

FIN3080_Assignment 1 Report

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Problem 1

Problem 1-1: Providing Summary Statistics

1. Summary Statistics of Main Board

	Market_Capitalization	Return	Total_Income	R&D_Investment	P/E_Ratio	P/B_Ratio	Total_Asset	Firm_Age
count	1.507180e+05	149791.000000	1.245930e+05	2.970000e+04	1.097100e+05	133216.000000	1.388770e+05	29425.000000
mean	1.402605e+07	0.040607	4.185091e+08	2.236618e+08	1.359308e+02	5.466236	7.514043e+10	26.124928
std	6.381189e+07	0.296222	3.538079e+09	1.048677e+09	4.911779e+03	85.916664	9.165190e+11	4.779842
min	1.653600e+03	-0.898564	-1.215140e+11	-1.602876e+07	0.000000e+00	0.000000	0.000000e+00	6.000000
25%	1.999010e+06	-0.120277	3.676691e+06	1.050316e+07	1.866089e+01	1.602674	1.250936e+09	23.000000
50%	3.920417e+06	-0.009424	3.008341e+07	3.505999e+07	3.320098e+01	2.566679	3.102716e+09	26.000000
75%	8.987208e+06	0.136763	1.264461e+08	1.122653e+08	6.491656e+01	4.240331	9.314836e+09	29.000000
max	5.013108e+09	22.052631	1.509400e+11	3.992738e+10	1.492373e+06	20452.057938	3.955066e+13	64.000000

2. Summary Statistics of GEM Board

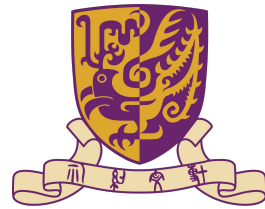
	Market_Capitalization	Return	Total_Income	R&D_Investment	P/E_Ratio	P/B_Ratio	Total_Asset	Firm_Age
count	3.033300e+04	29906.000000	2.838200e+04	1.584300e+04	2.330000e+04	28583.000000	2.908000e+04	6476.000000
mean	8.274750e+06	0.035363	3.753798e+07	6.592100e+07	1.798153e+02	4.933204	3.176716e+09	20.435300
std	2.652814e+07	0.325358	2.559439e+08	1.792947e+08	9.878637e+03	22.989038	8.709748e+09	4.530666
min	6.867263e+04	-0.950131	-9.881884e+09	0.000000e+00	2.191506e+00	0.560147	8.862633e+07	6.000000
25%	2.655130e+06	-0.140999	5.978568e+06	1.393974e+07	3.268915e+01	2.480269	1.000934e+09	18.000000
50%	4.224800e+06	-0.024945	2.079988e+07	3.051197e+07	4.959232e+01	3.641868	1.701080e+09	20.000000
75%	7.336878e+06	0.134067	4.887669e+07	6.568063e+07	8.367275e+01	5.621745	3.126424e+09	23.000000
max	1.370541e+09	17.572457	1.061734e+10	1.057652e+10	1.501433e+06	3797.001999	5.419411e+11	41.000000

3. Summary Statistics of SME Board

	Market_Capitalization	Return	Total_Income	R&D_Investment	P/E_Ratio	P/B_Ratio	Total_Asset	Firm_Age
count	4.428200e+04	43894.000000	4.267600e+04	1.584500e+04	35717.000000	42582.000000	4.330500e+04	9735.000000
mean	9.275656e+06	0.037004	7.627562e+07	1.173227e+08	131.237541	4.149197	7.966620e+09	21.788803
std	2.003945e+07	0.280176	4.490600e+08	3.386517e+08	3147.240276	40.895198	4.408407e+10	4.899690
min	1.264000e+05	-0.943182	-4.186825e+10	0.000000e+00	0.301848	0.000000	5.452158e+07	10.000000
25%	2.751289e+06	-0.122203	7.565225e+06	1.417612e+07	24.182225	1.977073	1.382079e+09	19.000000
50%	4.680551e+06	-0.010617	2.826942e+07	3.971305e+07	38.204824	2.939035	2.692945e+09	21.000000
75%	8.807608e+06	0.138614	7.762589e+07	1.030973e+08	68.103263	4.459129	5.659185e+09	24.000000
max	6.046650e+08	10.152134	1.666848e+10	1.087002e+10	420284.636251	8137.906061	2.315680e+12	55.000000

*Market Type Classification Criteria

- **Main Board:** *Market Type* = 1, 4, 64 (Excluding whose stock code starts with 002)
- **GEM Board:** *Market Type* = 16
- **SME Board:** The stocks whose *Stock Code* starts with 002



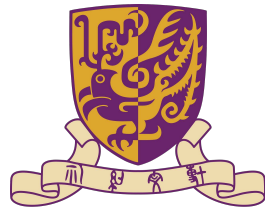
Data Acquisition and Data Processing Highlights

Data Acquisition Highlights

- **Stock Return:** Employ *Monthly Return with Cash Dividend Reinvested* to convert the quarterly return. The reason why choosing “With Cash Dividend Reinvested” is to follow the content in the lecture: “**Adjusted Dividend = Dividend + Reinvestment**”, so I choose Monthly Return with Cash Dividend Reinvested as the indicator rather than Monthly Return without Cash Dividend Reinvested.
- **R&D Investment, Total Asset, Total Profit:** When accessing data from CSMAR, I set the condition “**Statement Type = Consolidated Statements**” since Consolidated statements reflect the financial position and operating results of the entire enterprise group while the Parent statements only reflect the business situation of the parent company.
- **P/E Ratio:** Employ **P/E (TTM) Ratio** since this ratio uses more recent earnings, it provides a more up-to-date picture of a company’s valuation.
- **Firm Age:** When accessing data from CSMAR, I set the condition “**Listing Status = Normal Listing**” since we are to compute firm ages at the end of 2022Q4, if I do not filter out the firms that have been delisted at that time, the age of those delisted firms would be mistakenly increased.

Data Processing Highlights

- **Return:** Quarterly returns are computed by **compounding** monthly returns.
- **Market Capitalization:** Quarterly Market Capitalizations are computed by the **last** monthly market return in each quarter.
- **R&D Investment:** The original data is cumulative in each year, in order to get the net value for each quarter in each year, I **take the difference between two quarters** (a.k.a. Net value) as the quarterly R&D Investment.
- **Merging Sub Dataframes:** Six sub dataframes are **left merged** on **Stock Code** and **Quarter**.



Problem 1-2: Discussing my Findings based on the Summary Statistics

Finding 1

- **Observation:** The median of quarterly market capitalization of Main board is smaller than that of SME board, which is abnormal.
- **Analysis:** There are several possible explanations:
 - There can be significant variation in market capitalization within each board.
 - Companies may move between boards as their size and financial performance changes.

Finding 2

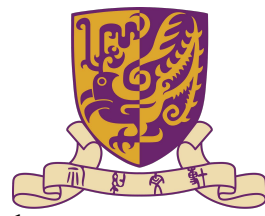
- **Observation:** The medians of quarterly returns of Main board, GEM board and SME board are all negative, which means that more stocks on Main board, GEM board and SME board have experienced losses than gains.
- **Analysis:** There are several possible explanations:
 - Speculative trading behavior of Chinese investors may increase the volatility of stock market and then drive down the stock returns.
 - Lack of transparency and regulation in the Chinese stock market may increase market inefficiencies and distortions.

Finding 3

- **Observation:** The standard variation of quarterly return of GEM board is higher than that of Main board and SME board.
- **Analysis:** There are several possible explanations:
 - The GEM board is designed for smaller, emerging companies with a focus on technology and innovation.
 - The GEM board tends to attract more speculative investors who are looking for high-growth potential.
 - The GEM board's smaller size and liquidity also contribute to greater volatility and instability.

Finding 4

- **Observation:** The median of quarterly total asset of GEM board is significantly smaller than that of Main board and SME board.
- **Analysis:** There are several possible explanations:



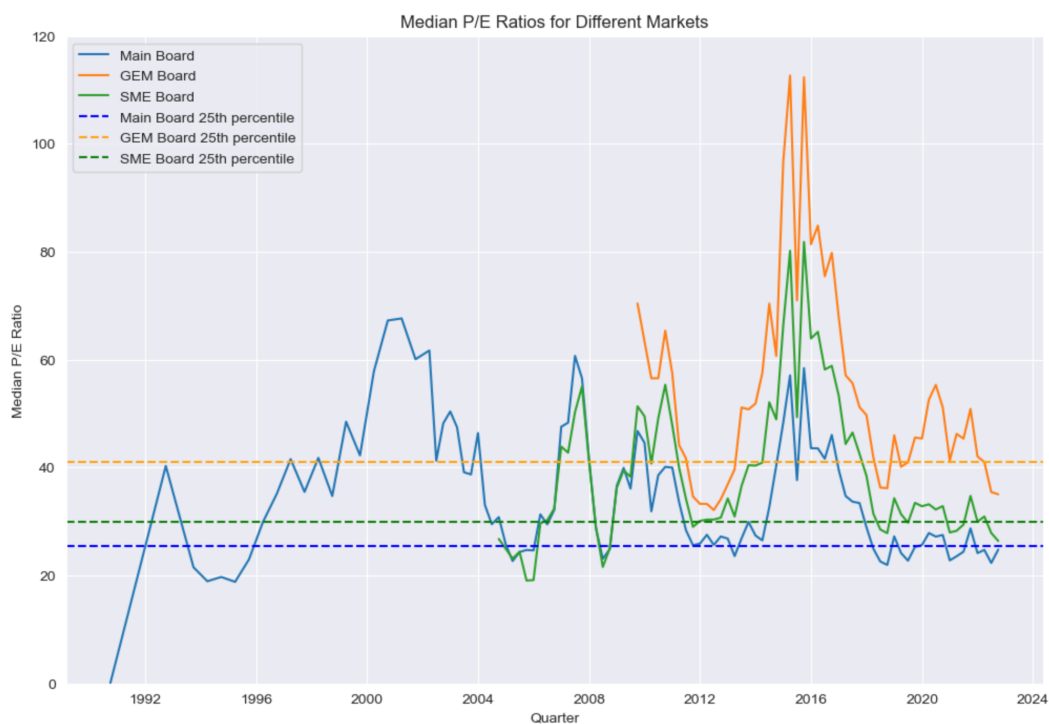
- Most of the assets of High-Tech Companies on GEM board are intangible and difficult to quantify and be incorporated into their total assets.
- Companies on Main board have been in operation for much longer, allowing more time for companies to grow and accumulate assets.

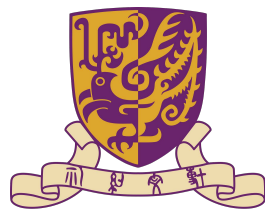
Finding 5

- **Observation:** The median of P/E Ratio of GEM board is higher than that of Main board and SME board.
- **Conclusion:** Generally, the stocks on GEM board enjoy higher valuation than that of Main board and SME board.
- **Analysis:** There are several possible explanations:
 - Valuation reflects the expectation of future cash flow, companies on GEM board often have a higher growth potential compared to more established companies.
 - Valuation reflects the degree of risk, the GEM Board is perceived as a higher-risk market segment with potentially higher returns, which can attract investors looking for high-growth potential.

Problem 2

Problem 2-1: Plotting Three Time-Series for Median P/E ratios by Market Types





Problem 2-2: Analyzing Whether it is a Good Time to Make New Investments in Either Market as of the End of 2022

- **Observation:** All medians of P/E Ratio of three boards are smaller than 25% of overall historical time-series data at the end of 2022.
- **Conclusion:** The valuation of stocks on three boards are relatively low, which means most of stocks are undervalued, **it is a good time** to make new investments in above three markets, especially GEM board (The difference between the current median P/E Ratio and 25% of the median P/E Ratio is the largest).
- **Analysis:** There are several possible supports for my investment strategy:
 - **Valuation:** Since the current P/E Ratio is low, then stocks are undervalued.
 - **Dividend Payment:** Since the current P/E Ratio is low, it is possibly caused by high dividend rate, which will attract investors to come to invest these stocks.
 - **Reinvestment Behavior:** Since these stocks are undervalued, in order to correct prices, the firms of these stocks may do reinvestment to increase their stock price.

Problem 2-3: Analyzing How to Make a Profit by Longing and Shorting Index ETFs

- **Observation:**
 - **Historical Trend of P/E Ratios:** The historical trends of P/E Ratios are highly similar for three markets.
 - **Short-term Future Trend of P/E Ratios:** It is found that at the end of 2022, P/E Ratio of Main board starts to increase, while P/E Ratios of GEM board and SME board remain decreasing.
- **Conclusion:** The stock prices of Main board start to be corrected while those of GEM board and SME board does not start to be corrected yet. It is a good to make arbitrage / make a profit by **longing index ETF of GEM board and SME board and shorting index ETFs of Main board simultaneously in the short term.**
- **Analysis:** There is a direct theoretical support for my investment strategy:
 - **Pair Trading:** Pair-Trading is a good investment strategy in quantitative finance, it is simply described as “When two securities’ prices are highly correlated with each other, we can make a profit by longing the underpriced one and shorting the overpriced one.”