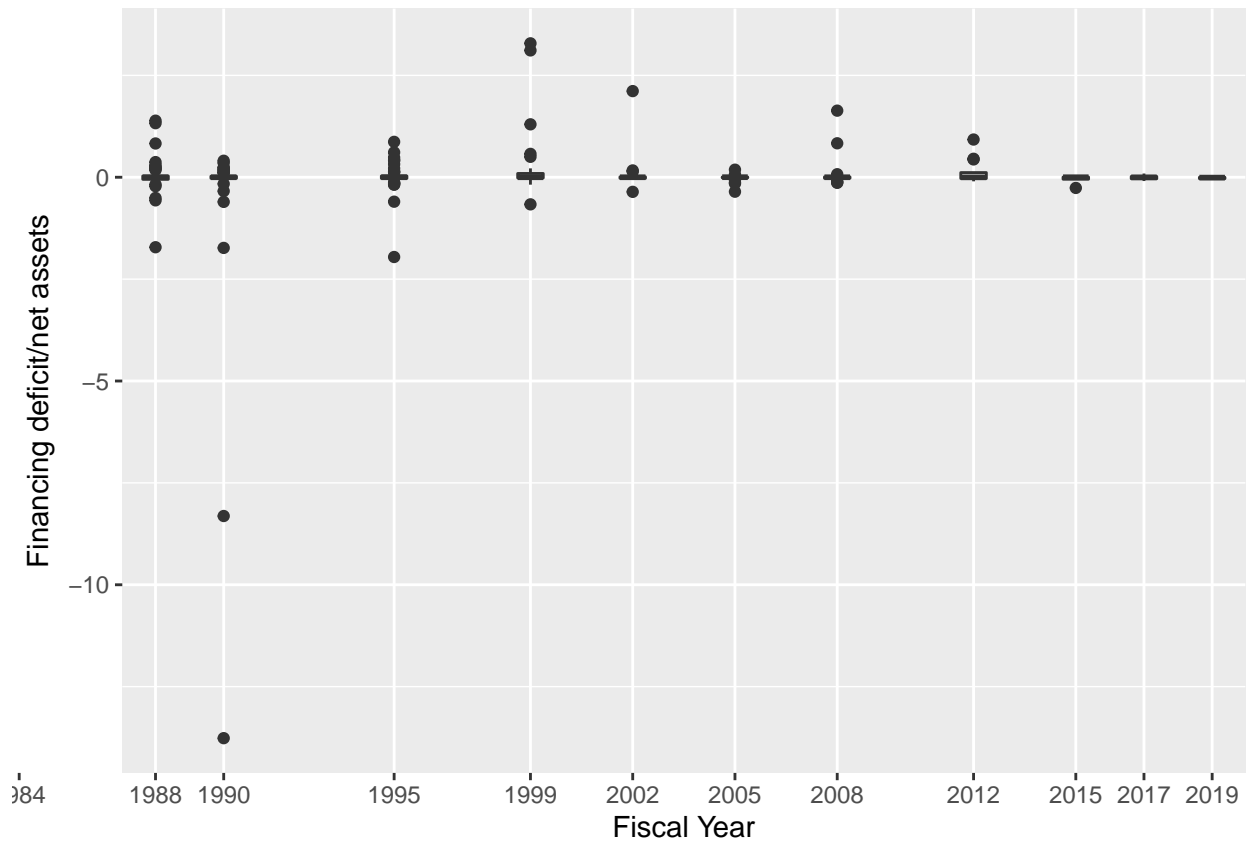
```

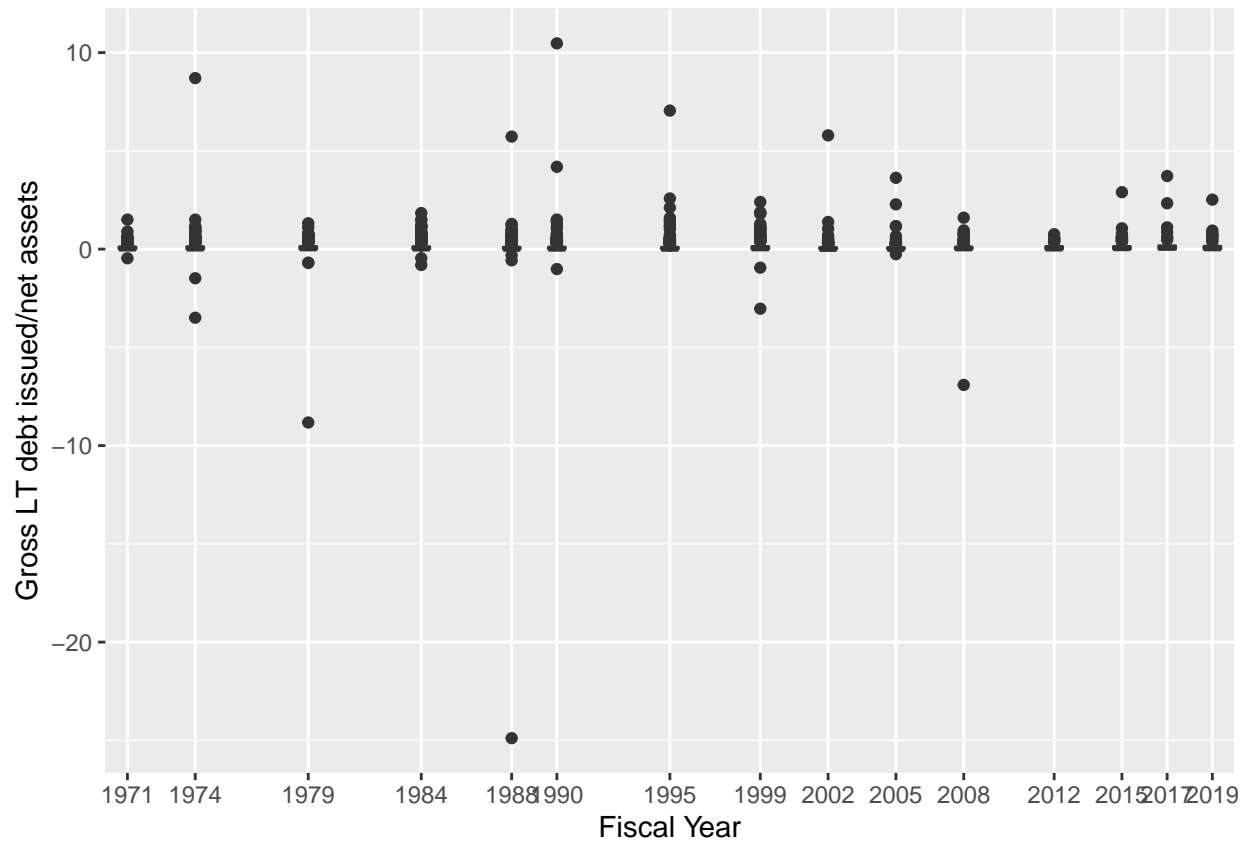




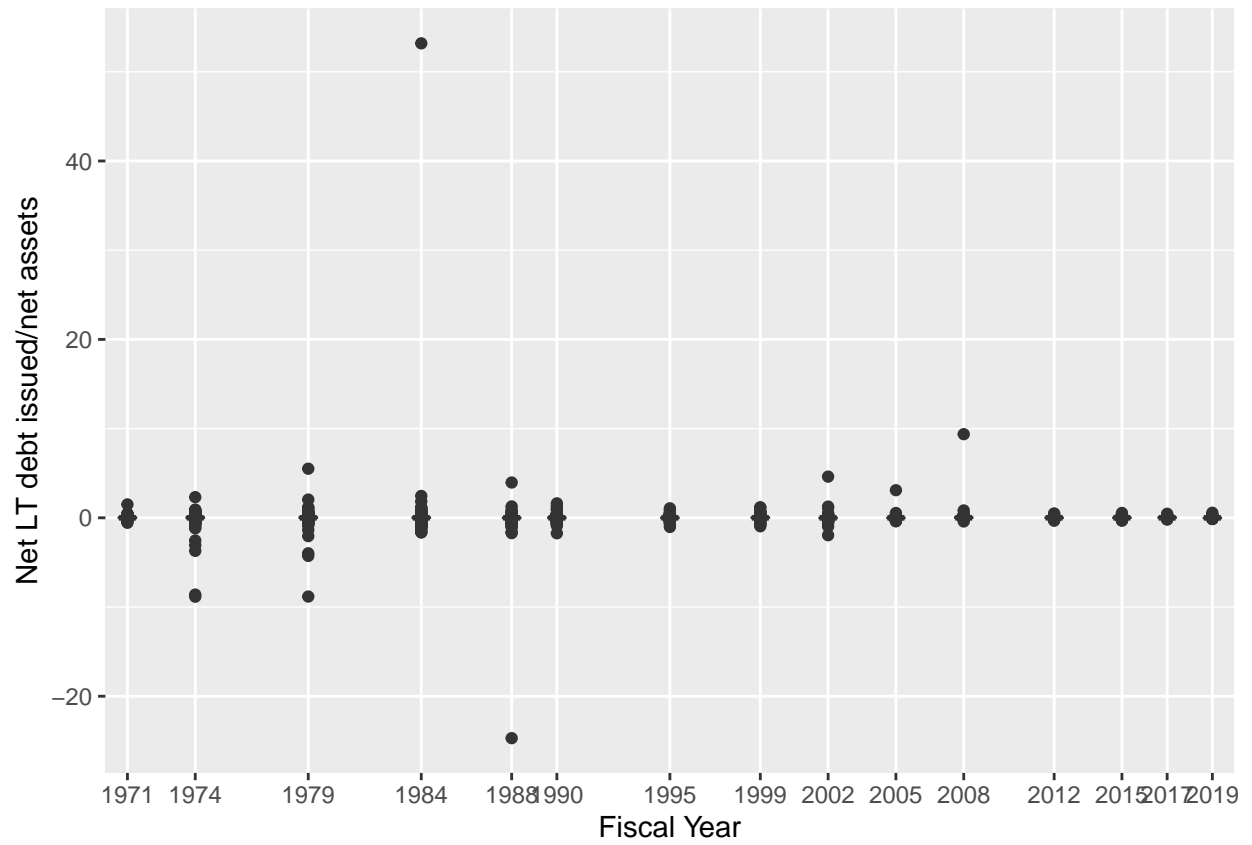


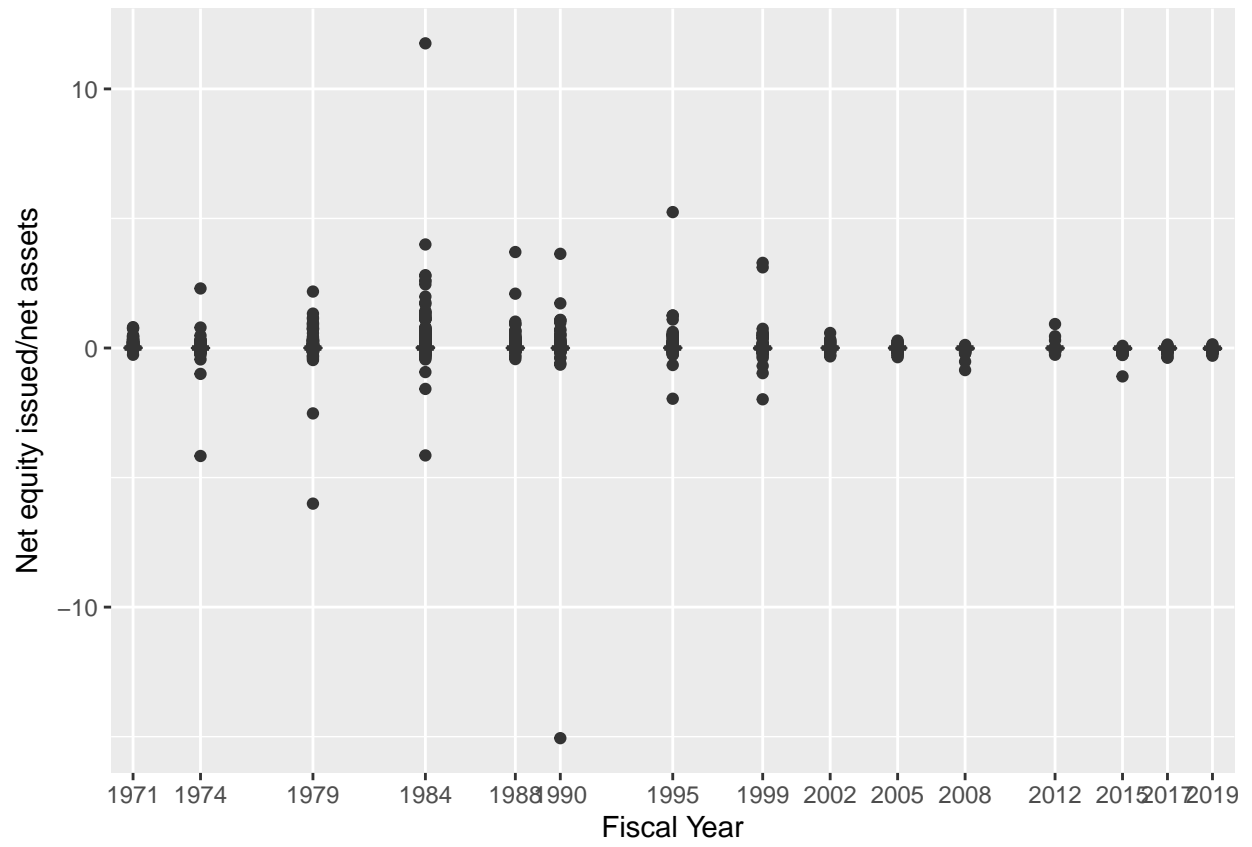


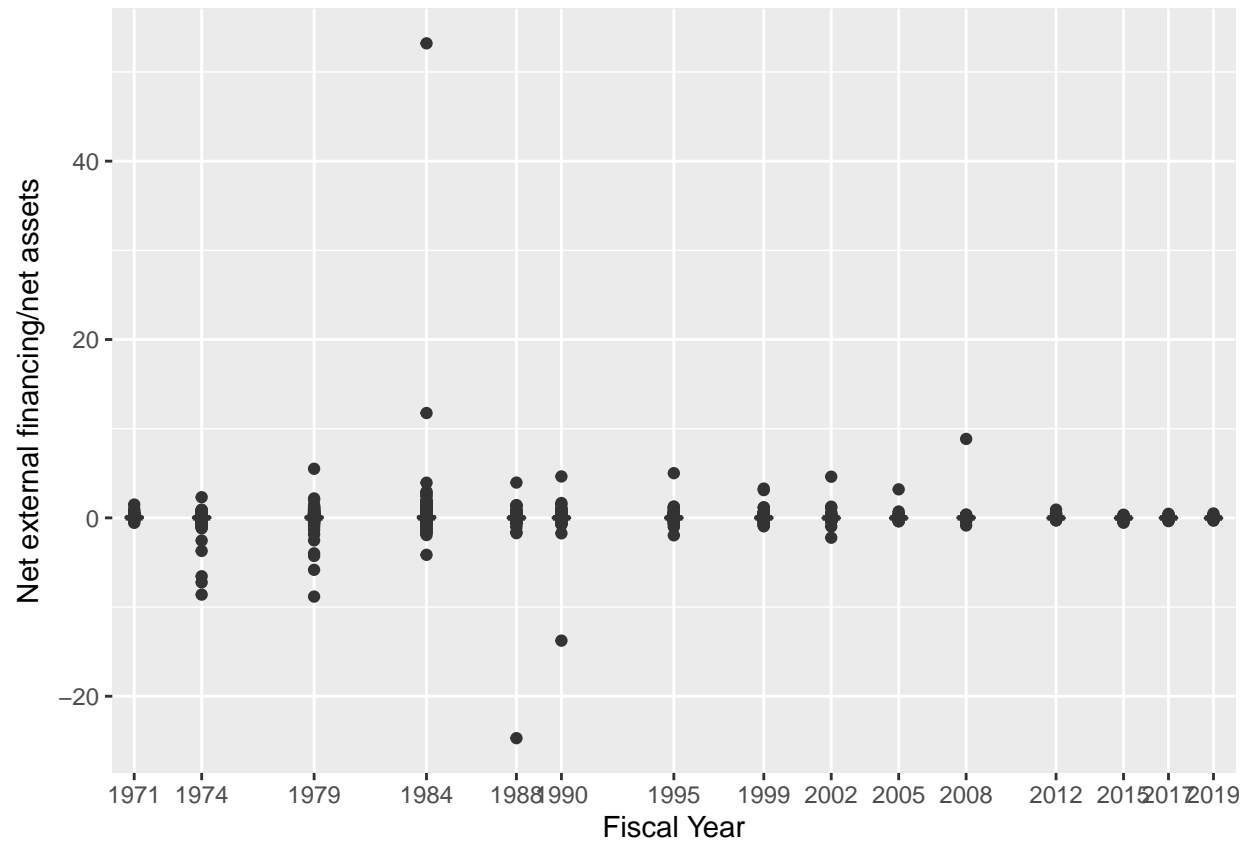


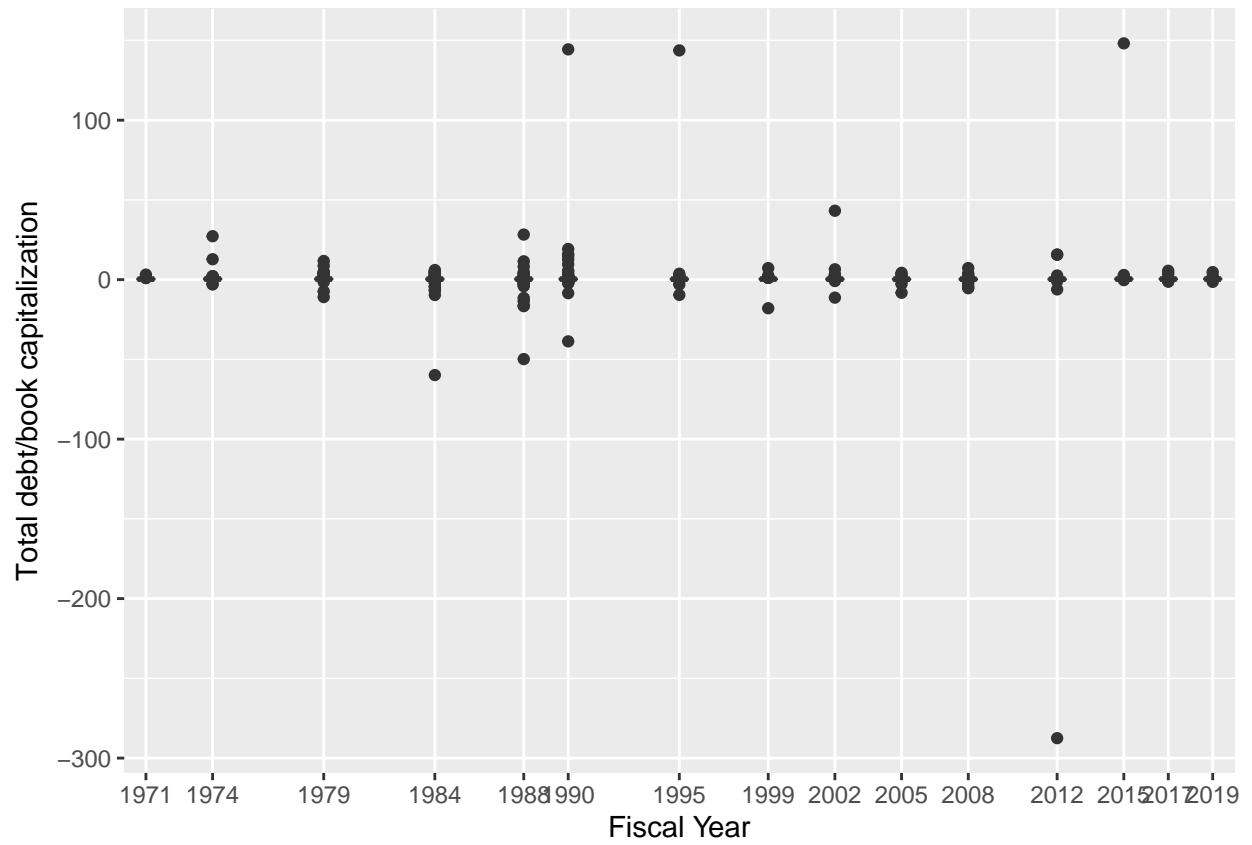


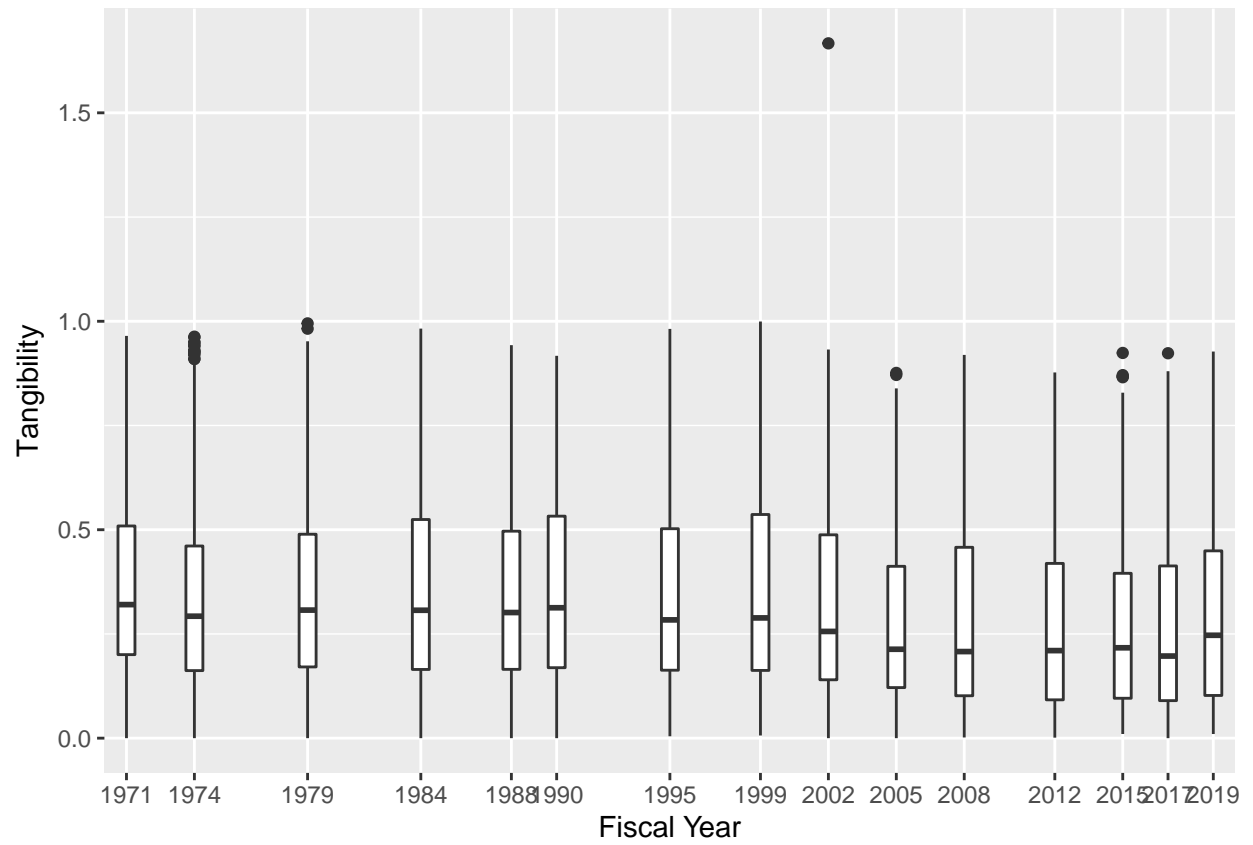


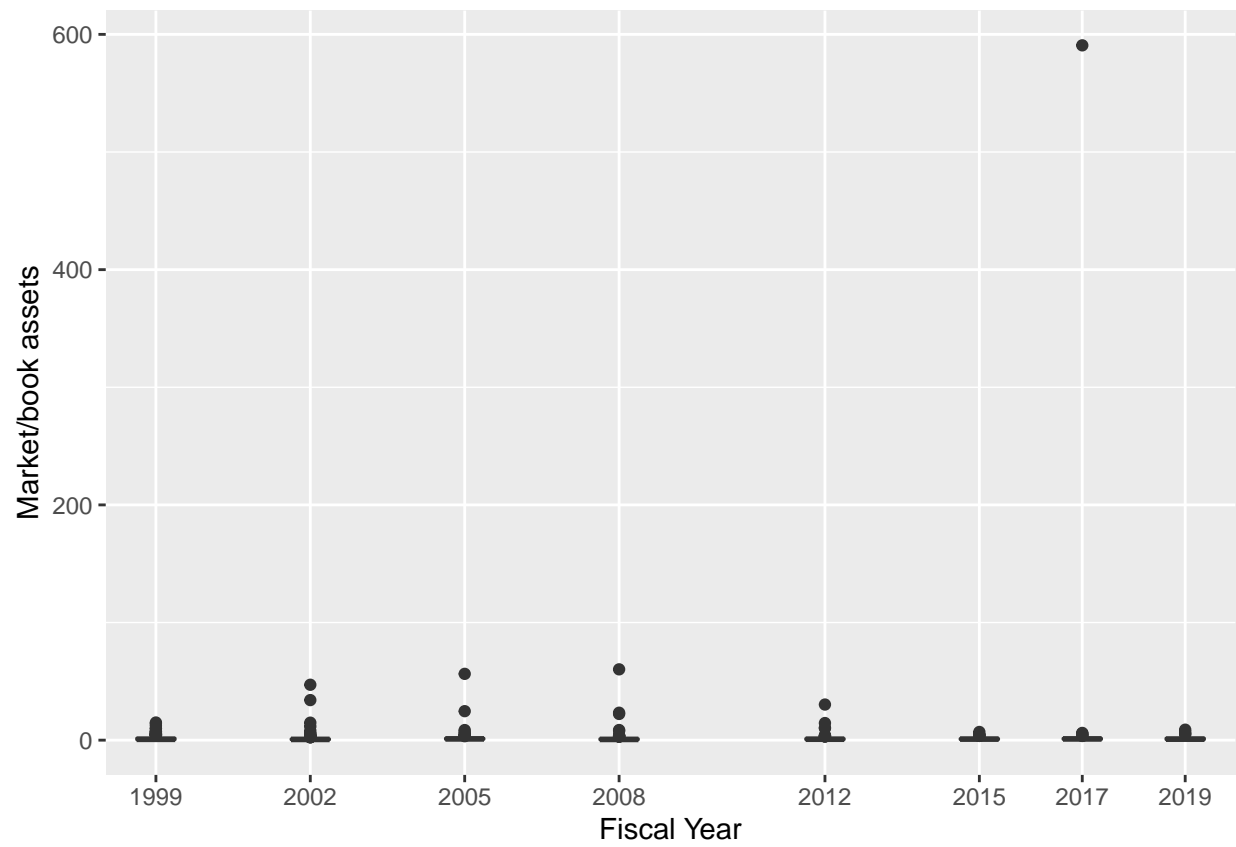


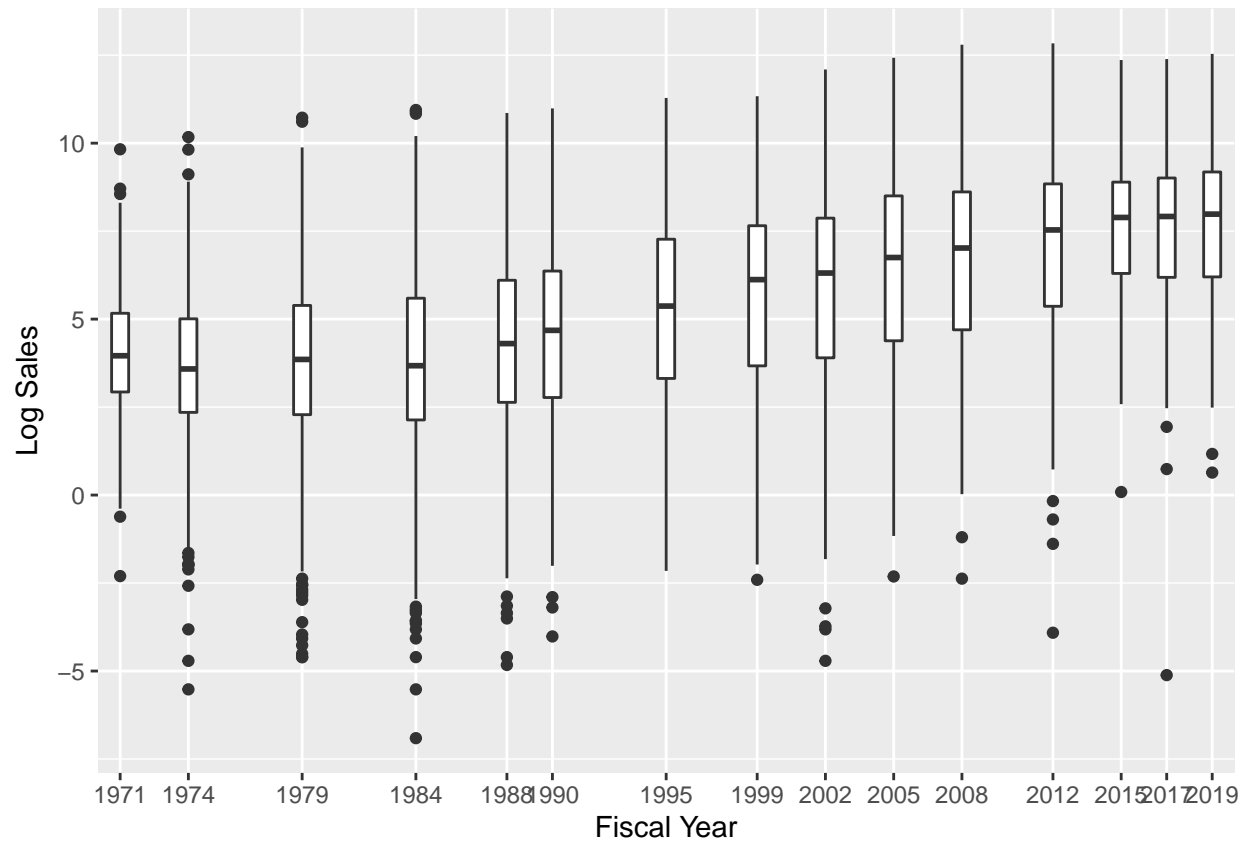


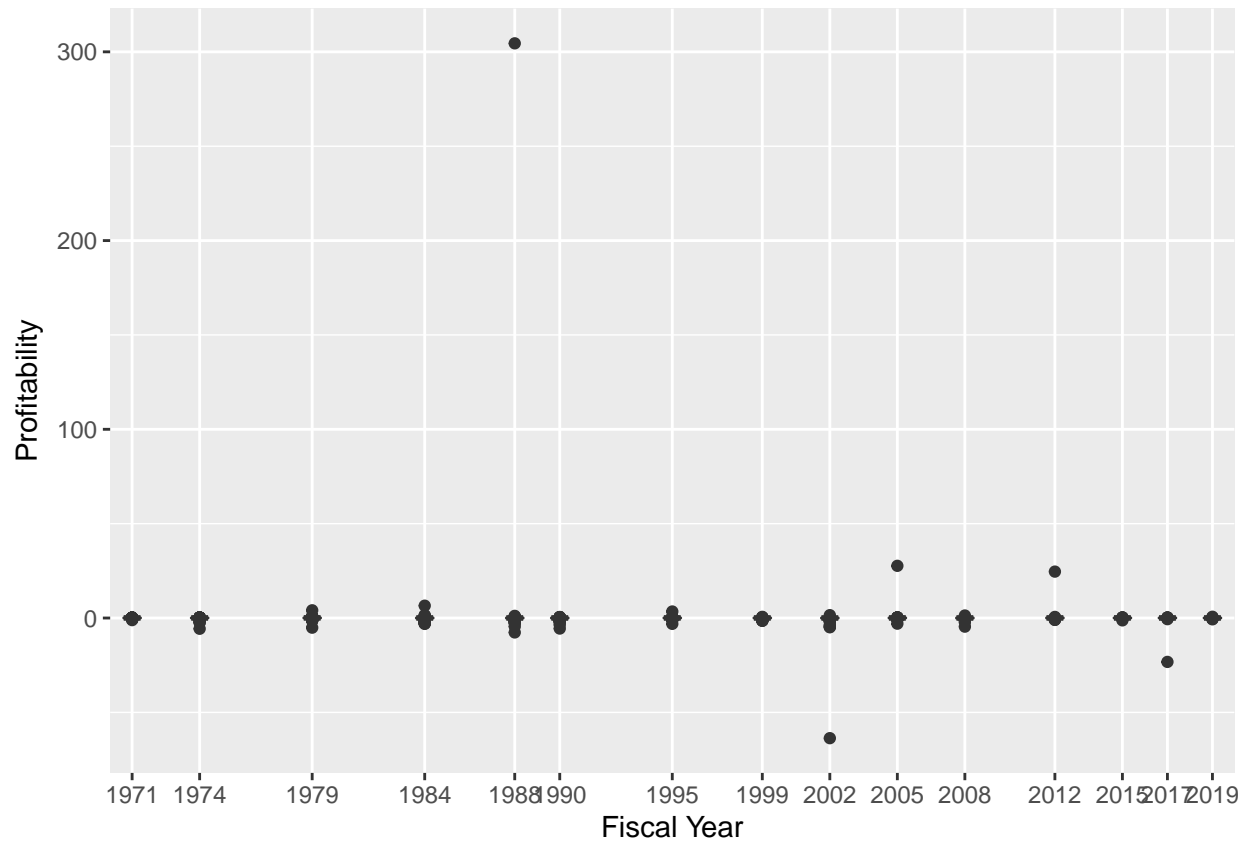








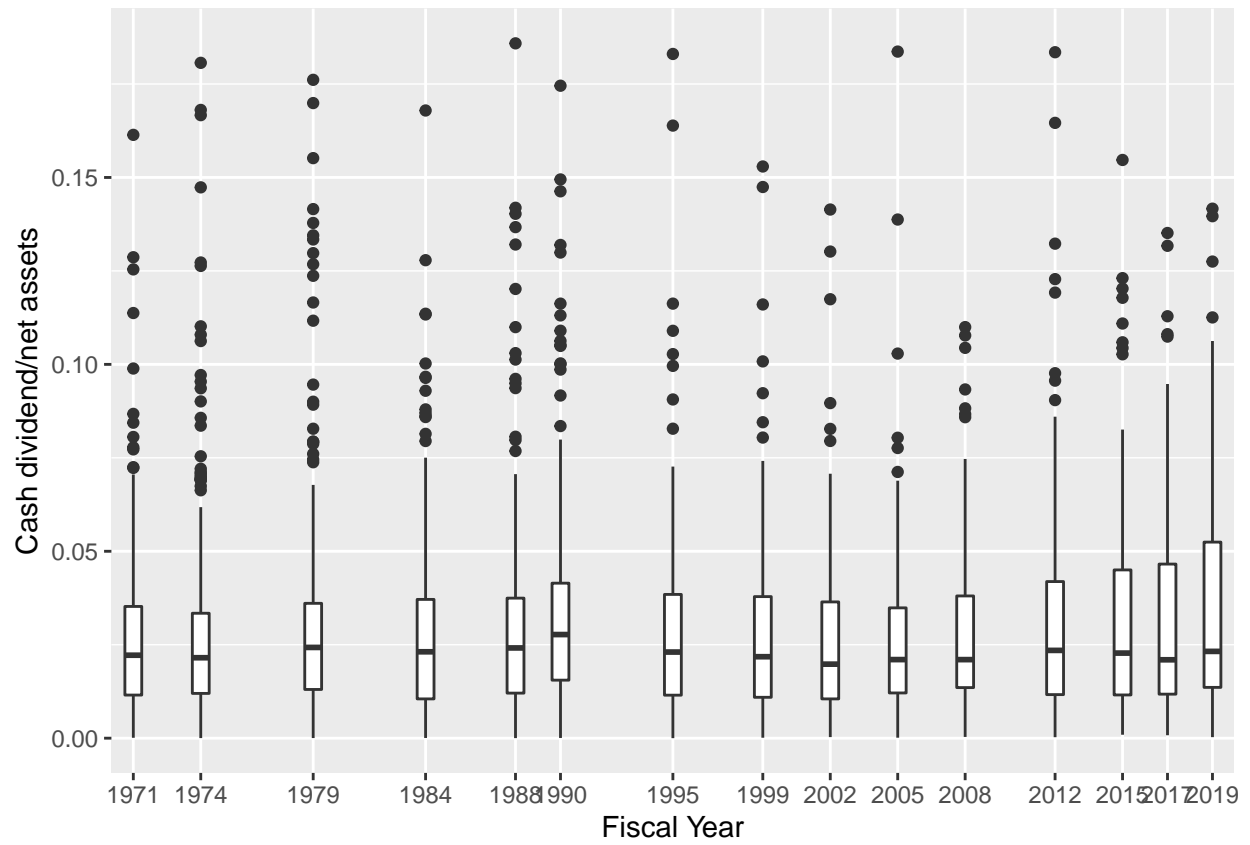


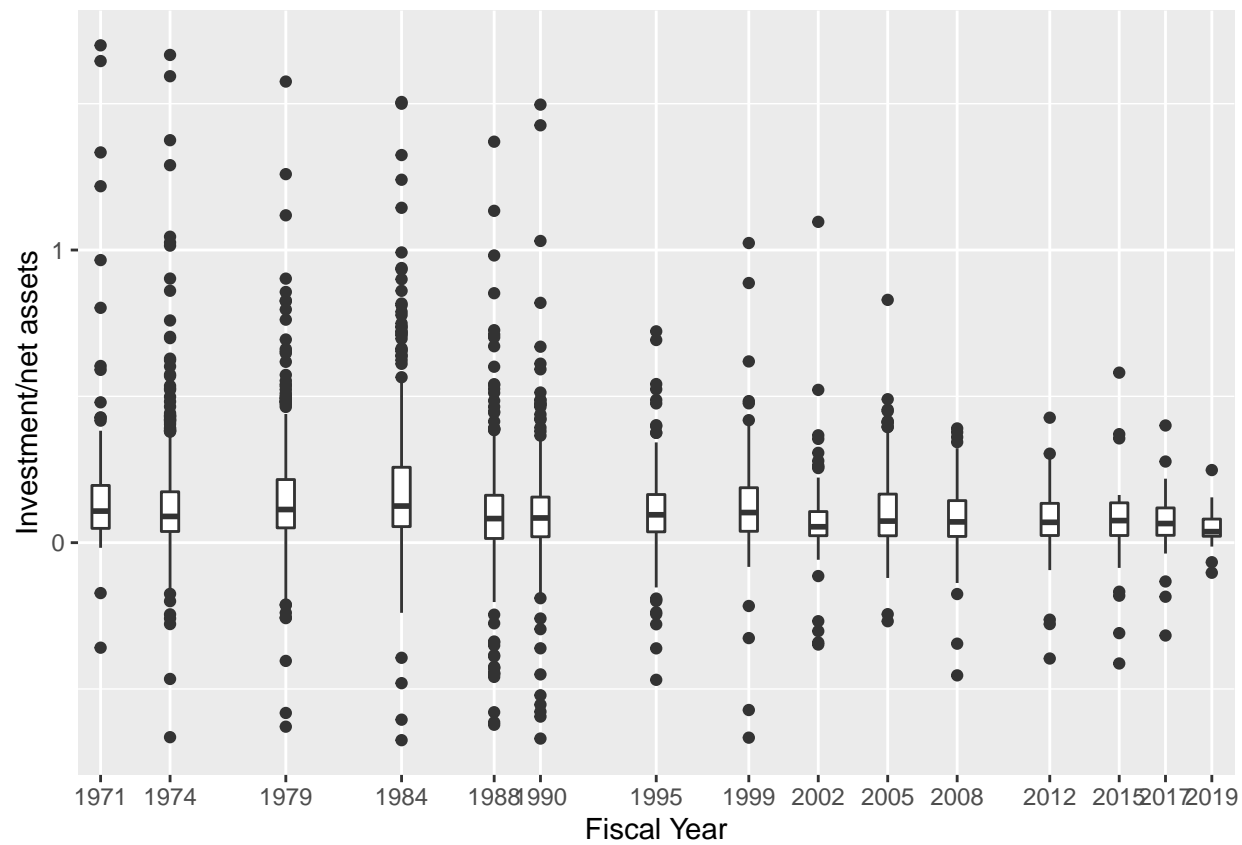


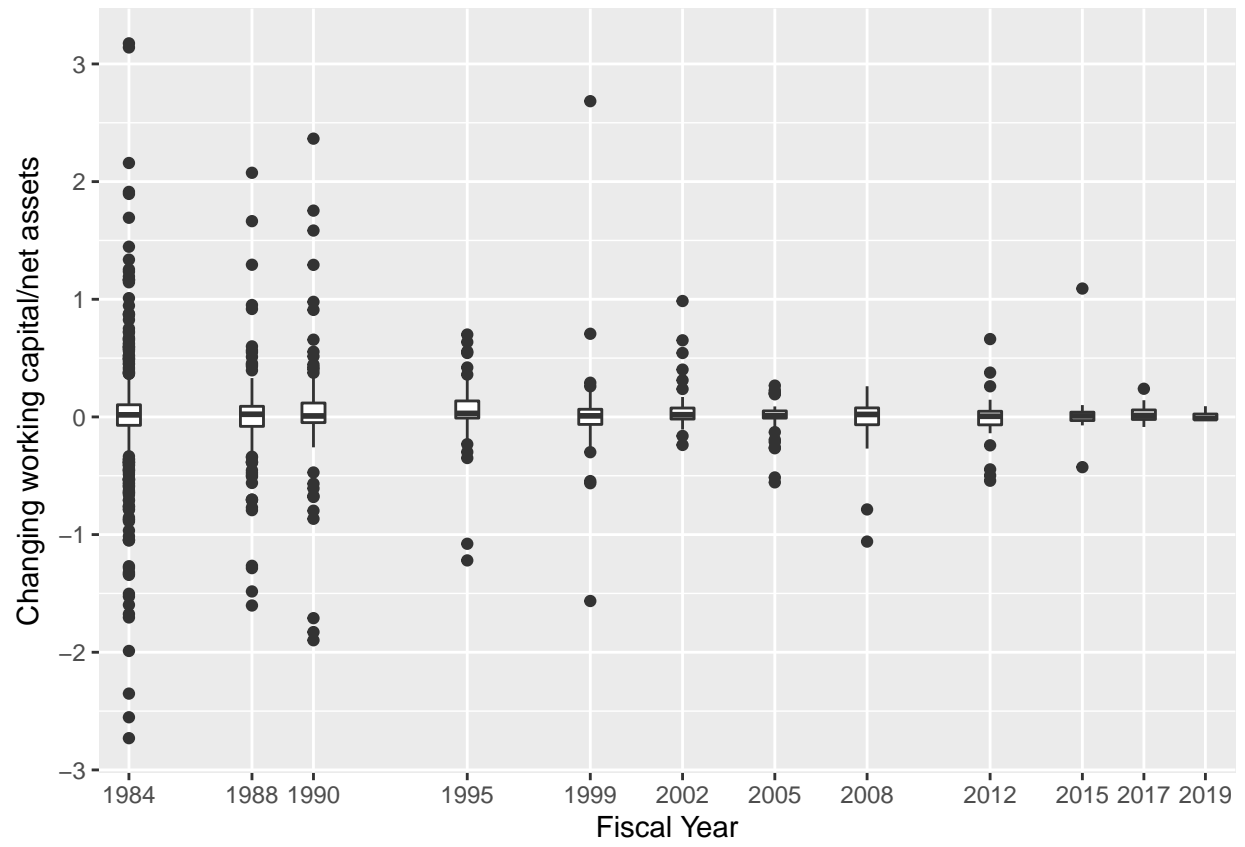
In the following plots, extreme outliers (1%) are filtered out to make the plots more readable

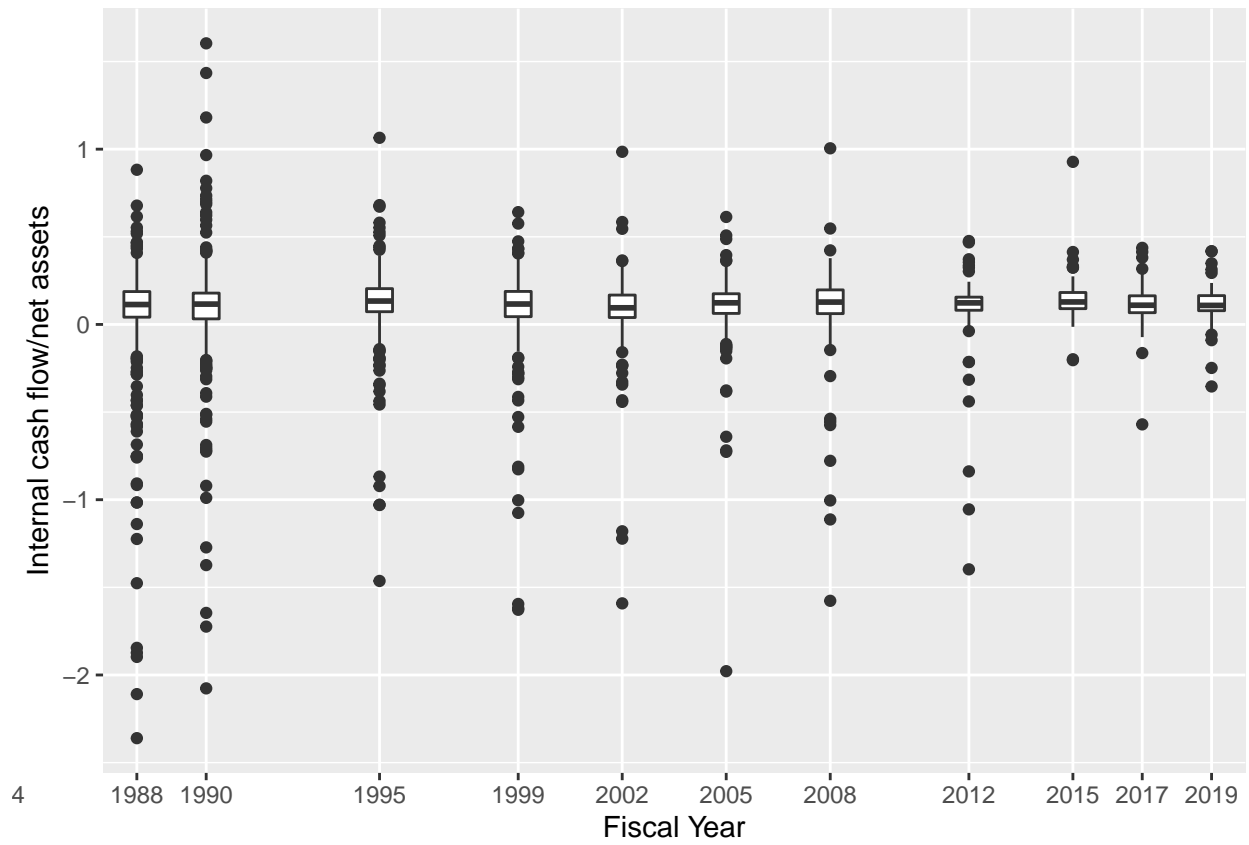
```
for (i in 3:16) {
  colns <- as.name(names(df)[i])
  plt <- df %>% select('FYEAR', colns) %>%
    filter(eval(colns) < quantile(eval(colns), .995, na.rm = T) &
           eval(colns) > quantile(eval(colns), .005, na.rm = T)) %>%
    ggplot(aes(x = 'FYEAR', y = eval(colns), group = 'FYEAR')) +
    geom_boxplot() + ylab(colns) +
    scale_x_discrete(name = 'Fiscal Year',
                     limits=c(1971, 1974, 1979, 1984, 1988, 1990, 1995, 1999, 2002, 2005, 2008, 2012, 2015,
                              2017, 2019))
  print(plt)
}
```

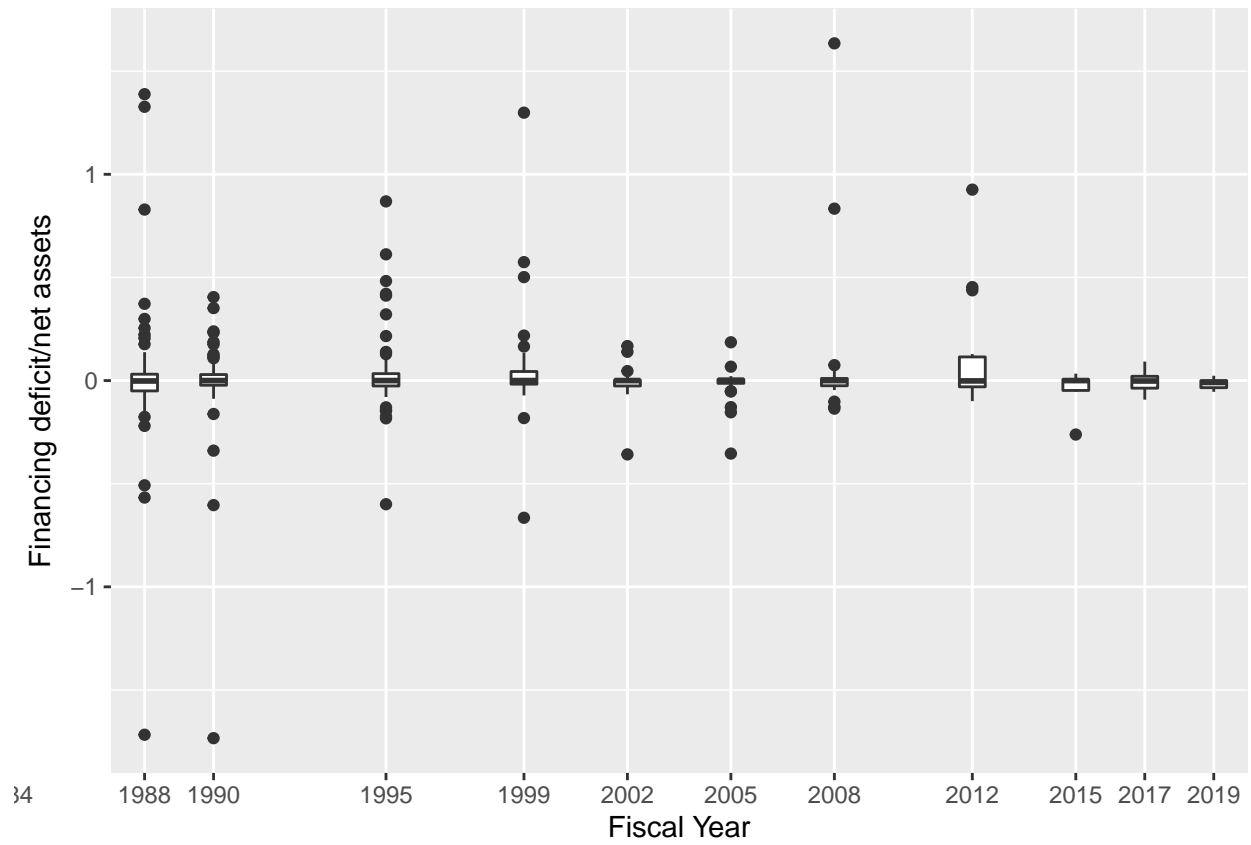


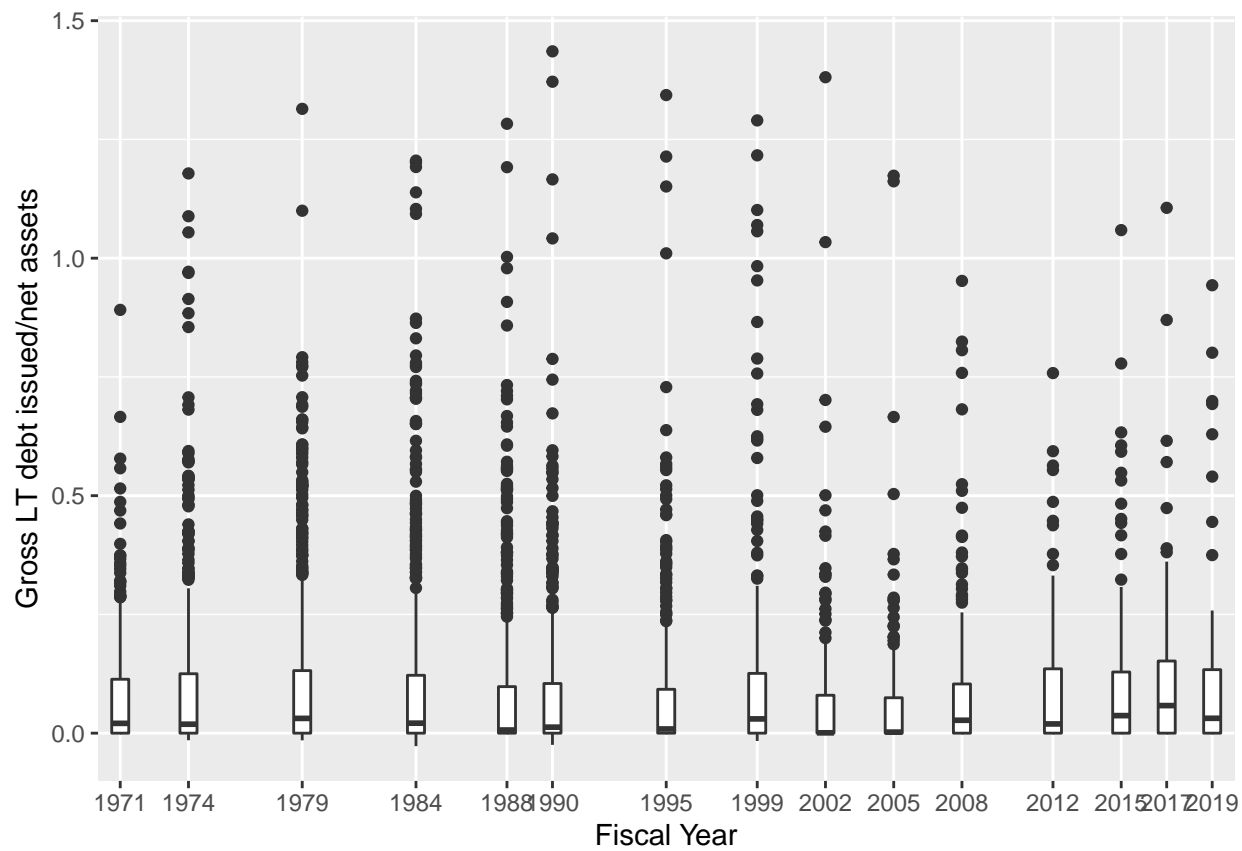


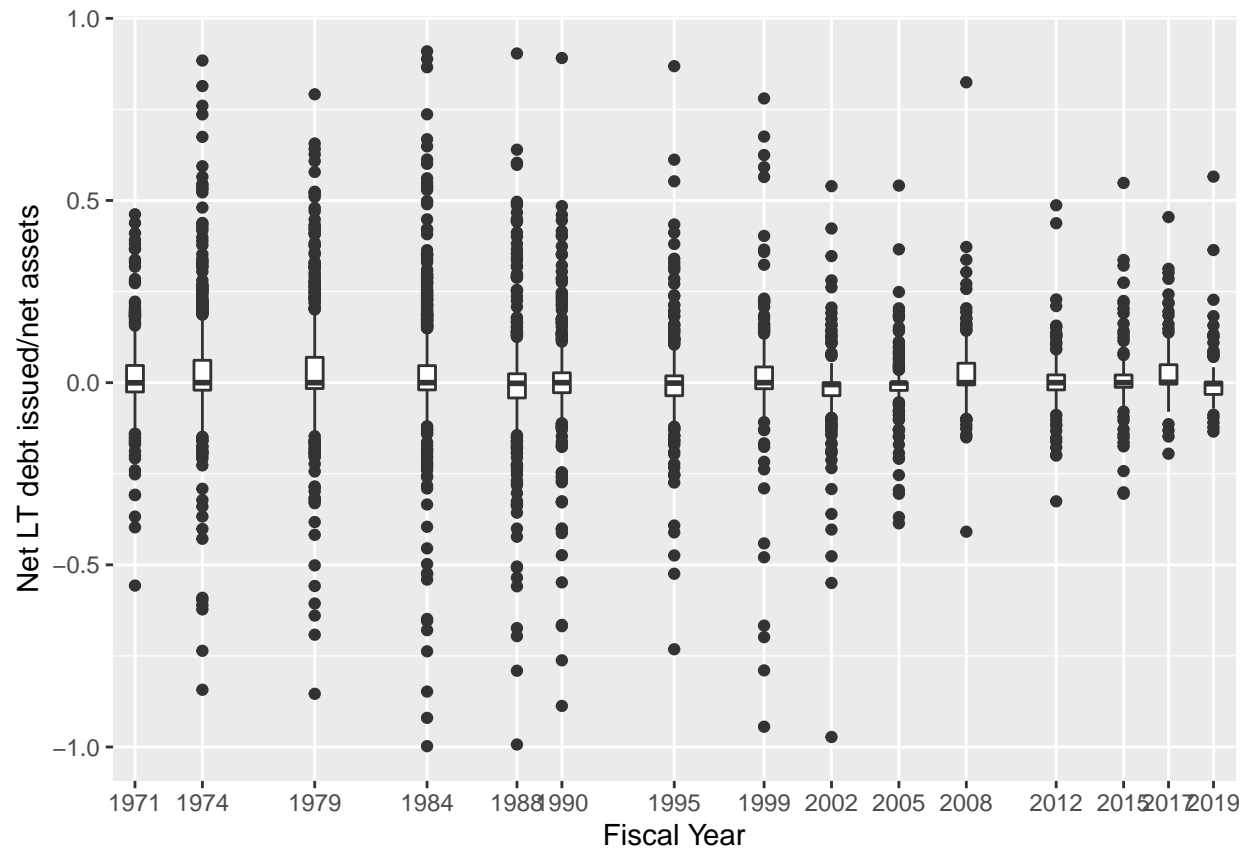


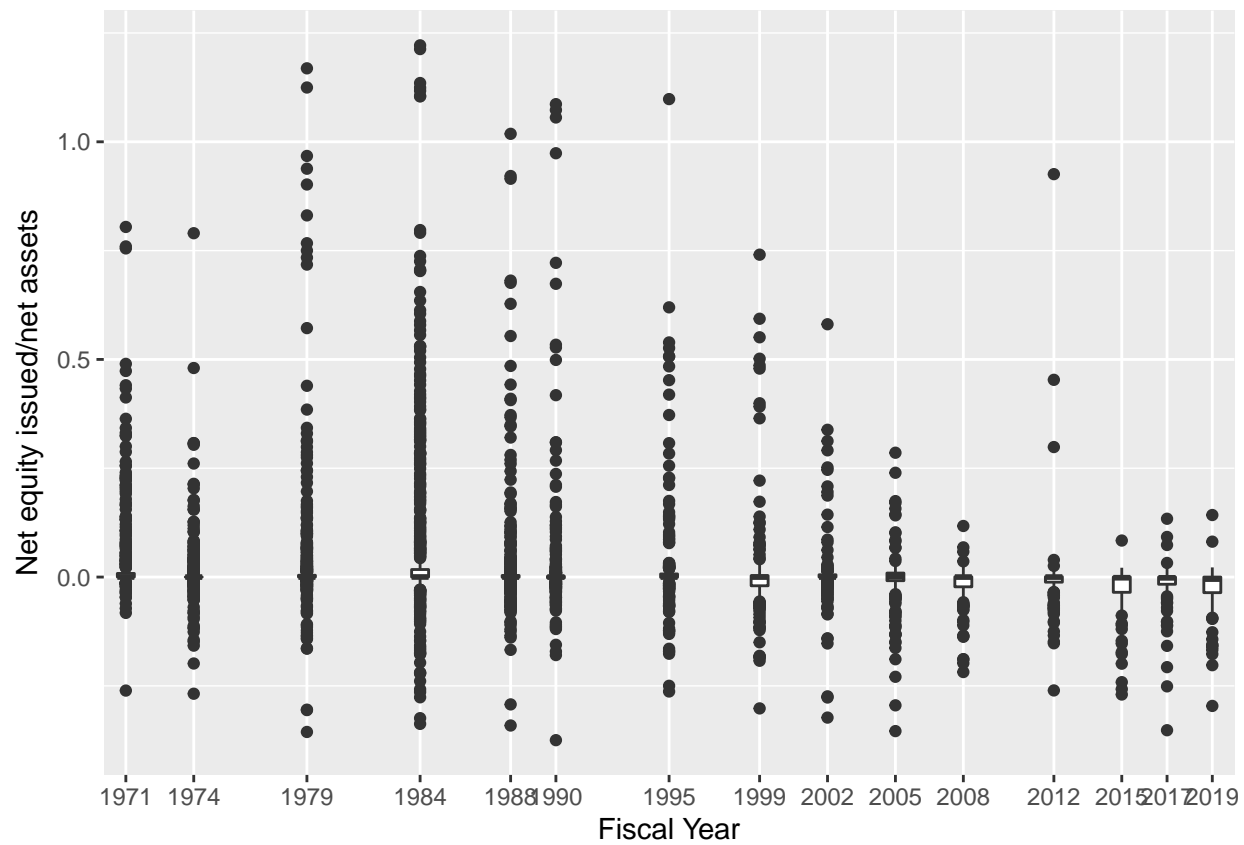




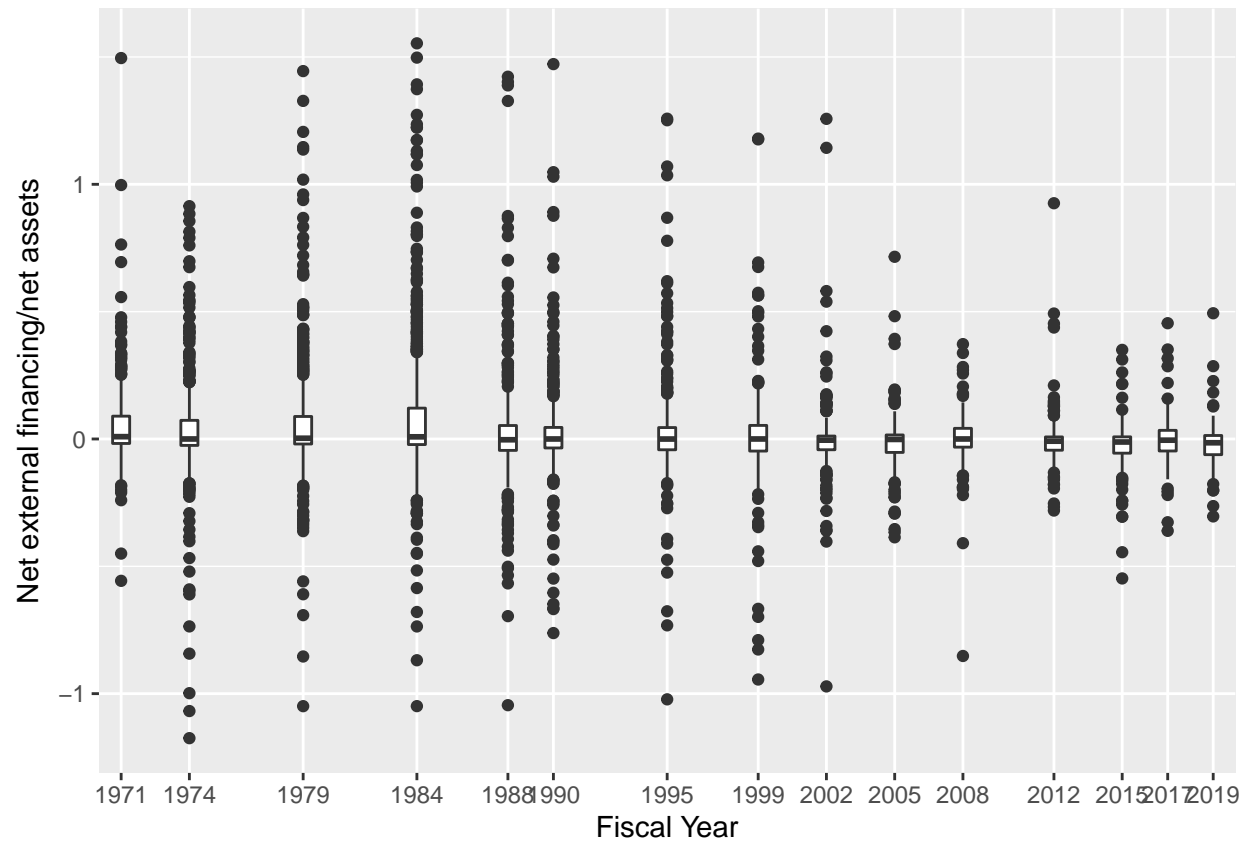


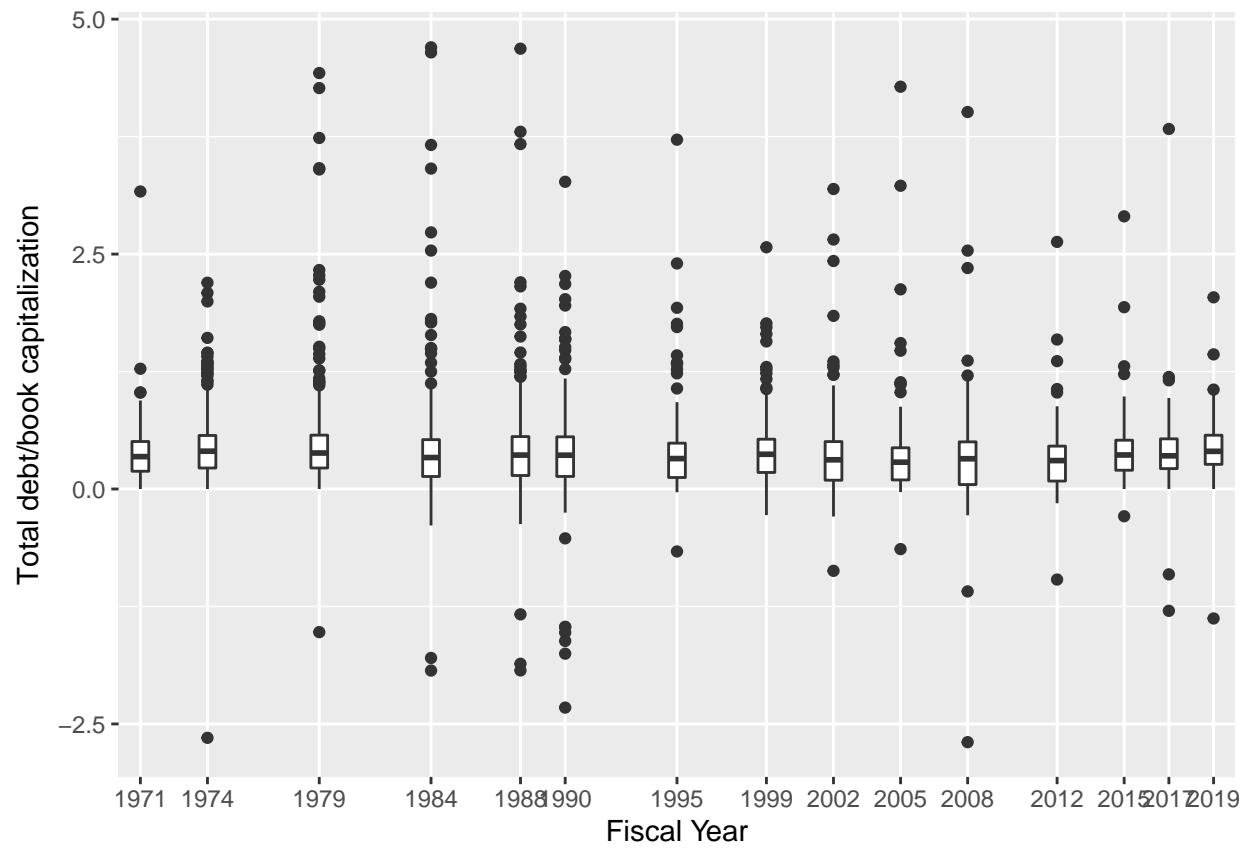


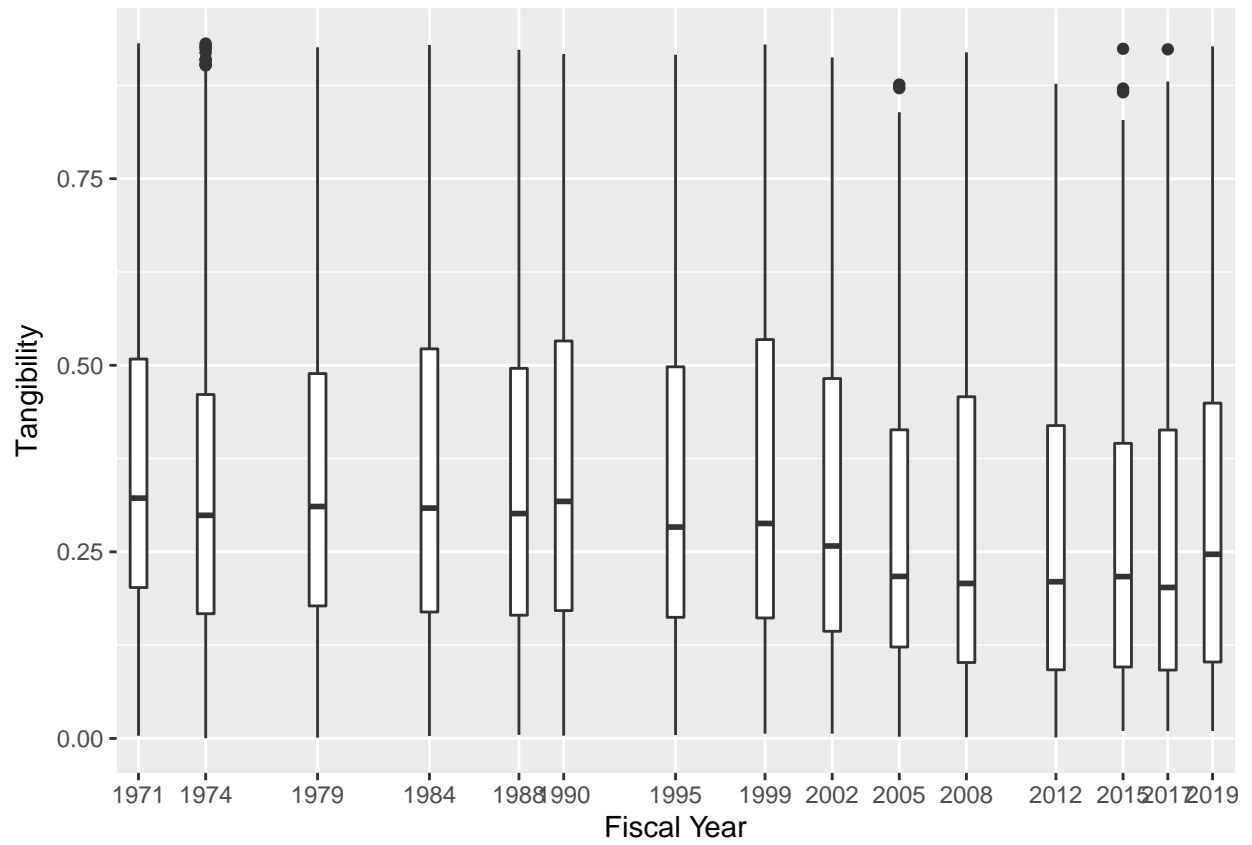


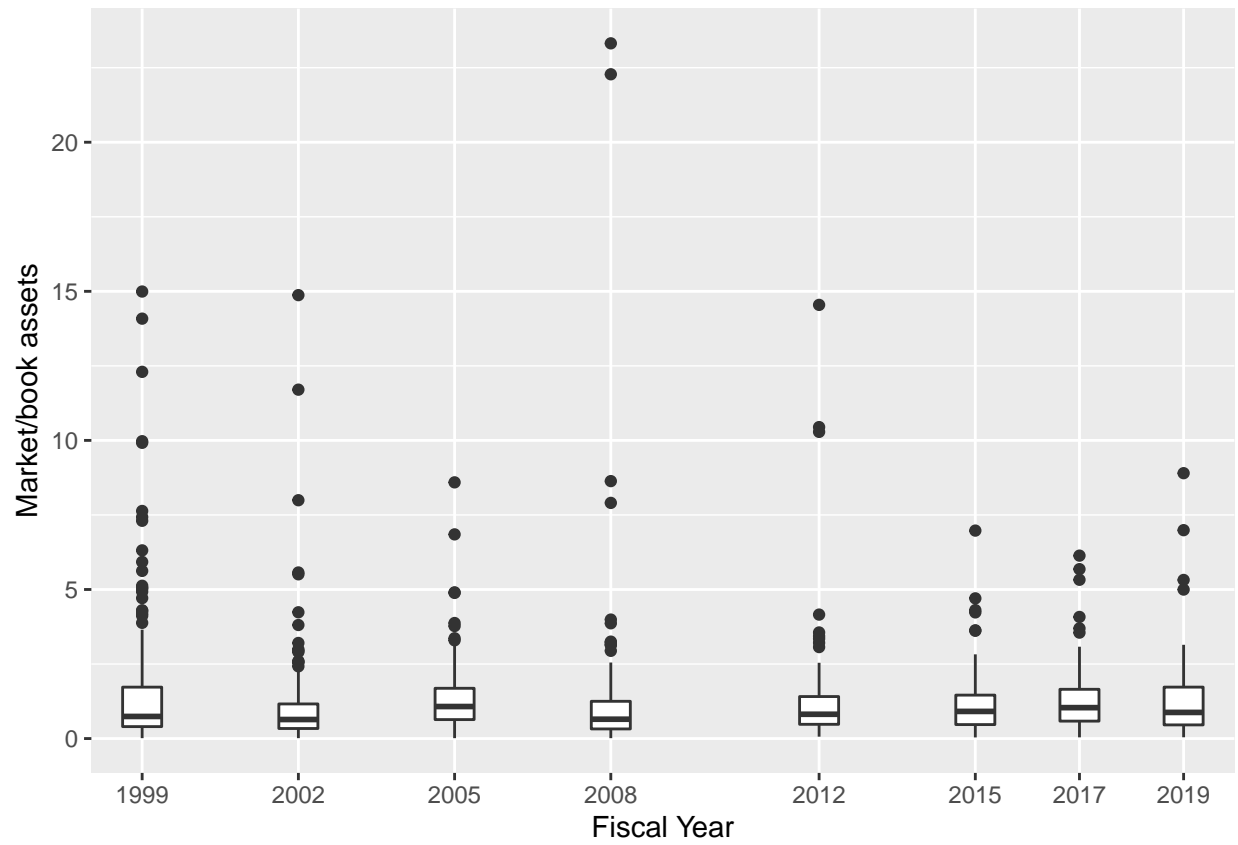


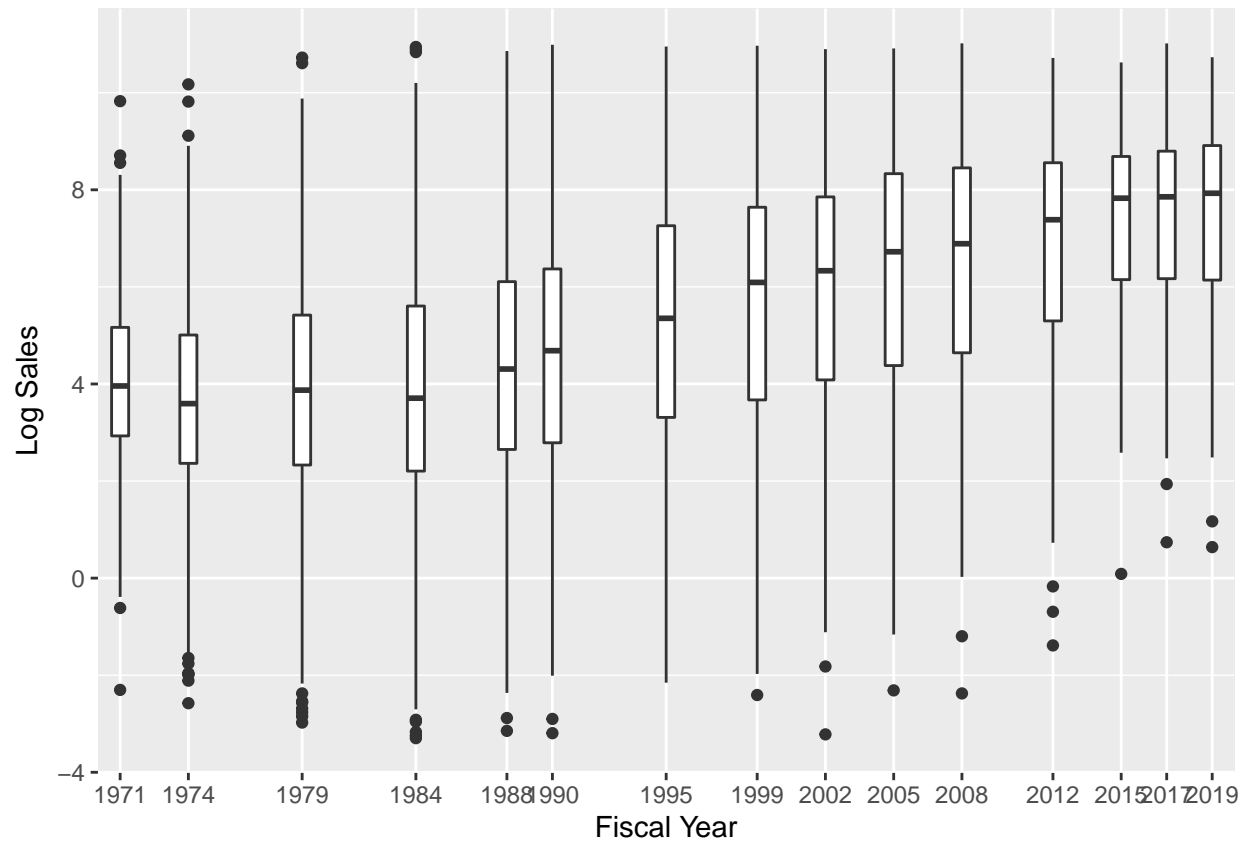


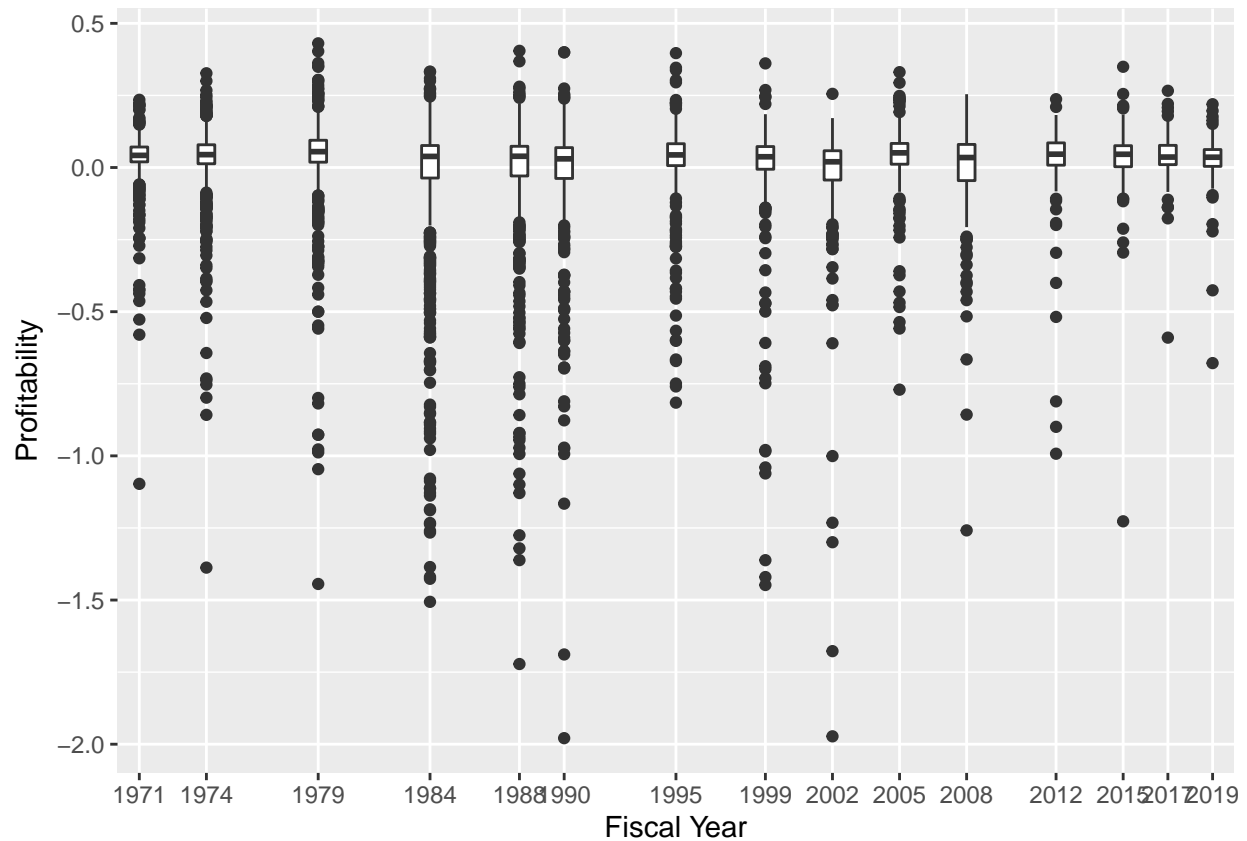












```
library("lubridate")
```

```
##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:base':
##
##   date, intersect, setdiff, union
```

```
library("readxl")
library("zoo")
```

```
##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##   as.Date, as.Date.numeric
```

```
###import the three data sets and make their monthly data able to be merged with the df
USREC <- read_excel(paste("P:/Mgt_of_FI/Assignment4/USREC.xls"),skip = 10)
colnames(USREC)[1] <- "Date"
USREC$Date <- USREC$Date %>% as.numeric() %>% as.Date(origin="1899-12-30") %>% as.yearmon
```

```
## Warning in function_list[[i]](value): NAs introduced by coercion
```

```
KCFSI <- read_excel(paste("P:/Mgt_of_FI/Assignment4/KCFSI.xls"),skip = 10)
colnames(KCFSI)[1] <- "Date"
KCFSI$Date <- ymd(KCFSI$Date) %>% strptime(format="%Y-%m") %>% as.yearmon

BAAFFM <- read_excel(paste("P:/Mgt_of_FI/Assignment4/BAAFFM.xls"),skip = 10)
colnames(BAAFFM)[1] <- "Date"
BAAFFM$Date <- ymd(BAAFFM$Date) %>% strptime(format="%Y-%m") %>% as.yearmon

### to add year-month data of original date for the corresponding the fiscal year
df$Date <- as.Date(df$DATADATE,format="%m/%d/%Y") %>% as.yearmon

merged <- df %>% left_join(USREC, by = "Date") %>% left_join(KCFSI, by = "Date") %>%
  left_join(BAAFFM, by = "Date")
```

```
#slightlyy change the original function to make it adaptable to the NBER == 0 or 1 analysis
describe_USREC <- function(input) {
  desnames <- names(input)[-c(1,2,17,19,20)]
  ds <- NA
  for (c in desnames) {
    coln <- as.name(c)
    output <- input %>% summarize(
      rec=mean(USREC),
      n=n(),
      m=mean(eval(coln), na.rm = T),
      min=min(eval(coln), na.rm = T),
      q25=quantile(eval(coln), probs=0.25, na.rm = T),
      median=median(eval(coln), na.rm = T),
      q75=quantile(eval(coln),probs=0.75, na.rm = T),
      max=max(eval(coln), na.rm = T),
      std=sd(eval(coln), na.rm = T))
    ds <- rbind(ds, output)
  }
  descriptive_table <- as.data.frame(ds[-1,])
  rownames(descriptive_table) = desnames
  colnames(descriptive_table) = c('Recession', 'N', 'Mean', 'Min', 'Q25', 'Q50', 'Q75', 'Max', 'SD')
  print(descriptive_table)
}
```

Print out the Description Tables based on USREC

```
merged %>% filter(USREC==0) %>% describe_USREC() %>% print()
```

##	Recession	N	Mean	Min
## Cash dividend/net assets	0	4268	0.01813992	-1.963621e-01
## Investment/net assets	0	4268	0.15180905	-3.906509e+00
## Changing working capital/net assets	0	4268	0.05006522	-2.248266e+01
## Internal cash flow/net assets	0	4268	0.11812333	-7.139915e+00
## Financing deficit/net assets	0	4268	0.03756342	-1.956897e+00
## Gross LT debt issued/net assets	0	4268	0.09574110	-2.488889e+01
## Net LT debt issued/net assets	0	4268	0.01951407	-2.470000e+01
## Net equity issued/net assets	0	4268	0.03012736	-6.006298e+00

## Net external financing/net assets	0	4268	0.05037916	-2.470000e+01
## Total debt/book capitalization	0	4268	0.35748935	-2.875000e+02
## Tangibility	0	4268	0.34386666	0.000000e+00
## Market/book assets	0	4268	1.98016624	3.341081e-03
## Log Sales	0	4268	4.74588678	-6.907755e+00
## Profitability	0	4268	0.05547958	-6.365000e+01
## USREC	0	4268	0.00000000	0.000000e+00
##			Q25	Q50 Q75
## Cash dividend/net assets	0.000000e+00	3.865930e-03	0.024852859	
## Investment/net assets	3.499714e-02	9.591001e-02	0.185445795	
## Changing working capital/net assets	-5.419447e-02	1.708926e-02	0.092745730	
## Internal cash flow/net assets	5.563545e-02	1.167090e-01	0.182202583	
## Financing deficit/net assets	-3.361938e-02	-3.212451e-17	0.023553546	
## Gross LT debt issued/net assets	0.000000e+00	1.738244e-02	0.115640213	
## Net LT debt issued/net assets	-2.436336e-02	0.000000e+00	0.038103232	
## Net equity issued/net assets	-6.192645e-04	0.000000e+00	0.005597935	
## Net external financing/net assets	-3.287071e-02	0.000000e+00	0.066339066	
## Total debt/book capitalization	1.555498e-01	3.476385e-01	0.527108150	
## Tangibility	1.534352e-01	2.897727e-01	0.495567995	
## Market/book assets	4.392248e-01	8.449805e-01	1.531606082	
## Log Sales	2.874637e+00	4.642162e+00	6.791068615	
## Profitability	7.901245e-05	4.196108e-02	0.077753776	
## USREC	0.000000e+00	0.000000e+00	0.000000000	
##			Max	SD
## Cash dividend/net assets	1.930094	0.05328134		
## Investment/net assets	47.515528	1.01083788		
## Changing working capital/net assets	50.786717	1.87706117		
## Internal cash flow/net assets	41.066667	1.40969927		
## Financing deficit/net assets	3.286124	0.36308006		
## Gross LT debt issued/net assets	7.048188	0.50467044		
## Net LT debt issued/net assets	53.188235	0.97493152		
## Net equity issued/net assets	11.757764	0.32430316		
## Net external financing/net assets	53.207211	1.04464900		
## Total debt/book capitalization	148.174699	5.67915094		
## Tangibility	1.666667	0.24009930		
## Market/book assets	590.671429	18.16773178		
## Log Sales	12.836227	2.79194925		
## Profitability	304.500000	4.82053247		
## USREC	0.000000	0.00000000		
##			Recession	N Mean Min
## Cash dividend/net assets	0	4268	0.01813992	-1.963621e-01
## Investment/net assets	0	4268	0.15180905	-3.906509e+00
## Changing working capital/net assets	0	4268	0.05006522	-2.248266e+01
## Internal cash flow/net assets	0	4268	0.11812333	-7.139915e+00
## Financing deficit/net assets	0	4268	0.03756342	-1.956897e+00
## Gross LT debt issued/net assets	0	4268	0.09574110	-2.488889e+01
## Net LT debt issued/net assets	0	4268	0.01951407	-2.470000e+01
## Net equity issued/net assets	0	4268	0.03012736	-6.006298e+00
## Net external financing/net assets	0	4268	0.05037916	-2.470000e+01
## Total debt/book capitalization	0	4268	0.35748935	-2.875000e+02
## Tangibility	0	4268	0.34386666	0.000000e+00
## Market/book assets	0	4268	1.98016624	3.341081e-03
## Log Sales	0	4268	4.74588678	-6.907755e+00
## Profitability	0	4268	0.05547958	-6.365000e+01



```

## USREC                                0 4268 0.00000000 0.000000e+00
##                                     Q25          Q50          Q75
## Cash dividend/net assets            0.000000e+00 3.865930e-03 0.024852859
## Investment/net assets                3.499714e-02 9.591001e-02 0.185445795
## Changing working capital/net assets -5.419447e-02 1.708926e-02 0.092745730
## Internal cash flow/net assets        5.563545e-02 1.167090e-01 0.182202583
## Financing deficit/net assets         -3.361938e-02 -3.212451e-17 0.023553546
## Gross LT debt issued/net assets      0.000000e+00 1.738244e-02 0.115640213
## Net LT debt issued/net assets        -2.436336e-02 0.000000e+00 0.038103232
## Net equity issued/net assets         -6.192645e-04 0.000000e+00 0.005597935
## Net external financing/net assets    -3.287071e-02 0.000000e+00 0.066339066
## Total debt/book capitalization       1.555498e-01 3.476385e-01 0.527108150
## Tangibility                         1.534352e-01 2.897727e-01 0.495567995
## Market/book assets                  4.392248e-01 8.449805e-01 1.531606082
## Log Sales                           2.874637e+00 4.642162e+00 6.791068615
## Profitability                       7.901245e-05 4.196108e-02 0.077753776
## USREC                                0.000000e+00 0.000000e+00 0.000000000
##                                     Max          SD
## Cash dividend/net assets            1.930094 0.05328134
## Investment/net assets                47.515528 1.01083788
## Changing working capital/net assets 50.786717 1.87706117
## Internal cash flow/net assets        41.066667 1.40969927
## Financing deficit/net assets         3.286124 0.36308006
## Gross LT debt issued/net assets      7.048188 0.50467044
## Net LT debt issued/net assets        53.188235 0.97493152
## Net equity issued/net assets         11.757764 0.32430316
## Net external financing/net assets    53.207211 1.04464900
## Total debt/book capitalization       148.174699 5.67915094
## Tangibility                         1.666667 0.24009930
## Market/book assets                  590.671429 18.16773178
## Log Sales                           12.836227 2.79194925
## Profitability                       304.500000 4.82053247
## USREC                                0.000000 0.00000000

```

```
merged %>% filter(USREC==1) %>% describe_USREC() %>% print()
```

```

##                                     Recession    N          Mean          Min
## Cash dividend/net assets            1 1435 0.023470225 -1.658536585
## Investment/net assets                1 1435 0.156847935 -8.154162001
## Changing working capital/net assets 1 1435 0.235311906 -9.958333333
## Internal cash flow/net assets        1 1435 0.231249310 -12.503546099
## Financing deficit/net assets         1 1435 -0.236058244 -13.764227642
## Gross LT debt issued/net assets      1 1435 0.105788636 -6.911764706
## Net LT debt issued/net assets        1 1435 0.009395027 -8.842105263
## Net equity issued/net assets         1 1435 -0.005054136 -15.056910569
## Net external financing/net assets    1 1435 0.002918308 -13.764227642
## Total debt/book capitalization       1 1435 0.559592087 -38.679939554
## Tangibility                         1 1435 0.341041841 0.000000000
## Market/book assets                  1 1435 1.621468587 0.003097621
## Log Sales                           1 1435 4.265355902 -5.521460918
## Profitability                       1 1435 -0.009485464 -5.687214612
## USREC                                1 1435 1.000000000 1.000000000
##                                     Q25          Q50          Q75
## Cash dividend/net assets            0.000000000 0.0027972028 0.0249381459

```

## Investment/net assets	0.031648693	0.0917497357	0.1803537463
## Changing working capital/net assets	-0.057770801	0.0080383400	0.0844682358
## Internal cash flow/net assets	0.042948800	0.1190078232	0.1827707188
## Financing deficit/net assets	-0.027397858	-0.0001304523	0.0311526480
## Gross LT debt issued/net assets	0.000000000	0.0202070484	0.1230337186
## Net LT debt issued/net assets	-0.021933953	0.0000000000	0.0557062801
## Net equity issued/net assets	-0.001045023	0.0000000000	0.0007889794
## Net external financing/net assets	-0.031451881	0.0000000000	0.0682733024
## Total debt/book capitalization	0.194021117	0.3873598369	0.5684731419
## Tangibility	0.157268050	0.2934593011	0.4821956853
## Market/book assets	0.322444924	0.6326421058	1.2774923760
## Log Sales	2.630407075	4.1155840652	5.8621587686
## Profitability	0.002849484	0.0425434864	0.0790705023
## USREC	1.000000000	1.0000000000	1.0000000000
##	Max	SD	
## Cash dividend/net assets	9.9600000	0.2761650	
## Investment/net assets	22.5438596	0.9141557	
## Changing working capital/net assets	49.8292683	3.9294928	
## Internal cash flow/net assets	64.7886179	3.2151733	
## Financing deficit/net assets	1.6348548	1.7225004	
## Gross LT debt issued/net assets	10.4707724	0.4804788	
## Net LT debt issued/net assets	9.3764706	0.4993386	
## Net equity issued/net assets	3.6345651	0.4540341	
## Net external financing/net assets	8.8529412	0.6499067	
## Total debt/book capitalization	144.4066265	4.1617200	
## Tangibility	0.9630643	0.2341244	
## Market/book assets	60.2160920	5.3259567	
## Log Sales	12.7970293	2.5453571	
## Profitability	1.3393768	0.3639588	
## USREC	1.0000000	0.0000000	
##	Recession	N	Mean
## Cash dividend/net assets	1	1435	0.023470225
## Investment/net assets	1	1435	0.156847935
## Changing working capital/net assets	1	1435	0.235311906
## Internal cash flow/net assets	1	1435	0.231249310
## Financing deficit/net assets	1	1435	-0.236058244
## Gross LT debt issued/net assets	1	1435	0.105788636
## Net LT debt issued/net assets	1	1435	0.009395027
## Net equity issued/net assets	1	1435	-0.005054136
## Net external financing/net assets	1	1435	0.002918308
## Total debt/book capitalization	1	1435	0.559592087
## Tangibility	1	1435	0.341041841
## Market/book assets	1	1435	1.621468587
## Log Sales	1	1435	4.265355902
## Profitability	1	1435	-0.009485464
## USREC	1	1435	1.000000000
##	Q25	Q50	Q75
## Cash dividend/net assets	0.000000000	0.0027972028	0.0249381459
## Investment/net assets	0.031648693	0.0917497357	0.1803537463
## Changing working capital/net assets	-0.057770801	0.0080383400	0.0844682358
## Internal cash flow/net assets	0.042948800	0.1190078232	0.1827707188
## Financing deficit/net assets	-0.027397858	-0.0001304523	0.0311526480
## Gross LT debt issued/net assets	0.000000000	0.0202070484	0.1230337186
## Net LT debt issued/net assets	-0.021933953	0.0000000000	0.0557062801

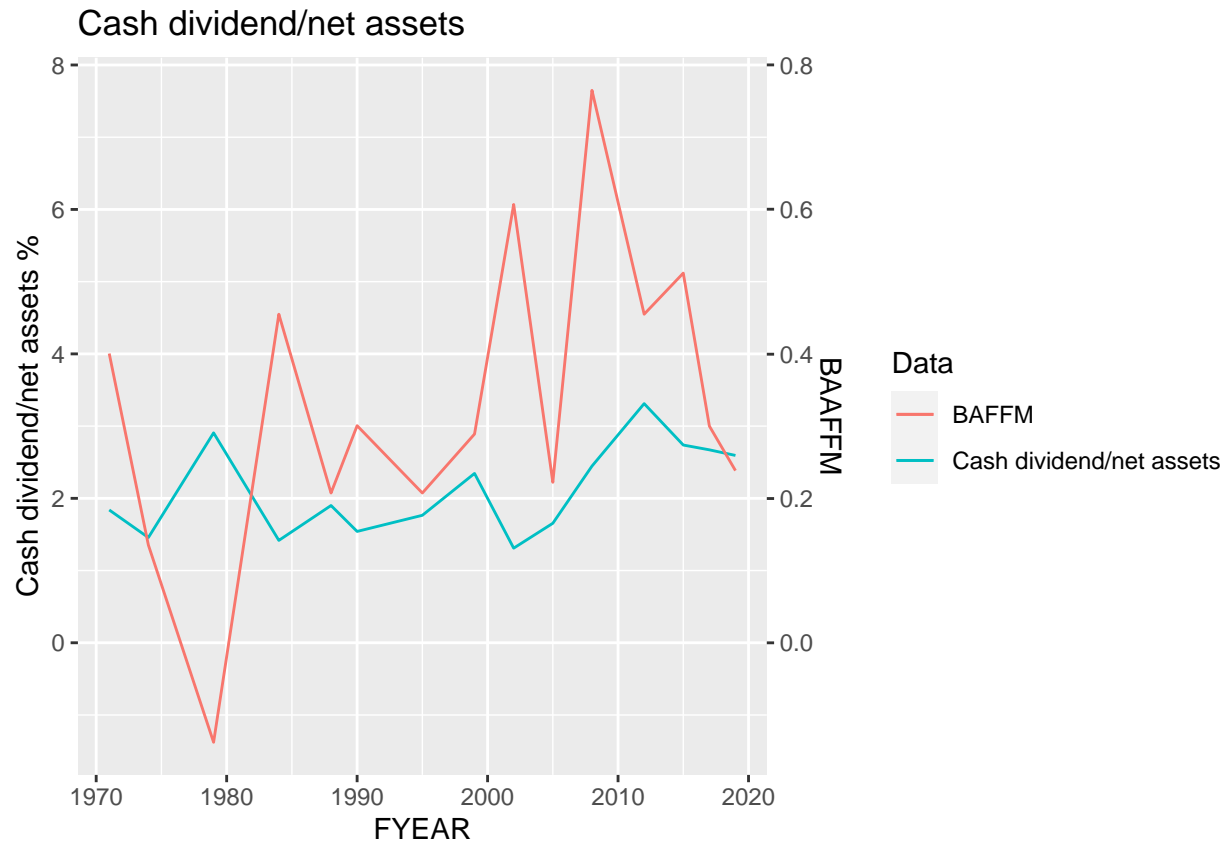
## Net equity issued/net assets	-0.001045023	0.0000000000	0.0007889794
## Net external financing/net assets	-0.031451881	0.0000000000	0.0682733024
## Total debt/book capitalization	0.194021117	0.3873598369	0.5684731419
## Tangibility	0.157268050	0.2934593011	0.4821956853
## Market/book assets	0.322444924	0.6326421058	1.2774923760
## Log Sales	2.630407075	4.1155840652	5.8621587686
## Profitability	0.002849484	0.0425434864	0.0790705023
## USREC	1.000000000	1.0000000000	1.0000000000
##	Max	SD	
## Cash dividend/net assets	9.9600000	0.2761650	
## Investment/net assets	22.5438596	0.9141557	
## Changing working capital/net assets	49.8292683	3.9294928	
## Internal cash flow/net assets	64.7886179	3.2151733	
## Financing deficit/net assets	1.6348548	1.7225004	
## Gross LT debt issued/net assets	10.4707724	0.4804788	
## Net LT debt issued/net assets	9.3764706	0.4993386	
## Net equity issued/net assets	3.6345651	0.4540341	
## Net external financing/net assets	8.8529412	0.6499067	
## Total debt/book capitalization	144.4066265	4.1617200	
## Tangibility	0.9630643	0.2341244	
## Market/book assets	60.2160920	5.3259567	
## Log Sales	12.7970293	2.5453571	
## Profitability	1.3393768	0.3639588	
## USREC	1.0000000	0.0000000	

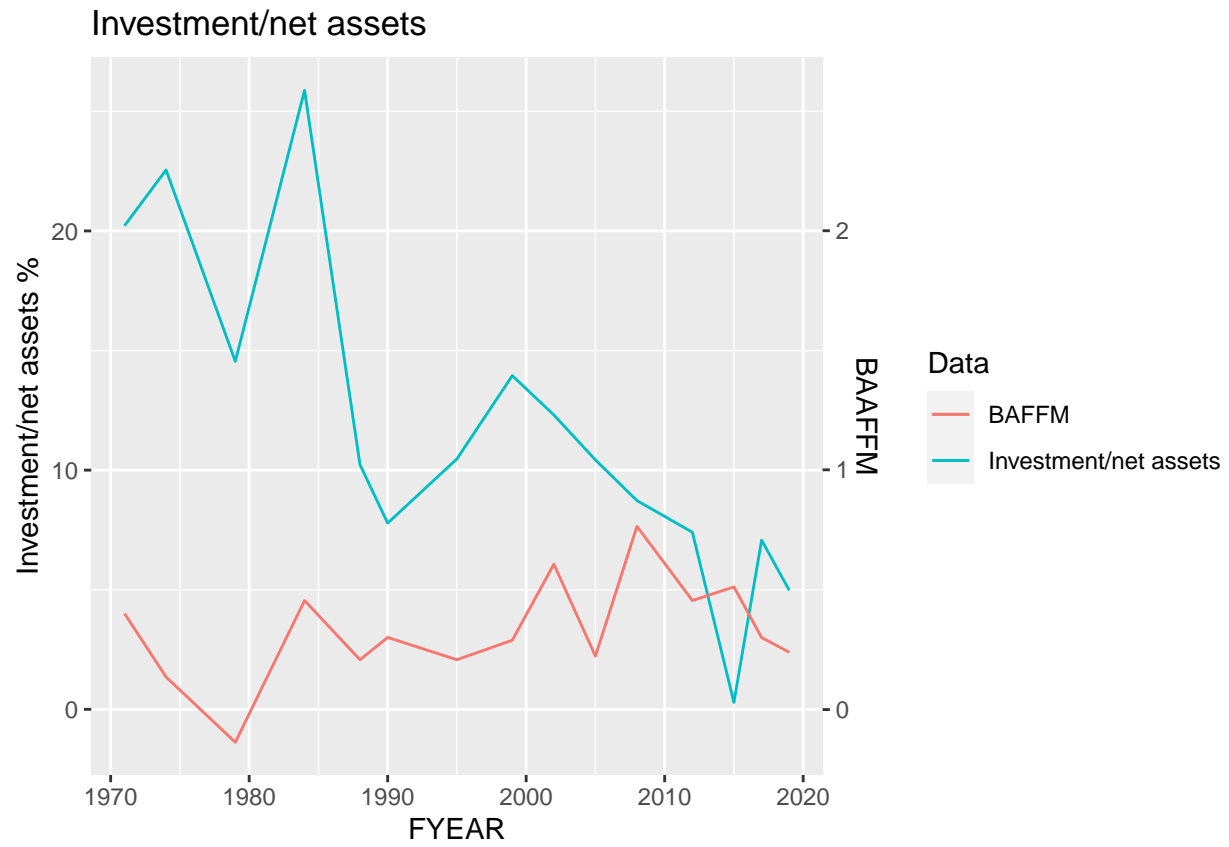
Plot variables along with BAA spread

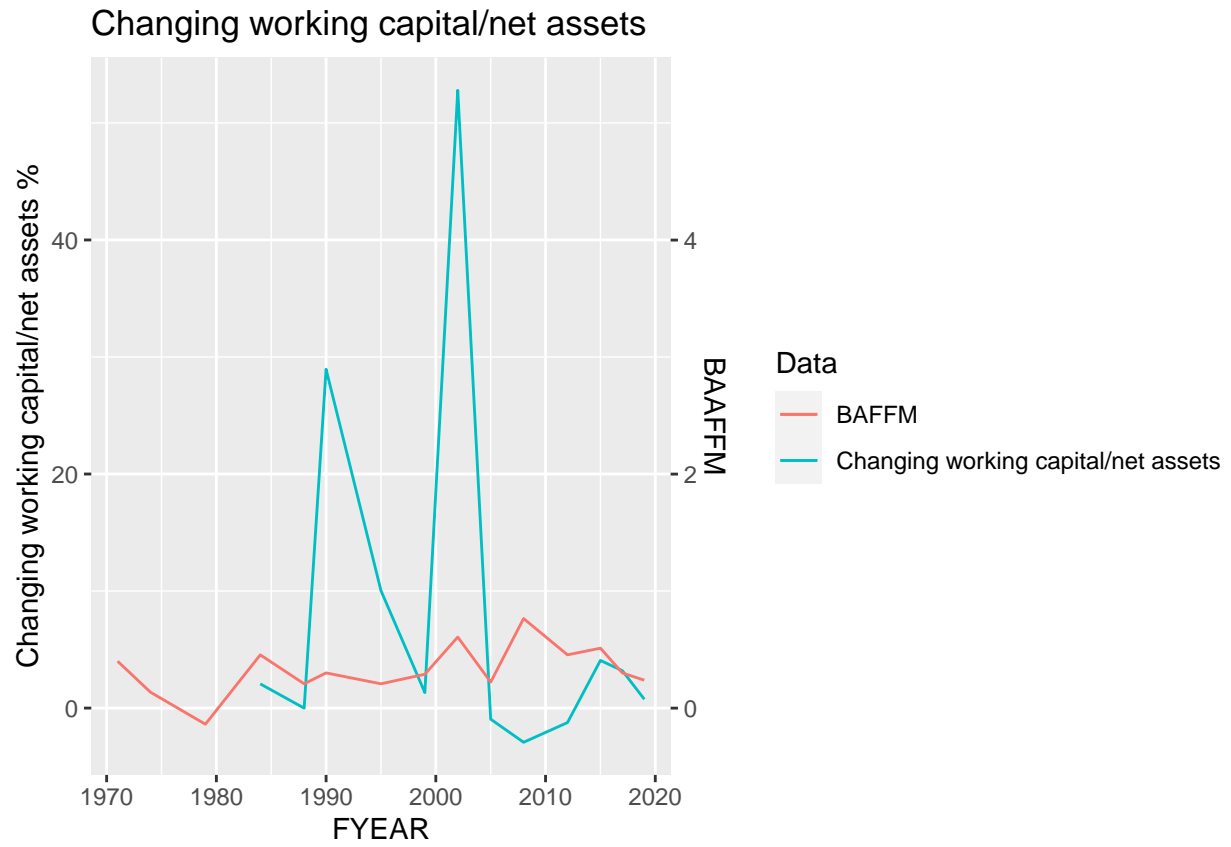
```
for (i in c(3:16)) {
  colns <- as.name(names(merged)[i])

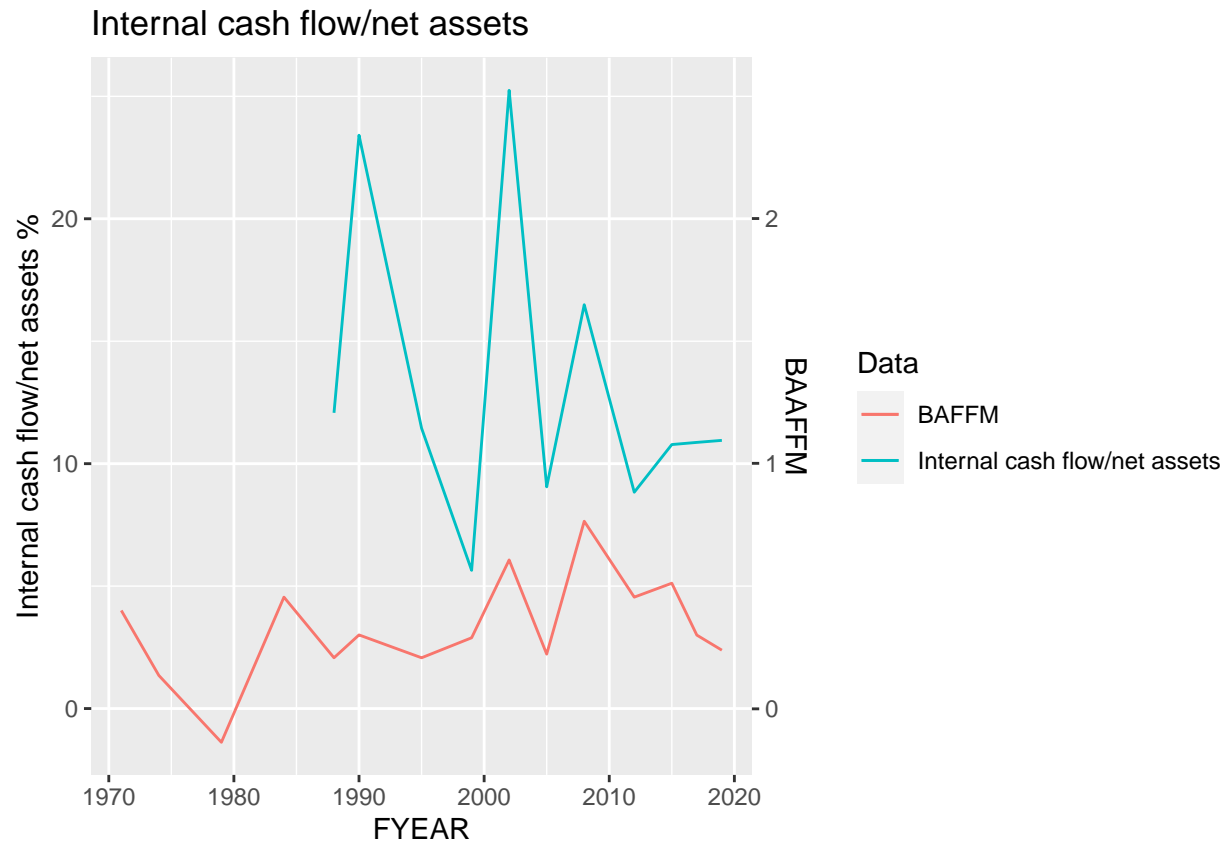
  plt <- merged %>% select('FYEAR', as.name(colns), 'BAAFFM') %>%
    group_by('FYEAR') %>% summarize(y1 = mean (eval(colns), na.rm = T),
                                     y2 = mean (BAAFFM, na.rm = T)) %>%

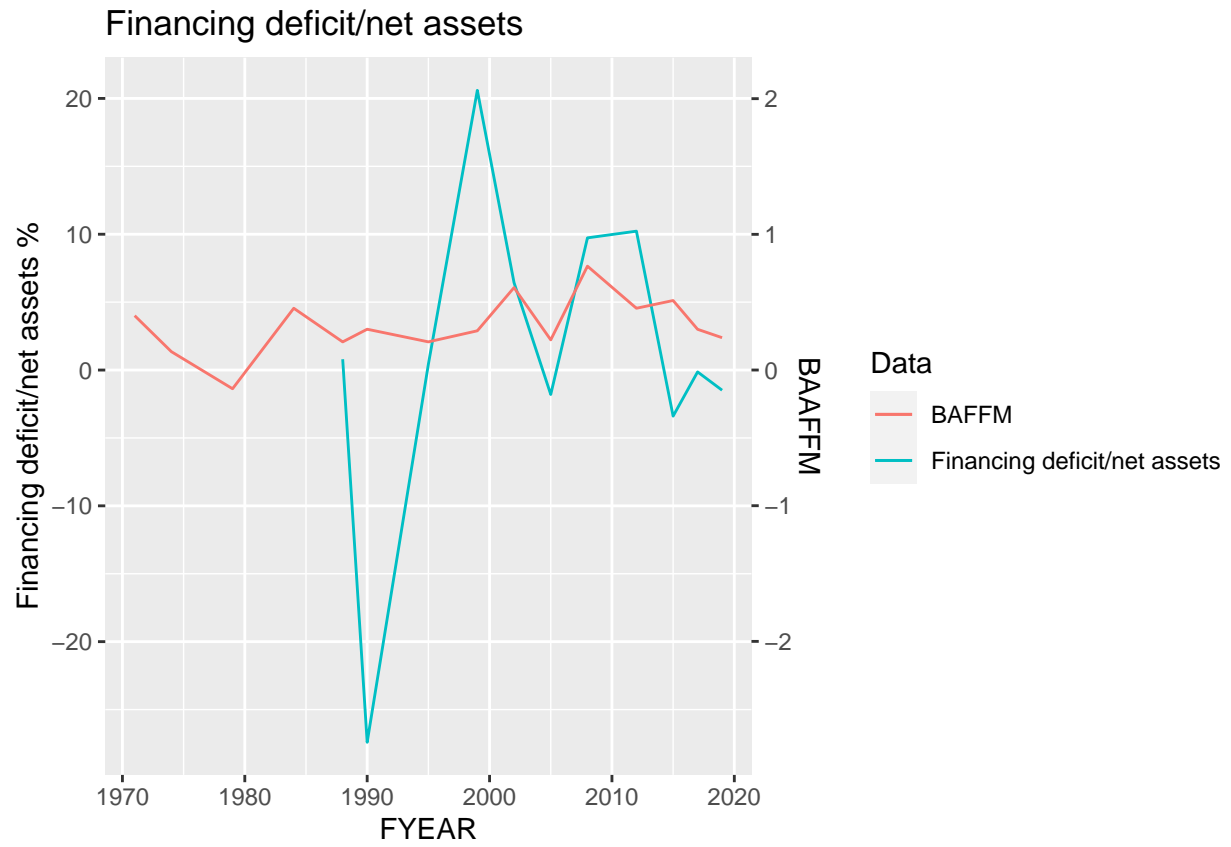
    ggplot(aes(x = 'FYEAR')) +
    geom_line(aes(y = y1*100, color = as.character(colns))) +
    geom_line(aes(y = y2, color = 'BAAFFM'))+
    scale_y_continuous(name = paste(as.character(colns), "%"),
                       sec.axis = sec_axis(~ ./10, name="BAAFFM")) +
    labs(title = as.character(colns), color = "Data")
  print(plt)
}
```



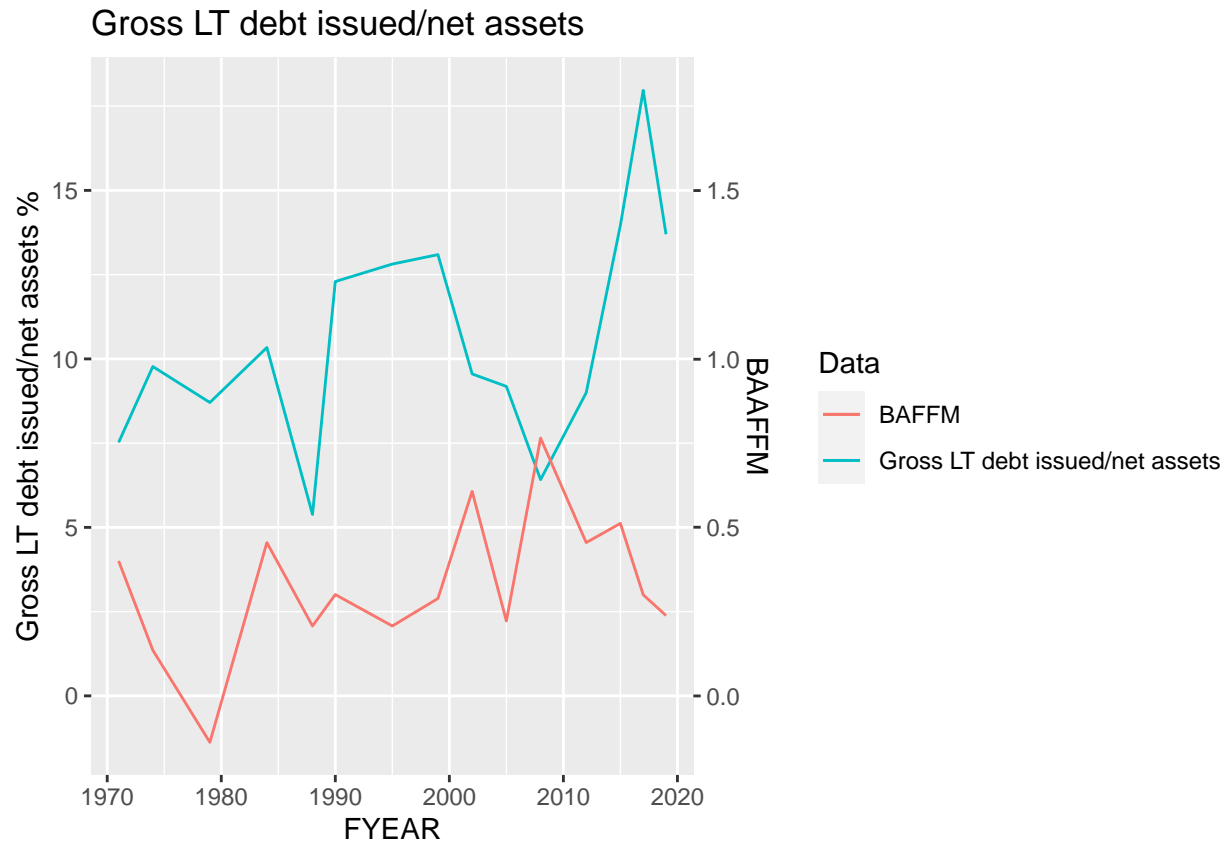




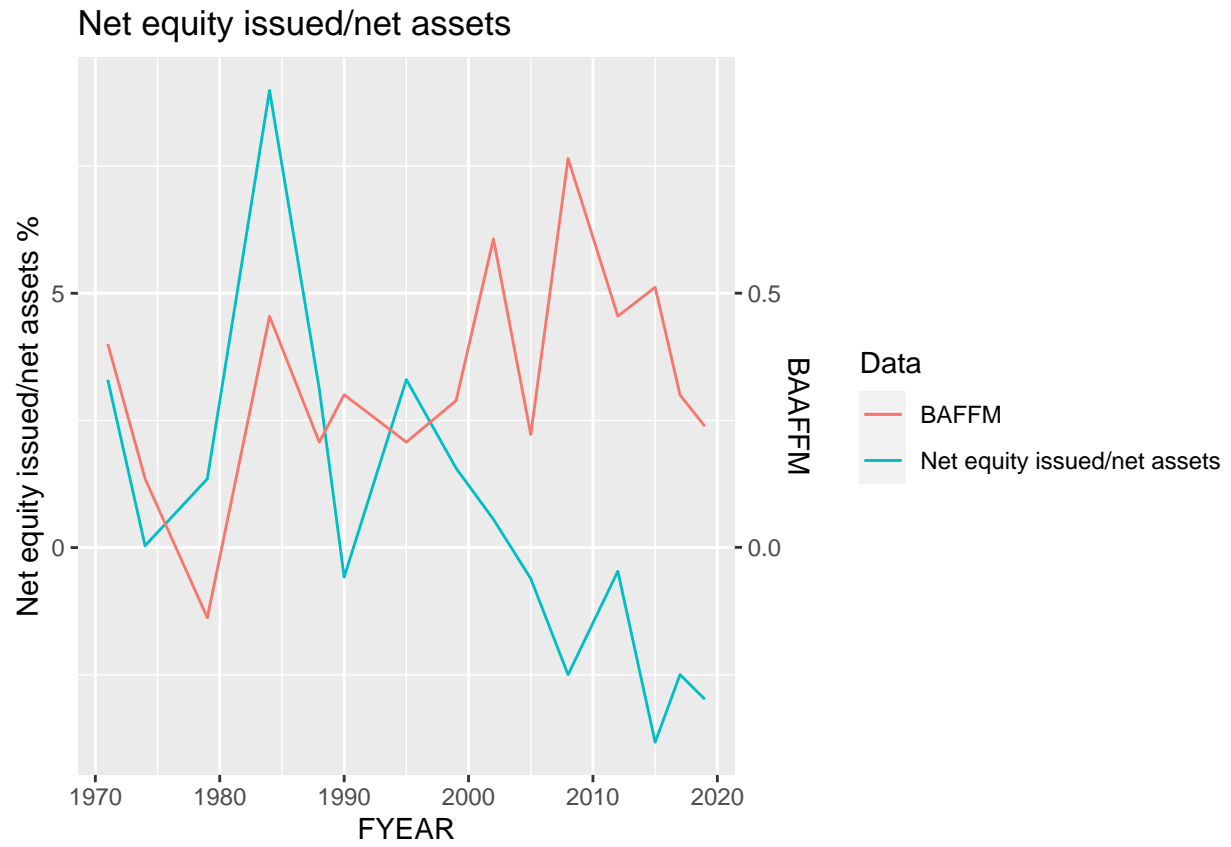


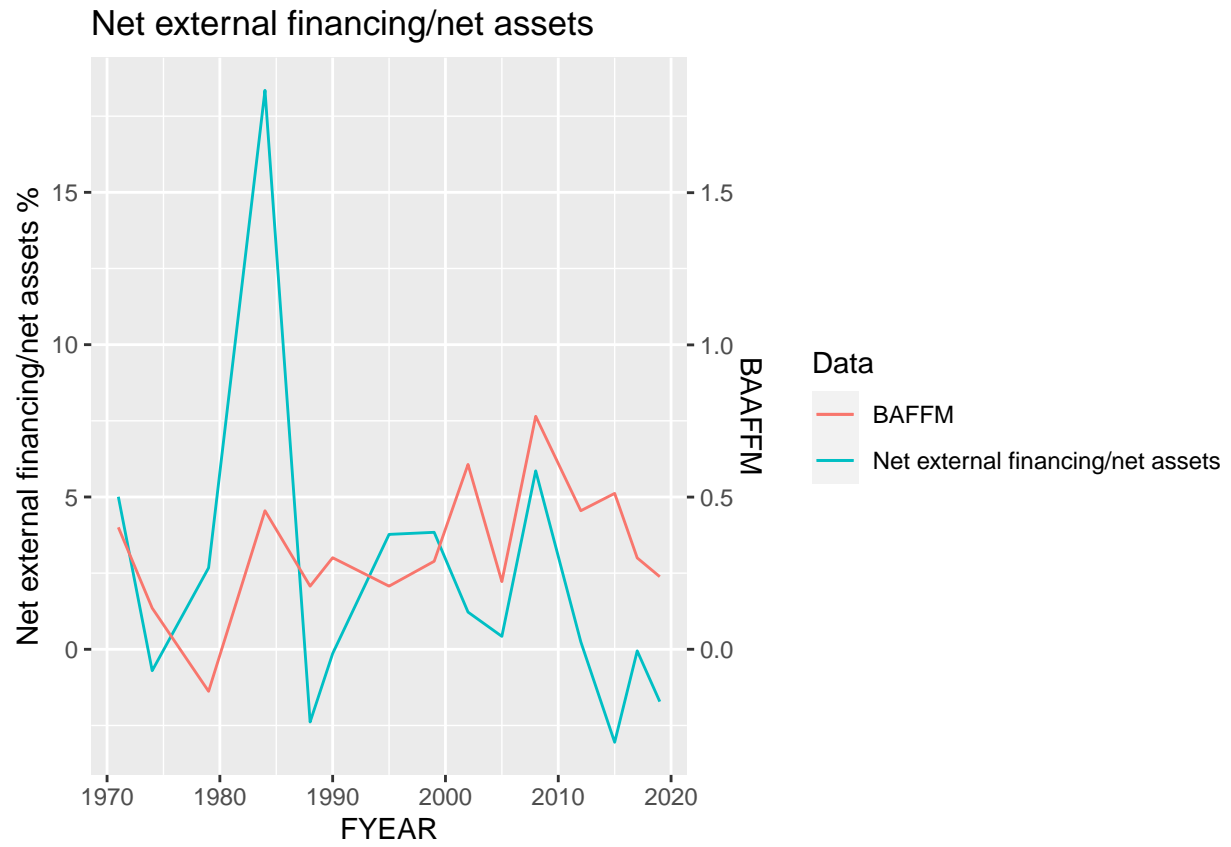


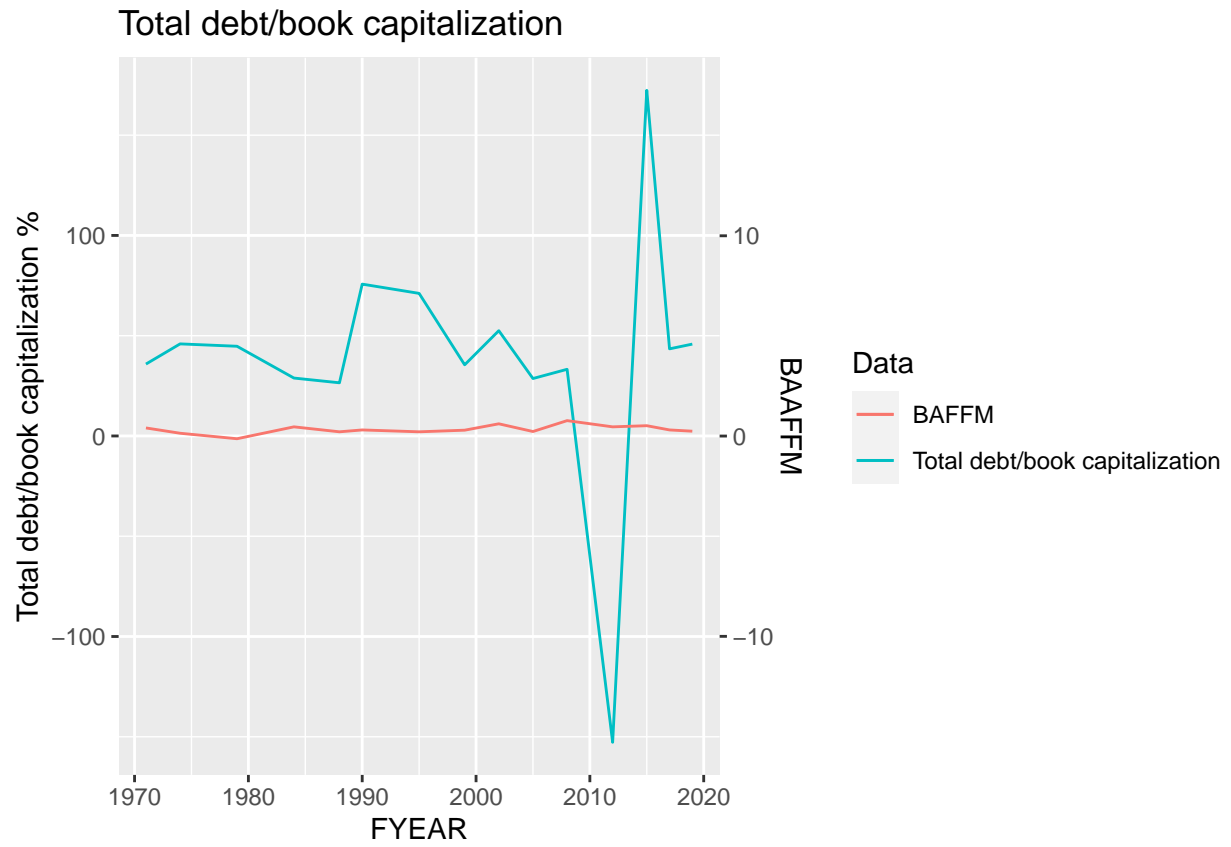


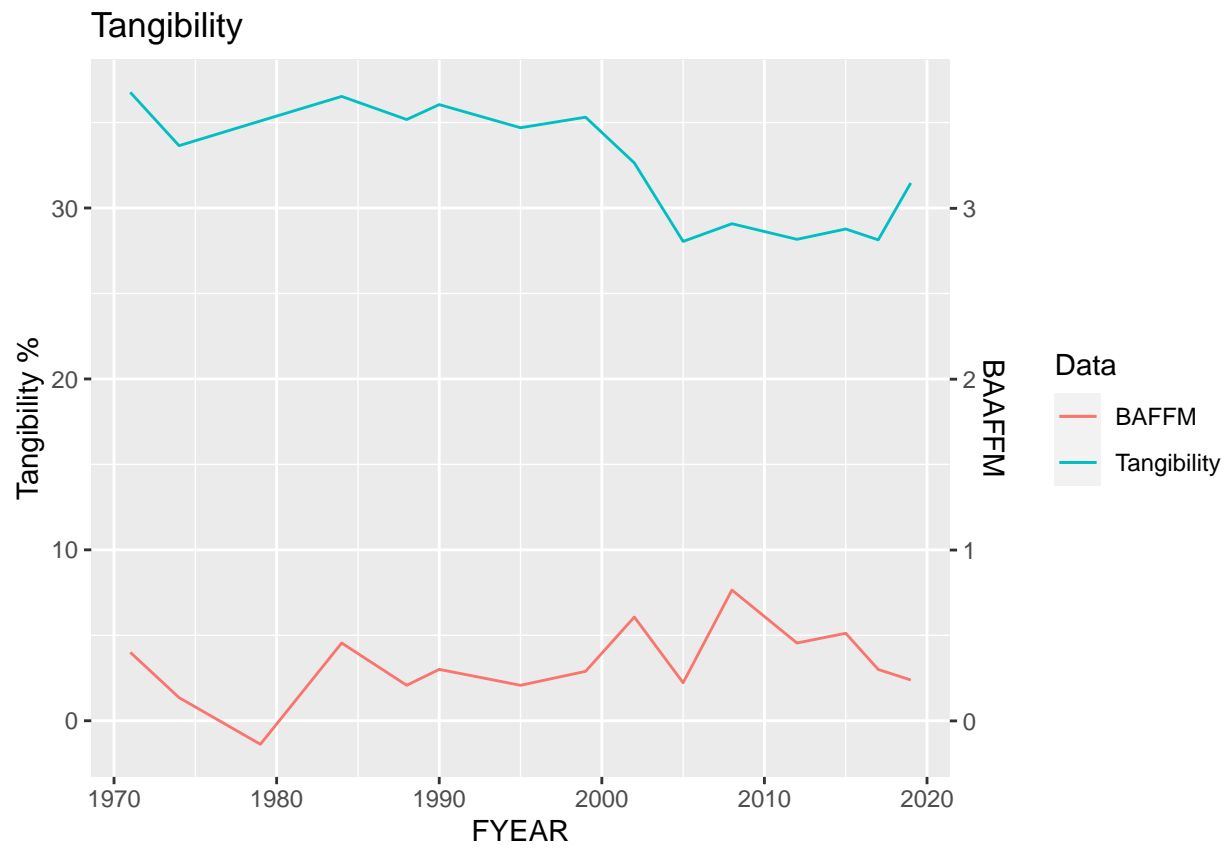


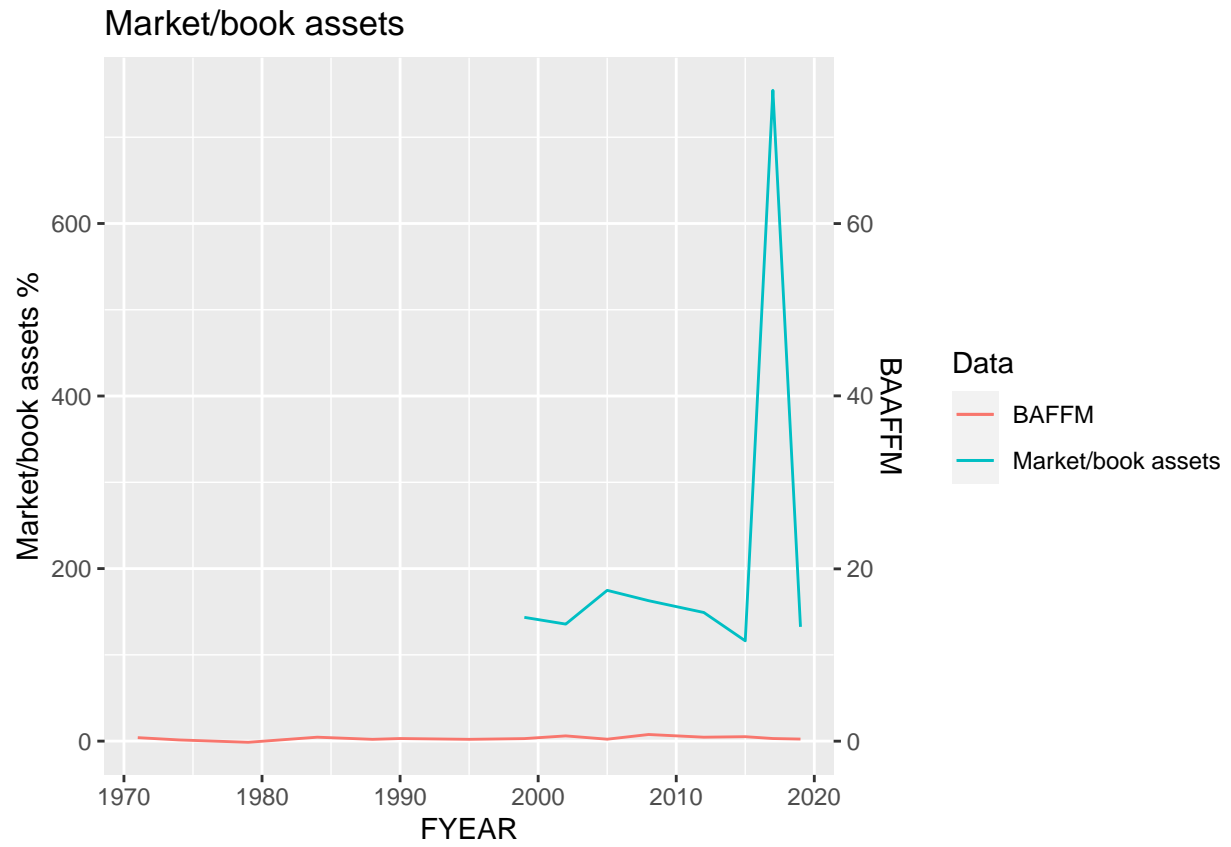


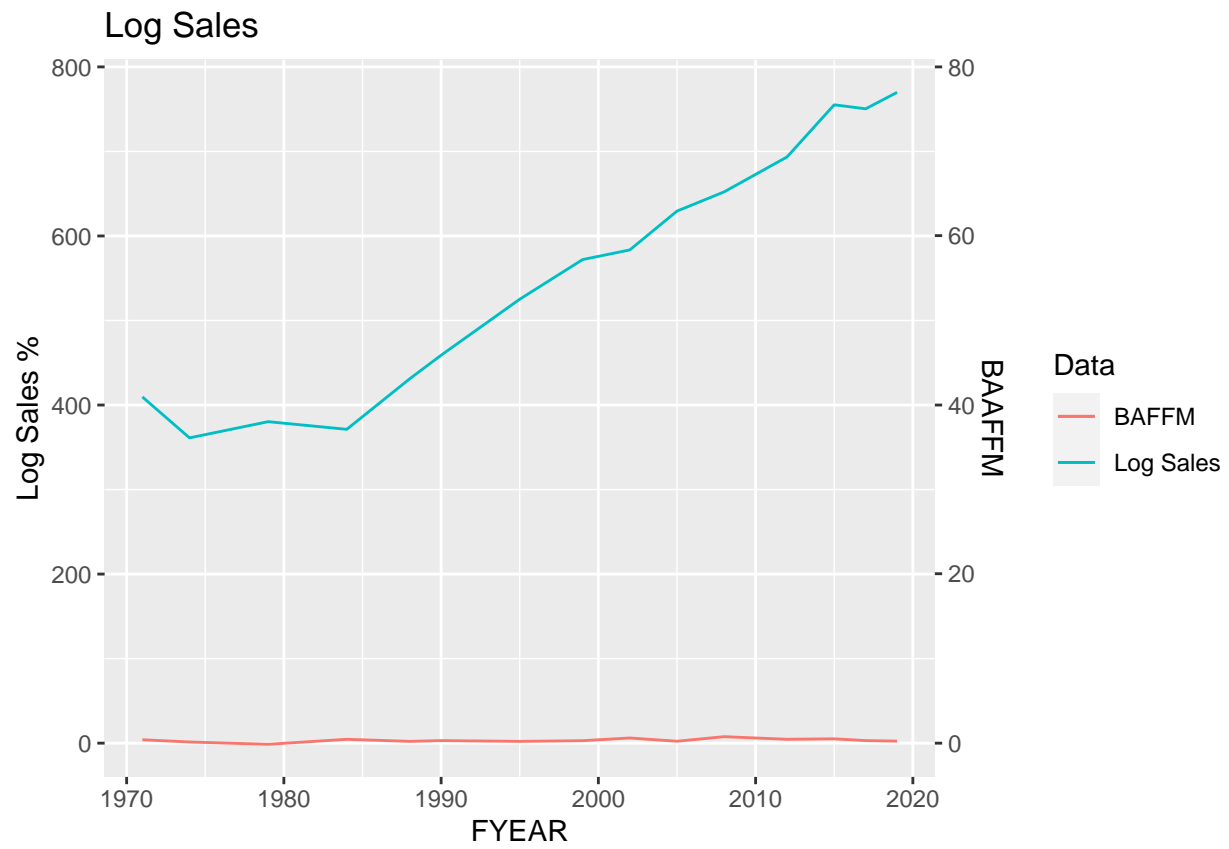




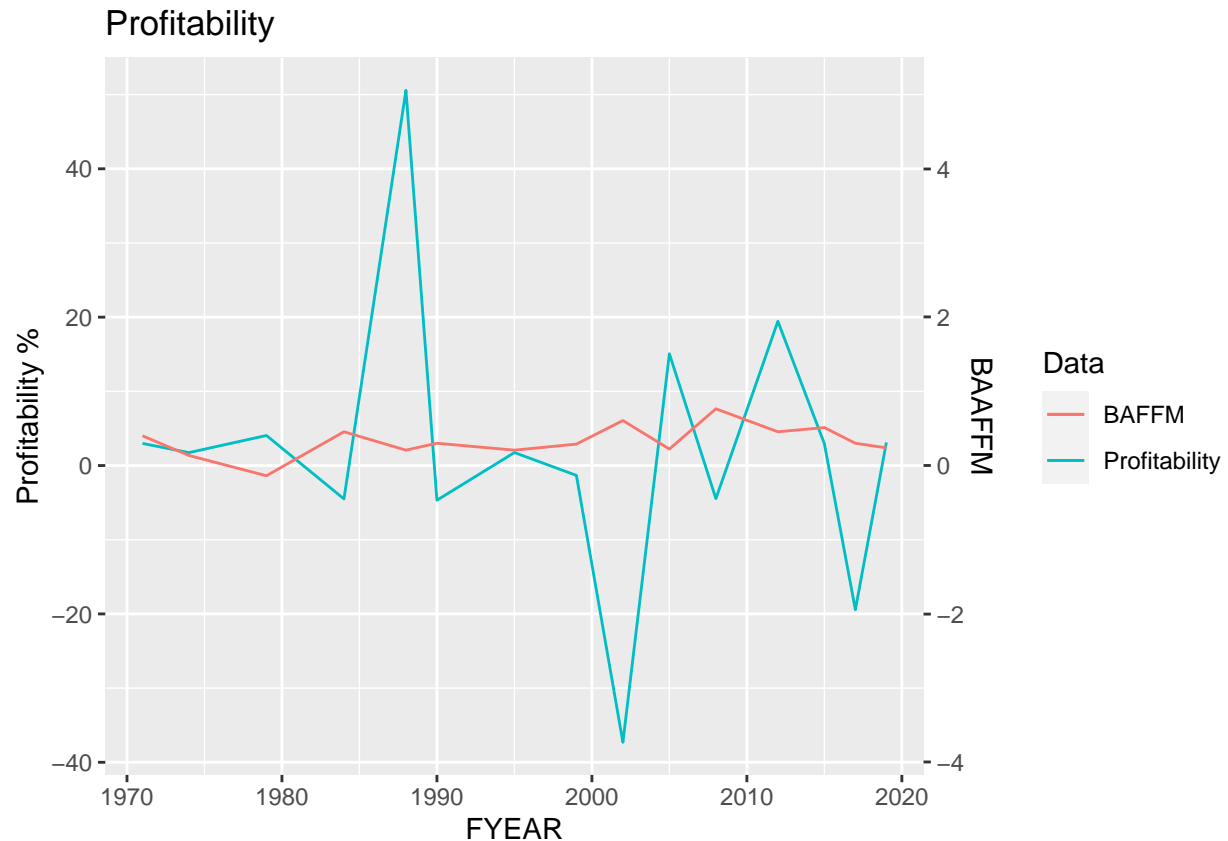












Plot along with KCFSI

```
for (i in c(3:16)) {
  colns <- as.name(names(merged)[i])
  #to use m and scale to adjust the scale of 2nd y-axis based on 1st y-axis
  m <- max(merged[as.character(colns)], na.rm = T)
  scale <- ifelse(m>10, 0.05,
                  ifelse (m>1, 0.2, 0.5))

  plt <- merged %>% select('FYEAR', as.name(colns), 'KCFSI') %>%
    group_by('FYEAR') %>% summarize(y1 = mean (eval(colns), na.rm = T),
                                    y2 = mean (KCFSI, na.rm = T)) %>%

  ggplot(aes(x = 'FYEAR')) +
    geom_line(aes(y = y1, color = as.character(colns))) +
    geom_line(aes(y = y2, color = 'KCFSI'))+
    scale_y_continuous(name = (as.character(colns)),
                      sec.axis = sec_axis(~.*as.numeric(scale), name="KCFSI")) +
    labs(title = as.character(colns), color = "Data")
  print(plt)
}
```

