FIN3080_Assignment 4 Report:

Back Testing for CAPM in China Stock Market

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Table 2 Replication Result

组合名称	αp	αp的t值	显著性	βp	βp的t值	显著性	R-squared
1	-0.003161	-3.126657	0.002304	0.933000	24.789105	5.647082e-45	0.857641
2	-0.001235	-1.409426	0.161751	0.980540	30.059634	1.716546e-52	0.898566
3	-0.000971	-0.953381	0.342651	0.998030	26.308512	2.949400e-47	0.871559
4	-0.000728	-0.725422	0.469854	1.070760	28.651638	1.370310e-50	0.889481
5	-0.000891	-0.892345	0.374309	1.114878	29.996453	2.081998e-52	0.898182
6	-0.000479	-0.451716	0.652433	1.124066	28.480757	2.358562e-50	0.888299
7	-0.000876	-0.793891	0.429102	1.117396	27.204491	1.477451e-48	0.878872
8	-0.001092	-0.881953	0.379876	1.171259	25.407182	6.478497e-46	0.863550
9	-0.000735	-0.556441	0.579128	1.171006	23.802675	1.940793e-43	0.847435
10	-0.001997	-1.417472	0.159393	1.266914	24.155090	5.421063e-44	0.851197

Analysis:

1. **Analysis for Beta:** As can be seen from Table 2, the βp values of all portfolios are similar, mostly around 1, and the significance level is basically small, which indicates that stock returns are significantly affected by stock market returns.
2. **Analysis for Alpha:** In addition, all the αp values are close to 0. However, **90%** of them are not significant (only the first one is significant), which means that the null hypothesis: existence of alpha return is not significantly rejected.
3. **Analysis for the whole Regression:** At the same time, R-square does not increase with the increase of βp value, which indicates that stock returns may be affected by other factors besides systemic risk.

Table 3 Replication Result

OLS Regression Results

Dep. Variable:	AVG_Excess_Group_Return	R-squared:	0.317
Model:	OLS	Adj. R-squared:	0.232
Method:	Least Squares	F-statistic:	3.718
Date:	Mon, 17 Apr 2023	Prob (F-statistic):	0.0900
Time:	06:26:46	Log-Likelihood:	69.251
No. Observations:	10	AIC:	-134.5
Df Residuals:	8	BIC:	-133.9
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	0.0002	0.001	0.178	0.863	-0.002	0.002
βp	0.0017	0.001	1.928	0.090	-0.000	0.004

Omnibus:	0.200	Durbin-Watson:	2.036
Prob(Omnibus):	0.905	Jarque-Bera (JB):	0.174
Skew:	-0.203	Prob(JB):	0.917
Kurtosis:	2.498	Cond. No.	22.9

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

	γ0	γ1	R-squared	F-statistic	P
系数	0.0002	0.0017	0.317	3.718	0.09
t检验值	0.1780	1.9280	NaN	NaN	NaN

Analysis:

1. **Analysis for γ0 Coefficient:** As can be seen from Table 3, the γ0 value is close to 0; however, its p-value is 0.863 (which is higher than 0.1), then it means that the constant γ0 is not significant to be zero, the null hypothesis is not rejected, indicating there may be the presence of factors other than systemic risk.
2. **Analysis for γ1 Coefficient:** In addition, the γ1 value is positive (0.0017); and its p-value is 0.09 (which is smaller than 0.1), then it means that γ1 is significant to be positive, showing that there is a significant positive correlation between return and systemic risk, which is consistent with CAPM.
3. **Analysis for the whole Regression:** At the same time, R-square is 0.317, which is relatively low, which means the fitting result is not sufficiently great. However, the p-value of the regression is 0.09 (which is smaller than 0.1), then it means that the model does make sense.

General Conclusion

1. Consistency with CAPM

The results of the empirical tests show that there is a certain positive linear correlation between returns and risks, i.e., it is largely consistent with the findings of the CAPM model.

2. Inconsistency with CAPM

2.1. Inconsistency Behavior

However, systematic risk is not the only determinant in the pricing model, so that it cannot be excluded that unsystematic risk also plays a role in pricing.

2.2. Reason for Inconsistency: Mainly the Asymmetric Information / Inefficiency

The securities market in China started late, the size of the stock market is small, and the degree of information disclosure in the securities market is low, compared with the securities markets in developed countries. The number of individual investors is absolutely dominant in the structure of investors, and the immature investment concept of investors is also the main reason for the bias of the model. The main reason for the deviation of the model.

3. Future Expectation

China's securities market is gradually becoming mature, and the equilibrium relationship between risk and return in securities investment will become increasingly important. The balanced relationship between risk and return in securities investment will be increasingly reflected. That is

Data Acquisition and Data Processing Highlights

Data Acquisition Highlights

- **Weekly Return:** $\boldsymbol{NetReturn = \frac{Price_{t+1}+C}{Price_t} = \frac{Price'_{t+1}}{Price_t}}$**.** Only when we incorporate the cash dividend reinvestment to our price, then we can compute the return more accurately.
- **Weekly Market Return:** Use **Weekly Market Return with Cash Dividend Reinvested (Total-Value-Weighted)** since
  - Compared with **Weekly Market Return with Cash Dividend Reinvested (Equally-Weighted)**, **Weekly Market Return with Cash Dividend Reinvested (Total-Value-Weighted)** takes market capitalization of different individual stocks into consideration.
  - Compared with **Weekly Market Return with Cash Dividend Reinvested (Current-Value-Weighted / Negotiable-Value-Weighted)**, **Weekly Market Return with Cash Dividend Reinvested (Total-Value-Weighted)** incorporates all the outstanding shares rather than just tradable shares, which is more representative.
- **Weekly Market Return:** Employ **Market Capitalization** to compute the value-weighted-average Weekly Market Return for the whole main board
- **Market Type Extraction**: Market Type = 1, 4 (including SME)
- **Weekly Risk-Free Rate:** Use **Weeklized Risk-Free Rate** since these two are equivalent. (0.0286% = 0.00286)

Data Processing Highlights

- **Period-Dividing Criterion:** Since our data incorporate 6 years, which means that every-two-year data can be approximately defined as one period, then we divide them into three parts based on year difference approximately.
- **Null Value Processing:** It is obvious that there are some null values for some certain stocks, we need to drop it before grouping.
- **Portfolio Return after Grouping:** The computation of group returns obeys the criterion used in the paper, that is, taking **Equal-weighted Average**.