



## STAR Ratings

Andy Moniz, PhD  
andy.moniz@db.com

Spyros Mesomeris, PhD  
spyros.mesomeris@db.com

Miguel-A Alvarez  
miguel-a.alvarez@db.com

Khoi LeBinh  
khoi.lebinh@db.com

Aris Tentes  
aris.tentes@db.com

**Search Tools for Academic Research (STARs)** – Our STAR rating system retrieves academic papers for a broad range of topics and assesses their relevance for investment processes (spreadsheet available upon request). Our approach:

- Reclassifies abstracts into a standardized set of quant-related topics enabling a researcher to quickly search for papers including asset allocation, factor investing, machine learning and sustainability.
- Weights papers based on their perceived relevance for traditional quant investment processes, whilst taking into account the author's influence and credibility within the academic and/or practitioner community.

Our latest recommendations include:

- **Earnings Quality**
  - The Magic Formula: Value, Profitability, and the Cross Section of Global Stock Returns.
  - Customer-Supplier Relationships and Abnormal Accruals.
- **Factor investing** - Dissecting Characteristics Nonparametrically.
- **Unstructured data** - Improving Experienced Auditors' Detection of Deception in CEO Narratives.



# A letter to our readers

In today's information age, the amount of data available to researchers can quickly become overwhelming. Our 'recommendation system' can help researchers find academic papers across a range of quant-related topics. Our approach:

- **Reclassifies abstracts into a standardized set of topics** enabling a researcher to search for papers using a consistent set of keywords.
- **Weights quant-related topics** more heavily by considering their relevance for a traditional quant investment process (e.g. alpha and portfolio construction research receive higher weights than high frequency trading research or derivatives research).
- **Considers the potential influence and credibility of an author** (i.e. the author's history of publishing in top ranking academic/practitioner journals and the number of abstract views).
- **Provides an Excel-based filtering tool**– by date, author, topic and investment relevance.

Figure 1: Illustration of our abstract filtering tool

Search by topic: All Topics

Search by keyword:  Filter Excel Results

Search by date: 20160901 20170131

Date	Topic	Title	Abstract	Keywords	Authors	High impact author?	Number of pages	Number of abstract views	Emerging markets related?	Macro research?	Alternative asset classes?	Commodities research?	Derivatives research?	FX research?	DB STAR Rating (1=Low, 5=High)
20170126	Corporate governance	<a href="#">The Basic Governance Structure: The Interests of Shareholders as a Class</a>	This paper is the third chapter of the third edition of The Anatomy of Corporate Law: A Comparative and Functional Approach, by Reinier	Shareholder-Management Conflict; One-Tier and Two-Tier	John Armour;Luca Enriques;Henry Hansmann;Reinier	N	40	12	N	N	N	N	N	N	3
20170126	Risk	<a href="#">Credit Expansion and Neglected Crash Risk</a>	By analyzing 20 developed countries over 1920–2012, we find the following evidence of overoptimism and neglect of crash risk by bank	Credit Expansion, Financial Crises	Matthew D. Baron;Wei Xiong	N	91	12	N	N	N	N	N	N	3
20170125	Alternatives	<a href="#">Super hedge fund</a>	Activist hedge funds revolutionized corporate America, generating both excitement and criticism alike. This article suggests that a novel	Hedge Fund Activism, Corporate Governance, Long-Term Firm Value	Sharon Hannes	N	44	393	N	N	Y	N	N	N	3
20170123	Machine learning	<a href="#">An Automation of the Proportional Rule in Financial Networks</a>	The most important rule to determine payments in real-life bankruptcy problems is the proportional rule. Many bankruptcy problems are	financial networks, systemic risk, bankruptcy rules, proportional rule	Peter Csöke;P. Jean-Jacques Herings	N	40	3	N	Y	N	N	N	N	4
20170123	Sustainability	<a href="#">Philanthropic Giving, Market-Based Performance and Institutional Ownership: Evidence</a>	This paper investigates the association of philanthropic giving with market-based performance and institutional ownership using	Philanthropic Giving; Corporate Social Responsibility; Firm	Sudipta Bose;Jyotirmoy Podder;Kumar	N	43	5	Y	N	N	N	N	N	3

Source: SSRN, Deutsche Bank

The Global Quant Research team



# Paper 1: Earning Quality

---

<b>Title:</b>	The Magic Formula: Value, Profitability, and the Cross Section of Global Stock Returns
<b>Authors:</b>	Blackburn, D; Cakici, N
<b>Abstract views:</b>	765
<b>Reviewer:</b>	Ronnie Shah

---

## Overview:

- The authors examine Greenblatt (2006, 2010) investment strategy called the “Magic Formula” which involves buying profitable, undervalued stocks and shorting un-profitable, over-valued stocks.
- The authors fail to find that such a strategy generates abnormal return premia in major developed equity markets.
- When the authors modify their measure using gross profits – they are able to construct long-only region portfolios that have twice the Sharpe ratio when compared to the relevant market portfolio.

## Related literature:

- Fama and French (1992, 1993, 2012).
- Novy-Marx (2013).
- There are several papers that talk about the value anomaly including Fama and French (1993) and more recent research that talk about profitability such as Novy-Marx (2013). Value strategies are price-scaled variables which are formed as ratios of fundamental scaled by price, while profitability captures a measure of economic profits scaled by a firm fundamental such as assets, book value or sales.

## Dataset:

- Stock return and fundamental data for 23 developed market countries are taken from Datastream.

## Methodology:

- The MF model requires two measures: (i) Profitability which is measured as EBIT divided by the sum of net working capital and net property, plant and equipment and (ii) earnings yield defined as EBIT divided by enterprise value. The 2<sup>nd</sup> version of the MF model involves replacing EBIT in (i) and (ii) with Gross profits which are defined as revenues less cost of goods sold. This paper also uses standard Fama-French global factors (MKT, SMB, HML).
- Using a reporting lag of 7 months (minimum time difference between accounting data period end and portfolio formation) stocks are ranked based on MF. The magic formula is calculated by averaging the ranks



of the two measures defined above: profitability and earnings yield. The authors then sort stocks into quintiles and report results.

#### Results:

- Portfolios formed on the Magic Formula fail to create reliable differences in average returns (except in Europe). When the authors replace EBIT with Gross Profits they find their modified MF portfolios explains cross-sectional return dispersion in North America, Europe, Japan and Asia with long/short T-statistics that exceed 2 in each region.

#### DB insights:

- This paper largely builds on Novy-Marx (2013) which identifies that profitability (gross profits/assets) explains returns and has low correlations to value strategies.
- Their main result involves extending the profitability research to other developed markets such as Japan and Europe.
- There are a couple of small items of interest in the paper – Value-oriented (growth-oriented), highly profitable (un-profitable) firms have very low (high) betas suggesting that their results may be driven by the low beta anomaly.



## Paper 2: Earning Quality

---

**Title:** Customer-Supplier Relationships and Abnormal Accruals

**Authors:** Bao, M. X., Billett, M. T., Liu, Y.

**Abstract views:** 311

**Reviewer:** Andy Moniz

---

### Overview:

- The authors investigate whether abnormal accruals of a supplier firm are affected by the abnormal accruals of its major customers?
- Consider a retailer that manufactures smartphones that experiences increased retail demand. They will need to produce more smartphones and will increase the orders for parts from suppliers. These suppliers will also need to order more input materials from their suppliers. Thus the increased demand for smartphones will reverberate down the supply chain. This magnification can occur if there is order batching (where orders are made in batches and only crudely communicate fluid demand changes), accumulation of safety stock, and price variation.
- The paper finds that abnormal accruals of a supplier positively relate to abnormal accruals of its major customer.

### Related Literature:

- Customers-supplier relationships have been shown to create contagion effects along the supply chain including financial distress, financing decisions and stock return predictability.
- Kale and Shahrur (2007) find that firms' capital structure is related to R&D intensities of the suppliers and customers, showing that leverage of a supplier is lower when the supplier invests more in customer-supplier relationship, and vice versa.
- Campello and Gao (2016) find that borrowers with higher customer concentration experience higher loan spreads and tighter loan covenants. Itzkowitz (2013) argues that firms, relying on major customers, increase cash holdings to dampen potential shocks caused by the loss of major customers.

### Dataset:

- The paper relies upon Compustat Business Segment Files to identify firms connected by supply chains. The files report the names of a firm's customers when those customers account for at least 10% of the firm's sales (i.e. "major customers").



- The paper follows Ellis, Fee and Thomas (2012) to match a customer's name to the Compustat database in order to obtain financial information of the customer.
- The sample dataset consists of 16,901 firm-year observations on 3,758 unique nonfinancial firms (i.e., excluding firms with SIC codes 6000-6999) from 1987 to 2015.

#### Methodology:

- The paper identifies trios of firms linked via the supply chain using business segment data. These trios include an ultimate customer (C), the supplier to the ultimate customer (S1), and the supplier to the supplier of the ultimate customer (S2):  $C \leftrightarrow S1 \leftrightarrow S2$ .
- To identify causality from C to S2, the paper conducts two-stage least squares.

#### Results:

- Using the abnormal accruals of C as an instrument for S1's abnormal accruals, the authors find the predicted value of S1's abnormal accruals is significantly related to the abnormal accruals of S2.
- The magnitude of the coefficients in these regressions increase along the supply chain (from C to S1 and then to S2).

#### DB insights:

- This paper provides an interesting take on economic inter-linkage effects by considering the impact on firms' accounting variables.
- The approach suggests the potential to design a lower portfolio turnover strategy using accounting data compared to prior studies which rely upon Granger causality tests of monthly stock returns.



# Paper 3: Factor investing

---

**Title:** Dissecting Characteristics Nonparametrically  
**Authors:** Freyberger, J; Neuhierl, A; Weber, M  
**Abstract views:** 319

**Reviewer:** Aris Tentes

---

## Overview:

- The authors suggest a non-linear methodology for calculating expected stock returns given a set of factors. The methodology is suitable when starting from a large set of factors.
- The authors suggest running a regression of returns on factor scores, however, to allow finer granularity, they suggest that for each factor there should be one quadratic term for each decile.
- For factor selection, the authors propose running regressions in a group Lasso framework, which enables predefined groups of independent variables to be either included or excluded from the model (as opposed to simple Lasso regression which selects single variables in or out of the model).
- The authors also compare the non-linear methodology to simple linear regressions and show that they can increase Sharpe ratios up to 50%.

## Related literature:

- Harvey et al. (2016) mention that over 300 had appeared in the literature and proposed that a higher t-statistic should be used to assess factors' predictability strength.
- Lewellen (2015) and Green et al. (2016) show that only a small number of characteristics are significant predictors of the cross-section of returns.
- DeMiguel et al. (2016) investigate which characteristics provide incremental information for returns and increase investors' utility.
- Connor et al. (2012) use a non-parametric regression methodology to estimate factor returns, while Bryzgalova (2016) proposes a shrinkage method to tackle the problem of weak factors that can make risk premia estimates unreliable.

## Dataset:

- Stock returns are taken from CRSP, for stocks that appear on NYSE, Amex or Nasdaq and have market prices above 5. Fundamental data are taken from Compustat. In total 36 factors are used.
- Factor selection is based upon data from 1963-1990, with backtesting from 1991 to 2014.



### Methodology:

- The methodology consists of 3 steps:
  - i. In the first step, a group Lasso regression of returns fits a quadratic function for each factor decile. For each factor there is one linear and 10 quadratic terms, where the  $i$ 'th quadratic term is non-zero only if the corresponding factor score is in the  $i$ 'th decile. The group Lasso regression ensures that for each factor, either all above 11 terms are selected or none.
  - ii. Another group Lasso regression is run, using weights in the group Lasso penalization term of the objective function. These weights are along the lines of Huang et al. (2010).
  - iii. In the third step, an OLS regression is run, using the same terms as above, but only for the factors that are selected by the previous step.
- In order to run a strategy, the above trained model is used every month to go long/short the 10% of stocks with the highest/lowest calculated expected returns.

### Results:

- The factor selection methodology selects 7-15 factors out of the 36, depending on whether they use quintiles, deciles etc. The deciles case selects 8 factors.
- The most common factors are Closeness to previous 52-week High Price, Short Term Momentum Reversal, Size and Standardized Unexplained Volatility.
- Using the same approach with simple linear regressions, leads to an increase in the number of selected factors to 21.
- The Sharpe ratio of the non-linear approach is 3.42, whereas for the linear regressions approach is 2.26. Even when the linear approach is used with the 8 factors selected by the non-linear one, the Sharpe ratio remains almost the same.
- The Sharpe ratio improves from 2.26 to 2.40 when using the non-linear approach for expected returns estimation with the 21 factors.

### DB insights:

- The idea of using a (grouped) Lasso regression for factor selection sounds appealing, due to its simplicity and its ability to capture nonlinearities.





## Paper 4: Unstructured data

---

<b>Title:</b>	Improving Experienced Auditors' Detection of Deception in CEO Narratives
<b>Authors:</b>	Hobson, J. L., Mayew, W.J., Peecher, M. E., Venkatachalam, M.
<b>Abstract views:</b>	162
<b>Reviewer:</b>	Andy Moniz

---

### Overview:

- The authors conduct an experimental study to investigate the accuracy of experienced auditors' abilities to detect fraudulent companies using CEO narratives from conference calls.

### Related Literature:

- Q&A between analysts and management provide information about the company (Blau et al. 2015, Hollander et al. 2010, Mayew and Venkatachalam 2012, Price et al. 2012), including cues that can facilitate detection of financial statement fraud (Larcker and Zakolyukina 2012; Hobson et al. 2012).
- A vast literature in social psychology reveals that individuals generally fail to exceed chance levels when attempting to detect deception (Bond and DePaulo 2006, Bond and DePaulo 2008, Vrij 2008). Prior work examining experienced auditors' capability to detect deception is sparse.

### Dataset:

- The authors gather 124 observations from thirty-one audit professionals at multiple large public accounting firms with an average of 24 years in the audit, assurance, and fraud/forensic services.
- Each auditor provides deception judgments on excerpts from the question and answer portion of quarterly earnings conference calls.

### Methodology:

- Following Hobson et al. (2012), narratives are characterized as deceptive if the company's financial statements being discussed in the call were restated and any of the following "irregularity conditions" hold: the restatement was deemed fraudulent, a regulatory investigation followed the restatement, or a class action lawsuit followed it.
- The authors create a sample dataset of company narratives by first requiring that fraudulent companies do not systematically differ from non-fraud companies on known financial statement predictors of fraud. To do so, the authors calculate a financial statement fraud score or "F-Score" (Dechow et al. 2011). Observations are sorted by the F-Score and, for each fraud observation, the authors select the



observation from the same two-digit industry with the closest F-Score, without replacement.

- When examining each transcript, auditors were asked to note in a text box the following for each red flag of fraud they identify: (1) the location of the red flag in the narrative via line number / timestamp, (2) the topical issue of the red flag, and (3) why it was a red flag.

#### Results:

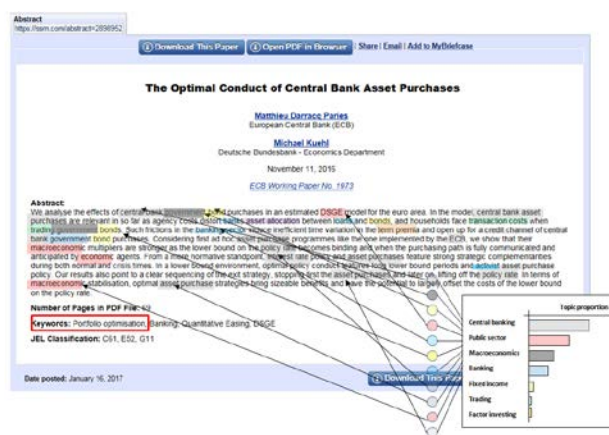
- As a baseline, the authors test whether auditors' deception judgments are better than chance rates and find an accuracy rate of 63%.
- This finding, however, is driven by accuracy on non-fraud companies. Their accuracy rates on non-fraud companies (83%) are far better than chance while their accuracy rates on fraud companies (43%) does not statistically differ from chance.
- The authors then refine the test to assess whether auditors more accurately identify sentence-specific fraudulent statements by CEOs in the conference call narratives of fraud companies.

#### DB insights:

- Prior studies have investigated the potential of text mining to infer qualitative information from financial disclosures. These studies have predominately relied upon a 'bag-of-words' dictionary based approach.
- This paper provides an interesting alternative based upon using human experts to classify text. The approach may be extended more generally to create a supervised learning model to classify fraudulent disclosures based upon, for example, using fundamental analysts' insights.
- The findings of the paper suggest even experienced analysts struggle to detect fraud in corporate communications.

- In today's information age, the amount of data available to researchers can quickly become overwhelming. For instance, website search engines often fail to retrieve relevant results when a user does not know exactly what he/she is looking for, when content is not described accurately, or not popular enough to appear high on search results.
- To illustrate the challenge of searching for relevant papers, Figure 1 displays a network analysis of the co-occurrence of all the keywords used in financial asset pricing research related to Optimization techniques (JEL code: C61). As well as including traditional topics such as 'Black-Litterman', keywords include 'basket option pricing' and 'optimal consumption'.

Figure 3: Illustration of our text analysis algorithm



Source: SSRN, Deutsche Bank

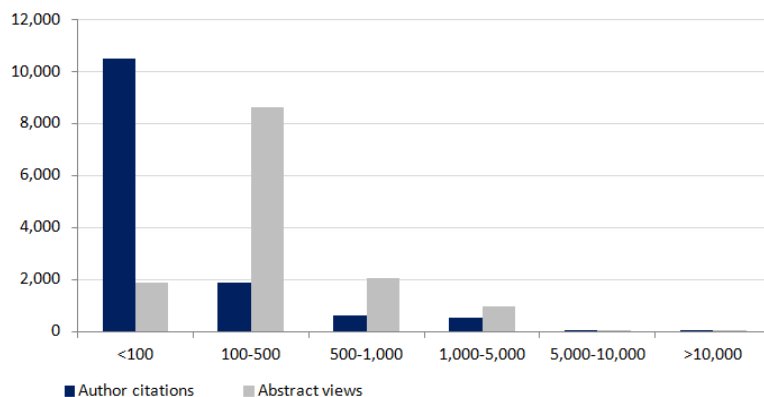
- Page 11



## Step 1: Reclassifying abstracts

- Our starting point consists of downloading academic abstracts from SSRN. We include asset allocation, asset pricing, and financial accounting literature, as well as more niche fields such as management studies, sustainability and machine learning.
- We employ a computational linguistics approach to reclassify abstracts into a standardised set of topics.
- Next, we search for whether a paper's authors have a history of publishing in top-rated academic journals (e.g. Journal of Finance, Journal of Accounting & Economics, Academy of Management) and/or practitioner journals (e.g. Financial Analyst Journal). We also make use of SSRN's metadata and retrieve data on the number of views an abstract has received and the number of paper downloads.

Figure 4: Histogram of author citations and SSRN abstract views



Source: SSRN, Deutsche Bank

To assess potential readership interest, our model includes an indicator variable equal to one if an abstract has received a very high number of views (in the top quintile), and zero otherwise.

## Step 2: Building a recommendation system

- Next we estimated a logistic regression using text features (keywords) and metadata (paper views and authors' impact) from each abstract.
- The regression was trained using 750 abstracts, leaving 250 abstracts for out-of-sample evaluation.



# Appendix 1

## Important Disclosures

\*Other information available upon request

Prices are current as of the end of the previous trading session unless otherwise indicated and are sourced from local exchanges via Reuters, Bloomberg and other vendors. Other information is sourced from Deutsche Bank, subject companies, and other sources. For disclosures pertaining to recommendations or estimates made on securities other than the primary subject of this research, please see the most recently published company report or visit our global disclosure look-up page on our website at <http://gm.db.com/ger/disclosure/DisclosureDirectory.eqsr>. Aside from within this report, important conflict disclosures can also be found at <https://gm.db.com/equities> under the "Disclosures Lookup" and "Legal" tabs. Investors are strongly encouraged to review this information before investing.

## Analyst Certification

The views expressed in this report accurately reflect the personal views of the undersigned lead analyst(s). In addition, the undersigned lead analyst(s) has not and will not receive any compensation for providing a specific recommendation or view in this report. Andy Moniz/Spyros Mesomeris/Miguel-A Alvarez/Khoi LeBinh

## Hypothetical Disclaimer

Backtested, hypothetical or simulated performance results have inherent limitations. Unlike an actual performance record based on trading actual client portfolios, simulated results are achieved by means of the retroactive application of a backtested model itself designed with the benefit of hindsight. Taking into account historical events the backtesting of performance also differs from actual account performance because an actual investment strategy may be adjusted any time, for any reason, including a response to material, economic or market factors. The backtested performance includes hypothetical results that do not reflect the reinvestment of dividends and other earnings or the deduction of advisory fees, brokerage or other commissions, and any other expenses that a client would have paid or actually paid. No representation is made that any trading strategy or account will or is likely to achieve profits or losses similar to those shown. Alternative modeling techniques or assumptions might produce significantly different results and prove to be more appropriate. Past hypothetical backtest results are neither an indicator nor guarantee of future returns. Actual results will vary, perhaps materially, from the analysis.



## Additional Information

The information and opinions in this report were prepared by Deutsche Bank AG or one of its affiliates (collectively "Deutsche Bank"). Though the information herein is believed to be reliable and has been obtained from public sources believed to be reliable, Deutsche Bank makes no representation as to its accuracy or completeness.

If you use the services of Deutsche Bank in connection with a purchase or sale of a security that is discussed in this report, or is included or discussed in another communication (oral or written) from a Deutsche Bank analyst, Deutsche Bank may act as principal for its own account or as agent for another person.

Deutsche Bank may consider this report in deciding to trade as principal. It may also engage in transactions, for its own account or with customers, in a manner inconsistent with the views taken in this research report. Others within Deutsche Bank, including strategists, sales staff and other analysts, may take views that are inconsistent with those taken in this research report. Deutsche Bank issues a variety of research products, including fundamental analysis, equity-linked analysis, quantitative analysis and trade ideas. Recommendations contained in one type of communication may differ from recommendations contained in others, whether as a result of differing time horizons, methodologies or otherwise. Deutsche Bank and/or its affiliates may also be holding debt or equity securities of the issuers it writes on. Analysts are paid in part based on the profitability of Deutsche Bank AG and its affiliates, which includes investment banking, trading and principal trading revenues.

Opinions, estimates and projections constitute the current judgment of the author as of the date of this report. They do not necessarily reflect the opinions of Deutsche Bank and are subject to change without notice. Deutsche Bank provides liquidity for buyers and sellers of securities issued by the companies it covers. Deutsche Bank research analysts sometimes have shorter-term trade ideas that are consistent or inconsistent with Deutsche Bank's existing longer term ratings. Trade ideas for equities can be found at the SOLAR link at <http://gm.db.com>. A SOLAR idea represents a high conviction belief by an analyst that a stock will outperform or underperform the market and/or sector delineated over a time frame of no less than two weeks. In addition to SOLAR ideas, the analysts named in this report may from time to time discuss with our clients, Deutsche Bank salespersons and Deutsche Bank traders, trading strategies or ideas that reference catalysts or events that may have a near-term or medium-term impact on the market price of the securities discussed in this report, which impact may be directionally counter to the analysts' current 12-month view of total return or investment return as described herein. Deutsche Bank has no obligation to update, modify or amend this report or to otherwise notify a recipient thereof if any opinion, forecast or estimate contained herein changes or subsequently becomes inaccurate. Coverage and the frequency of changes in market conditions and in both general and company specific economic prospects make it difficult to update research at defined intervals. Updates are at the sole discretion of the coverage analyst concerned or of the Research Department Management and as such the majority of reports are published at irregular intervals. This report is provided for informational purposes only and does not take into account the particular investment objectives, financial situations, or needs of individual clients. It is not an offer or a solicitation of an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Target prices are inherently imprecise and a product of the analyst's judgment. The financial instruments discussed in this report may not be suitable for all investors and investors must make their own informed investment decisions. Prices and availability of financial instruments are subject to change without notice and investment transactions can lead to losses as a result of price fluctuations and other factors. If a financial instrument is denominated in a currency other than an investor's currency, a change in exchange rates may adversely affect the investment. Past performance is not necessarily indicative of future results. Unless otherwise indicated, prices are current as of the end of the previous trading session, and are sourced from local exchanges via Reuters, Bloomberg and other vendors. Data is sourced from Deutsche Bank, subject companies, and in some cases, other parties.

The Deutsche Bank Research Department is independent of other business areas divisions of the Bank. Details regarding our organizational arrangements and information barriers we have to prevent and avoid conflicts of interest with respect to our research is available on our website under Disclaimer found on the Legal tab.

Macroeconomic fluctuations often account for most of the risks associated with exposures to instruments that promise to pay fixed or variable interest rates. For an investor who is long fixed rate instruments (thus receiving these cash



flows), increases in interest rates naturally lift the discount factors applied to the expected cash flows and thus cause a loss. The longer the maturity of a certain cash flow and the higher the move in the discount factor, the higher will be the loss. Upside surprises in inflation, fiscal funding needs, and FX depreciation rates are among the most common adverse macroeconomic shocks to receivers. But counterparty exposure, issuer creditworthiness, client segmentation, regulation (including changes in assets holding limits for different types of investors), changes in tax policies, currency convertibility (which may constrain currency conversion, repatriation of profits and/or the liquidation of positions), and settlement issues related to local clearing houses are also important risk factors to be considered. The sensitivity of fixed income instruments to macroeconomic shocks may be mitigated by indexing the contracted cash flows to inflation, to FX depreciation, or to specified interest rates – these are common in emerging markets. It is important to note that the index fixings may -- by construction -- lag or mis-measure the actual move in the underlying variables they are intended to track. The choice of the proper fixing (or metric) is particularly important in swaps markets, where floating coupon rates (i.e., coupons indexed to a typically short-dated interest rate reference index) are exchanged for fixed coupons. It is also important to acknowledge that funding in a currency that differs from the currency in which coupons are denominated carries FX risk. Naturally, options on swaps (swaptions) also bear the risks typical to options in addition to the risks related to rates movements.

Derivative transactions involve numerous risks including, among others, market, counterparty default and illiquidity risk. The appropriateness or otherwise of these products for use by investors is dependent on the investors' own circumstances including their tax position, their regulatory environment and the nature of their other assets and liabilities, and as such, investors should take expert legal and financial advice before entering into any transaction similar to or inspired by the contents of this publication. The risk of loss in futures trading and options, foreign or domestic, can be substantial. As a result of the high degree of leverage obtainable in futures and options trading, losses may be incurred that are greater than the amount of funds initially deposited. Trading in options involves risk and is not suitable for all investors. Prior to buying or selling an option investors must review the "Characteristics and Risks of Standardized Options", at <http://www.optionsclearing.com/about/publications/character-risks.jsp>. If you are unable to access the website please contact your Deutsche Bank representative for a copy of this important document.

Participants in foreign exchange transactions may incur risks arising from several factors, including the following: ( i) exchange rates can be volatile and are subject to large fluctuations; ( ii) the value of currencies may be affected by numerous market factors, including world and national economic, political and regulatory events, events in equity and debt markets and changes in interest rates; and (iii) currencies may be subject to devaluation or government imposed exchange controls which could affect the value of the currency. Investors in securities such as ADRs, whose values are affected by the currency of an underlying security, effectively assume currency risk.

Unless governing law provides otherwise, all transactions should be executed through the Deutsche Bank entity in the investor's home jurisdiction. Aside from within this report, important conflict disclosures can also be found at <https://gm.db.com/equities> under the "Disclosures Lookup" and "Legal" tabs. Investors are strongly encouraged to review this information before investing.

**United States:** Approved and/or distributed by Deutsche Bank Securities Incorporated, a member of FINRA, NFA and SIPC. Analysts located outside of the United States are employed by non-US affiliates that are not subject to FINRA regulations.

**Germany:** Approved and/or distributed by Deutsche Bank AG, a joint stock corporation with limited liability incorporated in the Federal Republic of Germany with its principal office in Frankfurt am Main. Deutsche Bank AG is authorized under German Banking Law and is subject to supervision by the European Central Bank and by BaFin, Germany's Federal Financial Supervisory Authority.

**United Kingdom:** Approved and/or distributed by Deutsche Bank AG acting through its London Branch at Winchester House, 1 Great Winchester Street, London EC2N 2DB. Deutsche Bank AG in the United Kingdom is authorised by the Prudential Regulation Authority and is subject to limited regulation by the Prudential Regulation Authority and Financial Conduct Authority. Details about the extent of our authorisation and regulation are available on request.

**Hong Kong:** Distributed by Deutsche Bank AG, Hong Kong Branch.

**India:** Prepared by Deutsche Equities India Pvt Ltd, which is registered by the Securities and Exchange Board of India





(SEBI) as a stock broker. Research Analyst SEBI Registration Number is INH000001741. DEIPL may have received administrative warnings from the SEBI for breaches of Indian regulations.

**Japan:** Approved and/or distributed by Deutsche Securities Inc.(DSI). Registration number - Registered as a financial instruments dealer by the Head of the Kanto Local Finance Bureau (Kinsho) No. 117. Member of associations: JSDA, Type II Financial Instruments Firms Association and The Financial Futures Association of Japan. Commissions and risks involved in stock transactions - for stock transactions, we charge stock commissions and consumption tax by multiplying the transaction amount by the commission rate agreed with each customer. Stock transactions can lead to losses as a result of share price fluctuations and other factors. Transactions in foreign stocks can lead to additional losses stemming from foreign exchange fluctuations. We may also charge commissions and fees for certain categories of investment advice, products and services. Recommended investment strategies, products and services carry the risk of losses to principal and other losses as a result of changes in market and/or economic trends, and/or fluctuations in market value. Before deciding on the purchase of financial products and/or services, customers should carefully read the relevant disclosures, prospectuses and other documentation. "Moody's", "Standard & Poor's", and "Fitch" mentioned in this report are not registered credit rating agencies in Japan unless Japan or "Nippon" is specifically designated in the name of the entity. Reports on Japanese listed companies not written by analysts of DSI are written by Deutsche Bank Group's analysts with the coverage companies specified by DSI. Some of the foreign securities stated on this report are not disclosed according to the Financial Instruments and Exchange Law of Japan. Target prices set by Deutsche Bank's equity analysts are based on a 12-month forecast period.

**Korea:** Distributed by Deutsche Securities Korea Co.

**South Africa:** Deutsche Bank AG Johannesburg is incorporated in the Federal Republic of Germany (Branch Register Number in South Africa: 1998/003298/10).

**Singapore:** by Deutsche Bank AG, Singapore Branch or Deutsche Securities Asia Limited, Singapore Branch (One Raffles Quay #18-00 South Tower Singapore 048583, +65 6423 8001), which may be contacted in respect of any matters arising from, or in connection with, this report. Where this report is issued or promulgated in Singapore to a person who is not an accredited investor, expert investor or institutional investor (as defined in the applicable Singapore laws and regulations), they accept legal responsibility to such person for its contents.

**Taiwan:** Information on securities/investments that trade in Taiwan is for your reference only. Readers should independently evaluate investment risks and are solely responsible for their investment decisions. Deutsche Bank research may not be distributed to the Taiwan public media or quoted or used by the Taiwan public media without written consent. Information on securities/instruments that do not trade in Taiwan is for informational purposes only and is not to be construed as a recommendation to trade in such securities/instruments. Deutsche Securities Asia Limited, Taipei Branch may not execute transactions for clients in these securities/instruments.

**Qatar:** Deutsche Bank AG in the Qatar Financial Centre (registered no. 00032) is regulated by the Qatar Financial Centre Regulatory Authority. Deutsche Bank AG - QFC Branch may only undertake the financial services activities that fall within the scope of its existing QFCRA license. Principal place of business in the QFC: Qatar Financial Centre, Tower, West Bay, Level 5, PO Box 14928, Doha, Qatar. This information has been distributed by Deutsche Bank AG. Related financial products or services are only available to Business Customers, as defined by the Qatar Financial Centre Regulatory Authority.

**Russia:** This information, interpretation and opinions submitted herein are not in the context of, and do not constitute, any appraisal or evaluation activity requiring a license in the Russian Federation.

**Kingdom of Saudi Arabia:** Deutsche Securities Saudi Arabia LLC Company, (registered no. 07073-37) is regulated by the Capital Market Authority. Deutsche Securities Saudi Arabia may only undertake the financial services activities that fall within the scope of its existing CMA license. Principal place of business in Saudi Arabia: King Fahad Road, Al Olaya District, P.O. Box 301809, Faisaliah Tower - 17th Floor, 11372 Riyadh, Saudi Arabia.

**United Arab Emirates:** Deutsche Bank AG in the Dubai International Financial Centre (registered no. 00045) is regulated by the Dubai Financial Services Authority. Deutsche Bank AG - DIFC Branch may only undertake the financial services





activities that fall within the scope of its existing DFSA license. Principal place of business in the DIFC: Dubai International Financial Centre, The Gate Village, Building 5, PO Box 504902, Dubai, U.A.E. This information has been distributed by Deutsche Bank AG. Related financial products or services are only available to Professional Clients, as defined by the Dubai Financial Services Authority.

**Australia:** Retail clients should obtain a copy of a Product Disclosure Statement (PDS) relating to any financial product referred to in this report and consider the PDS before making any decision about whether to acquire the product. Please refer to Australian specific research disclosures and related information at <https://australia.db.com/australia/content/research-information.html>

**Australia and New Zealand:** This research is intended only for "wholesale clients" within the meaning of the Australian Corporations Act and New Zealand Financial Advisors Act respectively.

Additional information relative to securities, other financial products or issuers discussed in this report is available upon request. This report may not be reproduced, distributed or published without Deutsche Bank's prior written consent.

Copyright © 2017 Deutsche Bank AG



---

## David Folkerts-Landau

Group Chief Economist and Global Head of Research

Raj Hindocha  
Global Chief Operating Officer  
Research

Michael Spencer  
Head of APAC Research  
Global Head of Economics

Steve Pollard  
Head of Americas Research  
Global Head of Equity Research

Anthony Klarman  
Global Head of  
Debt Research

Paul Reynolds  
Head of EMEA  
Equity Research

Dave Clark  
Head of APAC  
Equity Research

Pam Finelli  
Global Head of  
Equity Derivatives Research

Andreas Neubauer  
Head of Research - Germany

Stuart Kirk  
Head of Thematic Research

---

## International Locations

### Deutsche Bank AG

Deutsche Bank Place  
Level 16  
Corner of Hunter & Phillip Streets  
Sydney, NSW 2000  
Australia  
Tel: (61) 2 8258 1234

### Deutsche Bank AG

Große Gallusstraße 10-14  
60272 Frankfurt am Main  
Germany  
Tel: (49) 69 910 00

### Deutsche Bank AG

Filiale Hongkong  
International Commerce Centre,  
1 Austin Road West, Kowloon,  
Hong Kong  
Tel: (852) 2203 8888

### Deutsche Securities Inc.

2-11-1 Nagatacho  
Sanno Park Tower  
Chiyoda-ku, Tokyo 100-6171  
Japan  
Tel: (81) 3 5156 6770

### Deutsche Bank AG London

1 Great Winchester Street  
London EC2N 2EQ  
United Kingdom  
Tel: (44) 20 7545 8000

### Deutsche Bank Securities Inc.

60 Wall Street  
New York, NY 10005  
United States of America  
Tel: (1) 212 250 2500

---