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Taloustieteiden tiedekunta

Tentin päivämäärä / Date of exam: 17.8 2015
Opintojakson koodi, nimi ja tentin numero / The code and the name of the course and number of the exam: Asset Pricing, Summer Exam
Tentaattori(t)/ Examiner(s): Juha Joenväärä (Hamed Salehi)
Sallitut apuvälineet / The devices allowed in the exam: x Laskin (ei graafinen/ohjelmoitava)/Calculator (not graphic, programmable) □ Sanakirja/Dictionary □ Muu materiaali, tarkennettu alla/Other material, specified below
Tenttiin vastaaminen / Please answer the questions x suomeksi/ in Finnish x englanniksi/ in English
Kysymyspaperi on palautettava / Paper with exam questions must be returned: x Kyllä/Yes □ Ei/No

QUESTION 1.

a) Price is expected discounted payoff.

$$p_t = E_t[m_{t+1}x_{t+1}]$$

- Derive the expressions for *i)* return, *ii)* risk-free rate and *iii)* excess return. *(1 Point)*
- Decompose the price, to discounted payoff with risk free-rate component and risk component. Describe what is the source of risk in asset prices. *(1 Point)*

b) Consumption-CAMP

Consider an economy where the investor's goal is to gain optimal consumption plan. That is, investor's objective is to maximize:

$$Max\ u(c_t) + \beta E_t[u(c_{t+1})]\ s.t.$$

$$c_t = e_t - hp_t$$

$$c_{t+1} = e_{t+1} + hx_{t+1}$$

where

e_t is the endowment at time t,

c_t is the consumption at time t,

p_t is the price of asset at time t,

x_{t+1} is the payoff of the asset at time $t+1$,

h is the amount of the asset that investor chooses to buy,

and β is the subjective time-preference.

Derive the expression for the stochastic discount factor (m_{t+1}). *(2 Points)*

c) The stochastic discount factor is subject to the utility function of the investor. Suppose that investor's utility function is in power form. That is:

$$u(c) = c^{-\gamma}$$

- Show that the power utility function can be a good candidate to represent behavior of a risk-averse investor. *(1 Point)*
- Use the power utility to derive the expression for stochastic discount factor. *(1 Point)*

QUESTION 2.

Suppose that:

Average excess return is about 8% ($E(R^e) = 8\%$)

Standard deviation of the return is about 16% ($\sigma(R^e) = 16\%$)

Standard deviation of consumption growth is about 1% ($\sigma_t(\Delta c) = 2\%$)

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a)

Under consumption-CAMP with power utility investor, the approximation for Sharpe-ratio in continuous time is :

$$\frac{|E[R^e]|}{\sigma(R^e)} \approx \gamma\sigma(\Delta c)\rho_{R^e,\Delta c}$$

where γ is the risk aversion parameter and $\rho_{R^e,\Delta c}$ is the correlation between excess return and consumption growth. Use the provided information and describe the equity premium puzzle. *(3 Points)*

b)

Under consumption-CAMP with power utility investor, the risk-free rate can be approximated by:

$$r_t^f \approx \beta + \gamma E_t[\Delta c] - \frac{1}{2}\gamma(\gamma+1)\sigma_t^2(\Delta c)$$

where β is the intertemporal rate of substitution. Let $\beta \approx 0$. Use the provided information and describe the risk-free rate puzzle. *(3 Point)*

QUESTION 3. Consider following regression specifications:

- For $t = 1, 2, \ldots, T$

$$R_{t+1} = a + bx_t + \epsilon_{t+1} \tag{1}$$

- For $t = 1, 2, \ldots, T$

$$R^i_{t+1} = \alpha_i + \beta_i f_{t+1} + \epsilon^i_{t+1} \tag{2}$$

- For $i = 1, 2, \ldots, N$

$$E(R^i_{t+1}) = (\gamma+)\hat{\beta}_i\lambda + a_i \tag{3}$$

- For $i = 1, 2, \ldots, N$

$$R^i_t = (\gamma_t+)\hat{\beta}_i\lambda_t + a_{it} \tag{4}$$

R_{t+1} is the return at time $t+1$,
x_t is a set of macro- variables,
f_{t+1} is the set of factors,
$\hat{\beta}$ estimated β from regression 2,

Describe each regression and argue for what types of analysis they are applied. *(6 Points)*

QUESTION 4.

a) *Explain what is meant by liquidity as a characteristic. (1 point)*

b) Describe *liquidity risk. (1 point)*

c) Describe *liquidity spirals. (1 point)*

d) The attached Table reports the alphas of value-weighted portfolios sorted on predicted liquidity betas. Can CAPM price these portfolios? What about 3-factor model or 4-factor model? Has liquidity become more important risk factor during the more recent periods? *(3 points)*

TABLE 4
ALPHAS OF VALUE-WEIGHTED PORTFOLIOS SORTED ON PREDICTED LIQUIDITY BETAS

	DECILE PORTFOLIO										
	1	2	3	4	5	6	7	8	9	10	10–1
	A. January 1966–December 1999										
CAPM alpha	−5.16	−1.88	−.66	−.07	−1.48	1.48	1.22	1.38	1.68	1.24	6.40
	(−2.57)	(−1.24)	(−.56)	(−.08)	(−1.80)	(1.93)	(1.52)	(1.72)	(1.93)	(1.01)	(2.54)
Fama-French alpha	−6.05	−3.36	−2.15	−1.23	−2.10	.78	.86	1.41	1.90	3.18	9.23
	(−3.77)	(−2.47)	(−1.93)	(−1.37)	(−2.61)	(1.08)	(1.11)	(1.76)	(2.22)	(2.82)	(4.29)
Four-factor alpha	−5.11	−1.66	−1.02	−.76	−1.61	.91	.76	1.55	1.34	2.36	7.48
	(−3.12)	(−1.23)	(−.91)	(−.83)	(−1.96)	(1.22)	(.96)	(1.88)	(1.54)	(2.06)	(3.42)
	B. January 1966–December 1982										
CAPM alpha	−2.26	1.63	.54	.67	−3.09	1.44	.61	1.78	1.43	−.93	1.34
	(−.81)	(.76)	(.31)	(.50)	(−2.69)	(1.29)	(.54)	(1.46)	(1.14)	(−.52)	(.36)
Fama-French alpha	−7.32	−2.22	−1.80	−.75	−3.29	1.03	.20	1.91	2.32	1.18	8.50
	(−3.36)	(−1.23)	(−1.13)	(−.59)	(−2.85)	(.95)	(.17)	(1.56)	(1.86)	(.71)	(2.77)
Four-factor alpha	−6.43	−.25	−.22	−.03	−2.46	1.09	.31	2.89	1.67	−.22	6.21
	(−2.82)	(−.13)	(−.13)	(−.02)	(−2.05)	(.95)	(.25)	(2.28)	(1.28)	(−.13)	(1.95)
	C. January 1983–December 1999										
CAPM alpha	−8.01	−5.33	−1.76	−1.01	.20	1.55	1.74	.70	1.81	3.38	11.39
	(−2.76)	(−2.49)	(−1.08)	(−.77)	(.17)	(1.46)	(1.54)	(.67)	(1.47)	(1.98)	(3.36)
Fama-French alpha	−5.23	−5.08	−2.69	−1.80	−.82	.37	.89	.76	1.25	5.51	10.74
	(−2.23)	(−2.46)	(−1.67)	(−1.41)	(−.72)	(.38)	(.89)	(.72)	(1.05)	(3.51)	(3.53)
Four-factor alpha	−4.43	−3.72	−1.94	−1.52	−.63	.53	.70	.47	.84	5.06	9.49
	(−1.88)	(−1.85)	(−1.21)	(−1.17)	(−.54)	(.54)	(.69)	(.44)	(.70)	(3.20)	(3.12)

NOTE.—See the note to table 3. The table reports the decile portfolios' postranking alphas, in percentages per year. The alphas are estimated as intercepts from the regressions of excess portfolio postranking returns on excess market returns (CAPM alpha), on the Fama-French factor returns (Fama-French alpha), and on the Fama-French and momentum factor returns (four-factor alphas). The *t*-statistics are in parentheses.