IFTA Seminar – November 20th, 2014

Alex Neale, MSTA, CMT, MFTA

Based on the 2014 Brooks Award Winning MFTA Paper:

The Use of Social Media Mentions in Technical Analysis

CONTENTS

INTRODUCTION

My background

- Technical Analysis and Market Commentary since 2000
  - GNI, MF Global, Cantor Fitzgerald, Solo Capital
- Primarily Focused on Equities and Equity Indices
- STA – 2000
- CMT – 2013
- MFTA – 2013
- Business Studies and Financial Management 1996, B.Sc (1st)
- Bloomberg username: ANEALE9
- LinkedIn profile: Alex Neale, Solo Capital

TECHNICAL ANALYSIS

What is Technical Analysis

Definition

“the study of past market data, primarily price and volume data, to make trading or investment decisions.”

Kirkpatrick, Dahlquist, Technical Analysis: The Complete Resource for Financial Market Technicians

Modern Portfolio Theory, MPT

- Some market participants disagree with this basic logic
- However Modern Portfolio Theory, MPT and Capital Asset Pricing Model CAPM is based on exactly the same principle

  - Capital Asset Pricing Model (CAPM)

$$\mathrm{E}(R_i) = R_f + \beta_i(\mathrm{E}(R_m) - R_f)$$

  - No fundamental analysis is used in CAPM, only past price data is used
  - CAPM is an example of **"the study of past market data to make trading or investment decisions"**

Capital Asset Pricing Model

- CAPM is widely taught in Financial Management
- CAPM is broadly accepted amongst financial professionals
- CAPM practitioners are Technical Analysts
- The only debate left is how to manage historical prices for making investment decisions
- The decision whether to use historical prices or not was taken decades ago

Sentiment

- In addition to the mathematical approach TA also investigates the psychological
- The emotions of the market participants
- It is in this space that many finance based investors lose all interest in TA

- As emotions ‘should not’ affect investing decisions
- A central criticism of CAPM is that it assumes that investors always make rational investing decisions, in practice we see they do not
- Behavioural Economists are detailing numerous cognitive biases that demonstrate, and help to explain, why investors do make seemingly illogical decisions

Behavioural Finance

- Behavioural Finance has increase greatly over the past 20 years
- Experiments show how rational investors can make irrational trading decisions
- This can occur due to numerous cognitive biases through heuristics
- Heuristics are simple rules that allow us to quickly resolve complex problems
- These rules work well under most circumstances, but they do not provide optimal results
- Gamblers fallacy, Anchoring etc
- A comparable affect is also witnessed in simple visual illusions

Illusions

- Illusions can be thought of as being visual heuristics
- As we do not see the world as it is, only in ways it is useful to see
- If you were walking down this street, which would seem the biggest car?

Illusions

- Most people see the perspective of the street and visually “calculate” incorrectly that the top car is bigger
- (On the page the cars are the same size)
- We do not see in isolation, but in relation to all other information
- What is really interesting is that even after being told of the effect many still have difficulty in seeing the cars “correctly”

Anchoring Bias

- A comparable effect in decision making is the Anchoring bias
- Individuals do not act rationally on just the information provided
- Instead they act in relation to previous, even knowingly unrelated, data

- A fascinating experiment by Tversky and Kahneman showed that even the spin of a Roulette wheel witnessed by participants can impact answers to the question, “What percentage of African Nations are in the UN”
- A higher number from the spin resulted in responders giving a higher average response, and lower spin number gave a lower average response
- Clearly the result of a Roulette wheel has no logical bearing to the answer of the question, but as with the visual illusions, even intelligent people cannot avoid being influenced by these effects
- It is in this space that Technicians believe that Sentiment has an affect

- http://people.hss.caltech.edu/~camerer/Ec101/JudgementUncertainty.pdf Tversky and Kahneman

Irrational Exuberance

- 20 Years ago this psychological aspect to investing was seen as rather fringe thinking
- Robert J. Schiller was awarded the Nobel prize for Economics in 2013, primarily for his work that resulted in his book “Irrational Exuberance”
- Which stated that when certain factors combine individual investor seemingly irrational decisions can move in tandem with others making similar decisions to move whole markets
- The study of investor psychology is no longer fringe thinking

TA is the norm

- So most market participants are Technicians
  (even if they don't know it or admit to it, CAPM etc)

- Most market participants are affected by sentiment
  (even if they don't know it or admit it it)

Sentiment

Sentiment is the degree to which a group of market participants, in aggregate, are bullish or bearish on the market

- The Study of sentiment attempts to measure the market bubbles ‘animal spirits’ the ‘irrational exuberance’

Measuring Sentiment

- Numerous techniques have been developed over the years to attempt to quantify and measure sentiment and its impact on the market
- Such as:
  - Market Vane
  - Investors Intelligence
  - Headline Reading - contrarian
  - Commitment of Traders reports (COT)
- The explosion in Social Media opens the possibility of a new data source for measuring market sentiment

Social Media Data

- For the focus of my work I used Social Media Mention (SMM) data from Knowsis
- OHLC, and volume date on equity has an official amount
- There is not (yet) a single agreed central source for SMM data
- However I believe this will come, soon
- Knowsis is one data provider and it identifies and quantifies underlying behavioural trends from a broad range of online sources

USE OF SMM'S IN TECHNICAL ANALYSIS

- Should we even use Social Media data in Investing?
- What makes a viable data source?
  - Regulator Approval
  - Industry leader take up
  - Market acceptance

USE OF SMM'S IN TECHNICAL ANALYSIS

- **What makes a viable data source for investors?**
  - Regulator Approval
    - SEC – April 2, 2013 "Companies can use Social Media outlets to announce key information so long as investors have been alerted about which social media will be used"
  - Industry Leader usage
    - Activist investor Carl Icahn – August 13th, 2013, Tweeted his view that Apple, was undervalued and that he had taken a stake
    - Apple gained 5% intraday on this tweet
    - At its share price height Apple was the largest listed corporation in the world
    - http://www.bloomberg.com/news/2013-08-13/carl-icahn-discloses-large-stake-in-apple-in-tweet.html
  - Market Acceptance
    - Bloomberg - Bloomberg Social Velocity BSV <GO> launched in May, 2013
    - Growing number of other data providers, such as Knowsis
- **Social Media <u>has already</u> evolved into a new data source**

Social Media Data Mining

Data Mining Social Media

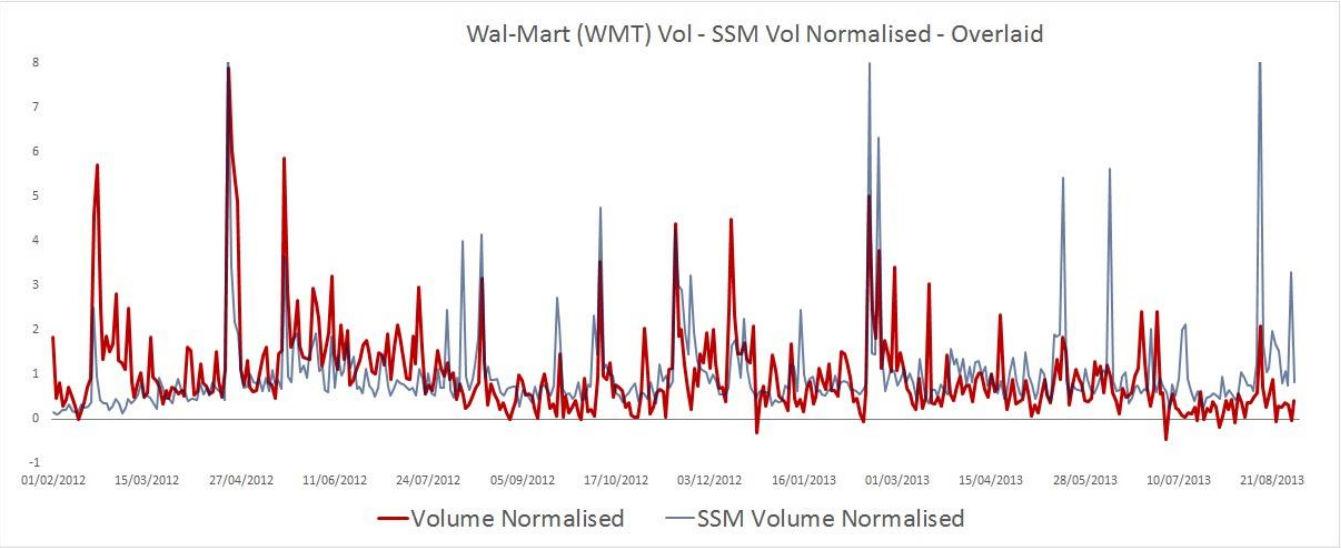
- **Data Mining of Social Media for forecasting is not new**
  - **Film box office receipts**
  - **Book sales**
  - **Predictive Correlation of public mood and DJIA values**

- **Asur and Huberman, 2010**
- **Daniel Druhl, 2005**
- **Johan Bollen and Huina Mao, 2011**

SMM's in TA

Data Mining Social Media for Investing

- **Strong correlation between share volumes and share SMMs**
- **So for the MFTA paper I compared one of the most widely used volume indicators, On Balance Volume, (OBV) with Social Media Mention data to create On Balance Sentiment Volume (OBSV)**



OBV

What is OBV?

- OBV was largely brought to the market by Joseph Granville in his book – New Key to Stock market Profits in 1963
- However the idea had previously been presented to the American Statistical Association in 1932 by Paul Clay of Moody's Investment Services
- It has become one of the most widely know volume indicators
- In his book Joseph Granville based his calculations on the constituents of the Dow Jones Industrial Average, DJIA
- The data used in the creation of the OBSV was also from the constituents of the DJIA

OBV Calculation

Calculation of OBV

- Day 1:
  - Volume of Day 1 is recorded as the OBV
- Day 2:
  - If close on Day 2 is same as Day 1, do nothing
  - If close on Day 2 is above Day 1, add Day 2 volume to OBV
  - If close on Day 2 less than Day 1, subtract Day 2 volume from OBV
- OBV is commonly either displayed as:
  - A simple line overlay on the price graph
  - or as a sub graph comparable to how RSI and MACD are usually displayed

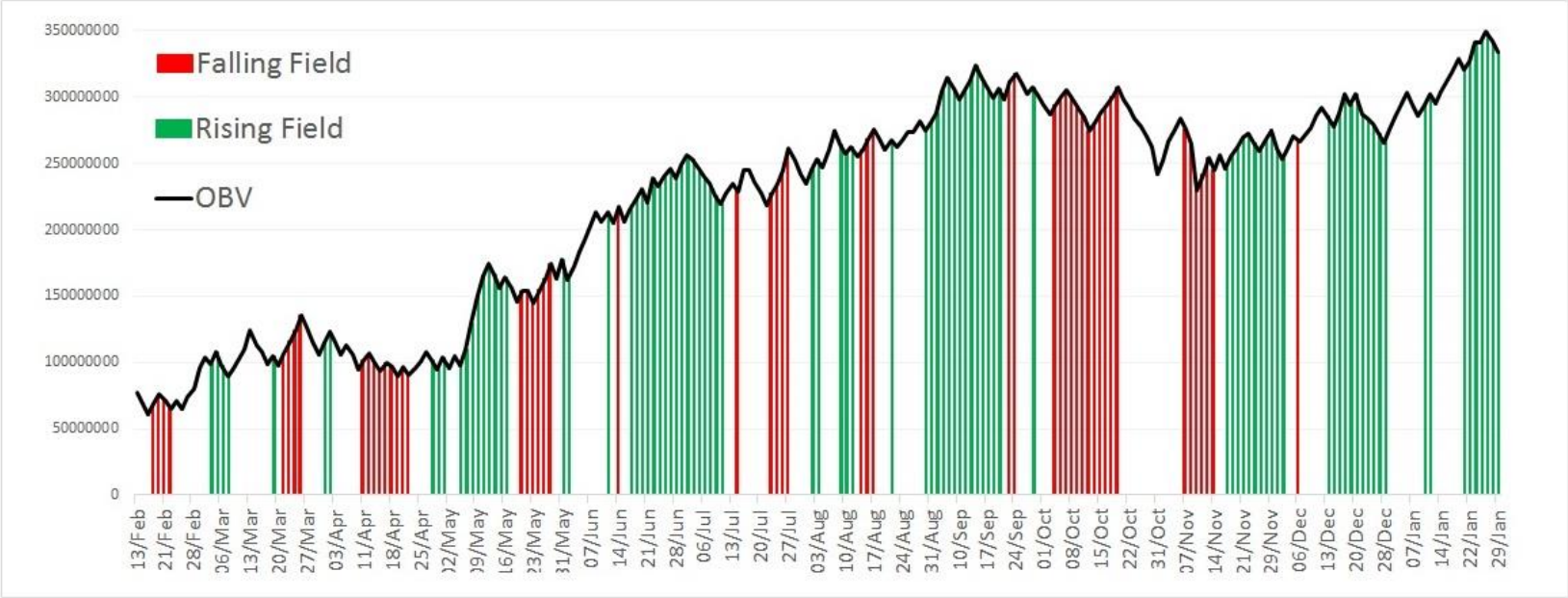
OBV and OBSV

How to mathematically compare OBV and OBSV?

- OBV has largely become known as a divergent indicator, the analysis of which requires some level of subjectivity and is more difficult to test
- However in his book Joseph Granville detailed a Net Field trend system, where he used OBV to create buy and sell alerts.
- I calculated Net Field Trends for both OBV, and OBSV, for the constituents of the Dow Jones Industrial Average, for the period February 2nd, 2012 August 30th 2013
- Then I simply compared the P&L of the trades, for both OBV and OBSV
- This was not intended as a trading system, the approach was employed simply to compare SMM volume data with traditional volume data

OBV and OBSV

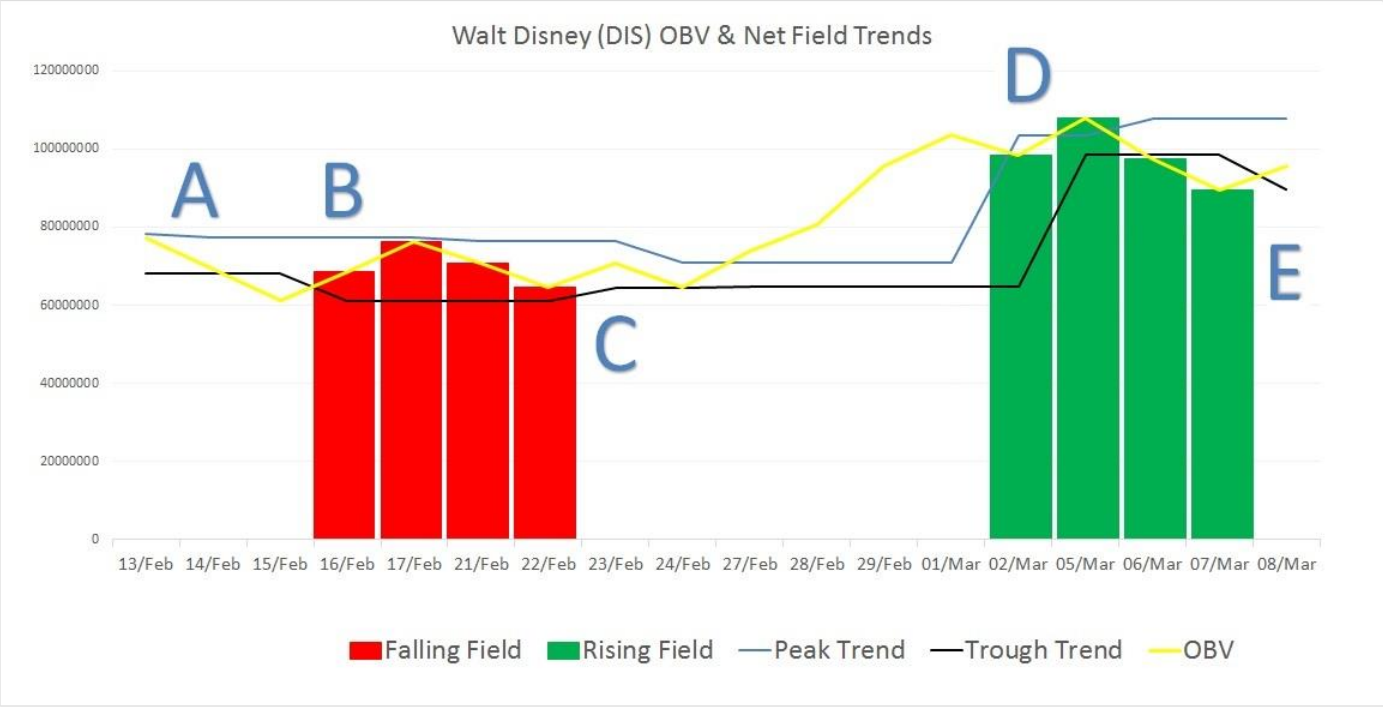
Net Field Trends – Walt Disney (DIS)



- Above is the OBV line for Walt Disney, with the field trends displayed
- This graph shows how the Rising Fields cluster in bullish phases
- And Falling Fields cluster in bearish phases

OBV and OBSV

Net Field Trends - Calculation



- From the OBV two new lines are created: the Peak Trend Line and Trough Trend Line
- In the graph above, Peak Trend is in blue, Trough Trend is Black
- When both are falling a Net Falling Field is created – Red bars
- When both the Peak Trend and Trough Trend are rising a Net Rising Field is created – Green bars

OBV and OBSV

Net Field Trends - Calculation

Date	Close	Volume	**OBV**	Peak Line	Trough Line	Peak	Trough	**Field**	Trades
13/02/2012	41.79	9065800	**77,294,000**	78,344,500	68,228,200	-	+		
14/02/2012	41.6	8210300	**69,083,700**	77,294,000	68,228,200	-	+		
15/02/2012	41.25	7891200	**61,192,500**	77,294,000	68,228,200	-	+		
16/02/2012	41.54	7464500	**68,657,000**	77,294,000	61,192,500	-	-	**Falling**	
17/02/2012	41.75	7758700	**76,415,700**	77,294,000	61,192,500	-	-	**Falling**	Sell Short
21/02/2012	41.57	5675100	**70,740,600**	76,415,700	61,192,500	-	-	**Falling**	
22/02/2012	41.27	6176200	**64,564,400**	76,415,700	61,192,500	-	-	**Falling**	
23/02/2012	41.48	6271000	**70,835,400**	76,415,700	64,564,400	-	+		
24/02/2012	41.31	6150600	**64,684,800**	70,835,400	64,564,400	-	+		Close Short
27/02/2012	41.64	9132300	**73,817,100**	70,835,400	64,684,800	-	+		
28/02/2012	41.93	6895200	**80,712,300**	70,835,400	64,684,800	-	+		
29/02/2012	41.99	14858700	**95,571,000**	70,835,400	64,684,800	-	+		
01/03/2012	42.39	7995900	**103,566,900**	70,835,400	64,684,800	-	+		
02/03/2012	42.36	5070500	**98,496,400**	103,566,900	64,684,800	+	+	**Rising**	
05/03/2012	42.7	9288800	**107,785,200**	103,566,900	98,496,400	+	+	**Rising**	Buy Long
06/03/2012	42	10434500	**97,350,700**	107,785,200	98,496,400	+	+	**Rising**	
07/03/2012	41.75	7793500	**89,557,200**	107,785,200	98,496,400	+	+	**Rising**	
08/03/2012	42.02	6163800	**95,721,000**	107,785,200	89,557,200	+	-		
									Close Long

OBV and OBSV

Net Field Trends - Calculation

Date	Close	Volume	**OBV**	Peak Line	Trough Line	Peak	Trough	**Field**
29/02/2012	41.99	14858700	**95,571,000**	70,835,400	64,684,800	-	+	
01/03/2012	42.39	7995900	**103,566,900**	70,835,400	64,684,800	-	+	
02/03/2012	42.36	5070500	**98,496,400**	103,566,900	64,684,800	+	+	**Rising**

- On 01/03/2012 the volume of 103,566,900 'peaked'
- The volume the day before, and day after, was lower, creating a peak

- The Peak of 103,566,900 was higher than the previous peak of 70,835,400
- This posted a higher high

- This followed the higher low, signalled by the + in the Trough Column
- Higher highs and higher lows = a bullish trend

OBV and OBSV

Net Field Trends – The comparison for every stock in the DJIA

- The net field trend, and resultant P&L, was calculated for each stock
- Running it once with share volumes
- And repeating using SMM volumes in the place of share volumes

OBV and OBSV

Net Field Trends - Comparison

		OBSV Net Field Signals			OBV Net Field Signals		
Code	Name	Trades	% Win	% P&L	Trades	% Win	% P&L
MMM	3M Company	55	38.2%	-0.28%	57	43.9%	-0.20%
AA	Alcoa	44	38.6%	-0.06%	42	42.9%	-0.16%
AXP	American Express Company	59	42.4%	0.07%	57	49.1%	-0.11%
T	AT&T, Inc.	36	47.2%	-4.40%	53	41.5%	-3.75%
BAC	Bank of America	44	38.6%	-1.53%	54	42.6%	1.61%
BA	The Boeing Company	50	52.0%	8.08%	55	45.5%	0.54%
CAT	Caterpillar Inc.	47	51.1%	11.31%	48	37.5%	-14.21%
CVX	Chevron Corporation	49	40.8%	-5.66%	50	40.0%	-17.37%
CSCO	Cisco Systems, Inc.	44	38.6%	-5.05%	41	34.1%	0.77%
KO	The Coca-Cola Company	54	50.0%	-0.04%	61	44.3%	-5.35%
DD	E. I. du Pont de Nemours and Co.	54	37.0%	-7.63%	55	43.6%	-8.40%
XOM	Exxon Mobil Corporation	51	47.1%	-0.05%	59	37.3%	-25.64%
GE	General Electric Company	52	38.5%	-0.16%	45	42.2%	-2.35%
HPQ	HP	53	37.7%	-0.65%	43	44.2%	-7.61%
HD	The Home Depot, Inc.	52	59.6%	0.38%	50	52.0%	5.82%
INTC	Intel Corporation	55	38.2%	-0.28%	55	34.5%	-0.30%
IBM	International Business Machines	46	41.3%	-0.12%	46	43.5%	0.03%
JNJ	Johnson & Johnson	46	54.3%	0.17%	45	57.8%	0.14%
JPM	JPMorgan Chase & Co.	48	47.9%	0.21%	51	35.3%	0.31%
MCD	McDonald's Corp.	48	37.5%	-0.30%	49	40.8%	-0.09%
MRK	Merck & Co. Inc.	42	57.1%	0.23%	44	38.6%	0.02%
MSFT	Microsoft Corporation	50	42.0%	-0.21%	53	37.7%	-0.32%
PFE	Pfizer Inc.	49	34.7%	-5.17%	58	37.9%	-0.25%
PG	The Procter & Gamble Company	40	35.0%	8.53%	44	31.8%	0.02%
TRV	The Travelers Companies, Inc.	20	60.0%	9.86%	50	46.0%	-0.11%
UTX	United Technologies Corp.	54	44.4%	13.23%	50	48.0%	0.24%
VZ	Verizon Communications Inc.	44	54.5%	0.03%	47	42.6%	-0.08%
WMT	Wal-Mart Stores Inc.	48	52.1%	0.14%	47	44.7%	0.17%
DIS	The Walt Disney Company	47	51.1%	0.34%	52	38.5%	0.01%
	Average	**47.6**	**45.1%**	**0.72%**	**50.4**	**42.0%**	**-2.64%**
	Standard Deviation	**7.3**	**7.7%**	**4.96%**	**5.4**	**6.32%**	**6.47%**
	Totals			**21.00%**			**-76.64%**

OBV and OBSV

Net Field Trends - Comparison

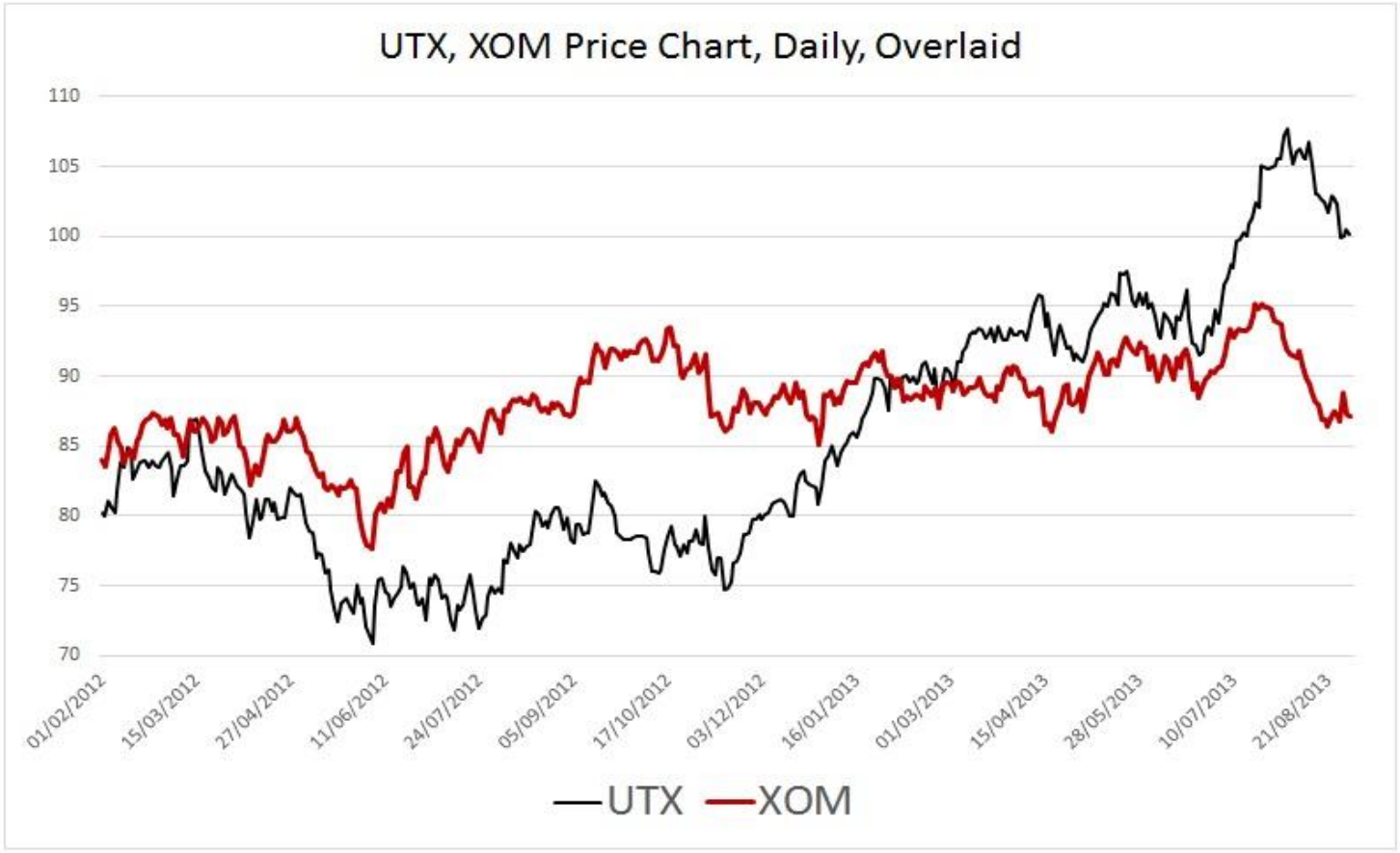
		OBSV Net Field Signals			OBV Net Field Signals		
Code	Name	Trades	% Win	% P&L	Trades	% Win	% P&L
	Average	**47.6**	**45.1%**	**0.72%**	**50.4**	**42.0%**	**-2.64%**
	Standard Deviation	**7.3**	**7.7%**	**4.96%**	**5.4**	**6.32%**	**6.47%**
	Totals			**21.00%**			**-76.64%**

- Average number of trades generated per stock: OBSV 47.6 OBV 50.4
- Win / Loss ratio OBSV 45.1% OBV 42.0%
- Average % Profit & Loss per trade: OBSV 0.72% OBV -2.64%

This was not a trading system, just a comparison of volumes and SMM volumes

OBV and OBSV

		OBSV Net Field Signals			OBV Net Field Signals		
Code	Name	Trades	% Win	% P&L	Trades	% Win	% P&L
XOM	Exxon Mobil Corporation	51	47.1%	-0.05%	59	37.3%	-25.64%
UTX	United Technologies Corp.	54	44.4%	13.23%	50	48.0%	0.24%



OBV and OBSV

Summary of Net Field trends

- Stocks in bullish/bearish phases perform well
- Stocks in neutral periods faced numerous whipsaws

USE OF SMM'S IN TECHNICAL ANALYSIS

Cumulative Data vs Average of Constituent Data

- So far we have only looked at individual stocks within the DJIA
- not the index itself
- To investigate OBV and OBSV for the DJIA a new data series was created
- The total of all the daily stock volumes for all the DJIA constituents was used to create a single OBV figure for the index
- The total of all the daily SMM volumes for all the DJIA constituents was used to create an OBSV figure for the index

USE OF SMM'S IN TECHNICAL ANALYSIS

Constituents versus the average

	OBSV Net Field Signals			OBV Net Field Signals		
	Trades	% Win	% P&L	Trades	% Win	% P&L
DJIA Constituents Average	47.6	45.1%	0.72%	50.4	42.0%	-2.64%
DJIA Index	55.0	45.5%	-1.26%	27	29.6%	-18.22%

- In this table the DJIA Constituent Average row we have seen before
- The DJIA Index row has been added
- For both OBV and OBSV the Index version performed worse
- Why?

USE OF SMM'S IN TECHNICAL ANALYSIS

OBV Climax Indicator

Joseph Granville suggested a Climax Indicator in his book

Where the Net Field trend state on each stock was added
If all 30 stocks were in a Rising Field, the reading would be +30
If all 30 stocks were in a Falling Field, the reading would be -30

He suggested that
Readings above 18 were signalling market tops
Readings under -16 would be signalling potential market bottoms

USE OF SMM'S IN TECHNICAL ANALYSIS

OBV Climax Indicator

	OBSV	OBV
Average Climax Indicator	1.89	1.18
Standard Deviation of Climax Indicator	7.52	8.82
Max Climax Indicator over period	21	22
Min Climax Indicator over period	-17	-20
Days Climax Indicator 16 or under	3	13
Days Climax Indicator 18 or over	2	3
Total % moves 10 days after 16 or under	1.28%	13.06%
Average % moves 10 days after 16 or under	0.43%	1.00%
Total % moves 10 days after 18 or over	1.93%	3.31%
Average % moves 10 days after 18 or over	0.96%	1.10%

- Average of Climax Indicator for OBSV was 1.89, high of 21, low of -17
- Readings under 16 did highlight market bottoms, particularly in OBV
- Readings over 18 did not highlight market tops

USE OF SMM'S IN TECHNICAL ANALYSIS

OBV Climax Indicator

	OBSV	OBV
Average Climax Indicator	1.89	1.18
Standard Deviation of Climax Indicator	7.52	8.82
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Total % moves 10 days after 18 or over	1.93%	3.31%
Average % moves 10 days after 18 or over	0.96%	1.10%

- In both extremes OBV performed better than OBSV
- Calculating OBSV for the parent index performed worse than on the individual stocks
- Why?

USE OF SMM'S IN TECHNICAL ANALYSIS

Equity Risk

Alpha and Beta

- Company risk/return — Alpha
- Market risk/return — Beta

- Company risk can be reduced through portfolio diversification
- Portfolio of as few as 15 stocks, largely removes the impact of company specific risk
- What remains is the market risk

USE OF SMM'S IN TECHNICAL ANALYSIS

Equity Risk

Alpha and Beta

- The bulk of the daily equity volumes in stock markets results from institutional buying and selling
- Most institutions are diversified
- Therefore significant percentages of the daily volumes in equities is related to wider market/sector rotation

- All stocks in the Dow Jones are be influenced by a major global event
- So share volumes on Dow stocks are influenced by global events
- Such as a missile attack on the passenger plane in the Ukraine, for example
- Would have an effect on the share volumes of a stock such as Wal-Mart

USE OF SMM'S IN TECHNICAL ANALYSIS

SMM Volume data is more focused on Company specific data

- SMM data filters for mentions specific to the stock
- It get less influenced by wider market issues
- News of a missile attack on a passenger plane in the Ukraine is less likely to create a spike in Social Media Mentions in Wal-Mart, for example.
- As a result OBSV is more focused to Company Specific risk/return

- Totalling the figures to create a cumulative number diversifies the stock specific nature of the data

USE OF SMM'S IN TECHNICAL ANALYSIS

SMM Data

- OBSV outperforms OBV for individual stocks
  - As SMM's are more focused to company specific risk/return
- OBSV under-performs OBV for the parent index
  - As the effects of the company specific mentions are diversified away
- Both OBV and OBSV perform better on individual stocks
  - For both OBSV and OBV the stock specific nature of the volume data is diversified and reduced when totalled to look at the parent index

USE OF SMM'S IN TECHNICAL ANALYSIS

Summary

- Most financial market participants are technicians, whether they admit to it or not
- Most financial market participants are affected by sentiment, whether they admit to it or not
- Social Media is already a legitimate data source, SEC, Carl Icahn, Bloomberg
- Social Media data mining is already providing profitable results, for a minority
- OBSV was intended to act as a springboard for additional investigation into this new field
- I believe Social Media analysis for technicians will become a major new arm in TA

- I do hope you all have found this an interesting introduction to this rapidly growing field

- Many thanks for viewing and please feel free to send me a connection invite via Social Media platform LinkedIn

- And all the very best with your trading