



## UBS Investment Research

# Trading on Corporate Insider Transactions *... using social network analysis*

**David Jessop**

Analyst

Tel: +44 20 7567 9882  
david.jessop@ubs.com

**Claire Jones**

Analyst

Tel: +44 20 7568 1873  
claire-c.jones@ubs.com

**Shanle Wu**

Analyst

Tel: +852 2971 7513  
shanle.wu@ubs.com

**Josie Gerken**

Analyst

Tel: +44 20 7568 3560  
josephine.gerken@ubs.com

**Paul Winter**

Analyst

Tel: +61 2 93 242 080  
paul-j.winter@ubs.com

**Desi Ivanova**

Analyst

Tel: +44 20 7568  
desi-r.ivanova @ubs.com

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## Section 1

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# Corporate Insider Network

# Analysing Corporates who Trade Stocks

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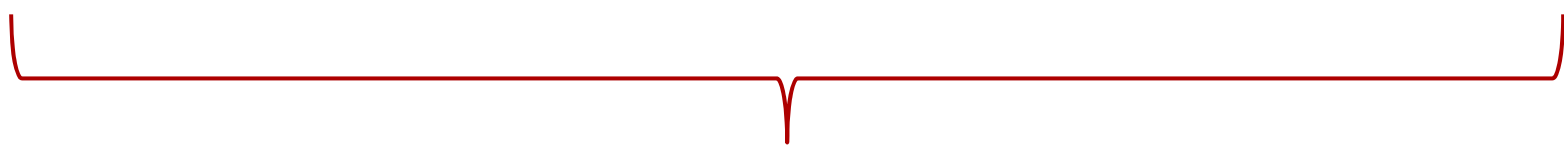
- Transactions by corporate insiders are disclosed to the **Securities and Exchange Commision (SEC)**.
- Can we generate alpha by exploiting this information?
- We introduce a way of building a trading strategy based on corporate insider networks using **Social Network Theory**.

## Traditional Approach

- Define who is a corporate insider
- Buy those stocks bought by corporate insiders; sell the stocks sold by corporate insiders
- Furthermore, account for the percentage of shares outstanding traded

## Network Approach

- Utilise social network theory
- Quantify how "critical" a corporate insider is
- Form a strategy by following those critical corporate insiders as defined by the network analysis

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- Utilising network theory can improve the performance of a strategy based on corporate insider transactions in the US. (Similar results are found for Hong Kong, Singapore and Australia)

## Section 2

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# Data

# Corporate Trades Data

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- Transactions disclosed by corporate insiders to the **SEC** are sourced from **Factset** (US only for this analysis).
- We focus only on open market sales and purchases by individual corporate insiders.
- Based on the SEC's current rules, changes in ownership by corporate insiders must be filed within two business days.
- The data is then uploaded to Factset's database within one to two business days.

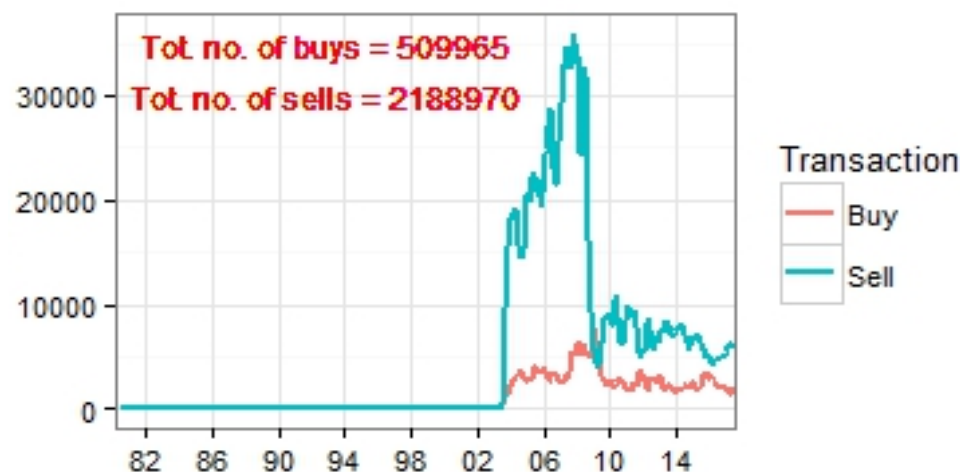
## **How Do we Define A Corporate Insider?**

- In our analysis, a corporate insider includes officers, directors and beneficial owners.
- We do not include transactions by institutional holders or corporates here.

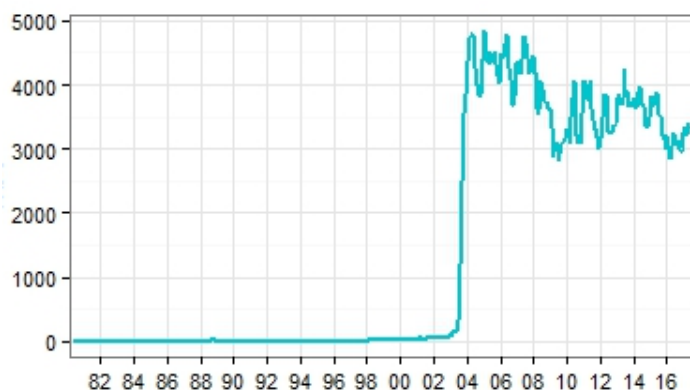
# FactSet Insider transactions Data – How good is the coverage?

- Data coverage goes back to March 1980
- Reliable data starts in 2004
- In general, there are more sells than buys.
- Sell transactions peaked just before 2007; buys peaked in early 2008.

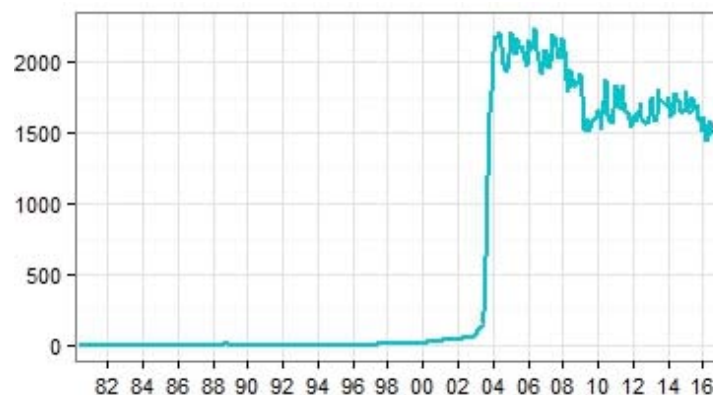
## Number of transactions per month (3mma)



## Number of corporate insiders traded per month(3mma)



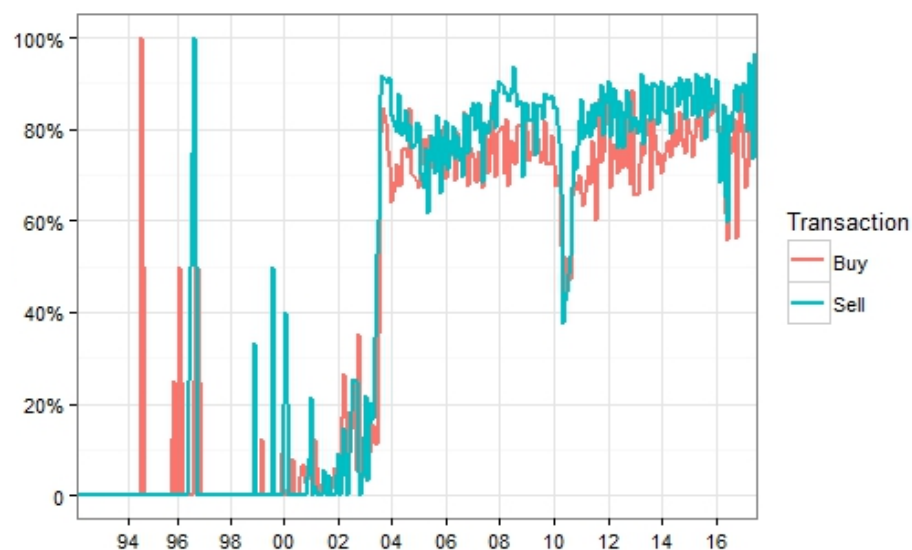
## Number of stocks traded by corporate insiders per month (3mma)



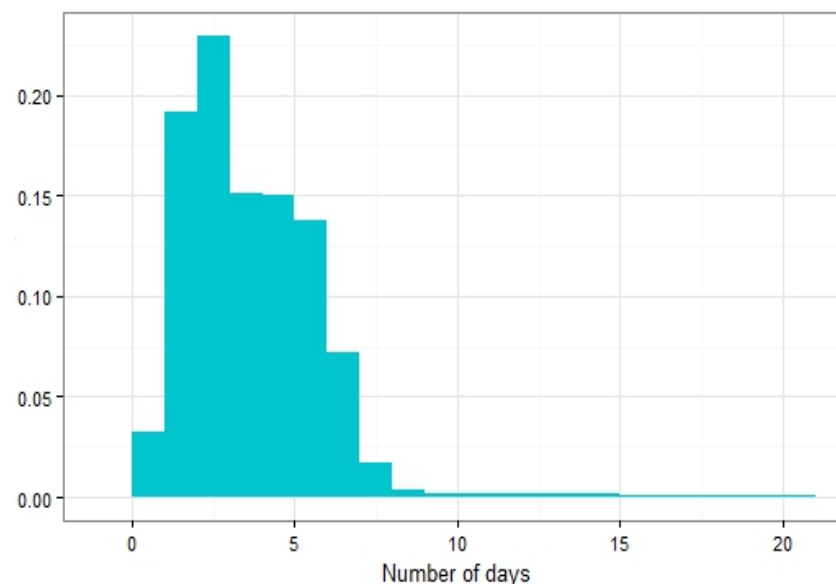
# FactSet Insider transactions Data – How timely is the data?

- Since 2004, except for a short period in 2010, on average, more than 80% of sell transactions are available in the database in the same month the transactions took place. For buys, this is around 70-80%.

## Percentage of trades data that are available in the same month



## Distribution of the time lag



Note: Data as of end-May 2017

Source (for both figures): FactSet, UBS Quantitative Research



# What type of stocks do corporate insiders tend to buy and sell?

## Corporate insiders tend to...

- **Buy** cheap stocks, small caps and stocks that performed poorly in the past 12 months
- **Sell** large caps, expensive stocks with good historical earnings and stocks that have performed well in the past.

## Aggregated transactions by styles

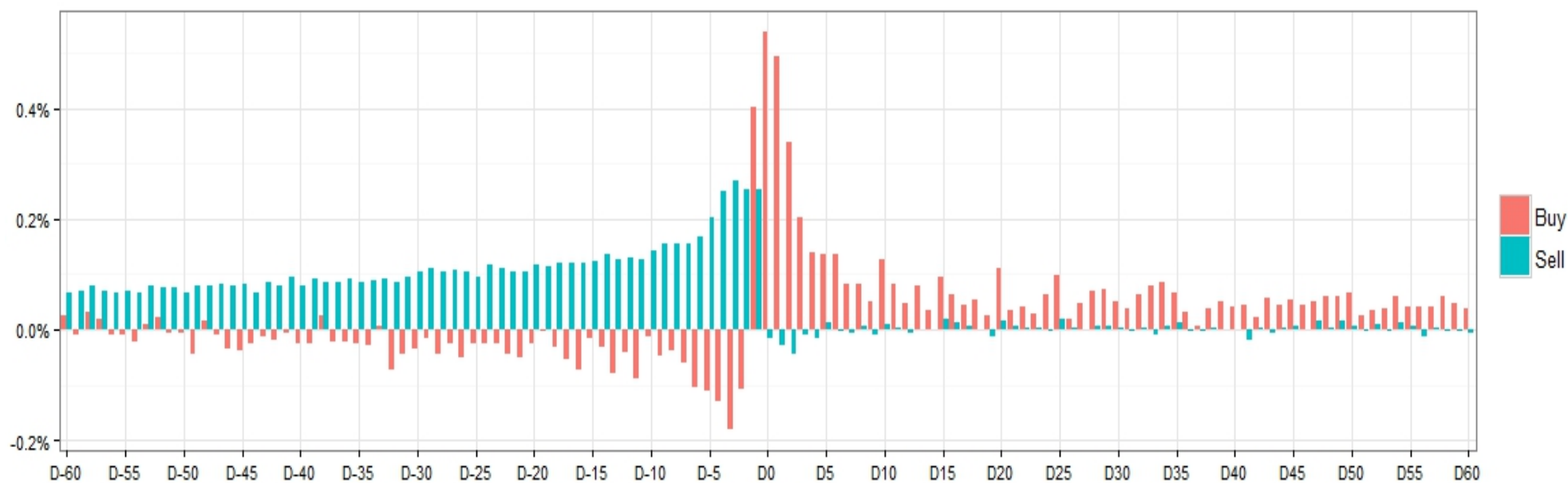


Note: Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

# Is there alpha in this data?

- At the aggregate level, buy transactions contain more information than sell transactions
- The alpha following buy transactions decays within 5 days

## Daily relative returns—60 days around corporate insider transactions



Note: Data as of end-May 2017

Source: FactSet, UBS Quantitative Research

## Section 3

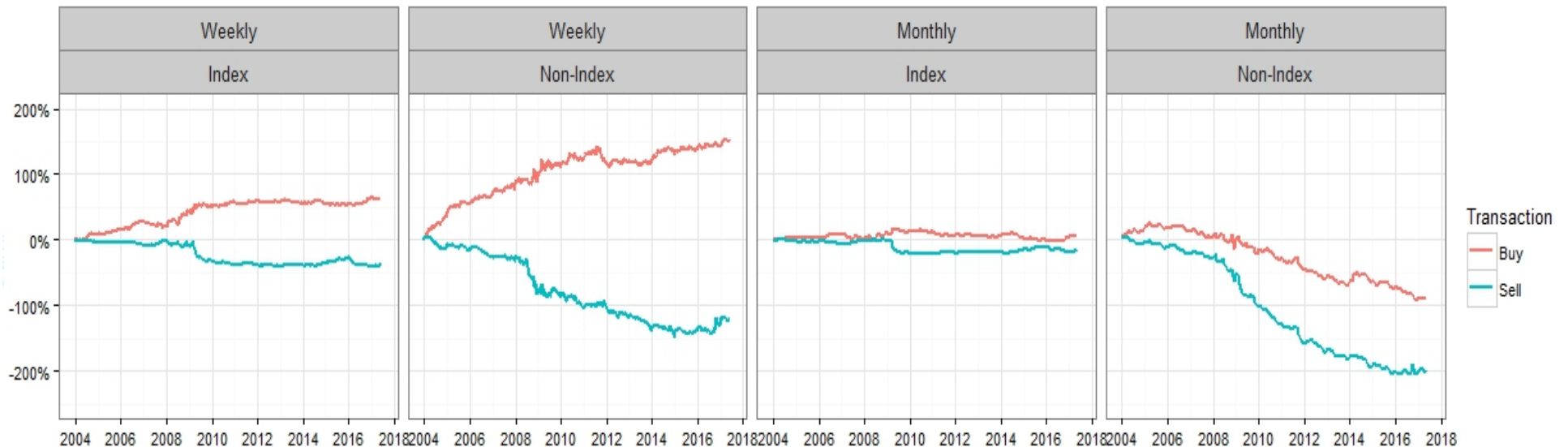
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# Traditional methods

# Strategy 1 – follow the corporate insider's trades

- **Strategy:** Buy the stocks which have been bought by corporate insiders and sell the ones which have been sold
- Our universe consists of stocks in **Russell 3000** index. We also consider how the strategy would perform given a universe of stocks not eligible for the index.
- Based on this universe, our first strategy does not generate much alpha since 2010.

## Cumulative relative performance of corporate insider buy and sell baskets by different universes

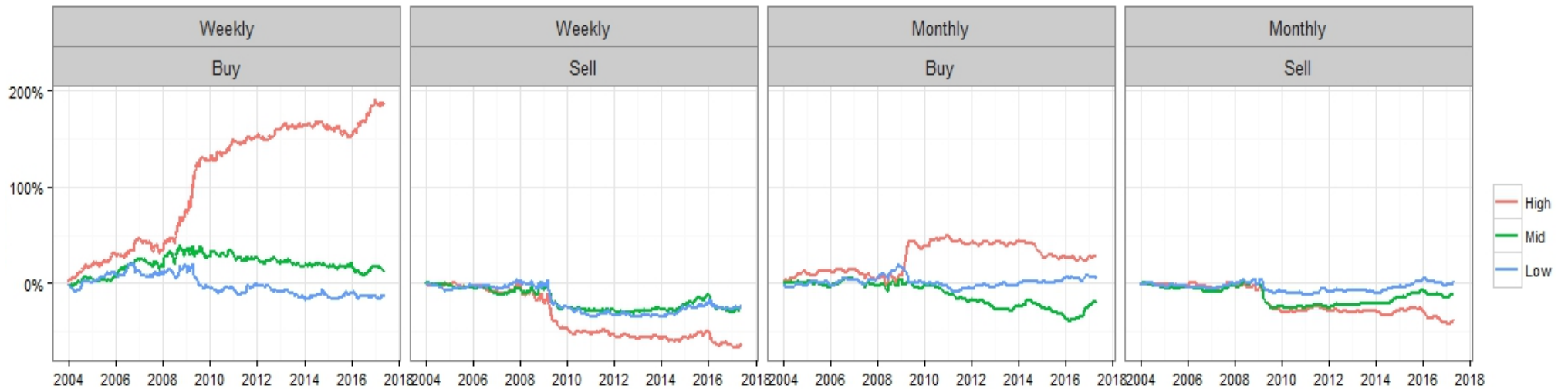


Note: We use the equally-weighted Russell 3000 index as the benchmark. Non-index refers to stocks not included in the index. Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

# Strategy 2 – take into account the amount traded

- **Strategy:** Further condition on the % of shares outstanding that has been traded
- The measure is not so effective except in 2008 and 2009.

## Cumulative relative performance of corporate insider buy and sell basket by different universes

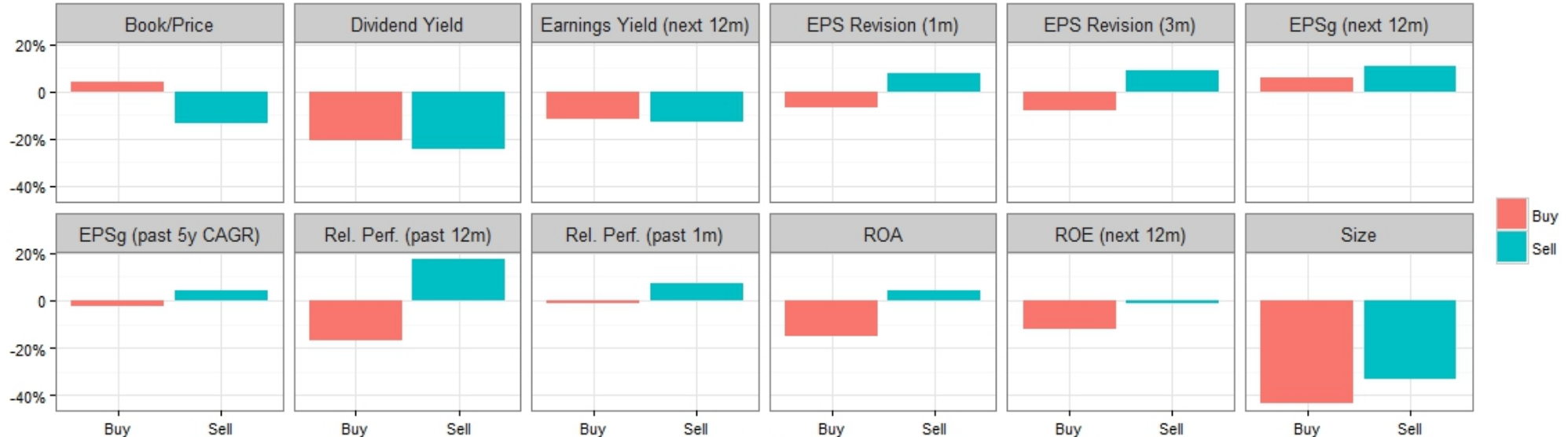


Note: The back-test is run for Russell 3000 index universe. Equally-weighted Russell 3000 index return is used as the benchmark. Data as of end-May 2017.  
Source: FactSet, UBS Quantitative Research

# Strategy 2 – correlation with other factors

- The absolute level of percentage of shares outstanding traded has high correlation with size and price momentum

## Average rank correlations between absolute % shares outstanding traded and other factors

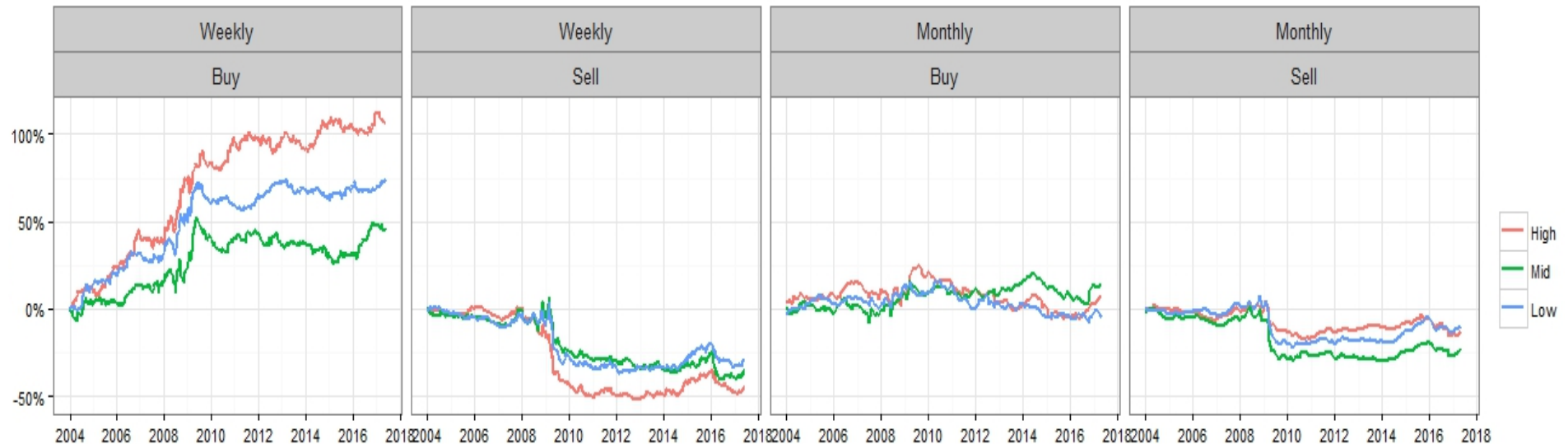


Note: We calculate the rank correlation using monthly factor values and the % of shares outstanding traded aggregated on a monthly basis. Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

# Strategy 2 – Adjust the loading on common risk premiums

- We removed factor loadings on common risk premiums from % shares outstanding traded
- Again, there is not much alpha being generated post-2010

## Cumulative relative performance—on adjusted percentage shared outstanding traded by corporate insiders



Note: The back-test is run for Russell 3000 index universe. We use the equally-weighted Russell 3000 index as the benchmark. Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

## Section 4

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# Network approach



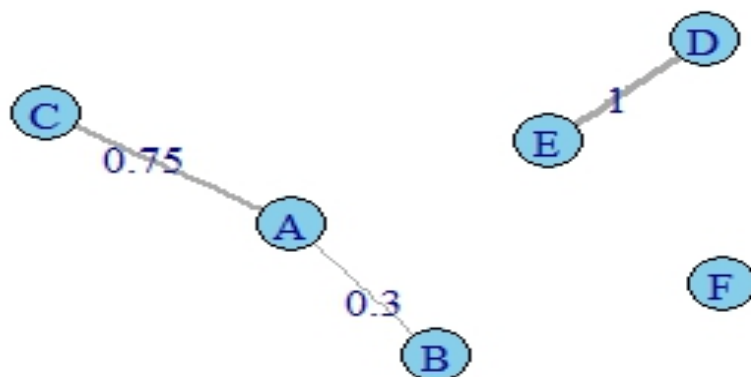
# Building corporate insiders network

- **Connection** between 2 corporate insiders are quantified according to the **similarity** of their trades. We measure this as follows:

$$Similarity(I_i, I_j) = \sum_{c \in Companies} \frac{N_{ijc}^2}{N_{ic} * N_{jc}}$$

- If the similarity level between two corporate insiders is greater than 0, a connection exists.
- Edge weights are given by the level of similarity
- We use 3-year rolling periods to build the connection

## Corporate insider network (for illustration purpose only)

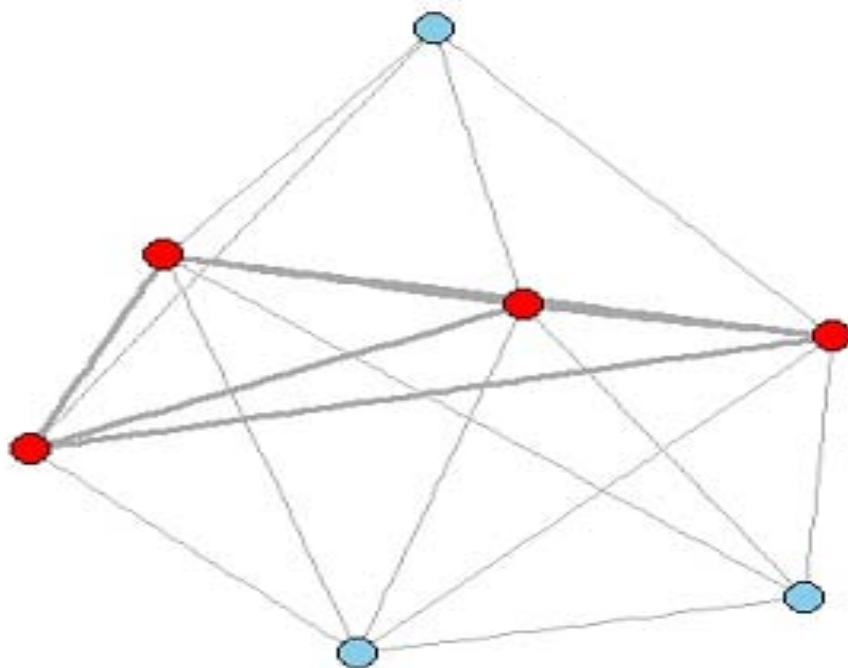


# Measures of centrality – Weighted degree

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- The degree for a node is simply the number of edges it connects to
- **Weighted degree** takes edge weights into account
- It measures how well-connected each corporate insider is

## A sub-network based on the real data



Note: Red marks nodes in the top five positions with highest weighted degree  
Source: FactSet, UBS Quantitative Research

# Measures of centrality – Closeness (1)

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Once a network is built, the next step is to identify those people who are in **critical** positions within the network.

- **Closeness** measures how close a node is to all the other nodes in the network:

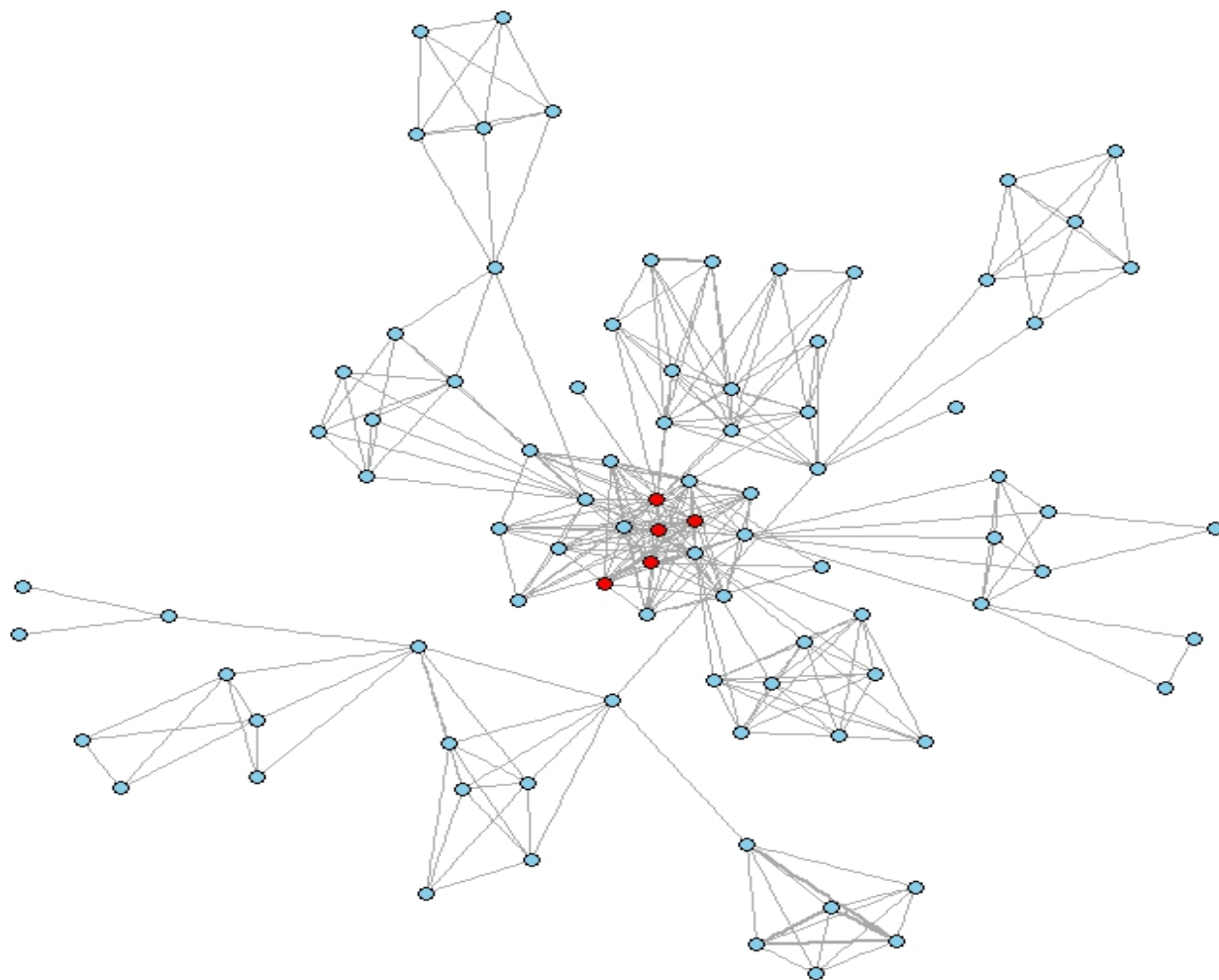
$$\text{Closeness} = \frac{1}{\text{sum}(\text{length of shortest path to all other nodes})}$$

- When calculating the shortest path, the reciprocal of the edge weight (1/similarity) is used as the length between two nodes.
- Nodes that sit in the central positions of the network typically have the highest closeness scores.

# Measures of centrality – Closeness (2)

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## A sub-network based on the real data



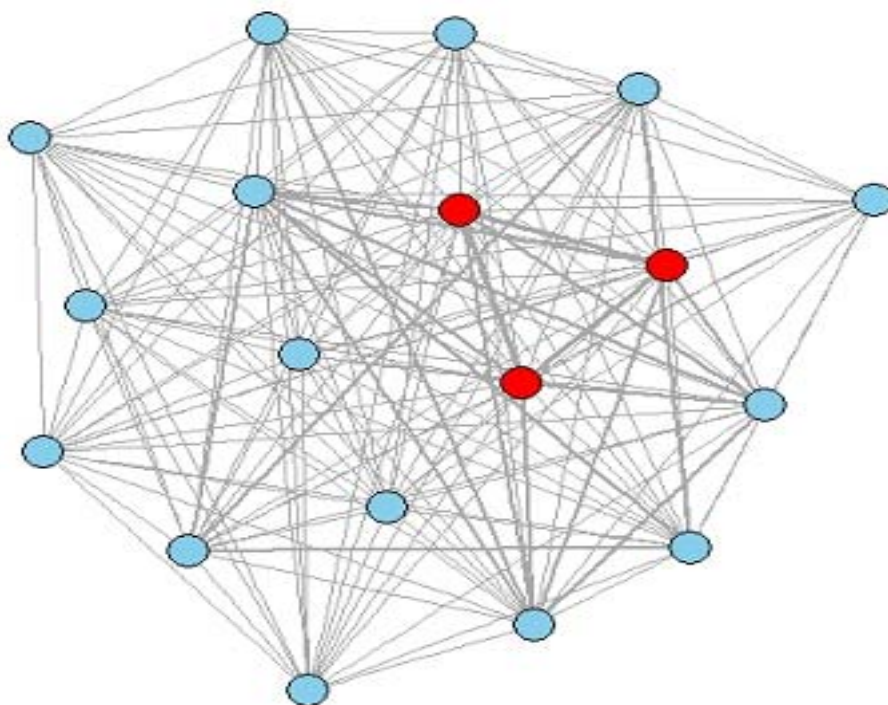
Note: Red marks nodes in the top five positions with highest weighted degree  
Source: FactSet, UBS Quantitative Research

# Measures of centrality – Composite measure

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- We form a **composite measure** by combining weighted degree and closeness.
- We first rank stocks according to these two measures.
- Our **trading signal** is then computed as the average of these ranks.

## A sub-network based on the real data

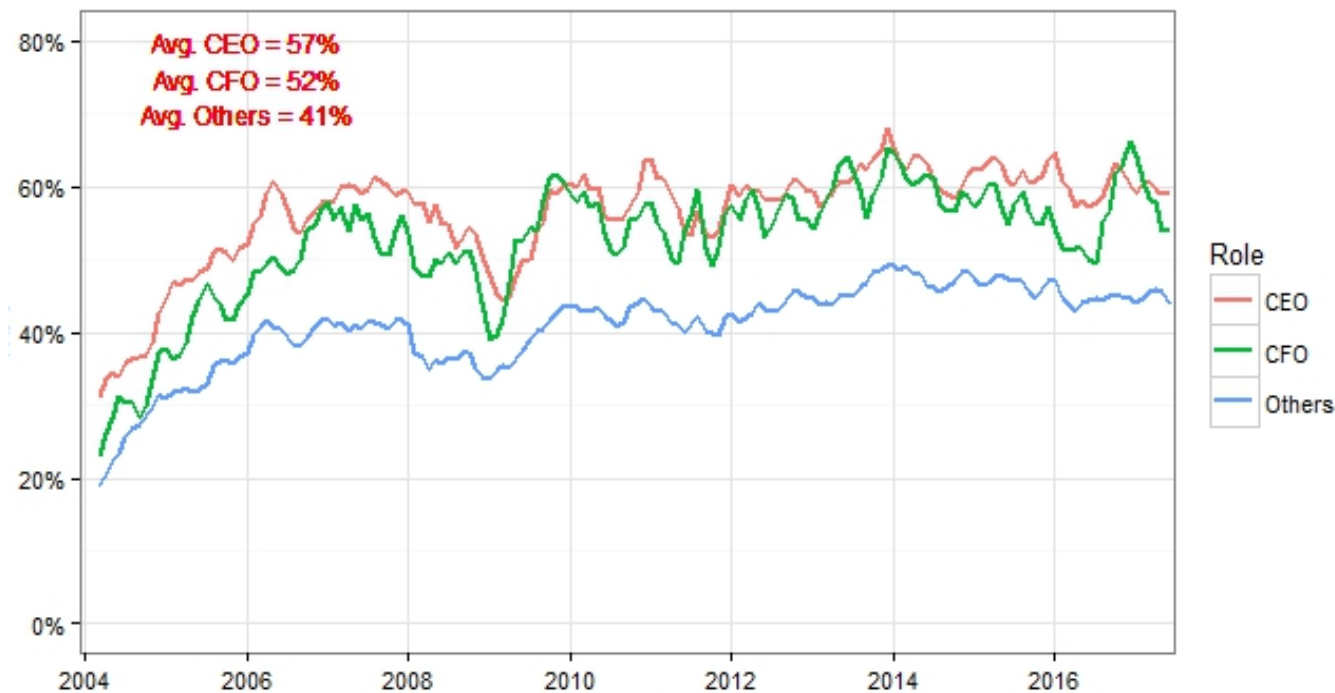


Note: Red marks nodes in the top five positions with highest weighted degree  
Source: FactSet, UBS Quantitative Research

# Do these measures pick out corporate insiders with particular roles?

- A higher proportion of insiders with network connections are CEOs and CFOs

## Percentage of the population with at least on network connection

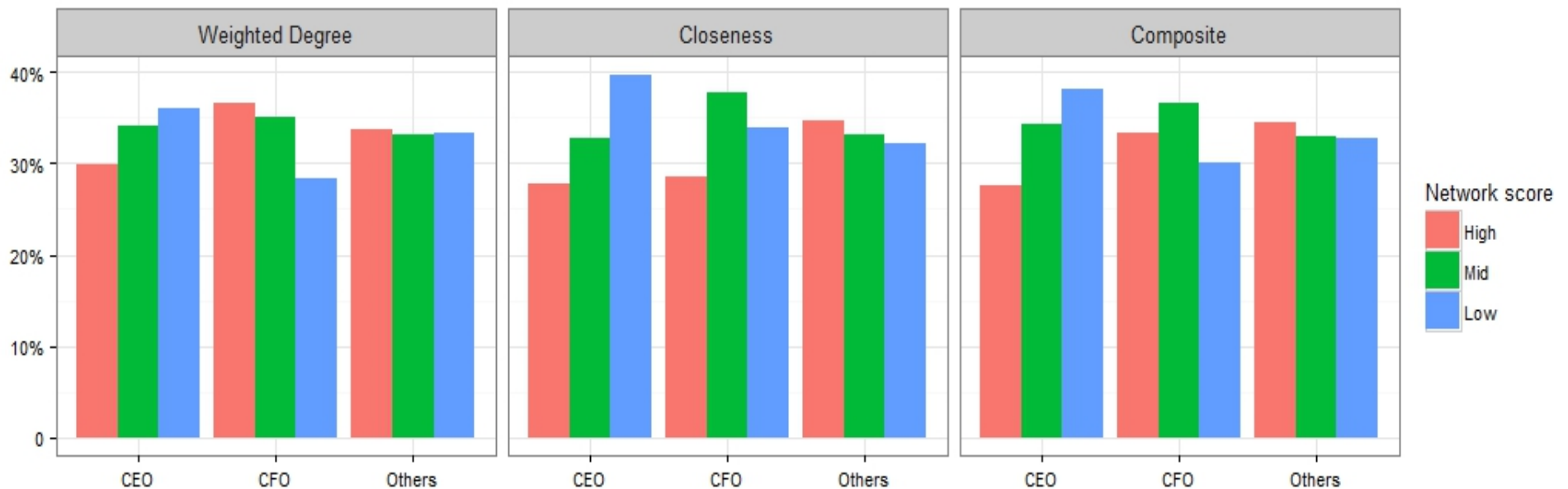


Note: Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

# Do these measures pick out corporate insiders with particular roles - continued

- CEOs are not necessarily in the most 'critical' positions of the network
- Network scores contain more information; whilst CEOs represent the highest percentage of network connections, they do not necessarily represent the most well-connected insiders.

## The distribution of network score for different roles



Note: Data as of end-May 2017

Source: FactSet, UBS Quantitative Research

# Strategy 3 – Follow the key corporate insiders trades only

- We build portfolios based on the composite network score.
- This approach largely improves the performance following 2010.

## Cumulative relative performance—composite network measures



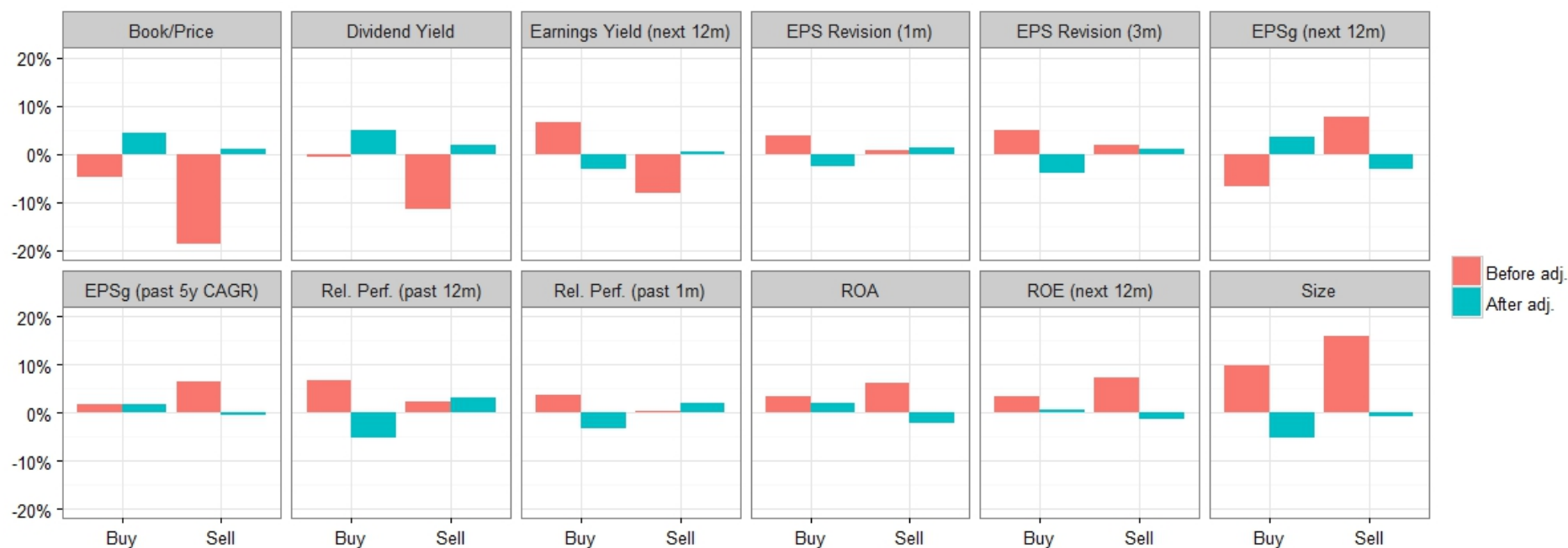
Note: The back-test is run for Russell 3000 index universe. Equally-weighted Russell 3000 Index is used as the benchmark. Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research



# Is the network score a new factor?

- Rank correlations between the composite network measure and other factors are generally low

## Rank correlation between composite network measure and other factors

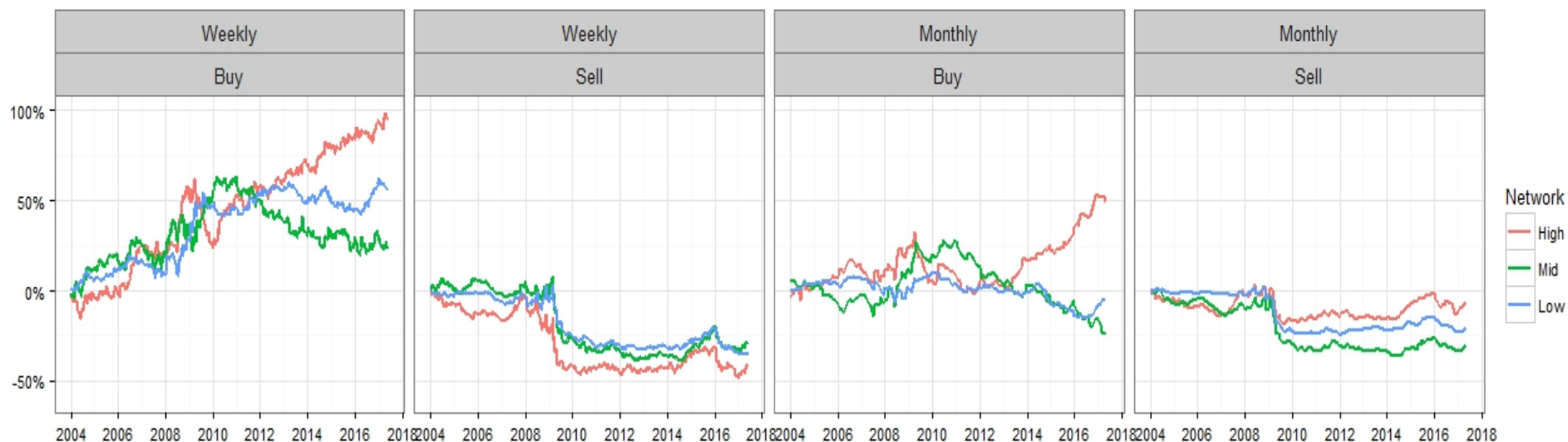


Note: Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

# Performance after removing the common risk premiums

- Performance of the strategy based on buy transactions actually improved after removing factor loadings
- As mentioned before, there is no alpha in sell transactions

## Cumulative relative performance—composite network measures

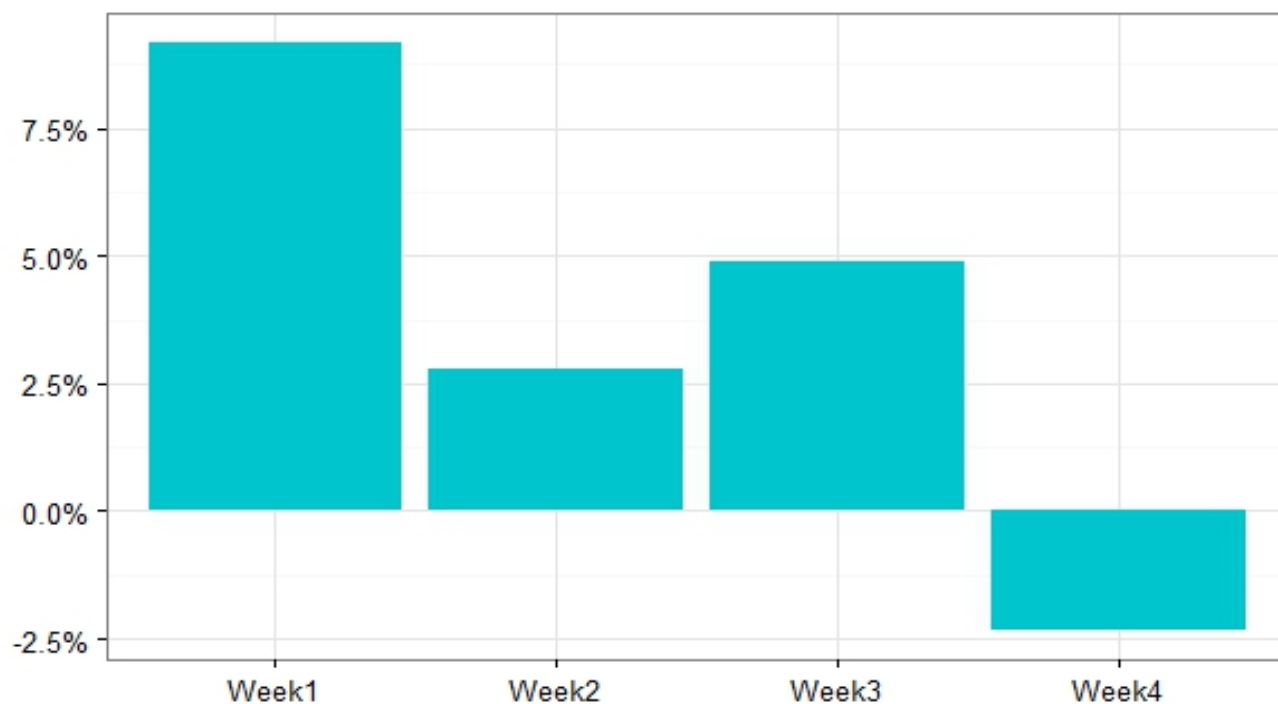


Note: The back-test is run for Russell 3000 index universe. Equally-weighted Russell 3000 Index is used as the benchmark. Data as of end-May 2017  
Source: FactSet, UBS Quantitative Research

# How long does the alpha last?

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- On average, outperformance lasted for approximately three weeks.



Note: The back-test is run on a universe of stocks in Russell 3000 index. We use the equally-weighted Russell 3000 as the benchmark. Our back-test period covers January 2010 to May 2017. Relative returns shown in the chart are annualised.

Source: FactSet, UBS Quantitative Research

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<b>Neutral</b>	FSR is between -6% and 6% of the MRA.	38%	27%
<b>Sell</b>	FSR is > 6% below the MRA.	17%	11%
Short-Term Rating	Definition	Coverage <sup>3</sup>	IB Services <sup>4</sup>
<b>Buy</b>	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
<b>Sell</b>	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 June 2017.

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# Contact information

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**UBS Limited**

5 Broadgate  
London  
EC2M 2QS

Tel: +44-207-567 8000

[www.ubs.com](http://www.ubs.com)

