ECON 490 003
Lab 2 - Test of CAPM and Adding Fama-French Factors

Name - Saksham Sudershan
Student Number - 31339427

ANALYSIS

(a) Summary Statistics:

	Mean	StDev
MKTRF	0.005510380	0.043764593
SMB	0.001909211	0.030370940
HML	0.003146345	0.027904745
RF	0.003772222	0.002631138

Mean of Portfolios:

	Lowest	Second	Third	Fourth	Highest
Smallest	0.006888905	0.011826325	0.011557200	0.013790409	0.01457351
Second	0.009060227	0.011710757	0.012331613	0.012861129	0.01378227
Third	0.009149227	0.011705921	0.011336276	0.012528276	0.01381148
Fourth	0.010187899	0.010213826	0.010848430	0.012317873	0.01260825
Largest	0.009184170	0.009197554	0.009646311	0.009129026	0.01036822

Standard Deviation of Portfolios:

	Lowest	Second	Third	Fourth	Highest
Smallest	0.07810443	0.06891974	0.05937782	0.05693514	0.05931049
Second	0.07046201	0.05943196	0.05388341	0.05208310	0.05967406
Third	0.06455272	0.05424890	0.04933721	0.04913580	0.05592653
Fourth	0.05779642	0.05051292	0.04855256	0.04800228	0.05572178
Largest	0.04557817	0.04347486	0.04225434	0.04618828	0.05409301

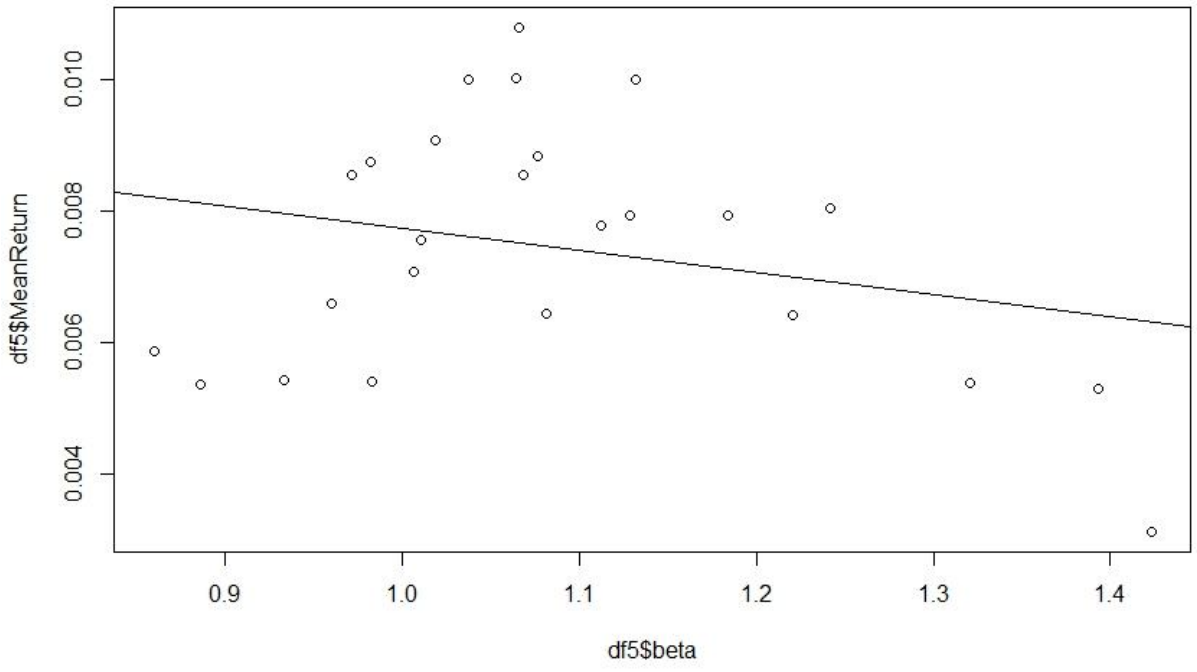
(b) Point Estimates for B_i For Each Portfolio:

	row	V2	V3	V4	V5
1	1.422989	1.2417980	1.1119189	1.0369770	1.0654303
2	1.392916	1.1836912	1.0682162	1.0186144	1.1314867
3	1.320620	1.1286156	1.0106672	0.9820916	1.0642975
4	1.220352	1.0810748	1.0061155	0.9711439	1.0765032
5	0.982370	0.9333673	0.8596762	0.8859789	0.9602725

T-statistic for Each Portfolio:

	row	V2	V3	V4	V5
1	34.30515	33.32062	37.14099	34.26490	33.01597
2	44.59418	45.98373	45.13664	43.02411	38.67822
3	51.86518	56.65823	52.18494	46.66552	39.16101
4	61.97104	67.98395	55.55899	49.21193	41.21160
5	71.87464	70.21028	50.23872	40.34698	32.19477

(d) Plot of Security Market Line:



(e) Summary of the Regression of Stock Returns on SMB and HML:

	S	TforS	H	TforH	R2
r1	1.7646635	27.036913	-0.63358354	-8.9190564	0.579258205
r2	1.6863382	29.800557	-0.27267402	-4.4273444	0.593653731
r3	1.4371736	27.573329	0.02231838	0.3934254	0.535526806
r4	1.4062225	28.332807	0.18793357	3.4790425	0.542252934
r5	1.4288427	26.847189	0.39222358	6.7712355	0.515129701
r6	1.4095891	22.323665	-0.72750173	-10.5858764	0.516631282
r7	1.2770991	22.580776	-0.19345054	-3.1427080	0.454718084
r8	1.0995190	20.002613	0.09094141	1.5200768	0.373320042
r9	1.0807400	20.503718	0.25849333	4.5058897	0.381888360
r10	1.2781093	21.718293	0.43983492	6.8670029	0.413060639
r11	1.1312807	18.432584	-0.75903698	-11.3631465	0.455734992
r12	0.9647386	16.690633	-0.17395598	-2.7651734	0.316638090
r13	0.7991504	14.348477	0.11434969	1.8863927	0.232812435
r14	0.7898130	14.250383	0.29478372	4.8868117	0.233872614
r15	0.9543447	15.575092	0.46169321	6.9230689	0.275270335
r16	0.7813295	13.056449	-0.75045481	-11.5221960	0.354956709
r17	0.6088954	10.137688	-0.14284775	-2.1851911	0.150323202
r18	0.5482821	9.306519	0.10023254	1.5631899	0.112891441
r19	0.5854490	10.181045	0.23509156	3.7562990	0.135819029
r20	0.7019612	10.697243	0.44163881	6.1836628	0.162518886
r21	0.1219995	2.292255	-0.65951800	-11.3854857	0.180932520
r22	0.1755567	3.201644	-0.22403424	-3.7539620	0.042275435
r23	0.1109914	2.043076	-0.01994873	-0.3373885	0.006892553
r24	0.1652976	2.850169	0.34285010	5.4316027	0.046080530
r25	0.2573378	3.835648	0.48685123	6.6673204	0.069975918

(f) Summary of the Fama-French Regression:

	S	TforS	H	TforH	Beta	TforBeta	R2
r1	1.3571494	43.330907	-0.29451372	-8.764193	1.0988383	49.92773	0.9098253
r2	1.3247835	53.648675	0.02815551	1.062708	0.9749113	56.18458	0.9279811
r3	1.0894089	62.896515	0.31167399	16.771523	0.9377273	77.04601	0.9522615
r4	1.0765063	62.932645	0.46227210	25.187982	0.8890608	73.96543	0.9493946
r5	1.0754594	58.399193	0.68625418	34.732345	0.9528778	73.63562	0.9459684
r6	0.9902564	45.382442	-0.37859833	-16.171681	1.1307064	73.74421	0.9462766
r7	0.8993931	48.246636	0.12081759	6.040653	1.0184624	77.75000	0.9448642
r8	0.7364160	37.220108	0.39305923	18.516065	0.9790863	70.42281	0.9244344
r9	0.7258800	45.171013	0.55375262	32.117895	0.9568596	84.73857	0.9465289
r10	0.8805102	51.024593	0.77065502	41.623775	1.0721030	88.41371	0.9530282
r11	0.7205242	36.319099	-0.41726936	-19.603755	1.1075812	79.45111	0.9470717
r12	0.5819702	28.498269	0.14452428	6.596215	1.0321128	71.92549	0.9206109
r13	0.4328126	20.949738	0.41915897	18.910094	0.9878087	68.04393	0.9017533
r14	0.4227755	21.595774	0.60017514	28.574142	0.9896952	71.94462	0.9110375
r15	0.5556676	22.835903	0.79341029	30.390457	1.0750099	62.87146	0.8936250
r16	0.3821160	19.188336	-0.41829150	-19.577508	1.0764561	76.92656	0.9335178
r17	0.2133301	9.659838	0.18628018	7.861777	1.0666192	68.73297	0.8930872
r18	0.1630509	7.180774	0.42076195	17.271126	1.0387536	65.10261	0.8773503
r19	0.2092899	9.466309	0.54807261	23.105041	1.0142913	65.28794	0.8811045
r20	0.2775565	10.299579	0.79476233	27.487901	1.1443827	60.43343	0.8685455
r21	-0.2396523	-16.488958	-0.35860769	-22.996802	0.9751731	95.48413	0.9431506
r22	-0.1896397	-10.247543	0.07982532	4.020384	0.9847309	75.72617	0.8984710
r23	-0.2421589	-11.166297	0.27388794	11.771126	0.9522493	62.48811	0.8527049
r24	-0.2183957	-10.582808	0.66210000	29.903126	1.0346070	71.34607	0.8875848
r25	-0.1594093	-4.861152	0.83360327	23.693063	1.1237344	48.76712	0.7932085

R Code:

```
df1 <- data.frame(read.csv("490lab2.csv"))
df2 <- data.frame(read.csv("490lab2b.csv"))
summary(df2)
SummaryTable <- data.frame(row.names = )
SummaryTable <- data.frame(Mean = c(mean(df2$mktrf), mean(df2$smb), mean(df2$hml), mean(df2$rf)),
StDev = c(sd(df2$mktrf), sd(df2$smb), sd(df2$hml), sd(df2$rf)))
rownames(SummaryTable) <- c("MKTRF", "SMB", "HML", "RF")
MeanOfPort <- data.frame(Lowest = c(mean(df1$s1b1_vwret), mean(df1$s2b1_vwret),
mean(df1$s3b1_vwret), mean(df1$s4b1_vwret), mean(df1$s5b1_vwret)),
            Second = c(mean(df1$s1b2_vwret), mean(df1$s2b2_vwret), mean(df1$s3b2_vwret),
mean(df1$s4b2_vwret), mean(df1$s5b2_vwret)),
            Third = c(mean(df1$s1b3_vwret), mean(df1$s2b3_vwret), mean(df1$s3b3_vwret),
mean(df1$s4b3_vwret), mean(df1$s5b3_vwret)),
            Fourth = c(mean(df1$s1b4_vwret), mean(df1$s2b4_vwret), mean(df1$s3b4_vwret),
mean(df1$s4b4_vwret), mean(df1$s5b4_vwret)),
            Highest = c(mean(df1$s1b5_vwret), mean(df1$s2b5_vwret), mean(df1$s3b5_vwret),
mean(df1$s4b5_vwret), mean(df1$s5b5_vwret)))
rownames(MeanOfPort) <- c("Smallest", "Second", "Third", "Fourth", "Largest")
STDOfPort <- data.frame(Lowest = c(sd(df1$s1b1_vwret), sd(df1$s2b1_vwret), sd(df1$s3b1_vwret),
sd(df1$s4b1_vwret), sd(df1$s5b1_vwret)),
              Second = c(sd(df1$s1b2_vwret), sd(df1$s2b2_vwret), sd(df1$s3b2_vwret),
sd(df1$s4b2_vwret), sd(df1$s5b2_vwret)),
              Third = c(sd(df1$s1b3_vwret), sd(df1$s2b3_vwret), sd(df1$s3b3_vwret),
sd(df1$s4b3_vwret), sd(df1$s5b3_vwret)),
              Fourth = c(sd(df1$s1b4_vwret), sd(df1$s2b4_vwret), sd(df1$s3b4_vwret),
sd(df1$s4b4_vwret), sd(df1$s5b4_vwret)),
              Highest = c(sd(df1$s1b5_vwret), sd(df1$s2b5_vwret), sd(df1$s3b5_vwret),
sd(df1$s4b5_vwret), sd(df1$s5b5_vwret)))
rownames(STDOfPort) <- c("Smallest", "Second", "Third", "Fourth", "Largest")
df3 <- data.frame(df1)
for (i in 2:26) {
  for (j in 1:684) {
    df3[j,i]=df1[j,i]-df2[j,5]
  }
}
df3[,27] = df2$mktrf
data.frame(row= c(1,2)) -> df4
for (k in 2:26) {
  capm.lm <- lm(formula = df3[,k] ~ df3 [,27], data = df3)
  x = k-1
  df4[,x] <- capm.lm$coefficients
  modsummary <- summary(capm.lm)
  modcoeff <- modsummary$coefficients
  df4[1,x] <- modcoeff[2,1]
```

```
  df4[2,x] <- modcoeff[2,3]
}
rownames(df4) <- c("beta", "t statistic")
df4 <- t(df4)

data.frame(row= c(1,2)) -> RegResultsEst
data.frame(row= c(1,2)) -> RegResultsT
x=0
for (l in 1:5) {
  for (m in 1:5) {
    x=x+1
    RegResultsEst[l,m] <- df4[x,1]
    RegResultsT[l,m] <- df4[x,2]
  }
}
colnames(RegResultsEst) <- c("lowest", "2", "3", "4", "highest")
rownames(RegResultsEst) <- c("smallest", "2", "3", "4", "largest")
colnames(RegResultsT) <- c("lowest", "2", "3", "4", "highest")
rownames(RegResultsT) <- c("smallest", "2", "3", "4", "largest")

data.frame(row= c(1,2)) -> df5
for (n in 2:26) {
  x=n-1
  mean(df3[,n]) -> df5[,x]
}

for (o in 1:26) {
  df5[1,o] <- df4[o,1]
}

rownames(df5) <- c("beta", "MeanReturn")
df5 <- t(df5)

df5 <- data.frame(df5)
smlreg <- lm(formula = df5[,2] ~ df5[,1], data = df5)
plot(df5$beta, df5$MeanReturn)
abline(lm(df5$MeanReturn ~ df5$beta))

df3 <- cbind(df3, df2$smb, df2$hml)

df6 <- data.frame(row= c(1,2,3,4,5))
for (p in 2:26) {
  x=p-1
  ffmod <- lm(formula = df3[,p] ~ df3$`df2$smb` + df3$`df2$hml`)
  modsummary <- summary(ffmod)
  modcoeff <- modsummary$coefficients
  df6[1,x] <- modcoeff[2,1]
  df6[2,x] <- modcoeff[2,3]
  df6[3,x] <- modcoeff[3,1]
```

```
  df6[4,x] <- modcoeff[3,3]
  df6[5,x] <- modsummary$r.squared
}

df6 <- t(df6)
colnames(df6) <- c("S","TforS","H","TforH","R2")
rownames(df6) <-
c("r1","r2","r3","r4","r5","r6","r7","r8","r9","r10","r11","r12","r13","r14","r15","r16","r17","r18","r19","r20","r21"
,"r22","r23","r24","r25")

df7 <- data.frame(row= c(1,2,3,4,5,6,7))
for (p in 2:26) {
  x=p-1
  ffmod <- lm(formula = df3[,p] ~ df3$`df2$smb` + df3$`df2$hml` + df3$V27)
  modsummary <- summary(ffmod)
  modcoeff <- modsummary$coefficients
  df7[1,x] <- modcoeff[2,1]
  df7[2,x] <- modcoeff[2,3]
  df7[3,x] <- modcoeff[3,1]
  df7[4,x] <- modcoeff[3,3]
  df7[5,x] <- modcoeff[4,1]
  df7[6,x] <- modcoeff[4,3]
  df7[7,x] <- modsummary$r.squared
}

df7 <- t(df7)
colnames(df7) <- c("S","TforS","H","TforH","Beta","TforBeta","R2")
rownames(df7) <-
c("r1","r2","r3","r4","r5","r6","r7","r8","r9","r10","r11","r12","r13","r14","r15","r16","r17","r18","r19","r20","r21"
,"r22","r23","r24","r25")
```