



## ***QF604 Econometrics of Financial Markets***

### ***Group Assignment 1***

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## ***DECLARATION***

*Completion of this assignment is a result of group collaboration. About completion of the assignment, we:*

- 1. have clear and fair division of work;*
- 2. have no complaint on other group members.*

*I have read through and give personal consent to statements above.*

***SIGNATURE:***

# **1 INTRODUCTION**

This assignment will study the cross-sectional properties of return forecasts derived from Fama-Macbeth regressions and aim to show if there is an effective way to combine many firm characteristics into a composite estimate of a stock's monthly expected return. Firstly, the data from WRDS will be collected and manipulated for analysing. Then models and parameters will be built and tested for predicting expected stock returns. Lastly, the predicting power of the model will be observed and compared with the Fama-French 3 factor model.

## **2 RESULTS AND DISCUSSION**

To start off, we download all common stocks data from the Center for Research in Security Prices (CRSP) monthly files and download accounting data from Compustat. All the data range are start from Jan 1963 to Dec 2020. We also consider two sub-samples of larger firms: “all-but-tiny” stocks and “large” stocks. The condition of determination is based on the market equity of stock. “all-but-tiny” stocks are those larger than the NYSE 20th percentile and ‘large’ stocks are those larger than the NYSE 50th percentile based on market equity at the beginning of the month.

we consider three specifications of FM regressions based on progressively larger sets of predictor variables. Model 1 includes size, B/M, and past 12-month stock returns, while Model 2 adds three-year share issuance, profitability, and asset growth. Model 3 includes five additional characteristics that have a weaker relation historically to subsequent returns, including one-year share issuance, 12-month volatility, 12-month turnover, market leverage, and the sales-to-price ratio. The logic of the three specifications is that the first two models are most relevant

if we believe an investor identified the best predictors early in the sample—perhaps based on theory rather than empirical evidence—while the third model is most relevant if an investor considered a larger number of predictors, even those we now know did not add significant explanatory power to the model.

**TABLE 1 Variables List**

Name	Description
<i>Log Size</i> <sub>-1</sub>	Log market value of equity at the end of the prior month
<i>Log <math>\frac{B}{M}</math></i> <sub>-1</sub>	Log book value of equity minus log market value of equity at the end of the prior month
<i>Return</i> <sub>-2,-12</sub>	Stock return from month -12 to month -2
<i>Log Issues</i> <sub>-1,-36</sub>	Log growth in split-adjusted shares outstanding from month -36 to month -1
<i>ROA</i> <sub>Yr-1</sub>	Income before extraordinary items divided by average total assets in the prior fiscal year
<i>Log AG</i> <sub>Yr-1</sub>	Log growth in total assets in the prior fiscal year,
<i>Log Issues</i> <sub>-1,-12</sub>	Log growth in split-adjusted shares outstanding from month -12 to month -1
<i>StdDev</i> <sub>-1,-12</sub>	Monthly standard deviation, estimated from daily returns from month -12 to month -1
<i>Turnover</i> <sub>-1,-12</sub>	Average monthly turnover (shares traded/shares outstanding) from month -12 to month -1
<i>Debt/Price</i> <sub>Yr-1</sub>	Short-term plus long-term debt divided by market value at the end of the prior month
<i>Sales/Price</i> <sub>Yr-1</sub>	Sales in the prior fiscal year divided by market value at the end of the prior month

TABLE 1 summarized and defined the variables. All characteristics, except monthly returns, are minorized monthly at their 1st and 99th percentiles.

### 3 FAMA-MACBETH RERESSION

**TABLE 2 FM regressions statistics**

		All stocks				All-but-tiny stocks			Large stocks	
	Slope	t-stat	R^2	Slope	t-stat	R^2	Slope	t-stat	R^2	
<b>Model 1:</b>	Three predictors									
LogSize	0.29	7.79	0.033	0.3	6.99	0.038	0.39	7.72	0.04	
LogB/M	-0.53	-0.89		-0.48	-0.84		0.34	0.59		
Return_2_12	0.68	1.74		0.32	0.73		0.42	0.98		
N		46359			37505			23890		
<b>Model 2:</b>	Seven predictors									
LogSize	0.31	5.9	0.036	0.31	5.7	0.042	0.38	5.73	0.045	
LogB/M	-0.31	-0.45		-0.43	-0.6		0.19	0.26		
Return_2_12	0.59	1.66		0.23	0.51		0.42	0.93		
LogIssues_1_36	-0.54	-0.96		0.19	0.36		0.19	0.24		
Accruals	2.18	3.69		2.19	4.14		2.05	3.94		
ROA	2.33	1.64		1.52	1.41		0.4	0.36		
LogAG	1.64	2.04		1.41	1.45		0.36	1.79		
N		34116			26944			17682		
<b>Model 3:</b>	Eleven predictors									
LogSize	0.36	6.46	0.037	0.38	6.83	0.042	0.46	6.28	0.046	
LogB/M	-0.58	-0.9		-0.48	-0.74		0.27	0.36		
Return_2_12	0.49	1.45		0.3	0.77		0.58	1.47		
LogIssues_1_36	-0.38	-0.59		0.15	0.25		0.57	0.6		
Accruals	0.52	0.89		0.38	0.73		0.33	0.64		
ROA	1.65	1.24		0.61	0.57		-0.59	-0.51		
LogAG	1.91	4.08		1.27	3.43		1.45	3.25		
LogIssues_1_12	-0.15	-1.25		-0.01	-0.1		-0.07	-0.52		
Turnover_1_12	-1.35	-3.9		-1.6	-5.06		-1.63	-5.41		
Debt/price	-0.43	-3.23		-0.37	-2.47		-0.46	-2.32		
Sales/price	0.02	0.63		0.04	1.21		0.07	1.71		
N		33337			26201			17133		

In the first two models, the slopes on return, ROA, and asset growth are significantly positive, while the slopes on logB/M, LogIssues are significantly negative. In general, the estimates are reasonably similar for the three groups of firms. The predictive ability of size, B/M, ROA and asset growth is somewhat weaker among larger stocks for slopes.

Adding the remaining characteristics to the regression, in the third model, has a modest effect on the slopes of the six variables included in Models 1 and 2. The D/P ratio is significant negative than other parameters. The slope of

turnover is likely not be significant, but the t-stat of large is likely to be significant negative than others.

**Table 3 FM regressions statistics**

<i>FM estimate</i>	<i>slopes</i>	<i>Model</i>	<i>Avg</i>	<i>Std</i>	<i>p10</i>	<i>p90</i>	<i>Slope</i>	<i>S.E.</i>	<i>t-stat</i>	<i>R<sup>2</sup></i>
<i>All stocks</i>	Rolling	Model 1	0.24	0.69	-0.82	0.98	1	0.54	1.83	0.034
<i>All stocks</i>	Rolling	Model 2	2.55	6.87	-4.77	9.92	0.45	0.03	15.09	0.706
<i>All stocks</i>	Rolling	Model 3	2.03	7.06	-4.73	9.63	0.43	0.03	12.88	0.636
<i>All stocks</i>	Cumulative	Model 1	0.28	0.29	-0.05	0.54	3.2	0.95	3.36	0.106
<i>All stocks</i>	Cumulative	Model 2	2.09	4.68	-3.16	6.73	0.71	0.03	22.85	0.846
<i>All stocks</i>	Cumulative	Model 3	1.8	4.29	-3.15	5.99	0.76	0.04	20.35	0.813
<i>All-but-tiny stocks</i>	Rolling	Mode 1	0.51	0.79	-0.67	1.38	1.19	0.4	2.98	0.085
<i>All-but-tiny stocks</i>	Rolling	Mode 2	1.98	5.53	-3.41	8.7	0.51	0.04	12.23	0.611
<i>All-but-tiny stocks</i>	Rolling	Mode 3	1.96	6.16	-3.43	8.78	0.43	0.04	10.51	0.538
<i>All-but-tiny stocks</i>	Cumulative	Mode 1	0.56	0.29	0.21	0.93	2.38	0.57	4.2	0.156
<i>All-but-tiny stocks</i>	Cumulative	Mode 2	1.85	3.49	-2.42	5.63	0.89	0.04	23.03	0.848
<i>All-but-tiny stocks</i>	Cumulative	Mode 3	1.75	3.36	-2.35	5.59	0.92	0.04	21.75	0.833
<i>Large stocks</i>	Rolling	Model 1	1.22	1.26	-0.67	2.69	0.67	0.21	3.26	0.1
<i>Large stocks</i>	Rolling	Model 2	2.16	5.61	-2.85	9.54	0.4	0.05	8.3	0.42
<i>Large stocks</i>	Rolling	Model 3	2.42	8.53	-3.13	10.78	0.27	0.03	8.06	0.406
<i>Large stocks</i>	Cumulative	Model 1	1.17	0.39	0.74	1.68	1.24	0.28	4.44	0.172
<i>Large stocks</i>	Cumulative	Model 2	1.99	3.31	-1.75	6.34	0.81	0.05	15.5	0.717
<i>Large stocks</i>	Cumulative	Model 3	1.71	3.22	-1.33	5.4	0.83	0.06	13.85	0.669

TABLE 3 explores the distribution and out-of-sample predictive ability of forecasts derived from the FM regressions above. These forecasts—i.e., estimates of expected returns—are based on a firm’s beginning-of-month characteristics and either the prior 10-year rolling average or the cumulative average of intercepts and slopes from the three models in previous section.

The left-hand columns in below table summarize the distribution of the forecasts, the average of their monthly cross-sectional means, standard deviations, and 10th and 90th percentiles. The right-hand columns in above table explore the critical question of whether the estimates actually pick up cross-sectional variation in true expected returns.

**Table 4 FF-3F model estimates**

FM estimate	Univariate Properties (%)					Predict Ability		
	<i>Avg</i>	<i>std</i>	<i>p10</i>	<i>p90</i>	<i>slop</i>	<i>S.E</i>	<i>t-stat</i>	<i>R^2</i>
Fama-French 3 factors model expected return	0.154	1.36	-5.4	1.47	0.162	0.002	13.93	0.759

From above result, we can see that Fama French 3 Factor Model is better than our model forecast. The Fama French expect return gives us the regression results with slope of 0.162 with 0.759 R- squares.