FRONTIER MARKET
ASSET MANAGMENT

The Magic of "Low-Vol" in Frontier Markets
Standard Deviation & Country Cross-correlations

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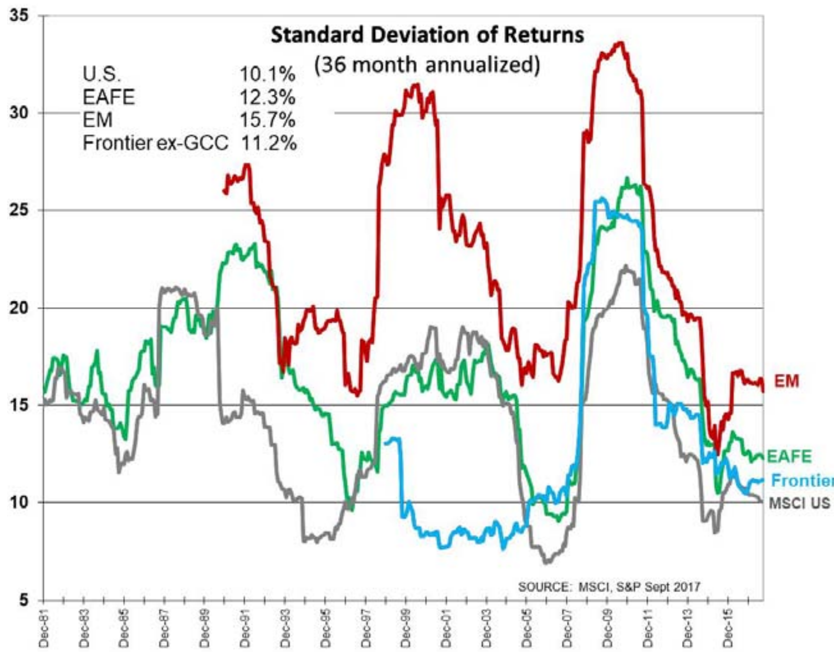
Low volatility has been a benefit of investing in frontier markets. When we look at market volatility, the evidence shows that the annualized standard deviation of the Russell Frontier ex-GCC Index over 36 months is lower than that of the MSCI Emerging Markets Index and of the MSCI EAFE (Europe, Australasia, Far East) Index. In fact, it is often close to the standard deviation of the U.S. market, measured by the MSCI US Index.

Exhibit 1 – Standard deviation of Indexes over rolling 36 month periods



As shown in exhibit 1, the standard deviation of the Frontier ex-GCC was 11.2% over the 36 months ended September 2017, while it was 10.1% for MSCI US, 12.3% for MSCI EAFE and 15.7% for MSCI Emerging Markets.

Intuitively, however, these results seem odd. For those who get their impressions from news headlines, it seems that frontier markets, like Nigeria, Kenya, Argentina, Bangladesh and Vietnam, are plagued by volatile politics, military crises, health crises, natural disasters and, as a result, volatile financial markets.

On the other hand, news headlines are not always the best guide to actual conditions in these places. Visitors to frontier countries are often surprised by how "normal" they seem, especially after a day or two on the

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ground. A more objective measure is the economic freedom ranks from The Heritage Foundation that show good progress over more than twenty years, especially for the frontier regions of Africa, Asia and Eastern Europe as shown in table 1:

Table 1 – Economic Freedom Ranks

Economic Freedom	1995	2017	22 yr % Chg
Frontier	56.1	60.7	8.3%
United States	76.7	75.1	-2.0%
Emerging Markets	59.9	65.6	9.5%
EAFE	70.9	74.6	5.3%
BRICs	49.9	55.0	10.3%
Frontier Africa	55.2	58.8	6.4%
Frontier Asia	49.3	55.8	13.2%
Frontier E Europe	49.7	66.3	33.5%
Frontier Latin Am	63.9	58.2	-8.8%
Frontier Mid East	63.7	60.4	-5.2%

Source: The Heritage Foundation, 2017

By these and other measures, one can make the case that frontier markets are less risky than suggested by the consensus opinion. More important to portfolio construction, however, is the objective measure of stock market volatility.

Volatility

To look at volatility, we began with monthly MSCI return data on 27 frontier countries, 22 emerging market countries and 21 EAFE countries. For some countries, data are available back to 1985, but June 2002 is the beginning of robust data for the frontier.

We then measured volatility based on the annualized standard deviations of monthly returns over rolling 36 month periods. Table 2 shows the 25 most volatile markets over the 36 months ended September 2017. The table also shows the higher volatilities at their peak seven years ago, which spans the 2008 crisis period.

Table 2 – Standard deviation of volatile markets as of September 2010 & 2017

Stdev (36 Mo)		Sep-10	Sep-17
Emerging	Greece	47%	43%
Frontier	Argentina	44%	38%
Emerging	Brazil	41%	36%
Frontier	Ukraine	56%	34%
Frontier	Egypt	39%	33%
Frontier	Nigeria	49%	33%
Frontier	Kazakstan	42%	32%
Emerging	Russia	47%	30%
Emerging	Colombia	34%	28%
Emerging	Turkey	50%	24%
Emerging	Hungary	50%	24%
Emerging	Peru	43%	23%
Emerging	Poland	46%	23%
Emerging	UAE	45%	22%
Emerging	South Africa	34%	22%
Developed	Austria	46%	22%
Emerging	Czech Rep	37%	21%
Frontier	Pakistan	44%	21%
Emerging	China	37%	21%
Developed	Portugal	30%	21%
Frontier	Serbia	76%	21%
Frontier	Romania	62%	20%
Frontier	Bahrain	32%	20%
Developed	New Zealand	28%	20%
Emerging	Indonesia	45%	20%

Of these most volatile markets, nine are frontier, thirteen are emerging and three are developed. Overall, these markets have seen large improvements in stability during the past seven years. The average volatility of this group is down by 39%, with the biggest improvement in Romania, at 20% standard deviation recently versus 62% in 2010, a decline of 67%. On the other hand, the volatility of Greece is only down by 8%, Brazil's volatility is only down 12% and Argentina's is down 13%.

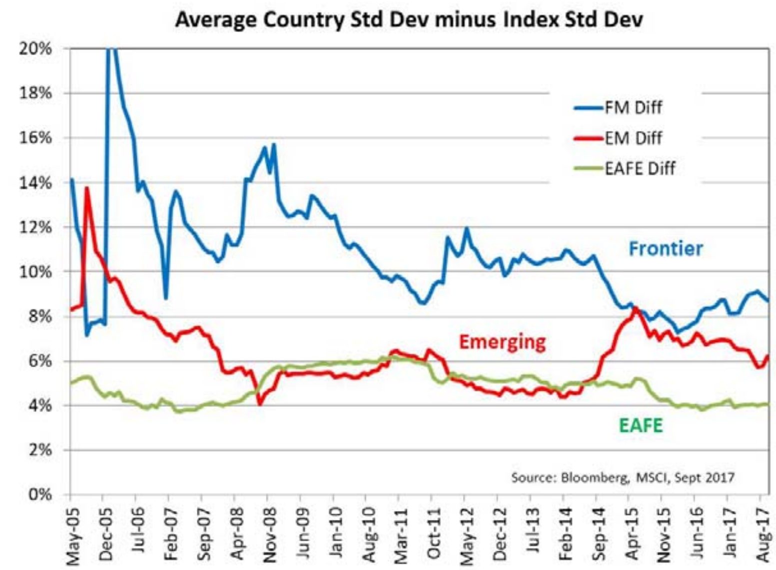
For further insight, we looked at the average volatility of the individual countries in each index compared with the volatility of their respective overall indexes, as shown in table 3.

Table 3 – Index versus Average Country Volatility

	Avg Ctry Volatility		Index Volatility		% diff Index/Avg	
	Sep-10	Sep-17	Sep-10	Sep-17	Sep-10	Sep-17
Frontier	39%	20%	29%	11%	-26%	-44%
Emerging	39%	22%	33%	16%	-14%	-27%
EAFE	32%	16%	26%	12%	-19%	-24%

Given the high volatility of many countries in table 2, it is not surprising that the average volatility of the countries in the frontier market index was 20% in September 2017. However, because country markets often move independently, the recent volatility of MSCI Frontier Market Index overall was only 11%, 9% lower or at a 44% discount. By contrast for emerging markets, the average of country volatilities was 22%, and the index volatility of 16% was only 27% lower than the average. For the EAFE countries, average volatility was 16%, compared with 12% for the Index, only 24% lower. Exhibit 2 shows this gap between the average component country volatilities and the overall index volatilities historically in absolute terms.

Exhibit 2 – Index Volatility versus Average Country Volatility



These lower index volatilities are all the result of the benefits of diversification across countries. However, as markets have become more global and as asset allocators have become more active across index categories, countries in the more popular indexes have begun to behave in a more similar fashion, reducing the country diversification benefit.

Cross-country Volatility

To shed light on the underlying dynamics of index volatility, we constructed correlation matrices composed of each country's correlation with the other countries in its index, as shown for frontier markets in table 4.

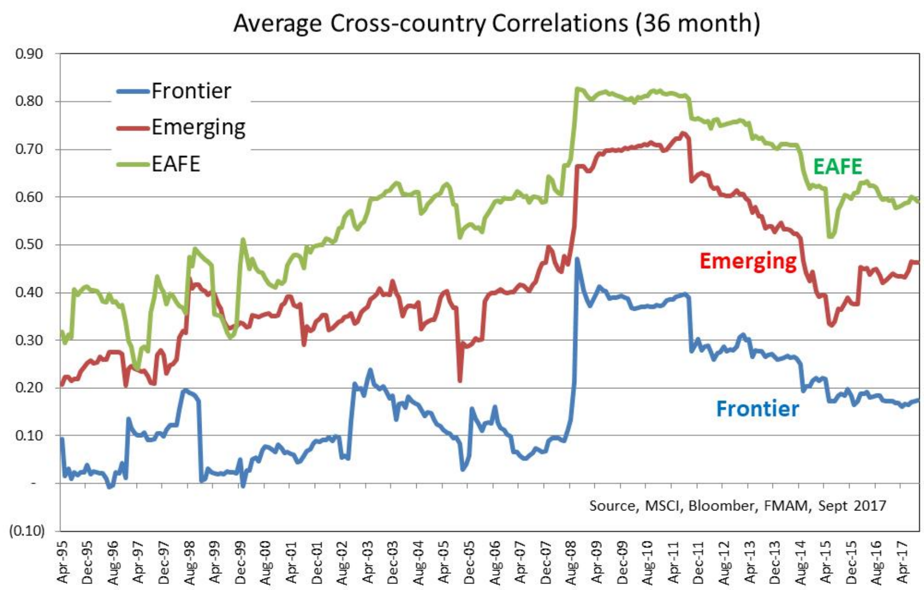
Table 4 – Cross- Country Correlation Matrix for frontier countries as of 36 months ended September 2017

FM 36M	Sri Lan	Bangla	Pakista	Vietnar	Kazaks	Roman	Ukraine	Argenti	Tanzar	Kenya	Uganda	Egypt	Morocc	Tunisia	Cote D	Nigeria	Mauriti	Jordan	Lebanc	Oman	Croatia	Estonia	Lithuar	Serbia	Sloveni	Bahrair	Kuwait	Average
Sri Lanka		0.19	0.39	0.33	0.20	0.38	0.12	0.06	(0.19)	(0.14)	(0.22)	0.15	0.27	(0.09)	0.28	0.16	0.41	(0.09)	(0.32)	0.28	0.41	(0.09)	0.00	0.27	0.30	0.19	0.13	0.13
Bangladesh			(0.04)	0.03	0.25	(0.17)	0.34	(0.18)	0.08	(0.23)	(0.11)	(0.10)	(0.02)	0.09	(0.16)	0.15	0.07	0.32	(0.08)	0.22	(0.18)	(0.26)	(0.34)	(0.11)	(0.22)	0.06	0.04	(0.02)
Pakistan				0.41	(0.05)	0.48	0.16	0.05	(0.04)	(0.17)	(0.22)	0.24	0.23	(0.17)	0.33	(0.11)	0.17	0.03	(0.19)	0.52	0.35	0.01	(0.08)	0.25	0.22	0.34	0.19	0.12
Vietnam					0.03	0.37	0.17	0.32	0.12	(0.03)	0.06	0.35	0.19	0.06	0.16	(0.03)	0.48	(0.11)	(0.09)	0.49	0.31	0.14	(0.00)	0.26	0.40	0.41	0.35	0.19
Kazakstan						0.20	0.21	0.46	0.03	0.05	0.06	0.02	0.19	(0.01)	(0.08)	0.26	0.15	0.17	0.25	(0.12)	0.37	0.10	0.30	0.33	0.23	0.23	0.28	0.17
Romania							0.36	0.08	(0.08)	0.17	0.02	0.38	0.24	0.11	0.59	0.21	0.40	(0.02)	(0.03)	0.30	0.60	0.34	0.51	0.57	0.65	0.50	0.40	0.30
Ukraine								(0.27)	0.31	(0.01)	(0.01)	0.31	0.25	0.15	(0.05)	0.17	0.27	0.06	0.07	0.29	0.28	0.04	0.19	0.24	0.12	0.30	0.32	0.15
Argentina									(0.05)	0.03	0.07	0.03	0.07	(0.17)	(0.09)	(0.01)	(0.05)	(0.08)	(0.04)	0.08	0.22	0.09	0.08	0.04	0.30	0.17	0.14	0.04
Tanzania										0.50	0.63	0.46	0.14	0.15	(0.11)	(0.13)	(0.02)	(0.02)	0.26	0.14	0.13	0.19	0.04	(0.01)	0.04	(0.04)	(0.03)	0.13
Kenya											0.87	0.24	0.03	0.10	0.10	0.27	0.19	(0.11)	0.29	(0.11)	0.02	0.35	0.32	0.17	0.27	(0.10)	0.06	0.17
Uganda												0.22	(0.03)	0.09	0.04	0.19	0.13	(0.04)	0.32	(0.05)	0.00	0.28	0.16	0.13	0.23	(0.09)	0.05	0.10
Egypt													0.43	0.19	0.09	0.12	0.20	(0.00)	0.25	0.37	0.36	0.32	0.25	0.35	0.54	0.17	0.12	0.25
Morocco														0.39	0.17	0.05	0.41	(0.17)	0.12	0.40	0.56	0.47	0.40	0.49	0.44	0.21	0.55	0.32
Tunisia															0.22	0.14	0.39	0.06	0.01	(0.05)	0.33	0.31	0.41	0.21	0.33	0.12	0.21	0.21
Cote D'lvoire																0.11	0.18	0.06	(0.08)	0.19	0.42	0.23	0.30	0.38	0.40	0.09	0.07	0.20
Nigeria																	0.37	0.08	(0.04)	(0.10)	0.06	0.07	0.18	0.37	0.34	0.14	0.10	0.14
Mauritius																		(0.14)	(0.10)	0.27	0.49	0.36	0.40	0.46	0.50	0.41	0.61	0.33
Jordan																			0.14	(0.04)	(0.02)	(0.00)	(0.17)	0.21	0.00	(0.03)	(0.14)	(0.01)
Lebanon																				(0.11)	(0.04)	0.12	0.06	0.26	(0.02)	(0.03)	0.17	0.05
Oman																					0.19	0.11	(0.13)	0.18	0.23	0.35	0.46	0.20
Croatia																						0.42	0.57	0.54	0.64	0.37	0.42	0.49
Estonia																							0.69	0.37	0.44	0.23	0.44	0.44
Lithuania																								0.51	0.60	0.29	0.39	0.45
Serbia																									0.62	0.46	0.44	0.51
Slovenia																										0.35	0.33	0.34
Bahrain																											0.56	0.56
Kuwait																												
Average		0.19	0.17	0.26	0.11	0.25	0.23	0.08	0.02	0.02	0.11	0.21	0.17	0.07	0.11	0.10	0.24	(0.00)	0.04	0.16	0.24	0.17	0.19	0.28	0.32	0.20	0.25	**0.17**

In the most recent 36 months period ended September 2017, for example, the average of these correlations for frontier markets is 0.17. By contrast, the corresponding average of cross-country correlations for emerging markets is .46, and for EAFE it is 0.59.

A historical chart of these average cross-country correlations done over rolling monthly windows of 36 months is shown in exhibit 3. This shows that all correlations spiked during the global financial crisis but have declined since then. It is interesting that the correlation across emerging market countries has actually increased since 2015, while for frontier markets, it has continued to trend lower.

Exhibit 3 – Average Cross-country Correlations



Conclusion

This analysis shows that the low volatility of a diversified frontier market index (or an actual frontier portfolio) is a result of low cross-country correlations due to the independent movement of the individual frontier stock markets. At a time when emerging and developed markets have become more tied together, frontier markets continue to provide good balance to overall portfolio risk because diversification across them has resulted in low standard deviation for overall frontier allocations.

It may seem odd to view frontier markets as low risk, but diversification across them can make it possible.

"Diversify. In stocks and bonds, as in much else, there is safety in numbers"
- Sir John Templeton