A Demand System Approach to Asset Pricing Verification

Replication of Table D1

Project Summary

A Demand System Approach to Asset Pricing[1] by Ralph S.J. Koijen and Motohiro Yogo discusses the restrictions of the law of one price in asset pricing and further evaluates the sensitivity of investors given price changes with limited arbitrage in the stock market. In this project, we replicated Table D1 - A summary of 13F institutions by type - which provides financial statistics for banks, insurance companies, investment advisors, mutual funds, and pension funds starting from 1980 until 2017.

Challenges and Successes

Overall, it would be unfair to claim the replication process was entirely smooth; we faced some challenges. The initial challenge arose during the data retrieval. Even though we eventually pulled the 13F data and the mutual fund mapping from Wharton Research Data Services (WRDS), the size of the 13F data (1.5GB) slowed our progress. Additionally, we encountered difficulty in obtaining the names of pension funds, resorting to manual extraction from a PDF file. A further challenge emerged from the absence of mutual fund mapping data from mid-2018 onwards, though this did not hinder the replication of Table D1; however, it proved troublesome for replicating Table D1 with more recent data (2018-2024). Apart from these impediments, close collaboration across team members and the instructions provided made this final project a great learning experience.

Task List

Daniel

- Created script to generate D1 Table statistics from cleaned dataset
- Created script to pull all necessary data from WRDS

Dylan

- Set up ‘dodo.py‘ to automate pulling of data and generation of PDF report
- Created unit tests

Gio

- Created LaTeX template for D1 Tables
- Created script to generate additional statistics and visuals from cleaned dataset

Nick

- Created script to clean dataset as specified in the paper; contributed to dodo.py, unit tests
- Created script to compile all tables, text, and visuals into the singular ‘.tex‘ report

Sarp

- Wrote write-up for the final report
- Created notebook walk-through of code and report generation process

Table D1
Summary of 13F Institutions by Type

Period	Number of institutions	% of market held	Assets under management ($ million)		Number of stocks held		Number of stocks in investment universe	
			median	90th percentile	median	90th percentile	median	90th percentile
				A. Banks				
1980-1984	207	11	270	2153	157	474	221	633
1985-1989	200	8	371	3227	193	598	346	994
1990-1994	191	7	332	4181	181	749	293	1195
1995-1999	134	2	300	2365	165	565	259	921
2000-2004	110	1	261	2393	154	532	254	944
2005-2009	90	1	264	2067	162	527	270	907
2010-2014	88	2	329	3698	165	634	264	973
2015-2017	85	1	410	4122	201	646	284	1121
				B. Insurance companies				
1980-1984	49	2	321	1487	92	252	127	388
1985-1989	54	1	379	1811	91	339	183	642
1990-1994	56	1	483	2071	104	423	193	703
1995-1999	50	1	777	5288	138	812	256	1196
2000-2004	19	1	881	15710	112	1344	233	1915
2005-2009	19	1	429	13538	103	1185	189	1924
2010-2014	19	1	361	20445	99	1229	160	1895
2015-2017	21	1	239	24300	86	1092	126	1461
				C. Investment advisors				
1980-1984	242	12	311	2366	108	349	172	519
1985-1989	498	17	327	2577	98	394	209	792
1990-1994	736	21	306	3272	94	448	186	900
1995-1999	963	16	375	4633	97	439	178	931
2000-2004	436	12	318	3593	81	403	170	940
2005-2009	709	17	294	3692	78	326	146	732
2010-2014	1107	16	212	3042	68	304	120	604
2015-2017	1582	16	165	2170	70	328	119	616
				D. Mutual funds				
1980-1984	41	4	566	5036	201	646	306	858
1985-1989	49	5	1050	6711	307	947	531	1749
1990-1994	54	4	1608	9732	458	1246	762	2100
1995-1999	144	10	2832	27749	501	2007	823	3094
2000-2004	316	35	2612	31895	266	1883	558	2950
2005-2009	209	34	4220	57151	329	2404	707	3603
2010-2014	159	27	5562	64973	317	2292	660	3374
2015-2017	173	28	5611	80284	309	2241	617	3089
				E. Pension funds				
1980-1984	0	0	0	0	0	0	0	0
1985-1989	0	0	0	0	0	0	0	0
1990-1994	0	0	0	0	0	0	0	0
1995-1999	0	0	0	0	0	0	0	0
2000-2004	0	0	0	0	0	0	0	0
2005-2009	0	0	0	0	0	0	0	0
2010-2014	0	0	0	0	0	0	0	0
2015-2017	0	0	0	0	0	0	0	0
				F. Other				
1980-1984	76	4	307	2607	72	236	98	326
1985-1989	91	4	398	5402	85	520	152	766
1990-1994	84	4	597	8530	106	715	180	1098
1995-1999	245	3	635	11632	102	953	164	1451
2000-2004	1225	11	242	2201	74	299	147	621
2005-2009	1793	17	226	2607	61	360	141	806
2010-2014	2026	20	235	3337	51	377	118	777
2015-2017	2405	20	256	3594	45	405	100	777

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			median	90th percentile	median	90th percentile	median	90th percentile
				A. Banks				
2018-2022	79	0	394	3510	180	597	259	936
2023-2023	82	0	390	4711	164	573	248	922
				B. Insurance companies				
2018-2022	19	1	146	23342	42	367	69	656
2023-2023	20	1	143	16497	32	167	78	433
				C. Investment advisors				
2018-2022	2631	15	120	1331	64	310	98	508
2023-2023	3712	15	90	917	54	273	93	510
				D. Mutual funds				
2018-2022	530	37	1525	30565	114	996	196	1484
2023-2023	538	36	1456	29321	107	864	204	1537
				E. Pension funds				
2018-2022	0	0	0	0	0	0	0	0
2023-2023	0	0	0	0	0	0	0	0
				F. Other				
2018-2022	2159	11	234	2687	38	337	74	635
2023-2023	2050	10	216	2795	33	359	79	730

Figure 1. Average AUM over Time

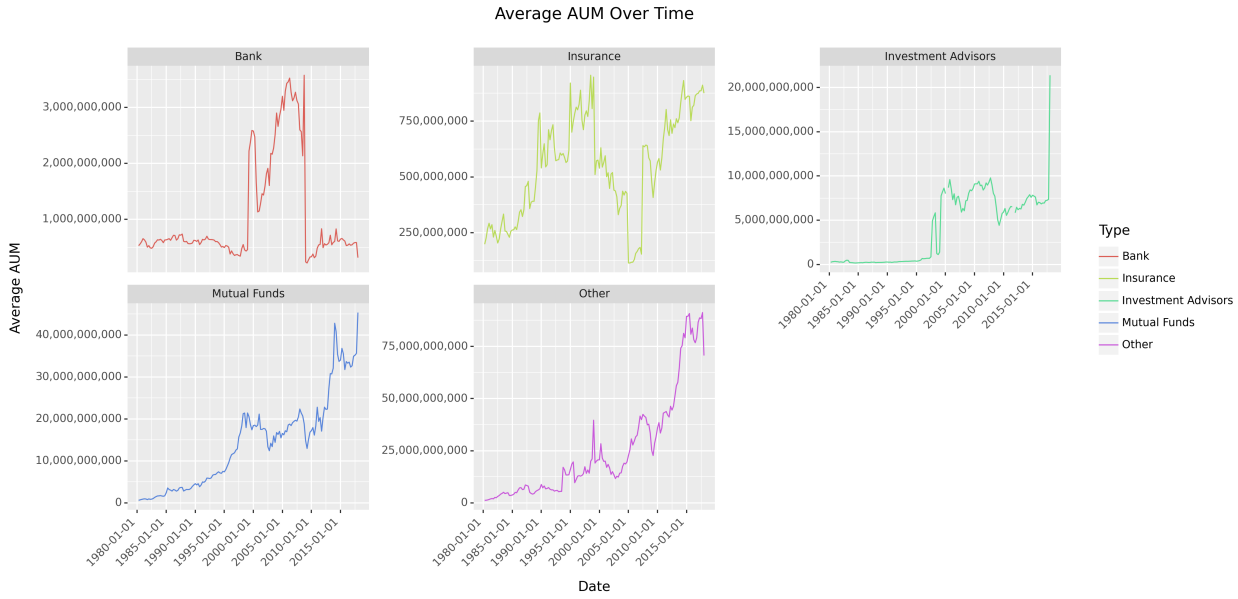

Figure 1: The average AUM held by each institution is mostly on an uptrend except for Banks. We see a drastic decrease in average AUM held by Banks during the 2008 crisis, which makes sense given the circumstances.

Figure 2. Total AUM by Institution Type over Time

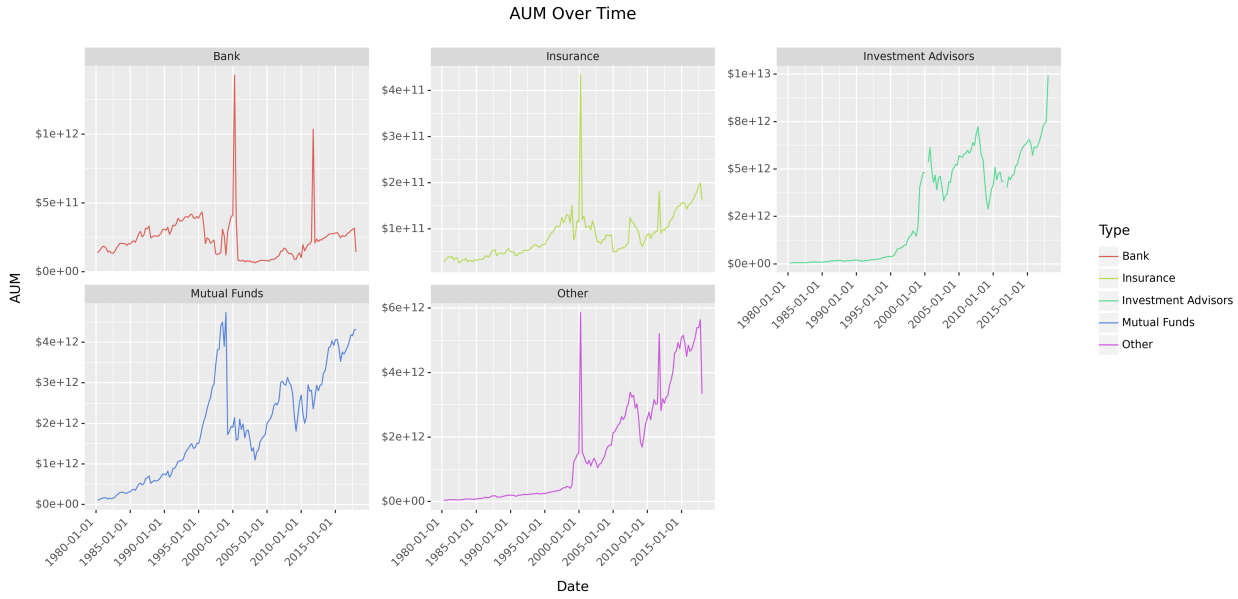

Figure 2: We see that all fund types have an increase in their AUM compared to the beginning of the period. However, we see that the greatest increases to AUM occur for Mutual Funds and Investment Advisors.

Figure 3. Number of Unique Managers over Time

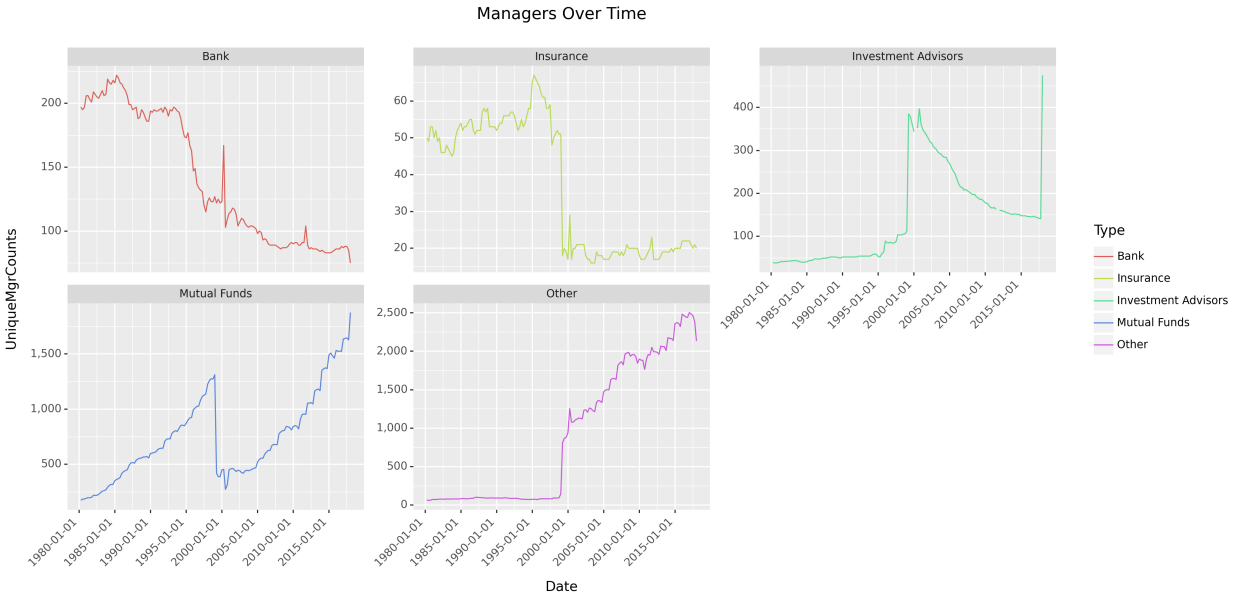

Figure 3: The number of unique managers varies drastically by institution type. We see a lot more managers involved with Banks to start, but this number decreases rapidly (similarly with Insurance). The other three investment types see the opposite trend, starting with less managers and increasing over time.

References

[1] Ralph SJ Koijen and Motohiro Yogo. A demand system approach to asset pricing. *Journal of Political Economy*, 127(4):1475–1515, 2019.