CONTRIBUTORS

Qing Li
Associate Director
Global Research & Design
qing.li@spglobal.com

Maria Sanchez
Associate Director
Global Research & Design
maria.sanchez@spglobal.com

Value and Momentum Strategies in Latin America

Modern portfolio theory (MPT) suggests that returns can be enhanced by reducing risk through diversification. To achieve this goal, market participants usually combine asset classes that have low correlations with one another. For example, bonds typically produce a steady stream of income, while equities can generate capital gains; the combination of equities and bonds in a portfolio can potentially provide both stability and growth features. More importantly, combining different asset classes can reduce overall volatility, which could result in a better risk/return tradeoff. The capital asset pricing model (CAPM) quantifies MPT by identifying beta, which measures a stock's sensitivity to the market, as the single risk factor in the model. Hence, higher returns can be realized by taking on greater risk, and a more moderate return could result from taking on less risk.

Higher returns can be realized by taking on greater risk, and a more moderate return could result from taking on less risk.

Many risk factors have been identified as drivers of equity return since the introduction of CAPM. As diversification can be achieved by combining various factors that have low or negative correlation, a factor-based asset allocation approach, which is designed to capture systematic risk factor exposures,[1] has gained popularity in recent years. Essentially, a factor-based strategy employs the underlying return drivers (factors) of securities to form a well-diversified, systematic portfolio that can deliver higher risk-adjusted returns than the broader market over a long-term investment horizon.

In this paper, we explore how a stylized, factor-based framework could be applied to equity markets in Latin America and whether performance can vary in different Latin American countries. In doing so, our research explores how a multi-factor concept, based on combining negatively correlated factors, could work effectively in a relatively volatile region such as Latin America.

For our stylized, multi-factor framework, we used two well-known factors: value and momentum. Value, which was determined by using three fundamental metrics, has long been established as a priced risk factor. On average, companies with undervalued fundamentals tend to have more upside potential and offer higher risk-adjusted returns. The momentum factor is considered a performance persistence indicator, and studies have

[1] Cazalet, Zélia, and Thierry Roncalli. "Facts and Fantasies About Factor Investing." October 2014.

shown that stocks tend to continue in the same upward or downward direction due to their price strength gained over the past 3 to 12 months.[2] Over a longer period of time, a momentum strategy tends to go along with economic boom and bust cycles, which may result in higher volatility.

Asness, Moskowitz, and Pedersen (2013) found that value and momentum strategies produce high positive returns and are negatively correlated within and across different asset classes. The authors argued that a combination of value and momentum factors brings returns closer to the efficient frontier, with less volatility.[3]

Our research on Latin American equity markets found similar results. By isolating the value factor and the momentum factor from the S&P Latin America BMI (Broad Market Index), we observed that value and momentum returned 204% and 192%, respectively, on a cumulative basis, in Latin America equity markets from Dec. 30, 2005, to March 31, 2017, compared with a 80% cumulative return from the broad market. As expected, the value factor was negatively correlated to the momentum factor in individual stocks. The median correlation between the factors for individual stocks was -0.44. A stronger negative correlation (-0.70) between the two factors was observed when using returns from the spread (first minus last quintile) of each factor.

Given that liquidity is a common concern in emerging markets, we overlaid a median monthly traded value screen to minimize trading volume distortion.

DATA AND PORTFOLIO CONSTRUCTION

For our study, we first formed hypothetical value and momentum portfolios, which we will refer to as the Latin America Value Momentum Strategy. Our defined universe is the S&P Latin America BMI, which is also used as a benchmark throughout the research. Given that liquidity is a common concern in emerging markets, we overlaid a monthly median traded value (MTV)[4] screen to minimize trading volume distortion. To be eligible for inclusion, a stock must first pass two liquidity screenings: its six-month average MTV should be greater than or equal to USD 50,000, and its six-month median traded value ratio (MTVR) must be at least 1%.[5]

We used three fundamental metrics—book value-to-price, earnings-to-price, and sales-to-price—to identify value characteristics. These fundamental ratios are combined to form the final value indicator through averaging. In our back-test of the hypothetical portfolio, the 12-month price change, excluding the most recent month, was used to capture the

[2] Jegadeesh, Narasimhan, and Sheridan Titman. "Momentum." August 2011.

[3] Asness, Clifford, Tobias Moskowitz, and Lasse Heje Pedersen. "Value and Momentum Everywhere." The Journal of Finance. VOL LXVIII, NO 3, June 2013.

[4] The monthly MTV is the median daily value traded in a month. The six-month average MTV is the average MTV for the past six months. The MTVR is calculated by taking the monthly MVT divided by its respective end-of-month, float-adjusted market capitalization. The six-month median traded value ratio is the average MTVR over the past six months.

[5] Li, Qing, and Maria Sanchez. "Exploring Liquidity and Dividends in Peru." May 2016.

momentum of a stock. We divided the price change by the stock's volatility during the same time frame to obtain the final risk-adjusted momentum value. If 12 months of price history is not available, the previous nine months were used. The definitions of the factors used in our analysis are shown in Exhibit 1.

Exhibit 1: Factor Definition

FACTOR	FUNDAMENTAL	DEFINITION
Value	Book Value-to-Price	A company's latest book value per share divided by its price
	Earnings-to-Price	A company's trailing 12-month earnings per share divided by its price
	Sales-to-Price	A company's trailing 12-month sales per share divided by its price
Momentum	Price Momentum	Volatility-adjusted 12-month (or 9-month if 12-month data is not available) price change, excluding the most recent month; the pricing data is in local currency

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

The factor scores are calculated as follows.

1. Each value factor and momentum factor of a stock is ranked in ascending order.
2. The fundamental data is further winsorized at the top and bottom 2.5 percentile to ensure that the overall scores are less distorted by extreme values. In other words, if the value at the 2.5 percentile is X, then the value of a stock above the 2.5 percentile is set at X; if the value at the 97.5 percentile is Y, then the value of a stock below percentile 97.5 is replaced with Y.

It is not uncommon in Latin American markets that a stock with a high factor score has low liquidity.

To normalize the data for comparison, we computed a standardized score (z-score) for each factor. The z-score of the value factor is the average of the z-scores of the three value factors. The z-scores were further applied with capping in order to minimize the outlier effect. If a stock's value or momentum z-score was greater than 4 or less than -4, it was capped at 4 or -4, respectively. Since a z-score can be positive or negative, we standardized and presented them as positive values. That is, for any positive z-score, the standardized form was 1+z; for any negative z-score, the standardized form was 1/(1-z); if the z-score was 0, the standardized value was 1. The final factor z-score of a stock was computed by averaging the momentum and value factor scores.

The top 50% of stocks by z-score were selected to construct the hypothetical Latin America Value Momentum Strategy. If we were to assign the weight of the portfolio solely based on the stocks' factor scores, the effect of the value and momentum factors seem pure. However, this form of weighting results in high exposure to illiquid stocks, and it is not uncommon in Latin American markets that a stock with a high factor score has low liquidity. For instance, if we weight the index by factor scores and use 50% of the trading capacity of each stock in a USD 500 million portfolio, 20% of the portfolio will require more than five days to trade, with

a maximum of 12 days needed. To reduce illiquidity, we computed the weight of a security in the portfolio by multiplying its factor score and its float-adjusted market cap. This enabled 100% tradability within five days, using the same capacity scenario.

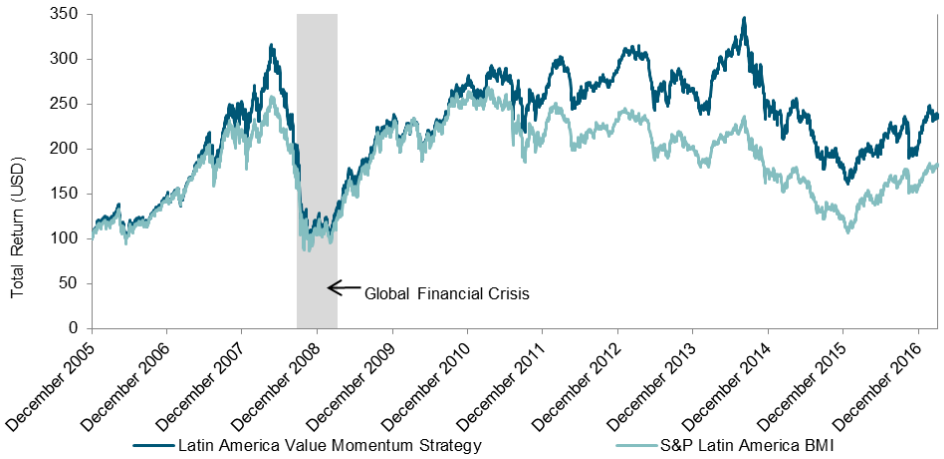
The portfolios were rebalanced on a semiannual basis in June and December. In order to reduce turnover, a 20% two-way buffer was applied. Since the portfolio covers multiple countries, the returns were calculated in USD.

RISK/RETURN RESULTS

Over the period studied, the multi-factor portfolio delivered a cumulative return of 134%, compared with the benchmark's return of 80%.

Exhibit 2 illustrates the overall performance of the hypothetical value and momentum portfolio relative to the overall broad market index. Over the period studied, the multi-factor portfolio delivered a cumulative return of 134%, compared with the benchmark's return of 80%. It is interesting to see that the aggregated value and momentum factor worked more effectively outside of the global financial crisis in 2008.

Exhibit 2: Performance of Latin America Value Momentum Strategy



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 3 confirms the aforementioned observation from a different angle, by presenting the returns on a year-by-year basis. Between 2006 and 2016, the Latin America Value Momentum Strategy outperformed the benchmark in 8 out of the11 years, offering an average annual gain of 15.12%, compared with the benchmark's 12.45%. The largest margin of outperformance occurred in 2007, with 16.27% excess return over the benchmark. However, the strategy underperformed by 2.7% during the global financial crisis in 2008 and lagged 4.64% during the broad market's recovery in 2009. The strategy also lagged 14% on a relative basis in 2016, which stemmed from a sizable overweight in Brazil. In 2016, the S&P/BOVESPA Momentum Index underperformed the broad market (as measured by the S&P Brazil BMI) by 32%, while the S&P/BOVESPA

Enhanced Value Index outperformed the broad market by 33%. As the strategy measures value and momentum factors equally, the exposure to the momentum factor actually negated the positive return contribution from the value factor.

The Latin America Value Momentum Strategy outperformed the benchmark over 53% of the time in up markets and down markets, providing an average monthly excess return of 0.28% during up market periods and 0.15% in down market periods.

Exhibit 3: Calendar Year Performance

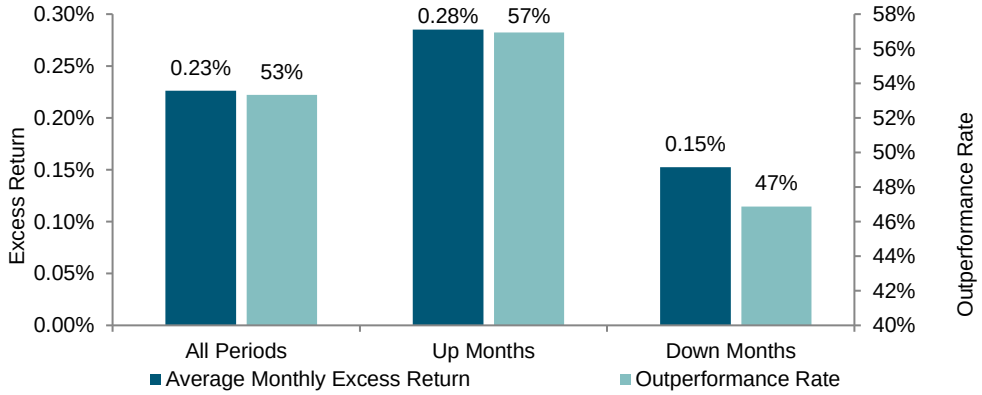
YEAR	LATIN AMERICA VALUE MOMENTUM STRATEGY (%)	S&P LATIN AMERICA BMI (%)	DIFFERENCE (%)
2016	16.63	30.8	-14.17
2015	-28.94	-30.74	1.79
2014	-5.38	-12.7	7.32
2013	-8.53	-12.99	4.46
2012	14.25	11.61	2.64
2011	-8.81	-20.05	11.24
2010	21.43	17.53	3.89
2009	103.36	108	-4.64
2008	-54.17	-51.47	-2.7
2007	67.79	51.52	16.27
2006	48.65	45.39	3.26
Average	**15.12**	**12.45**	**2.67**

The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 30, 2016. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Based on the monthly return data over the period studied, the Latin America Value Momentum Strategy outperformed the benchmark over 53% of the time in both up markets and down markets, providing an average monthly excess return of 0.28% during up market periods and 0.15% in down market periods (see Exhibit 4).

Although the Latin America Value Momentum Strategy outperformed the market at a per-risk level overall, it demonstrated unusually high volatility prior to and during the financial crisis.

Exhibit 4: Outperformance in Up and Down Markets



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 5 shows the performance of the strategy during different market cycles. The period analyzed was from December 2005 to March 2017, during which the global financial crisis took place. We define the global financial crisis period as from Sept. 15, 2008, when Lehman Brothers declared bankruptcy, to April 2, 2009, when the global leaders at the London G20 summit committed to restore global economic growth. Although the Latin America Value Momentum Strategy outperformed the market at a per-risk level overall, it demonstrated unusually high volatility prior to and during the financial crisis.

Exhibit 5: Performance in Different Market Cycles

PHASE	PERIOD	LATIN AMERICA VALUE MOMENTUM STRATEGY	S&P LATIN AMERICA BMI	DIFFERENCE
ANNUALIZED RETURN (%)				
Before Global Financial Crisis	December 2005-September 2008	36.25	29.20	**7.05**
Global Financial Crisis	September 2008-April 2009	-69.20	-65.66	**-3.54**
Post Global Financial Crisis	April 2009-March 2017	6.550	4.01	**2.54**
ANNUALIZED DAILY VOLATILITY (%)				
Before Global Financial Crisis	December 2005-September 2008	28.81	24.39	**4.41**
Global Financial Crisis	September 2008-April 2009	54.34	48.93	**5.42**
Post Global Financial Crisis	April 2009-March 2017	24.06	24.54	**-0.48**
RETURN/RISK				
Before Global Financial Crisis	December 2005-September 2008	1.26	1.20	**0.06**
Global Financial Crisis	September 2008-April 2009	-1.27	-1.34	**0.07**
Post Global Financial Crisis	April 2009-March 2017	0.27	0.16	**0.11**

The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

The risk-adjusted return of the strategy showed better results over the long-term horizon.

Exhibit 6 shows that the annualized volatility of the Latin America Value Momentum Strategy was comparable to that of the benchmark across all time periods studied. The risk-adjusted return of the strategy showed better results over the long-term horizon. The 10-year, risk-adjusted return from the strategy was 0.14, nearly tripling the benchmark's 0.05.

Exhibit 6: Risk/Return Profiles

PERIOD	LATIN AMERICA VALUE MOMENTUM STRATEGY	S&P LATIN AMERICA BMI	DIFFERENCE
ANNUALIZED RETURN (%)			
3-Year	-5.33	-3.70	-1.63
5-Year	-4.68	-5.61	0.93
10-Year	3.99	1.47	2.52
Since Dec. 30, 2005	7.74	5.30	2.44
ANNUALIZED DAILY VOLATILITY (%)			
3-Year	24.54	25.30	-0.76
5-Year	22.33	22.70	-0.37
10-Year	28.53	27.59	0.94
Since Dec. 30, 2005	28.43	27.21	1.21
RETURN/RISK			
3-Year	-0.22	-0.15	-0.07
5-Year	-0.21	-0.25	0.04
10-Year	0.14	0.05	0.09
Since Dec. 30, 2005	0.27	0.19	0.08

The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

PERFORMANCE BY QUINTILE

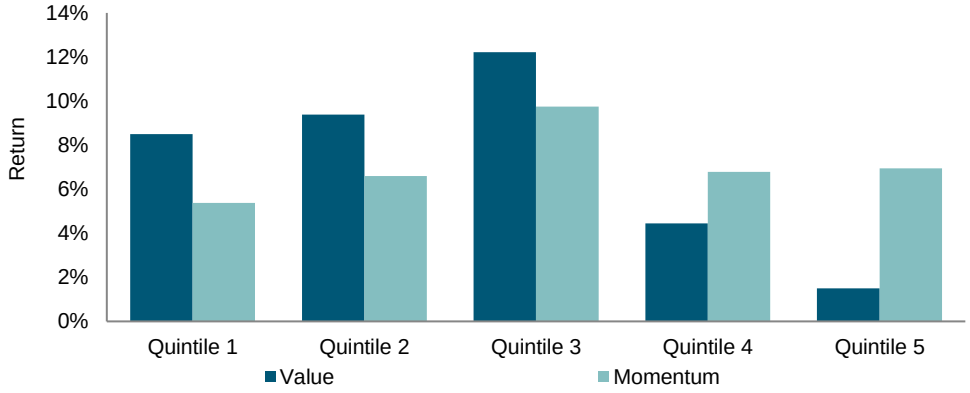
We further grouped the securities in the eligible universe into quintiles, based on their value and momentum scores on a quarterly basis. We then computed the annualized risk/return characteristics of each quintile for each factor (see Exhibits 7 and 8).

In the top three quintiles, the returns were dominated by the value factor, while the momentum factor took a larger share of returns in the bottom two quintiles.

It was not surprising to see that the bottom quintile offered the lowest return for the value factor, but it was somewhat surprising that the highest return was not from the top quintile. Instead, the largest return for the value factor was provided from the third quintile. Similarly, we can also see that the highest-momentum securities, as grouped in the top quintile, provided the lowest return. The highest return for the momentum factor was observed in the third quintile.

Looking at volatility as measured by the standard deviation of the return, the middle quintiles (second, third, and fourth) had lower volatility for both factors. The top quintile had the highest volatility from the value factor, and the bottom quintile showed the highest risk from the momentum factor.

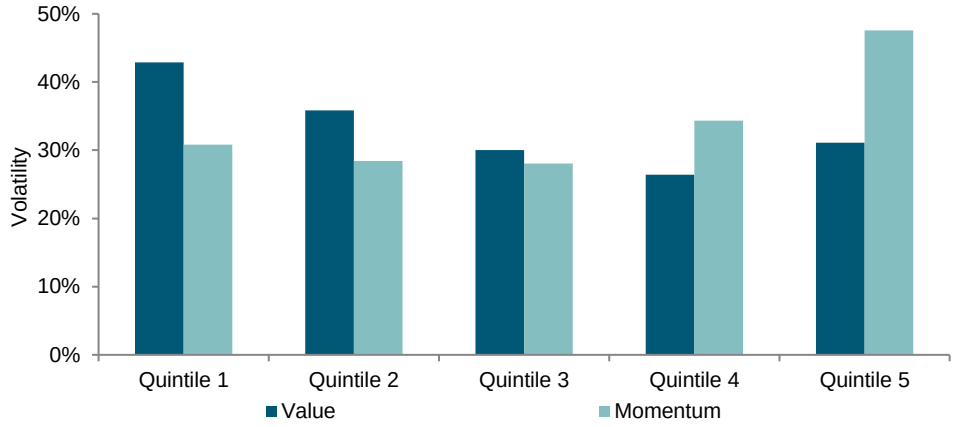
Exhibit 7: Returns of Value and Momentum Quintiles



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

In terms of risk-adjusted return, the higher returns are observed in the middle quintiles; however, there were wide gaps in the returns in the top and bottom quintiles between value and momentum.

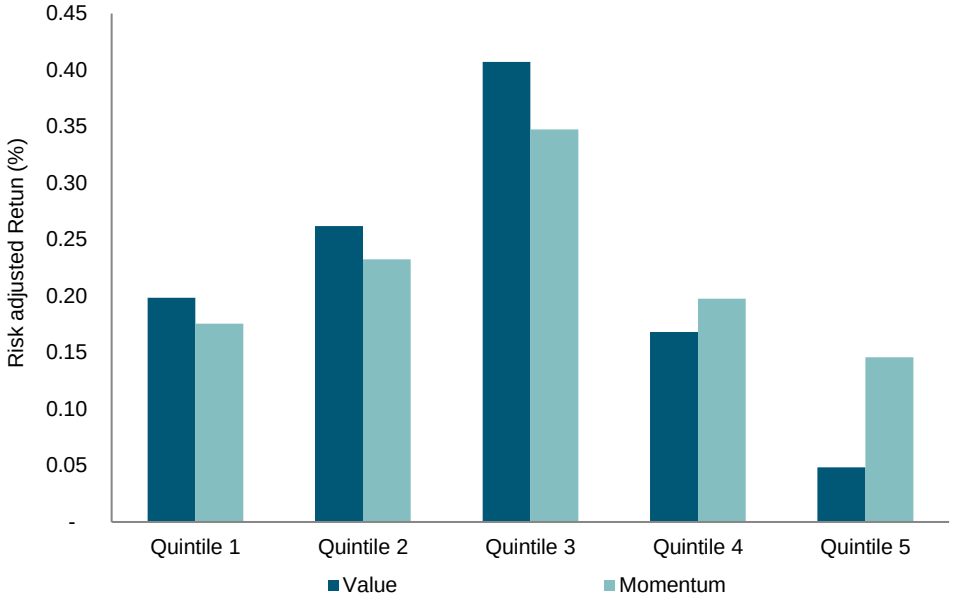
Exhibit 8: Volatility of Value and Momentum Quintiles



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

In terms of risk-adjusted return, the higher returns were observed in the middle quintiles; however, there were wide gaps in the returns in the top and bottom quintiles between value and momentum (see Exhibit 9). Value exhibited higher risk-adjusted return than momentum in the top quintile, but it was the opposite situation in the bottom quintile, in which the momentum factor showed stronger results.

Exhibit 9: Risk-Adjusted Returns

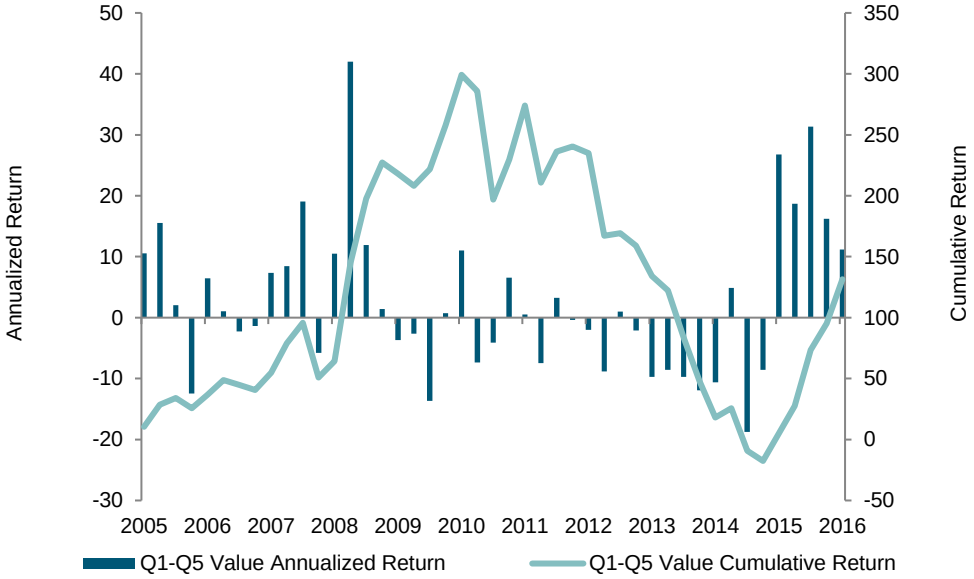


The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

The spread between the top and bottom quintile of each factor is presented on an annualized and cumulative basis in Exhibits 10 and 11. The value factor showed strong performance during the financial crisis, while the momentum factor was drastically affected by the historical downturn. The charts also demonstrate the negative correlation between the value and momentum factors.

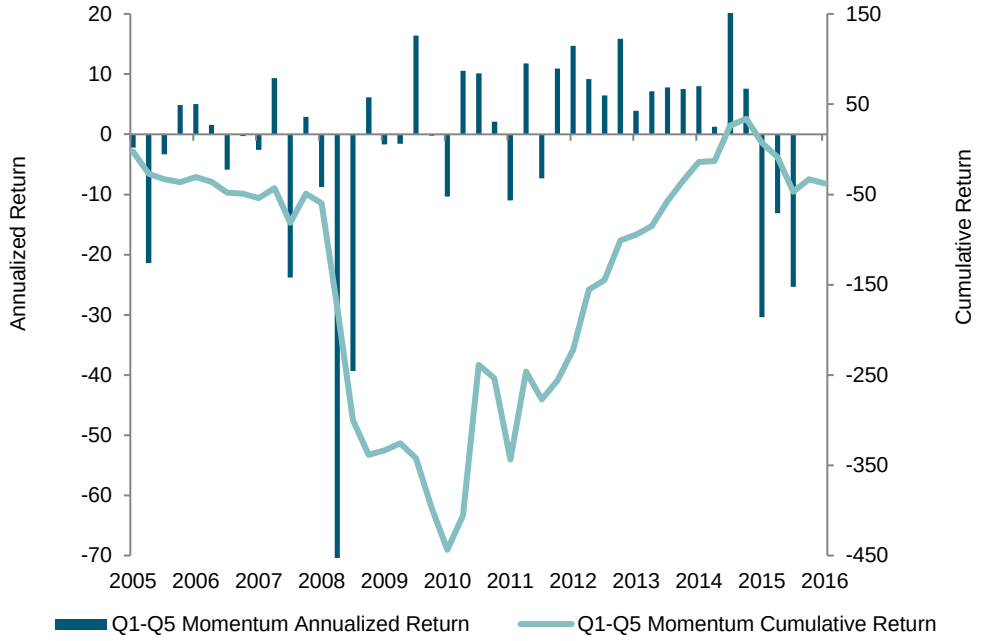
The value factor showed strong performance during the financial crisis, while the momentum factor was drastically affected by the historical downturn.

Exhibit 10: Quintile Spread Performance for the Value Factor



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 30, 2016. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 11: Quintile Spread Performance for the Momentum Factor



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 30, 2016. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

COUNTRY AND SECTOR BREAKDOWN

Latin American equity markets have been growing, despite troubling economic conditions in some markets.

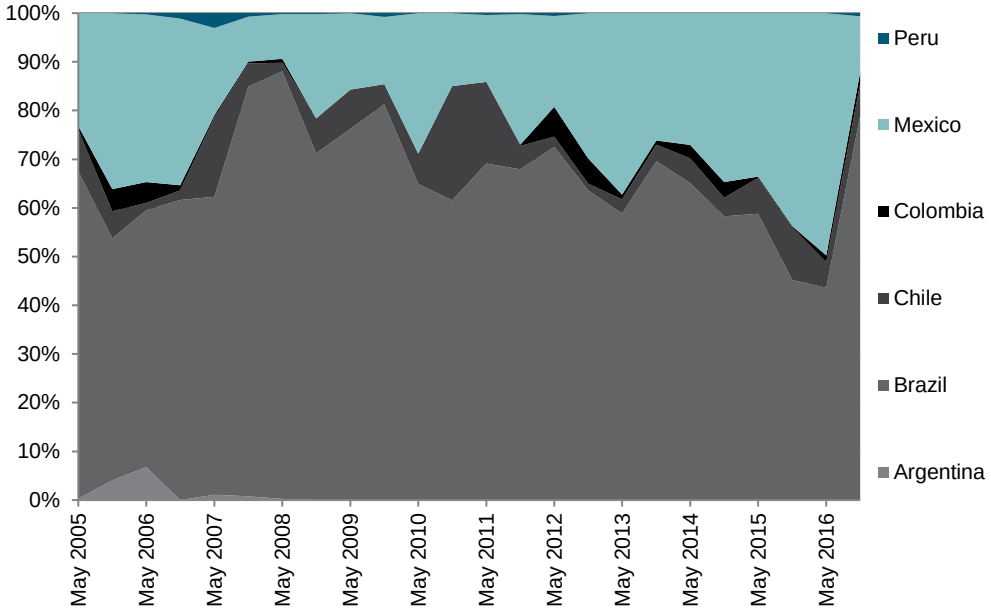
Latin American equity markets have been growing, despite troubling economic conditions in some markets. One piece of evidence for this is that the number of qualified value and momentum stocks increased over the past decade. The average number of constituents in the Latin America Value Momentum Strategy jumped from 59 stocks in 2005 to 97 stocks in June 2016, with the highest count (117) in 2013 (see Exhibit 12). However, stock count and weight were consistently dominated by Brazil and Mexico, while Chile, Colombia, and Peru had smaller constituent counts throughout the period studied (see Exhibit 13). Argentina was only included for four years, as it has been excluded from the underlying universe since Sept. 21, 2009.

Exhibit 12: Average Number of Constituents per Year in the Latin America Value Momentum Strategy

YEAR	AVERAGE NUMBER OF CONSTITUENTS	YEAR	AVERAGE NUMBER OF CONSTITUENTS
2016	97	2010	93
2015	103	2009	83
2014	114	2008	96
2013	117	2007	90
2012	106	2006	68
2011	102	2005	59

The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from May 2005 rebalancing to November 2016 rebalancing. Portfolio is rebalanced twice a year. Table is provided for illustrative purposes.

Exhibit 13: Country Weight Breakdown

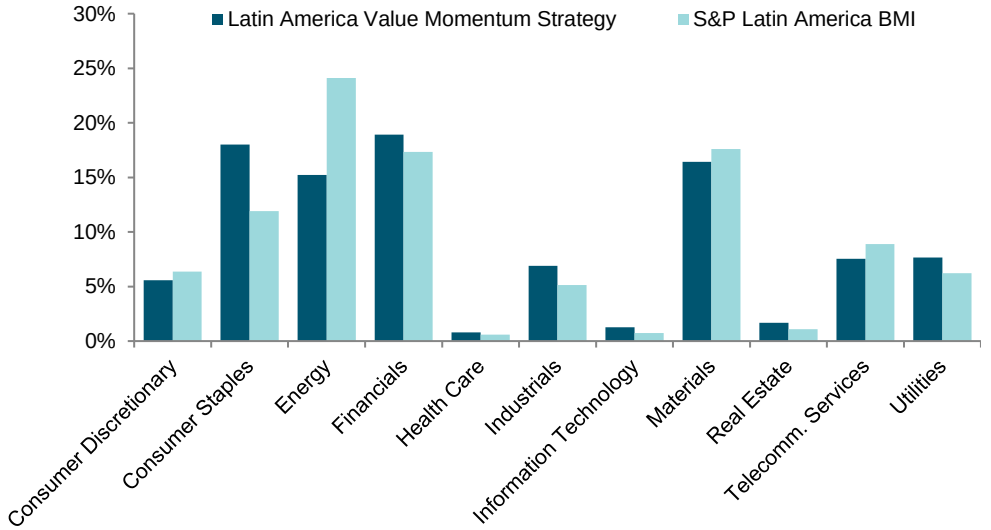


The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from May 2005 rebalancing to November 2016 rebalancing. Chart is provided for illustrative purposes.

The multi-factor strategy allocates weight across sectors differently than the underlying benchmark. Exhibit 14 compares the average sector weights of the Latin America Value Momentum Strategy and those of the broad market. The largest active weight differences can be seen in the energy and consumer staples sectors. On average, the strategy maintained 8.9% underweight in the energy sector, while the overweight in the consumer staples sector amounted to 6.1%. The impact of the weight distribution can be significant in the contribution to return data.

The impact of the weight distribution can be significant in the contribution to return data.

Exhibit 14: Average Sector Weights



The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 30, 2016. Chart is provided for illustrative purposes.

Exhibit 15 displays contribution to return by sector. Despite having the largest average weight of 24.11%, the energy sector contributed -0.58% to the return of the broad market. In contrast, with an average weight of 15.22% in the multi-factor strategy, the energy sector positively contributed to the return, with 5.72%. Consumer staples has stable demand characteristics, as people tend to consume similar amounts during up and down economies. In the value and momentum strategy, this sector had the second-highest weight (18.01% on average) and was the third-largest contributor to return, at 2.42%, versus a mere 0.96% return from the same sector in the benchmark, with an average weight of 11.91%.

Exhibit 15: Contribution to Return by Sector

SECTOR	AVERAGE WEIGHT (%)		CONTRIBUTION TO RETURN (%)	
	LATIN AMERICA VALUE MOMENTUM STRATEGY	S&P LATIN AMERICA BMI	LATIN AMERICA VALUE MOMENTUM STRATEGY	S&P LATIN AMERICA BMI
Consumer Discretionary	5.57	6.37	0.39	0.87
Consumer Staples	18.01	11.91	2.42	0.96
Energy	15.22	24.11	5.72	-0.58
Financials	18.93	17.32	4.34	3.03
Health Care	0.80	0.60	0.06	0.03
Industrials	6.89	5.14	0.55	0.35
Information Technology	1.26	0.75	0.16	0.05
Materials	16.44	17.59	1.96	4.24
Real Estate	1.67	1.09	0.00	-0.05
Telecommunication Services	7.55	8.88	1.96	1.58
Utilities	7.67	6.23	1.24	1.16
Total	**100.00**	**100.00**	**18.79**	**11.63**

The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 30, 2016. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

The top three contributors were energy, consumer staples, and industrials, in which both overweight sector allocations and security selections contributed to the excess returns.

The performance attribution analysis in Exhibit 16 breaks down the sources of active return of the strategy versus the benchmark. The top three contributors were energy, consumer staples, and industrials, in which both overweight sector allocations and security selections contributed to the excess returns.

Exhibit 16: Attribution Analysis

SECTOR	AVERAGE ANNUAL ALLOCATION EFFECT	AVERAGE ANNUAL SELECTION + INTERACTION EFFECT	AVERAGE ANNUAL TOTAL EFFECT
Consumer Discretionary	-0.02	0.41	0.39
Consumer Staples	2.24	0.66	2.89
Energy	3.33	0.75	4.08
Financials	-0.54	0.61	0.07
Health Care	-0.05	-0.10	-0.15
Industrials	0.51	0.24	0.75
Information Technology	0.19	-0.01	0.19
Materials	-0.60	-0.55	-1.15
Real Estate	0.19	-0.09	0.10
Telecommunication Services	0.10	0.13	0.23
Utilities	0.16	-0.41	-0.26
Total	**5.50**	**1.65**	**7.15**

The Latin America Value Momentum Strategy is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 30, 2016. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

VALUE AND MOMENTUM IN LATIN AMERICAN COUNTRIES

As shown in the prior section, a regional value and momentum strategy tends to be dominated by larger economies, such as Brazil and Mexico. In this section, we further test the effectiveness of the strategy on an individual country level for Brazil, Chile, Mexico, and Colombia. Brazil, Chile, and Mexico combined account for approximately 95% of Latin American equity markets in the underlying universe and the multi-factor strategy. These countries represent relatively liquid markets, while a comparatively illiquid trading environment is observed in Colombia.

A regional value and momentum strategy tends to be dominated by larger economies, such as Brazil and Mexico.

We used the S&P Brazil BMI, S&P Chile BMI, S&P Mexico BMI, and S&P Colombia BMI as the universes to form country-level, hypothetical, multi-factor portfolios. Additionally, we set different liquidity criteria to reflect the liquidity conditions in each market. For Brazil, Chile, and Mexico, stocks needed to have at least USD 50,000 for the six-month average monthly median traded value, and the MTVR needed to be at least 1%. In Colombia, we added trading frequency criteria to ensure sufficient liquidity. In addition, all stocks needed to have a six-month MTVR of at least 0.5%.

We applied the same selection rules as the Latin America Value Momentum Strategy to the individual country portfolios. However, in Colombia, different selection and weighting schemes were applied. After applying the liquidity criteria, we chose only the top 15 stocks from the ranking order to form the portfolio. Additionally, we tested which portfolio size can work the best under the market liquidity constraint. Based on stocks' recent trading value, a minimum initial portfolio of COP 150 billion

needed to be turned over within five days. Given the limited number of stocks and the highly concentrated sectors (two-thirds of stocks are in financials and materials), we limited the weight for each stock within the portfolio to 15%.

In Exhibit 17, we see that the value and momentum strategy worked differently depending on the market. In line with the results we observed on an overall regional basis, the strategy displayed higher excess returns for Brazil and Mexico over the longer period, but returns over the medium and short term varied among the markets. The strategy had higher risk-adjusted returns than the underlying broad market in Chile over a near- to medium-term investment horizon. The strategy also fared better than the underlying market in Colombia during the period studied, starting in November 2011.

Exhibit 17: Value and Momentum at the Country Level

PERIOD	BRAZIL		MEXICO		CHILE		COLOMBIA	
	VALUE MOMENTUM STRATEGY	S&P BRAZIL BMI	VALUE MOMENTUM STRATEGY	S&P MEXICO BMI	VALUE MOMENTUM STRATEGY	S&P CHILE BMI	VALUE MOMENTUM STRATEGY	S&P COLOMBIA BMI
ANNUALIZED RETURN (%)								
3-Year	-2.93	-3.56	-5.98	-4.66	6.17	2.04	-9.92	-13.64
5-Year	-5.16	-7.22	1.81	-1.27	-0.39	-4.71	-5.84	-8.27
10-Year	6.66	1.56	5.69	1.44	3.58	4.07		
Since Inception	10.20	5.65	9.37	5.05	6.24	6.81	-2.39	-4.68
ANNUALIZED VOLATILITY (%)								
3-Year	33.78	37.37	16.95	17.47	15.85	15.44	28.16	27.87
5-Year	33.78	37.37	16.95	17.47	15.85	15.44	28.16	27.87
10-Year	32.61	34.39	27.19	23.51	24.37	22.69		
Since Inception	31.00	33.80	16.51	16.76	16.83	16.96	25.15	24.68
RISK/RETURN RATIO								
3-Year	-0.09	-0.10	-0.35	-0.27	0.39	0.13	-0.35	-0.49
5-Year	-0.15	-0.19	0.11	-0.07	-0.02	-0.31	-0.21	-0.30
10-Year	0.20	0.05	0.21	0.06	0.15	0.18		
Since Inception	0.33	0.17	0.57	0.30	0.37	0.40	-0.09	-0.19

All Value Momentum Strategies are hypothetical portfolios.
Source: S&P Dow Jones Indices LLC. Data for Brazil, Mexico, and Chile value momentum strategy portfolios from Dec. 30, 2005, to March 31, 2017. Data for Colombia value momentum strategy portfolios from Nov. 30, 2011, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

In Mexico and Chile, the spread between the top and bottom quintiles was negative.

Exhibit 18 shows the return of the spread portfolio (top quintile minus the bottom) for the value and momentum factors for each region. For the value factor, we can see that securities of Latin America and Brazil in the top quintile, on average, delivered higher returns than those in the bottom quintile, as noted by the positive spread returns. However, the same strategy reveals different stories in Mexico and Chile, where the spread between the top and bottom quintiles was negative.

Exhibit 18: Regional Performance for Top Minus Bottom Quintile

REGION/COUNTRY	FACTOR	RETURN
Latin America	Value	7.01
	Momentum	-1.56
Brazil	Value	7.21
	Momentum	-5.32
Mexico	Value	-9.47
	Momentum	11.49
Chile	Value	-16.44
	Momentum	7.95

All Value Momentum Strategies are hypothetical portfolios.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Our analysis of the combined factor strategy in Latin America shows that factor-based investing can work effectively in the region.

CONCLUSION

Historically, the value and momentum factors have exhibited negative correlation. As such, combining the two factors in a strategy can potentially result in higher risk-adjusted returns than the broad market. Our analysis of the combined factor strategy in Latin America shows that factor-based investing can work effectively in the region. Back-tested results show that the strategy delivered higher risk-adjusted returns than the underlying broad market over the long-term investment horizon. With different liquidity gauges based on the conditions in different markets, the strategy could work for individual Latin American countries, especially over longer time periods.

S&P DJI RESEARCH CONTRIBUTORS		
Charles Mounts	Global Head	charles.mounts@spglobal.com
Jake Vukelic	Business Manager	jake.vukelic@spglobal.com
GLOBAL RESEARCH & DESIGN		
AMERICAS		
Aye M. Soe, CFA	Americas Head	aye.soe@spglobal.com
Dennis Badlyans	Associate Director	dennis.badlyans@spglobal.com
Phillip Brzenk, CFA	Director	phillip.brzenk@spglobal.com
Smita Chirputkar	Director	smita.chirputkar@spglobal.com
Rachel Du	Senior Analyst	rachel.du@spglobal.com
Bill Hao	Director	wenli.hao@spglobal.com
Qing Li	Associate Director	qing.li@spglobal.com
Berlinda Liu, CFA	Director	berlinda.liu@spglobal.com
Ryan Poirier, FRM	Senior Analyst	ryan.poirier@spglobal.com
Maria Sanchez	Associate Director	maria.sanchez@spglobal.com
Kelly Tang, CFA	Director	kelly.tang@spglobal.com
Peter Tsui	Director	peter.tsui@spglobal.com
Hong Xie, CFA	Director	hong.xie@spglobal.com
APAC		
Priscilla Luk	APAC Head	priscilla.luk@spglobal.com
Utkarsh Agrawal, CFA	Associate Director	utkarsh.agrawal@spglobal.com
Liyu Zeng, CFA	Director	liyu.zeng@spglobal.com
Akash Jain	Associate Director	akash.jain@spglobal.com
EMEA		
Sunjiv Mainie, CFA, CQF	EMEA Head	sunjiv.mainie@spglobal.com
Andrew Innes	Senior Analyst	andrew.innes@spglobal.com
INDEX INVESTMENT STRATEGY		
Craig J. Lazzara, CFA	Global Head	craig.lazzara@spglobal.com
Fei Mei Chan	Director	feimei.chan@spglobal.com
Tim Edwards, PhD	Senior Director	tim.edwards@spglobal.com
Anu R. Ganti, CFA	Director	anu.ganti@spglobal.com
Hamish Preston	Senior Associate	hamish.preston@spglobal.com
Howard Silverblatt	Senior Industry Analyst	howard.silverblatt@spglobal.com

PERFORMANCE DISCLOSURE

Charts and graphs are provided for illustrative purposes. Past performance is not an indication or guarantee of future results. The charts and graphs may reflect hypothetical historical performance. All information presented prior to the launch date is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the index(es) was officially launched. However, it should be noted that the historic calculations of an Economic Index may change from month to month based on revisions to the underlying economic data used in the calculation of the index. Complete index methodology details are available at www.spdji.com. It is not possible to invest directly in any index.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency on their products. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which a given index is set at a fixed value for calculation purposes. The Launch Date designates the date upon which the values of a given index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via S&P Dow Jones Indices' public website or its datafeed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the index's public release date.

Prospective application of the methodology used to construct the index(es) as well as revisions to economic data may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the index(es). Please refer to the index methodology for the particular index in question, available at www.spdji.com, for more details about such index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested data and/or information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

The index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices LLC maintains the index(es) and calculates the index levels and performance shown or discussed, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index(es) or investment funds that are intended to track the performance of the index(es). The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).

GENERAL DISCLAIMER