

Quantitative Portfolio Strategy

10 September 2010 | 15 pages

Introducing Quantitative Style Indices for Japanese Equities

Quant 

QuantIFI: Quantitative Investable Factor Indices

- **New Research Tool for Japanese Style Analysis** — In this report we introduce a new tool for equity style analysis in Japanese markets which clients can use for daily monitoring (via Bloomberg) of payoffs to six equity investment styles: Size, Value, Growth, Risk, Momentum and Quality
- **Key Differentiators** — In addition to explicit liquidity constraints, each index has a unit beta to the one style and a zero beta to the other five styles, so the index returns represent pure factor payoffs, stripped of secondary effects. It is our belief that that post such orthogonalization these indices provide a useful tool to interpret style performance.
- **All roads lead to Value** — Value has trounced all other equity styles in Japan. While this is may not be surprising to anyone, the Japanese QuantIFI indices help us determine the pure payoff to Value net of country, sector and style effects. At 4.31% per annum return on a 4.14% annualized volatility basis, a passive Value trade tracking our Japan QuantIFI Value index has shown an impressive 1.04 Information Ratio.
- **Trend is not your friend, Growth disappoints, avoid Risk, Size does matter** — To sum up our other key takeaways. Detailed performance figures inside

Paul Chanin
+65-6432-1153
paul.chanin@citigroup.com

Head, Pan Asia Quantitative Research

Japan

Nachiket Garde, CFA
+65-6-432-1157
nachiket.garde@citi.com

Ryoichi Naito
+81-3-6270-4888
ryoichi.naito@citi.com

Singapore

Puneet Singh
puneet.singh@citi.com

Si An Tan
si.an.tan@citi.com

Anmol Sethy
anmol.sethy@citi.com

Australia

Nick Morton
nick.morton@citi.com

India

Aditya Shah
aditya.b.shah@citi.com

Figure 1. Summary Statistics and BB Tickers for Citi Japan QuantIFI indices

	Size	Value	Growth	Risk	Momentum	Quality
BB Ticker	CITQJPSZ	CITQJPVA	CITQJPGR	CITQJPRI	CITQJPMO	CITQJPQU
Return (% Ann.)	-1.41	4.31	-1.14	2.98	-1.51	1.43
Volatility (% Ann.)	4.09	4.14	3.63	10.44	4.96	4.08
Information Ratio	-0.35	1.04	-0.31	0.29	-0.3	0.35

Source: Citi Investment Research and Analysis.

See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

Citi Investment Research & Analysis is a division of Citigroup Global Markets Inc. (the "Firm"), which does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the Firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

Executive Summary

In this report we introduce our new “pure” style factor indices for Japanese equities. These indices have two key differentiating characteristics from most other style indices. Firstly, they provide “pure” factor exposure, i.e. a Value index has a unit exposure to the Value factor, and a Zero exposure to all other Style factors. Secondly, the indices are investible as each stock weight in the index is by construction a function of its recent liquidity in the market - attributes which give the indices potential applicability within the investment process in multiple areas such as Asset Allocation, Portfolio Construction and Risk Management.

Please contact the authors or your Citi Equity Salesperson for further details.

Index Construction Philosophy

In the first part of this two-part series of reports we describe the index construction process and highlight their key characteristics such as their factor exposures and risk/return profiles. In the next part we will illustrate potential applications of style indices for the Japanese market with the help of simple case studies.

The philosophy underlying factor indices is an extension of the financial theory of capital asset pricing. Essentially there is one key difference: the beta itself is expressed as a combination of “factor betas” to several individual and independent factors instead of just the one factor Capital Asset Pricing Model (CAPM) which provides a beta against the market. Thus, it stays true to the philosophy of efficient separation of alpha and beta in portfolio construction, a topic of much interest within the investment community.

In a nutshell, working with factor indices helps us to accomplish the following:

- a) attribute equity market returns between systematic market wide factors and an unsystematic, stock specific component
- b) create orthogonal factor (or style) indices as benchmarks of linearly independent payoffs to each systematic factor
- c) apply tilts to (or hedge) the individual factor exposures as a way of effectively managing the portfolio’s systematic risk exposures

Clients will recognize this as simply a multifactor extension to the processes commonly employed to measure and manage a portfolio’s market beta. The main value-add comes from the additional level of granularity they provide in portfolio construction and risk management.

Spectacular returns through pure factor tilts are obviously not possible without perfect foresight on relative factor performance. However it is very much possible to use these indices to implement cost efficient factor tilts to express an alpha view or to hedge any existing excessive portfolio factor exposures.

Index construction methodology

The first step in the index construction process involves the identification of the most important systematic drivers of risk and return in the Japanese Equity market over the long term. Using results from the extensive style performance research published by the Citi Global Quantitative Research team¹ together with client feedback and stylized facts documented within the Academic literature we arrive at the following styles: Size, Value, Growth, Risk, Momentum, Quality and Sector risks.

For each style factor, we then select a list of descriptors that best represent that specific attribute. For instance we use the total market capitalization and last reported total assets to represent a company's Size attribute. These descriptors are then winsorized and weighted to arrive at a style factor loading or style factor beta for each stock in the Standard and Poors Primary market index (S&P PMI Japan) to each style. We also center the market cap weighted mean loading of the estimation universe around zero for each style factor which ensures that the market has zero exposures to all of the above style factors.

We next employ weighted regression techniques to compute a set of orthogonal style factor portfolios using the monthly total excess returns of all stocks in the estimation universe and their *a priori* style factor loadings constructed as described above. Please see Appendix A for further details.

Figure 2 below is a list of the Citi Japanese Equity Style Factor Indices together with the descriptors used in the construction of each index.

Figure 2. Citi Japanese Equity Style Factor Indices – Factors & Descriptors

Style Index	Descriptors	Description
Size	Market Capitalization	Natural log of Market Capitalization
	Balance Sheet Size	Last Reported Total Assets
Value	FY1 Earnings Yield	Forecast IBES FY1 Consensus Earnings Yield
	Trailing Valuation Measures	Combination of Trailing Yields (Earnings, Book, Cash Flow, Dividends)
Growth	S&P Growth Score	5 Year Trailing Growth measures (Earnings, Sales, Internal Growth)
	Long Term Growth Forecasts	Forecast IBES Consensus Long Term Growth Rate
Risk	Volatility	Share Price Volatility (6 Months)
	Beta	Historical Beta (1 Year) to the S&P Japan Primary Market Index
Momentum	Price Momentum - Long Term	One year volatility adjusted price trend
	Price Momentum - Short Term	60 days volatility adjusted price trend
	Earnings Momentum	Earnings Revision Ratio (IBES Consensus - 3 Months)
Quality	Profitability	IBES Consensus FY1 Return on Equity
	Earnings Quality	Earnings Stability
	Leverage	Debt/Assets Ratio
	Balance Sheet Liquidity	Quick Ratio

Source: Citi Investment Research and Analysis.

The last step involves a simple linear combination of the monthly style factor portfolios with the forward returns of each constituent stock measured over a monthly or daily periodicity to generate an index of style returns. By construction, each index has a unit exposure to any one style and zero exposure to all other styles, at the time of the monthly rebalance.

¹ see for example, 'Japan Drivers : Sector Focus, Nachiket Garde, CFA and Ryoichi Naito, August 2010.

Index characteristics

In this section we review a few key characteristics of the style factor portfolios such as their betas to the styles and to the market, and their historical return and risk characteristics.

Index Factor & Market Betas

By construction each style index has a unit beta to itself and a beta of zero to all other styles. While no specific constraint is applied on the market beta of each index, this too is close to zero given the dollar neutral weights of each index. The style and market betas of each index as of August 2010 are shown in Figure 3 below.

Figure 3. Beta to Style/Market Indices

Style/Market Index	Size	Value	Growth	Risk	Momentum	Quality	S&P Beta
Size	1	0	0	0	0	0	0
Value	0	1	0	0	0	0	0
Growth	0	0	1	0	0	0	0
Risk	0	0	0	1	0	0	0
Momentum	0	0	0	0	1	0	0
Quality	0	0	0	0	0	1	0
S&P Index	0	0	0	0	0	0	1

Source: Citi Investment Research and Analysis.

Index Returns – Long/Short

In Figure 4 below we present summary risk and return characteristics since 2002 for each style index. These returns are “pure” returns to a specific style (i.e., the returns to Quality are the actual payoff to Quality characteristics in the Japanese equity market after neutralizing for beta and other systematic effects represented by the other style indices). This indicates an annualized return of 1.43% since 2001 on an Information Ratio of 0.35 for Quality.

Figure 4. Risk & Return Characteristics of Citi Japan “Pure” Style Factor Indices

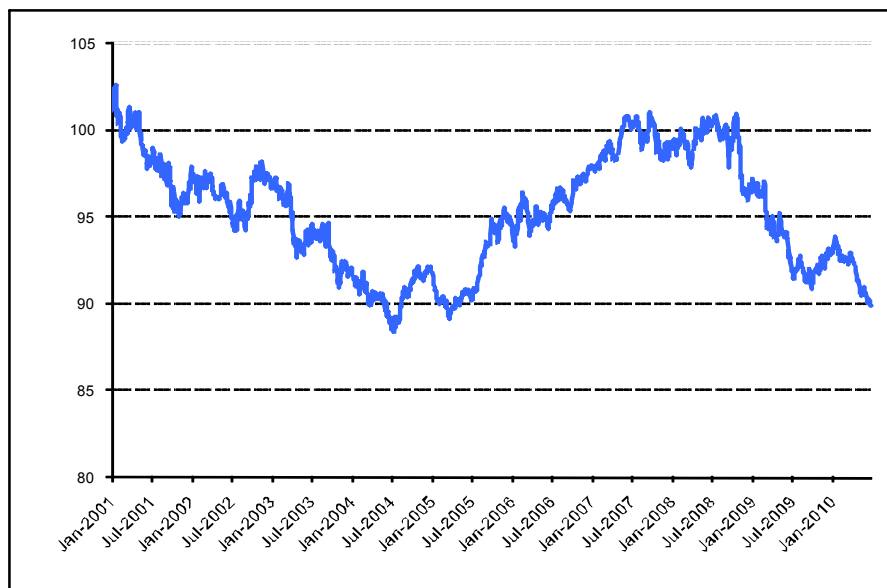
Return (% Ann.)	Size	Value	Growth	Risk	Momentum	Quality
2001	-3.42	2.48	0.72	-6.78	-5.44	-3.77
2002	-1.35	12.81	-1.09	4.89	3.87	2.38
2003	-7.53	8.15	-4.07	25.26	1.77	-2.30
2004	-0.51	4.99	-0.47	5.23	-4.86	4.33
2005	2.30	0.70	0.25	3.88	1.82	0.65
2006	4.56	5.75	-2.59	-7.78	2.39	4.21
2007	1.22	2.15	-1.00	0.76	2.50	0.43
2008	-2.01	2.92	-1.53	-11.20	-6.68	6.56
2009	-5.20	0.44	0.40	23.85	-9.63	0.61
2010 (Jan-Aug)	-2.89	4.06	-2.54	-2.81	-0.17	1.78
2001 - Aug 2010						
Return (% Ann.)	-1.41	4.31	-1.14	2.98	-1.51	1.43
Volatility (% Ann.)	4.09	4.14	3.63	10.44	4.96	4.08
Information Ratio	-0.35	1.04	-0.31	0.29	-0.30	0.35

Source: Citi Investment Research and Analysis.

It is interesting to note that there has been a positive payoff to Quality and Value but not to Growth or Momentum. We also see evidence of a Small Cap risk premium as the negative Size returns represent returns to large caps vs. small caps. There is also evidence of an aggregate Risk premium, as seen from the positive returns to the Risk style index.

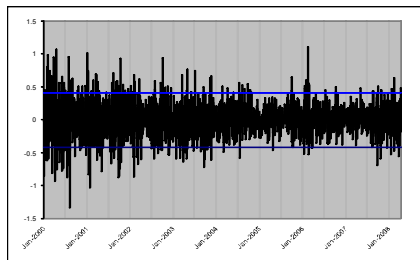
Historical QuantIFI Style Performance

Figure 5. Citi Japan Size Index



Source: Citi Investment Research and Analysis.

Figure 6. Daily Return distribution (Jan'00-date)



Source: Citi Investment Research and Analysis.

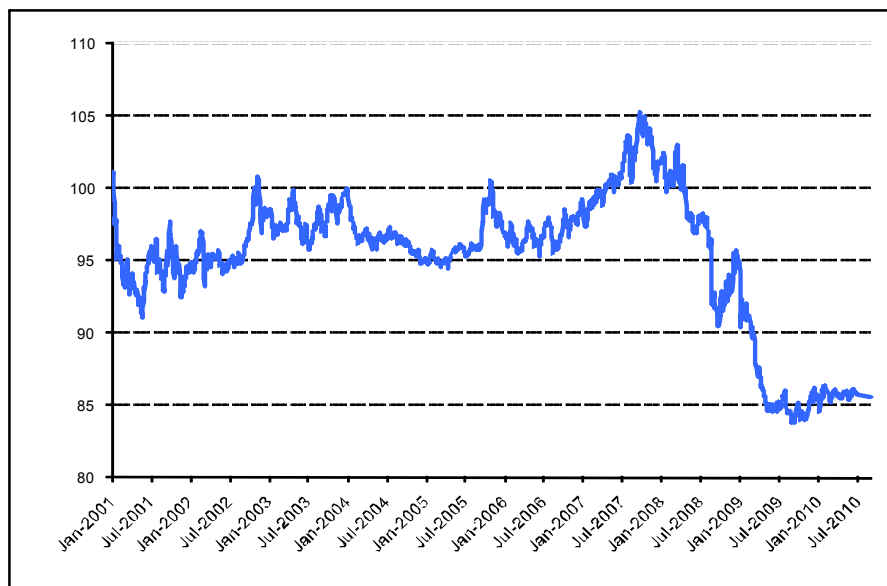
The Size index measures the return to large caps vs small caps and is a measure of the size effect. In Japan (see Fig 5) small caps underperformed from 2000-2005- when the effect reversed – with small caps outperforming in the 2005-2008 period. Since the global financial crisis, large caps have outperformed small caps again. In the last 12 months size effects have not been very big with return to this style being close to zero. The returns to a size style of investing tend to be positively correlated in Japan to the value style of investing.

Figure 7. Year-to-date Correlation between Size and other QuantIFI indices

	Growth	Momentum	Quality	Risk	Size	Value
Growth	100%					
Momentum	-27%	100%				
Quality	-39%	21%	100%			
Risk	5%	5%	5%	100%		
Size	2%	-17%	13%	16%	100%	
Value	-18%	21%	3%	-17%	-12%	100%
Consumer Discretionary	6%	15%	10%	74%	13%	-17%
Consumer Staples	5%	4%	10%	72%	11%	-18%
Energy	8%	18%	4%	58%	5%	-9%
Financials	6%	-10%	3%	61%	9%	-11%
Health Care	11%	1%	-2%	73%	7%	-25%
Industrials	9%	3%	7%	75%	15%	-23%
Materials	5%	7%	12%	70%	14%	-15%
Real Estate	0%	9%	10%	58%	5%	-13%
TMT	3%	6%	9%	78%	9%	-21%
Utilities	4%	9%	18%	75%	2%	-15%

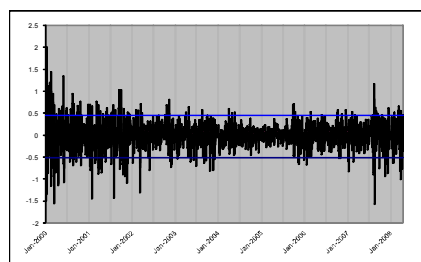
Source: Citi Investment Research and Analysis.

Figure 8. Citi Japan Momentum Index



Source: Citi Investment Research and Analysis.

Figure 9. Daily Return distribution (Jan'00-date)



Source: Citi Investment Research and Analysis.

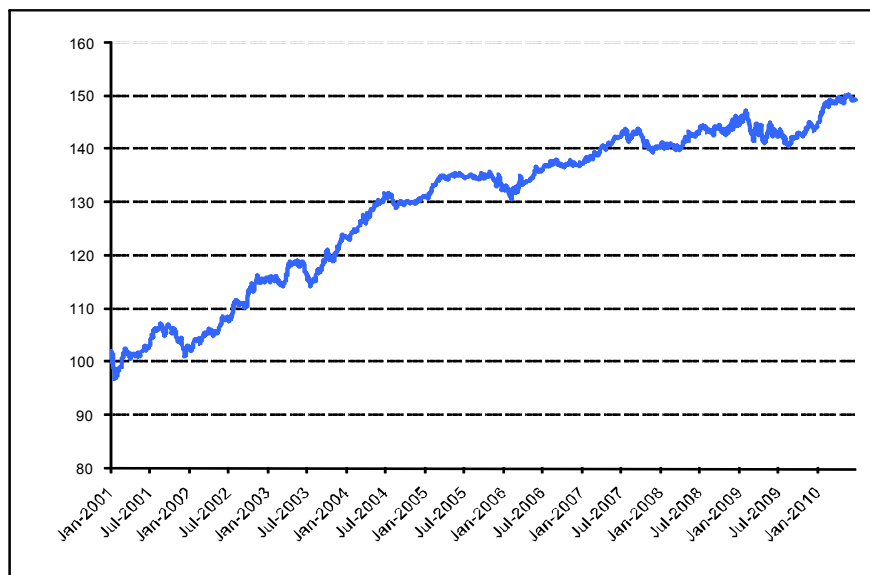
Figure 8 shows the historical performance of following a pure momentum style factor. Apart from a brief period in 2006-2008, momentum has disappointed in Japan. Since 2008, Momentum has basically collapsed and the picture has not changed year to date. What is also worth noting is the volatility of the return profile, thus indicating a strong reversal effect in equity market in Japan.

Figure 10. Year-to-date Correlation between Momentum and other QuantIFI indices

	Growth	Momentum	Quality	Risk	Size	Value
Growth	100%					
Momentum	-27%	100%				
Quality	-39%	21%	100%			
Risk	5%	5%	5%	100%		
Size	2%	-17%	13%	16%	100%	
Value	-18%	21%	3%	-17%	-12%	100%
Consumer Discretionary	6%	15%	10%	74%	13%	-17%
Consumer Staples	5%	4%	10%	72%	11%	-18%
Energy	8%	18%	4%	58%	5%	-9%
Financials	6%	-10%	3%	61%	9%	-11%
Health Care	11%	1%	-2%	73%	7%	-25%
Industrials	9%	3%	7%	75%	15%	-23%
Materials	5%	7%	12%	70%	14%	-15%
Real Estate	0%	9%	10%	58%	5%	-13%
TMT	3%	6%	9%	78%	9%	-21%
Utilities	4%	9%	18%	75%	2%	-15%

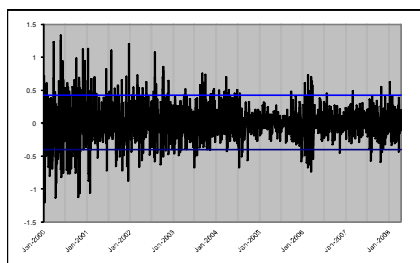
Source: Citi Investment Research and Analysis.

Figure 11. Citi Japan Value Index



Source: Citi Investment Research and Analysis

Figure 12. DailyReturn distribution (Jan'00-date)



Source: Citi Investment Research and Analysis

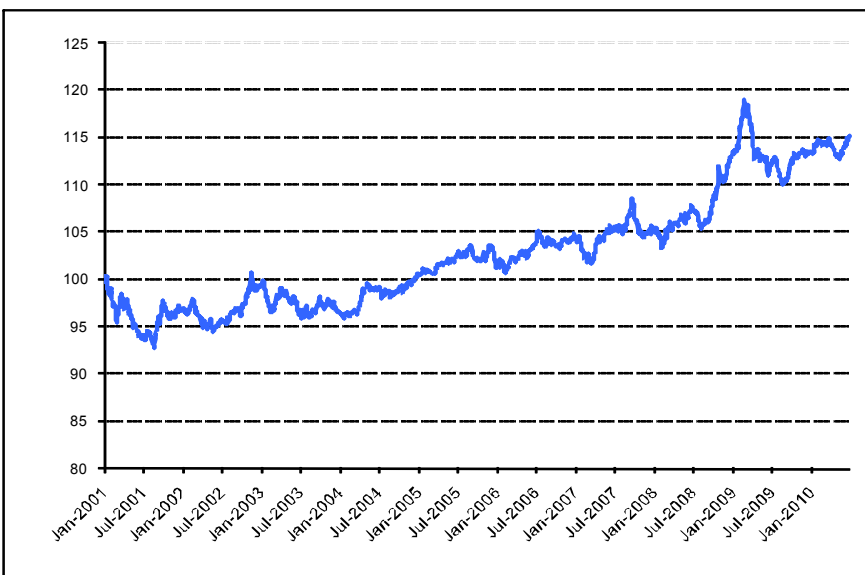
Value style investing has triumphed over all other styles in Japan. What is also notable is the consistency of the return profile. It has delivered returns over most periods, barring the late 2001 and the recent GFC periods. It is worth noting that our value attribute is a weighted attribute consisting of an average of historical and forward looking measures (see Figure 2).

Figure 13. Year-to-date Correlation between Value and other QuantIFI indices

	Growth	Momentum	Quality	Risk	Size	Value
Growth	100%					
Momentum	-27%	100%				
Quality	-39%	21%	100%			
Risk	5%	5%	5%	100%		
Size	2%	-17%	13%	16%	100%	
Value	-18%	21%	3%	-17%	-12%	100%
Consumer Discretionary	6%	15%	10%	74%	13%	-17%
Consumer Staples	5%	4%	10%	72%	11%	-18%
Energy	8%	18%	4%	58%	5%	-9%
Financials	6%	-10%	3%	61%	9%	-11%
Health Care	11%	1%	-2%	73%	7%	-25%
Industrials	9%	3%	7%	75%	15%	-23%
Materials	5%	7%	12%	70%	14%	-15%
Real Estate	0%	9%	10%	58%	5%	-13%
TMT	3%	6%	9%	78%	9%	-21%
Utilities	4%	9%	18%	75%	2%	-15%

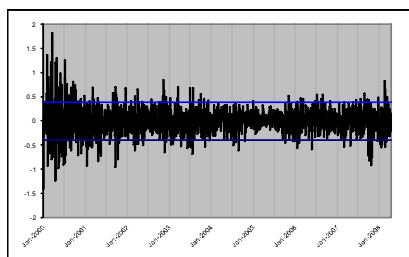
Source: Citi Investment Research and Analysis.

Figure 14. Citi Japan Quality Index



Source: Citi Investment Research and Analysis

Figure 15. DailyReturn distribution (Jan'00-date)



Source: Citi Investment Research and Analysis

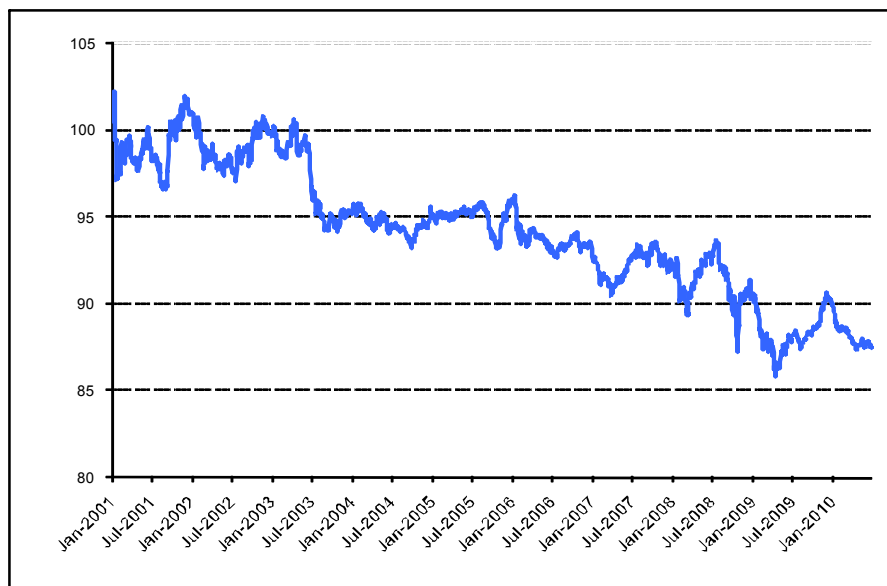
Quality style factor has demonstrated a positive return in the Japanese equity market second only to value. However, relative to the value style, it performed comparatively worse during the global financial crisis although its defensive attributes were still apparent. It has come back strongly in the last twelve months, posting a information ratio of 0.85.

Figure 16. Year-to-date Correlation between Quality and other QuantIFI indices

	Growth	Momentum	Quality	Risk	Size	Value
Growth	100%					
Momentum	-27%	100%				
Quality	-39%	21%	100%			
Risk	5%	5%	5%	100%		
Size	2%	-17%	13%	16%	100%	
Value	-18%	21%	3%	-17%	-12%	100%
Consumer Discretionary	6%	15%	10%	74%	13%	-17%
Consumer Staples	5%	4%	10%	72%	11%	-18%
Energy	8%	18%	4%	58%	5%	-9%
Financials	6%	-10%	3%	61%	9%	-11%
Health Care	11%	1%	-2%	73%	7%	-25%
Industrials	9%	3%	7%	75%	15%	-23%
Materials	5%	7%	12%	70%	14%	-15%
Real Estate	0%	9%	10%	58%	5%	-13%
TMT	3%	6%	9%	78%	9%	-21%
Utilities	4%	9%	18%	75%	2%	-15%

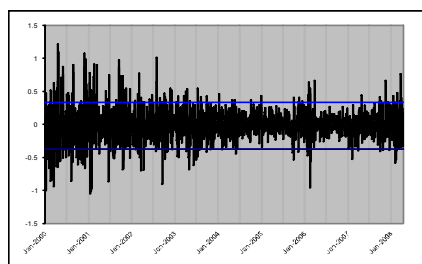
Source: Citi Investment Research and Analysis

Figure 17. Citi Japan Growth Index



Source: Citi Investment Research and Analysis.

Figure 18. DailyReturn distribution (Jan'00-date)



Source: Citi Investment Research and Analysis.

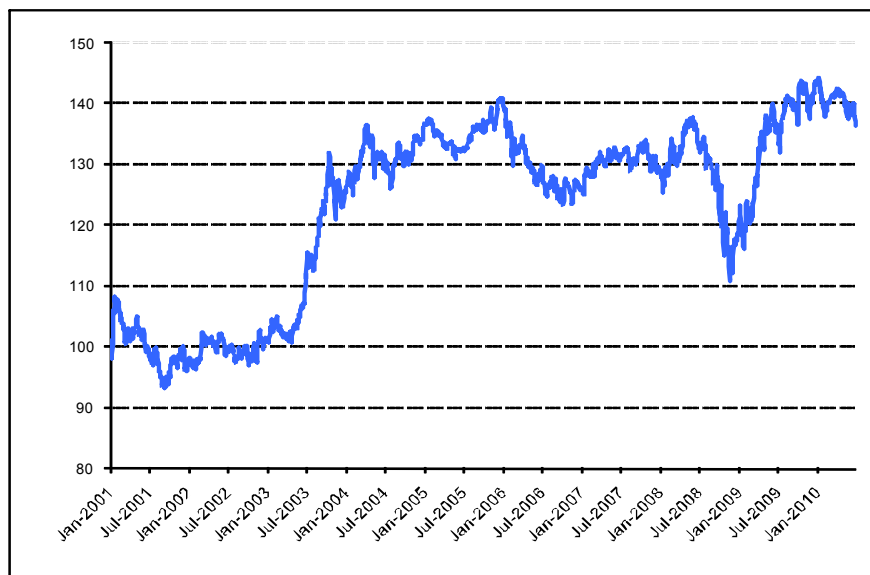
Growth investing as a style has not worked in Japan as can be seen from Figure 17. This is unlikely to be surprising to most people. Its best performance was in 2001 during the TMT bubble. It missed out on the bull market too and underperformed during the GFC. Growth has disappointed year to date too, posting an information ratio of negative 0.23. Growth tends to be positively correlated to Risk but negatively correlated to other styles.

Figure 19. Year-to-date Correlation between Growth and other QuantIFI indices

	Growth	Momentum	Quality	Risk	Size	Value
Growth	100%					
Momentum	-27%	100%				
Quality	-39%	21%	100%			
Risk	5%	5%	5%	100%		
Size	2%	-17%	13%	16%	100%	
Value	-18%	21%	3%	-17%	-12%	100%
Consumer Discretionary	6%	15%	10%	74%	13%	-17%
Consumer Staples	5%	4%	10%	72%	11%	-18%
Energy	8%	18%	4%	58%	5%	-9%
Financials	6%	-10%	3%	61%	9%	-11%
Health Care	11%	1%	-2%	73%	7%	-25%
Industrials	9%	3%	7%	75%	15%	-23%
Materials	5%	7%	12%	70%	14%	-15%
Real Estate	0%	9%	10%	58%	5%	-13%
TMT	3%	6%	9%	78%	9%	-21%
Utilities	4%	9%	18%	75%	2%	-15%

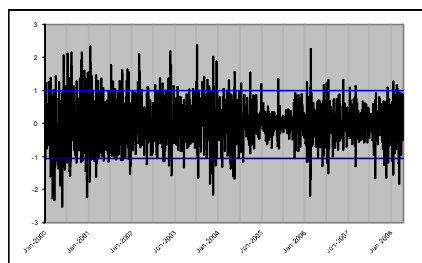
Source: Citi Investment Research and Analysis.

Figure 20. Citi Japan Risk Index



Source: Citi Investment Research and Analysis.

Figure 21. DailyReturn distribution (Jan'00-date)



Source: Citi Investment Research and Analysis.

The Risk Style Index is intended to measure the return to risk in the Japanese equity market (net of the effect of other systematic styles and the market) and Figure 20 shows that the return to risk has been positive. The Risk style has especially delivered in 2003 and 2009, when it returned 25.26% and 23.85% respectively. The return to risk year to date has been negative, indicating that risk aversion has paid off. This style could potentially be used to gauge the risk appetite in the Japanese Equity market.

Figure 22. Year-to-date Correlation between Risk and other QuantIFI indices

	Growth	Momentum	Quality	Risk	Size	Value
Growth	100%					
Momentum	-27%	100%				
Quality	-39%	21%	100%			
Risk	5%	5%	5%	100%		
Size	2%	-17%	13%	16%	100%	
Value	-18%	21%	3%	-17%	-12%	100%
Consumer Discretionary	6%	15%	10%	74%	13%	-17%
Consumer Staples	5%	4%	10%	72%	11%	-18%
Energy	8%	18%	4%	58%	5%	-9%
Financials	6%	-10%	3%	61%	9%	-11%
Health Care	11%	1%	-2%	73%	7%	-25%
Industrials	9%	3%	7%	75%	15%	-23%
Materials	5%	7%	12%	70%	14%	-15%
Real Estate	0%	9%	10%	58%	5%	-13%
TMT	3%	6%	9%	78%	9%	-21%
Utilities	4%	9%	18%	75%	2%	-15%

Source: Citi Investment Research and Analysis.

Appendix A

We can express stock returns over any period using the following regression equation

$$Y = XR + \delta$$

Where Y – Stock returns in excess of the T-Bill rate

X – Matrix of the betas of stocks to the different Style factors and dummy loadings indicating their Sector membership

R – Returns of the pure Style factors

δ – Stock specific returns

Pure factor portfolios are then computed as

$$fp = (x^T wx)^{-1} \cdot (x^T w)$$

Where w is a matrix of regression weights computed as a function of each stock's recent liquidity

Pure factor returns are then estimated by cross multiplying the factor portfolios into the next period returns of each stock

$$R = fp \cdot Y$$

Where Y may be of monthly or daily or any other periodically

Residual portfolio returns are then derived as follows

$$K = P - \beta_{mkt} \cdot R_{mkt} - \beta_{style} \cdot R_{style} - \beta_{sector} \cdot R_{sector}$$

Where Portfolio returns, $P = \sum h_i Y_i$

Appendix A-1

Analyst Certification

The research analyst(s) primarily responsible for the preparation and content of all or any identified portion of this research report hereby certifies that, with respect to each issuer or security or any identified portion of the report with respect to an issuer or security that the research analyst covers in this research report, all of the views expressed in this research report accurately reflect their personal views about those issuer(s) or securities. The research analyst(s) also certify that no part of their compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this research report.

IMPORTANT DISCLOSURES

Analysts' compensation is determined based upon activities and services intended to benefit the investor clients of Citigroup Global Markets Inc. and its affiliates ("the Firm"). Like all Firm employees, analysts receive compensation that is impacted by overall firm profitability which includes investment banking revenues.

For important disclosures (including copies of historical disclosures) regarding the companies that are the subject of this Citi Investment Research & Analysis product ("the Product"), please contact Citi Investment Research & Analysis, 388 Greenwich Street, 28th Floor, New York, NY, 10013, Attention: Legal/Compliance. In addition, the same important disclosures, with the exception of the Valuation and Risk assessments and historical disclosures, are contained on the Firm's disclosure website at www.citigroupgeo.com. Valuation and Risk assessments can be found in the text of the most recent research note/report regarding the subject company. Historical disclosures (for up to the past three years) will be provided upon request.

Citi Investment Research & Analysis Ratings Distribution

Data current as of 30 Jun 2010

	Buy	Hold	Sell
Citi Investment Research & Analysis Quantitative World Radar Screen Model Coverage	30%	40%	30%
% of companies in each rating category that are investment banking clients	22%	22%	20%
Citi Investment Research & Analysis Quantitative Decision Tree Model Coverage	46%	0%	54%
% of companies in each rating category that are investment banking clients	57%	0%	49%
Citi Investment Research & Analysis Quantitative European Value & Momentum Screen	30%	40%	30%
% of companies in each rating category that are investment banking clients	50%	52%	49%
Citi Investment Research & Analysis Asia Quantitative Radar Screen Model Coverage	20%	60%	20%
% of companies in each rating category that are investment banking clients	19%	19%	22%
Citi Investment Research & Analysis Australia Radar Model Coverage	50%	0%	50%
% of companies in each rating category that are investment banking clients	17%	0%	35%

Guide to Citi Investment Research & Analysis (CIRA) Quantitative Research Investment Ratings:

CIRA Quantitative Research World Radar Screen recommendations are based on a globally consistent framework to measure relative value and momentum for a large number of stocks across global developed and emerging markets. Relative value and momentum rankings are equally weighted to produce a global attractiveness score for each stock. The scores are then ranked and put into deciles. A stock with a decile rating of 1 denotes an attractiveness score in the top 10% of the universe (most attractive). A stock with a decile rating of 10 denotes an attractiveness score in the bottom 10% of the universe (least attractive).

CIRA Asia Quantitative Radar Screen model recommendations are based on a regionally consistent framework to measure relative value and momentum for a large number of stocks across regional developed and emerging markets. Relative value and momentum rankings are equally weighted to produce a global attractiveness score for each stock. The scores are then ranked and put into quintiles. A stock with a quintile rating of 1 denotes an attractiveness score in the top 20% of the universe (most attractive). A stock with a quintile rating of 5 denotes an attractiveness score in the bottom 20% of the universe (least attractive).

CIRA Australia Quantitative Radar Screen model recommendations are based on a robust framework to measure relative value and momentum for a large number of stocks across the Australian market. Stocks with a ranking of 1 denotes a stock that is above average in terms of both value and momentum relative to the stocks in the Australian market. A ranking of 10 denotes a stock that is below average in terms of both value and momentum relative to the stocks in the Australian market.

CIRA Quantitative Decision Tree model recommendations are based on a predetermined set of factors to rate the relative attractiveness of stocks. These factors are detailed in the text of the report. The Decision Tree model forecasts whether stocks are attractive or unattractive relative to other stocks in the same sector (based on the Russell 1000 sector classifications).

For purposes of NASD/NYSE ratings-distribution-disclosure rules, a Citi Investment Research & Analysis (CIRA) Quantitative World Radar Screen recommendation of (1), (2) or (3) most closely corresponds to a buy recommendation; a recommendation from this product group of (4), (5), (6) or (7) most closely corresponds to a hold recommendation; and a recommendation of (8), (9) or (10) most closely corresponds to a sell recommendation. An (NR) recommendation indicates that the stock is no longer in the screen.

For purposes of NASD/NYSE ratings distribution disclosure rules, a CIRA Asia Quantitative Radar Screen recommendation of (1) most closely corresponds to a buy recommendation; a CIRA Asia Quantitative Radar Screen recommendation of (2), (3), (4) most closely corresponds to a hold recommendation; and a recommendation of (5) most closely corresponds to a sell recommendation. An (NR) recommendation indicates that the stock is no longer in the screen.

For purposes of NASD/NYSE ratings-distribution-disclosure rules, a CIRA Quantitative Research Decision Tree model or Quantitative Research Australia Radar Screen recommendation of "attractive" (1) most closely corresponds to a buy recommendation. All other stocks in the sector are considered to be "unattractive" (10) which most closely corresponds to a sell recommendation. An (NR)/(0) recommendation indicates that the stock is no longer in the screen.

Recommendations are based on the relative attractiveness of a stock, thus can not be directly equated to buy, hold and sell categories. Accordingly, your decision to buy or sell a security should be based on your personal investment objectives and only after evaluating the stock's expected relative performance.

NON-US RESEARCH ANALYST DISCLOSURES

Non-US research analysts who have prepared this report (i.e., all research analysts listed below other than those identified as employed by Citigroup Global Markets Inc.) are not registered/qualified as research analysts with FINRA. Such research analysts may not be associated persons of the member organization and therefore may not be subject to the NYSE Rule 472 and NASD Rule 2711 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account. The legal entities employing the authors of this report are listed below:

Citigroup Global Markets Singapore PTE LIMITED

Paul R Chanin, Puneet Singh, Si An Tan, Anmol Sethy

**Introducing Quantitative Style Indices
for Japanese Equities**
10 September 2010

Citigroup Global Markets Japan Inc.	Nachiket R Garde, CFA, Ryoichi Naito
Citigroup Pty Limited	Nick Morton
Citigroup Global Markets India Private Limited	Aditya Shah

OTHER DISCLOSURES

For securities recommended in the Product in which the Firm is not a market maker, the Firm is a liquidity provider in the issuers' financial instruments and may act as principal in connection with such transactions. The Firm is a regular issuer of traded financial instruments linked to securities that may have been recommended in the Product. The Firm regularly trades in the securities of the issuer(s) discussed in the Product. The Firm may engage in securities transactions in a manner inconsistent with the Product and, with respect to securities covered by the Product, will buy or sell from customers on a principal basis.

Securities recommended, offered, or sold by the Firm: (i) are not insured by the Federal Deposit Insurance Corporation; (ii) are not deposits or other obligations of any insured depository institution (including Citibank); and (iii) are subject to investment risks, including the possible loss of the principal amount invested. Although information has been obtained from and is based upon sources that the Firm believes to be reliable, we do not guarantee its accuracy and it may be incomplete and condensed. Note, however, that the Firm has taken all reasonable steps to determine the accuracy and completeness of the disclosures made in the Important Disclosures section of the Product. The Firm's research department has received assistance from the subject company(ies) referred to in this Product including, but not limited to, discussions with management of the subject company(ies). Firm policy prohibits research analysts from sending draft research to subject companies. However, it should be presumed that the author of the Product has had discussions with the subject company to ensure factual accuracy prior to publication. All opinions, projections and estimates constitute the judgment of the author as of the date of the Product and these, plus any other information contained in the Product, are subject to change without notice. Prices and availability of financial instruments also are subject to change without notice. Notwithstanding other departments within the Firm advising the companies discussed in this Product, information obtained in such role is not used in the preparation of the Product. Although Citi Investment Research & Analysis (CIRA) does not set a predetermined frequency for publication, if the Product is a fundamental research report, it is the intention of CIRA to provide research coverage of the/those issuer(s) mentioned therein, including in response to news affecting this issuer, subject to applicable quiet periods and capacity constraints. The Product is for informational purposes only and is not intended as an offer or solicitation for the purchase or sale of a security. Any decision to purchase securities mentioned in the Product must take into account existing public information on such security or any registered prospectus.

Investing in non-U.S. securities, including ADRs, may entail certain risks. The securities of non-U.S. issuers may not be registered with, nor be subject to the reporting requirements of the U.S. Securities and Exchange Commission. There may be limited information available on foreign securities. Foreign companies are generally not subject to uniform audit and reporting standards, practices and requirements comparable to those in the U.S. Securities of some foreign companies may be less liquid and their prices more volatile than securities of comparable U.S. companies. In addition, exchange rate movements may have an adverse effect on the value of an investment in a foreign stock and its corresponding dividend payment for U.S. investors. Net dividends to ADR investors are estimated, using withholding tax rates conventions, deemed accurate, but investors are urged to consult their tax advisor for exact dividend computations. Investors who have received the Product from the Firm may be prohibited in certain states or other jurisdictions from purchasing securities mentioned in the Product from the Firm. Please ask your Financial Consultant for additional details. Citigroup Global Markets Inc. takes responsibility for the Product in the United States. Any orders by US investors resulting from the information contained in the Product may be placed only through Citigroup Global Markets Inc.

Important Disclosures for Morgan Stanley Smith Barney LLC Customers: Morgan Stanley & Co. Incorporated (Morgan Stanley) research reports may be available about the companies that are the subject of this Citi Investment Research & Analysis (CIRA) research report. Ask your Financial Advisor or use smithbarney.com to view any available Morgan Stanley research reports in addition to CIRA research reports.

Important disclosure regarding the relationship between the companies that are the subject of this CIRA research report and Morgan Stanley Smith Barney LLC and its affiliates are available at the Morgan Stanley Smith Barney disclosure website at www.morganstanleysmithbarney.com/researchdisclosures.

The required disclosures provided by Morgan Stanley and Citigroup Global Markets, Inc. on Morgan Stanley and CIRA research relate in part to the separate businesses of Citigroup Global Markets, Inc. and Morgan Stanley that now form Morgan Stanley Smith Barney LLC, rather than to Morgan Stanley Smith Barney LLC in its entirety. For Morgan Stanley and Citigroup Global Markets, Inc. specific disclosures, you may refer to www.morganstanley.com/researchdisclosures and https://www.citigroupgeo.com/geopublic/Disclosures/index_a.html.

This CIRA research report has been reviewed and approved on behalf of Morgan Stanley Smith Barney LLC. This review and approval was conducted by the same person who reviewed this research report on behalf of CIRA. This could create a conflict of interest.

The Citigroup legal entity that takes responsibility for the production of the Product is the legal entity which the first named author is employed by. The Product is made available in Australia through Citigroup Global Markets Australia Pty Ltd. (ABN 64 003 114 832 and AFSL No. 240992), participant of the ASX Group and regulated by the Australian Securities & Investments Commission. Citigroup Centre, 2 Park Street, Sydney, NSW 2000. The Product is made available in Australia to Private Banking wholesale clients through Citigroup Pty Limited (ABN 88 004 325 080 and AFSL 238098). Citigroup Pty Limited provides all financial product advice to Australian Private Banking wholesale clients through bankers and relationship managers. If there is any doubt about the suitability of investments held in Citigroup Private Bank accounts, investors should contact the Citigroup Private Bank in Australia. Citigroup companies may compensate affiliates and their representatives for providing products and services to clients. The Product is made available in Brazil by Citigroup Global Markets Brasil - CCTVM SA, which is regulated by CVM - Comissão de Valores Mobiliários, BACEN - Brazilian Central Bank, APIMEC - Associação dos Analistas e Profissionais de Investimento do Mercado de Capitais and ANBID - Associação Nacional dos Bancos de Investimento. Av. Paulista, 1111 - 11º andar - CEP. 01311-920 - São Paulo - SP. If the Product is being made available in certain provinces of Canada by Citigroup Global Markets (Canada) Inc. ("CGM Canada"), CGM Canada has approved the Product. Citigroup Place, 123 Front Street West, Suite 1100, Toronto, Ontario M5J 2M3. The Product is made available in France by Citigroup Global Markets Limited, which is authorised and regulated by Financial Services Authority. 1-5 Rue Paul Cézanne, 8ème, Paris, France. The Product may not be distributed to private clients in Germany. The Product is distributed in Germany by Citigroup Global Markets Deutschland AG & Co. KGaA, which is regulated by Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin). Frankfurt am Main, Reuterweg 16, 60323 Frankfurt am Main. If the Product is made available in Hong Kong by, or on behalf of, Citigroup Global Markets Asia Ltd., it is attributable to Citigroup Global Markets Asia Ltd., Citibank Tower, Citibank Plaza, 3 Garden Road, Hong Kong. Citigroup Global Markets Asia Ltd. is regulated by Hong Kong Securities and Futures Commission. If the Product is made available in Hong Kong by The Citigroup Private Bank to its clients, it is attributable to Citibank N.A., Citibank Tower, Citibank Plaza, 3 Garden Road, Hong Kong. The Citigroup Private Bank and Citibank N.A. is regulated by the Hong Kong Monetary Authority. The Product is made available in India by Citigroup Global Markets India Private Limited, which is regulated by Securities and Exchange Board of India. Bakhtawar, Nariman Point, Mumbai 400-021. The Product is made available in Indonesia through PT Citigroup Securities Indonesia. 5/F, Citibank Tower, Bapindo Plaza, Jl. Jend. Sudirman Kav. 54-55, Jakarta 12190. Neither this Product nor any copy hereof may be distributed in Indonesia or to any Indonesian citizens wherever they are domiciled or to Indonesian residents except in compliance with applicable capital market laws and regulations. This Product is not an offer of securities in Indonesia. The securities referred to in this Product have not been registered with the Capital Market and Financial Institutions Supervisory Agency (BAPEPAM-LK) pursuant to relevant capital market laws and regulations, and may not be offered or sold within the territory of the Republic of Indonesia

or to Indonesian citizens through a public offering or in circumstances which constitute an offer within the meaning of the Indonesian capital market laws and regulations. The Product is made available in Israel through Citibank NA, regulated by the Bank of Israel and the Israeli Securities Authority. Citibank, N.A., Platinum Building, 21 Ha'arba'ah St, Tel Aviv, Israel. The Product is made available in Italy by Citigroup Global Markets Limited, which is authorised and regulated by Financial Services Authority. Foro Buonaparte 16, Milan, 20121, Italy. The Product is made available in Japan by Citigroup Global Markets Japan Inc. ("CGMJ"), which is regulated by Financial Services Agency, Securities and Exchange Surveillance Commission, Japan Securities Dealers Association, Tokyo Stock Exchange and Osaka Securities Exchange. Shin-Marunouchi Building, 1-5-1 Marunouchi, Chiyoda-ku, Tokyo 100-6520 Japan. If the Product was distributed by Nikko Cordial Securities Inc. it is being so distributed under license. In the event that an error is found in a CGMJ research report, a revised version will be posted on the Firm's Global Equities Online (GEO) website. If you have questions regarding GEO, please call (81 3) 6270-3019 for help. The Product is made available in Korea by Citigroup Global Markets Korea Securities Ltd., which is regulated by the Financial Services Commission, the Financial Supervisory Service and the Korea Financial Investment Association (KOFIA). Citibank Building, 39 Da-dong, Jung-gu, Seoul 110-180, Korea. KOFIA makes available registration information of research analysts on its website. Please visit the following website if you wish to find KOFIA registration information on research analysts of Citigroup Global Markets Korea Securities Ltd. <http://dis.kofia.or.kr/fs/dis2/fundMgr/DISFundMgrAnalystPop.jsp?companyCd2=A03030&pageDiv=02>. The Product is made available in Malaysia by Citigroup Global Markets Malaysia Sdn Bhd, which is regulated by Malaysia Securities Commission. Menara Citibank, 165 Jalan Ampang, Kuala Lumpur, 50450. The Product is made available in Mexico by Acciones y Valores Banamex, S.A. de C. V., Casa de Bolsa, Integrante del Grupo Financiero Banamex ("Accival") which is a wholly owned subsidiary of Citigroup Inc. and is regulated by Comision Nacional Bancaria y de Valores. Reforma 398, Col. Juarez, 06600 Mexico, D.F. In New Zealand the Product is made available through Citigroup Global Markets New Zealand Ltd. (Company Number 604457), a Participant of the New Zealand Exchange Limited and regulated by the New Zealand Securities Commission. Level 19, Mobile on the Park, 157 Lambton Quay, Wellington. The Product is made available in Pakistan by Citibank N.A. Pakistan branch, which is regulated by the State Bank of Pakistan and Securities Exchange Commission, Pakistan. AWT Plaza, 1.1. Chundrigar Road, P.O. Box 4889, Karachi-74200. The Product is made available in Poland by Dom Maklerski Banku Handlowego SA an indirect subsidiary of Citigroup Inc., which is regulated by Komisja Nadzoru Finansowego. Dom Maklerski Banku Handlowego S.A. ul. Chalubinskiego 8, 00-630 Warszawa. The Product is made available in the Russian Federation through ZAO Citibank, which is licensed to carry out banking activities in the Russian Federation in accordance with the general banking license issued by the Central Bank of the Russian Federation and brokerage activities in accordance with the license issued by the Federal Service for Financial Markets. Neither the Product nor any information contained in the Product shall be considered as advertising the securities mentioned in this report within the territory of the Russian Federation or outside the Russian Federation. The Product does not constitute an appraisal within the meaning of the Federal Law of the Russian Federation of 29 July 1998 No. 135-FZ (as amended) On Appraisal Activities in the Russian Federation. 8-10 Gasheka Street, 125047 Moscow. The Product is made available in Singapore through Citigroup Global Markets Singapore Pte. Ltd., a Capital Markets Services Licence holder, and regulated by Monetary Authority of Singapore. 1 Temasek Avenue, #39-02 Millenia Tower, Singapore 039192. The Product is made available by The Citigroup Private Bank in Singapore through Citibank, N.A., Singapore branch, a licensed bank in Singapore that is regulated by Monetary Authority of Singapore. Citigroup Global Markets (Pty) Ltd. is incorporated in the Republic of South Africa (company registration number 2000/025866/07) and its registered office is at 145 West Street, Sandton, 2196, Saxonwold. Citigroup Global Markets (Pty) Ltd. is regulated by JSE Securities Exchange South Africa, South African Reserve Bank and the Financial Services Board. The investments and services contained herein are not available to private customers in South Africa. The Product is made available in Spain by Citigroup Global Markets Limited, which is authorised and regulated by Financial Services Authority. 29 Jose Ortega Y Gasset, 4th Floor, Madrid, 28006, Spain. The Product is made available in Taiwan through Citigroup Global Markets Taiwan Securities Company Ltd., which is regulated by Securities & Futures Bureau. No portion of the report may be reproduced or quoted in Taiwan by the press or any other person. No. 1, Songzhi Road, Taipei 110, Taiwan. The Product is made available in Thailand through Citicorp Securities (Thailand) Ltd., which is regulated by the Securities and Exchange Commission of Thailand. 18/F, 22/F and 29/F, 82 North Sathorn Road, Silom, Bangkok, Bangkok 10500, Thailand. The Product is made available in Turkey through Citibank AS which is regulated by Capital Markets Board. Tekfen Tower, Eski Buyukdere Caddesi # 209 Kat 2B, 23294 Levent, Istanbul, Turkey. In the U.A.E, these materials (the "Materials") are communicated by Citigroup Global Markets Limited, DIFC branch ("CGML"), an entity registered in the Dubai International Financial Center ("DIFC") and licensed and regulated by the Dubai Financial Services Authority ("DFSA") to Professional Clients and Market Counterparties only and should not be relied upon or distributed to Retail Clients. A distribution of the different CIRA ratings distribution, in percentage terms for Investments in each sector covered is made available on request. Financial products and/or services to which the Materials relate will only be made available to Professional Clients and Market Counterparties. The Product is made available in United Kingdom by Citigroup Global Markets Limited, which is authorised and regulated by Financial Services Authority. This material may relate to investments or services of a person outside of the UK or to other matters which are not regulated by the FSA and further details as to where this may be the case are available upon request in respect of this material. Citigroup Centre, Canada Square, Canary Wharf, London, E14 5LB. The Product is made available in United States by Citigroup Global Markets Inc, which is regulated by FINRA and the US Securities and Exchange Commission. 388 Greenwich Street, New York, NY 10013. Unless specified to the contrary, within EU Member States, the Product is made available by Citigroup Global Markets Limited, which is regulated by Financial Services Authority. Many European regulators require that a firm must establish, implement and make available a policy for managing conflicts of interest arising as a result of publication or distribution of investment research. The policy applicable to CIRA's Products can be found at www.citigroupgeo.com. Compensation of equity research analysts is determined by equity research management and Citigroup's senior management and is not linked to specific transactions or recommendations. The Product may have been distributed simultaneously, in multiple formats, to the Firm's worldwide institutional and retail customers. The Product is not to be construed as providing investment services in any jurisdiction where the provision of such services would not be permitted. Subject to the nature and contents of the Product, the investments described therein are subject to fluctuations in price and/or value and investors may get back less than originally invested. Certain high-volatility investments can be subject to sudden and large falls in value that could equal or exceed the amount invested. Certain investments contained in the Product may have tax implications for private customers whereby levels and basis of taxation may be subject to change. If in doubt, investors should seek advice from a tax adviser. The Product does not purport to identify the nature of the specific market or other risks associated with a particular transaction. Advice in the Product is general and should not be construed as personal advice given it has been prepared without taking account of the objectives, financial situation or needs of any particular investor. Accordingly, investors should, before acting on the advice, consider the appropriateness of the advice, having regard to their objectives, financial situation and needs. Prior to acquiring any financial product, it is the client's responsibility to obtain the relevant offer document for the product and consider it before making a decision as to whether to purchase the product.

© 2010 Citigroup Global Markets Inc. Citi Investment Research & Analysis is a division and service mark of Citigroup Global Markets Inc. and its affiliates and is used and registered throughout the world. Citi and Citi with Arc Design are trademarks and service marks of Citigroup Inc and its affiliates and are used and registered throughout the world. All rights reserved. Any unauthorized use, duplication, redistribution or disclosure is prohibited by law and will result in prosecution. Where included in this report, MSCI sourced information is the exclusive property of Morgan Stanley Capital International Inc. (MSCI). Without prior written permission of MSCI, this information and any other MSCI intellectual property may not be reproduced, disseminated or used to create any financial products, including any indices. This information is provided on an "as is" basis. The user assumes the entire risk of any use made of this information. MSCI, its affiliates and any third party involved in, or related to, computing or compiling the information hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of this information. Without limiting any of the foregoing, in no event shall MSCI, any of its affiliates or any third party involved in, or related to, computing or compiling the information have any liability for any damages of any kind. MSCI, Morgan Stanley Capital International and the MSCI indexes are services marks of MSCI and its affiliates. The information contained in the Product is intended solely for the recipient and may not be further distributed by the recipient. The Firm

accepts no liability whatsoever for the actions of third parties. The Product may provide the addresses of, or contain hyperlinks to, websites. Except to the extent to which the Product refers to website material of the Firm, the Firm has not reviewed the linked site. Equally, except to the extent to which the Product refers to website material of the Firm, the Firm takes no responsibility for, and makes no representations or warranties whatsoever as to, the data and information contained therein. Such address or hyperlink (including addresses or hyperlinks to website material of the Firm) is provided solely for your convenience and information and the content of the linked site does not in anyway form part of this document. Accessing such website or following such link through the Product or the website of the Firm shall be at your own risk and the Firm shall have no liability arising out of, or in connection with, any such referenced website.

ADDITIONAL INFORMATION IS AVAILABLE UPON REQUEST
