

BANK STOCK INDEXES: A Comparison

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ABSTRACT

This study tests the new Valulytics Equal Weighted Community Bank Index (the Valulytics Index) against the five Fisher tests and the three Lo tests of a valid index. Then, we compare the index with the five best known U. S. bank indexes exploring the effect of market capitalization weighting compared to equal weighting on the usefulness of the indexes by smaller regional community banks.

We find that the Valulytics Index meets all the tests to qualify as a valid index. In addition, our calculations suggest that capitalization weighting adds from 13.4% to 18.8% to the reported index values of community bank indexes compared to equal weighting, with the Valulytics index showing a difference of 15.7% between the equal weighted and capitalization weighted index values.



INTRODUCTION

The nasdaqomx.com (Nasdaq, 2021) web site lists 47,094 stock and bond indexes worldwide. From that listing 898 indexes have the word “Bank” in their name. After eliminating all of the foreign and specialized indexes, we arrive at five U. S. bank indexes for further examination:

- (1) ABA NASDAQ Community Bank Index (ABAQ),
- (2) Nasdaq US Small Cap Banks Index (NQUSS3010),
- (3) NASDAQ OMX ABA Community Bank Index (ABQI),
- (4) KBW Nasdaq Regional Banking Index (KRX), and
- (5) KBW Nasdaq Bank Index (BKX).

We find that all these established bank stock indexes are market capitalization weighted indexes. Since bigger banks have larger market capitalizations, it follows that smaller banks would be underweighted, causing these indexes to be less useful to smaller regional and community banks.

For this reason, Valulytics, Inc. created an equal weighted community bank index (the Valulytics Index) containing 337 publicly traded regional and community banks.

A comparison of the Valulytics Index to the five established capitalization weighted indexes as of November 11, 2021, reveals the following:

- (1) The three small stock indexes have similar mean Total Assets amounts, averaging between \$6.5 Billion and \$7.5 Billion.
- (2) However, the median Total Assets of the Nasdaq US Small Cap Banks Index (NQUSS3010) is significantly higher than the Valulytics Index and the ABA NASDAQ Community Bank Index (ABAQ).
- (3) The minimum Total Assets size for the Valulytics Index is half that of the ABAQ index and one-eighth the size of the Nasdaq US Small Cap Banks Index.
- (4) The market capitalization comparison shows similar results as the Total Assets comparison discussed above.

The four comparisons above reflect the fact that the Valulytics Index includes more of the smaller banks and weights them equally to larger banks and, thus they carry a weighting higher than in any of the other bank stock indexes. In addition, the average unweighted market-to-book ratios appear to be higher for the bigger banks than for the smaller banks.



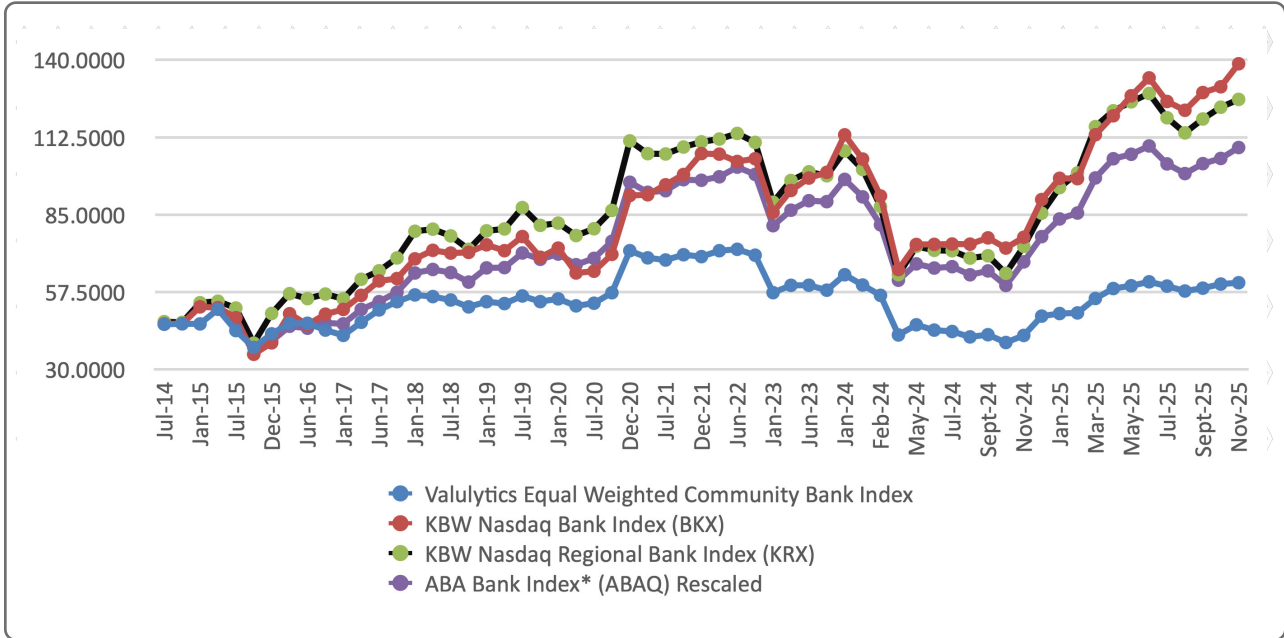
TABLE 1 - Summary Index Comparison

DESCRIPTION	Valuptyics	ABAQ	NQUSS3010	ABQI	KRX	BKX
Sample Size	337	288	244	189	49	24
Total Assets Mean (\$M) (As of 12/31/2020)	\$6,868	\$6,492	\$7,515	\$9,177	\$26,565	\$622,505
Total Assets Median (\$M) (As of 12/31/2020)	\$2,912	\$2,957	\$4,621	\$5,659	\$22,960	\$176,843
Total Assets Minimum (\$M) (As of 12/31/2020)	\$103	\$235	\$848	\$1,258	\$8,942	\$56,310
Market Cap Mean (\$M) (As of 11/11/2021)	\$1,120	\$1,091	\$1,225	\$1,573	\$4,604	\$80,035
Market Cap Median (\$M) (As of 11/11/2021)	\$417	\$455	\$649	\$822	\$3,829	\$32,911
Market Cap Minimum (\$M) (As of 11/11/2021)	\$4	\$24	\$150	\$187	\$1,289	\$5,803
Market/Book Mean (As of 11/11/2021)	1.274	1.320	1.394	1.410	1.484	1.613
Market/Book Median (As of 11/11/2021)	1.183	1.193	1.252	1.255	1.331	1.401
Market/Book Minimum (As of 11/11/2021)	0.322	0.562	0.628	0.628	0.799	0.725
Cap Weighted Market/Book Mean (As of 11/11/2021)	1.511	1.625	1.609	1.646	1.659	1.608
Difference Cap Weighted Vs Equal (As of 11/11/2021)	0.237	0.305	0.215	0.236	0.175	-0.005
% Difference Cap Weighted Vs Equal (As of 11/11/2021)	15.7%	18.8%	13.4%	14.3%	10.5%	-0.3%



This explains the current index differences shown in the following graph:

Valulytics Equal Weighted Index Vs KBW & ABA Value Weighted Indexes



This paper is organized as follows: review of the relevant academic literature, research design, discussion analysis, conclusions, and limitations of the findings for theory, practice, and future research.

II. LITERATURE REVIEW

A stock market index is defined as “an index that measures a stock market, or a subset of the stock market, that helps investors compare current price levels with past prices to calculate market performance. It is computed from the prices of selected stocks (typically a weighted arithmetic mean). Below is a sample of common index weighting methods. In practice, many indexes will impose constraints, such as concentration limits, on these rules:

Market-Capitalization Weighting based indexes weight constituent stocks by its market capitalization (often shortened to “market-cap”), or its stock price multiplied by its number of shares outstanding, divided by the total market capitalization of all the constituents in the index...

Free-float adjusted Market-Capitalization

Weighting based indexes adjust market-cap index weights by each constituent’s shares outstanding for closely or strategically held shares that are not generally available to the public market. Such shares may be held by governments, affiliated companies, founders, and employees. Foreign ownership limits imposed by government regulation could also be subject to free-float adjustments...

Price Weighting based indexes weight constituent stocks by their price per share divided by the sum of all share prices in the index. A price-weighted index can be thought of as a portfolio with one share of each constituent stock. However, a stock split for any constituent stock of the index would cause the weight in the index of the stock that split to decrease, even in the absence of any meaningful change in the fundamentals of that stock...



Equal Weighting based indexes give each constituent stock weights of $1/n$, where n represents the number of stocks in the index. This method produces the least-concentrated portfolios... Equal weight stock indexes tend to overweight small-cap stocks and to underweight large-cap stocks compared to a market-cap weighted index...

Fundamental Factor Weighting based indexes, or fundamentally based indexes, weight constituent stocks based on stock fundamental factors rather [than] stock financial market data. Fundamental factors could include sales, income, dividends, and other factors analyzed in fundamental analysis. Similar to fundamental analysis, fundamental weighting assumes that stock market prices will converge to an intrinsic price implied by fundamental attributes. Certain fundamental factors are also used in generic factor weighting indexes...

Factor Weighting based indexes weight constituent stocks based on market risk factors of stocks as measured in the context of factor models, such as the Fama-French three-factor model. These indexes' common factors include Growth, Value, Size, Yield, Momentum, Quality, and Volatility. Passive factor investing strategies are sometimes known as "smart beta" strategies. Investors could use factor investment strategies or portfolios to complement a market-cap weighted indexed portfolio by tilting or changing their portfolio exposure to certain factors...

Volatility Weighting based indexes weight constituent stocks by the inverse of their relative price volatility. Price volatility is defined differently by each index provider, but two common methods include the standard deviation of the past 252 trading days (approximately one calendar year), and the weekly standard deviation of price returns for the past 156 weeks (approximately three calendar years)...

Minimum Variance Weighting based indexes weight constituent stocks using a mean-variance optimization process. In volatility weighted indexes, highly volatile stocks are given less weight in the index, while in a minimum variance weighting index, highly volatile stocks that are negatively correlated with the rest of the index can be given relatively larger weights than they would be given in the volatility weighted index." (Wikipedia, 2021).

There are two major theoretical frameworks used to construct price indexes: (1) the Laspeyres method and (2) the Paasche method. (Diewert, 1998).

"The Laspeyres Price Index is a price index used to measure the economy's general price level and cost of living, and to calculate inflation. The index commonly uses a base year figure...A key differentiator between the Laspeyres Price Index and other indexes ... is that it uses weights taken from a base period." (Diewert, 1998).

The formula for the Laspeyres Price Formula is as follows:

$$\left\{ \text{Laspeyres Price Index} = \left[\frac{\sum (P_{i,t}) \times (Q_{i,0})}{\sum (P_{i,0}) \times (Q_{i,0})} \right] \times 100 \right\}$$

Where:

P_{i,0} is the price of the individual item at the base period and **P_{i,t}** is the price of the individual item at the observation period.

Q_{i,0} is the quantity of the individual item at the base period."

(Corporate Finance Institute, 2021-1)



“The Paasche Price Index is a consumer price index used to measure the change in the price and quantity of a basket of goods and services relative to a base year price and observation year quantity. Developed by German economist Hermann Paasche, the Paasche Price Index is commonly referred to as

the “current weighted index... The main differentiator between the Paasche Index and the Laspeyres Price Index is that the former uses current-period quantity weightings while the latter uses base-period quantity weightings...

The formula for the Paasche index is as follows:

$$\left\{ \text{Paasche Price Index} = \left[\frac{\sum (P_{i,t}) \times (Q_{i,t})}{\sum (P_{i,0}) \times (Q_{i,t})} \right] \times 100 \right\}$$

Where:

P_{i,0} is the price of the individual item at the base period, and **P_{i,t}** is the price of the individual item at the observation period.

Q_{i,t} is the quantity of the individual item at the observation period.

(Corporate Finance Institute, 2021-2)

The Laspeyres methodology is used more often than the Paasche methodology due to updating difficulties associated with the Paasche methodology. Updating a Paasche index would require recalculating previous periods index values each month to adjust for changes in quantities.

However, notwithstanding its practical benefits over the Paasche methodology, the following issues have been raised with using the Laspeyres methodology: (1) the substitution bias, and (2) quality change and new goods bias (Diewert, 1998).

The substitution bias involves the buyer purchasing goods from a cheaper supplier. Thus affecting the average price and total quantity sold of the good as an input into an index number formula.

In addition, “every year, statistical agencies find that some of the commodities that they are pricing in various outlets disappear ... The typical disappearance rate of goods from the outlet where they were previously surveyed is about 20 percent per year. Some of these disappearances are due to seasonal factors and temporary inventory outages, but a substantial fraction result from improved models ... The appearance of new goods offers an additional problem for a fixed-weight index.” (Diewert, 1998).

These and other index issues drove Irving Fisher to develop “several tests that he thought any acceptable index number ought to satisfy... T1: Proportionality

Test: If all prices increase by a constant factor, then the index must show exactly this increase, ... T2: Circular Test: A price index should be independent of the choice of a third time point. Therefore, it should be possible to decompose it into a product of two similar price indexes with the base of one equal to the current time point of the other. ... T3: Determinateness Test: If any argument in the index function *f* becomes zero or infinite, then *f* must not vanish, become infinite, or become indeterminate... T4: Commensurability Test: A price index must be independent of the units of measurement... T5: Factor Reversal Test: In *f*, replace *p* by *x*, and *x* by *p*... The product of the price and quantity indexes should be a ratio of values. (Swamy, 1965)

In addition, Andrew W. Lo proposes “broadening the definition of an index using a functional perspective. Any portfolio strategy that satisfies three properties should be considered an index if: (1) it is completely transparent, (2) it is investable, and (3) it is systematic (i.e. it is entirely rules-based and involves no judgment or unique investment skill). (Lo, 2016)

In the United States, there are five major bank stock indexes, two created by Keefe, Bruyette & Woods – the KBW Nasdaq Bank Index (KBX) and the KBW Regional Banking Index (KRX), two created by the American Bankers Association – the ABA Bank Index (ABAQ) and the NASDAQ OMX ABA Community Bank Index (ABQI) and one created by Nasdaq itself – the NASDAQ US Small Cap Banks Index (NQUSS3010).



A brief description of each index follows:

KBW Nasdaq Bank Index (BKX)

The KBW Nasdaq Bank Index is designed to track the performance of leading banks and thrifts that are publicly-traded in the U.S. The Index includes banking stocks representing large U.S. national money centers, regional banks and thrift institutions.

The KBW Nasdaq Bank Index is a modified market capitalization weighted index. The value of the Index equals the aggregate value of the Index share weights, also known as the Index Shares, of each of the Index Securities multiplied by each such security's Last Sale Price and divided by the divisor of the Index. The divisor serves the purpose of scaling such aggregate value to a lower order of magnitude which is more desirable for Index reporting purposes. The Index began on October 21, 1991, at a base value of 250, as adjusted. (KBW Nasdaq Bank Index, 2018)

KBW Nasdaq Regional Banking Index (KRX)

The KBW Nasdaq Regional Banking Index is designed to track the performance of U.S. regional banks and thrifts that are publicly traded in the U.S. The KBW Nasdaq Regional Banking Index is a modified market capitalization weighted index. The value of the Index equals the aggregate value of the Index share weights, also known as the Index Shares, of each of the Index Securities multiplied by each such security's Last Sale Price and divided by the divisor of the Index. The divisor serves the purpose of scaling such aggregate value to a lower order of magnitude which is more desirable for Index reporting purposes. The Index began on July 25, 2005, at a base value of 99.96. (KBW Nasdaq Regional Banking Index, 2018)

ABA NASDAQ Community Bank Index (ABAQ)

The ABA NASDAQ Community Bank Index is designed to track the performance of banks and thrifts or their holding companies listed on The Nasdaq Stock Market as selected by the American Bankers Association (ABA)... The Index is a market capitalization-weighted index. Index Security weights are determined by dividing each Index Security's market capitalization by the aggregate market capitalization of all Index Securities. (ABA NASDAQ Community Bank Index, 2020)

NASDAQ OMX ABA Community Bank Index (ABQI)

The NASDAQ OMX ABA Community Bank Index is designed to measure the performance of a subset of securities included in the ABA Nasdaq Community Bank Index (ABAQ). The Index is a modified market capitalization-weighted index. To be included in the NASDAQ OMX ABA Community Bank Index, a security must be included in the ABA Nasdaq Community

Bank Index (ABAQ). An issuer must have a market capitalization of at least \$200 million (USD). (NASDAQ OMX ABA Community Bank Index, 2020)

NASDAQ US Small Cap Banks Index (NQUSS3010)

The Nasdaq US Small Cap Banks Index is a float adjusted market capitalization-weighted index which includes securities in the US Small Cap Index that are classified as Banks Supersector according to the Industry Classification Benchmark (ICB). (NASDAQ US Small Cap Banks Index, 2021)

Each of the above indexes are market capitalization weighted. This means that bigger banks are weighted heavier than smaller banks. Consequently, small banks prices are underrepresented in the index values.

As noted above, the indexes share another common trait. They all use Stock Price as the Numerator (times the bank's capitalization weighting). Compared to market-to-book ratios, stock prices themselves don't carry any particular significance. They only become significant when multiplied by the number of shares outstanding.

On the other hand, the market-to-book ratio has been "interpreted as indicating expected return on equity" (Graham, Dodd and Cottle, 1962) and "as a growth indicator" (Preinreich (1932), Kay (1976) and Brief and Lawson (1992). Penman (1996) concludes that because the market-to-book ratio "reflects future profitability (and is unaffected by current profitability) it is nominated as the appropriate indicator of earnings growth." The market-to-book numerator reflects future growth and the denominator reflects current net worth. Combined, they reflect the true value of a bank.

It would follow that an equal weighted index comprised of market-to-book ratios would reflect smaller bank values better than the currently available indexes.

Consequently, this paper creates such an equal weighted index (the Valulytics Index) and compares it to the five-market capitalization weighted U. S. bank indexes described above.



III. RESEARCH DESIGN

Purpose

To compare the Valulytics Index to the five established capitalization weighted bank indexes.

Sampling

From the nasdaqomx.com (Nasdaq, 2021) web site, we downloaded a listing of 47,094 indexes worldwide that Nasdaq follows. From that listing we extracted 898 indexes with the word "Bank" in their name. We examined the listing noting that all but 7 of the indexes contained foreign banks or were otherwise unsuitable for our analysis of United States regional or community banks. We further eliminated 2 indexes from our listing to arrive at five bank stock indexes for further investigation: (1) ABA NASDAQ Community Bank Index (ABAQ), (2) Nasdaq US Small Cap Banks Index (NQUSS3010), (3) NASDAQ OMX ABA Community Bank Index (ABQI), (4) KBW Nasdaq Regional Banking Index (KRX), and (5) KBW Nasdaq Bank Index (BKX).

From the Nasdaq.com web sites, we downloaded the listing of component banks for each index, and, matching those banks with the component banks in the Valulytics Index, arrived at a sample size of 468 publicly traded banks. From the Seeking Alpha website, we downloaded each bank's market capitalization and market-to-book ratio as of November 11, 2021 and, from the Mergent Online database, we downloaded each bank's total assets as of December 31, 2020. Thirty-seven banks were eliminated due to lack of data, resulting in a final sample size of 431 banks.

Variables

The Nasdaq index component listings did not report each bank's capitalization weighting used to calculate each index's capitalization weighted index, so we calculated a market capitalization weighted index as of November 11, 2021, using the relative market capitalization amounts for each bank that comprised each index.

We then calculated the capitalization weighted average market-to-book ratio for each index.

The resulting variables that we examined for each bank for each index were: (1) total assets, (2) market capitalization, (3) actual market-to-book ratio as of November 11, 2021, and (4) capitalization weighted market-to-book ratio for each index.

Statistical and Theoretical Tests

To determine whether each index's capitalization weighting methodology underweights small regional community banks, we performed the following

statistical calculations that are summarized on Table 1 in the Introduction section of this paper:

- (1) For total assets, market cap, and market-to-book ratio, we calculated the following:
 - a. Mean.
 - b. Median.
 - c. Minimum.
- (2) We calculated the capitalization weighted market to-book ratio for the total sample and each index's sub sample for comparison purposes.
- (3) We performed the following Fisher Tests of the Valulytics Index (Swamy, 1965):
 - a. T1: Proportionality Test: If all prices increase by a constant factor, then the index must show exactly this increase.
 - b. T2: Circular Test: A price index should be independent of the choice of a third time point. Therefore, it should be possible to decompose it into a product of two similar price indexes with the base of one equal to the current time point of the other.
 - c. T3: Determinateness Test: If any argument in the index function f becomes zero or infinite, then f must not vanish, become infinite, or become indeterminate.
 - d. T4: Commensurability Test: A price index must be independent of the units of measurement.
 - e. T5: Factor Reversal Test: In the index function f , replace p by x , and x by p . The product of the price and quantity indexes should be a ratio of values.
- (4) We performed the following Lo Tests of the Valulytics Index (Lo, 2016):
 - a. It is completely transparent.
 - b. It is investable.
 - c. It is systematic (i.e. it is entirely rules-based and involves no judgment or unique investment skill)



IV. DISCUSSION

The Valulytics Index, based on a sample of 337 publicly traded regional and community banks, had a mean total assets size of \$6.868 Billion (a median total assets value of \$2.912 Billion and a minimum total assets value of \$103 Million) at December 31, 2020. The mean value is within \$376 Million of the smallest mean value (the ABAQ index), the median value is \$45 Million lower than the ABAQ index, and the minimum value is \$132 Million lower than the ABAQ index. The relationships to the other indexes are even starker – clearly showing that the Valulytics Index contains more of the smaller regional and community banks than any other U. S. bank stock index.

A comparison of the mean, median, and minimum November 11, 2021, market cap numbers reveals the same pattern, showing an even larger disparity when comparing the minimum market capitalization numbers between the indexes – clearly showing that the Valulytics Index contains more of the smaller regional and community banks than any other U. S. bank stock index.

For the November 11, 2021, market-to-book numbers, summarized in Table 2 below, the mean, median, and minimum market-to-book ratio comparison between the six indexes reveals a clear pattern of increased market-to-book ratios as the bank sizes increase.

TABLE 1 - Summary Index Comparison

DESCRIPTION	Valulytics	ABAQ	NQUSS3010	ABQI	KRX	BKX
Sample Size	337	288	244	189	49	24
Total Assets Mean (\$M) (As of 12/31/2020)	\$6,868	\$6,492	\$7,515	\$9,177	\$26,565	\$622,505
Total Assets Median (\$M) (As of 12/31/2020)	\$2,912	\$2,957	\$4,621	\$5,659	\$22,960	\$176,843
Market/Book Mean (As of 11/11/2021)	1.274	1.320	1.394	1.410	1.484	1.613
Market/Book Median (As of 11/11/2021)	1.183	1.193	1.252	1.255	1.331	1.401
Cap Weighted Market/Book Mean (As of 11/11/2021)	1.511	1.625	1.609	1.646	1.659	1.608



Is this pattern statistically significant? To find out, we combined all of the banks included in any of the above indexes and performed correlations between their

market-to-book ratio and their total assets. The results are shown below for the Pearson parametric and Kendall's and Spearman's non-parametric correlations:

		Combined M/B	Combined Assets
Combined M/B	Pearson Correlation	1	.036
	Sig. (2-tailed)		.452
	N	431	431
Combined Assets	Pearson Correlation	.036	1
	Sig. (2-tailed)	.452	
	N	431	431

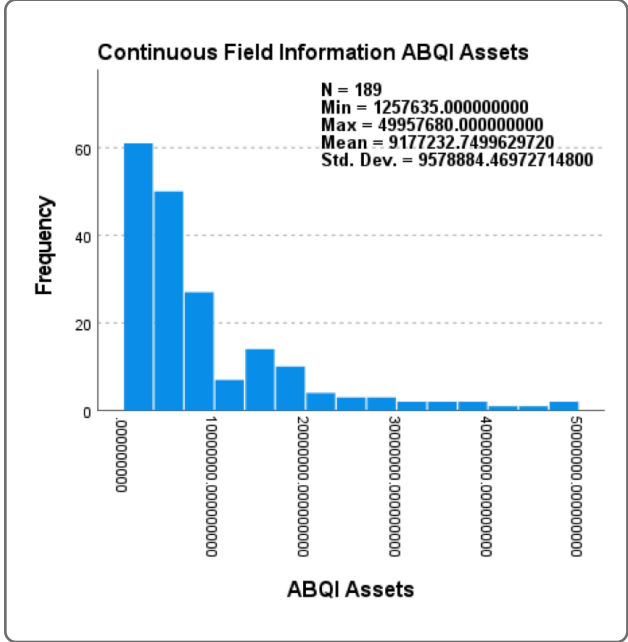
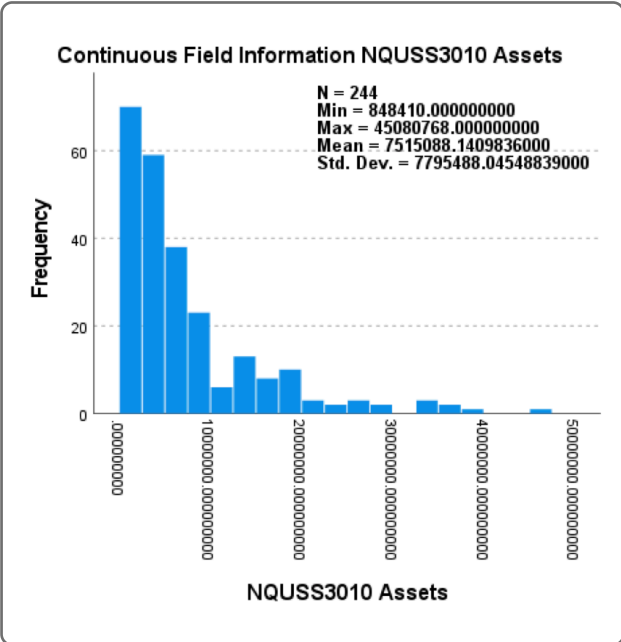
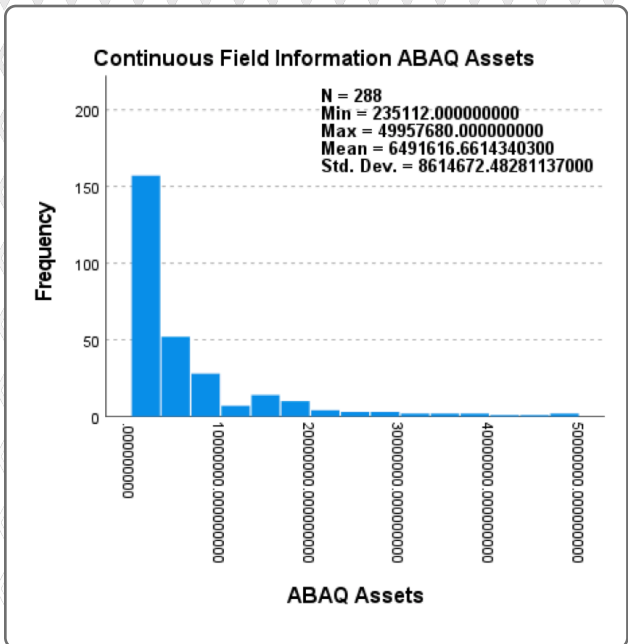
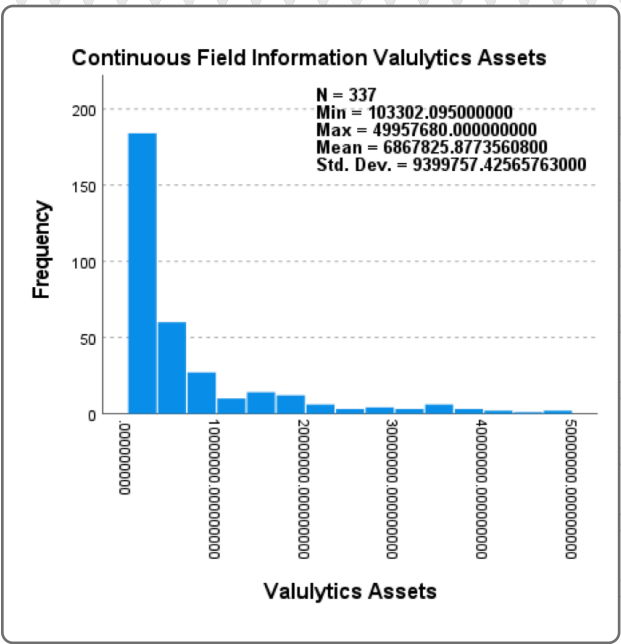
		Combined M/B	Combined Assets
Kendall's tau_b	Combined M/B	Correlation Coefficient	1.000
		Sig. (2-tailed)	.265**
		N	431
	Combined Assets	Correlation Coefficient	.265**
		Sig. (2-tailed)	1.000
		N	431
Spearman's rho	Combined M/B	Correlation Coefficient	1.000
		Sig. (2-tailed)	.383**
		N	431
	Combined Assets	Correlation Coefficient	.383
		Sig. (2-tailed)	1.000
		N	431

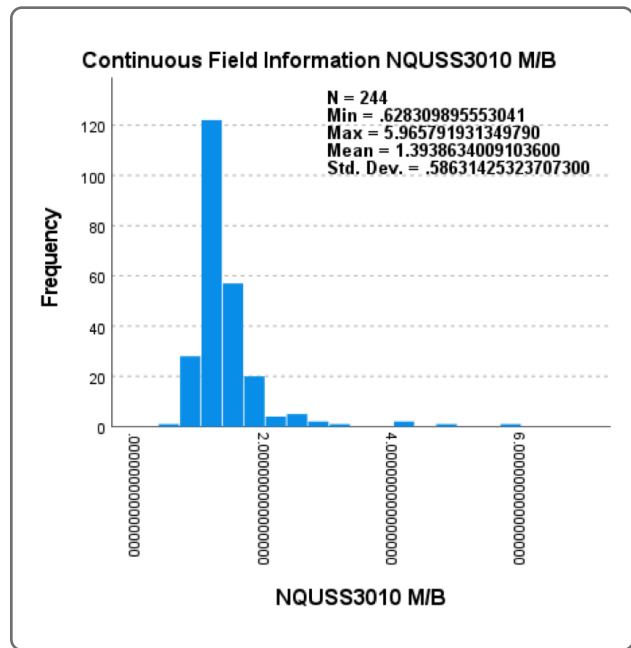
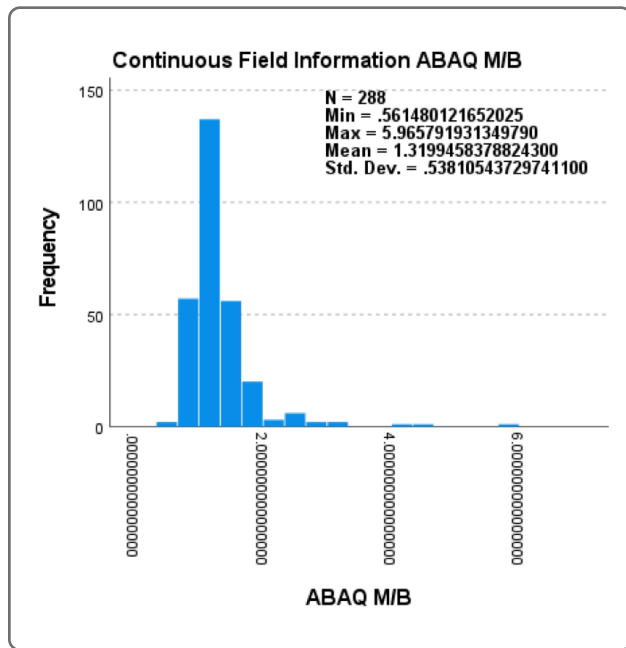
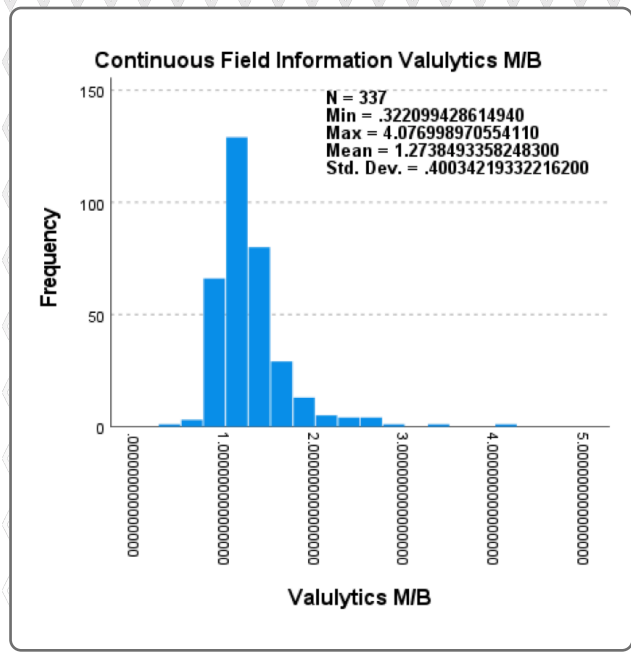
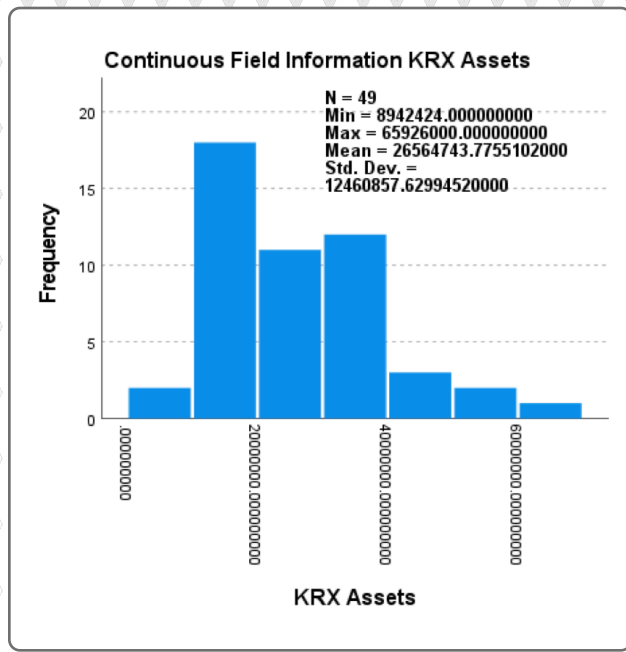
** . Correlation is significant at the 0.01 level (2-tailed).

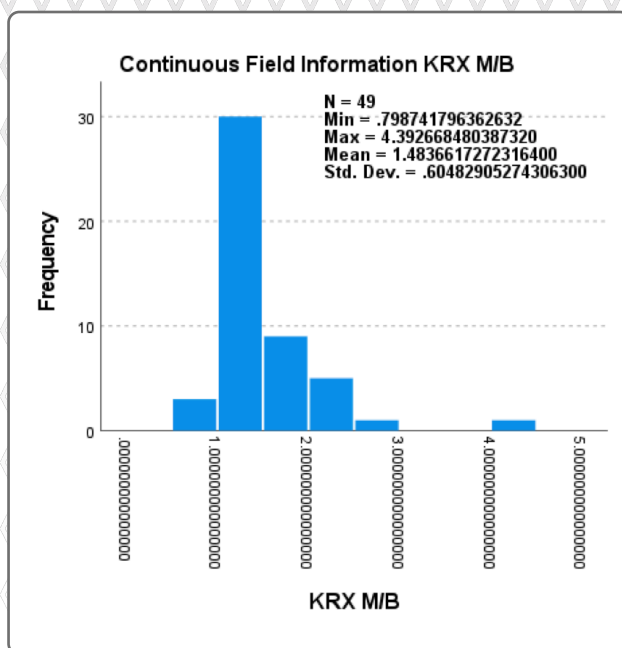
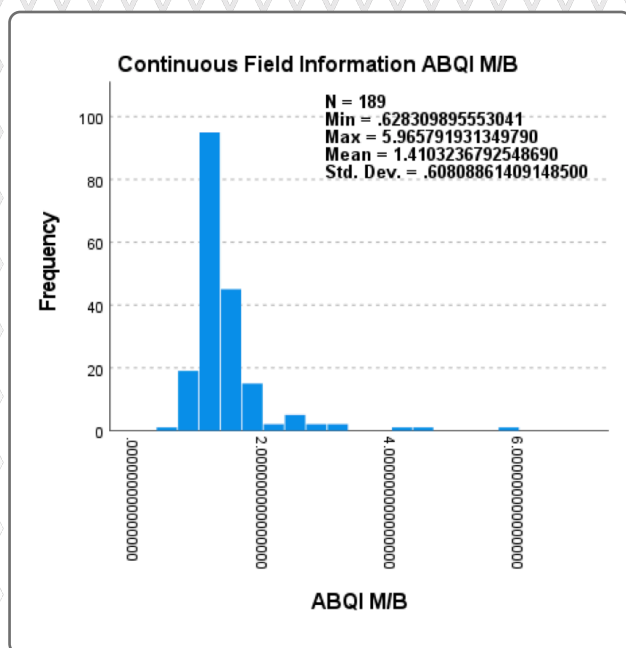
It appears that there is a small positive statistically significant correlation between banks' market-to-book ratios and their asset sizes for the sample as a whole, resulting in bigger banks earning higher market-to-book ratios.

Comparing the distribution of assets and market-to-book ratios between the various indexes is a little more revealing.









CONCLUSION

This study tests whether the new Valulytics Equal Weighted Community Bank Index methodology qualifies the index as a valid index. Then, it compares the Valulytics Index to the five established U. S. bank indexes.

We find that the Valulytics Index meets all the tests to qualify as a valid index.

In addition, our calculations suggest that capitalization weighting adds from 13.4% to 18.8% to the reported index values of community bank indexes compared to equal weighting, with the Valulytics index showing a difference of 15.7% between the equal weighted and capitalization weighted index values.

Contribution to Knowledge and Limitations

This article tests the new Valulytics Equal Weighted Community Bank Index (the Valulytics Index) against the five Fisher tests and the three Lo tests of a valid index. Then, we compare the index to the five best known U. S. bank indexes exploring the effect of market capitalization weighting compared to equal weighting on the usefulness of the indexes by smaller regional community banks.

This article provides empirical evidence of the effect of Market Cap weighting compared to Equal weighting in Bank Stock indexes.

Further study on this topic would include comparing our calculated values as of November 11, 2021, to other time periods and to other banks not included in this study.

Future research may be strengthened by introducing a larger set of variables. Regulators, for example, use a review process that focuses on capital analysis, asset quality, management quality, earnings, liquidity, and sensitivity to market factors (also known as CAMELS). Creating additional variables based on the CAMELS approach may provide more statistically significant results. This study also does not control for individual bank non-financial characteristics that would impact the reported Market-to-Book values.



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