



FOMO in equity markets? Concentration risk in (sustainable) investing

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Pensioen Pro

Geconcentreerde portefeuille Huisartsen 'riskante strategie'

Tiibbe Hoekstra

13 december 2024

Richtingenstrijd bij PGGM over duurzame beleggingen

Marceline Bresson Gerben van de Marel 23 december 2024

Eumedion waarschuwt voor 'overdiversificatie'

Maarten van Wijk

14 november 2024

Het bezit van duizenden bedrijven in een index betekent in feite overdiversificatie, aldus PGGM-cio Lars Dijkstra. Dat levert duurzaamheidsrisico's op.



PME Goes Back To The Future – PME Pensioenfonds



Tjibbe Hoekstra | March 2023 (Magazine)

Marcel Andringa (pictured) of PME, the Dutch pension fund for the metal and electronics industry, talks to Tiibbe Hoekstra about the fund's decision to ditch index investing and move to a more concentrated portfolio



Turmoil at Alecta as CEO fired and equity revamp promised

Alecta, known for maintaining a very concentrated equity portfolio, has also begun reducing risk from its large stakes in companies far from its home market, focused particularly on holdings in the US.





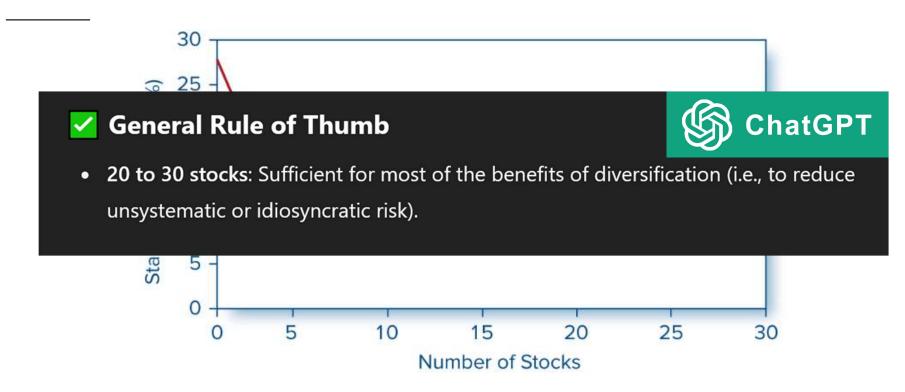


Background

- Standard practice of institutional investors: equity portfolios with 1000s of stocks
- More recently, trend towards more concentrated portfolios
 - Sustainable / ESG investing
 - "Know what you own" / reputation (perhaps even litigation) risks
 - ESG / climate risk measurement & management
 - · Active engagement with companies
- Broader relevance: median # of stocks of international equity mutual funds is only 86 (Dyakov, Jiang & Verbeek, 2020)
- Our research question:
 - "How is the financial performance of global equity portfolios affected by greater concentration (based on sustainability criteria)?"



Classical answer



Source: Zvi Bodie, Alex Kane, and Alan J. Marcus (BKM), 2023, Investments, 13th international student edition, McGraw-Hill, p. 203 – update of Statman (1987 JFQA): NYSE backtest 2008-2017



Is the classical answer still correct?

- Not sure!
- Classical answer...
 - · may be outdated
 - is mainly based on US data
 - is based on random draws
 - · is not based on ESG criteria
 - stock market concentration increases over time (Emery & Koëter 2024; Jiang, Vayanos, & Zheng, 2025)
 - only looks at volatility, not at returns
 - Bessembinder (2018) & Bessembinder et al. (2023) show most stocks underperform risk-free rate + equity premium stems from just 2-4% of stocks!

So let's figure this thing out!



Our data

- Comprehensive global stock returns database (CRSP for US; Compustat for Global)
 - Based on Jensen-Kelly-Pedersen WRDS integration (Jensen, Kelly & Pedersen, 2023)
 - 87,266 unique stocks from 47 countries (around 25,000 stocks on average each year)
 - Monthly data January 1985 December 2023 (468 months)
 - ESG data 2003-2021 from 5 ESG rating agencies: FTSE, ISS, MSCI, Refinitiv, S&P Global
- Most analyses based on pseudo MSCI ACWI sample
 - Top 2500 largest stocks each month
 - Actual MSCI ACWI has 2,558 constituents from the same 47 countries with similar country and industry composition



Our approach

- We backtest hypothetical portfolios with N = 10, 50, 100, ..., 1500 stocks
 - each month, we draw N stocks from universe and form portfolios
 - draw is repeated each month, for each N we take 10,000 draws (1,000 draws for optimal portfolios)
- Many different ways of doing this:
 - Different samples: all stocks vs. pseudo MSCI ACWI
 - Different portfolio formation: equal weights (EW), market cap weights (VW), "optimal" weights
 - **Different drawing probability**: equal probability vs. probability based on "optimal" allocation vs. probability based on ESG rating
- We report:
 - Historical performance of portfolios for each N (mean, 95% confidence band around mean)
 - Performance: volatility, average return, Sharpe ratio, tracking error, downside risk (2.5th percentile)

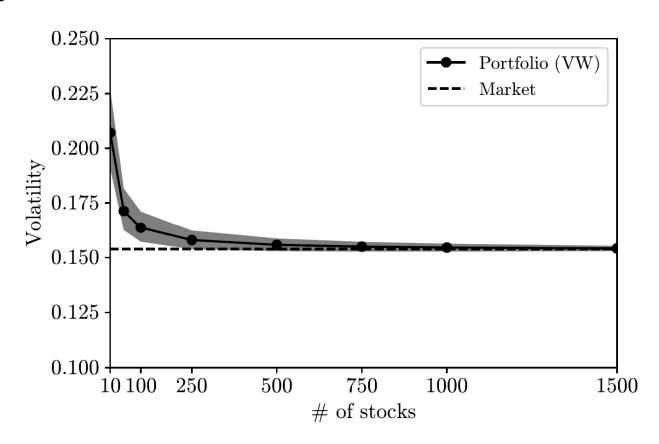


Our limitations

- In-sample analysis: some findings may be due to "chance patterns" (noise) in historical data that may not show up going forward
 - Particular concern with ESG analyses with only 20 years of data
 - Focus on traditional risks: climate risks and other ESG risks may not show up in data
- Hard to replicate real-life investing: so many possible choices
 - Idea is that random draws may reflect some of this
- Equity only: smaller N may be sufficient in portfolio that also contains other asset classes
- Purely financial analysis: other possible valid motivations for concentrated portfolios:
 - Ethical considerations
 - Know what you own / (climate) risk measurement and management
 - Engagement / impact



Volatility (ACWI, equal drawing probability, VW portfolios)



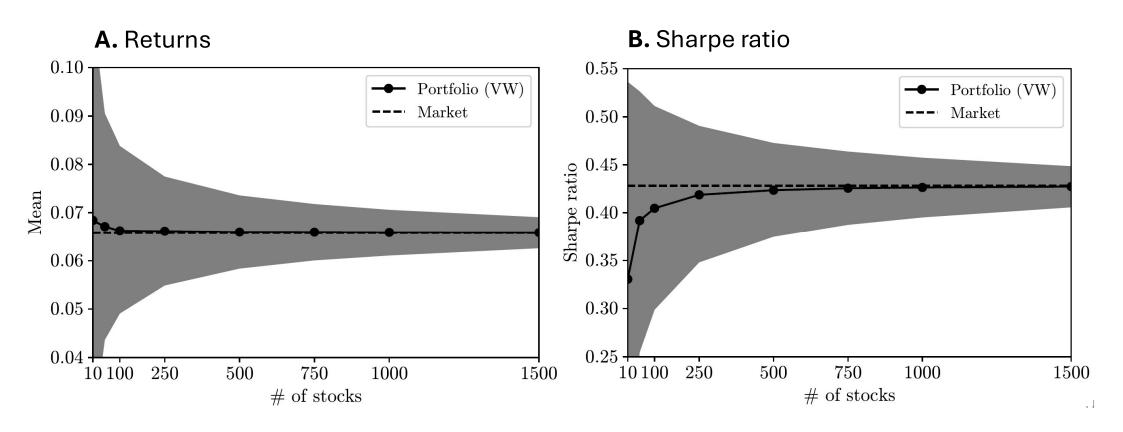


Motivating FOMO: Bessembinder et al.

- Bessembinder (2018) & Bessembinder, et al. (2023):
 - majority of stocks underperform risk-free rate
 - very small fraction of stocks account for equity premium: 4.3% of U.S. stocks over 1926-2016 and 2.4% of global stocks over 1990-2020.
- Replication of these findings in our sample:
 - Only 41% of 87,266 stocks positively contribute to wealth creation over 1985-2023
 - Top 5 stocks: Apple (3.8% of global wealth creation), Microsoft (3.2%), Amazon (1.5%), NVIDIA (1.2%), Alphabet (0.9%), Exxon Mobile (0.86%)
 - Top-performing 30 stocks (0.03% of all stocks) account for 25% of global stock market wealth creation
 - Top-performing 162 stocks (0.19%) account for 50% of wealth creation
 - Top-performing 1,871 stocks (2.1%) account for all global wealth creation



FOMO risk? (ACWI, equal drawing probability, VW portfolios)



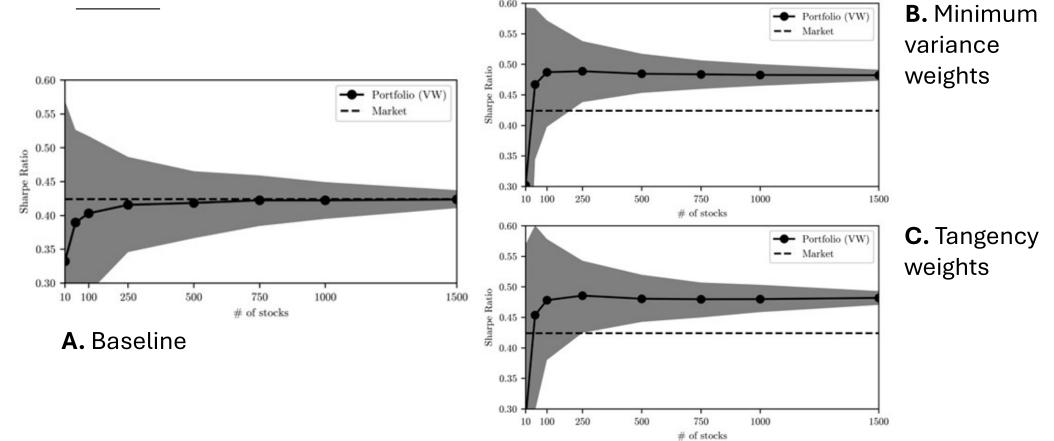


Optimal concentrated portfolios

- We construct "optimal" portfolios in three ways:
 - 1. Minimum variance
 - 2. Tangency (maximum) Sharpe ratio
 - 3. Black-Litterman
- Approach:
 - Using factor correlations + stock-level volatility & factor loadings/t-stats over prior 60 months (min. 48m)
 - Using Woodbury Matrix Identity to infer correlations across stocks
 - 8 factors: Fama-French 5 Developed *Size*, *Value*, *Profitability* & *Investment* factors + separate market factor by region (North America, Europe, Asia-ex Japan, and Japan)
 - We restrict weights to be positive and at most twice their equal weight
 - · Drawing probabilities can also be based on optimal weights
 - Universe is pseudo ACWI



Sharpe ratio: Optimal weights (ACWI)





Findings on optimal portfolios

- Optimal portfolios have higher mean Sharpe ratio
 - Optimal selection adds relatively little over optimal weights within portfolio
 - Tangency adds very little over minimum variance
- Optimal portfolios have quicker convergence to market Sharpe ratio
 - Diversification virtually "complete" by 100 < N < 250 (instead of N = 750 in baseline)
 - Still quite incomplete at N = 50
 - Caveats: based on 1,000 draws instead of 10,000 draws + contaminated by returns for small N
- Optimal portfolios still have substantial FOMO risk though seemingly slightly lower
 - Philosophically speaking, FOMO risk cannot be decreased by changing weights and/or drawing probability → VW portfolios still potentially viable alternative

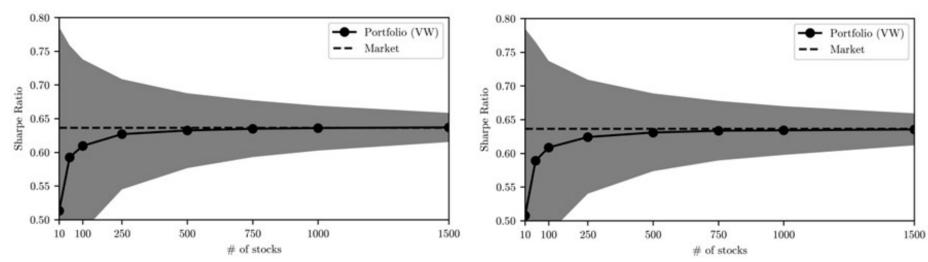


Concentrated portfolios based on ESG scores

- We rescale all five ESG ratings (FTSE, ISS, MSCI, Refinitiv, S&P) from 0 to 100
- We then let drawing probability depend on ESG score:
 - Based on stock's Z-score in cross-sectional ESG rating distribution within GICS sector
 - Stock-level Z-score averaged across multiple rating agencies
 - Highest (lowest) Z-score → drawing probability of twice (half) uniform drawing probability
 - For stocks without ESG score, drawing probability is halved
- We also redo our baseline analysis excluding sin stocks
 - Inspired by Hong and Kacperczyk (2009)



Sharpe ratio: ESG analysis (ACWI, VW portfolios, 2003-2021)



A. Baseline

B. ESG-based drawing probability



Conclusions

- 1st main result: in recent global sample, 30-40 stocks are insufficient to diversify
 - Three ways to "speed up" diversification:
 - "Smarter" stock selection based on low correlations
 - Impose maximum weight on individual stocks
 - Maintain industry composition of MSCI ACWI
- 2nd main result: concentrated portfolios exhibit FOMO risk
 - Economically, arguably even more important than insufficient diversification
 - Baseline backtests, 95% confidence bound around mean return is still 1% at N = 1000
 - €1 with 7% (instead of 6%) return over 30 years yields €7.6 (instead of €5.7)
 - Philosophically speaking, FOMO cannot be diminished, depends on investor perspective on reasonable benchmark



Literature

Evans & Archer (1968 JF): 8-10 stocks

Solnik (1974 FAJ): 15 stocks

Statman (1987 JFQA): 30-40 stocks

Alexeev & Tapon (2014 JoIS): >73 stocks

• Bender & Sun (2023 JPM): 100-200 stocks to keep tracking error below 1%

• Zaimovic, Omanovic & Arnaut-Berilo (2021 JRFM) review of 150 studies:

- No single answer to question "how many stocks needed for diversification?"
- Size of well-diversified portfolio larger now than in past
- Size of well-diversified portfolio smaller in emerging markets



Summary statistics (pseudo MSCI ACWI sample)

-	obs.	mean	std	25%	50%	75%
Return	1,170,000	0.61%	10.76%	-4.95%	0.45%	5.94%
Size	1,170,000	12,584	38,485	2,042	5,037	11,021
Beta	1,009,356	1.02	0.48	0.72	0.99	1.26
B/M	1,055,721	0.56	0.54	0.25	0.45	0.74
Profitability	917,341	0.30	0.29	0.13	0.24	0.40
Investment	1,037,034	0.22	2.64	0.00	0.08	0.20
Momentum	1,119,732	0.21	0.58	-0.07	0.12	0.35
Quality	868,076	0.33	0.89	-0.36	0.42	1.10
Idio vol	1,047,673	1.58%	0.97%	0.96%	1.35%	1.92%
ESG FTSE	149,271	0.16	0.98	-0.58	0.20	0.92
ESG ISS	182,026	0.01	0.98	-0.74	-0.19	0.62
ESG MSCI	383,421	0.04	1.01	-0.64	0.01	0.71
ESG Refinitiv	374,699	0.14	1.02	-0.68	0.11	0.94
ESG S&P	363,912	0.10	1.03	-0.68	-0.25	0.75
ESG	466,798	0.05	0.74	-0.46	0.01	0.53



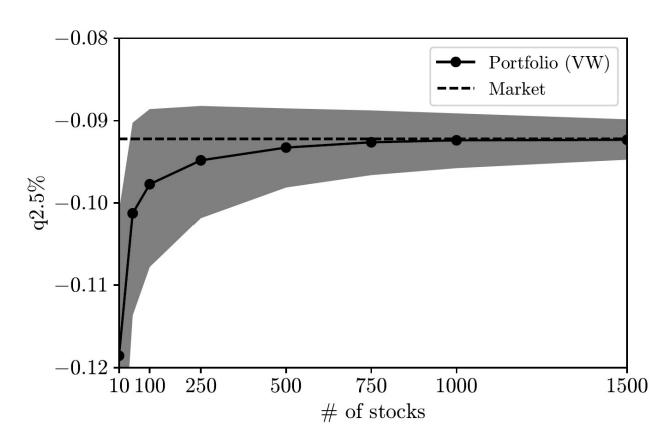
Global equity premium

	mean	volatility	Sharpe ratio	drawdown
All stocks (1985-2023)	6.9%	15.5%	0.44	-9.2%
ACWI (1985-2023)	6.8%	15.4%	0.44	-9.2%
ACWI ex. JPN (1985-2023)	7.6%	15.4%	0.49	-9.3%
ACWI ex. MAG7 (1985-2023)	6.5%	15.3%	0.42	-9.3%
ACWI ex. Top10 (1985-2023)	7.0%	15.5%	0.45	-9.3%
ACWI ex. small decile (1985-2023)	6.8%	15.4%	0.44	-9.2%
ACWI (2014-2023)	7.2%	14.1%	0.51	-7.5%
ACWI ex. MAG7 (2014-2023)	6.0%	13.9%	0.43	-7.5%
ACWI (2003-2021)	9.6%	15.1%	0.64	-9.2%
ACWI ex. Bottom 10% ESG (2003-2021)	9.5%	15.2%	0.63	-9.0%
ACWI ex. Top 10% ESG (2003-2021)	9.5%	15.1%	0.63	-9.2%

	81	(1)	(2)	(3)	(5)	(6)
Netspar	Beta	0.071	0.114	0.031		0.054
and the same of th		(0.41)	(0.65)	(0.21)		(0.29)
	ln(Size)	0.018	0.033	-0.003		-0.072**
		(0.62)	(1.08)	(-0.10)		(-2.42)
Anomalies (ACWI)	B/M	0.256*	0.353**	0.483***		0.192*
		(1.88)	(2.40)	(5.17)		(1.66)
	Profitability		0.667***	0.484***		0.379*
			(4.24)	(3.11)		(1.87)
	Investment		-0.174	-0.165*		-0.068
			(-1.47)	(-1.76)		(-0.60)
	Return t-1			-0.018***		-0.012*
				(-3.61)		(-1.69)
	Momentum			0.664***		0.323
				(3.73)		(1.17)
	Quality			0.117***		0.093**
				(3.39)		(1.97)
	Idio vol			-15.151***		-8.307
				(-2.84)		(-1.17)
	ESG				0.028	0.033
	360		*		(0.51)	(0.78)
	#obs.	958,730	816,002	713,728	468,479	362,831
	Period	1985-2023	1985-2023	1985-2023	2003-2021	2003-2021

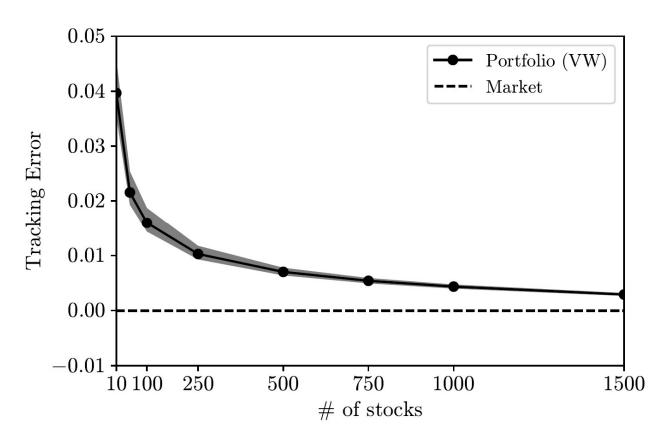


Drawdown (ACWI, equal drawing probability, VW portfolios)



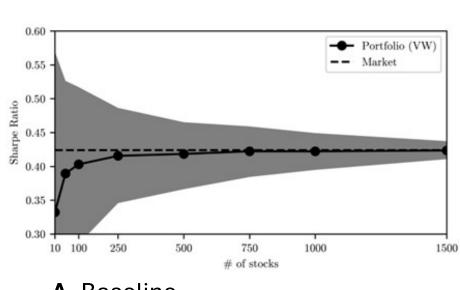


Tracking error (ACWI, equal drawing probability, VW portfolios)

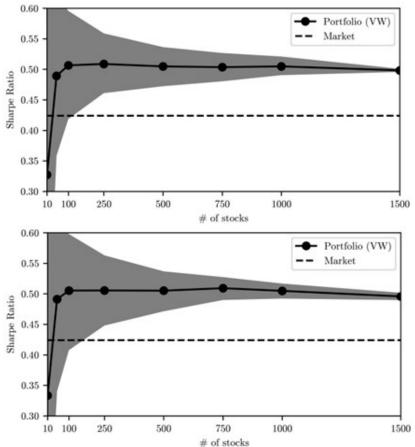




Sharpe ratio: Optimal weights + drawing probability (ACWI)



A. Baseline

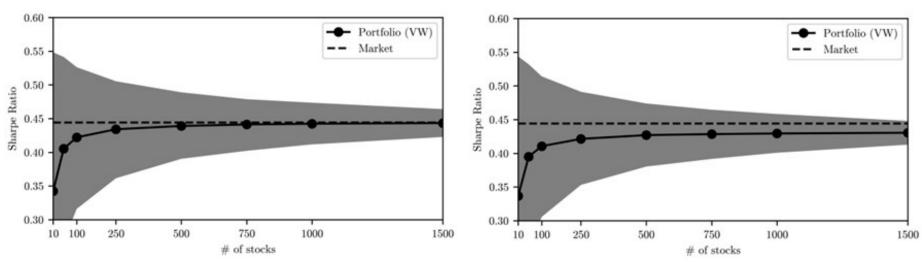


B. Minimum variance weights + drawing probability

C. Tangency weights + drawing probability



Sharpe ratio: Sinless portfolios (ACWI, VW portfolios, 1985-2023)



A. All industries

B. Excluding sin industries