Do U.S. Investors Benefit from Investing in Frontier Equity Markets?

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This study examines whether investing in frontier markets is beneficial to U.S. investors. The results are not so encouraging. First, the change in currency exchange rate weakens the benefit of overseas investment. Second, the correlations between the U.S. market and the frontier markets rose over time. Third, most of the frontier markets in the sample scored lower Sharpe Ratios than the U.S. market. Fourth, the frontier markets and their currency markets move in the same direction. Finally, frontier markets are more sensitive to the U.S. market return when it falls rather than when it rises.

INTRODUCTION

Theoretically, international diversification is a natural risk reduction vehicle for investors whose investment domain is limited to the domestic market, because it only improves the efficient frontier. Given the argument made by Markowitz (1952), the benefits of international portfolio diversification increase as the correlations between equity markets decrease. Therefore, the investors in developed countries can achieve bigger diversification benefits from investing in developing markets than from investing in developed markets, since developed countries are more highly integrated. The early literature (e.g., Grubel (1968), Levy and Sarnat (1970), Lessard (1973)) confirms that low correlations between developed markets and developing markets offer considerable benefits for investors of developed countries. The subsequent studies (e.g., Eun and Resnick (1984), Errunza and Padmanabhan (1988), Meric and Meric (1989), Bailey and Stulz (1990), Divecha et al. (1992), Harvey (1995), Li, Sarkar, and Wang (2003), Driessen and Laeven (2007)) elaborate on the benefit from diversifying into developing markets.

Particularly when the U.S. market underperformed many developing markets after the Dot.com Crash, there arose a strong sentiment that U.S. investors should expand their investment domain over to

emerging markets, highlighted by BRIC (Brazil, Russia, India, and China). For example, *Business Week* (December 25, 2005) states that "developed nations can't match the growth of emerging economies." Later *Business Week* (January 18, 2007) reports, "Even after such a lengthy winning streak, now might be as good a time as any to follow the experts' advice and make sure your portfolio has proper international exposure, pegged by some analysts at 20% of total holdings. Exchange-traded funds, or ETFs, can be a smart, low-cost route to a globally diversified portfolio." International diversification would be an exciting proposition to U.S. investors particularly if the foreign markets they are buying into move in a different way. It would be a great comfort to them if the foreign market zigs when the U.S. market zags. Ideally for U.S. investors, the foreign market would fall to a lesser degree or even rise when the U.S. market falls.

Recently, however, several studies (e.g., Goetzmann et al. (2005), Carrieri et al. (2007), Pukthuanthong and Roll (2009), Berger et al. (2011), You and Daigler (2010), Christoffersen et al. (2012), and Han et al. (2017)) document that the benefits of international diversification had been reduced due to the intensifying globalization and world equity market integration. Desiring to find better diversification opportunities, investors consider expanding their investment domain even to "frontier markets." Investors, particularly searching for growth, are increasingly looking beyond the more familiar emerging markets to "frontier markets." *Forbes* (June 15, 2016) report, "For investors with long-term investment horizons who can withstand volatility and liquidity, frontier markets can provide access to attractive growth potential and offer portfolio diversification benefits. While many frontier markets are positioned for long-term growth, capitalizing on the demographic and resource potential requires supportive policies and economic investment. The risk remains that policy mistakes could limit future returns."

In this study, we examine whether investing in frontier markets is beneficial to U.S. investors, and retail investors in particular. We focus on the potential benefits from international diversification into the nine frontier equity markets: Argentina, Jordan, Kenya, Morocco, Nigeria, Pakistan, Sri Lanka, Trinidad Tobago, and Tunisia. Our sample period covers the twenty years, January 1996 through December 2015. The sample period is then divided into two sub-periods: January 1996 – December 2005 and January 2006 – December 2015. The first sub-period includes the Asian Crisis and Dot.Com Crash. The second sub-period includes the recent financial crisis.

The results we find in this study are not so encouraging for international diversification. First, the change in currency exchange rate in general weakens the benefit of overseas investment to U.S. investors. When we measured returns on frontier equity markets in their own local currencies, seven out of nine frontier countries outperformed the U.S. market. But when we translated the returns into U.S. dollar-denominated returns, the outperformance weakened with one exception. Furthermore, when we measured the Sharpe Ratios, only two countries scored higher Sharpe Ratio than the U.S. The results indicate that the exchange rates and the volatilities move against U.S. investors. In addition, the correlations between the U.S. market and the frontier markets rose during the sample period. For example, the correlation between the U.S. and Kenya increased from 0.0183 for 1996 – 2005 to 0.1875 for 2006 – 2015. These results are consistent with the findings reported by several studies (e.g., Longin and Solnik (1995), Christoffersen et al. (2012)). Given that the correlations increased substantially, the benefit of international diversification is questionable.

In addition, using a regression analysis, we investigate how the frontier market return in its own currency is associated with the U.S. market and with its currency exchange rate move. We find that the frontier market return in terms of its own currency is in general positively associated with both. The finding that the frontier equity market and the U.S. equity market move in the same direction is not desirable from the diversification perspective, but it is not surprising. More important is the finding that the frontier market and its currency market move in the same direction. Basically, when the frontier equity market performs well, the value of its currency also rises so that the return to U.S. investors is even higher. But when the emerging market does not perform well, the currency of the frontier market adds to the damage to U.S. investors.

Finally, we examined how differently the frontier markets move in response to whether the U.S. market moves up or down. Obviously, U.S. investors would want to invest where the return is as positive as the U.S. market when it rises, but the return is not as negative as the U.S. market when it falls. For this purpose, we estimated the return on the frontier market in response to the upward move and downward move of the U.S. market. Results show that frontier markets are more sensitive to the U.S. stock market return when it falls rather than when it rises. This means that the magnitude of the negative return on these frontier markets in response to the U.S. down market is larger than the positive return in response to the U.S. up market, which defeats the purpose of international diversification.

This study contributes to investors' understanding of diversification into frontier equity markets. As the aforementioned studies (e.g., Eun and Resnick (1984), Errunza and Padmanabhan (1988), Meric and Meric (1989), Bailey and Stulz (1990), Divecha et al. (1992), Harvey (1995), Li, Sarkar, and Wang (2003), Driessen and Laeven (2007)) show, investors can only benefit from diversification into frontier equity markets by enlarging their investment domain. This study shows that benefits from frontier equity markets are not so readily available to U.S. investors and retail investors in particular. All the results we find are not so positive. Although the results cannot be generalized for other frontier countries, it seems that international diversification into frontier markets does not bring what U.S. investors would want to achieve. Frontier markets pose a great challenge to U.S. investors and retail investors in particular, as the investment is complicated by the exchange rate moves and unexpected political risks that they do not face in domestic investment.

The remainder of the paper is structured as follows. The next section describes the data sources. The following two sections report the descriptive statistics and empirical results. The last section contains our summary and conclusions.

DATA

We obtain weekly stock market indices and currency exchange rates for nine frontier countries between January 1996 and December 2015 from *Thomson Reuters Datastream*. The database reports stock indices in their own currencies and exchange rates in number of units of their currencies per U.S. dollar. In case of Kenya, for example, it reports MSCI (Morgan Stanley Capital International) Kenyan Market Index in Kenyan Shilling and currency exchange rate as units of Kenyan Shilling per U.S. dollar. For our purpose, we converted all the exchange rates into units of U.S. dollar per foreign currency. Whenever the exchange rate data for some countries are not available from *Thomson Reuters Datastream*, we separately collected from FRED of Federal Reserve Bank of St. Louis.

The sample period, from January 1996 to December 2015, is set largely by the data availability. This sample period is then divided into two sub-periods of equal length to see whether there is any noticeable pattern in our empirical analyses: January 1996 – December 2005 and January 2006 – December 2015. The first sub-period contains the Asian Crisis and the Dot.Com Crash. The second sub-period includes the recent financial crisis.

EMPIRICAL RESULTS

Descriptive statistics are reported in Table 1. Panel A presents average weekly market returns in local currency for each country during the whole sample period and sub-periods. These returns represent weekly average returns on each of frontier markets. For example, the Kenyan stock market produced, on average, 0.41% on a weekly basis (23.71% on an annual basis), as measured in its own currency, during the sample period, whereas the weekly average return on the U.S. market in dollar terms was 0.18% (9.80% per annum). The panel demonstrates that several countries outperformed the U.S. market in terms of local currencies during the sample period: Argentina, Morocco, Kenya, Pakistan, Nigeria, Sri Lanka, and Trinidad Tobago.

TABLE 1
DESCRIPTIVE STATISTICS

Panel A: Stock Market Return in Local Currency

	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad	Tunisia	US
Whole	0.002135	0.003945	0.000762	0.003498	0.004093	0.003284	0.003112	0.002839	0.001215	0.001795
Period 1	0.002453	0.003129	0.002977	0.004407	0.004451	0.005116	0.003517	0.004836	0.000349	0.001948
Period 2	0.001764	0.004684	-0.00153	0.002513	0.003721	0.001446	0.002569	0.000877	0.002053	0.001621

Panel A presents average weekly market returns in local currency for each country during the whole sample period and sub-periods (1st: 1996 – 2005; 2nd: 2006 – 2015). These returns represent weekly average returns on each market. Panel B reports weekly exchange rate changes. The frontier market performances in U.S. dollar-denominated returns are represented in Panel C.

Panel B: Currency Exchange Rate (U.S. $/Local Currency) Change

	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad	Tunisia
Whole	-9E-05	-0.00226	1.58E-06	-0.00105	-0.00038	-0.00073	-0.00092	-0.0001	-0.00067
Period 1	-0.00016	-0.00214	-1.4E-06	-0.00107	-0.0005	-0.00083	-0.00122	-0.00017	-0.00069
Period 2	-0.00017	-0.00279	2.3E-06	-0.00108	-0.00065	-0.00083	-0.00066	-4.3E-05	-0.0008

Panel C: Stock Market Return in U. S. Dollars

	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	SriLanka	Trinidad	Tunisia	US
Whole	0.002046	0.001583	0.000765	0.002455	0.003772	0.002568	0.002196	0.002739	0.000539	0.001795
Period 1	0.002324	0.001053	0.002977	0.003358	0.004083	0.004404	0.002314	0.004674	-0.00028	0.001948
Period 2	0.001674	0.002027	-0.00153	0.001472	0.003452	0.000713	0.00194	0.00085	0.001296	0.001621

Panel B reports weekly exchange rate changes. With an exception of Jordan, these frontier markets witnessed the value of their currency fall during the sample period. The currency devaluation was especially severe for Argentina with -0.23% on a weekly basis (-11.3% on an annual basis). So the strong performance of the frontier market displayed in Panel A could not be directly translated into strong performance for U.S. investors. This is a difficult aspect of international investment. For example, even if U.S. investors invest in a promising company in a frontier market that performs great with soaring domestic sales, an adverse exchange rate move can possibly result in a loss for the U.S. investors.

The frontier market performance from the perspective of U.S. investors is represented in Panel C. All these returns are measured in U.S. dollars, and therefore they represent the returns that U.S. investors could have earned if they had invested in these frontier markets. Panel C shows that the change in currency exchange rate weakens the benefit of overseas investment. For example, Argentina in Panel C displays dramatically different picture than in Panel A. Argentina produced a greater return (0.39% weekly) in its own currency than the U.S. (0.18% weekly), as shown in Panel A, but its U.S. dollar-denominated return (0.16% weekly) was smaller than the U.S. return (0.18% weekly). This indicates that investors need to be careful of exchange rate moves when they pick overseas investments. Their domestic

market return in their own currencies can be wiped out by adverse exchange rate moves for U.S. investors.

Table 2 reports the correlations among these frontier markets and the U.S. market. All these correlations are based on U.S. dollar-denominated returns. Panel A contains the correlations for the whole sample period. The correlations for the two sub-periods are presented in Panels B, and C. Comparing sub-period correlations, we can see a clear pattern among all these markets. Apparently, correlations increased dramatically as we moved from the first sub-period to the second. In the 1996 – 2005 period, four countries scored a negative correlation with the U.S., but in the 2006 – 2015 period, negative correlations all disappeared. With an exception of Trinidad Tobago, the correlations all increased between the frontier markets and the U.S. market. This is another difficult challenge in diversification through overseas investment. Because of increasing global integration, diversification is more difficult to achieve through overseas investment.

TABLE 2
CORRELATIONS AMONG STOCK MARKET RETURNS IN U. S. $

Panel A: Whole Period

	US	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad
Morocco	0.117228								
Argentina	0.40993	0.098568							
Jordan	0.064876	0.121136	0.068952						
Pakistan	0.094243	0.041458	0.096263	0.090047					
Kenya	0.121592	0.107396	0.198701	0.156088	0.070283				
Nigeria	0.044916	0.043413	0.081921	0.074157	0.043077	0.007838			
Sri Lanka	0.071486	0.051505	0.137496	0.114779	0.120792	0.071627	0.059498		
Trinidad	0.053605	0.019872	0.037121	0.011596	-0.02536	0.058201	-0.02024	-0.0669	
Tunisia	0.02291	0.212443	0.005131	0.092437	0.022617	0.046868	0.009643	0.049073	-0.01192

Panel B: January 1996 – December 2005

	US	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad
Morocco	-0.04381								
Argentina	0.358789	-0.01015							
Jordan	-0.05043	0.028756	-0.05771						
Pakistan	0.038629	0.010098	0.061855	0.094277					
Kenya	0.018319	0.096712	0.0524	0.142519	0.066218				
Nigeria	0.033079	0.013616	0.081081	0.001817	0.012383	-0.06114			
Sri Lanka	-0.00026	-0.00337	0.103813	0.07164	0.136677	-0.02691	0.076393		
Trinidad	0.066835	0.057664	0.040972	-0.04665	-0.03051	0.124868	-0.0585	-0.09031	
Tunisia	-0.13585	0.147789	-0.07072	0.012959	0.027771	-0.03536	0.017287	0.020682	-0.02064

Panel C: January 2006 – December 2015

	US	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad
Morocco	0.236904								
Argentina	0.461079	0.178324							
Jordan	0.144449	0.162619	0.158435						
Pakistan	0.170397	0.071496	0.143924	0.089795					
Kenya	0.187486	0.112889	0.294754	0.162335	0.084459				
Nigeria	0.054029	0.058799	0.084506	0.106867	0.075917	0.038377			
Sri Lanka	0.176832	0.107177	0.188426	0.168254	0.084381	0.168193	0.045175		
Trinidad	0.036246	-0.02223	0.040734	0.071322	-0.01758	0.009068	0.017817	-0.00242	
Tunisia	0.214227	0.278966	0.093394	0.168045	0.012631	0.10972	0.00558	0.092145	0.021551

To see if frontier markets offer better investment opportunities than the U.S., we measure volatilities and Sharpe Ratios for each country from the perspective of U.S. investors. As a proxy for risk-free rate, ten-year U.S. Treasury rates, obtained from the Federal Reserve, are adopted since our Sharpe Ratios are measured from the viewpoint of U.S. investors. Table 3 reports average weekly return on the frontier markets in U.S. dollar terms, the standard deviation of exchange rate change, the standard deviation of market return in local currency, the standard deviation of market return in U.S. dollars, and the Sharpe Ratios. The results show that only two countries, Morocco and Trinidad Tobago, produced higher Sharpe Ratios than the U.S. market according to Panel A. This suggests that it is tough for U.S. investors to truly benefit from the investment in frontier markets.

TABLE 3
STOCK MARKET RETURN, VOLATILITIES, AND SHARPE RATIO

Panel A: Whole Period

	Market Return in U.S Dollars	Std Dev of Exch. Rate Move	Std Dev of Market Return in Local Currency	Std Dev of Market Return in U.S Dollars	Sharpe Ratio in U.S Dollars
Morocco	0.002045856	0.010546445	0.019031612	0.021842398	0.100074009
Argentina	0.001582798	0.022750628	0.042574922	0.044302828	0.038886852
Jordan	0.000764652	0.000929124	0.026304921	0.026360396	0.034318599
Pakistan	0.002454564	0.007432777	0.039661503	0.040440124	0.064158157
Kenya	0.00377232	0.020268281	0.047127848	0.052651638	0.074305755
Nigeria	0.002568421	0.013692498	0.034786904	0.037763655	0.071720307
Sri Lanka	0.002195592	0.006065668	0.033643154	0.034333649	0.068026323
Trinidad	0.002738682	0.004982589	0.020688423	0.021287684	0.135227583
Tunisia	0.000539494	0.010063979	0.020143881	0.022453035	0.030262885
US	0.001795			0.023770596	0.081403092

Panel B: January 1996 – December 2005

	Market Return in U.S Dollars	Std Dev of Exch. Rate Move	Std Dev of Market Return in Local Currency	Std Dev of Market Return in U.S Dollars	Sharpe Ratio in U.S Dollars
Morocco	0.002324298	0.009510415	0.016384107	0.018316999	0.132898311
Argentina	0.001053437	0.024893927	0.043692522	0.044414926	0.026194729
Jordan	0.002977035	0.00082035	0.0209955	0.021073317	0.146490238
Pakistan	0.003357791	0.008462521	0.045415881	0.045936902	0.075490321
Kenya	0.004082563	0.014480887	0.033248217	0.037089122	0.113040234
Nigeria	0.004404284	0.016925582	0.028650589	0.03281573	0.137564637
Sri Lanka	0.002313602	0.005795877	0.039452315	0.039957646	0.060654262
Trinidad	0.004673695	0.004324209	0.02577499	0.026133465	0.183048642
Tunisia	-0.000283068	0.009733943	0.022183238	0.02445394	-0.007077324
US	0.001948			0.023756901	0.08662746

Panel C: January 2006 – December 2015

	Market Return in U.S Dollars	Std Dev of Exch. Rate Move	Std Dev of Market Return in Local Currency	Std Dev of Market Return in U.S Dollars	Sharpe Ratio in U.S Dollars
Morocco	0.001673907	0.011483897	0.021329313	0.024795417	0.073961532
Argentina	0.002026984	0.014834872	0.041416962	0.044184902	0.049496185
Jordan	-0.001526909	0.001026195	0.030513979	0.030554507	-0.044736745
Pakistan	0.001472277	0.006005836	0.032887817	0.03403983	0.047951966
Kenya	0.003451636	0.023834727	0.05779718	0.064605356	0.055903046
Nigeria	0.000713166	0.009404036	0.039937069	0.042083775	0.020748282
Sri Lanka	0.001939536	0.006265518	0.026254513	0.027445216	0.076499158
Trinidad	0.000849836	0.00555186	0.013566171	0.014690822	0.068739264
Tunisia	0.001296014	0.010370796	0.017842338	0.020192295	0.072107405
US	0.001621			0.023801384	0.07482758

FURTHER ANALYSIS

It is important to see how the frontier equity market return in local currency is associated with the U.S. equity market and its currency exchange rate. For this purpose the following equation is estimated:

$$R_{jt} = \alpha_0 + \alpha_1 SNP_t + \alpha_2 EXR_{jt} + e_{jt} \quad (1)$$

where:

R_{jt} = the return on stock market of country j in local currency;
SNP_t = the return on the S&P 500;
EXR_{jt} = the first log difference in exchange rate for country j;
e_{jt} = error term.

Since we are focused on the equity return on frontier markets from the perspective of U.S. investors, we use the S&P 500 Index rather than MSCI World Index. In other words, the investors view frontier markets in comparison of the U.S. market. It should be noted that this estimation is implemented to

examine the directional, not causal, relationship between the dependent variable and independent variables. Given the correlations between the U.S. market and the frontier markets as seen in Table 2, we expect that the estimate of α_1 is positive. But the estimate of α_2 is not clear. If the country's currency value rises, its competitive power in the global market will get weaker and thus having a negative impact on the stock market. However, if the stock market and currency market are affected by a third factor in the same direction, the estimate of α_2 will be positive. For example, if the political risk of a frontier market declines, its impact on the stock market and on the currency market will be both positive. So it is an empirical matter.

The results of estimating the above equation are reported, with t-values in the parentheses, in Table 4. The results in Panel A are for the entire sample period. As expected, the estimate of α_1 is positive with an exception of Tunisia, indicating that the frontier market and the U.S. market in general move in the same direction, which is not so desirable from the diversification perspective. The estimate of α_2 is mostly insignificant. The results for the two sub-periods are presented in Panels B and C. It is noteworthy that in the second sub-period, 2006 – 2015, not only the estimate of α_1 but also the estimate of α_2 is all positive with just one exception. The fact that α_2 is positive suggests that exchange rate moves make investment in frontier equity markets even riskier to U.S. investors. It is because when the frontier equity market performs well, the currency of the frontier market strengthens so that the return to U.S. investors is even higher. But when the frontier equity market does not perform well, the currency of the frontier market also weakens so that the return to U.S. investors is even worse. In other words, the currency exchange rate amplifies the risk for U.S. investors.

TABLE 4
ESTIMATION OF THE EQUATION: $R_{jt} = \alpha_0 + \alpha_1 SNP_t + \alpha_2 EXR_{jt} + e_{jt}$

Panel A: Whole Period

	α_0	α_1	α_2	F-statistic	R-square
Morocco	0.002(3.45)	0.054(2.15)	-0.003(-0.05)	2.34	0.004
Argentina	0.002(1.53)	0.723(14.3)	-0.32(-5.45)	112.12	0.177
Jordan	0.001(0.78)	0.067(1.96)	1.112(1.26)	2.878	0.006
Pakistan	0.003(2.68)	0.14(2.71)	0.082(0.49)	3.888	0.007
Kenya	0.004(2.65)	0.177(2.88)	0.146(1.97)	6.718	0.013
Nigeria	0.003(3.03)	0.034(0.74)	0.072(0.92)	0.741	0.001
Sri Lanka	0.003(3.00)	0.102(2.33)	0.245(1.43)	3.745	0.007
Trinidad	0.003(4.29)	0.045(1.69)	0(0.00)	1.424	0.003
Tunisia	0.001(1.97)	-0.014(-0.52)	-0.002(-0.03)	0.138	0

Panel B: January 1996 – December 2005

	α_0	α_1	α_2	F-statistic	R-square
Morocco	0.002(3.30)	0.029(0.94)	-0.116(-1.52)	1.901	0.007
Argentina	0.001(0.53)	0.627(8.49)	-0.456(-6.47)	53.074	0.17
Jordan	0.003(3.32)	-0.043(-1.12)	1.933(1.73)	2.144	0.008
Pakistan	0.004(2.05)	0.053(0.64)	-0.152(-0.65)	0.384	0.001
Kenya	0.004(3.07)	0.018(0.29)	0.155(1.54)	1.232	0.005
Nigeria	0.005(3.98)	0.009(0.17)	-0.08(-1.07)	0.583	0.002
Sri Lanka	0.004(2.08)	0.014(0.19)	0.163(0.55)	0.162	0.001
Trinidad	0.005(4.13)	0.076(1.6)	-0.01(-0.04)	1.289	0.005
Tunisia	0.001(0.52)	-0.064(-1.55)	0.055(0.55)	1.544	0.006

Panel C: January 2006 – December 2015

	α_0	α_1	α_2	F-statistic	R-square
Morocco	0.002(1.7)	0.054(1.29)	0.061(0.71)	1.65	0.006
Argentina	0.004(2.18)	0.81(11.96)	0.074(0.68)	72.762	0.219
Jordan	-0.002(-1.37)	0.179(3.2)	0.221(0.17)	5.26	0.02
Pakistan	0.003(1.91)	0.223(3.75)	0.562(2.38)	10.346	0.038
Kenya	0.003(1.29)	0.339(3.18)	0.119(1.12)	6.37	0.024
Nigeria	0.002(1.05)	0.047(0.65)	0.569(3.07)	5.109	0.019
Sri Lanka	0.002(2.15)	0.185(3.87)	0.287(1.59)	9.11	0.034
Trinidad	0.001(1.43)	0.014(0.56)	0.015(0.14)	0.172	0.001
Tunisia	0.002(2.36)	0.059(1.7)	-0.129(-1.63)	2.082	0.008

The results presented above clearly show that we cannot afford to ignore the effect of exchange rate in our selection of international investment. In many cases investment in foreign markets sounds attractive, but the actual results for U.S. investors can be not so attractive. Theoretically, overseas investment offers an excellent opportunity for U.S. investors to diversify their portfolio beyond the domestic horizon. U.S. investors would want to have some comfort of diversification particularly when the domestic market falls. Whether international diversification is indeed beneficial to U. S. investors during the time of falling market is an empirical issue. To address the issue, we estimate the following equation:

$$RD_{jt} = \alpha_0 + \beta_1 D_1 SNP_t + \beta_2 D_2 SNP_t + e_{jt} \quad (2)$$

where

RD_{jt} = the return on stock market of country j in U. S. dollar terms;
D_1 = Dummy Variable equal to 1 if $SNP_t > 0$, or 0 otherwise
SNP_t = the return on the S&P 500;
D_2 = Dummy Variable equal to 1 if $SNP_t < 0$, or 0 otherwise
e_{jt} = error term.

Given the correlations in Table 2, we expect that both estimates of β_1 and β_2 will be positive, suggesting that the U.S. market and frontier markets move in the same direction whether the U.S. market moves up or down. However, one thing is clear: For the international diversification to be truly beneficial to U.S. investors, β_1 had better be greater than β_2. In other words, U.S. investors would want to see that the return on the frontier market in response to the rising U.S. market is greater than that in response to the falling U.S. market. Otherwise, the overseas investment will only hurt, rather than help, U.S. investors.

Results of estimating Equation (2) are presented in Table 5. The results are not so desirable. Panel A shows that for every country, the estimate of β_2 is greater than the estimate of β_1, with no exception. The results clearly demonstrate that frontier markets are more sensitive to the U.S. stock market return when the U.S. market falls rather than when it rises. In other words, the magnitude of the negative return on these frontier markets in response to the U.S. down market is more than the positive return in response to the U.S. up market, which defeats the purpose of international diversification. This message is persistent with both sub-periods, as displayed in Panels B and C. The results are in line with what Bekaert, Harvey, and Ng (2005) found: "…….negative news regarding the world or regional market may increase volatility of the factor more than positive news and lead to increased correlations between stock markets." Throughout the sample period, investing overseas does not bring much comfort to U.S. investors.

TABLE 5
UP BETA & DOWN BETA ESTIMATION: $RD_{jt} = \alpha_0 + \beta_1 D_1 SNP_t + \beta_2 D_2 SNP_t + e_{jt}$

Panel A: Whole Period

	α_0	β_1	β_2	F-statistic	R-square
Morocco	0.003(2.83)	0.052(1.01)	0.156(3.27)	8.1	0.02
Argentina	0.001(0.74)	0.696(7.27)	0.828(9.10)	105.47	0.17
Jordan	0.005(4.36)	-0.196(-3.19)	0.321(5.49)	15.91	0.03
Pakistan	0.004(2.17)	0.052(0.55)	0.261(2.88)	5.59	0.01
Kenya	0.007(2.97)	0.046(0.38)	0.477(4.06)	10.18	0.02
Nigeria	0.006(3.64)	-0.153(-1.72)	0.28(3.31)	5.64	0.01
Sri Lanka	0.006(3.62)	-0.111(-1.37)	0.302(3.94)	7.75	0.01
Trinidad	0.003(3.52)	0.003(0.07)	0.089(1.87)	2.06	0
Tunisia	0.001(0.88)	-0.002(-0.03)	0.043(0.86)	0.41	0

Panel B: January 1996 – December 2005

	α_0	β_1	β_2	F-statistic	R-square
Morocco	-0.000(-0.28)	-0.117(-1.46)	-0.166(-1.93)	4.934	0.019
Argentina	0.000(0.09)	0.644(4.72)	0.700(4.78)	39.299	0.128
Jordan	0.005(3.47)	-0.145(-2.09)	0.066(0.885)	2.188	0.008
Pakistan	0.004(2.05)	0.053(0.64)	-0.15(-0.65)	0.384	0.001
Kenya	0.008(3.33)	-0.199(-1.64)	0.281(2.15)	2.66	0.01
Nigeria	0.007(3.27)	-0.110(-0.02)	0.218(1.88)	1.808	0.007
Sri Lanka	0.004(2.08)	0.014(0.19)	0.163(0.55)	0.162	0.001
Trinidad	0.005(4.13)	0.076(1.604)	-0.01(-0.04)	1.289	0.005
Tunisia	-0.000(-0.28)	-0.116(-1.46)	-0.165(-1.93)	4.934	0.019

Panel C: January 2006 – December 2015

	α_0	β_1	β_2	F-statistic	R-square
Morocco	0.002(1.06)	0.226(2.72)	0.263(3.72)	15.445	0.056
Argentina	0.002(0.7)	0.785(5.79)	0.911(7.93)	70.171	0.213
Jordan	0.004(2.35)	-0.226(-2.21)	0.506(5.83)	17.054	0.062
Pakistan	0.002(0.83)	0.201(1.73)	0.277(2.82)	7.843	0.029
Kenya	0.005(1.18)	0.373(1.7)	0.615(3.3)	9.712	0.036
Nigeria	0.005(1.96)	-0.208(-1.4)	0.332(2.71)	3.847	0.015
Sri Lanka	0.005(2.85)	-0.009(-0.1)	0.370(4.7)	12.167	0.045
Trinidad	0.004(3.95)	-0.160(-3.2)	0.164(3.88)	9.67	0.036
Tunisia	0.001(0.83)	0.181(2.65)	0.183(3.16)	12.458	0.046

The above results are discouraging to U.S. investors who consider investing in frontier markets. Although it is beyond the scope of this paper, we attempt to see if frontier markets offer a potential of better returns to those who consider a different trading strategy other than a buy-and-hold strategy. It is commonly believed that frontier markets are more subject to market inefficiencies mainly due to relatively high information costs and transactions costs. We adopt a very simple trading strategy, which is to take a long (short) position if the return in the market is positive (negative) in the previous month. Thus, this strategy takes advantage of a sort of market trend. We make the decision every month. The

results are reported in Table 6. The results show that these frontier markets, and Argentina, Kenya, Nigeria, Sri Lanka, and Trinidad Tobago in particular, offer substantially higher returns than the U.S. market. For example, the monthly average return on this trading strategy is 1.79% on Nigeria, translated into 23.7% a year over the 20 year sample period. During the same period, the same strategy would result in 0.43% a month, equivalent to 5.3% a year, for the U.S. market. The results indicate some potential of excellent returns in frontier markets even though a buy-and-hold strategy hardly brings any benefits to U.S. investors.

TABLE 6
AUTOCORRELATION & STOCK RETURN ON SIMPLE MOMENTUM-BASED STRATEGY

Panel A: January 1996 – December 2015

	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad	Tunisia	US
Average Return	0.0063	0.0167	0.0078	0.0032	0.0133	0.0179	0.0120	0.0115	0.0044	0.0043
Autocorrelation	0.1631	0.0937	0.1626	-0.0022	-0.2028	0.1105	0.0880	0.1950	0.1331	0.0986

Panel B: January 1996 – December 2005

	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad	Tunisia	US
Average Return	0.0103	0.0167	0.0121	0.0076	0.0247	0.0156	0.0074	0.0169	-0.0042	0.0057
Autocorrelation	0.1912	0.1439	0.1471	-0.0542	0.1024	0.0124	0.0340	0.1501	0.0699	0.0875

Panel C: January 2006 – December 2015

	Morocco	Argentina	Jordan	Pakistan	Kenya	Nigeria	Sri Lanka	Trinidad	Tunisia	US
Average Return	0.0023	0.0167	0.0035	-0.0011	0.0019	0.0202	0.0166	0.0061	0.0130	0.0028
Autocorrelation	0.0829	0.0439	0.1167	0.0774	-0.3085	0.1561	0.1971	0.2121	0.1918	0.1086

All the results in this table are based on monthly dollar-denominated returns. The simple momentum-based strategy is to make a decision using the performance in the previous month. If the previous month result is positive (negative), we take a long (short) position. We repeat this strategy every month during the sample period.

SUMMARY AND CONCULSION

Expanding the investment domain beyond the domestic market is appealing as investors can achieve diversification through supposedly different markets. International diversification will be an exciting proposition to U.S. investors if the foreign markets they are buying into move in quite a different way. It will be a great comfort to them if the foreign market zigs when the U.S. market zags. It will be of great help to U.S. investors particularly if the foreign market falls less or even rises when the domestic market falls. But the results of this study on frontier markets are discouraging.

First, the change in currency exchange rate weakens the benefit of overseas investment to U.S. investors. When we measured returns on frontier equity markets in their own currencies, several countries outperformed the U. S. market. But when we measured the returns from the perspective of U.S. investors, the outperformance weakened.

Second, the correlations between the U.S. market and the frontier markets have risen during the sample period. Given that the correlations dramatically increased recently, the benefit of international diversification is questionable.

Third, to see whether the investment in frontier markets offers a good opportunity to U.S. investors in the sense of return and volatility, we also computed the Sharpe Ratios for frontier markets. Only two out of nine countries scored a higher Sharpe Ratio than the U.S. for the sample period.

Fourth, we investigated how the frontier market return in its own currency is associated with the U.S. market and with its currency exchange rate move. We found, particularly in the more recent sub-period, that the frontier market return in terms of its own currency is positively associated with both. The finding that the frontier market and the U.S. market move in the same direction is not so desirable from the diversification perspective. More importantly, the finding that the frontier market and its currency market move in the same direction makes international diversification more difficult for U.S. investors. Basically, when the frontier equity market performs well, the currency of the frontier market strengthens so that the return to U.S. investors is even higher. But when the frontier equity market does not perform well, the currency of the emerging market adds to the damage to U.S. investors.

Finally, we examined how differently the frontier markets move in response to whether the U.S. market moves up or down. Obviously, U.S. investors would want to invest where the return is as positive as the U.S. market when it rises, but the return is not as negative as the U.S. market when it falls. For this purpose, we estimated the return on the frontier market in response to the upward move and downward move of the U.S. market. Results show that frontier markets are more sensitive to the U.S. stock market return when it falls. In other words, the magnitude of the negative return on these frontier markets in response to the U.S. down market is larger than the positive return in response to the U.S. up market, which largely defeats the purpose of international diversification.

The results we report in this paper are not so encouraging from the perspective of diversification for U.S. investors and retail investors in particular. Although the results cannot be generalized for other frontier countries, it seems that international diversification into frontier markets does not bring what U.S. investors would want to achieve. Frontier markets indeed pose a great challenge to U.S. investors, as the analysis of the local economies is complicated by the exchange rate moves. Besides, exchange risk is only a part of the risk that U.S. investors should consider when they tap into frontier markets. There are many other types of risk, such as political risk and corruption, which U.S. investors need to take into consideration (see Bekaert and Harvey (1997) for country risk). Analyzing all the risk can be overwhelming to retail investors.

Although it is beyond the scope of this paper, we looked at the possibility of higher returns that can be achieved through market imperfections in the frontier markets. It is commonly believed that frontier markets are more subject to market inefficiencies due to higher information cost and transactions cost. We applied a very simple strategy exploiting a sort of market trend. The results show that remarkable returns were available in several frontier markets, which were not available from the U.S. market during the sample period. This indicates that there is some potential to take advantage of the market inefficiencies in the frontier markets.

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