Intermediary asset pricing: New evidence from many asset classes

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1 Introduction

In this Final Project, our main task is to reproduce Table 2 and Table 3 from the paper ”Intermediary asset pricing: New evidence from many asset classes” and to carry out a series of extension works based on this. Our specific work is divided into the following parts:

- Modify the primary dealer list (ticks.csv) based on real data sources.
- Adjust the calculation methods for key ratios and macroeconomic variables in Table 2 and Table 3 according to the description in the paper.
- Automatically generate and save the reproduced table results as .tex files, and further perform data analysis such as descriptive statistics, correlation analysis, and trend plots of factors.
- Write additional files and implement project automation, such as the notebook, dodo.py, README file, and test files.

Through the above work, we have successfully optimized the reproduction based on the reference code, making the reproduced results extremely close to the target results while achieving clear visualization and an automated project workflow.

2 Table 2 Replication

Table 2 Replication

Metric		Total assets			Book debt			Book equity			Market equity	
Source	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.
Period												
1960-2012	0.901	0.402	0.124	0.912	0.440	0.172	0.891	0.317	0.030	0.866	0.284	0.017
1960-1990	0.894	0.352	0.084	0.913	0.414	0.145	0.877	0.271	0.018	0.834	0.232	0.009
1990-2012	0.910	0.458	0.175	0.910	0.464	0.205	0.908	0.369	0.047	0.904	0.349	0.027

In the graphs below, we can see each of the four ratios shown over the original timeframe of 1960 to 2012.

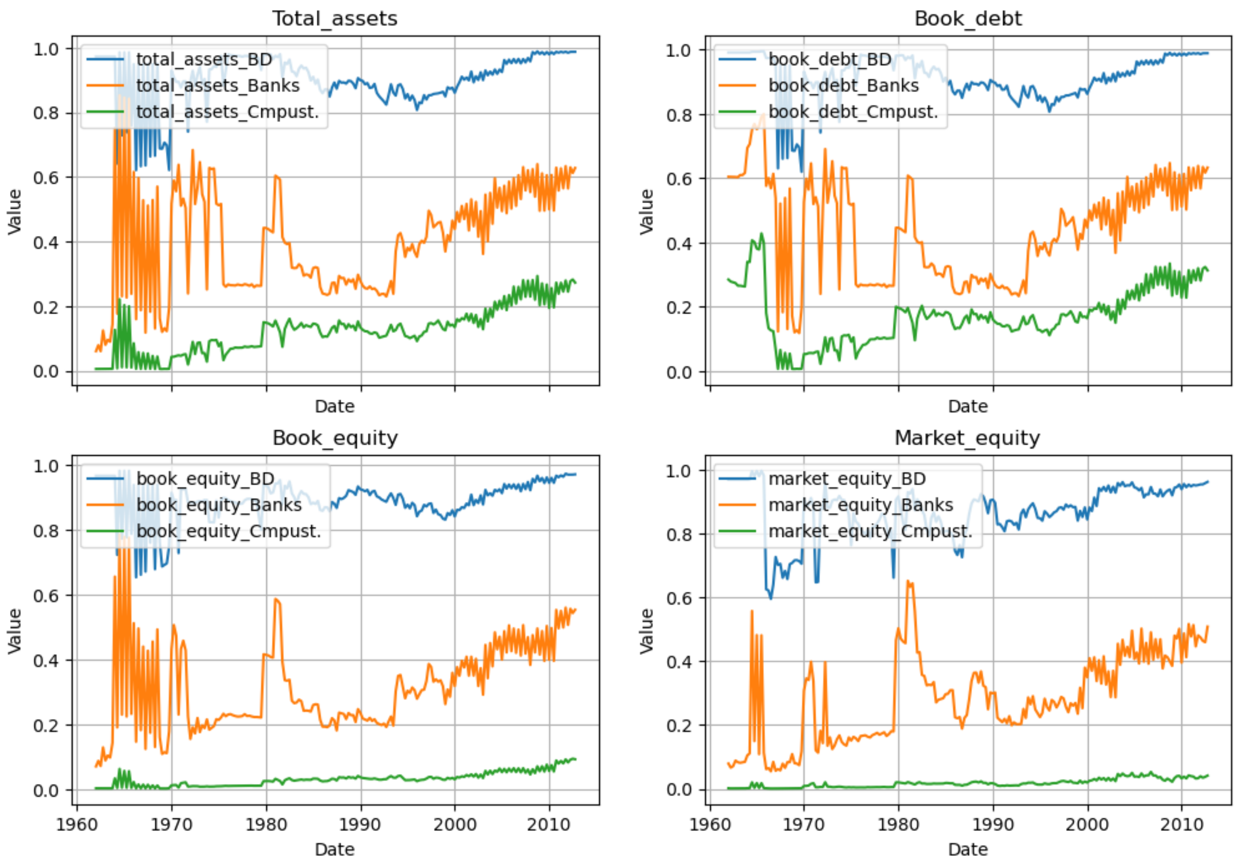

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Table 2 Correlation Analysis

	total_assets_PD	total_assets_BD	total_assets_Banks	total_assets_Cmpust.
total_assets_PD	1.000	0.214	0.911	-0.132
total_assets_BD	0.214	1.000	0.137	0.619
total_assets_Banks	0.911	0.137	1.000	-0.180
total_assets_Cmpust.	-0.132	0.619	-0.180	1.000

	book_debt_PD	book_debt_BD	book_debt_Banks	book_debt_Cmpust.
book_debt_PD	1.000	-0.091	0.901	-0.126
book_debt_BD	-0.091	1.000	-0.115	0.650
book_debt_Banks	0.901	-0.115	1.000	-0.193
book_debt_Cmpust.	-0.126	0.650	-0.193	1.000

	book_equity_PD	book_equity_BD	book_equity_Banks	book_equity_Cmpust.
book_equity_PD	1.000	0.866	0.887	0.445
book_equity_BD	0.866	1.000	0.772	0.569
book_equity_Banks	0.887	0.772	1.000	0.368
book_equity_Cmpust.	0.445	0.569	0.368	1.000

	market_equity_PD	market_equity_BD	market_equity_Banks	market_equity_Cmpus
market_equity_PD	1.000	0.688	0.743	0.08
market_equity_BD	0.688	1.000	0.427	0.25
market_equity_Banks	0.743	0.427	1.000	-0.01
market_equity_Cmpust.	0.088	0.258	-0.015	1.00

Table 2 Descriptive Statistics

There are significantly fewer entries for book equity than for other measures as shown in the count rows. There are also some negatives for book equity.

Key	index	total assets	book debt	book equity	market equity
BD	count	5727.00	5727.00	5727.00	5727.00
	mean	9312.48	8748.16	551.96	768.15
	std	36444.65	35077.55	1533.46	1879.44
	min	0.00	0.00	-2399.54	0.05
	max	451566.00	434036.00	17530.00	24890.26
Banks	count	66240.00	66240.00	66240.00	66240.00
	mean	13900.70	12997.08	954.02	1274.81
	std	79444.76	74665.29	4906.98	6188.90
	min	0.01	0.00	-3380.64	0.00
	max	2805969.94	2655924.50	158911.00	182650.75
Cmpust.	count	1221989.00	1221989.00	1221989.00	1221989.00
	mean	3217.15	2491.96	676.91	1479.33
	std	29259.38	27274.52	3633.92	8274.07
	min	-106.97	-13615.20	-90520.00	0.00
	max	3293755.00	3302126.00	224234.30	626550.35
PD	count	2777.00	2777.00	2777.00	2777.00
	mean	322107.81	311888.46	15342.05	18847.69
	std	568984.94	539919.84	31416.11	35200.33
	min	226.68	39.99	31.49	0.00
	max	3643585.13	3586633.39	238606.00	273598.07

3 Table 2 (Updated)

Below is the Table 2 result calculated using updated data up to 2025-02-01.

Table 2(Updated)

Metric	Total assets			Book debt			Book equity			Market equity		
Source	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.
Period												
1960-2025	0.927	0.471	0.161	0.937	0.505	0.210	0.912	0.394	0.048	0.878	0.362	0.022
1960-1990	0.903	0.395	0.099	0.925	0.463	0.165	0.878	0.310	0.024	0.824	0.269	0.011
1990-2025	0.945	0.527	0.212	0.945	0.533	0.246	0.940	0.458	0.068	0.920	0.438	0.032

In the graphs below, we can see each of the four ratios shown over the updated timeframe of 1960 to 2024.

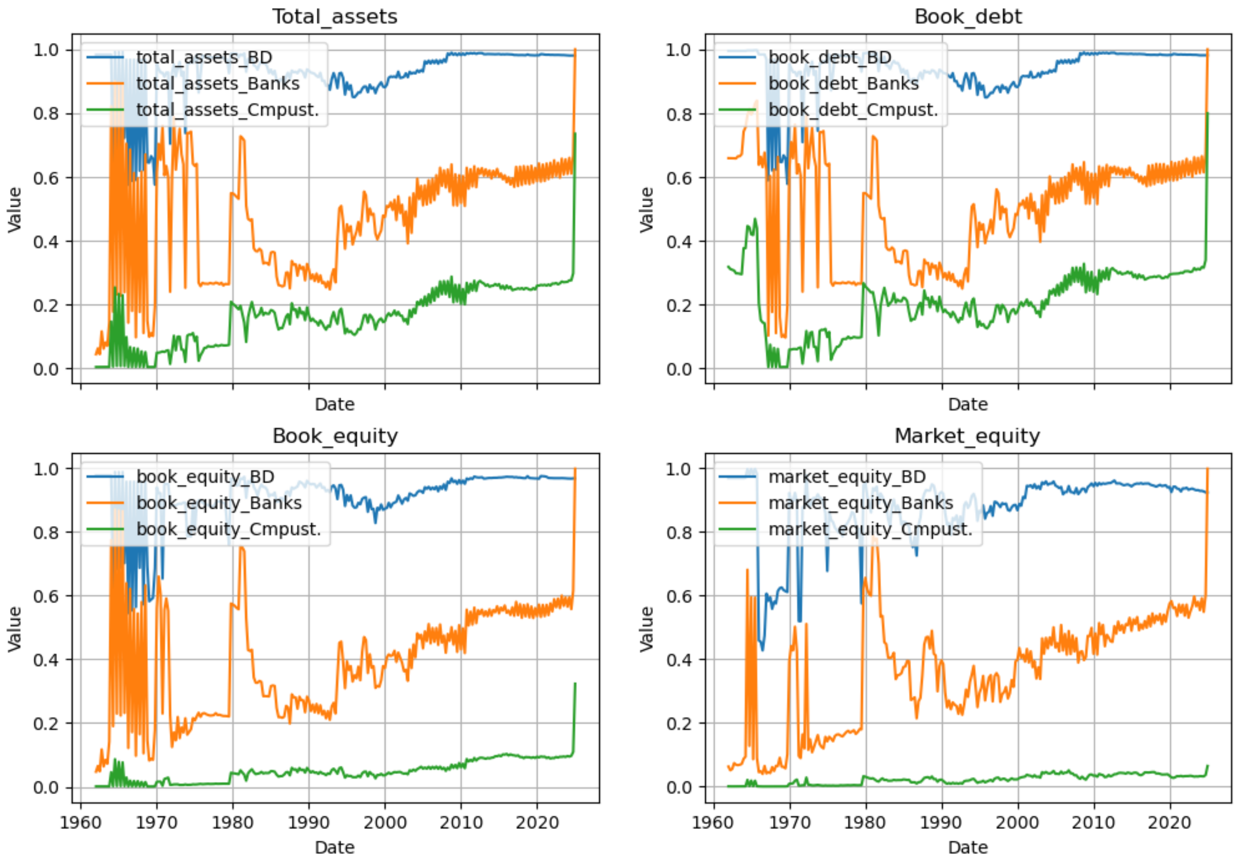

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Table 2 Correlation Analysis(Updated)

	total_assets_PD	total_assets_BD	total_assets_Banks	total_assets_Cmpust.
total_assets_PD	1.000	-0.383	0.873	-0.161
total_assets_BD	-0.383	1.000	-0.286	0.571
total_assets_Banks	0.873	-0.286	1.000	-0.223
total_assets_Cmpust.	-0.161	0.571	-0.223	1.000

	book_debt_PD	book_debt_BD	book_debt_Banks	book_debt_Cmpust.
book_debt_PD	1.000	-0.307	0.863	-0.146
book_debt_BD	-0.307	1.000	-0.267	0.630
book_debt_Banks	0.863	-0.267	1.000	-0.227
book_debt_Cmpust.	-0.146	0.630	-0.227	1.000

	book_equity_PD	book_equity_BD	book_equity_Banks	book_equity_Cmpust.
book_equity_PD	1.000	-0.131	0.818	0.463
book_equity_BD	-0.131	1.000	0.150	0.066
book_equity_Banks	0.818	0.150	1.000	0.327
book_equity_Cmpust.	0.463	0.066	0.327	1.000

	market_equity_PD	market_equity_BD	market_equity_Banks	market_equity_Cmpust
market_equity_PD	1.000	0.138	0.678	0.15
market_equity_BD	0.138	1.000	0.529	0.08
market_equity_Banks	0.678	0.529	1.000	-0.04
market_equity_Cmpust.	0.151	0.086	-0.044	1.00

Table 2 Descriptive Statistics(Updated)

There are significantly fewer entries for book equity than for other measures as shown in the count rows. There are also some negatives for book equity.

Key	index	total assets	book debt	book equity	market equity
BD	count	6905.00	6905.00	6905.00	6905.00
	mean	11307.41	10423.65	869.94	1512.39
	std	36538.84	34947.88	2022.57	3718.00
	min	0.00	0.00	-2399.54	0.00
	max	451566.00	434036.00	17530.00	51202.20
Banks	count	84937.00	84937.00	84937.00	84937.00
	mean	21633.00	20051.57	1658.46	1917.04
	std	120732.72	112727.69	8368.28	9225.70
	min	0.01	0.00	-3380.64	0.00
	max	3247701.28	3097661.08	208079.00	296774.40
Cmpust.	count	1533510.00	1533510.00	1533510.00	1533510.00
	mean	5328.14	4122.27	1158.41	2863.70
	std	46497.08	43340.31	6277.97	21726.92
	min	-106.97	-13615.20	-90520.00	0.00
	max	4349731.00	4255655.00	651655.00	3766499.86
PD	count	3630.00	3630.00	3630.00	3630.00
	mean	635797.67	605080.58	38257.38	40429.49
	std	834967.26	778114.07	59878.93	63578.33
	min	226.68	39.99	31.49	0.00
	max	4210048.00	3864212.00	345836.00	670617.49

4 Table 3 Replication

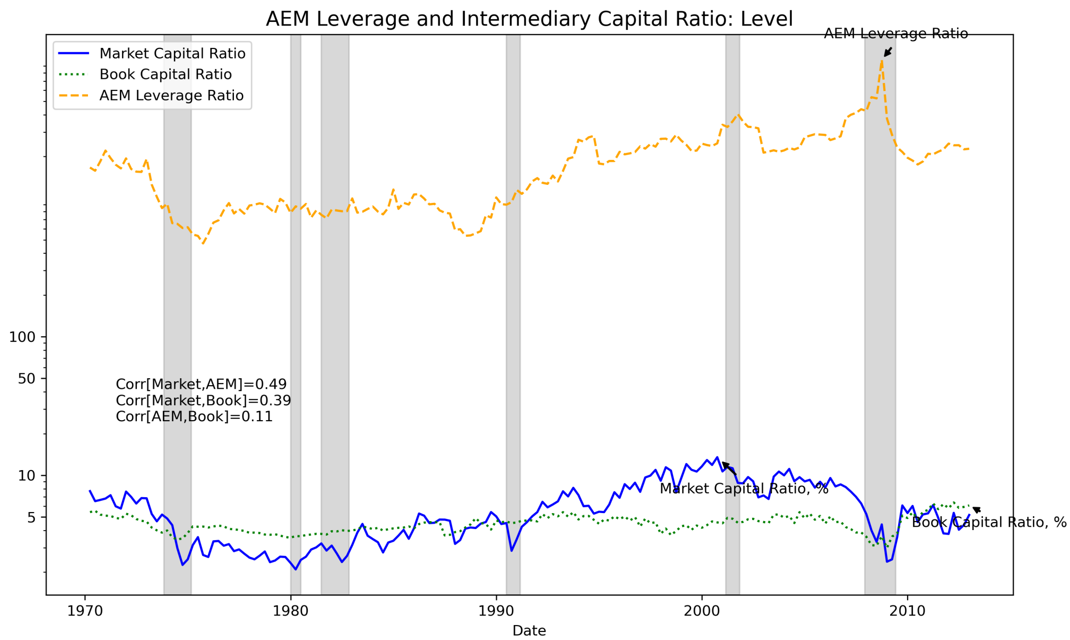
Next, we replicate Table 3. We made many key logic corrections, including important ratio calculation methods, macroeconomic data sources, and computational methods. As a result, we have greatly optimized the reproduction performance, with most correlations being very close to the original table's results.

Table 3(Replication)

Panel A: Correlation of Levels			
	Market capital	Book capital	AEM leverage
Market capital	1.0	0.39	0.49
Book capital		1.0	0.11
AEM leverage			1.0
E/P	-0.81	-0.48	-0.63
Unemployment	-0.57	0.14	-0.34
GDP	0.14	0.1	-0.16
Financial conditions	-0.51	-0.53	-0.26
Market volatility	-0.02	-0.21	0.33
Panel B: Correlations of Factors			
	Market capital	Book capital	AEM leverage
Market capital factor	1.0	0.59	0.17
Book capital factor		1.0	0.13
AEM leverage factor			1.0
Market excess return	0.33	0.11	-0.02
E/P growth	-0.49	-0.18	-0.13
Unemployment growth	0.01	0.1	-0.0
GDP growth	0.01	-0.03	-0.02
Financial conditions growth	-0.05	-0.06	-0.07
Market volatility growth	-0.42	-0.15	0.01

Three Key Ratios Chart

The figure below shows the trends of three key ratios. They closely match the original paper, confirming the good replication results.



Variable Trend Chart

Table 3 Descriptive Statistics

	Market capital factor	Book capital factor	AEM leverage factor	E/P growth	Unemployment growth	Financial conditions growth	GDP growth	Market excess return	Market volatility growth
count	171.00	171.00	172.00	172.00	172.00	172.00	172.00	172.00	172.00
mean	-0.00	-0.00	0.01	-0.00	0.00	0.02	0.01	0.00	0.00
std	0.16	0.07	0.15	0.07	0.05	0.84	0.01	0.04	0.34
min	-0.48	-0.21	-0.67	-0.20	-0.09	-3.81	-0.02	-0.13	-0.98
max	0.66	0.32	0.88	0.31	0.23	5.41	0.04	0.11	1.44

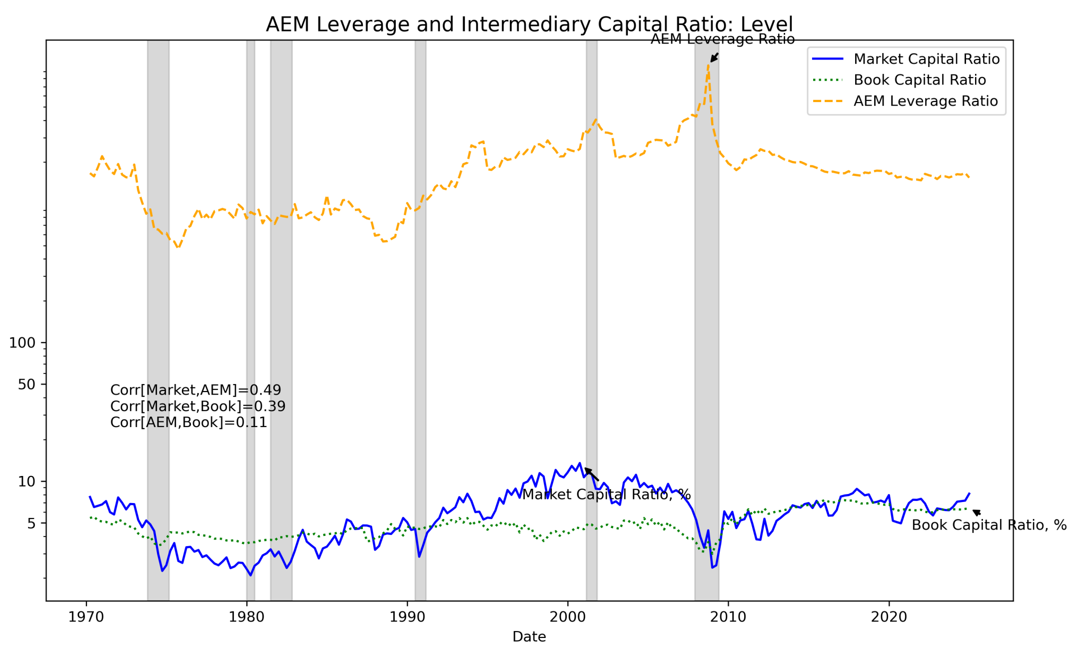
5 Table 3 (Updated)

Below is the Table 3 result calculated using updated data up to 2025-02-01.

Table 3(Updated)

Panel A: Correlation of Levels			
	Market capital	Book capital	AEM leverage
Market capital	1.0	0.39	0.49
Book capital		1.0	0.11
AEM leverage			1.0
E/P	-0.81	-0.48	-0.63
Unemployment	-0.57	0.14	-0.34
GDP	0.14	0.1	-0.16
Financial conditions	-0.51	-0.53	-0.26
Market volatility	-0.02	-0.21	0.33
Panel B: Correlations of Factors			
	Market capital	Book capital	AEM leverage
Market capital factor	1.0	0.56	0.16
Book capital factor		1.0	0.11
AEM leverage factor			1.0
Market excess return	0.33	0.1	-0.02
E/P growth	-0.49	-0.14	-0.12
Unemployment growth	-0.0	0.15	-0.01
GDP growth	0.01	-0.07	-0.02
Financial conditions growth	-0.05	-0.05	-0.07
Market volatility growth	-0.42	-0.14	0.02

Three Key Ratios Chart (Updated)



Variable Trend Chart (Updated)

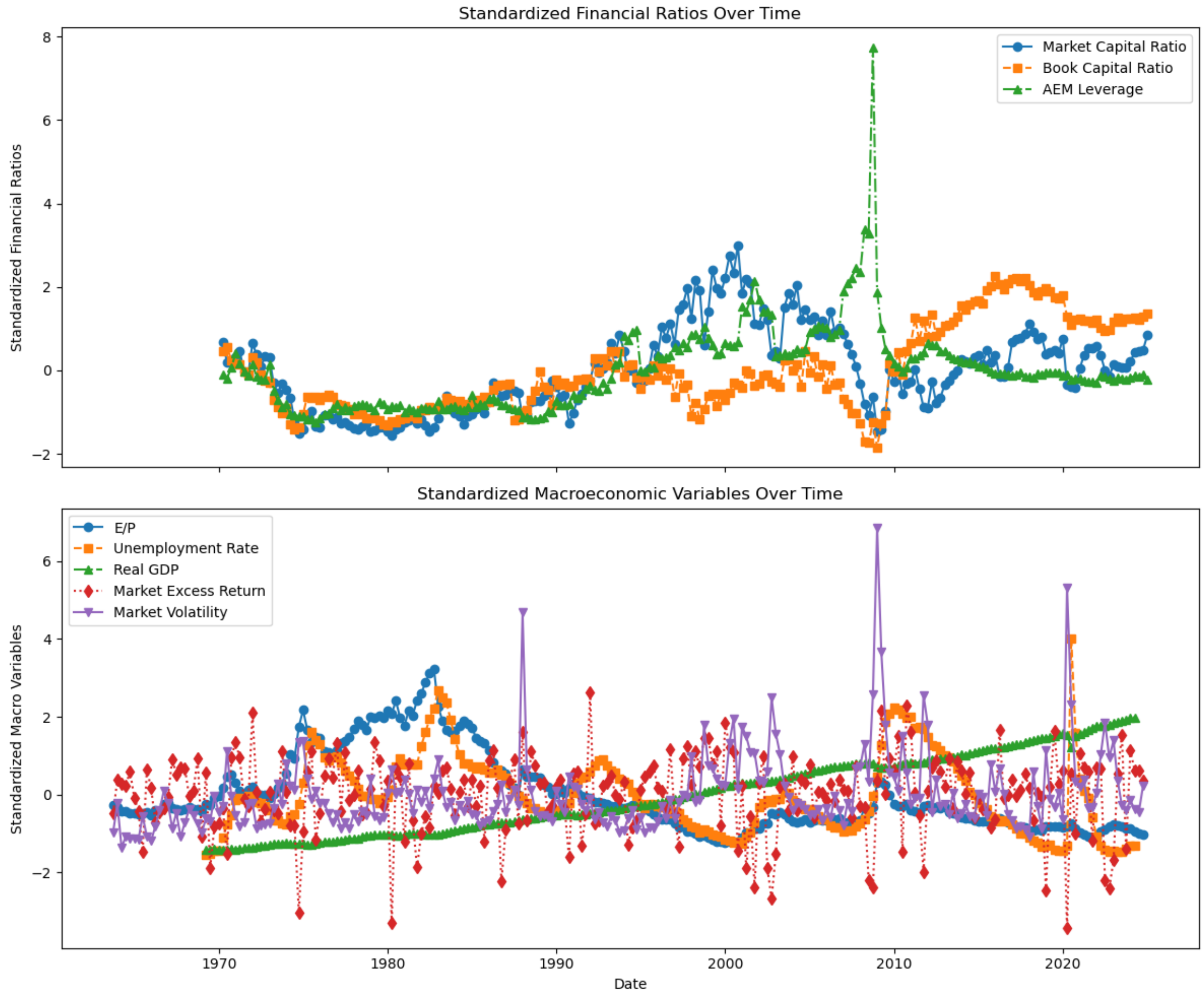


Table 3 Descriptive Statistics(Updated)

	Market capital factor	Book capital factor	AEM leverage factor	E/P growth	Unemployment growth	Financial conditions growth	GDP growth	Market excess return	Market volatility growth
count	218.00	218.00	219.00	219.00	219.00	219.00	219.00	219.00	219.00
mean	-0.00	0.00	0.01	-0.00	0.00	0.02	0.01	0.00	0.00
std	0.15	0.07	0.14	0.07	0.10	0.84	0.01	0.04	0.37
min	-0.49	-0.20	-0.65	-0.20	-0.39	-3.81	-0.08	-0.13	-0.98
max	0.65	0.33	0.88	0.31	1.22	5.41	0.08	0.11	1.82