R: Assignment 1

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1 1

We examine short-term reversal excess returns, and have downloaded the FF factors dataset and downloaded the dataset 10 portfolios formed on short-term reversal, monthly periodicity.

2 2

Peering at the head of the monthly excess return for each decile portfolio table, we have:

Lo.PRIOR	PRIOR.2	PRIOR.3	PRIOR.4	PRIOR.5	PRIOR.6	PRIOR.7	PRIOR.8	PRIOR.9	Hi.PRIOR
-2.45	3.23	1.53	0.82	3.14	1.89	1.76	2.90	1.47	10.28
1.22	3.37	4.02	2.22	4.35	3.53	2.11	1.51	0.54	3.91
-4.70	1.28	-1.04	0.47	-0.03	0.56	0.09	-1.90	5.24	-2.57
-11.11	-4.72	-2.78	-2.22	-3.39	-2.65	-3.63	-1.79	-2.73	-6.02
-1.26	6.21	3.12	3.56	3.97	2.85	1.83	1.61	1.34	0.56
4.22	2.68	5.10	3.44	2.99	2.50	0.38	2.59	1.55	-0.29

3 Testing the null

For the first 9 decile short-term reversal portfolios, the null that the excess returns on short-term reversals is not statistically significantly different from zero can be rejected. There is evidence against the null, as presented in the following table. The table shows that the p-values are extremely small, smaller than $\alpha = 0.01, 0.05$, and 0.1 significance levels. In addition, the t-statistics in magnitude are much larger than the critical values of $2.58, 1.96, 1.64$, at the 1, 5, and 10% significance levels respectively. On the other hand, the t-statistic produced from the excess return of the 10th decile portfolio is less than 1.64 in magnitude. Therefore, this is evidence supporting the null, and the null cannot be rejected. Hence this decile's portfolio generates an excess return that is not statistically significantly different from 0.

	y-bar (%)	se	t-stat	p-value
Lo.PRIOR	1.14	0.26	4.46	0.00
PRIOR.2	0.90	0.20	4.44	0.00
PRIOR.3	0.88	0.18	4.80	0.00
PRIOR.4	0.76	0.17	4.54	0.00
PRIOR.5	0.79	0.17	4.56	0.00
PRIOR.6	0.74	0.16	4.61	0.00
PRIOR.7	0.71	0.16	4.30	0.00
PRIOR.8	0.65	0.17	3.79	0.00
PRIOR.9	0.57	0.18	3.14	0.00
Hi.PRIOR	0.29	0.21	1.41	0.16

4 4

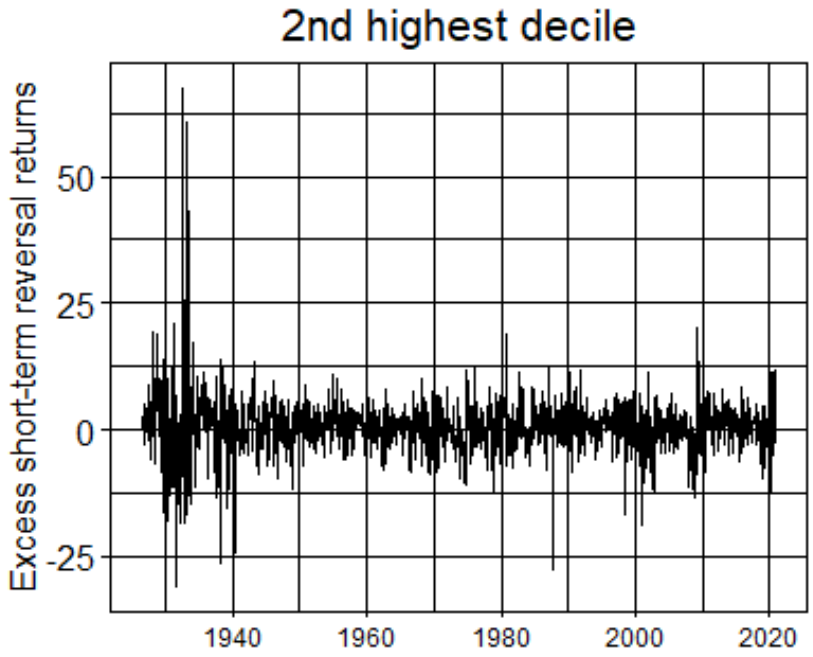

Figure 1: Time-series plot for one of the decile portfolio excess returns (short-term reversal).

5 Appendix: Code

```
################################################################################
# Assignment1.R
#
# FIN 560: Research Methods in Finance
# Cindy Lu
#
# Last modified: 12-Feb-2021
################################################################################

###############
# Load packages
###############

library(openxlsx)
library(ggplot2)
library(lubridate)
library(xtable)

############################
# Question 1:
# Load data & Pre-processing
############################

# Short term reversal monthly data downloaded
```

```
pth <- "10_Portfolios_Prior_1_0.csv"
ports <- read.csv(pth, skip = 10)

ports <- ports[1:1139,]         # use only value weighted returns

# Process date column
colnames(ports)[1]<- "Date"
ports$Date <- as.Date(as.character(as.numeric(ports$Date)*100+1),
                      format = '%Y%m%d')

# Fama-French factors & risk-free return
pth2 <- 'F-F_Research_Data_Factors.csv'
f <- read.csv(pth2, skip=3)
f <- f[1:1134,]

# Process date column again
colnames(f)[1] <- "Date"
f$Date = as.Date(as.character(as.numeric(f$Date)*100+1), format = '%Y%m%d')

# Load momentum
pth3 <- "C://Users/cindy.lu/Downloads/10_Portfolios_Prior_12_2.csv"
mom <- read.csv(pth3, skip=10)
mom <- mom[1:1128,]
colnames(mom)[1] <- "Date"
mom$Date <- as.Date(as.character(as.numeric(mom$Date)*100+1), format = '%Y%m%d')

############################################################
# Question 2:
# Compute monthly excess return for each decile portfolio
############################################################

# Require RF for all dates in ports data frame
merge_df <- left_join(ports, f, by = "Date")
merge_df <- merge_df %>%
  select(-SMB, -HML, -Mkt.RF)

# Get rid of rows with missing Risk free rate
merge_df <- merge_df[!is.na(merge_df$RF),]
# Quick check
any(is.na(merge_df))

# Convert columns to numeric
merge_df[,2:12] <- sapply(merge_df[2:12],as.numeric)

# Excess return momentum monthly
momExRet_df <- merge_df[,c(-1,-12)]-merge_df$RF

##########################################
# Question 3:
# Compute sample means & test significance
##########################################

# Number of rows used later
numrows = nrow(momExRet_df)
```

```
# Sample means
samp_means <- apply(momExRet_df, 2, mean)

# Standard errors of sample means
samp_vars <- apply(momExRet_df, 2, var)
std_errs <- sqrt(samp_vars/numrows)

# t-stats
t_stats <- samp_means/std_errs

# p-values
p_vals <- 2*pnorm(-abs(t_stats))

# Combination of results
results = cbind(samp_means,
                std_errs,
                t_stats,
                p_vals)

# Convert to table format
results = as.table(round(results, 2))
colnames(results) = c('y-bar (%)',
                      'se',
                      't-stat',
                      'p-value')

# Print to console
cat('Sample means - decile momentum portfolio excess returns\n\n')
print(results)
cat('\n')

# 95% Confidence intervals
conf_ints95 = cbind(samp_means-1.96*std_errs,
                    samp_means+1.96*std_errs)

# Converting to table
conf_ints95 = as.table(round(conf_ints95, 2))

colnames(conf_ints95) = c('lower bound','upper bound')

cat('95% confidence intervals for means\n\n')
print(conf_ints95)
cat('\n')

# Export function to LaTeX - copy and paste to document
print(xtable(results))

######################################################################
# Question 4:
# Create time series figure for 1 decile portfolio's excess return
######################################################################

# Create date column
```

```
momExRet_df$Date <- merge_df$Date

# Interested in 9th decile (2nd highest decile after Hi.PRIOR)
fig1 = ggplot(momExRet_df,
              aes(x = Date)) +
  geom_line(aes(y = PRIOR.9),
            linetype = 'solid',
            color = 'black') +
  labs(title = "2nd highest decile, excess short-term reversal returns",
       y = 'Excess returns') +
  geom_hline(yintercept = 0,
             color = 'black',
             linetype = 'solid',
             size = 0.25) +
  theme_linedraw() +
  theme(plot.title = element_text(hjust = 0.5,
                                  size = 16),
        axis.title.x = element_blank(),
        axis.title.y = element_text(size = 12),
        axis.text.y = element_text(size = 12))
print(fig1)
```