Replicating *Intermediary asset pricing: New evidence from many asset classes*

James, Young Jin Song, Jaehwa Youm, Monica Panigrahy, and Jacob Simeral
For our project, we were tasked with replicating 4 tables from the paper Intermediary asset pricing: New evidence from many asset classes. This paper aims to show how shocks to the equity capital ratio of financial intermediaries, specifically Primary Dealer counterparties of the New York Federal Reserve, exhibit substantial explanatory power for cross-sectional variance in expected returns across diverse asset classes, indicating the pivotal role of intermediary capital risk factor in understanding asset pricing dynamics. We split our work up amongst our selves to accomplish this task. Jacob and Young Jin worked on Tables 1, 2, and A,1. Monica and Jaehwa worked on Table 03. We found some success in replicating some of the more recent numbers but found much difficulty in determining the exact methodology used by the original authors to determine which holding company to use. We had two different attempts at this, the first was to choose the holding company that held the primary dealer for the longest period of time in a specified period - this data is in ticks.csv. The second method was to use the current holding company for a given primary dealer - this data is in ticksv2.csv. The third, which we did not have time to do, would be to have sub-periods for each holding company of a given primary dealer, which would likely produce the most accurate results. To pull our data, we used the Compustat database through our WRDS subscription. Specifically, we used the quarterly fundamentals table from Compustat.

table01 writeup

Primary Dealer	Holding Company	S
GOLDMAN, SACHS & CO.	The Goldman Sachs Group, Inc.	1
BARCLAYS CAPITAL INC.	Barclays PLC	1
HSBC SECURITIES (USA) INC.	HSBC Holdings PLC	1
BNP PARIBAS SECURITIES CORP.	BNP Paribas Group	2
DEUTSCHE BANK SECURITIES INC.	Deutsche Bank AG	2
MIZUHO SECURITIES USA INC.	Mizuho Financial Group, Inc.	2
CITIGROUP GLOBAL MARKETS INC.	Citigroup Inc.	2
UBS SECURITIES LLC.	UBS Group AG	2
CREDIT SUISSE SECURITIES (USA) LLC	Credit Suisse Group AG	2
CANTOR FITZGERALD & CO.	Cantor Fitzgerald & Company	2
RBS SECURITIES INC.	The Royal Bank of Scotland Group PLC	2
NOMURA SECURITIES INTERNATIONAL, INC.	Nomura Holdings, Inc.	2
DAIWA CAPITAL MARKETS AMERICA INC.	Daiwa Securities Group Inc. (Japan)	2
J.P. MORGAN SECURITIES LLC	JPMorgan Chase & Co.	2
MERRILL LYNCH, PIERCE, FENNER & SMITH INCORPORATED	Bank of America Corporation	2
RBC CAPITAL MARKETS, LLC	ROYAL BANK OF CANADA	2
SG AMERICAS SECURITIES, LLC	Soci t G n rale S.A.	2
MORGAN STANLEY & CO. LLC	Morgan Stanley Group Inc.	2
BMO CAPITAL MARKETS CORP.	Bank of Montreal	2
BANK OF NOVA SCOTIA, NEW YORK AGENCY	The Bank of Nova Scotia (Scotiabank)	2
JEFFERIES LLC	Jefferies LLC	2
TD SECURITIES (USA) LLC	The Toronto-Dominion Bank	2

tableA1 writeup

Primary Dealer	Start Date	End Date	Primary De
ABN AMRO BANK, N.V., NY BR	2002-12-09 00:00:00	9/15/2006	HARRIS T
ABN AMRO INCORPORATED	1998-09-29 00:00:00	12/8/2002	HARRIS-N
AUBREY G. LANSTON & CO., INC.	1960-05-19 00:00:00	4/17/2000	HSBC SEC
BA SECURITIES, INC.	1994-04-18 00:00:00	9/30/1997	HSBC SEC
BANC OF AMERICA SECURITIES LLC	1999-05-17 00:00:00	11/1/2010	HUTTON
BANC ONE CAPITAL MARKETS, INC	1999-04-01 00:00:00	8/1/2004	IRVING SE
BANCAMERICA ROBERTSON STEPHEN	1997-10-01 00:00:00	8/31/1998	J.P. MORG
BANCAMERICA SECURITIES, INC.	1998-09-01 00:00:00	9/30/1998	J.P. MORG
BANK OF AMERICA NT & SA	1971-11-17 00:00:00	4/15/1994	J.P.MORGA
BANK OF NOVA SCOTIA, NEW YORK AGENCY	2011-10-04 00:00:00	Current	JEFFERIE
BANKERS TRUST	1960-05-19 00:00:00	7/7/1989	JEFFERIE
BARCLAYS CAPITAL INC.	1998-04-01 00:00:00	Current	KIDDER, F
BARCLAYS DE ZOETE WEDD GSI	1989-12-07 00:00:00	3/1/1990	KLEINWO
BARCLAYS DE ZOETE WEDD SECURITIES IN	1990-03-02 00:00:00	6/30/1996	L.F.ROTHS
BARTOW LEEDS & CO.	1960-05-19 00:00:00	6/14/1962	L.F.ROTHS
BEAR,STEARNS & CO., INC.	1981-06-10 00:00:00	10/1/2008	LEHMAN
BECKER	1971-11-17 00:00:00	9/10/1984	LEHMAN I
BLYTH & CO., INC.	1962-04-16 00:00:00	1/14/1970	LEHMAN C
BLYTH EASTMAN DILLON CAPITAL MARKETS	1974-12-05 00:00:00	12/31/1979	LEHMAN C
BMO CAPITAL MARKETS CORP.	2011-10-04 00:00:00	Current	LLOYDS G
BMO NESBITT BURNS CORP.	2000-02-15 00:00:00	3/31/2002	MALON S.
BNP PARIBAS SECURITIES CORP.	2000-09-15 00:00:00	Current	MANUFAC
BNY SECURITIES, INC.	1989-08-01 00:00:00	8/9/1990	MANUFAC
BROPHY,GESTAL, KNIGHT AND CO., L.P.	1987-05-08 00:00:00	6/19/1988	MERRILL
BT ALEX. BROWN INCORPORATED	1997-10-23 00:00:00	6/4/1999	MERRILL
BT SECURITIES CORPORATION	1989-07-10 00:00:00	10/22/1997	MF GLOBA
BZW SECURITIES INC.	1996-07-01 00:00:00	3/31/1998	MIDLAND-
C.F. CHILDS & CO., INC	1960-05-19 00:00:00	6/29/1965	MIZUHO S
CANTOR FITZGERALD & CO.	2006-08-01 00:00:00	Current	MORGAN
CARROLL MCENTEE & MCGINLEY INC.	1976-09-29 00:00:00	5/6/1994	MORGAN
CHASE MANHATTAN CAPITAL MARKETS CORP	1987-07-01 00:00:00	12/19/1988	N.Y.HANSE
CHASE MANHATTAN GOV'T SECURITIES	1970-07-15 00:00:00	6/30/1987	NATIONSE
CHASE SECURITIES, INC	1996-04-01 00:00:00	4/30/2001	NATIONSE
CHASE SECURITIES, INC	1988-12-20 00:00:00	3/31/1996	NATIONSE
CHEMICAL	1960-05-19 00:00:00	3/31/1989	NATIONSE
CHEMICAL SECURITIES INC	1992-01-01 00:00:00	3/31/1996	NESBITT I
CHEMICAL SECURITIES, INC.	1989-04-01 00:00:00	12/31/1991	NOMURA
CIBC OPPENHEIMER CORP.	1997-12-04 00:00:00	5/2/1999	NOMURA
CIBC WOOD GUNDY SECURITIES CO	1996-03-27 00:00:00	12/3/1997	NORTHER
CIBC WORLD MARKETS CORP.	1999-05-03 00:00:00	2/8/2007	NUVEEN C
CITIBANK	1961-06-15 00:00:00	4/13/1989	PAINE WE
CITICORP SECURITIES MARKETS, INC.	1989-04-14 00:00:00	7/14/1993	PAINE, WI
CITICORP SECURITIES, INC.	1993-07-15 00:00:00	11/30/1998	PARIBAS C
CITIGROUP GLOBAL MARKETS INC.	2003-04-07 00:00:00	Current	PRUDENT
CONTINENTAL BANK, NATIONAL ASSOC.	1988-12-15 00:00:00	8/30/1991	PRUDENT
CONTINENTAL ILL.	1960-05-19 00:00:00	12/14/1988	RBC CAPI
COUNTRYWIDE SECURITES CORPORATION	2004-01-15 00:00:00	7/15/2008	RBC CAPI
COUNTY NATWEST GOV. SEC., INC.	1988-09-29 00:00:00	1/13/1989	RBS SECU
CREDIT SUISSE 1ST BOSTON LLC	2003-01-17 00:00:00	1/16/2006	REFCO PA
CREDIT SUISSE FIRST BOSTON CO	1996-12-16 00:00:00	1/16/2003	S.G. WARE
CREDIT SUISSE SECURITIES (USA) LLC	2006-01-16 00:00:00	Current	SALOMON
CRT GOVERNMENT SECURITIES,INC.	1987-12-22 00:00:00	7/5/1993	SALOMON
CS FIRST BOSTON CORPORATION	1993-10-12 00:00:00	12/15/1996	SANWA SE
D.W. RICH & CO., INC	1960-05-19 00:00:00	12/31/1969	SANWA-BO
DAIWA CAPITAL MARKETS AMERICA INC$_2$	2010-04-01 00:00:00	Current	SBC CAPI
DAIWA SECURITIES AMERICA INC.	1986-12-11 00:00:00	4/1/2010	SBC GOVE
DEAN WITTER REYNOLDS INC.	1977-11-02 00:00:00	4/30/1998	SBC WARE
DEUTSCH BANC ALEX. BROWN INC.	2001-01-12 00:00:00	3/29/2002	SBC WARE
DEUTSCHE BANK GSI	1990-12-13 00:00:00	9/30/1993	SECOND I

Table 2 was the first table our group was tasked with replicating. This table involves getting numbers such as total assets or market equity from CRSP Compustat database for different groups of firms, with the limitation that the firms be US domestic and have data available in CRSP Compustat. These groups were comprised of the primary dealers of the New York Fed, which are detailed in table A.1, all broker dealers, all banks, and all firms in Compustat. There were three time ranges that we observed, 1960-2012, 1960-1990, and 1990-2012. Replicating table 2 turned out to be a lot more involved than initially expected, due largely to the condition that we use the data of holding companies of the primary dealers rather than of the actual primary dealer. This required us to manually go through each individual dealer in the list of 112, and look up information about their holding company during a specified time period where they were considered a primary dealer. This was not a simple task because there were many cases where holding companies shifted multiple time within the specified period - forcing us to try and guess how the original author of the paper made this decision.

After finishing the main lookup file, ticks.csv, which including all primary dealers listed in table A.1, their holding companies, their start and end dates, and their permcos and gvkeys (identifiers for CRSP and Compustat respectively) we then focused on pulling data from the WRDS database. After establishing a connection with WRDS we were able to query data from multiple sources. We made use of the CRSP Compustat historical link table to do most of this research, as well as some holding companies lookups on Google and chatGPT. We queried a full list of link table data from the WRDS website and downloaded it in Excel format to be able to filter and make notes. We also queried the link table from the WRDS historical table and used this table to help merge SIC codes with our completed ticks.csv dataset. For the financials dataset, we opted to query data by gvkey since the data for table 2 was specifically for company level financials which are found through Compustat.

After having the primary dealer data in the proper format of total assets, total book debt, book equity, and market equity, it was now time to create our subgroups and query data for them. The first one we worked on was the broker dealer dataset, which, as specified in the paper, included all primary dealers in our main dataset plus any firms with the SIC code 6211 or 6221. Using the historical linktable and our primary dealer linktable we created our subset and then used it to query financial data from Compustat. Now with our two different subsets of data, we merged them on the date key and then performed our ratio calculation. This calculation was the total value of primary dealers divided by the sum of the total value of primary dealers and the total value of non-primary dealer broker dealers. We then repeated this methodology for the banks comparison group which was generally comprised of firms with the SIC code 6020. We had to use backfill and forward fill on some of the data due to gaps. These gaps were most prevalent in Banks and the period of 1960 to 1990.

Table 1: Updated

Metric	Total assets			Book debt			Book equity			Market equity		
Source	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.
Period												
1960-2012	0.895	0.329	0.142	0.894	0.333	0.168	0.897	0.312	0.053	0.892	0.325	0.038
1960-1990	0.903	0.188	0.095	0.902	0.190	0.115	0.888	0.217	0.048	0.857	0.239	0.037
1990-2012	0.883	0.507	0.200	0.882	0.512	0.232	0.906	0.433	0.057	0.932	0.437	0.039

Table 2: Original

Metric	Total assets			Book debt			Book equity			Market equity		
Source	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.	BD	Banks	Cmpust.
Period												
1960-2024	0.912	0.381	0.166	0.911	0.385	0.193	0.911	0.360	0.061	0.903	0.368	0.038
1960-1990	0.903	0.188	0.095	0.902	0.190	0.115	0.888	0.217	0.048	0.857	0.239	0.037
1990-2024	0.915	0.545	0.223	0.914	0.549	0.258	0.928	0.480	0.072	0.937	0.479	0.039

In the graphs below, we can see each of the four ratios shown over the original timeframe of 1960 to 2012
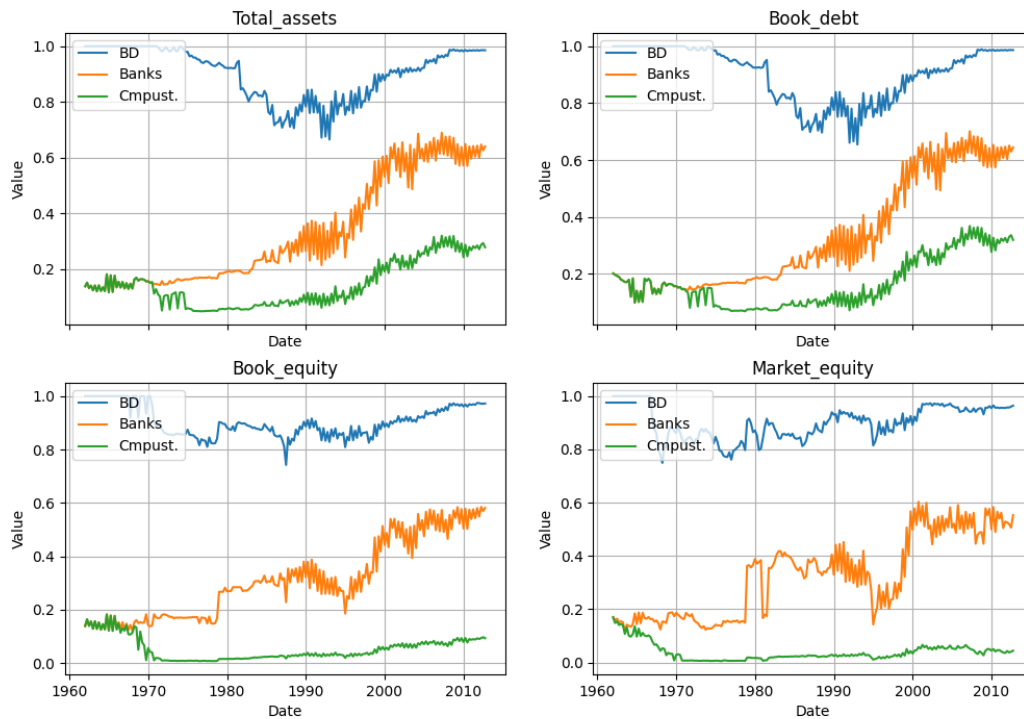
and the updated timeframe of 1960 to 2024.

table03 writeup01

This project of replication proved to be a fruitful endeavor. The most beneficial parts of this project were all of important computing concepts we used. We learned a lot about virtual environments, dependencies, command line, version control, and more. In addition, we were able to get some practice trying to replicating some somewhat complicated financial data, which will also be useful in our careers. Going forward we are going to have a better idea of how to approach a project for our employers because we understand how important and difficult automation can be and things such as dependency management - this will make us more aware of these problems as we encounter them in the workplace.
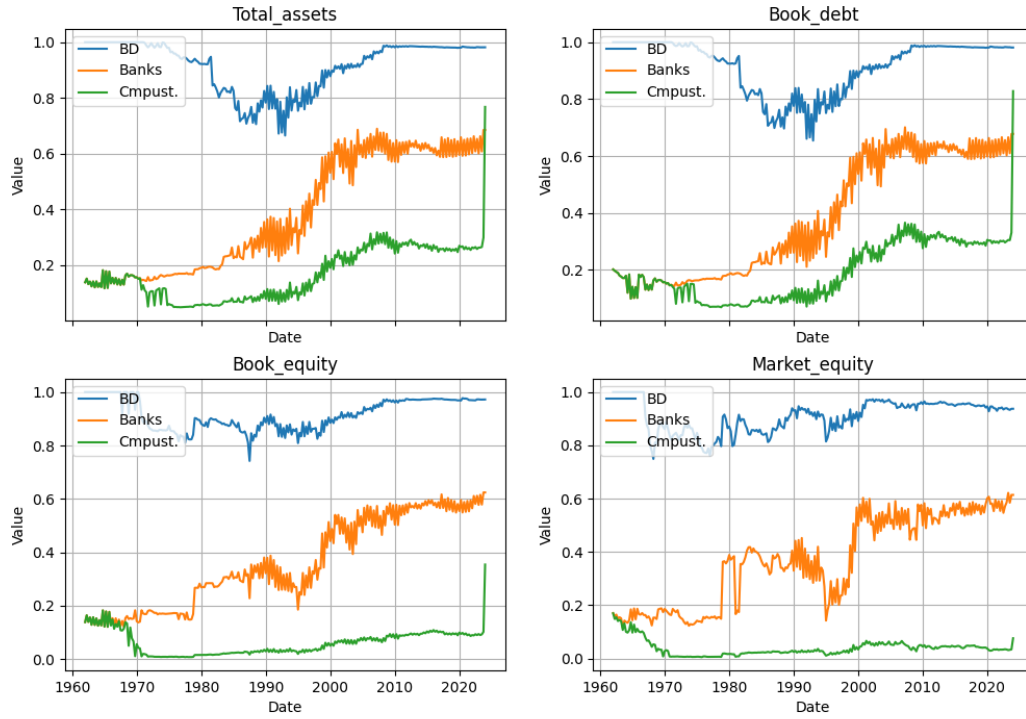
Panel A: Correlation of Levels			
	Market capital	Book capital	AEM leverage
Market capital		0.44	-0.1
Book capital			0.48
AEM leverage			
E/P	-0.19	0.57	0.76
Unemployment	-0.19	0.47	0.31
GDP	-0.09	-0.49	-0.71
Financial conditions	-0.26	0.3	0.43
Market volatility	-0.04	0.06	0.11

Panel B: Correlation of Factors			
	Market capital	Book capital	AEM leverage
Market capital factor		0.44	-0.11
Book capital factor			0.11
AEM leverage factor			
Market excess return	-0.05	0.23	0.11
E/P growth	-0.35	0.01	0.28
Unemployment growth	0.0	0.13	0.11
GDP growth	-0.04	-0.08	-0.1
Financial conditions growth	-0.13	0.02	0.1
Market volatility growth	-0.09	0.05	-0.1

Panel A: Correlation of Levels			
	Market capital	Book capital	AEM leverage
Market capital		0.36	-0.05
Book capital			0.38
AEM leverage			
E/P	-0.1	0.36	0.75
Unemployment	-0.13	0.24	0.3
GDP	-0.2	-0.09	-0.61
Financial conditions	-0.2	0.19	0.46
Market volatility	-0.06	0.08	0.08
Panel B: Correlation of Factors			
	Market capital	Book capital	AEM leverage
Market capital factor		0.44	-0.1
Book capital factor			0.12
AEM leverage factor			
Market excess return	-0.04	0.19	0.09
E/P growth	-0.36	0.0	0.25
Unemployment growth	-0.02	0.03	0.08
GDP growth	-0.01	-0.04	-0.07
Financial conditions growth	-0.11	0.03	0.08
Market volatility growth	-0.11	0.03	-0.1