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This is a study to assess the execution quality of FINRA reported trades vs lit-market trades by assessing how far off the NBBO each trade was for thin stocks with fairly wide spreads that trade in the tens of dollars--not the hyper liquid names.

FINRA reported trades are Payment for Order Flow (PFOF), Internalized, and Dark Pool trades. This study will compare FINRA reported trades' price improvement to the price improvement offered on all the LIT and ATS markets to assess execution quality.

My hypothesis is that PFOF provides dramatically worse prices in illiquid names with fairly large spreads.

The study uses the first 1000 trades each from 33 low volume issues on 11/15/22. These were chosen with a market screener for prices between \$10 and \$50 and daily volume between 5000 and 25000 shares.

The data comes from Interactive Brokers Python API

Each trade records the price, the volume of the trade, the NBBO, and the exchange of the trade.

The procedure for the study is:

- 1) For each trade find the smallest absolute value of its price difference from the National Best Bid (NBB) and the National Best Offer (NBO). I used the standard assumption that trades closer to the offer are buys, while those closer to the bid are sells. The absolute value allows me to sum them.
- 2) Group the sum of these difference off the NBBO by exchange and sum the total volume grouped by exchange. Divide the sum of the differences by the sum of the total volume by exchange to get the weight per share price improvement off the NBBO for each exchange.
- 3) Compare them: We can see from the output table that FINRA reported trades are .0055 worse than NYSE, .024 worse than ISLD and a staggering .056 worse than IEX per share.

Exchange	Trade count	Total Volume	improvement_off_NBBO
AMEX	110	5599	0.064
DRCTEDGE	987	46701	0.084
BEX	173	2878	0.093

BYX	300	6702	0.094
FINRA	3006	211549	0.105
NYSE	210	7090	0.110
PEARL	20	876	0.118
PSX	39	821	0.121
BATS	675	14702	0.122
CHX	56	3036	0.124
NYSENAT	59	1206	0.124
ARCA	1102	33934	0.126
MEMX	244	8701	0.128
ISLAND	3999	146967	0.128
IEX	997	41783	0.162
EDGEA	244	5786	0.167

List of symbols used

SYMBOL,COMPANY NAME,PRICE,CHG,CHG %,VOL

DLHC,DLH Holdings Corp.,\$13.30 ,-0.1,-0.75%,6.36K

DSGR,Distribution Solutions Group Inc.,\$37.56 ,-0.36,-0.95%,19.22K

EBTC,Enterprise Bancorp Inc.,\$34.29 ,0.63,1.87%,13.04K

ECBK,ECB Bancorp Inc.,\$16.75 ,0.05,0.30%,14.66K

EDRY,EuroDry Ltd.,\$16.19 ,0.19,1.19%,18.41K

EMCF,Emclair Financial Corp.,\$32.65 ,-1.22,-3.60%,5.51K

ENCP,Energem Corp. Cl A,\$10.36 ,0.06,0.57%,11.68K

ESSA,ESSA Bancorp Inc.,\$21.42 ,0.24,1.13%,13.27K

EVI,EVI Industries Inc.,\$18.65 ,-0.14,-0.75%,7.85K

FBIZ,First Business Financial Services Inc.,\$39.39 ,0.14,0.36%,16.23K
 FET,Forum Energy Technologies Inc.,\$28.71 ,-0.06,-0.21%,18.31K
 FFBW,FFBW Inc.,\$11.75 ,-0.13,-1.07%,5.95K
 FGBI,First Guaranty Bancshares Inc.,\$23.91 ,-0.19,-0.79%,7.25K
 FLXS,Flexsteel Industries Inc.,\$15.44 ,0.79,5.39%,14.43K
 FMAO,Farmers & Merchants Bancorp Inc.,\$28.58 ,0.06,0.21%,18.03K
 FNLC,First Bancorp Inc.,\$31.20 ,0.3,0.97%,15.77K
 FRBA,First Bank (NJ),\$15.25 ,0.15,0.99%,17.91K
 FRBN,Forbion European Acquisition Corp. Cl A,\$10.21 ,-0.01,-0.05%,5.7K
 FRST,Primis Financial Corp.,\$12.48 ,0.09,0.73%,24.7K
 FRW,PWP Forward Acquisition Corp. I Cl A,\$10.04 ,0.01,0.05%,24.64K
 FSBC,Five Star Bancorp,\$28.33 ,0.08,0.28%,19.22K
 FSBW,FS Bancorp Inc.,\$33.10 ,0.11,0.33%,5.73K
 FSFG,First Savings Financial Group Inc.,\$23.03 ,0.24,1.05%,8.37K
 FSTR,L.B. Foster Co.,\$11.00 ,0.07,0.64%,16.71K
 FVCB,FVCBankcorp Inc.,\$19.87 ,-0.1,-0.50%,18.82K
 GECC,Great Elm Capital Corp.,\$10.23 ,0.03,0.31%,8.23K
 GHM,Graham Corp.,\$10.15 ,0.15,1.50%,7.79K
 GNTY,Guaranty Bancshares Inc.,\$35.80 ,0.4,1.13%,6.84K
 GRRR,Gorilla Technology Group Inc.,\$10.80 ,-0.63,-5.53%,5.28K
 GRVY,GRAVITY Co. Ltd. ADR,\$45.27 ,0.36,0.80%,5.11K
 HBB,Hamilton Beach Brands Holding Co. Cl A,\$13.22 ,-0.52,-3.78%,15.76K
 HBCP,Home Bancorp Inc.,\$42.63 ,0.35,0.83%,11.49K
 HQI,HireQuest Inc.,\$16.60 ,1.7,11.41%,19.53K
 HSON,Hudson Global Inc.,\$22.38 ,-0.06,-0.25%,13.18K
 HURC,Hurco Cos.,\$25.65 ,0.42,1.66%,6.49K
 IESC,IES Holdings Inc.,\$33.17 ,0.05,0.15%,9.88K

