May 12, 2014

Portfolio Strategy P/E-Based Horizon Returns

It is well known that extremely low starting S&P 500 P/E's appear to lead to particularly good S&P 500 returns over the subsequent 10 years, and vice versa for extremely high P/E's. This effect is somewhat curious in that the same relationship does not seem to hold over shorter periods. This paper explores the drivers behind this 10-year effect and seeks to understand why it is not evident within shorter horizons.

Using S&P data over the 1950-2014 period, we created three buckets with starting P/E levels of below 13, 13-17, and above 17. The P/E's were derived from both trailing 12-month earnings and the Shiller CAPE model. For each bucket, the subsequent total returns and the associated components were then analyzed over 1- to 10-year horizons. The findings were then tested further with forward 1-year earnings.

The three buckets led to very different return paths. The average 10year returns were 15% for starting P/E's below 13, 11% for P/E's in the middle 13-17 range, and 6% for P/E's greater than 17. These results for the 10-year horizon were quite similar to the findings reported by a number of authors [1,2].

However, the surprise was that each of these very different levels of return remained largely stable over time, so that the *average* withinbucket returns were essentially the same for a 5-year horizon as for the 10-year horizon. (While some of this stability in later years could be traced to the annualization process, even the annual returns in the 10th year were significantly differentiated by their bucket source).

An even more striking finding was that virtually the same regression line surfaced when either the 5-year and 10-year returns were plotted against the initial P/E's.

Across all three P/E buckets, the earnings growth and dividend components of return were essentially the same at around 11%, suggesting that prospective earnings growth was not the key player in determining P/E levels. This left the total return trajectories to be driven largely by the average P/E growth rates of 6%, 0%, and -4%, respectively, for the below-13, the 13-17, and the above-17 P/E buckets. These different P/E growth rates remained quite stable over time, as the extreme starting P/E's required 8-10 years to slowly regress back towards "normal" levels.

MORGAN STANLEY & CO. LLC	
Martin Leibowitz	
Martin.Leibowitz@morganstanley.com	+1 212 761-7597
Anthony Bova	
Anthony.Bova@morganstanley.com	+1 212 761-3781



Morgan Stanley appreciates your support in the Institutional Investor 2014 All-America Equity Research Team Survey. Request your ballot.

Morgan Stanley does and seeks to do business with companies covered in Morgan Stanley Research. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of Morgan Stanley Research. Investors should consider Morgan Stanley Research as only a single factor in making their investment decision.

For analyst certification and other important disclosures, refer to the Disclosure Section, located at the end of this report.

The volatility around these returns decreases with time due in part to the annualization process. However, another striking finding is that these volatility paths are virtually identical across all three P/E buckets.

Thus, even though both the 5- and 10-year **average** returns had a similar inverse relationship to the initial P/E, the 5-year horizon returns were subject to a much wider dispersion that obscured the underlying similarity between the 5-year and the better-known 10-year patterns.

This high level of dispersion may also act to limit the practical applicability of P/E signals for the 5-year horizon – and maybe for the 10-year horizon as well.

While shedding some light on the "5-year vs. 10-year question", this analysis raises a number of even more challenging questions: What really determines extreme P/Es, what is the mechanism that drives the regression from these extreme levels, why is this regression so amazingly slow, and why are the within-bucket average P/E growth and total return values so stable over time?

P/E's and Historical Equity Returns

We thank Dr. Stanley Kogelman (who is a not a member of Morgan Stanley's Research Department) for his important contributions to the development of the mathematics and the research in this report. Unless otherwise indicated, his views are his own and may differ from the views of the Morgan Stanley Research Department and from the views of others within Morgan Stanley.

If you ask most investors whether they believe there is a tight relationship between P/E's and long-term equity returns, the answers would probably be both yes and no. Those in the "yes" camp would likely say that P/E's mean revert over time so that buying at low P/E's should bring higher returns while investing at high P/E's should bring lower returns. Those in the "no" camp would likely acknowledge the concept of buying cheap and selling dear but state that many factors can come into play when forecasting equity returns and therefore relying solely on the P/E in this forecast could prove problematic.

In fact, there appears to be quite a strong relationship between P/E's and future equity returns over a long-term period. Using a simple regression of the 10-year annualized returns for the S&P 500 vs the initial trailing P/E from 1950- Feb 2014 yields a 68% R^2 . However, this relationship does not seem to work well in the short term as the R^2 's are much lower.

Using S&P data over the 1950-2014 period, we created three buckets with starting P/E levels of below 13, 13-17, and above 17. The P/E's were derived from both trailing 12-month earnings and the Shiller CAPE model. For each bucket, the subsequent total returns and the associated components were then analyzed over 1- to 10-year horizons. The findings were then tested further with forward 1-year earnings.

In order to better understand what is happening with equity returns over time, we can break them down into three components: 1) Trailing P/E growth (or decay), 2) Earnings growth, and 3) Dividend Return. Each component of equity return follows a different pattern. The combination of earnings growth and dividend return is pretty much the same across the three P/E buckets. In the middle P/E range, dividends and earnings are the drivers of total returns, while the P/E change is minimal and does not play an important role. At the extreme ends of the initial P/E distribution, the P/E change is the swing factor. It has a positive impact for low initial P/E's and a negative impact for high initial P/E's.

Focusing on the P/E change over time, we see that the average P/E effect stabilizes by the 5th year regardless of the initial P/E range. So we ask why are there such significant horizon-based differences in R² if the average annualized P/E change is not materially different? The answer is found in the volatility of P/E changes. In the 5th year, the P/E change volatility ranged between 5%-7%. By the 10th year, this volatility converged to between 3-4%. Thus, the average annualized P/E changes over time do not tell the entire story since they fail to take into account the declining P/E volatility.

The majority of this report uses trailing P/E's and trailing earnings since this long data set allowed for a greater number of non-overlapping multi-year return periods. Although the forward P/E and earnings are commonly used in a number of valuation techniques, the lack of a long period of history made us uncomfortable using the forward data as the primary source in this report.

Exhibit 1 plots the 10 year annualized return for the S&P 500 vs the initial trailing P/E for each month from 1950 to Feb 2014. The large dots in Exhibit 1 represent the average values for three distinct P/E buckets: 1) less than 13, 2) between 13-17 and 3) greater than 17.

rather than as a formal measure of statistical "fit". The triangles in Exhibit 1 correspond to the returns for non-overlapping 10-year periods starting with January, 1950. The positioning of these triangles provide some comfort that the 10-year returns do in fact have a generally inverse relationship to the starting P/E values.





Source: Morgan Stanley Research

Although the initial P/E's and returns exhibit a clear relationship over the long term, this relationship does not seem to work as well for the shorter-term horizons. Exhibit 2 plots the 5-year annualized return vs the initial trailing P/E's. It should be noted that the regression line for the 5-year horizon is almost identical to Exhibit 1's regression line for the 10-year horizon. However, the greater dispersion reduces the 5-year R² to 36%.

Exhibit 3 plots the R^2 between the initial trailing P/E's and annualized returns over all horizons from 1-10 years. Over short horizons, the R^2 is low but increases almost linearly with time.





Source: Morgan Stanley Research





Morgan Stanley Research

Exhibit 4 shows the annualized total return over time using the trailing P/E to form the three buckets. For a given P/E bucket, the total annualized return remains stable once the 5-year horizon is reached. This same pattern over time occurs, regardless of the initial P/E bucket.

Note that Exhibit 4 shows annualized cumulative returns. The annualized returns within each one-year period

have a much greater dispersion.



Exhibit 4: Annualized Equity Return Using Initial Trailing P/E's (1950-Feb 2014)

Morgan Stanley Research

Components of Equity Returns

To better understand the development of equity returns over time, we separate the returns into three components: 1) P/E Growth, 2) Earnings Growth, and 3) Dividend Return. Exhibit 5 displays these components over a 10-year horizon given the three initial trailing P/E buckets.





Source: Morgan Stanley Research

Exhibit 5 shows that each component of equity return follows a different pattern. The combination of earnings growth and dividend return is virtually the same across all 3 buckets, ranging between 10.2%-11.8%. In the middle 13-17 P/E range, dividends and earnings are the driver of total returns and the P/E change on average does not play an important role. At the extreme ends of the distribution, the P/E change is a swing factor which has a major positive impact for initial P/E's less than 13 and a substantial negative impact for initial P/E's greater than 17.

Exhibit 6 plots the average P/E over time for the three P/E buckets. Note that the average P/E over this period was 15.3 and therefore the results in Exhibit 4 do suggest some mean reversion is occurring over time. The P/E's at the extreme lows and highs tend to increase and decrease, respectively, while the P/E's in the middle range tend to stay within the middle range.



Exhibit 6: Average Trailing P/E Over Time for 3 P/E Buckets (1950-Feb 2014)

Source: Morgan Stanley Research

Exhibit 7 plots the 10 year annualized P/E growth rate for the S&P 500 vs the initial trailing P/E. The R^2 of 58% between P/E changes and initial P/E's is somewhat less than the 68% R^2 between returns and initial P/E's.

Exhibit 7: 10-Year Annualized P/E Change vs Initial Trailing P/E (1950-Feb 2014)



Source: Morgan Stanley Research

Exhibit 8 shows the annualized P/E change over time. For the middle bucket, P/E change has some effect in the earlier years but does not significantly impact returns over the long term. For the initial P/E's less than

13, in the earlier years of the horizon, the P/E change is a substantial driver of equity returns. From the 5th year onward, the annualized P/E change remains stable at 6% per year. For initial P/E's above 17, there is a large negative contribution to returns due to changes in P/E's. However, this P/E decline stabilizes by the 5th year at a rate of -3% per year.





Source: Morgan Stanley Research

An explanation for the significant difference between the 5- and 10- year R² can be inferred from Exhibit 9, which plots the volatility of P/E growth over time. In the 5th year, for all three buckets, the volatility in the P/E growth rate ranges between 5% and 7%. By the 10th year, the volatilities converge to roughly 3% - 4%. Thus, the difference in the 5- and 10-year R² is, at least partially,due to the decline in P/E growth volatility.

Exhibit 9: Volatility of P/E Growth Rate Over Time



Source: Morgan Stanley Research

In Exhibit 10, the three components of return are shown (with earnings change added to dividend return) as annualized contributions to equity return for initial P/E above 17. Clearly, the earnings change is the biggest contributor to equity returns over the different horizons. A portion of this positive effect from the change in earnings and dividend return is offset by the negative change in P/E's. This offset leads to a stable annualized return at about 6% over time.





Source: Morgan Stanley Research

In Exhibit 11, the three components are return are shown for initial P/E's less than 13. In the early years, P/E decay is a significant factor in equity returns. After the 3^{rd} year, the annualized P/E growth stabilizes at 5 - 6% per year. The earnings growth plus the dividend return increases slightly over time.





Source: Morgan Stanley Research

The stability in P/E growth can be seen more clearly in Exhibit 12, which plots the average growth rate $\pm 1\sigma$ for initial P/E's less than 13. In the early years, there is large variation in P/E growth, but the narrowing of this spread is consistent with the reduction in P/E volatility shown in Exhibit 9.



Exhibit 12: Average and $\pm 1\sigma$ Change Over Time for Initial Trailing P/E's < 13

Source: Morgan Stanley Research

Comparison of Results using Forward and Shiller P/E's

Thus we far, we have used P/E's based on trailing earnings from Jan 1950 - Feb 2014 in our analysis. This long data set allowed us to calculate a significant number of non-overlapping multi-year return periods. Although the forward P/E and earnings are commonly used in a number of valuation techniques, the lack of a long period of history made us uncomfortable using the forward data as the primary source in this report. Recall that Exhibit 4 shows the annualized total return over time using the trailing P/E buckets. In contrast, Exhibit 13 shows the annualized total return over time using forward P/E buckets (The dotted lines reflect the more limited number of 5-10 year horizons in this dataset). For a given P/E bucket, the total annualized return follows a persistent pattern over time, regardless of whether trailing or forward P/E's are used.



Exhibit 13: Annualized Equity Return Using Initial Forward P/E's

Source: Morgan Stanley Research

Another common metric, the Shiller CAPE P/E, uses the inflation-adjusted average real earnings over the last 10 years as the denominator [1]. The Shiller data series is available beginning in 1881 but we have used data starting in 1950 to be consistent with the earlier trailing P/E data series.

As a point of comparison between trailing, forward and Shiller P/E's, Exhibit 14 shows the R² between returns and initial P/E's over 5 and 10 year horizons using all three P/E metrics. Two time frames are shown: 1) from 1950-Feb 2014 and 2) 1984-June 2013.

	1950-Feb 2014	1984-June 2013
10 Years		
Trailing P/E	68%	78%
Forward P/E	NA	87%
Shiller P/E	68%	85%
	1950-Feb 2014	1984-June 2013
5 Years		
Trailing P/E	36%	30%
Forward P/E	NA	48%
Shiller P/E	37%	49%

Exhibit 14: R^2 Between Returns and Initial P/E's Using Trailing, Forward and Shiller P/E's

Source: Morgan Stanley Research

Over both the 1950-2014 and 1984-2013 periods, Exhibit 14 suggests consistency between the initial P/E and 10-year returns, regardless of the P/E metric. However, the 5-year R² are much lower, again for both historical periods and for all P/E metrics.

Related Work

The empirical results in the current study show the earnings growth to be basically the same across all starting P/E buckets. Indeed, this disconnect between the various P/E levels and the subsequent growth of either realized or expected earnings suggests that prospective earnings growth may not play much of a role in driving the P/E level.

If earnings are not the key to the P/E level, then attention might shift to other factors such as the discount rate and its associated components – the real rate, an appropriate risk premium, and an inflation "flow-through" factor.

This possibility that such rate effects may play a more dominant pricing role was a key point in John Cochrane's 2011 AFA Presidental Address [5].

Another earlier study may shed –some admittedly very incomplete– light on this issue. Over 1984-2006, forward P/E ratios were shown to exhibit a "tent pattern" relationship with real rates, with low P/E's being found in both low and high real rate environments, while high P/E's were associated with moderate real rates [5]. This result was later shown to hold across a much larger historical period [6].

While it is clear how high real rates could dampen P/E's, it is less obvious how low real rates could also lead to low P/E's. One hypothesis is that low real rates are typically accompanied by a dour economic environment and a more clouded future for equity returns. The resulting higher equity risk premiums could then lead to higher overall discount rates and exert downward pressure on P/E's.

Thus, rather than the earnings growth being key, it could be the various components of the prevailing discount rate that act as drivers of the P/E level.

Conclusions

In both the 1950-2014 data using trailing P/E's and the 1984-2014 data using forward P/E's, the 5-and 10year S&P returns exhibited virtually identical regression lines versus initial P/E levels. Thus, a given initial P/E seemed to lead to roughly the same **average** returns over both the 5- and 10-year horizons. However, the dispersion of the annualized returns became far more compressed over the longer periods, and it was this lower volatility that gave rise to the higher regression R-squares for the 10-year result (and perhaps as well to its wider recognition).

The dividend return and the earnings growth appeared to play a small role in the P/E-based variation of returns. The combination of the actual dividend return and earnings growth provided a relatively stable 10-11% component of S&P returns over the subsequent 3-10 years – regardless of the initial P/E level. The P/Ebased variation in returns could therefore be traced almost entirely to the movement of the more extreme P/E's back towards normal levels.

References

1) Shiller, Robert J. "Irrational Exuberance." 2nd edition. Princeton University Press, 2005

2) Bogle, John C. "Investing in the 1990's: Remembrance of Things Past, and Things Yet to Come. "*The Journal of Portfolio Management,* Spring 1991

3) Bogle, John C. "Investing in the 1990's: Occam's Razor Revisited "The Journal of Portfolio Management, Fall 1991

4) Bogle, John C. "The 1990's at the Halfway Mark "The Journal of Portfolio Management, Summer 1995

5) Cochrane, John H. "Presidental Address: Discount Rates. "The Journal of Finance, August 2011

6) Leibowitz, Martin L. and Anthony Bova. "P/E's and Pension Fund Ratios", Financial Analysts Journal, January/February 2007

7) Parker, Adam S. "The 2013 Playbook", Morgan Stanley Research, November 26,2012

Disclosure Section

The information and opinions in Morgan Stanley Research were prepared by Morgan Stanley & Co. LLC, and/or Morgan Stanley C.T.V.M. S.A., and/or Morgan Stanley Mexico, Casa de Bolsa, S.A. de C.V., and/or Morgan Stanley Canada Limited. As used in this disclosure section, "Morgan Stanley" includes Morgan Stanley & Co. LLC, Morgan Stanley C.T.V.M. S.A., Morgan Stanley Mexico, Casa de Bolsa, S.A. de C.V., Morgan Stanley C.T.V.M. S.A., Morgan Stanley Mexico, Casa de Bolsa, S.A. de C.V., Morgan Stanley C.T.V.M. S.A., Morgan Stanley Mexico, Casa de Bolsa, S.A. de C.V., Morgan Stanley C.T.V.M. S.A., Morgan Stanley Mexico, Casa de Bolsa, S.A. de C.V., Morgan Stanley Canada Limited and their affiliates as necessary.

For important disclosures, stock price charts and equity rating histories regarding companies that are the subject of this report, please see the Morgan Stanley Research Disclosure Website at www.morganstanley.com/researchdisclosures, or contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Research Management), New York, NY, 10036 USA.

For valuation methodology and risks associated with any price targets referenced in this research report, please contact the Client Support Team as follows: US/Canada +1 800 303-2495; Hong Kong +852 2848-5999; Latin America +1 718 754-5444 (U.S.); London +44 (0)20-7425-8169; Singapore +65 6834-6860; Sydney +61 (0)2-9770-1505; Tokyo +81 (0)3-6836-9000. Alternatively you may contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Research Management), New York, NY 10036 USA.

Analyst Certification

The following analysts hereby certify that their views about the companies and their securities discussed in this report are accurately expressed and that they have not received and will not receive direct or indirect compensation in exchange for expressing specific recommendations or views in this report: Martin Leibowitz.

Unless otherwise stated, the individuals listed on the cover page of this report are research analysts.

Global Research Conflict Management Policy

Morgan Stanley Research has been published in accordance with our conflict management policy, which is available at www.morganstanley.com/institutional/research/conflictpolicies.

Important US Regulatory Disclosures on Subject Companies

The equity research analysts or strategists principally responsible for the preparation of Morgan Stanley Research have received compensation based upon various factors, including quality of research, investor client feedback, stock picking, competitive factors, firm revenues and overall investment banking revenues.

Morgan Stanley and its affiliates do business that relates to companies/instruments covered in Morgan Stanley Research, including market making, providing liquidity and specialized trading, risk arbitrage and other proprietary trading, fund management, commercial banking, extension of credit, investment services and investment banking. Morgan Stanley sells to and buys from customers the securities/instruments of companies covered in Morgan Stanley Research on a principal basis. Morgan Stanley may have a position in the debt of the Company or instruments discussed in this report. Certain disclosures listed above are also for compliance with applicable regulations in non-US jurisdictions.

STOCK RATINGS

Morgan Stanley uses a relative rating system using terms such as Overweight, Equal-weight, Not-Rated or Underweight (see definitions below). Morgan Stanley does not assign ratings of Buy, Hold or Sell to the stocks we cover. Overweight, Equal-weight, Not-Rated and Underweight are not the equivalent of buy, hold and sell. Investors should carefully read the definitions of all ratings used in Morgan Stanley Research. In addition, since Morgan Stanley Research contains more complete information concerning the analyst's views, investors should carefully read Morgan Stanley Research, in its entirety, and not infer the contents from the rating alone. In any case, ratings (or research) should not be used or relied upon as investment advice. An investor's decision to buy or sell a stock should depend on individual circumstances (such as the investor's existing holdings) and other considerations.

Global Stock Ratings Distribution

(as of April 30, 2014)

For disclosure purposes only (in accordance with NASD and NYSE requirements), we include the category headings of Buy, Hold, and Sell alongside our ratings of Overweight, Equal-weight, Not-Rated and Underweight. Morgan Stanley does not assign ratings of Buy, Hold or Sell to the stocks we cover. Overweight, Equal-weight, Not-Rated and Underweight are not the equivalent of buy, hold, and sell but represent recommended relative weightings (see definitions below). To satisfy regulatory requirements, we correspond Overweight, our most positive stock rating, with a buy recommendation; we correspond Equal-weight and Not-Rated to hold and Underweight to sell recommendations, respectively.

	COVERAGE UNIVERSE		INVESTMEI	INVESTMENT BANKING CLIENTS (IBC)		
STOCK RATING CATEGORY	COUNT	% OF TOTAL	COUNT	% OF TOTAL	% OF RATING	
				IBC	CATEGORY	
Overweight/Buy	1045	35%	355	38%	34%	
Equal-weight/Hold	1301	43%	455	48%	35%	
Not-Rated/Hold	110	4%	22	2%	20%	
Underweight/Sell	543	18%	109	12%	20%	
TOTAL	2,999		941			

Data include common stock and ADRs currently assigned ratings. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months.

Analyst Stock Ratings

Overweight (O). The stock's total return is expected to exceed the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Equal-weight (E). The stock's total return is expected to be in line with the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Not-Rated (NR). Currently the analyst does not have adequate conviction about the stock's total return relative to the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Underweight (U). The stock's total return is expected to be below the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Unless otherwise specified, the time frame for price targets included in Morgan Stanley Research is 12 to 18 months.

Analyst Industry Views

Attractive (A): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be attractive vs. the relevant

broad market benchmark, as indicated below.

In-Line (I): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be in line with the relevant broad market benchmark, as indicated below.

Cautious (C): The analyst views the performance of his or her industry coverage universe over the next 12-18 months with caution vs. the relevant broad market benchmark, as indicated below.

Benchmarks for each region are as follows: North America - S&P 500; Latin America - relevant MSCI country index or MSCI Latin America Index; Europe - MSCI Europe; Japan - TOPIX; Asia - relevant MSCI country index or MSCI sub-regional index or MSCI AC Asia Pacific ex Japan Index.

Important Disclosures for Morgan Stanley Smith Barney LLC Customers

Important disclosures regarding the relationship between the companies that are the subject of Morgan Stanley Research and Morgan Stanley Smith Barney LLC or Morgan Stanley or any of their affiliates, are available on the Morgan Stanley Wealth Management disclosure website at www.morganstanley.com/online/researchdisclosures. For Morgan Stanley specific disclosures, you may refer to www.morganstanley.com/researchdisclosures.

Each Morgan Stanley Equity Research report is reviewed and approved on behalf of Morgan Stanley Smith Barney LLC. This review and approval is conducted by the same person who reviews the Equity Research report on behalf of Morgan Stanley. This could create a conflict of interest.

Other Important Disclosures

Morgan Stanley is not acting as a municipal advisor and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of Section 975 of the Dodd-Frank Wall Street Reform and Consumer Protection Act.

Morgan Stanley produces an equity research product called a "Tactical Idea." Views contained in a "Tactical Idea" on a particular stock may be contrary to the recommendations or views expressed in research on the same stock. This may be the result of differing time horizons, methodologies, market events, or other factors. For all research available on a particular stock, please contact your sales representative or go to Matrix at http://www.morganstanley.com/matrix.

Morgan Stanley Research is provided to our clients through our proprietary research portal on Matrix and also distributed electronically by Morgan Stanley to clients. Certain, but not all, Morgan Stanley Research products are also made available to clients through third-party vendors or redistributed to clients through alternate electronic means as a convenience. For access to all available Morgan Stanley Research, please contact your sales representative or go to Matrix at http://www.morganstanley.com/matrix.

Any access and/or use of Morgan Stanley Research is subject to Morgan Stanley's Terms of Use (http://www.morganstanley.com/terms.html). By accessing and/or using Morgan Stanley Research, you are indicating that you have read and agree to be bound by our Terms of Use (http://www.morganstanley.com/terms.html). In addition you consent to Morgan Stanley processing your personal data and using cookies in accordance with our Privacy Policy and our Global Cookies Policy (http://www.morganstanley.com/privacy_pledge.html), including for the purposes of setting your preferences and to collect readership data so that we can deliver better and more personalized service and products to you. To find out more information about how Morgan Stanley processes personal data, how we use cookies and how to reject cookies see our Privacy Policy and our Global Cookies Policy (http://www.morganstanley.com/privacy_pledge.html).

If you do not agree to our Terms of Use and/or if you do not wish to provide your consent to Morgan Stanley processing your personal data or using cookies please do not access our research.

Morgan Stanley Research does not provide individually tailored investment advice. Morgan Stanley Research has been prepared without regard to the circumstances and objectives of those who receive it. Morgan Stanley recommends that investors independently evaluate particular investments and strategies, and encourages investors to seek the advice of a financial adviser. The appropriateness of an investment or strategy will depend on an investor's circumstances and objectives. The securities, instruments, or strategies discussed in Morgan Stanley Research may not be suitable for all investors, and certain investors may not be eligible to purchase or participate in some or all of them. Morgan Stanley Research is not an offer to buy or sell or the solicitation of an offer to buy or sell any security/instrument or to participate in any particular trading strategy. The value of and income from your investments may vary because of changes in interest rates, foreign exchange rates, default rates, prepayment rates, securities/instruments prices, market indexes, operational or financial conditions of companies or other factors. There may be time limitations on the exercise of options or other rights in securities/instruments transactions. Past performance is not necessarily a guide to future performance. Estimates of future performance are based on assumptions that may not be realized. If provided, and unless otherwise stated, the closing price on the cover page is that of the primary exchange for the subject company's securities/instruments.

The fixed income research analysts, strategists or economists principally responsible for the preparation of Morgan Stanley Research have received compensation based upon various factors, including quality, accuracy and value of research, firm profitability or revenues (which include fixed income trading and capital markets profitability or revenues), client feedback and competitive factors. Fixed Income Research analysts', strategists' or economists' compensation is not linked to investment banking or capital markets transactions performed by Morgan Stanley or the profitability or revenues of particular trading desks.

The "Important US Regulatory Disclosures on Subject Companies" section in Morgan Stanley Research lists all companies mentioned where Morgan Stanley owns 1% or more of a class of common equity securities of the companies. For all other companies mentioned in Morgan Stanley Research, Morgan Stanley may have an investment of less than 1% in securities/instruments or derivatives of securities/instruments of companies and may trade them in ways different from those discussed in Morgan Stanley Research. Employees of Morgan Stanley not involved in the preparation of Morgan Stanley Research may have investments in securities/instruments or derivatives of securities/instruments of companies mentioned and may trade them in ways different from those discussed in Morgan Stanley Research. Derivatives of securities/instruments of companies mentioned and may trade them in ways different from those discussed in Morgan Stanley Research. Derivatives may be issued by Morgan Stanley or associated persons.

With the exception of information regarding Morgan Stanley, Morgan Stanley Research is based on public information. Morgan Stanley makes every effort to use reliable, comprehensive information, but we make no representation that it is accurate or complete. We have no obligation to tell you when opinions or information in Morgan Stanley Research change apart from when we intend to discontinue equity research coverage of a subject company. Facts and views presented in Morgan Stanley Research have not been reviewed by, and may not reflect information known to, professionals in other Morgan Stanley business areas, including investment banking personnel.

Morgan Stanley Research personnel may participate in company events such as site visits and are generally prohibited from accepting payment by the company of associated expenses unless pre-approved by authorized members of Research management.

Morgan Stanley may make investment decisions or take proprietary positions that are inconsistent with the recommendations or views in this report. To our readers in Taiwan: Information on securities/instruments that trade in Taiwan is distributed by Morgan Stanley Taiwan Limited ("MSTL"). Such information is for your reference only. The reader should independently evaluate the investment risks and is solely responsible for their investment decisions. Morgan Stanley Research may not be distributed to the public media or quoted or used by the public media without the express written consent of Morgan Stanley. Information on securities/instruments that do not trade in Taiwan is for informational purposes only and is not to be construed as a recommendation or a solicitation to trade in such securities/instruments. MSTL may not execute transactions for clients in these securities/instruments. To our readers in Hong Kong: Information is distributed in Hong Kong by and on behalf of, and is attributable to, Morgan Stanley Asia Limited as part of its regulated activities in Hong Kong. If you have any queries concerning Morgan Stanley Research, please contact our Hong Kong sales representatives.

Morgan Stanley is not incorporated under PRC law and the research in relation to this report is conducted outside the PRC. Morgan Stanley Research does not constitute an offer to sell or the solicitation of an offer to buy any securities in the PRC. PRC investors shall have the relevant qualifications to invest in such securities and shall be responsible for obtaining all relevant approvals, licenses, verifications and/or registrations from the relevant governmental authorities themselves.

Morgan Stanley Research is disseminated in Brazil by Morgan Stanley C.T.V.M. S.A.; in Japan by Morgan Stanley MUFG Securities Co., Ltd. and, for Commodities related research reports only, Morgan Stanley Capital Group Japan Co., Ltd; in Hong Kong by Morgan Stanley Asia Limited (which accepts

responsibility for its contents); in Singapore by Morgan Stanley Asia (Singapore) Pte. (Registration number 199206298Z) and/or Morgan Stanley Asia (Singapore) Securities Pte Ltd (Registration number 200008434H), regulated by the Monetary Authority of Singapore (which accepts legal responsibility for its contents and should be contacted with respect to any matters arising from, or in connection with, Morgan Stanley Research); in Australia to "wholesale clients" within the meaning of the Australian Corporations Act by Morgan Stanley Australia Limited A.B.N. 67 003 734 576, holder of Australian financial services license No. 233742, which accepts responsibility for its contents; in Australia to "wholesale clients" and "retail clients" within the meaning of the Australian Corporations Act by Morgan Stanley Wealth Management Australia Pty Ltd (A.B.N. 19 009 145 555, holder of Australian financial services license No. 240813, which accepts responsibility for its contents; in Korea by Morgan Stanley & Co International plc, Seoul Branch; in India by Morgan Stanley India Company Private Limited; in Indonesia by PT Morgan Stanley Asia Indonesia; in Canada by Morgan Stanley Canada Limited, which has approved of and takes responsibility for its contents in Canada; in Germany by Morgan Stanley Bank AG, Frankfurt am Main and Morgan Stanley Private Wealth Management Limited. Niederlassung Deutschland, regulated by Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin); in Spain by Morgan Stanley, S.V., S.A., a Morgan Stanley group company, which is supervised by the Spanish Securities Markets Commission (CNMV) and states that Morgan Stanley Research has been written and distributed in accordance with the rules of conduct applicable to financial research as established under Spanish regulations; in the US by Morgan Stanley & Co. LLC, which accepts responsibility for its contents. Morgan Stanley & Co. International plc, authorized by the Prudential Regulatory Authority and regulated by the Financial Conduct Authority and the Prudential Regulatory Authority, disseminates in the UK research that it has prepared, and approves solely for the purposes of section 21 of the Financial Services and Markets Act 2000, research which has been prepared by any of its affiliates. Morgan Stanley Private Wealth Management Limited, authorized and regulated by the Financial Conduct Authority, also disseminates Morgan Stanley Research in the UK. Private UK investors should obtain the advice of their Morgan Stanley & Co. International plc or Morgan Stanley Private Wealth Management representative about the investments concerned. RMB Morgan Stanley (Proprietary) Limited is a member of the JSE Limited and regulated by the Financial Services Board in South Africa. RMB Morgan Stanley (Proprietary) Limited is a joint venture owned equally by Morgan Stanley International Holdings Inc. and RMB Investment Advisory (Proprietary) Limited, which is wholly owned by FirstRand Limited.

The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (DIFC Branch), regulated by the Dubai Financial Services Authority (the DFSA), and is directed at Professional Clients only, as defined by the DFSA. The financial products or financial services to which this research relates will only be made available to a customer who we are satisfied meets the regulatory criteria to be a Professional Client. The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (QFC Branch), regulated by the Qatar Financial Centre Regulatory Authority (the QFCRA), and is directed at business customers and market counterparties only and is not intended for Retail Customers as defined by the QFCRA.

As required by the Capital Markets Board of Turkey, investment information, comments and recommendations stated here, are not within the scope of investment advisory activity. Investment advisory service is provided in accordance with a contract of engagement on investment advisory concluded between brokerage houses, portfolio management companies, non-deposit banks and clients. Comments and recommendations stated here rely on the individual opinions of the ones providing these comments and recommendations. These opinions may not fit to your financial status, risk and return preferences. For this reason, to make an investment decision by relying solely to this information stated here may not bring about outcomes that fit your expectations. The trademarks and service marks contained in Morgan Stanley Research are the property of their respective owners. Third-party data providers make no warranties or representations relating to the accuracy, completeness, or timeliness of the data they provide and shall not have liability for any damages relating to such data. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and S&P. Morgan Stanley Research or portions of it may not be reprinted, sold or redistributed without the written consent of Morgan Stanley.

Morgan Stanley Research, or any portion thereof may not be reprinted, sold or redistributed without the written consent of Morgan Stanley.

© 2014 Morgan Stanley