Question 1: The Basics

The main goal of financial markets is to channel capital to its most productive use. In the current market environment, we see that there is a lot of capital available (ageing population, quantitative easing) and interest rates are low, pushing investors towards the equity market (TINA, there is no alternative).

a. (6 points) Explain what the current market situation might do to the efficiency of capital allocation.

In the Capital Asset Pricing Model (CAPM), the beta measures the sensitivity of a stock to the market index.

b. (6 points) Explain what you think happened to the market beta of Zoom Video Communications Inc. during the outbreak of the Corona crisis (March, April). How did this affect its expected return according to the CAPM?

Imagine you would want to test whether a stock's sensitivity to Corona is priced in the cross-section of stocks returns.

c. (8 points) Explain step-by-step how you would test this using the Fama-MacBeth methodology.

Question 2: Factor Models

I downloaded the returns for Apple and Zoom but accidentally deleted the labels; I don't know which returns belong to which company. Now I estimate the Fama-French 3-factor model on both return series to figure out which is which.

$$r_t = \alpha + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_t$$

These are the estimation results (t-statistics in parentheses) for the two companies:

	Company 1	**Company 2**
α	0.158	0.387
	(2.356)	(1.882)
β_1	1.206	0.280
	(27.30)	(1.560)
β_2	-0.379	1.150
	(-3.222)	(3.503)
β_3	-0.292	-1.848
	(-4.609)	(-6.786)
R^2	0.755	0.186

a. (8 points) Explain which of the two companies represents Apple and which represents Zoom.

Fama and French (2015) introduce the 5-factor model. In the paper, they try to explain the economic intuition behind their findings using the following model:

$$m_t = \sum_{\tau=1}^{\infty} E(d_{t+\tau}) / (1+r)^{\tau}$$

$$M_t = \sum_{\tau=1}^{\infty} E(Y_{t+\tau} - dB_{t+\tau}) / (1+r)^{\tau}$$

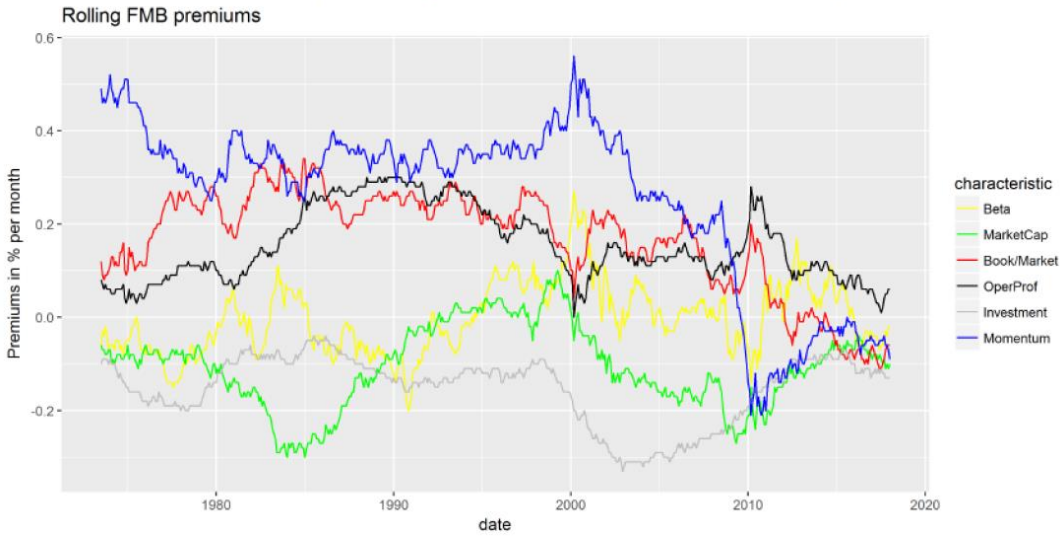
$$\frac{M_t}{B_t} = \frac{\sum_{\tau=1}^{\infty} E(Y_{t+\tau} - dB_{t+\tau}) / (1+r)^{\tau}}{B_t}$$

in which *m* is the stock price, *d* is dividend, *r* the discount rate, *M* the market capitalization, *Y* total earnings, and *B* book value.

b. (5 points) Explain, based on the above model, why companies that invest more have lower expected returns.

The figure below shows the 10-year rolling Fama-MacBeth premia, i.e., the γ's from the regression $r_i = \alpha + \gamma_1\beta + \gamma_2 Size_i + \gamma_3 BTM_i + \gamma_4 Mom_i + \gamma_5 Profit_i + \gamma_6 Investments_i + \varepsilon_i$

Figure 1: 10-year rolling Fama-MacBeth estimates of factor premia



c. (7 points) Explain which period in the figure was the best from the perspective of the regulator.

Question 3: Behavioral Finance

Limits to arbitrage are a central concept in Behavioral Finance; they come in three forms: implementation costs, noise trader risk, and fundamental risk. Now assume that you believe that the stocks of the company Tesla are over-valued in today's market.

a. (6 points) Explain which of the three limits to arbitrage might prevent you from profiting from this over-valuation.

One of the limits to arbitrage, 'noise trader risk', is further developed in the study by DeLong, Shleifer, Summer, and Waldman (1990). In their model, the return difference between sophisticated traders and noise trader is given by

$$E(\Delta R_{n-i}) = \rho^* - \frac{(1+r)^2(\rho^*)^2 + (1+r)^2\sigma_\rho^2}{(2\gamma)\mu\sigma_\rho^2}.$$

in which ρ^* is the average misperception of noise traders, r the risk-free rate, σ the variation in the misperception, μ the proportion of noise traders, and γ the risk aversion.

b. (7 points) Intuitively explain why the return of noise traders relative to sophisticated traders goes up if there are more noise traders in the market (a higher μ).

Baker and Wurgler (2007) develop a sentiment index, and test whether it is priced in the cross-section of stock returns. To do so, they estimate the following equation:

$$R_{X_{it}=High,t} - R_{X_{it}=Low,t} = c + dSENTIMENT_{t-1} + \beta RMRF_t + sSMB_t + hHML_t + mUMD_t + u_t.$$

c. (7 points) Explain why they take sentiment in period (t-1) and all other factors in period (t).

Question 4: Beyond mean-variance utility

Barberis et al. (2016) test to what extent Prospect Theory is important in describing the cross-section of stock returns. These are (part of) their results:

TK	**−0.107**	**−0.108**	**−0.059**	**−0.050**	**−0.043**	**−0.043**
	(−3.77)	(−4.94)	(−3.07)	(−2.60)	(−2.16)	(−2.18)
Beta		0.132	0.166	0.192	**0.240**	**0.243**
		(1.14)	(1.22)	(1.40)	(1.99)	(2.07)
Size		**−0.132**	**−0.125**	**−0.078**	**−0.097**	**−0.089**
		(−4.07)	(−3.65)	(−2.44)	(−3.38)	(−3.24)
Bm		**0.151**	**0.203**	**0.177**	**0.126**	**0.127**
		(2.67)	(3.44)	(3.06)	(2.26)	(2.29)
Mom		**0.01**	**0.009**	**0.009**	**0.008**	**0.009**
		(7.99)	(6.47)	(6.73)	(6.39)	(6.47)
Rev			**−0.079**	**−0.079**	**−0.078**	**−0.081**
			(−16.39)	(−16.28)	(−15.20)	(−16.47)
Illiq				**0.286**	**0.597**	**0.622**
				(2.37)	(4.90)	(5.08)
Lt rev					−0.041	−0.039
					(−1.40)	(−1.31)
Ivol					**−0.138**	0.068
					(−4.27)	(1.43)
Max						**−0.036**
						(−3.45)
Min						**−0.059**
						(−4.50)
Skew						

a. (6 points) Explain to what extent prospect theory helps, in this table, to solve the problem that the CAPM beta is not priced in the cross-section of stock returns.

It turns out that stock with a high maximum daily return in the previous month, have a lower expected return in current month.

b. (6 points) Explain how prospect theory can help explain this finding.

Question 5: Frictions

One of the consequences of the electronification and subsequent fragmentation of exchanges, is the rise of private exchanges, or dark pools.

a. (6 points) Explain why market regulators are in general not happy with the activities of dark pools.

Liquidity knows three dimensions: Time, Costs, and Price-impact. At the same time, we know that there are two (main) types of exchanges: Order driven and quote driven.

b. (8 points) Explain to what extent the three dimensions of liquidity are relevant to both types of exchanges.

One of the main findings of the study by Brunnermeier and Pedersen (2009) is that there is a strong commonality in market liquidity across stocks (in other words, a high correlation between changes in market liquidity for stocks).

c. (7 points) Explain, using the concept of funding liquidity, why this is the case.

The executive director of the Austrian market regulator FMA, Helmut Ettl, stated in the Financial Times on May 18, 2020:

“The restrictions on short selling have made an important contribution to absorb the irrational overreactions of the markets as well as to maintain investor confidence in the stability of the Austrian financial market,”

d. (7 points) Give your educated opinion about this statement, based on the results of Beber and Pagano (2013).