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# ASSIGNMENT 1

Figure 1:

```
. regress rj rm
```

| 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 |

```
. est store withcon
```

Figure 2:

```
. regress rj rm, noconstant
```

| Source | SS | df | MS | Number of obs | = | 11,959 |
|---|---|---|---|---|---|---|
| | | | | F(1, 11958) | = | 6004.58 |
| Model | 11478.8888 | 1 | 11478.8888 | Prob > F | = | 0.0000 |
| Residual | 22859.9824 | 11,958 | 1.91168944 | R-squared | = | 0.3343 |
| | | | | Adj R-squared | = | 0.3342 |
| Total | 34338.8712 | 11,959 | 2.87138316 | Root MSE | = | 1.3826 |

| rj | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| rm | .9950862 | .0128416 | 77.49 | 0.000 | .9699145 | 1.020258 |

```
. est store wocon
```

Figure 3:

```
. est table withcon wocon, star(0.1 0.05 0.01) stat(N rss F r2 r2_a)
```

| Variable | withcon | wocon |
|---|---|---|
| rm | .99472062*** | .99508618*** |
| _cons | .00842732 | |
| N | 11959 | 11959 |
| rss | 22859.135 | 22859.982 |
| F | 5988.9442 | 6004.5782 |
| r2 | .33372132 | .33428265 |
| r2_a | .3336656 | .33422698 |

legend: * p<.1; ** p<.05; *** p<.01

.

1.) From the STATA, you can see that the P-value is 0.505 which is more than 0.05 therefore I concluded that the Jenen Alpha is not statistically significant.

Figure 4:

```
. regress rj rm
```

| 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 |

```
. est store withcon
```

2.) If the market premium increases by 1, this portfolio will have an increase in return by 0.99 which is approximately 0.01% less than the market. Therefore this portfolio is a little bit less volatile than the market.

Figure 5:

```
. regress 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 |

3.) Since the P-value of ‘SMB’,size premium, is less than 0.05, SMB can explain the return of the portfolio significantly.

4.) Since the P-value of ‘HML’,growth premium, is less than 0.05, SMB can explain the return of the portfolio significantly.

Figure 6:

```
. test smb hml

 ( 1)  smb = 0
 ( 2)  hml = 0

       F(  2, 11955) =   61.20
            Prob > F =    0.0000
```

5.) Null hypothesis: Beta2=Beta3=0

FF models are more appropriate because the P-value is less than 0.05, we reject the null hypothesis.

Figure 7:

```
. regress rj d1 rm smb hml
```

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

| rj | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| d1 | .05393 | .045781 | 1.18 | 0.239 | -.0358082 | .1436682 |
| 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 |
| _cons | .0028773 | .0131425 | 0.22 | 0.827 | -.0228842 | .0286388 |

6.) d1 represents January. Since the P-value of d1 is 0.231 which is more than 0.05, January is not statistically significant.

7.1) If the market premium increases by 1, the return on the portfolio will increase by 1.01. If the market premium increases by 1, the size premium will increase by 0.04. If the market premium increases by 1, the growth premium increases by 0.06.

7.2) Null hypothesis: beta1=beta2=beta is not equal to 0

Since the P-value=0.0000 which is less than 0.05, meaning the null hypothesis is being rejected.

7.3) R^2 = 0.3406 meaning the model can explain return on the portfolio by 34.06%.

7.4) Since rm P-value is less than 0.05, the market premium can explain the return on the portfolio significantly. For smb P-value is less than 0.05, the size premium can explain the return on the portfolio significantly. For hml P-value is less than 0.05, the growth premium can explain the return on the portfolio significantly.

Figure 8:

```
. regress rj rm smb hml d1 d1rm d1smb d1hml
```

| Source | SS | df | MS | Number of obs | = | 11,959 |
|---|---|---|---|---|---|---|
| | | | | F(7, 11951) | = | 881.86 |
| Model | 11685.5157 | 7 | 1669.35938 | Prob > F | = | 0.0000 |
| Residual | 22623.1533 | 11,951 | 1.89299249 | R-squared | = | 0.3406 |
| | | | | Adj R-squared | = | 0.3402 |
| Total | 34308.669 | 11,958 | 2.86909759 | Root MSE | = | 1.3759 |

| rj | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| rm | 1.008159 | .0133675 | 75.42 | 0.000 | .9819563 | 1.034361 |
| smb | .0364768 | .0064084 | 5.69 | 0.000 | .0239153 | .0490383 |
| hml | .0553364 | .0063695 | 8.69 | 0.000 | .0428511 | .0678216 |
| d1 | .0552912 | .0461135 | 1.20 | 0.231 | -.0350988 | .1456811 |
| d1rm | -.035594 | .0475853 | -0.75 | 0.454 | -.1288689 | .0576808 |
| d1smb | .0037628 | .0217997 | 0.17 | 0.863 | -.0389682 | .0464937 |
| d1hml | .0106311 | .0218876 | 0.49 | 0.627 | -.0322721 | .0535344 |
| _cons | .0027652 | .0131445 | 0.21 | 0.833 | -.0230002 | .0285307 |

Figure 9:

```
. regress 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)
```

Figure 10:

```
. 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 |

Figure 11:

```
. reg rj rm smb hml if d1==1
```

| 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 |

Figure 12:

```
. sca list ChowTest
  ChowTest =  .56997206
```

Figure 13:

```
. test d1 d1rm d1smb d1hml

 ( 1)  d1 = 0
 ( 2)  d1rm = 0
 ( 3)  d1smb = 0
 ( 4)  d1hml = 0

       F(  4, 11951) =    0.57
            Prob > F =    0.6844
```

8.) Null hypothesis : d1=0, d1smb=0, d1hml=0, d1rm=0
Since the chow test is = 0.57 which is more than 0.05, January and other months are not statistically significant, so it failed to reject the null hypothesis. Therefore, I conclude that the Model 2 shares the same structure as Model 3.