FIN3080 Assignment1 Report

122090625 Xu Penggan

Problem 1

Board_Category	Metric	Count	Mean	Median	25th Percentile (p25)	75th Percentile (p75)	Standard Deviation
Main_Board	Monthly_Returns	544939.0	0.011630	-0.001379	-0.069441	0.075061	0.158544
	Monthly_P/E_Ratio	544939.0	52.592590	16.347211	6.494957	39.933571	1987.043643
	Monthly_P/B_Ratio	544932.0	0.736161	0.845564	0.530073	1.381848	228.125733
	ROA	538598.0	0.025735	0.016461	0.004423	0.038307	1.083471
	ROE	538598.0	0.022978	0.033853	0.009847	0.072694	2.904849
	Quarterly_R&D_Expenses/Total_Asset_ratios	162797.0	0.012595	0.007916	0.002595	0.017432	0.015969
	Quaterly_Firm_Ages (years)	544939.0	17.122494	16.934247	11.852055	22.065753	7.045948
GEM_Board	Monthly_Returns	113480.0	0.012205	-0.004808	-0.084375	0.081054	0.180336
	Monthly_P/E_Ratio	113480.0	54.598804	25.342163	12.007223	55.423573	5732.368490
	Monthly_P/B_Ratio	113480.0	1.583604	1.176321	0.794794	1.851130	6.079828
	ROA	113141.0	0.027070	0.022760	0.007044	0.048347	0.059710
	ROE	113141.0	0.022985	0.033495	0.010666	0.068749	0.480078
	Quarterly_R&D_Expenses/Total_Asset_ratios	73702.0	0.020620	0.014620	0.007277	0.026129	0.022566
	Quaterly_Firm_Ages (years)	113480.0	16.666489	16.460274	12.800000	20.123288	5.446765

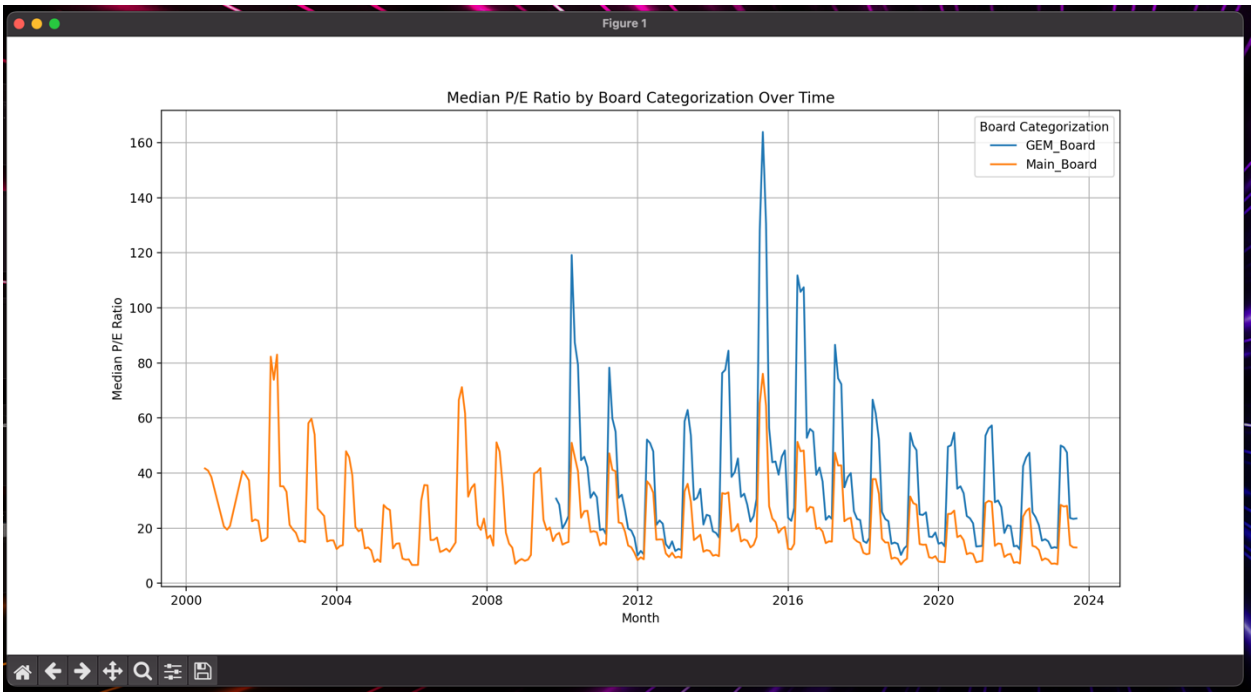
Summary statistics have been calculated & presented successfully.

Comparisons:

- Numbers of observations:
  - Main board is higher than GEM board.
  - More stocks listed on Main
- Monthly returns:
  - on average (Mean), two boards are close to each other, but the GEM board performs slightly better.
- Monthly_P/E_ratios:
  - All values on GEM are higher than the Main (except for number of observations), higher return
  - Standard_Deviation for GEM(5732.3) is significantly higher than Main(1987.0), higher risks and volatility
  - Higher risk, higher return
- Monthly_P/B_ratios
  - Most values on GEM are higher than the Main
  - But Standard_Deviation for GEM(6.07) is significantly lower than the Main(228.12). This is might because of GEM boards typically host smaller and more growth-oriented companies compared to the Main boards. Smaller companies may hold less for their book_value.
- ROA:
  - All values on GEM are larger than Main (except for number of observations)
  - Higher risks, higher return
- ROE:
  - Most values are approximately the same
- Quarterly_R&D_Expenses / Total_Assets:
  - GEM board is larger than the main board in most statistics
  - Reasons: firms on GEM board are in high development speed, they spend more on Researching and Developing new things compared to firms on Main board.
- Firm_Ages:
  - Most values of Main are higher than GEM
  - Firms on GEM are younger compared with those on Main

Problem 2

Output is as follows:



(1) Yes, it is advisable to consider new investments in either market as of Sept. 2023.
From the graph, by standing at Sept. 2023, we are very likely at the bottom of the line graph, which means that most companies are undervalued now. Based on the empirical data shown in the graph, we can clearly see cyclical ups and downs in the market. So, based on such a pattern, we can predict that the market will likely be up in the future. In conclusion, it is advisable to enter either market as of Sept. 2023.

(2) Since we observe that P/E ratios with lower values on the Main board and greater fluctuations on the GEM board (the ups and downs are larger), a potential trading strategy could be buying or longing index ETFs, and selling or shorting during high P/E periods. One can also adjust the investment proportion of the Main board and GEM board. For speculative investors, consider investing more in GEM, while risk-averse investors can consider investing more in the main board. However, careful consideration is also crucial while doing investing.

Problem 3

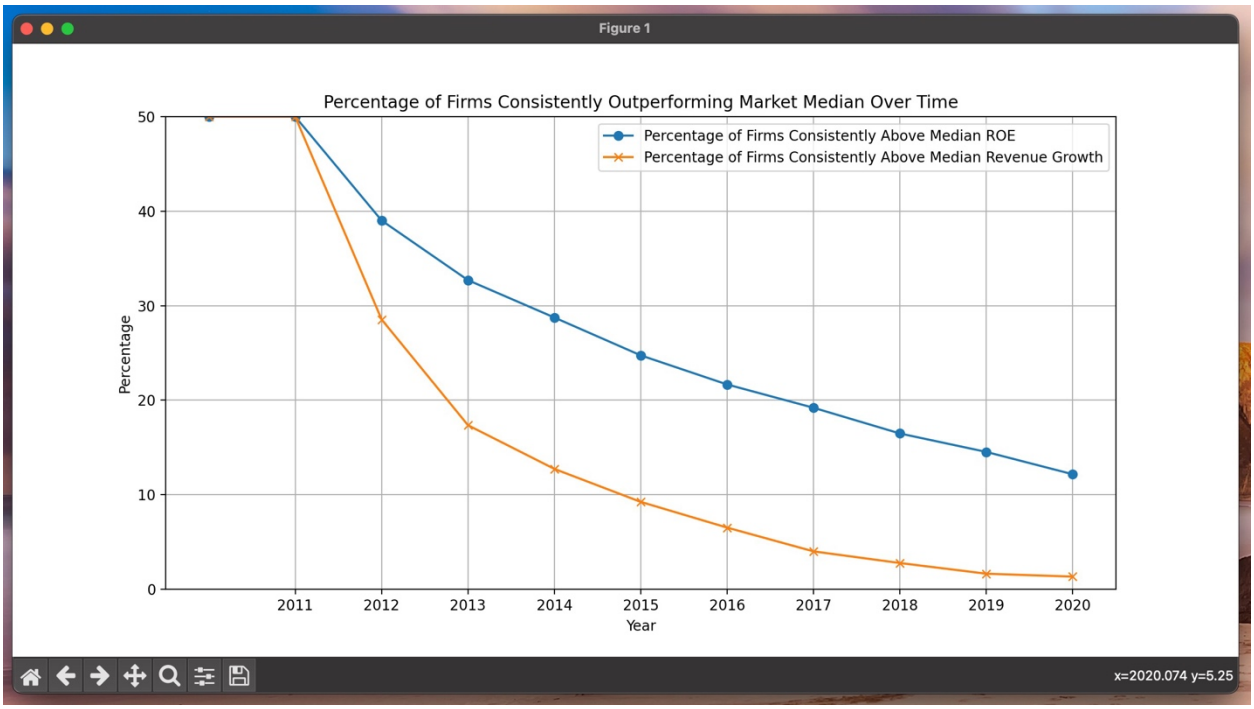
Output of calculating Annual_Median_Values:

	Year	ROEC
0	2011	0.0912
1	2012	0.0731
2	2013	0.0684
3	2014	0.0701
4	2015	0.0689
5	2016	0.0753
6	2017	0.0819
7	2018	0.0701
8	2019	0.0718
9	2020	0.0781

Output of calculating Annual_Median_Values_for_Total_Revenue_Growth_Rate

	Year	Company_Growth_Rate
0	2011	0.160729
1	2012	0.059488
2	2013	0.105678
3	2014	0.075344
4	2015	0.031322
5	2016	0.099070
6	2017	0.160024
7	2018	0.107928
8	2019	0.066351
9	2020	0.038987

Output for the two-time series diagram



From this diagram, we can clearly see that the two time-series lines are decaying over time since it is very difficult for companies to consistently beat the median of the market. Only a small percentage of firms can achieve this. As the time goes on and on, fewer and fewer firms are keeping beating the market constantly.

Some notes about my algorithm to realize this graph:

When dealing with this problem, I faced some problem when dealing with the first year's y-axis values (the problem asks us to define 2011 as 50 in advance). But after defining 2011 to be 50, based on my algorithm, the output diagram shows 50 starts from 2012 but not 2011.

To debug it, I set 2010 to be 50, and after my algorithm, the 50 starts correctly from 2011 and keep decaying over time. Then in the plotting, I specify the x-axis to show [1:], which does not show the first element 2010 and starting from 2011 on the x-axis.

You can check the "P3.py" file for further explanations about my algorithm.