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Assignment1

CAPM: $r_{jt} = \alpha_j + \beta_{j1} r_{mt} + \varepsilon_{jt}$

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. reg rj rm
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Source	SS	df	MS	Number of obs	=	11,959
				F(1, 11957)	=	5988.94
Model	11449.5344	1	11449.5344	Prob > F	=	0.0000
Residual	22859.1346	11,957	1.91177842	R-squared	=	0.3337
				Adj R-squared	=	0.3337
Total	34308.669	11,958	2.86909759	Root MSE	=	1.3827

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	.9947206	.0128536	77.39	0.000	.9695254	1.019916
_cons	.0084273	.0126552	0.67	0.505	-.0163789	.0332335

```
. test rm==1

 ( 1)  rm = 1

       F(  1, 11957) =    0.17
            Prob > F =    0.6813
```

Fama & French: $r_{jt} = \alpha_j + \beta_{j1} r_{mt} + \beta_{j2} r_{smbt} + \beta_{j3} r_{hmlt} + \varepsilon_{jt}$

```
. reg rj rm smb hml
```

Source	SS	df	MS	Number of obs	=	11,959
				F(3, 11955)	=	2057.22
Model	11681.1999	3	3893.73328	Prob > F	=	0.0000
Residual	22627.4691	11,955	1.89272013	R-squared	=	0.3405
				Adj R-squared	=	0.3403
Total	34308.669	11,958	2.86909759	Root MSE	=	1.3758

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	1.005554	.0128271	78.39	0.000	.9804104	1.030697
smb	.0371377	.0061189	6.07	0.000	.0251437	.0491318
hml	.0562866	.00609	9.24	0.000	.0443492	.068224
_cons	.0073088	.0125928	0.58	0.562	-.0173752	.0319928

```
. test rm==1

 ( 1)  rm = 1

       F(  1, 11955) =    0.19
            Prob > F =    0.6651
```

(1) For CAPM model, it shows that Jensen Alpha is not significant. As its t = 0.67 and p-value = 0.505 which is greater than 0.05, rejection region. In other word, Null hypothesis is not rejected and the Jensen Alpha equal to 0. Moreover, Fama & French model also gives the same result. From this model, t-value = 0.58 and p-value = 0.562.

(2) For CAPM model, t-test determines that portfolio j has the same risk as the market since we cannot reject Null hypothesis (F = 0.17 and p-value= 0.6813 which is greater than 0.05). Then, meaning that beta j equal to 1. T-test in Fama & French model also indicate the same conclusion which F = 0.19 and p-value = 0.6651.

(3) For size premium, from Fama & French model, it is significant. Since its t-value = 6.07 and p-value = 0.000 which is less than 0.05, rejection region. So, we will reject Null hypothesis stated that beta j2 equal to 0.

(4) For growth (value) premium, from Fama & French model, it is significant. Since its t-value = 9.24 and p-value = 0.000 which is less than 0.05, rejection region. So, we will reject Null hypothesis stated that beta j3 equal to 0.

(5) Comparing these two models, from F-test, size premium and value premium in FF model are both significant. However, they are not included in CAPM model. Moreover, if we consider Adj R-squared of the two model. We would see that Adj R-squared of FF model is equal to 0.3403 which is greater than Adj R-squared of CAPM model which is 0.3337. So, the most appropriated model should be Fama & French model.

$$r_{jt} = \alpha_j + \gamma_j D_{1t} + \beta_{j1} r_{mt} + \beta_{j2} r_{smbt} + \beta_{j3} r_{hmlt} + \varepsilon_{jt}$$

```
. reg rj rm smb hml d1
```

Source	SS	df	MS		
Model	11683.8263	4	2920.95657	Number of obs	= 11,959
Residual	22624.8427	11,954	1.89265875	F(4, 11954)	= 1543.31
Total	34308.669	11,958	2.86909759	Prob > F	= 0.0000
				R-squared	= 0.3406
				Adj R-squared	= 0.3403
				Root MSE	= 1.3757

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	1.005405	.0128275	78.38	0.000	.9802607	1.030549
smb	.0369291	.0061214	6.03	0.000	.0249302	.048928
hml	.0562495	.00609	9.24	0.000	.0443121	.0681868
d1	.05393	.045781	1.18	0.239	-.0358082	.1436682
_cons	.0028773	.0131425	0.22	0.827	-.0228842	.0286388

(6) From using STATA, it shows that January effects is insignificant. Since its t-value = -1.18 and p-value = 0.239 greater than 0.05, rejection region. In other word, Null hypothesis is not rejected and January effect equals to 0.

(7) Firstly, all coefficients of all variables are positive. Meaning that they have positive relationship or effect with the excess return on portfolio j. Secondly, the overall test or F-test indicate that the model is significant as its p-value is less than 0.05. Thirdly, R-squared of the model is 0.3406 which can be interpreted that the independent variables in a regression model can explain variation of a dependent variable by 34.06%. Lastly, if we consider individual test, t-test, we will find that market risk premium, size premium, and value premium are significant as their p-value are less than 0.05 while constant term and 1 on January (D1) are not significant as their p-value are greater than 0.05.

(8)

```
. reg rj rm smb hml
```

Source	SS	df	MS	Number of obs	=	11,959
				F(3, 11955)	=	2057.22
Model	11681.1999	3	3893.73328	Prob > F	=	0.0000
Residual	22627.4691	11,955	1.89272013	R-squared	=	0.3405
				Adj R-squared	=	0.3403
Total	34308.669	11,958	2.86909759	Root MSE	=	1.3758

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	1.005554	.0128271	78.39	0.000	.9804104	1.030697
smb	.0371377	.0061189	6.07	0.000	.0251437	.0491318
hml	.0562866	.00609	9.24	0.000	.0443492	.068224
_cons	.0073088	.0125928	0.58	0.562	-.0173752	.0319928

```
. sca rss1=e(rss)

. sca n1=e(N)

. reg rj rm smb hml if d1==0
```

Source	SS	df	MS	Number of obs	=	10,974
				F(3, 10970)	=	1887.21
Model	10805.6192	3	3601.87308	Prob > F	=	0.0000
Residual	20936.975	10,970	1.90856654	R-squared	=	0.3404
				Adj R-squared	=	0.3402
Total	31742.5942	10,973	2.89279087	Root MSE	=	1.3815

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	1.008159	.0134224	75.11	0.000	.9818484	1.034469
smb	.0364768	.0064347	5.67	0.000	.0238636	.04909
hml	.0553364	.0063956	8.65	0.000	.0427998	.0678729
_cons	.0027652	.0131985	0.21	0.834	-.0231062	.0286367

```
. sca rss2=e(rss)

. sca n2=e(N)
```

```
. reg rj rm smb hml if d1==1
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Source	SS	df	MS	Number of obs	=	985
				F(3, 981)	=	169.11
Model	872.032797	3	290.677599	Prob > F	=	0.0000
Residual	1686.17832	981	1.71883621	R-squared	=	0.3409
				Adj R-squared	=	0.3389
Total	2558.21111	984	2.59980804	Root MSE	=	1.311

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	.9725647	.0435176	22.35	0.000	.8871664	1.057963
smb	.0402395	.0198549	2.03	0.043	.0012766	.0792024
hml	.0659675	.0199538	3.31	0.001	.0268104	.1051246
_cons	.0580564	.0421181	1.38	0.168	-.0245956	.1407084

```
.  reg rj rm smb hml d1 d1rm d1smb d1hml
note: d1rm omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	11,959
				F(6, 11952)	=	1028.78
Model	11684.4565	6	1947.40942	Prob > F	=	0.0000
Residual	22624.2124	11,952	1.89292273	R-squared	=	0.3406
				Adj R-squared	=	0.3402
Total	34308.669	11,958	2.86909759	Root MSE	=	1.3758

rj	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rm	1.00535	.012829	78.37	0.000	.980203	1.030497
smb	.036414	.0064077	5.68	0.000	.0238538	.0489741
hml	.0552522	.0063684	8.68	0.000	.0427692	.0677352
d1	.0527127	.0459836	1.15	0.252	-.0374227	.142848
d1rm	0	(omitted)				
d1smb	.0047171	.0217619	0.22	0.828	-.0379397	.047374
d1hml	.0111731	.0218752	0.51	0.610	-.0317059	.054052
_cons	.0028763	.0131435	0.22	0.827	-.022887	.0286397

```
. sca rss3=e(rss)

. sca n3=e(N)

. sca ChowTest=((rss1-rss2-rss3)/4)/((rss2+rss3)/(n2+n3-4*2))

. sca list ChowTest
  ChowTest =  .56997206
```

From Chow-test and F-test, all dummy variables are significant. Then, January and other month share the same structure of the Fama-French model.