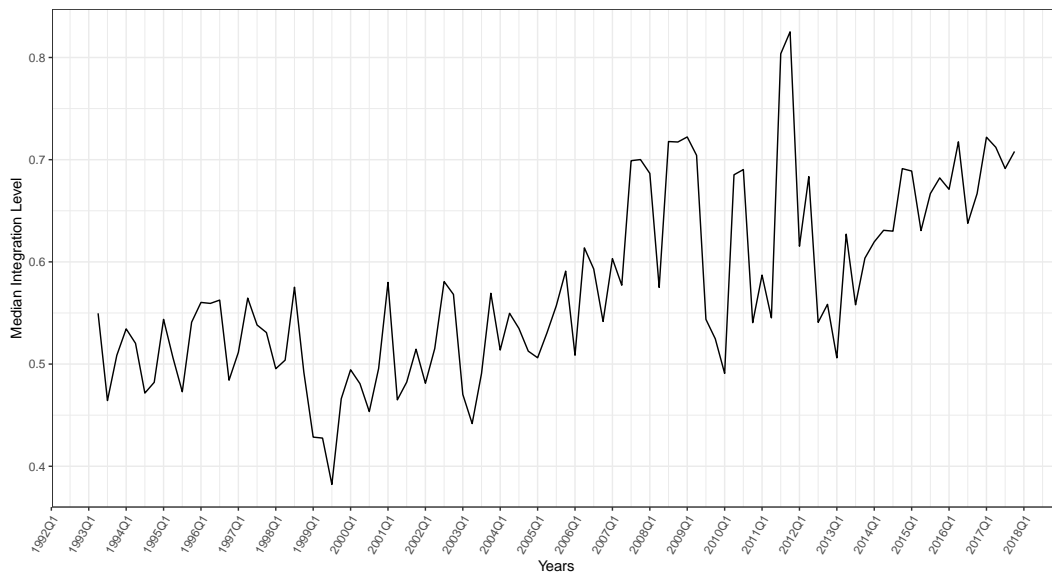


Integration Among US Banks: Rerun

Abhinav Anand and John Cotter

2018/12/07

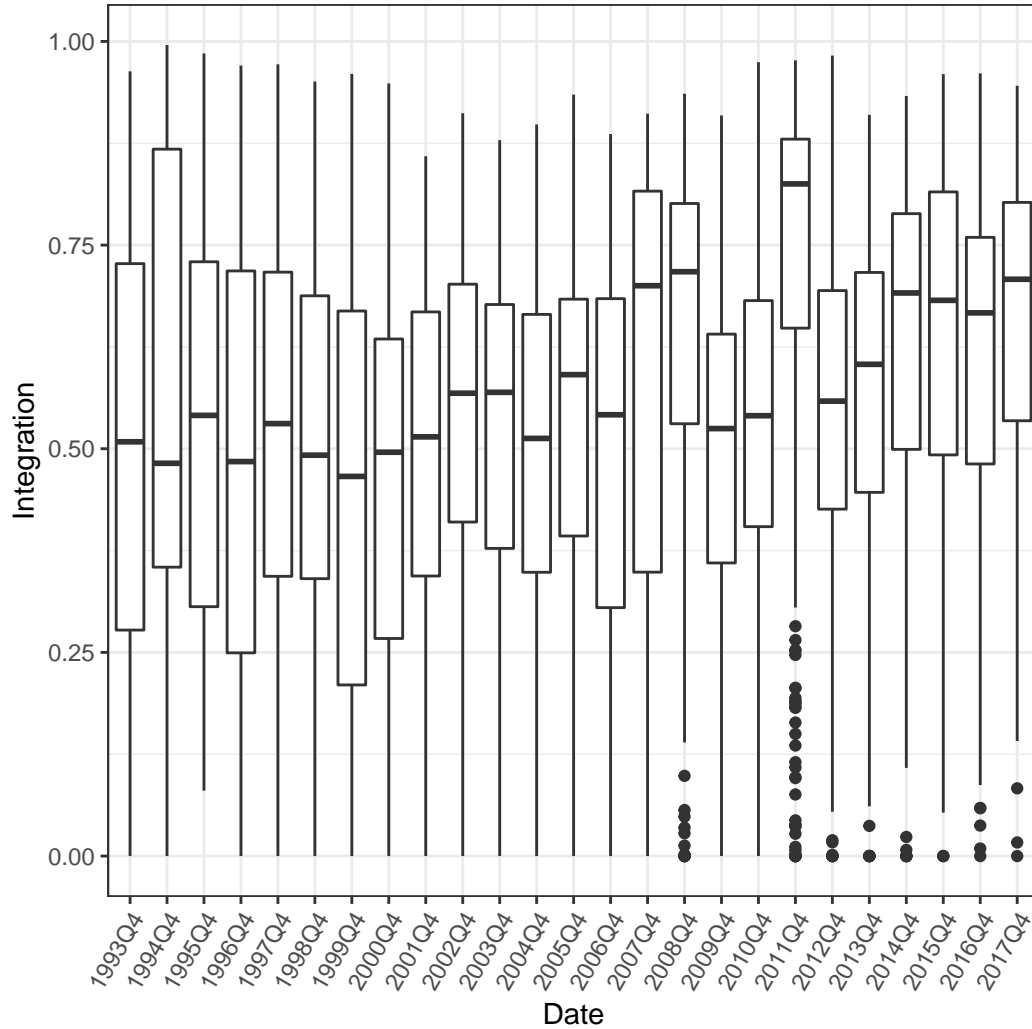
Median US Bank Integration



Linear Time Trends

term	estimate	std.error	statistic	p.value
(Intercept)	0.4581718	0.0132543	34.567852	0.000000
qtrs	0.0021318	0.0002241	9.513426	0.000000
dummy__recession	0.0537071	0.0203766	2.635722	0.009791

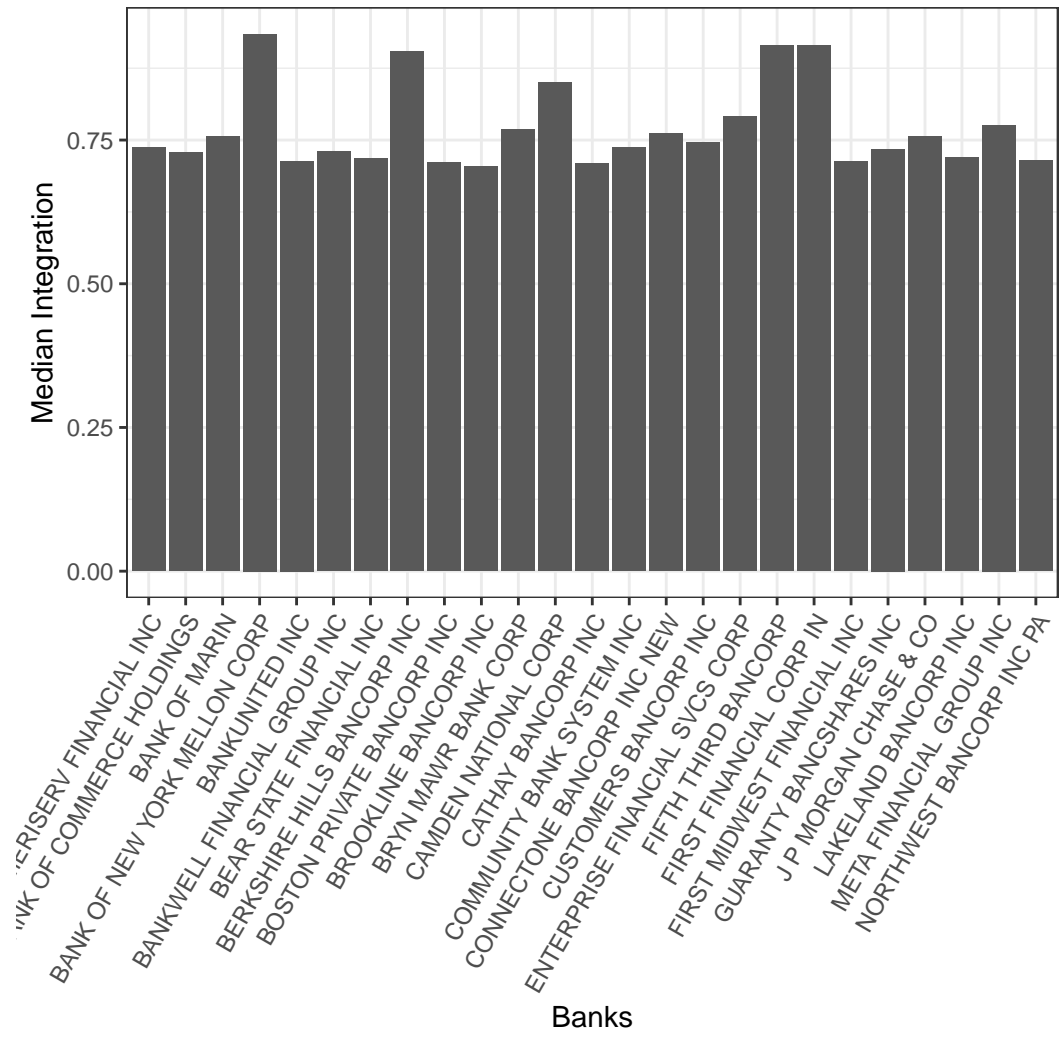
Empirical Distribution of US Bank Integration



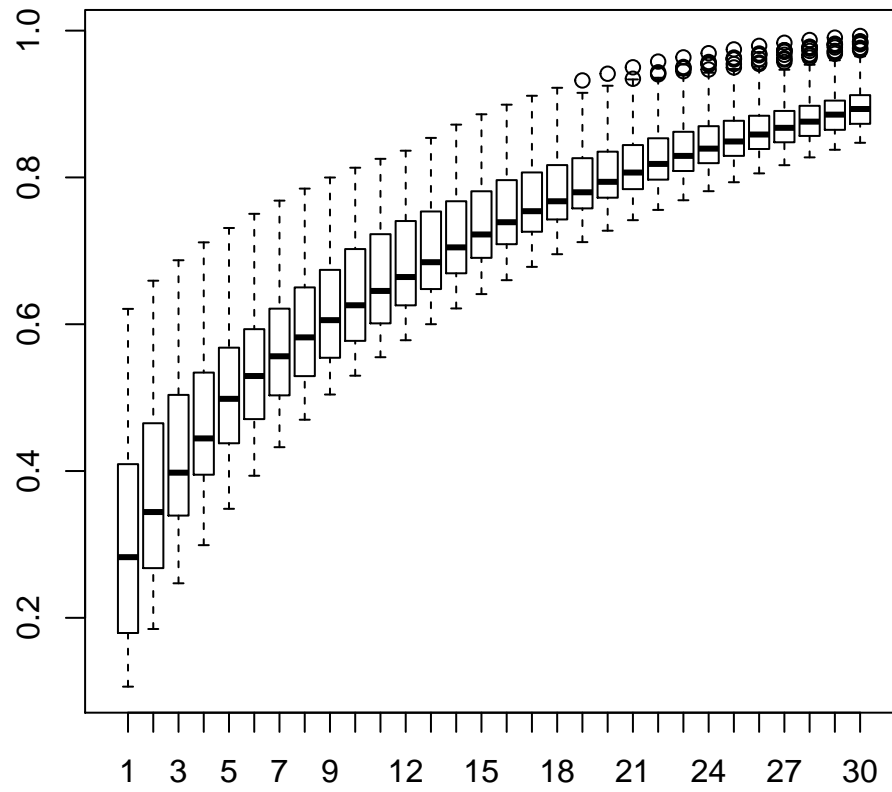
Most Integrated Banks

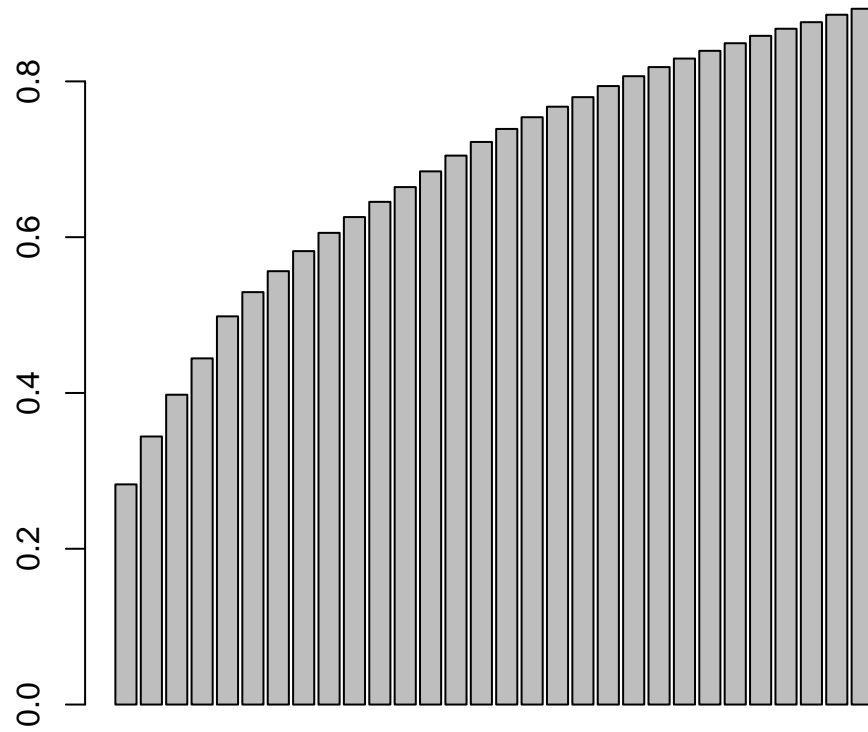
Bank	Median_Integration
BANK OF NEW YORK MELLON CORP	0.9342853
FIFTH THIRD BANCORP	0.9149052
FIRST FINANCIAL CORP IN	0.9147155
BERKSHIRE HILLS BANCORP INC	0.9035986

Bank	Median Integration
CAMDEN NATIONAL CORP	0.8497972
ENTERPRISE FINANCIAL SVCS CORP	0.7915368
META FINANCIAL GROUP INC	0.7761193
BRYN MAWR BANK CORP	0.7684859
CONNECTONE BANCORP INC NEW	0.7612680
J P MORGAN CHASE & CO	0.7563842
BANK OF MARIN	0.7563703
CUSTOMERS BANCORP INC	0.7453668
COMMUNITY BANK SYSTEM INC	0.7373918
AMERISERV FINANCIAL INC	0.7370163
GUARANTY BANCSHARES INC	0.7346873
BANKWELL FINANCIAL GROUP INC	0.7303000
BANK OF COMMERCE HOLDINGS	0.7282580
LAKELAND BANCORP INC	0.7193299
BEAR STATE FINANCIAL INC	0.7177329
NORTHWEST BANCORP INC PA	0.7150237
BANKUNITED INC	0.7138438
FIRST MIDWEST FINANCIAL INC	0.7124135
BOSTON PRIVATE BANCORP INC	0.7107307
CATHAY BANCORP INC	0.7095135
BROOKLINE BANCORP INC	0.7038179



Explanatory Power of Eigenvectors





Linear Time Trends for Bank Integration

Banks	T_stat	p_val
1ST SOURCE CORP	3.6503120	0.0004514
ARROW FINANCIAL CORP	1.7696440	0.0802505
ASSOCIATED BANC CORP	7.1435390	0.0000000
BANK NEW YORK INC	0.3030300	0.7630103
COMERICA INC	3.0979962	0.0025488
COMMERCE BANCSHARES INC	8.6661210	0.0000000
CULLEN FROST BANKERS INC	6.8634047	0.0000000
F N B CORP PA	6.0601741	0.0000000
FIFTH THIRD BANCORP	5.2331903	0.0000010
FIRST CITIZENS BANCSHARES INC NC	4.0673153	0.0001010
FIRST EMPIRE STATE CORP	-0.0153343	0.9879342
FIRST MIDWEST BANCORP DE	10.2782346	0.0000000

Banks	T_stat	p_val
FIRST TENNESSEE NATIONAL CORP	1.9701636	0.0555989
HANCOCK HOLDING CO	4.7987010	0.0000064
HUNTINGTON BANCSHARES INC	4.7016637	0.0000086
NATIONSBANK CORP	-0.8757723	0.3915509
NORTHERN TRUST CORP	1.4467397	0.1511937
NORWEST CORP	1.8278316	0.0825331
P N C BANK CORP	-1.2605035	0.2191261
PEOPLES BANK BRIDGEPORT	-3.2292573	0.0021527
SILICON VALLEY BANCSHARES	-0.5548199	0.5817653
SUNTRUST BANKS INC	2.9711659	0.0037402
T C F FINANCIAL CORP	2.2113293	0.0293616
TRUSTMARK CORP	6.5942859	0.0000000
UNITED BANKSHARES INC	6.7615432	0.0000000
WEBSTER FINANCIAL CORP	6.0643539	0.0000000
WESTAMERICA BANCORPORATION	9.6293740	0.0000000
ZIONS BANCORPORATION	8.9385832	0.0000000
BANCORPSOUTH INC	5.2899693	0.0000008
C V B FINANCIAL CORP	7.2250238	0.0000000
COMMUNITY BANK SYSTEM INC	7.3426362	0.0000000
FIRST FINANCIAL BANCORP OHIO	7.3564996	0.0000000
FULTON FINANCIAL CORP PA	5.0029106	0.0000026
INDEPENDENT BANK CORP MA	4.5553163	0.0000166
N B T BANCORP INC	9.3295509	0.0000000
S & T BANCORP INC	5.6228556	0.0000002
TRUSTCO BANK CORP NY	3.6770108	0.0003928
USBANCORP INC PA	-0.2096571	0.8355093
WESBANCO INC	8.5121491	0.0000000
CHEMICAL FINANCIAL CORP	2.5620520	0.0121269
COLUMBIA BANKING SYSTEM INC	2.7346023	0.0074785
FIRST MERCHANTS CORP	4.8648045	0.0000055
OLD NATIONAL BANCORP	9.2404958	0.0000000
VALLEY NATIONAL BANCORP	6.2641600	0.0000000

Banks	T_stat	p_val
WSFS FINANCIAL CORP	4.2507135	0.0000529
ASTORIA FINANCIAL CORP	4.5277271	0.0000176
FIRST COMMONWEALTH FINANCIAL COR	6.7919302	0.0000000
QUEENS COUNTY BANCORP INC	-2.4229966	0.0229680
KEYCORP NEW	3.7181666	0.0003428
SUFFOLK BANCORP	1.8918637	0.0622689
GREAT SOUTHERN BANCORP INC	2.1968046	0.0312095
REGIONS FINANCIAL CORP	3.5417790	0.0010704
U M B FINANCIAL CORP	6.7372892	0.0000000
CENTURY BANCORP INC	-0.3905533	0.6971655
PARK NATIONAL CORP	7.8748794	0.0000000
WASHINGTON FEDERAL INC	6.2864370	0.0000000
CATHAY BANCORP INC	-1.4549052	0.1586510
FIRST DEFIANCE FINANCIAL CORP	1.3860898	0.1695235
BANCFIRST CORP	8.1417736	0.0000000
FLUSHING FINANCIAL CORP	5.4135596	0.0000006
MERCHANTS BANCSHARES INC	1.6397184	0.1053084
FIRST FEDERAL BANCSHARES ARK INC	0.0219106	0.9825920
PREMIER FINANCIAL BANCORP INC	-1.1683976	0.2461603
PROVIDENT FINANCIAL HOLDINGS INC	-0.0962783	0.9235404
WASHINGTON TRUST BANCORP INC	5.1731227	0.0000017
A B C BANCORP	0.9784187	0.3356919
CITY HOLDING CO	4.2360329	0.0000604
COMMUNITY TRUST BANCORP INC	5.2837689	0.0000010
FIRST FINANCIAL BANKSHARES INC	6.6210528	0.0000000
SANDY SPRING BANCORP INC	4.3810547	0.0000347
TRICO BANCSHARES	4.4469239	0.0000281
ORIENTAL FINANCIAL GROUP INC	2.8000339	0.0068041
STATE STREET CORP	0.3784539	0.7060836
WINTRUST FINANCIAL CORPORATION	9.2410362	0.0000000
B B & T CORP	1.3740134	0.1734764
MIDSOUTH BANCORP INC	4.5564406	0.0000267

Banks	T_stat	p_val
BANK OF THE OZARKS INC	5.2517574	0.0000013
BAR HARBOR BANKSHARES	4.0667542	0.0001191
BRYN MAWR BANK CORP	4.3488812	0.0000462
FARMERS CAPITAL BANK CORP	0.4852962	0.6288266
FIRST FINANCIAL CORP IN	4.5666556	0.0000180
SOUTHERN MISSOURI BANCORP INC	0.2411213	0.8108681
SOUTHWEST BANCORP INC OKLA	2.1129456	0.0379328
UNITY BANCORP INC	-1.3414045	0.1844573
CAMDEN NATIONAL CORP	3.1019825	0.0027092
CAPITAL CITY BANK GROUP	-0.4445197	0.6578979
FIDELITY NATIONAL CORP GA	-2.3328027	0.0308050
PEOPLES BANCORP INC	3.1034650	0.0026859
REPUBLIC FIRST BANCORP INC	0.7737627	0.4414714
S Y BANCORP INC	7.0241439	0.0000000
BROOKLINE BANCORP INC	5.6582112	0.0000003
HERITAGE FINANCIAL CORP WA	5.5062564	0.0000005
INTERNATIONAL BANCSHARES CORP	7.2940316	0.0000000
NORTHWEST BANCORP INC PA	2.1479073	0.0371418
PEOPLES HOLDING CO	2.9565879	0.0068784
UNION BANKSHARES CORP	3.6853160	0.0007468
DIME COMMUNITY BANCSHARES	3.5671762	0.0006287
GERMAN AMERICAN BANCORP	0.2160493	0.8307025
M & T BANK CORP	4.5572458	0.0000194
SOUTHSIDE BANCSHARES INC	3.5090030	0.0007907
UNITED COMMUNITY FINL CORP OHIO	-0.0858375	0.9318339
CARDINAL FINANCIAL CORP	2.5510508	0.0129610
GLACIER BANCORP INC NEW	6.7266475	0.0000000
BOSTON PRIVATE FINL HLDGS INC	5.0454300	0.0000033
HERITAGE COMMERCE CORP	2.0599196	0.0433534
WELLS FARGO & CO NEW	1.5423137	0.1272632
CAPITOL FEDERAL FINANCIAL	0.1325972	0.8951165
EAST WEST BANCORP INC	6.6858929	0.0000000

Banks	T_stat	p_val
OLD SECOND BANCORP INC	-0.7022212	0.4850484
UMPQUA HOLDINGS CORP	7.0198243	0.0000000
AMERICAN NATIONAL BANKSHARES INC	1.1742067	0.2446631
BANK OF AMERICA CORP	1.9741486	0.0522016
PRIVATEBANCORP INC	2.9645469	0.0041768
PROSPERITY BANCSHARES INC	6.4022874	0.0000000
TOMPKINS TRUSTCO INC	5.7184225	0.0000045
MERCANTILE BANK CORP	3.0864691	0.0029012
OCEANFIRST FINANCIAL CORP	4.0769250	0.0001176
C & F FINANCIAL CORP	0.3284450	0.7438455
FIRST BANCORP NC	1.7473398	0.0849640
FIRST UNITED CORP	1.2092520	0.2308159
LAKELAND BANCORP INC	2.8657776	0.0055309
P N C FINANCIAL SERVICES GRP INC	2.6286077	0.0105597
BERKSHIRE HILLS BANCORP INC	7.2575065	0.0000000
IBERIABANK CORP	7.3059230	0.0000000
MACATAWA BANK CORP	0.2642657	0.7923987
MUTUALFIRST FINL INC	0.6685887	0.5060549
PACIFIC MERCANTILE BANCORP	-0.8970677	0.3728479
LAKELAND FINANCIAL CORP	6.1099755	0.0000001
NEW YORK COMMUNITY BANCORP INC	1.6485354	0.1039955
COBIZ INC	0.9662244	0.3439826
FIRST COMMUNITY BANCSHARES INC	2.6335524	0.0105482
NARA BANCORP INC	2.0867605	0.0433281
AMERISERV FINANCIAL INC	-1.3218161	0.1910091
CENTER BANCORP INC	-0.0496322	0.9606173
PEOPLES BANCORP NC INC NEW	-0.9669379	0.3378078
N A S B FINANCIAL INC	0.5083842	0.6134198
CHARTER FINANCIAL CORP	-0.3123392	0.7571823
FIRST COMMUNITY BANCORP	3.1658288	0.0043167
HORIZON BANCORP IND	1.9546610	0.0567165
M B FINANCIAL INC NEW	6.5002738	0.0000000

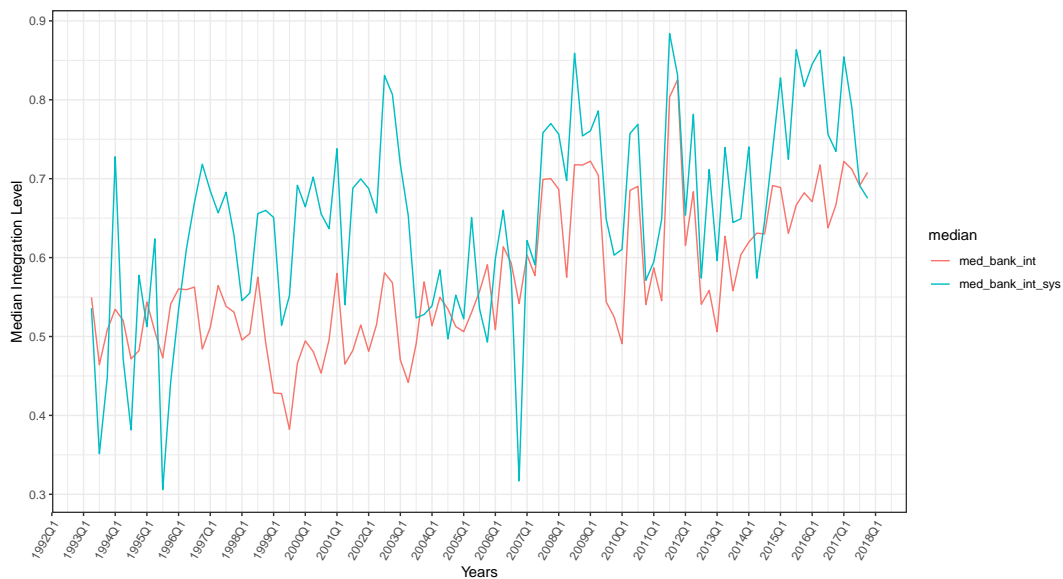
Banks	T_stat	p_val
NORTHRIM BANCORP INC	1.8661832	0.0667473
SIERRA BANCORP	1.0396218	0.3025530
WESTFIELD FINANCIAL INC	0.8316176	0.4092873
NATIONAL BANKSHARES INC	2.2888994	0.0257452
PEAPACK GLADSTONE FINANCIAL CORP	-3.3507564	0.0027696
BANK OF HAWAII CORP	4.6419510	0.0000193
FIRST LONG ISLAND CORP	3.5170446	0.0008932
MAINSOURCE FINANCIAL GROUP INC	1.7723459	0.0814140
PINNACLE FINANCIAL PARTNERS INC	5.8431304	0.0000002
WEST BANCORPORATION INC	2.4850789	0.0157581
1ST CONSTITUTION BANCORP	-0.4094105	0.6847332
EASTERN VIRGINIA BANKSHARES INC	-1.0350203	0.3051889
FIRST PACTRUST BANCORP INC	3.4383135	0.0015643
MIDDLEBURG FINANCIAL CORP	1.8703910	0.0666592
C N B FINANCIAL CORP PA	4.1361545	0.0001267
CENTERSTATE BANKS OF FLORIDA INC	1.7210735	0.1014811
FIRST CITIZENS BANC CORP	-1.2871057	0.2046388
PENNS WOODS BANCORP INC	2.7242373	0.0086227
PROVIDENT FINANCIAL SVCS INC	5.6568388	0.0000005
Q C R HOLDINGS INC	-0.0683010	0.9458030
EAGLE BANCORP INC	6.4059675	0.0000000
CODORUS VALLEY BANCORP INC	0.8902714	0.3783916
FIDELITY SOUTHERN CORP NEW	2.8120621	0.0067741
HEARTLAND FINANCIAL USA INC	1.7079880	0.0931771
M B T FINANCIAL CORP	-2.2678619	0.0272868
NORWOOD FINANCIAL CORP	-0.5291476	0.6001410
B N C BANCORP	3.1933297	0.0025679
COLONY BANCORP INC	-0.2585133	0.7972442
TEXAS CAPITAL BANCSHARES INC	3.5535729	0.0007891
UNIVEST CORP OF PENNSYLVANIA	0.6187256	0.5386514
BANK MUTUAL CORP NEW	-0.7823228	0.4374421
CATHAY GENERAL BANCORP	2.9523137	0.0046603

Banks	T_stat	p_val
HINGHAM INSTITUTION FOR SVGS MA	0.1635670	0.8714417
FIRST HORIZON NATIONAL CORP	5.5082722	0.0000011
S C B T FINANCIAL CORP	-0.8405003	0.4063334
SIGNATURE BANK NEW YORK N Y	2.8709573	0.0058694
BANK OF COMMERCE HOLDINGS	1.5792587	0.1223543
JPMORGAN CHASE & CO	3.4795961	0.0010248
REGIONS FINANCIAL CORP NEW	3.1276763	0.0028848
ACCESS NATIONAL CORP	1.2107381	0.2316879
BANCORP INC	2.4725085	0.0168622
CITIZENS & NORTHERN CORP	1.3822248	0.1730465
AMES NATL CORP	0.9476870	0.3481362
B OF I HOLDING INC	4.0030335	0.0002114
ENTERPRISE FINANCIAL SVCS CORP	1.0087363	0.3180566
KEARNY FINANCIAL CORP	-1.9295558	0.0611532
OLD LINE BANCSHARES	0.3987947	0.6930696
RENASANT CORP	2.6817743	0.0099528
SUMMIT FINANCIAL GROUP INC	0.0619958	0.9508603
BANKFINACIAL CORP	-1.2809265	0.2063740
META FINANCIAL GROUP INC	1.3279086	0.1909049
PARKE BANCORP INC	-0.0679440	0.9461247
PROVIDENT NEW YORK BANCORP	0.0505854	0.9599804
ROCKVILLE FINANCIAL INC	-0.8114219	0.4266753
S V B FINANCIAL GROUP	4.3188474	0.0000783
WESTERN ALLIANCE BANCORPORATION	4.7242448	0.0000205
CENTRAL VALLEY COMM BANCORP	2.4008589	0.0219738
HERITAGE OAKS BANCORP	2.6467605	0.0113913
INVESTORS BANCORP INC	0.9247265	0.3620295
AMERIS BANCORP	-1.6974473	0.0963689
B C B BANCORP INC	-0.4496253	0.6556762
GERMAN AMERICAN BANCORP INC	6.4120814	0.0000001
YADKIN VALLEY FINANCIAL CORP	-0.6562001	0.5176901
ENTERPRISE BANCORP INC	2.9619623	0.0054623

Banks	T_stat	p_val
SOUTHERN NATIONAL BANCORP VA INC	1.0111031	0.3187150
E S S A BANCORP INC	-0.0110247	0.9912572
PEOPLES UNITED FINANCIAL INC	3.9983607	0.0002598
TFS FINANCIAL CORP	2.9741055	0.0049055
BANK OF MARIN BANCORP	1.3082645	0.1982518
BANK OF NEW YORK MELLON CORP	-0.1777139	0.8598446
BENEFICIAL MUTUAL BANCORP INC	-1.3694740	0.1817357
COBIZ FINANCIAL INC	0.4703771	0.6406404
FIRST BUSINESS FINL SVCS INC	2.9976999	0.0059184
SOUTHERN FIRST BANCSHARES INC	-0.2978960	0.7677082
TOMPKINS FINANCIAL CORP	2.4043324	0.0209239
FIRST FINANCIAL NORTHWEST INC	-0.1148622	0.9091437
HAWTHORN BANCSHARES INC	1.8868187	0.0685811
TOWNEBANK	2.6255520	0.0122939
NORTHFIELD BANCORP INC	1.3287060	0.2005445
MERIDIAN INTERSTATE BANCORP INC	0.9187435	0.3677649
MIDWESTONE FINANCIAL GRP INC NEW	3.3526739	0.0018562
BRIDGE BANCORP INC	3.0105062	0.0047447
FIRST BANCORP INC ME	-1.9208368	0.0626996
PACWEST BANCORP DE	1.4165896	0.1651986
WATERSTONE FINANCIAL INC	-2.3814158	0.0278600
CITIZENS HOLDING CO	1.5344308	0.1374833
CENTERSTATE BANKS INC	2.0600220	0.0478758
ORRSTOWN FINANCIAL SERVICES INC	-1.6487083	0.1089923
NORTHWEST BANCSHARES INC	2.3299405	0.0267268
ORITANI FINANCIAL CORP NEW	0.9112545	0.3699402
A C N B CORP	2.5788579	0.0159239
CAPITOL FEDERAL FINANCIAL INC	3.6228406	0.0012399
FIRST REPUBLIC BANK S F NEW	2.2690667	0.0317962
PARK STERLING BANK NEW	1.5205191	0.1409286
S I FINANCIAL GROUP INC MD	3.0638729	0.0050373
BANKUNITED INC	4.3731884	0.0001892

Banks	T_stat	p_val
STATE BANK FINANCIAL CORP	4.115540	0.0003933
FARMERS NATIONAL BANC CORP	1.2980043	0.2071524
L C N B CORP	1.1255402	0.2719686
NATIONAL BANK HOLDINGS CORP	4.8078049	0.0001223
FIRST BANCSHARES INC MS	0.2803760	0.7823860

Systemic Banks' Integration



Effect of NBER Recessions on Bank Integration

Integration Variation with SIC category

```
## $SIC_1
##      avg      med      std      iqr      skew      kurt
## 1  0.584798  0.5714926  0.0922168  0.1276282  0.3894072  2.659068
##
## $SIC_2
```

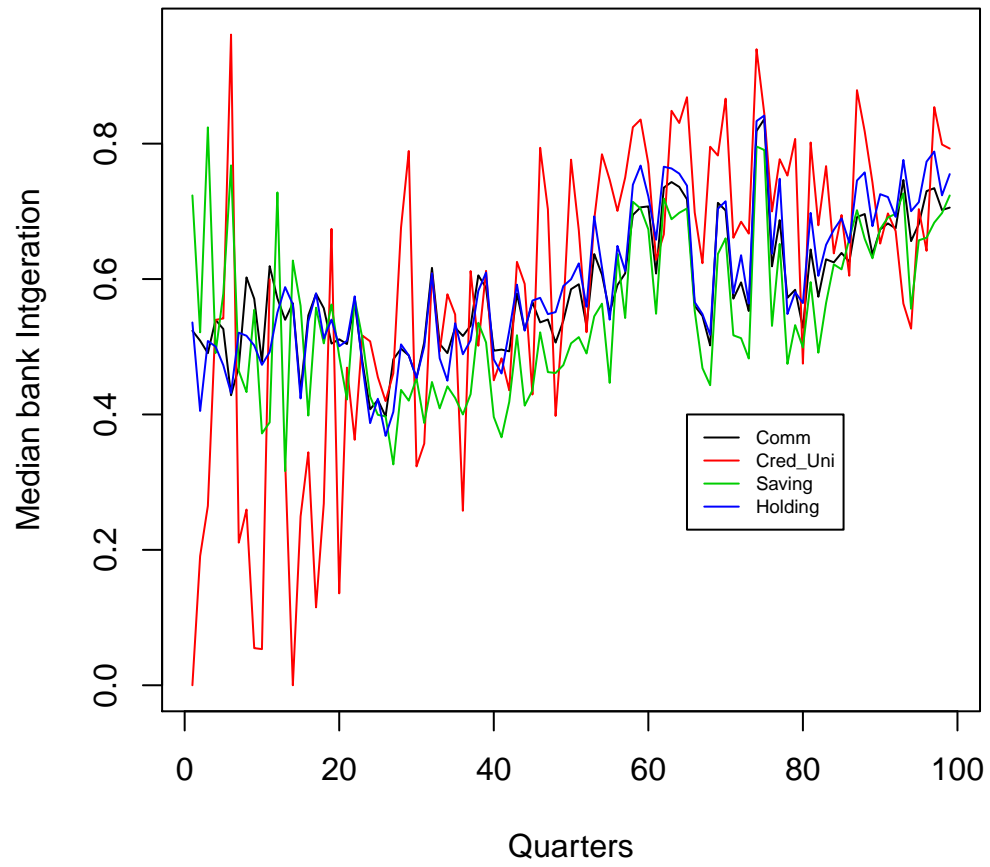
```

##          avg          med          std          iqr          skew          kurt
## 1 0.5848668 0.6330858 0.2226694 0.3003526 -0.802515 3.029697
##
## $SIC_3
##          avg          med          std          iqr          skew          kurt
## 1 0.5476616 0.5307884 0.1193832 0.2110806 0.2909012 2.119126
##
## $SIC_4
##          avg          med          std          iqr          skew          kurt
## 1 0.5941108 0.5744666 0.1111273 0.1830553 0.2360741 2.176285

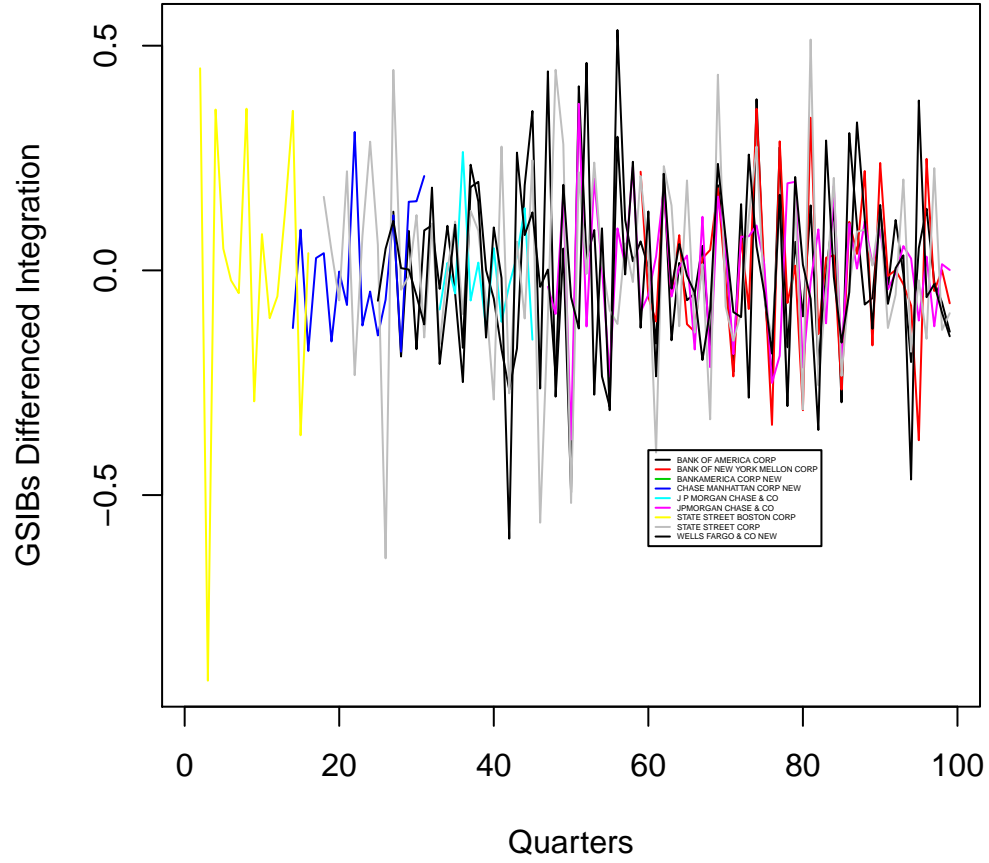
## $stats
##          [,1]          [,2]          [,3]          [,4]
## [1,] 0.3971835 0.05341229 0.3163659 0.3683127
## [2,] 0.5135116 0.46086525 0.4472890 0.5092080
## [3,] 0.5714926 0.63308578 0.5307884 0.5744666
## [4,] 0.6411399 0.76679269 0.6583696 0.6922633
## [5,] 0.8186373 0.96106915 0.8240858 0.8415198
##
## $n
## [1] 99 98 99 99
##
## $conf
##          [,1]          [,2]          [,3]          [,4]
## [1,] 0.5512258 0.5842585 0.4972696 0.5453981
## [2,] 0.5917595 0.6819131 0.5643071 0.6035350
##
## $out
## [1] 0.8362843 0.0000000 0.0000000
##
## $group
## [1] 1 2 2
##
## $names

```

```
## [1] "SIC_1" "SIC_2" "SIC_3" "SIC_4"
```



Differencing the Intgration Series



Panel Estimation

Table 4: Pooled Model

term	estimate	std.error	statistic	p.value
(Intercept)	0.04	0.07	0.55	0.58
size	0.12	0.02	7.01	0.00
lev_ratio	0.89	0.28	3.14	0.00

Table 5: Fixed Effects Model

term	estimate	std.error	statistic	p.value
size	0.33	0.03	11.84	0.00
lev_ratio	0.48	0.28	1.73	0.08