

## Equities

14 September 2011 | 32 pages

# Searching for Alpha

## Accruals Volatility – A New Approach to Quality Investing

■ Quantitative Analysis

- **Measure of Earnings Quality** — Accruals volatility measures the persistency of company earnings quality. We show that there is a significant negative relationship between company accruals volatility and future returns.
- **Low Correlation with Other Factors** — On both an ex-ante and ex-post basis, accruals volatility has low correlation with other well-known pricing factors in the market.
- **Desirable Signal Characteristics** — Accruals volatility delivers significantly positive returns with lower turnover than that of the standard accruals factor. The persistent nature of the signal and the slow-decay profile make it a compelling alpha strategy for investors.
- **Independent Effect from Accruals** — We demonstrate that after controlling for the accruals effect, the accruals volatility strategy still delivers statistically significant returns.
- **Deflator is not a Driver of Returns** — We examine the efficacy of accruals volatility by using Net Operating Assets, Total Assets and Sales as the deflators in the signal construction. Our findings show that the accruals volatility effect is consistent regardless of deflators used.
- **Investment Application** — As accruals volatility is associated with accruals by construction, we present a combined strategy which achieves a higher Sharpe ratio with lower turnover than the plain accruals strategy.

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### Chris Montagu

+44-20-7986-3958  
chris.montagu@citi.com

### Helen H Krause, CFA

+44-20-7986-8653  
helen.krause@citi.com

### Matthew J Burgess

+44-20-7986-8325  
matt.burgess@citi.com

### Rahul Jalan

+44-20-7986-4075  
rahul.jalan@citi.com

### Lingjuan Ma

+44-20-7986-4104  
lingjuan.ma@citi.com

### David T Chew

+44-20-7986-7698  
david.chew@citi.com

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

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## Executive Summary

In this research, we investigate the concept of accruals volatility in the context of the European market and from an applied perspective. Essentially, we seek to answer the question of whether accruals volatility could be a useful additional quality factor for institutional investors.

### Accruals Volatility Anomaly

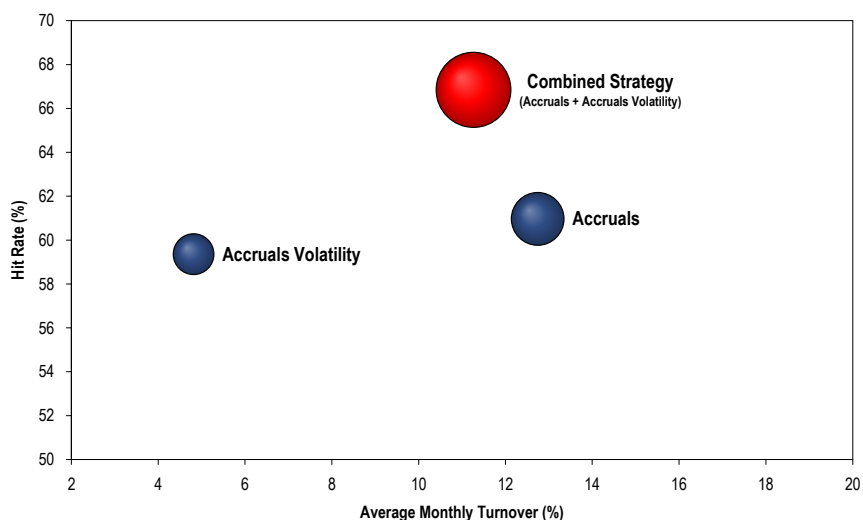
Similar to the Accruals anomaly, the accruals volatility anomaly measures how the market penalizes firms that consistently vary the proportion of physical cashflow in reported earnings. In other words, companies that have higher accruals volatility attract lower future returns and vice versa.

### What We Find

Our research shows that the risk-adjusted alpha associated with accruals volatility is economically and statistically significant and comes with lower turnover than the standard accruals factor. We also find that the return of the accrual volatility strategy is not attributable to well-known risk factors in the market.

As an investment application, we present a strategy that combines accruals and accruals volatility which delivers a Sharpe ratio of 1.49, compared to 1.05 for plain accruals strategy – a significant improvement of 42%.

Figure 1. Strategy Comparison (size of the bubble indicates the magnitude of the Sharpe Ratio)



	Sharpe Ratio	Hit Rate	Average Monthly Turnover
Accruals	1.05	60.96	12.74
Accruals Volatility	0.81	59.36	4.82
Combined Strategy	1.49	66.84	11.26

Source: Citi Investment Research and Analysis

Please contact Citi European Quantitative Research Team ([gqrlondon@citi.com](mailto:gqrlondon@citi.com)) for stock screens &/or current top stocks based on aforementioned strategies.

## Introduction

**Accrual accounting provides a more relevant picture of earnings....**

Accrual accounting is a fundamental feature of corporate financial reports. Unlike cash accounting, under which a company recognises revenues and costs when it receives/pays cash, accrual accounting distinguishes between the recording of cash and benefits, and the actual payment and receipt of cash. To compute net income, which is the primary performance index of a company under this system, economic transactions are recorded on the basis of expected, not necessarily actual, cash receipts and payments. Since cash accounting does not report the full economic consequence of the transactions undertaken in a given period, accrual accounting provides a more complete image of the company's periodic performance. In other words, earnings under accrual accounting provide a more relevant picture. However, this increased relevance comes at the cost of reliability: accrual earnings are less reliable than cash earnings because they involve subjective judgments regarding the period in which revenues and expenses are recognised.

**...but subjectivity when matching expenses to revenues can make accruals earnings less reliable.**

Accrual accounting attempts to match expenses with associated revenues. Since the allocation of revenues and expenses to different periods involves subjective judgment, accrual accounting, under the various accounting standards, has rules in place to avoid abuses. However, these rules still allow for substantial discretion on behalf of managers. But even without abusing the rules, revenues and expenses for a certain financial year can be recognised more or less aggressively, with the consequence that the accounting numbers in subsequent years will depend heavily on how much revenues and/or expenses were booked in the preceding years. In other words, artificially increasing a revenue/expense during a fiscal year (even with a valid reason) will trigger an equivalent decrease in the subsequent years.

### Introducing Accruals Volatility

**Accruals Volatility is based on the principle that accruals are mean reverting....**

The concept of accruals volatility, documented by Bandyopadhyay et al (2009, April 2011), is based on the principle that accruals are mean-reverting in nature. Similar to the Accruals anomaly (which states that buying low accruals stocks and short-selling high accrual stocks generates positive abnormal returns), the accruals volatility anomaly argues that the market penalizes firms that consistently vary the proportion of physical cashflow in reported earnings. In other words, there is a strong negative relationship between the volatility of a firm's historical accruals and future stock returns.

**...with a strong negative relationship between volatility of historic accruals and future stock returns.**

In this research we examine the concept of accruals volatility in the context of the European market and from a more applied perspective. Basically, we seek to answer the question of whether accruals volatility could be a useful additional quant factor for institutional investors.

**We find statistically significant returns with low turnover for accruals volatility.**

Our research shows that the risk-adjusted alpha associated with accruals volatility is economically and statistically significant and comes with lower turnover than the standard accruals factor. Furthermore, the accruals volatility effect still persists after accounting for accruals anomaly and the volatility of the deflators.

We demonstrate that the return of the accrual volatility strategy is not attributable to well-known risk factors in the market. We suggest that the returns associated with accruals volatility may be due to the way investors perceive high accrual volatility firms to have high uncertainty surrounding the firm's future fundamentals. If accruals indicate the sustainability of the earnings trend, accruals volatility quantifies the persistency of such sustainability.

## Academic Research Review

**The simplicity of accruals based investment strategies has attracted considerable interest.**

The accruals volatility anomaly falls in the broader literature of the accrual anomaly, documented by Sloan (1996). The simplicity of the accruals-based investment strategy and the size of the returns it generates have largely attracted the interest of both academics and practitioners in the last decade. Richardson, Tuna, and Wysocki (2010) provide a very comprehensive survey of the research written on the accruals anomaly (as well as other accounting anomalies) over the last decade. In this section we rely on Richardson, Tuna, and Wysocki (2010) to highlight some papers from the literature on the accrual anomaly. We also survey papers on the accrual anomaly that are more targeted for equity portfolio managers as well as recent papers relating to the accrual volatility anomaly.

**Sloan: investors fail to correctly identify the two components of earnings**

Sloan's conclusion suggests that investors fail to identify correctly the different properties of the two components of earnings, that is the accrual and cash flow components. These two components have different abilities to predict future earnings and in particular accruals tend to mean-revert. Subsequent works have provided evidence that is not consistent with the fixation explanation (Ali et al.(2000), Zach (2005), Kothari et al. (2007)) while others have attributed the accrual anomaly to investor inattention (Hirshleifer et al.(2004)). More recent works have investigated whether the accrual anomaly is a manifestation of earnings management or accounting distortion (Chan et al.(2006), Beneish and Vargus(2002), Richardson et al.(2005)).

Another strand of literature has examined risk-based explanations for the accrual anomaly. Papers in this strand include Khan (2008) and Wu et al.(2010). Regardless of what explanation can one attribute to the accrual anomaly, it appears to have been fairly pervasive over the years (Fama and French, 2008). Papers that have investigated the extent to which transaction costs or market frictions discourage investors to arbitrage away the accrual anomaly include Mashruwala et al.(2006), Lev and Nissim(2006), Collins et al.(2003), and Kraft, Leone, and Wasley (2004), Palmon, Sudit, and Yezegel (2008)). This research concludes that the accrual anomaly is indeed stronger in the presence of capital market imperfections but these explanations cannot account for all of the negative relation between measures of accruals and future returns.

Many authors have identified linkages between the accruals anomaly and other anomalies (Collins and Hribar (2000), Barth and Hutton (2004), Desai, Rajgopal, and Venkatachalam (2004), Fairfield, Whisenant, and Yohn (2003)). A recent paper by Dechow et al. (2008) suggests that although the accrual anomaly is linked with other anomalies, it actually subsumes them. Also Wei and Xie (2008) the accruals anomaly and the capital investment anomaly are distinct, even though capital investments and accruals may be related in a certain way. However, Green, Hand, and Soliman (2011) conclude that the hedge returns of the accruals anomaly has decayed in U.S. stock markets to the point that they are, on average, no longer reliably positive.

**Bandyopadhyay: the market should penalise firms that consistently report earnings that deviate from cashflows**

Related to the accrual anomaly is the accrual volatility anomaly first documented in Bandyopadhyay et al (2011). Bandyopadhyay et al (2011) conjecture that in light of the deviation of earnings from cash flows the market should penalize firms that consistently report earnings that deviate from cash flows. They suggest that their conjecture and supporting empirical evidence is consistent with the convexity valuation of uncertainty in firms' profitability. These firms in equilibrium command higher prices and while the uncertainty is not resolved over time they exhibit high market-to-book ratios, and hence long-lasting lower future returns. Subsequent research by Wirjanto et al. (2010) uses accrual volatility to explain why income smoothing through accruals, while it implies higher current prices (Rountree, Weston, Allayannis (2008)), also implies a lower (or even negative) future returns.

# What is Accruals Volatility?

**Accruals Volatility: the historical standard deviation of a stock's accruals.**

At a basic level the methodology used to calculate the accruals volatility factor is straight-forward. We are simply calculating the historical standard deviation of a stock's accruals. However there are a number of different aspects to consider such as the definition of accruals, controlling for firm size and the period in which to calculate the volatility. All these aspects impact the efficacy of the accruals volatility factor.

## Defining Accruals

Consistent with our research that we conducted on this topic back in 2004, the definition that we have used for accruals is the one suggested by Richardson et al. (2004, 2005) and has its origin from a few simple accounting identities<sup>1</sup>:

$$FCF = CF - I = OI - \Delta NOA$$

or

$$\Delta NOA = OI - FCF = Accruals$$

Taking into consideration that:

$$CSE + MI = OA + FA - OL - FL = NOA + NFA$$

We can write Net Operating Assets as

$$OA - OL = CSE + MI - NFA$$

Combining the first and the last formulas mentioned above, we have

$$Accruals = \Delta NOA = \Delta NOA - \Delta OL = \Delta(TA - C) - \Delta(TA - TD - MI - TSE)$$

Where

FCF	= Free Cash Flow	CF	= Cash Flow
I	= Investments	OI	= Operating Income
NOA	= Net Operating Assets	MI	= Minority Interests
CSE	= Common Shareholder Equity	OA	= Operating Assets
FA	= Financial Assets	OL	= Operating Liabilities
FL	= Financial Liabilities	NFA	= Net Financial Assets
TA	= Total Assets	C	= Cash & Equivalents
TD	= Total Debt	TSE	= Total Shareholder Equity

**Accruals: Change in Net Operating Assets**

**We scale accruals by Net Operating Assets, Total Assets or Sales to avoid issues relating to company size...**

Operating Assets are calculated as the residual from total assets after subtracting financial assets, and operating liabilities are the residual amount from total assets after subtracting equity and financial liabilities. In order to avoid issues related to the size of the companies in our sample analysis, we can scale the factors by either Net Operating Assets (NOA), Total Assets (TA) or Sales. In order to avoid issues related to different accounting rules in different countries<sup>2</sup>, we have computed all the factors on a country relative basis (we have normalized the factors by subtracting the country mean and dividing by the country standard deviation).

**..and normalize by country to counter different accounting standards.**

<sup>1</sup> See "Financial Statement Analysis and Security Valuation" by Stephen H. Penman, McGraw-Hill 2003

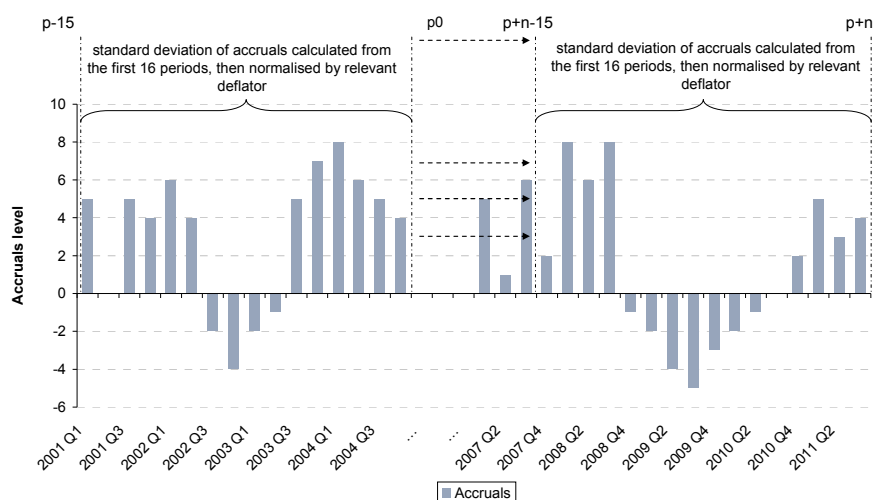
<sup>2</sup> This is more an issue for the sample period prior to IFRS introduction in 2005.

Accruals Volatility aims to measure the persistency of the long term deviation of earnings from cashflows.

## Defining Accruals Volatility

As mentioned previously, the essence of the accruals volatility anomaly is to measure the persistency of the long-term deviation of earnings from cash flows, as accruals will revert back to zero (probably not in practice but at least to a "long-run" value) in the long run. Negative accruals are more likely to be followed by positive accruals and vice versa. Following Bandyopadhyay et al. (April 2011) methodology, to calculate this factor we simply compute the standard deviation of a firm's historical accruals over a period of 48 months. The tricky part here is getting enough observations.

Figure 2. Calculation of Accruals Volatility



Source: Citi Investment Research and Analysis

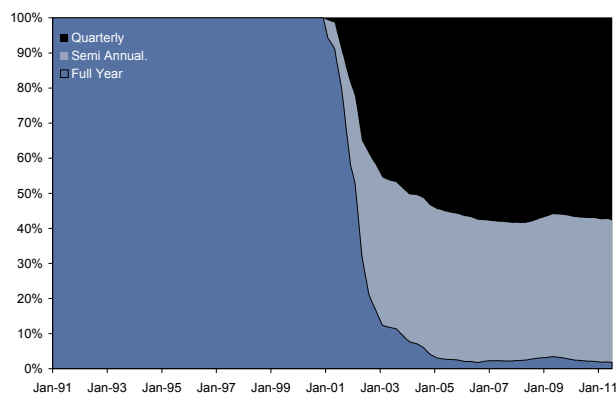
## Data Coverage – Reporting Data with Different Periodicities

Much of the research conducted on accruals utilises annual reported data. However, when we extend the analysis to incorporate the time variation in accruals, using annual data becomes problematic (i.e. for the standard accruals factor when using point-in-time cross-sectional comparison data is generally not a problem). Bandyopadhyay et al. (April 2011) avoid this issue by using quarterly data. Specifically, they use four years of quarterly data resulting in 16 data points. Using quarterly data is all well and good when examining stocks in the US – all companies report on a quarterly basis. But when extending the analysis to other countries/regions like Europe, dealing with quarterly data becomes problematic since not all companies in Europe (and elsewhere) report on a quarterly basis.

Figure 1 shows the percentage of companies in the MSCI Europe through time that either report on a full year, semi-annual (most of UK companies) or quarterly basis<sup>3</sup>. Over 50% of companies in our sample currently report on a quarterly basis with the balance reporting semi-annually. Over time this has not been the case where for most of the 1990s nearly all companies reported on a full-year basis. To avoid look-ahead bias, we lag accounting information from the full year, semi-annual and quarterly data by 3, 2, and 1 month respectively.

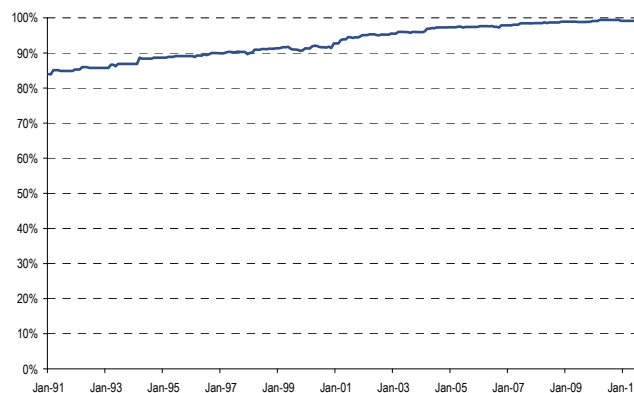
<sup>3</sup> The official interim data from Worldscope goes back to 2001.

**Figure 3. Percentage of Companies Reporting on Different Periodicities in Data Sample (MSCI Europe ex Financials )**



Source: Citi Investment Research and Analysis

**Figure 4. Percentage of Sample with Valid Data (MSCI Europe ex Financials )**



Source: Citi Investment Research and Analysis

**Regardless of reporting frequency, we use 4 years of reported data to calculate accruals volatility.**

More than 50% of the companies would have 16 quarters of observations after 2005, which is sufficient for the calculations. The definition of the accruals factor is as described above. The universe we use for the study is MSCI Europe ex Financials, with backtesting period from January 1996 to July 2011.

Regardless of reporting frequency, balance sheet data provides snap-shot information of the financial status of a company at a given point in time. Since our accruals calculations are solely based on balance sheet data items, blending data with different frequency is reasonable. Similarly, blending is also valid if the deflators in the accruals volatility calculations are sourced from balance sheet. As Sales is a flow variable, we use cumulative sales over the last 12 months to provide point-in-time information and accommodate different interim reporting frequencies across European countries. As a consequence of data availability, we have used annual data prior to 2001 and interim data, i.e. quarterly/semi-annual where appropriate, from 2001 onwards.

### Dealing with Outliers

To reduce the influence of the outliers and ensure robustness of our results, we trim accruals volatility at their 1<sup>st</sup> and 99<sup>th</sup> percentiles. Agreeing with Collins and Hribar (2000), we found that most of extreme outliers are associated with mergers and acquisitions. Consequently, we also exclude stocks that have total asset increased by more than 50% from one period to the next.



Deflating underlying accruals by Total Assets, Net Operating Assets or Sales removes any size bias and enables us to cross-sectionally compare stocks on accruals volatility.

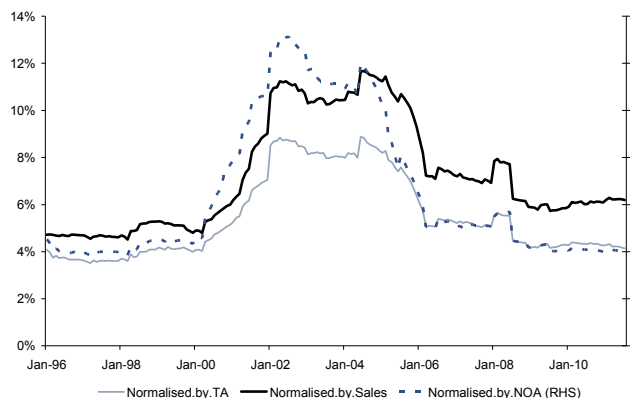
## Controlling For Firm Size

In order to utilise accruals on a cross-sectional comparative basis, the raw accruals metric is usually standardized (deflated) to take into account magnitude of the metric related to the size of the firm. However, the choice of the deflator used in a range of academic research for the accruals calculation is not consistent. For example, Richardson et al. (2002) use beginning period Net Operating Assets (NOA) as their deflator, while many other studies, such as Sloan (1996), use Total Assets (TA) while Bandyopadhyay et al. (April 2011) use Sales. When NOA is used as the deflator, accruals volatility can be interpreted as the volatility of the growth rate in NOA. As growth companies tend to have a higher and more volatile growth rate in NOA, they may be wrongly categorized as having higher accruals volatility. On the other hand, TA and Sales can be good choices of the deflators because they proxy for firm size. Additionally, when quarterly accruals is used, Bandyopadhyay et al. (April 2011) advocate that Sales is better than TA because it interacts less with the numerator of the ratio and reduces the seasonality effect in accruals.

## Correlations among Accruals Volatility Metrics

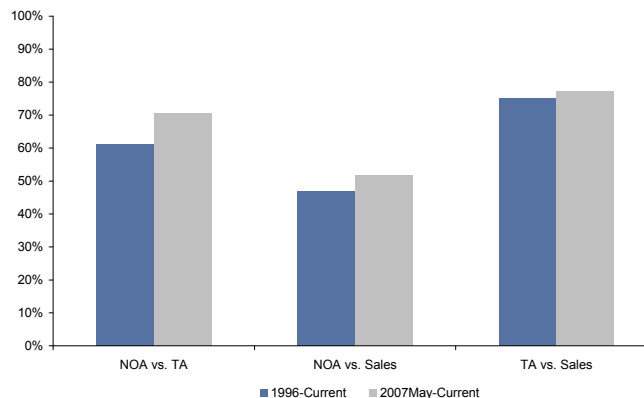
While the choice of deflator can vary, the aforementioned definitions of accruals are actually highly correlated. Figure 5 shows the cross-sectional average accruals volatility based on different deflators from January 1996 to July 2011. Over time, all three average accruals volatility measures show a similar profile. Figure 6 presents the average cross-sectional correlations of the raw value of accruals volatility. We observe comparable correlations for the whole sample period and from the sub-prime collapse in 2007 to date. The correlations appear to be in the region of 50% to 70% and are stable over time.

Figure 5. Average Accruals Volatility over time



Source: Citi Investment Research and Analysis

Figure 6. Average Cross Sectional Correlations of Accruals Volatility



Source: Citi Investment Research and Analysis

Mathematically, the three definitions of accruals volatility (i.e. the three choices of deflators in the accruals calculation) are related to each other through accounting turnover measures. We define net operating asset turnover ( $AT^{NOA}$ ) and asset turnover ( $AT^{Asset}$ ) as

$$AT_{t-1}^{NOA} = \frac{Sales_{t-1}}{NOA_{t-1}},$$

and,

$$AT_{t-1}^{Asset} = \frac{Sales_{t-1}}{TA_{t-1}} \text{ respectively.}$$

We can therefore write the three definitions of accruals as

$$Accruals_{TA} = [AT_{t-1}^{Asset}] * Accruals_{Sales} = \left[ \frac{AT_{t-1}^{Asset}}{AT_{t-1}^{NOA}} \right] * Accruals_{NOA}$$

$$\text{where } Accruals_{TA} = \frac{\Delta NOA_t}{TA_{t-1}},$$

$$Accruals_{Sales} = \frac{\Delta NOA_t}{Sales_{t-1}}, \text{ and}$$

$$Accruals_{NOA} = \frac{\Delta NOA_t}{NOA_{t-1}}$$

All three definitions yield the same value if NOA turnover is close to asset turnover and both are close to one. The decomposition suggests that, when calculating the volatility, there will be an element of measuring the covariance of accruals volatility and accounting turnover (which measures the efficiency of company operations). This relationship could vary with economies of scale and business cycles. In addition, the covariance term, when looking at the volatility of each measure, makes the linear decomposition of the equation above problematic.

**We focus our attention on using Total Assets as the deflator for underlying accruals.**

In the following section, we show that after controlling for different deflators, the low accruals volatility group outperforms the high accruals volatility group. Since all three measures are similar, we will only focus on the accruals volatility normalized by TA. Results from metrics using other two deflators are available upon request.

# Signal Strength and Correlations with Other Factors

## Accruals Volatility – Attractive Returns with Lower Turnover

IR increases as accruals volatility drops.

Figure 7 shows the relative return<sup>4</sup> characteristics of accruals volatility, where accruals are also standardized by TA. The information ratio increases almost monotonically as accruals volatility drops. The relative return produced by the lowest accruals volatility group is 3.22%, which significantly outperformed the highest accruals volatility group (-2.09%). After accounting for the lower beta<sup>5</sup>, the CAPM alpha of the low volatility group increases to 4.12% with the market being the equal-weighted universe, or 4.93% with the cap-weighted universe. Both market-adjusted returns are statistically significant at 95% confidence level. The IR of the lowest accruals volatility group is 0.82 with an average monthly one-way turnover of 2.50%.

Figure 7. Relative Returns Characteristics of Accruals Volatility (%)<sup>6</sup>

	Annualised Relative Returns	Annualised Volatility	Information Ratio	Hit Rate	Average Monthly Turnover (one-way)	CAPM Alpha (Ann, Eql wt)	CAPM Beta (Eql wt)*	CAPM Alpha (Ann, capwt)	CAPM Beta (Cap wt)*
High Accruals Volatility	-2.09	4.21	-0.50	48.13	2.31	-2.45*	1.05	-1.61	1.16
2	-1.63	3.51	-0.46	44.39	4.23	-1.92	1.04	-1.02	1.14
3	1.04	3.23	0.32	52.94	4.91	0.77	1.04	1.81	1.12
4	-0.21	3.47	-0.06	51.87	4.58	0.11	0.96	0.96	1.05
Low Accruals Volatility	3.22	3.94	0.82	59.89	2.50	4.12*	0.88	4.93*	0.96
(Low – High) Accruals Volatility	5.41	6.70	0.81	59.36	4.82	3.64*	-0.17	3.56*	-0.19

\*Significant at 95% confidence level, including all CAPM betas.

Source: Citi Investment Research and Analysis

Turnover of low accruals volatility portfolio is half that of low accruals portfolio.

As a comparison, Figure 8 shows the relative return attributes of the accruals strategy<sup>7</sup>. The lowest accruals quintile has a higher hit ratio than that of the lower accruals volatility group. However, the average monthly turnover of this group is 6.55%, which is more than double that of the lowest accruals volatility group. The long-short return of accruals is 6.69% versus 5.41% of accrual volatility strategy. One interesting point to make here is that the lowest and highest quintiles of both strategies have the lowest turnover, which suggests that both signals are persistent.

Figure 8. Relative Returns Characteristics of Accruals (%)

	Annualised Relative Returns	Annualised Volatility	Information Ratio	Hit Rate	Average Monthly Turnover (one-way)	CAPM Alpha (Ann, Eql wt)	CAPM Beta (Eql wt)*	CAPM Alpha (Ann, capwt)	CAPM Beta (Cap wt)*
High Accruals	-3.54	3.88	-0.91	41.18	6.20	-3.59*	1.01	-2.83	1.12
2	-1.52	3.42	-0.44	41.71	8.81	-1.46	0.99	-0.61	1.09
3	0.03	2.99	0.01	53.48	9.54	0.21	0.98	1.16	1.05
4	2.35	3.85	0.61	56.68	9.30	2.45	0.99	3.42	1.07
Low Accruals	2.93	3.91	0.75	62.03	6.55	2.98*	0.99	3.91*	1.08
(Low – High) Accruals	6.69	6.40	1.05	60.96	12.74	3.72*	-0.01	3.84*	-0.03

\*Significant at 95% confidence level.

Source: Citi Investment Research and Analysis

<sup>4</sup> Relative to the equal-weighted universe return, excluding financials

<sup>5</sup> The data frequency used for CAPM regressions is monthly.

<sup>6</sup> Risk free rate: we use 3-month EURIBOR and 3-month local rate prior to euro introduction.

<sup>7</sup> Blended means using interim data when possible otherwise annual. Blended data have a higher IR than FY data. The average turnover across the FY accruals quintile basket is 11.7%.

## Information Coefficient (IC) and IC decay

While we have demonstrated that accruals volatility in the top and bottom of the cross-section is negatively correlated with future returns, we next focus our attention on the efficacy of the signal across all stocks. Additionally, we calculate the information coefficient to examine if the return predictability of accruals volatility is consistent through time. Figure 9 shows the rank information coefficient (IC) of the inverted accruals volatility.

Accruals volatility: struggles in periods of rising risk appetite...

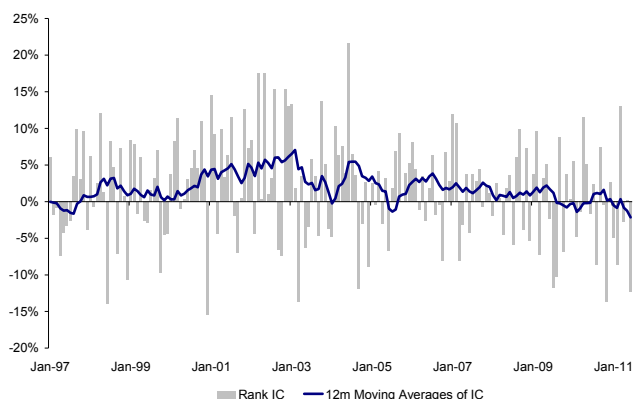
It is evident from the chart below that rank ICs are positive most of the time within our sample period. Negative ICs appear in months where there is a rising risk appetite in the market and when low risk/quality under-performs.

...but signal decay is slow with the construct based on reported accounts...

In addition to examining one cross-section of stocks, we also test the signal decay of accruals volatility over a period of 24 months. Figure 10 shows the average Spearman rank correlations of accrual volatility score and stocks returns up to 24 months. The average lagged IC is 1.28% for the 24-month period and the slope is (-0.03), based on a regression of lagged ICs against the trend line. This finding confirms our prior that it is a slow-burn signal as the construct is based on reported accounting information. With an R-squared of 70%, the slow decay profile of the signal and its persistent nature make it a compelling alpha strategy for investors.

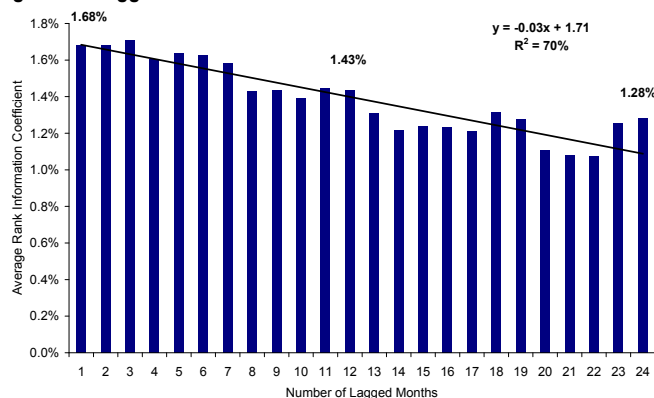
..making accruals volatility an appealing alpha strategy for investors

Figure 9. Rank IC of the Inverted Accruals Volatility



Source: Citi Investment Research and Analysis

Figure 10. Lagged Rank IC



Source: Citi Investment Research and Analysis

## Correlations with other Style Factors

As shown in Figure 9, rising risk appetite in the market is responsible for brief down periods of the accruals volatility strategy. As a measure of quality, part of accruals volatility is priced through the changing risk aversion in the market. For this reason, accruals volatility is expected to be correlated with low risk and other quality measures. Additionally, accruals volatility, as an accounting measure, reflects the pricing behaviour in the months between the current and the next reporting seasons. It is therefore also interesting to examine the correlation of accruals quality and price momentum.

Low correlation with other factors, but consistent negative relationship with idiosyncratic risk.

Figure 11 shows the correlations of the z-scores of accruals volatility (inverted) with the z-scores of other factors. We calculate the average rank correlation since if accruals volatility can be represented by other factors, then it should be highly correlated with that factor(s). As can be seen below, accruals volatility has a low correlation with other well-known predictors of future stock returns. The correlations are time-varying across all factors except for idiosyncratic risk where the correlation is consistent with an average of -17% for the whole sample period.

Figure 11. Average Rank Correlations of Accruals Volatility and Other Factors

	Beta	Log Mktcap	Earnings Yield	Log (Book Yield)	12m Price Momentum	ACC <sup>8</sup> , Inverted	Idiosyncratic Risk
1996-2000	-8%	14%	2%	4%	2%	21%	-20%
2001-2005	-12%	-2%	17%	9%	0%	-2%	-15%
2006- Jul 2011	-10%	6%	10%	7%	0%	3%	-16%

Source: Citi Investment Research and Analysis

Accruals volatility is a measure of both high quality and low risk...

The table below shows the pair-wise factor correlations, averaged over time from 1996 - 2011. The upper diagonal contains the rank correlation, while the lower diagonal exhibits the standard correlation. Inverted accruals volatility has a consistently higher correlation with idiosyncratic risk. It is also positively correlated with accruals and negatively correlated with beta. These observations suggest that accruals volatility can be viewed as a measure of quality and low risk.

Figure 12. Average Pair-wise Factor Correlations\*

	Beta	Log Mktcap	Earnings Yield	Log (Book Yield)	12m Price Momentum	ACC Inverted <sup>7</sup>	Idiosyncratic Risk	ACCV Inverted <sup>7</sup>
Beta	-	-20%	-4%	18%	-1%	6%	49%	-9%
Log Mktcap	-21%	-	-7%	-20%	2%	-2%	-36%	9%
Earnings Yield	0%	-8%	-	40%	6%	-1%	-8%	8%
Log (Book Yield)	16%	-19%	38%	-	9%	10%	6%	6%
12m Price Momentum	-1%	2%	5%	8%	-	3%	-1%	1%
ACC Inverted <sup>7</sup>	5%	-1%	-1%	9%	3%	-	4%	8%
Idiosyncratic Risk	49%	-27%	0%	1%	-1%	1%	-	-17%
ACCV Inverted <sup>7</sup>	-8%	8%	5%	8%	1%	15%	-17%	-

\*Spearman rank correlations in the upper diagonal (shaded grey) and Pearson correlations in the lower diagonal

Source: Citi Investment Research and Analysis

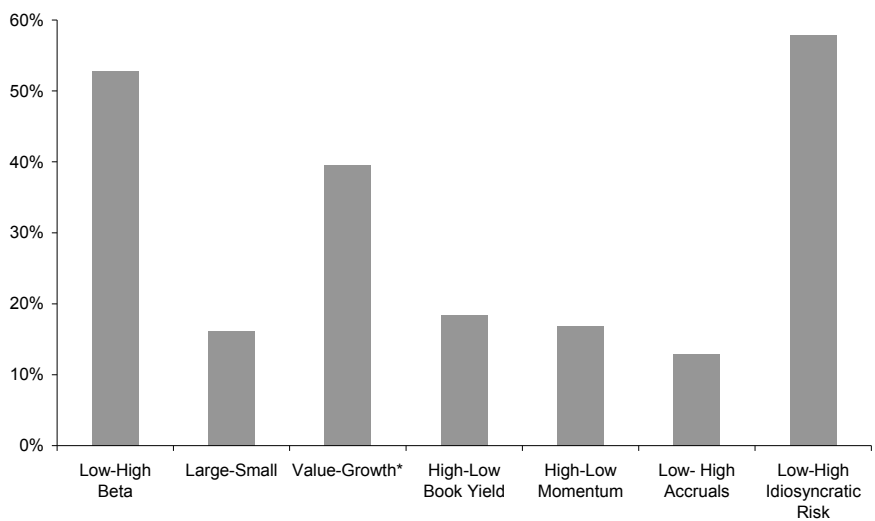
...with strong ex-post correlation to low beta and low idiosyncratic risk.

On an ex-ante basis, as shown above, accruals volatility is not highly correlated with other well-known factors. Below we examine the correlation on an ex-post basis: the chart shows return correlations between the long-short returns of accruals volatility (inverted) and other factors. The return of (low – high, LMH hereafter) accruals volatility is strongly correlated with that of LMH beta and LMH idiosyncratic risk strategies. It also has a moderate correlation with value return.

<sup>8</sup> Accruals as defined: change in net operating assets (time t) divided by total assets at t-1

---

**Figure 13. Factor Return Correlation**



\*Value – Growth: calculated using the top quintile return of earnings yield minus the bottom quintile return

Source: Citi Investment Research and Analysis

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In summary, our observations suggest that accruals volatility is a signal that exhibits both quality and low risk characteristics, as it is more correlated with beta, idiosyncratic risk and (on an ex-ante basis) accruals.

# Accruals Volatility – Source of Returns

## Risk-adjusted Returns

The performance of a stock selection strategy can be (partially) attributable to its exposure to well-known factors such as the market, size, value and momentum. In order to determine how significant the value exposure is for each strategy and whether the portfolios we form simply have beta exposure, size biases and momentum tilts, we regress the returns of each long-short portfolio against the returns of the Fama-French/Carhart risk factors<sup>9</sup>. We use equal-weighted and cap-weighted returns as proxies for the market. We divide the universe into three sub-groups based on book yield, log (market cap) and 12-month price momentum. We then construct long-short portfolios using top minus bottom book yield, small cap minus large cap<sup>10</sup> and high momentum minus low momentum.

Returns generated are significantly in excess of those captured by typical market, value, size and momentum premiums.

Figure 14 shows the Fama-French/Carhart regression coefficients and the corresponding statistical significance of our accruals volatility portfolio, using total assets as the deflator. The risk-adjusted returns are in the region of 5.2% per annum, based on equal-weighted and cap-weighted universe returns as benchmarks and are both statistically significant. We interpret this finding as an indication that the accruals volatility portfolio is able to generate returns that are not fully captured by market, value, size and momentum premiums. Risk-adjusted alpha is slightly higher than the original long-short return of the strategy due to its negative market beta exposure. Value and Size also appear to have positive influences on the returns of the accruals volatility strategy.

**Figure 14. Fama-French Regression Coefficients and Alpha: Accrual Volatility (TA)**

	Alpha (Ann)	Market	Value-Growth	Small-Large	High-Low Momentum
Equal-weighted market	5.26%*	-0.16*	0.30*	-0.12*	0.04
Cap-weighted market	5.10%*	-0.16*	0.29*	-0.21*	0.04

\* t-stats significant at 95% confidence level

Source: Citi Investment Research and Analysis

## Independent Effect from Accruals

Owing to the mean-reverting nature of accruals, accruals volatility may be an add-on effect to accruals. By construction, accruals volatility is associated with the volatility of the deflators (NOA, TA, or Sales). The key question here is whether these signal construction choices can fully explain the signal performance we showed earlier. Following Bandyopadhyay et al. (April 2011), and to demonstrate that the accruals volatility is independently associated with future returns, we calculate returns on the tertile<sup>11</sup> portfolios sorted by both accruals and accruals volatility. In addition to the tertile portfolio returns, we also show the long-short portfolio returns based on a strategy buying low accruals volatility stocks and selling high accruals volatility stocks, after controlling for accruals.

<sup>9</sup> Risk-free rate: we use 3-month EURIBOR and 3-month local rate prior to euro introduction.

<sup>10</sup> Based on strategies of top 1/3 minus bottom 1/3 for both factors

<sup>11</sup> We use tertile here, as using quintile (resulting in 25 sub-groups) would have serious breadth issues for our sample size. Both accruals and accruals volatility are normalised by total assets. Similar results are observed for the other two variations.

Accruals volatility is a separate effect from the accruals anomaly...

Figure 15 shows the Fama-French alpha for each of the 9 tertile portfolios, adjusted for market and other risk factors that may vary according to accruals. Each accruals volatility tertile group contains all accruals portfolios. If the risk-adjusted returns associated with accruals volatility are fully attributable to the ones associated with accruals, then we would expect the average returns across each accrual volatility tertile group, after controlling for accruals, are statistically the same.

Low accruals and low accruals volatility produces an average monthly alpha of 0.31%, comparing to a much lower alpha of -0.26% for the high accruals and high accruals volatility portfolio. After controlling for accruals effect, the monthly alpha for the low volatility portfolio is 0.15%, which is 0.26% higher than the high volatility portfolio. The alpha monotonically increases as accruals volatility decreases<sup>12</sup>. These results suggest that accruals volatility is a separate effect from the accruals anomaly.

Figure 15. Fama-French Monthly Alpha of Double-Sorted Portfolios

Accruals	vs. Equal Weighted Market Return, Accrual Volatility Tertiles			
	High	2	Low	Low – High Accruals Volatility
High	-0.26%*	-0.26%*	-0.05%	0.21%
2	-0.10%	0.03%	0.20%*	0.30%
Low	0.05%	0.18%	0.31%*	0.26%
ACCV Controlled for Accruals	-0.11%	-0.02%	0.15%	

\*Significant at 95% confidence level.

Source: Citi Investment Research and Analysis

## Independent Effects from the Deflators

The average correlations among various metrics of accruals volatility are around 70%. While this value is high, there might still be differences in strategy performances caused by the volatility of the deflators. The question is; how much of the alpha comes from the volatility of the deflators?

...and risk adjusted returns appear to be independent to the underlying volatility of the deflators.

To answer this question, we show the Fama-French alpha after controlling for volatility of the deflators associated with accruals volatility. Each volatility group contains all groups of the deflator volatility. The results below suggest that low accruals volatility groups always outperform high volatility groups. This holds for each tertile group of the control variables and each metric, which, in turn, confirms that the risk-adjusted returns of accruals volatility do not come from the volatility of the deflators.

Figure 16. Fama-French Alpha, Controlled for the Volatility of the Deflators

Control variables	Accruals Volatility, Normalised by NOA			Accruals Volatility, Normalised by TA			Accruals Volatility, Normalised by Sales		
	High	2	Low	High	2	Low	High	2	Low
Low	-0.08%	0.07%	0.22%*	-0.11%	-0.05%	0.27%*	0.03%	-0.11%	0.07%
2	-0.10%	-0.15%	0.03%	-0.11%	-0.01%	0.01%	-0.02%	-0.18%	0.23%*
High	-0.12%	0.07%	0.23%*	-0.22%*	0.05%	0.23%*	-0.21%	0.11%	0.06%
Average	-0.10%	0.00%	0.16%	-0.15%	0.00%	0.17%	-0.07%	-0.06%	0.12%

\* Significant at 95% confidence level.

Source: Citi Investment Research and Analysis

<sup>12</sup> Cap-weighted portfolios have similar results and are available upon request.



## Firm-level Evidence

So far we have demonstrated that the cross-sectional returns of the accruals volatility factor are not purely attributable to exposure to common risk factors. In this section, we examine if accruals volatility is associated with market mispricing after controlling for multiple factors in addition to other common risk factors.

Accruals volatility may vary significantly across industries. For example, an engineering company may appear to have higher accruals volatility because of certain long-term projects. Consequently, we explore in the section below whether or not there are still positive returns associated with accruals volatility after controlling for sector effects, accruals and the volatility of the deflators.

To examine accruals volatility as a pricing factor, we employ Fama-Macbeth (1973) methodology to estimate cross-sectional return regressions<sup>13</sup> at the company level. Figure 17 contains the two-stage regression results of returns on accruals volatility and other factors. Since the accruals volatility examined is normalized by TA, we present the results by using TA volatility. Similar to Bandyopadhyay et al. (April 2011), we have included accruals (inverted), CAPM beta (based on 5-year monthly data), log market cap, earnings yield, log book equity to market equity, T-stats of 12-month returns (represents momentum) and an intercept term in the regression. The idiosyncratic risk is from the aforementioned CAPM regression. The returns are universe returns multiplied by 100.

Figure 17. Fama Macbeth (1973) Cross-Sectional Regression of Returns on Accruals Volatility (average monthly %)

	Accruals Volatility (Inverted)	Accruals (Inverted)	TA volatility (Inverted)	Intercept	Beta	Log (Mcap)	Earnings Yield	Log (Book Yield)	12-month Price Momentum	Idiosyncratic Risk
No Sector Dummy	0.09*	0.17*	-0.06	0.74*	-0.07	0.06	0.20*	0.05	-0.31*	0.06
With Sector Dummy	0.08*	0.18*	-0.04	1.22*	0.01	0.03	0.18*	0.05	-0.41*	0.03
No Sector Dummy, 6m forward	0.11*	0.05	-0.03	0.69	-0.03	0.03	0.06	0.06	0.15*	-0.02
With Sector Dummy, 6m forward	0.12*	0.09	-0.02	1.00*	0.06	0.02	0.06	0.04	0.15*	0.00

\* significant at 95% confidence level

Source: Citi Investment Research and Analysis

**Returns remain statistically significant when applying a layer of sector neutrality...**

**...regardless of the sector, lower accruals volatility implies higher returns.**

When regressed together with accruals volatility, the coefficient of TA volatility is small and statistically insignificant. This regression result confirms our observation in the previous section that the risk-adjusted returns of accruals volatility do not come from volatility of the deflators. When adding sector dummies into the regression, the t-statistics of accruals volatility are effectively the same. Regardless of the forecast periods and sector neutrality examined here, the coefficient of inverted accruals volatility reads positively, i.e. the lower the accruals volatility the higher the return.

<sup>13</sup> The cross-sectional regression is conducted monthly, using t+1 forward returns regressed against factor z-scores at time t.

## Possible Explanation of the Accruals Volatility Anomaly

In the previous two sections, we have demonstrated that there are attractive risk-adjusted future returns associated with accruals volatility. Following Bandyopadhyay et al. (April 2011) and Pastor and Veronesi (2003)<sup>14</sup> we provide explanations on the source of returns below.

**Persistent accruals imply consistent cash earnings: the “quality of the quality” companies.**

Since accruals volatility measures the persistency of accruals, assuming accruals follow a mean-reverting process, low volatility firms tend to have low accruals for an extended period<sup>15</sup>. From a balance sheet point of view, the proportion of the cash element within earnings of these firms appears to be consistent over time. Naturally, firms with such characteristics are the “quality of the quality” companies.

**Lower volatility of accruals implies lower idiosyncratic risk...**

Our previous observations confirm such conjecture. The reading of the rank correlation between accruals volatility (inverted) and idiosyncratic risk (Figure 11 and Figure 12) is negative, approximately -18%, implying stocks with lower accruals volatility, have lower idiosyncratic risk. On an ex-post basis, the long-short return of accruals volatility is highly correlated with low beta and low idiosyncratic risk. By construction, accruals volatility is linked to accruals, which is a clear quality indicator. The aforementioned ex-ante and ex-post correlations with low risk also suggest that accruals volatility measures the “quality of the quality” element of the balance sheet.

**...and, when combined with low accruals, results in more reliable earnings and profitability**

Accruals volatility is also seen to be associated with uncertainties surrounding fundamentals of companies. By definition, when the cash component of earnings has been large for an extended period of time, accruals volatility would be low. Low accruals volatility, together with low accruals implies that it is less likely that the management of the company has “managed” their accounts. Hence, investors can have more confidence in the firm’s profitability and earnings.

Pastor and Veronesi (2003) show that investors require a premium to compensate for uncertainties surrounding fundamentals such as future profitability and cash flow generation. In other words, companies with high fundamental uncertainty should command higher current prices. To test this conjecture, we run Fama-Macbeth regressions of current and future price-to-book on accruals volatility and other variables associated with uncertainty of the fundamentals. Utilising the framework set out in Bandyopadhyay et al. (April 2011) and Pastor and Veronesi (2003), we include a firm’s age (the reciprocal of one plus the number of years since firm’s listing), leverage (total liability to total assets), beta, log of market cap, past 12-month returns, and idiosyncratic risk.

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<sup>14</sup> Pastor, Lubos, and Pietro Veronesi, 2003, Stock valuation and learning about profitability, Journal of Finance 58, 1749 – 1789.

<sup>15</sup> Richardson, Sloan, Soliman & Tuna (2001) found the average accrual in their sample was 9.2%, indicating the firms were growing in their sample period.

Figure 18. Cross-sectional Regression of Price-to-Book ratio

	Log (Price to Book)	1-month ahead Log (Price to Book)	3-month ahead Log (Price to Book)	6-month ahead Log (Price to Book)	12-month ahead Log (Price to Book)
Intercept*	-0.7532	-0.7312	-0.6933	-0.6499	-0.5761
ACCV*	1.0552	1.0237	0.9644	0.8961	0.8083
Age, inverted*	5.2493	5.1489	4.9714	4.7673	4.3249
Leverage*	0.6178	0.6095	0.5937	0.5693	0.5256
Beta*	-0.3882	-0.3911	-0.3925	-0.3936	-0.3883
Size	0.1370	0.1357	0.1335	0.1308	0.1275
12-Month Ret	0.0073	0.0072	0.0071	0.0067	0.0055
Idiosyncratic Risk	0.1060	0.1084	0.1133	0.1208	0.1315

Age, inverted: reciprocal of one plus the number of years since the firm's listing

Size: log of lagged month market equity

Beta and Idiosyncratic Risk: beta and sigma from a 5-year monthly CAPM regression

\*Significant at 99% confidence level.

Source: Citi Investment Research and Analysis

Low accruals volatility → higher earnings  
transparency → higher future returns

The results echo the findings from Bandyopadhyay et al. (April 2011) that accruals volatility is positively correlated with contemporaneous and future book yields. The coefficients across all time periods are highly significant which confirms the consistent "overpricing" of such stocks, resulting in lower future returns. By the same token, firms with lower accruals volatility possibly offer higher transparency of their earnings, which in turn should result in higher future returns.

# Investment Application

## Combining Accruals and Accruals Volatility

As shown earlier, accruals volatility offers lower turnover but at the expense of returns when compared to accruals strategy. In this section, we examine a strategy which combines accruals and accruals volatility. Specifically, we calculate a z-score based on the accruals and the accruals volatility of each stock in the universe. We then equally weight the two factors and calculate returns of the subsequent month.

Overlaying the accruals anomaly with accruals volatility results in improved absolute returns and risk profile...

Figure 19 shows the returns characteristics of long-short portfolios based on accruals and accruals volatility. Regardless of the deflator used in the accruals volatility calculation, the combined strategy produces higher returns than accruals on a risk-adjusted basis. Additionally, the combined strategy achieves a higher hit ratio whilst offering lower turnover compared to the blended accruals strategy.

Figure 19. Returns Characteristics of Long-Short Metrics (%)

	Annualised Returns	Annualised Volatility	Sharpe Ratio	Hit Rate	Average Monthly Turnover (one-way)	Max Drawdown
Accruals	6.69	6.40	1.05	60.96	12.74	-6.85
ACCV, Normalised by TA	5.41	6.70	0.81	59.36	4.82	-9.59
Accruals + ACCV, Normalised by NOA	8.10	6.82	1.19	65.78	12.00	-10.25
Accruals + ACCV, Normalised by TA	8.91	5.99	1.49	66.84	11.26	-6.86
Accruals + ACCV, Normalised by Sales	6.25	5.85	1.07	60.96	11.09	-5.74

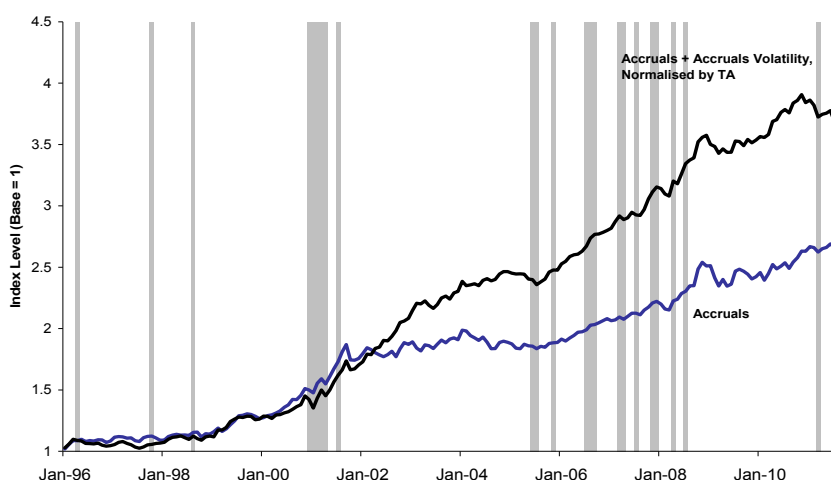
Source: Citi Investment Research and Analysis

...and 4% higher returns during the global financial crisis

Figure 20 (overleaf) shows the cumulative returns of long-short portfolios that combine the two signals. As a comparison, it also shows the long-short returns of the standard accruals signal. Over the investment period of the last four years, the combined portfolio has yielded 4% higher return than that of the standard accruals portfolio. Investing 1 unit in January 2007 in a long-short accruals strategy would have achieved 1.27 in July 2011, while combining accruals and accruals volatility (normalized by Total Assets) would have produced a return of 1.32 over the same period.

The shaded area in the chart represents periods when the combined strategy outperformed accruals for two consecutive months. One interesting observation from the chart is that the shaded area appears to scatter across the whole sample period rather than concentrating on any particular sub-period.

Figure 20. Cumulative Returns of Long-Short Portfolios



Source: Citi Investment Research and Analysis

## Closer Look on the Combined Portfolio (Top and Bottom Quintile)

Figure 21 and Figure 22 (next page) show the relative performance of the top and bottom quintile separately and a few observations are in place.

**Performance of both long and short legs improved.**

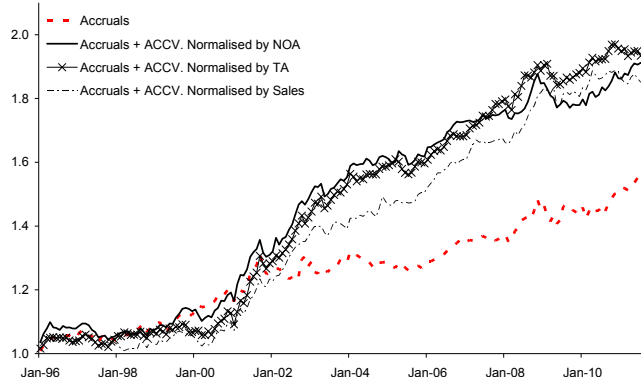
Firstly, combining accruals with accruals volatility improves performance, both on the long and the short leg.

Secondly, among all deflators TA produces the best results, achieving superior returns, particularly over Sales on both long and short legs. This difference is attributed to the volatility of the deflators as we previously highlighted. During periods of economic uncertainty, Sales could attract higher volatility than balance sheet based measures which results in a more significant influence on the overall accruals volatility value. Consequently, the ranking of accruals volatility based on Sales versus TA and NOA could look quite different during these times.

**Outperforms with risk aversion, underperforms with risk appetite**

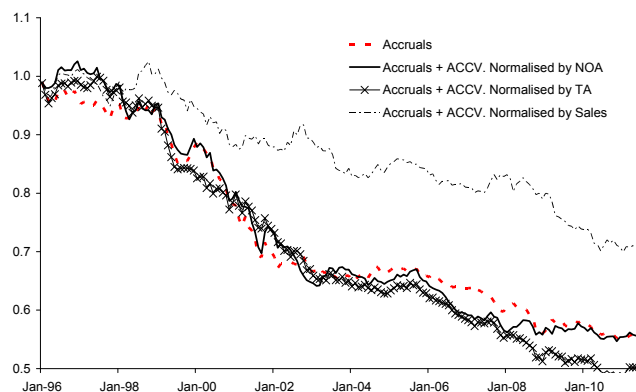
Thirdly, the top quintile group outperforms in the period of higher risk aversion and displays drawdowns in the periods of rising risk appetite: for example, the few months after the TMT bubble, two months after 9/11, several months around the sub-prime bubble, and the value rally in 2009. Conversely, the relative performance of the bottom quintile group, representing lower quality/higher risk, rises in the brief periods of falling risk aversion. Lastly, Figure 20 shows that the gap between the combined portfolio and accruals widens further after 2008, which is also related to the changing risk appetite in the market.

**Figure 21. Relative Performance of Top Quintile Relative to Equal-weighted Universe**



Source: Citi Investment Research and Analysis

**Figure 22. Relative Performance of Bottom Quintile Relative to Equal-weighted Universe**



Source: Citi Investment Research and Analysis

Positive alpha remains after removing market, value, size and momentum effects

### Fama-French/Carhart Adjustment on the Combined Portfolio Alpha

To reaffirm that the above combined strategy performance did not come solely from well-known market factor exposure, we conduct Fama-French/Carhart regression on the overall portfolio return. Figure 23 shows the annualized alpha after controlling for market, value premium, size premium and momentum effects. Since our previous section suggests that uncertainty surrounding future fundamentals explains the accruals volatility anomaly, we also include the volatility premium<sup>16</sup> as an additional risk factor.

The value and momentum premiums are significant in the regression, suggesting that these tilts have added to the performance. However, the alphas remain positive and statistically significant at 7.51% and 7.62% by using equal-weighted and cap-weighted benchmarks respectively on an annualised basis.

Figure 23. Returns adjusted for Market, Value, Size, Momentum and Volatility (Combined, LS)

	Alpha (Ann)	Market	Value- Growth	Small-Large	Momentum (H-L)	Low Vol- High Vol
Equal-wgtd market	7.51%*	-0.01	0.21*	-0.01	0.08*	0.07
Cap-wgtd market	7.62%*	-0.03	0.22*	-0.02	0.08*	0.06

\* Statistically significant at 95% confidence level

Source: Citi Investment Research and Analysis

<sup>16</sup> The volatility premium is the long-short return of the lowest (1/3) minus the highest (1/3) tertiles, where the volatility is calculated based on 3-year weekly returns.

## Conclusion

**Pioneered by Sloan (1996) accruals continues to be an important quality factor**

The accruals signal was introduced to the investment community as a measurement of earnings quality, following the pioneering paper by Sloan (1996) and continues to be an important quality factor for many investors. Following recent literature in volatility of accruals, we follow the research framework set out by Bandyopadhyay et al. (April 2011) paper and examine the persistency of accruals as a potential investment strategy.

**Accruals volatility: statistically significant returns with low turnover...**

We have tested the volatility of accruals, or accruals volatility, normalized by total assets, net operating assets and sales for MSCI Europe ex Financials universe. Regardless of the deflator used, the risk-adjusted alpha associated with the accruals volatility is economically and statistically significant. The turnover of the accruals volatility portfolio is also significantly lower than the accruals portfolio. Furthermore, we show that the accruals volatility effect still persists after accounting for the accruals anomaly and the volatility of the deflators.

**...even after controlling for risk factors,**

Many investment strategies can be explained by their exposures to common risk factors such as market, value/growth, size and momentum. We have demonstrated that this is not case with accruals volatility. We have found statistically significant alpha after controlling for various risk factors. We further show that accruals volatility is a pricing factor associated with future returns.

**Correlated with low beta and low idiosyncratic risk...**

What are the sources of returns? Accruals volatility is highly correlated with low beta and low idiosyncratic risk. It is also positively associated with current and future market to book value. We show that the returns associated with accruals volatility may be due to how investors perceive high accruals volatility firms as having high uncertainty surrounding the firm's future fundamentals. Consequently, a higher premium is required to justify bearing such risk, commanding higher current prices, which contributes to lower future returns. If accruals indicate the sustainability of the earnings trend, accruals volatility quantifies the persistency of such sustainability.

**...high accruals volatility implies higher uncertainty of fundamentals...**

**...quantifying persistency of earnings sustainability.**

As an investment application, we combine accruals and accruals volatility as a strategy and examine its characteristics. The combined strategy proves to be better than plain accruals on a risk-adjusted basis, regardless of the deflator. After adjusting for Fama-French/Carhart factors, we confirm that the alpha from the combined strategy remains statistically intact.

**Combining accruals volatility with the accruals anomaly offers attractive returns...**

**...with slow signal decay and low turnover.**

In summary, the slow decay profile of the accruals volatility strategy and its low turnover characteristics make it a compelling investment case. Since it can be seen as an add-on strategy to accruals, we demonstrate that the combined strategy provides significantly superior return to the accruals strategy.

# Appendix

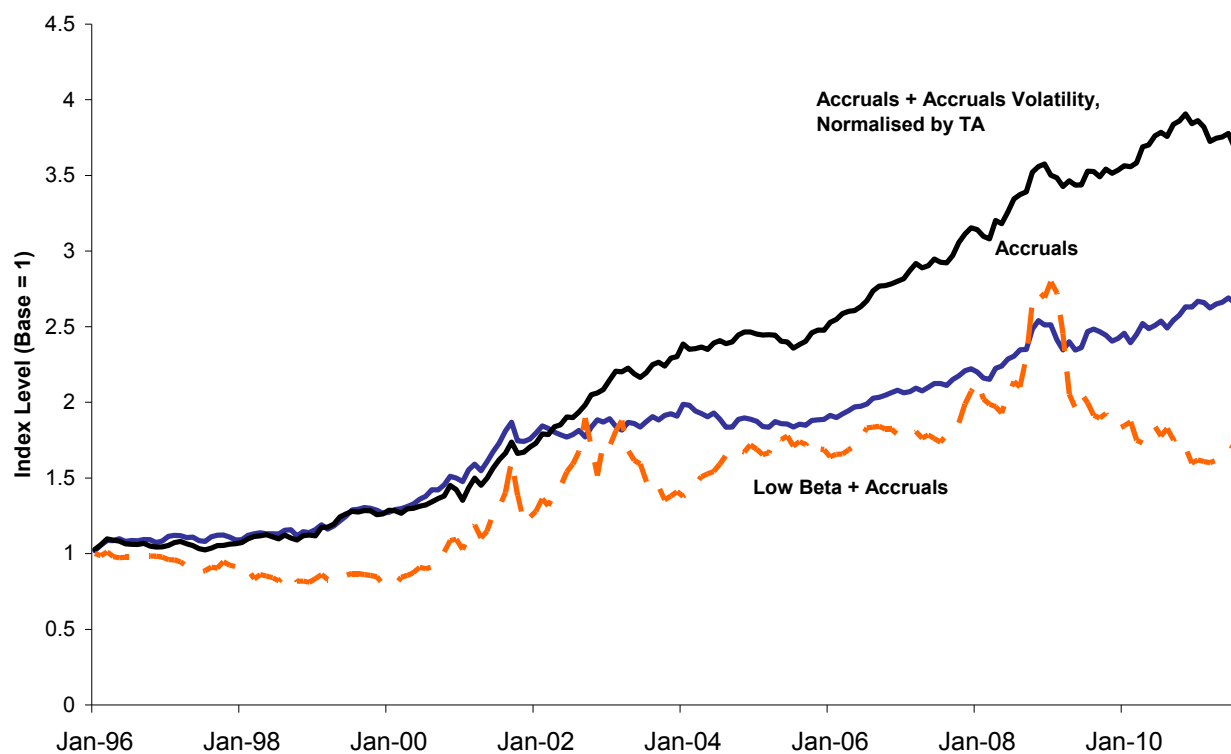
Figure 24. Fama-French Regressions on Accruals Volatility

Alpha (Ann)	Market	Value-Growth	Small-Large	HM-LM	Low - High Vol	Low - High Beta	Energy	Materials	Industrials	Consumer Discretionary	Consumer Staples	Health Care	Information Technology	Telecommunication Services	Utilities
3.75%*	0.00	0.19*	-0.04	0.01	0.23*										
4.63%*	-1.47*	0.06	-0.07	0.00	0.09	0.13**	0.00	0.28*	0.40*	0.40*	0.21*	-0.02	0.09*	-0.04	0.12*

\* Statistically significant at 95% confidence level

Source: Citi Investment Research and Analysis

Figure 25. Cumulative Long-Short Returns of Strategies



Source: Citi Investment Research and Analysis



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# Global Quantitative Research Contacts

Figure 26. Global Quantitative Research Team

Region	Name	Office Number	Email Address
ASIA-PACIFIC	Paul Chanin <sup>5</sup>	+65-6432-1153	paul.chanin@citi.com
	Tan Si An <sup>5</sup>	+65-6432-1163	si.an.tan@citi.com
	Nachiket Garde <sup>3</sup>	+81 (3) 6270 -4888	nachiket.garde@citi.com
	Tushar Mandal <sup>5</sup>	+65-6432-1154	tushar.mandal@citi.com
	Nick Morton <sup>4</sup>	+61-2-8225-4895	nick.morton@citi.com
	Anmol Sethy <sup>5</sup>	+65-6432-1175	anmol.sethy@citi.com
	Puneet Singh <sup>5</sup>	+65-6432-1172	puneet.singh@citi.com
	Aditya Shah <sup>6</sup>	+91 (22) 6641-8959	aditya.b.shah@citi.com
	Zee Yusuf <sup>4</sup>	+61-2-8225-4895	zee.yusuf@citi.com
EUROPE	Chris Montagu <sup>1</sup>	+44-20-7986-3958	chris.montagu@citi.com
	Helen Krause <sup>1</sup>	+44-20-7986-8653	helen.krause@citi.com
	Matt Burgess <sup>1</sup>	+44-20-7986-8325	matt.burgess@citi.com
	Rahul Jalan <sup>1</sup>	+44-20-7986-4075	rahul.jalan@citi.com
	Lingjuan Ma <sup>1</sup>	+44-20-7986-4404	lingjuan.ma@citi.com
	David Chew <sup>1</sup>	+44-20-7986-7698	david.chew@citi.com
NORTH AMERICA	Keith Miller <sup>2</sup>	+1-212-816-2285	keith.l.miller@citi.com
	Emily Jing Jia <sup>2</sup>	+1-212-816-1867	emily.jing.jia@citi.com
	Dading Li <sup>2</sup>	+1-212-816-1824	dading.li@citi.com
	Hong Li <sup>2</sup>	+1-212-816-1844	hong.li@citi.com
	Jason Li	+1-212-816-6033	jason.li@citi.com
	Richard Schlatter <sup>2</sup>	+1-212-816 6279	richard.w.schlatter@citi.com
	Aline Sun <sup>2</sup>	+1-212-816-7083	aline.sun@citi.com
	Tiffany Zhou <sup>2</sup>	+1-212-816-4659	tiffany.zhou@citi.com
	Peter Lo <sup>2</sup>	+1-212-816-0379	peter.lo@citi.com
ACADEMIC CONSULTANT	Daniel Giamouridis <sup>1</sup>	+44-20-7986-3958	gqrlondon@citi.com

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