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# Pitfalls of Relying on P/E Ratios

## Get better research.

Important Disclosure Information is contained on the last page of this report. The recipient of this report is directed to read these disclosures.

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615-377-0443

1. P/E Ratio – obvious flaws
  - Hi/Lo Fallacy
2. Examples
3. How do you protect yourself?
4. Get better research – for free

P/E ratio = price/earnings per share:

- Calculation:
  - If price of stock is \$20 per share and EPS are \$2 per share, then the P/E ratio is 10.
- How to use:
  - To determine value and relative value.
  - For example:
    1. If an investor thinks a stock should be equal to 20 times earnings, then a stock with EPS of \$2 should trade at \$40 per share.
    2. Stocks with the higher P/E ratios are considered more expensive than stocks with lower P/E ratios.

\*This graph was created based on information collected and analyzed by New Constructs, LLC. New Constructs regularly gathers information from over 3,000 companies' 10Ks, including the Notes to the Financial Statements and MD&A.

# THE P/E RATIO - PITFALLS

## Structural Issues

Blind spots for P/E ratios:

- Ignore risk
- Ignore the time value of money
- Ignore leverage
- Ignore capex

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### Blind spots for P/E ratios: **Reliance on reported EPS**

1. [CFO's admit to earnings manipulation](#)
  - Featured on [MarketWatch.com](#)
2. The earnings denominator of the P/E ratio is subject to accounting rules that are constantly being reshaped. Former Financial Accounting Standards Board (FASB) chairman [Bob Herz](#):  
*"I'm not a big fan of earnings multiples, of P/E multiples and things like that. We have made over time dramatic changes in the accounting that affect the denominator of the P/E ratio, but it's not clear whether and how that flows through the valuations."*

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# THE P/E RATIO - PITFALLS

## Short Cuts Don't Always Work

P/E ratios are a short cut [that has risks.](#)

		<u>ROIC</u>			
		5%	10%	15%	20%
<u>Earnings Growth</u>	5%	4.1	10.0	12.0	12.9
	10%	(7.3)	10.0	15.8	18.6
	15%	(29.8)	10.0	23.3	29.9
	20%	(74.5)	10.0	38.2	52.2
	35%	(661.5)	10.0	233.8	345.8

Assumptions: WACC is 10% and 20yr forecast horizon.

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# THE P/E RATIO - PITFALLS

## Hi/Lo Fallacy – Tricks to make any M&A look good

P/E ratios can be manipulated to show EPS growth.

- Whenever a company buys a lower P/E company, combined EPS go up - no matter the economics.
- When company buys a higher company, combined EPS go down.
- More details:
  - [Spreadsheet](#) that shows how the math works
  - [Webinar](#) walking thru the spreadsheet

	High	Low	Get EPS Up! High buys Low	Get P/E Up! Low buys High
Earnings	\$5,000	\$5,000	\$10,000	\$10,000
Shares	5,000	5,000	8,333	12,500
Stock price	\$30	\$20	\$30	\$20
EPS	\$1.00	\$1.00	\$1.20	\$0.80
P/E	30X	20X	25X	25X

Note: Adapted from *The Quest for Value*, G. Bennett Stewart, HarperCollins, 1991.

Source for chart is *Credit Suisse First Boston, Frontiers of Finance*, "[Let's Make a Deal](#)", Michael Mauboussin, page 7

# Part II

## Examples Where P/Es Lead You Astray



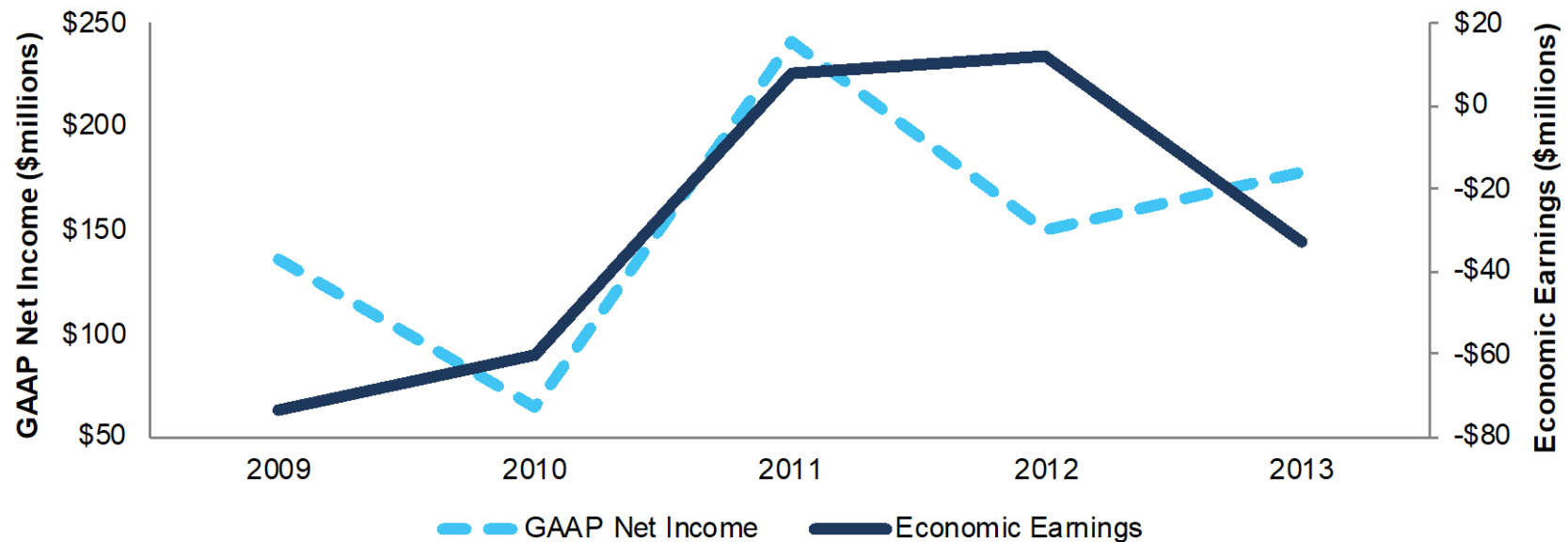
# SEE THE DIFFERENCE: PROTECT YOUR PORTFOLIO

## Accounting Results Going Up Economic Earnings Going Down

### Olin Corporation (OLN)

- GAAP EPS increased by 20% in 2013 even as Economic Earnings swung to a loss
- Low P/E of 13 based on “misleading” accounting earnings
- Valuation implied 35 years of 5.5% NOPAT growth

### Falling Economic Earnings and Rising Net Income



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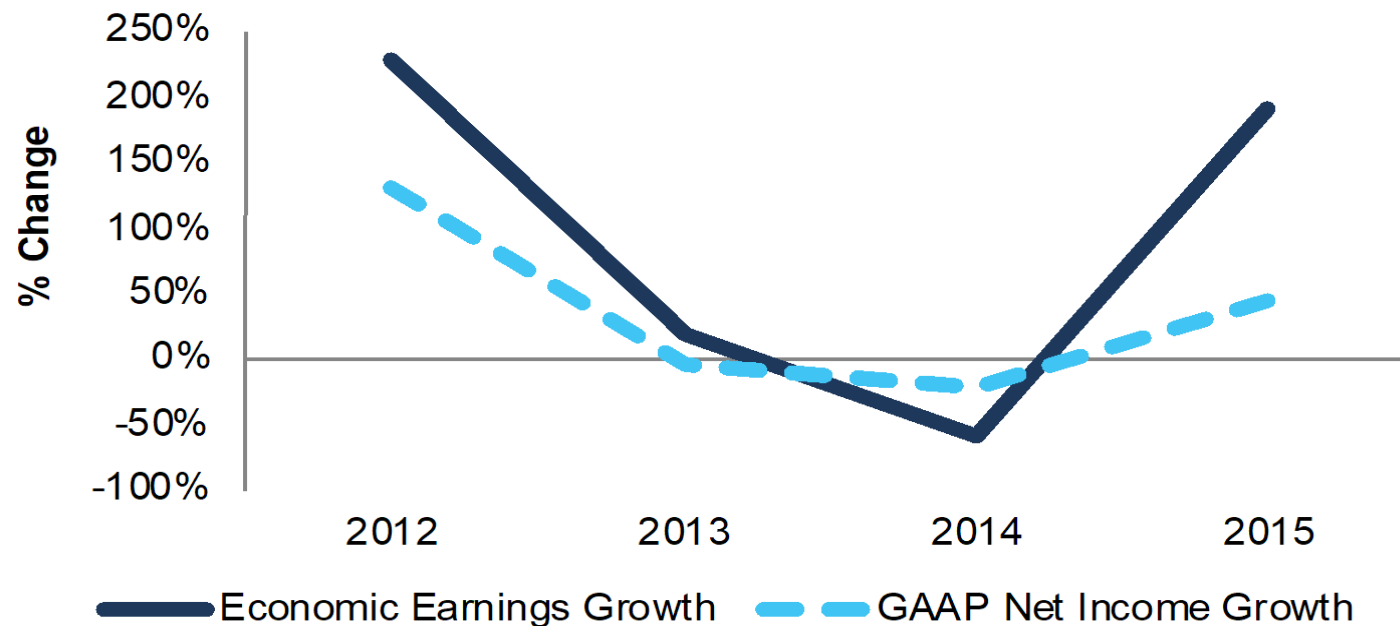
# SEE THE DIFFERENCE: BOOST YOUR PORTFOLIO

## Economic Earnings Rising Faster than Accounting

### NVIDIA (NVDA)

- From 2011-2015, EE per share grew at a CAGR of 48% vs. 27% for GAAP EPS
- P/E of 24, above the S&P 500 average of 22
- Valuation implied no more than 10% profit growth into perpetuity

### NVDA GAAP vs. Economic Earnings Growth



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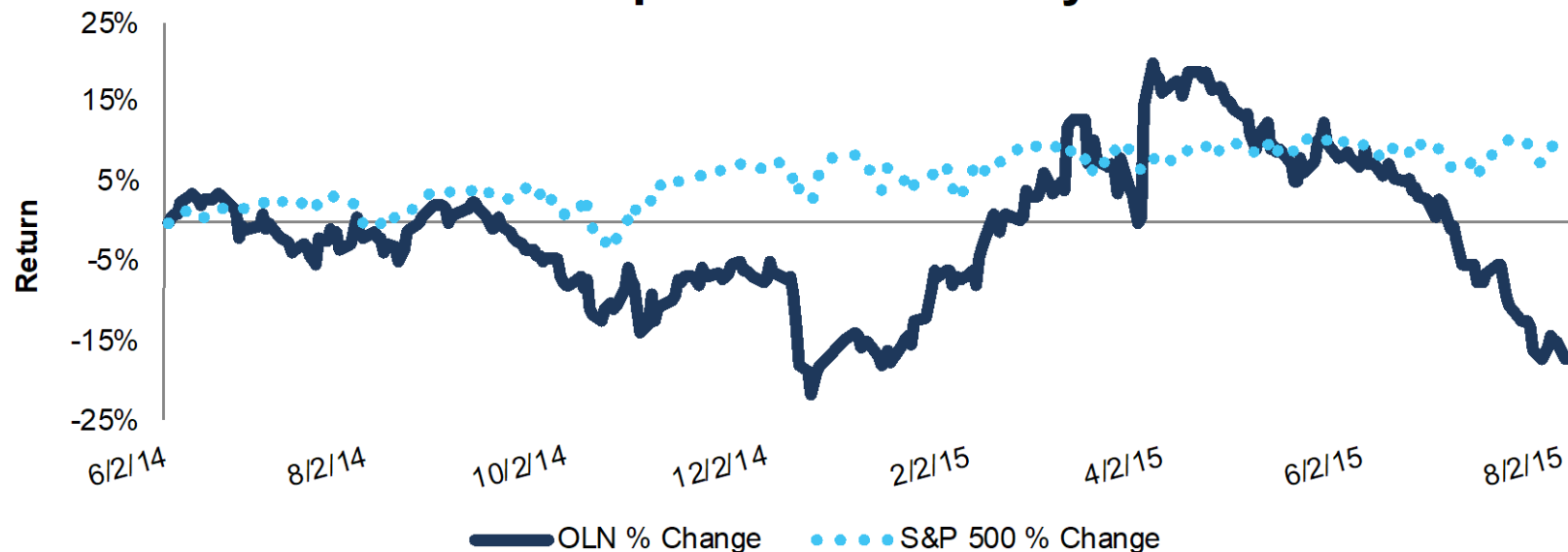
# ECONOMICS DRIVE PERFORMANCE

Warned on 6/2/2014: Olin Corporation (OLN)

## Accounting Loopholes Mislead" Investors

1. \$50 million (17% of reported operating income) in non-operating income due to one-time items, changes in reserves, and pension gains
2. Upgraded to Neutral on 8/5/15, down 17% vs. S&P 500 up 9% during holding period.

## OLN Underperformed SPY by 26%



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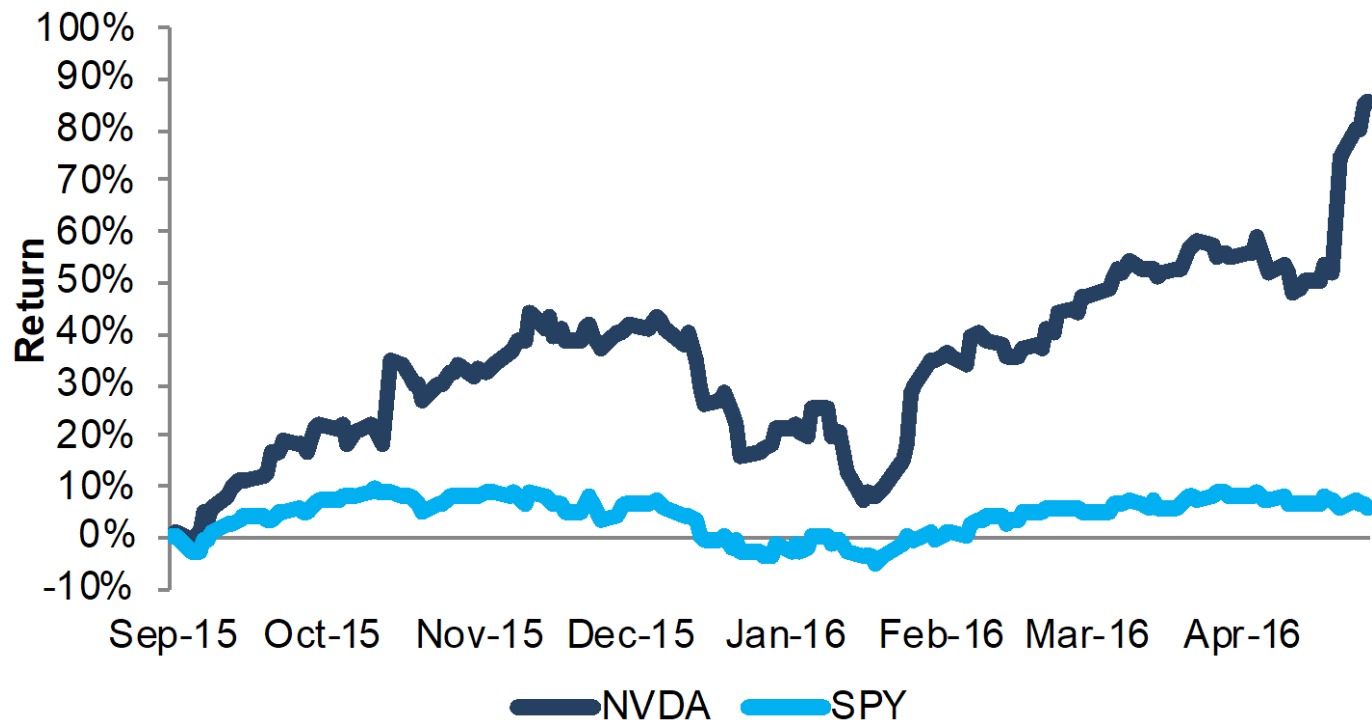
# ECONOMICS DRIVE PERFORMANCE

Buy Call on 9/24/2015: NVIDIA (NVDA)

## Accounting Results Missed the Bigger Picture

1. 2015 GAAP earnings understated by \$60 million write-down (9% of GAAP results)
2. Up 86% while SPY +6% while rated “Attractive”
3. Up 41% vs SPY +6% when we closed official position on 12/10/15

## NVDA Outperformed SPY by 80%



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# Part III

## How do you protect yourself?

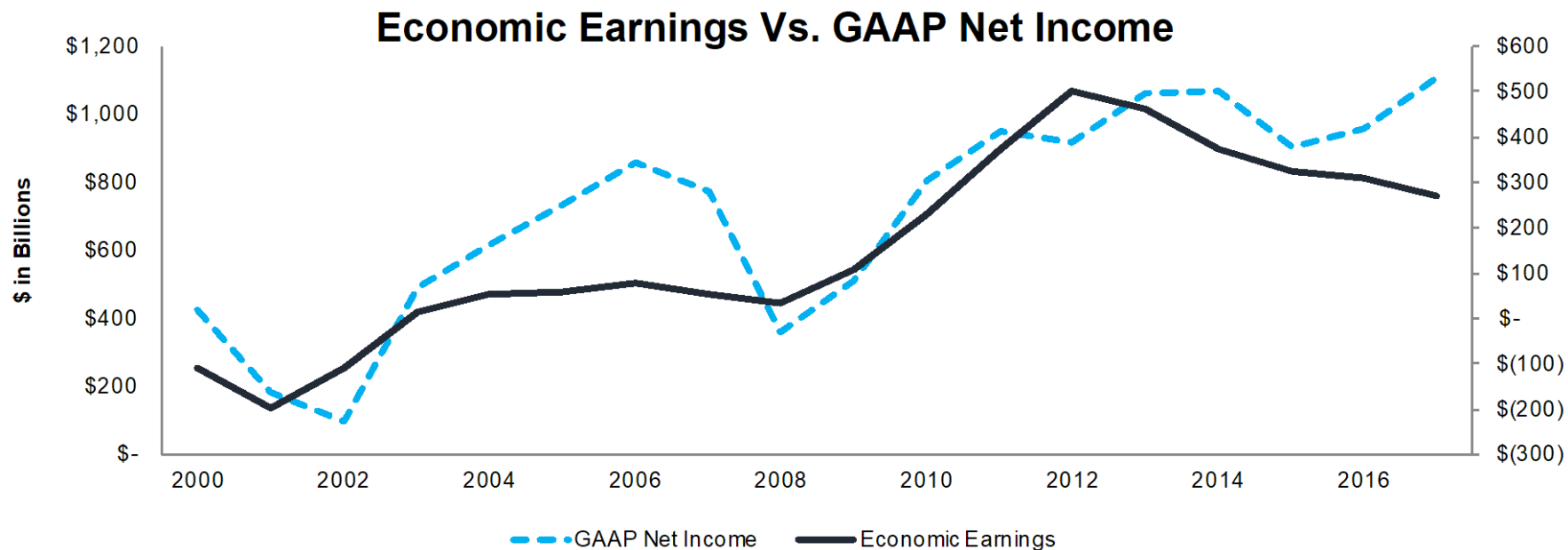
# FOCUS ON ECONOMIC EARNINGS

## (Unscrubbed) Earnings Trends Are Misleading

*“Look at the financial footnotes in 10-K filings and the gains then disappear”*

*“Only 1 sector has experienced real earnings gains in the past 12 months”*

– MarketWatch.com [5/4/17](#) & [2/28/18](#)



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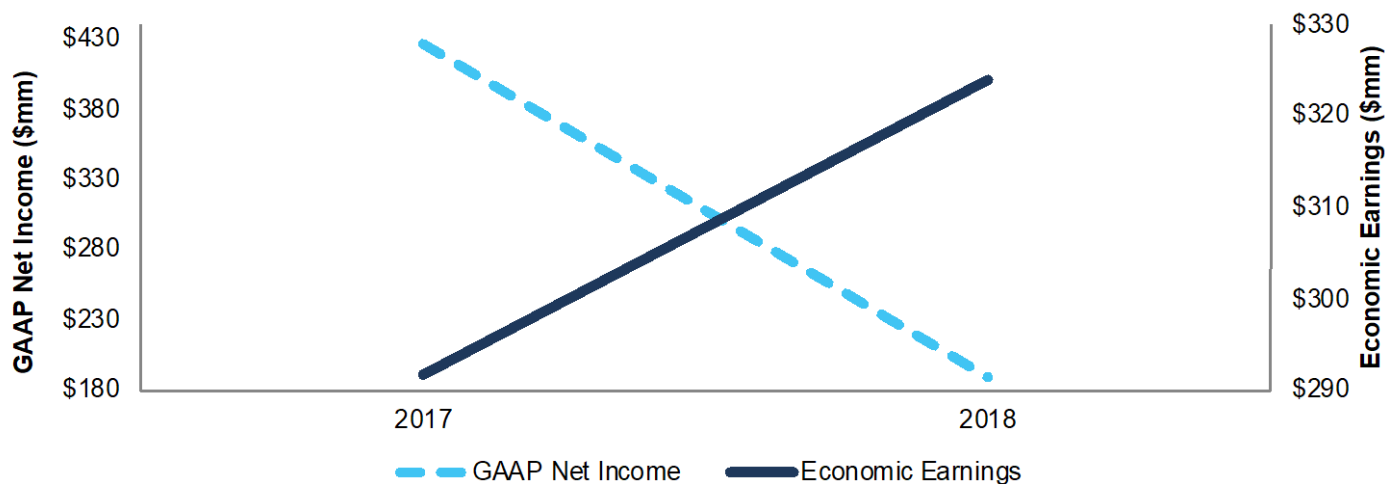
# MAKING MONEY WITH ECONOMIC EARNINGS

## Autoliv (ALV) – reported earnings understate real earnings

### Autoliv (ALV)

In 2018, GAAP net income fell by 55% YoY while economic earnings increased 11% YoY. Stock is underpriced at \$28/share – [Price to Economic Book Value \(P/EBV\)](#) is 0.9.

#### ALV's GAAP Falls As Economic Earnings Rise



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# MAKING MONEY WITH ECONOMIC EARNINGS

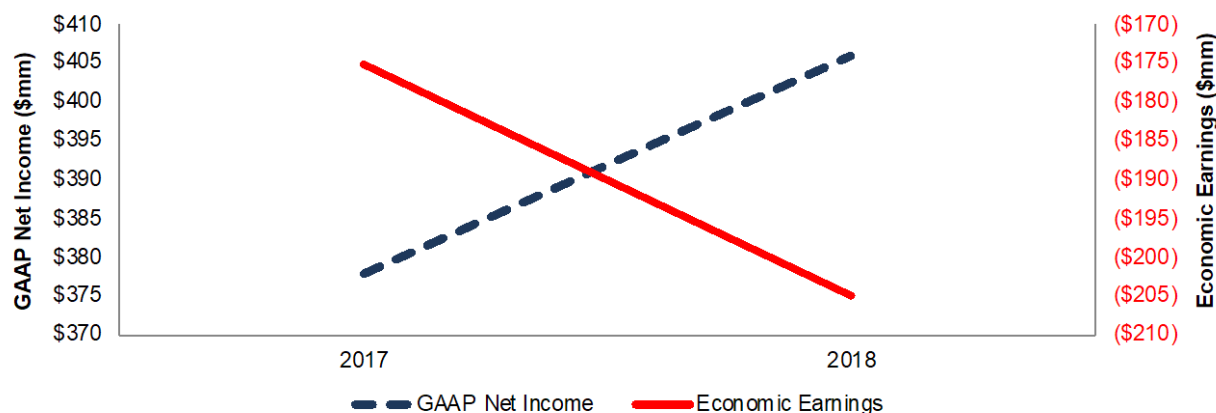
## Expedia (EXPE) – reported earnings OVERstate real earnings

### Expedia (EXPE)

In 2018, GAAP net income grew by 8% YoY while economic earnings, the true cash flows of the business, fell 17% to -\$205 million

Stock is overpriced at \$128/share – [Price to Economic Book Value \(P/EBV\)](#) is 4.4.

#### EXPE's GAAP Rises As Economic Earnings Decline



More details on valuation:

To justify its current price of \$129/share, EXPE must achieve 7% NOPAT margins (three year average prior to HomeAway and Orbitz acquisitions vs. 5% in 2018) and grow NOPAT by 12% compounded annually for the next decade. [See the math behind this dynamic DCF scenario](#). These expectations seem overly optimistic given that EXPE has grown NOPAT by just 3% compounded annually over the past decade.

Even if EXPE can maintain current NOPAT margins (5%) and grow NOPAT by 9% compounded annually for the next decade, the stock is worth just \$93/share today – a 28% downside. [See the math behind this dynamic DCF scenario](#).

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Core Problem: GAAP is exploitable.

Only Solution: Read the Footnotes and MD&A.

## Traditional P&L

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Revenues

- operating expenses

---

= pretax earnings

- taxes

---

= Reported Profit

## Economic P&L

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Revenues

- operating expenses

- **Hidden Incomes/Charges**

---

= pretax earnings

- taxes

---

= Profit

- **capital charge/hidden liabilities and assets**

---

= Economic Profit

## Scouring the Footnotes and MD&A of 10-Ks

- Hidden Expenses/Income
- Unrecorded Goodwill
- Impairments
- Unconsolidated Subsidiaries
- Minority Interests
- Unrealized Gains/Losses
- Changes in Accounting Rules
- Derivatives Exposure
- Customer Concentration
- FASB 159
- Employee Stock Options
- Option Valuation Assumptions
- Operating Leases
- Loan Loss/LIFO Reserves
- Pension Assumptions
- Excess Cash
- Pension Over/Under Funding
- Auditor's Opinions
- Carrying Value vs Fair Value
- Mid-year acquisitions

# GETTING TO THE ECONOMICS

## Measuring Key Results

- **NOPAT** ➡ core operating earnings after-tax
- **Invested Capital** ➡ all cash invested in the business
- **WACC** ➡ rent management must pay for use of capital

Return on Invested Capital = NOPAT/Avg Invested Capital

Economic Earnings = (ROIC – WACC) \* Invested Capital

- Aka: “EVA”, economic profit, residual income

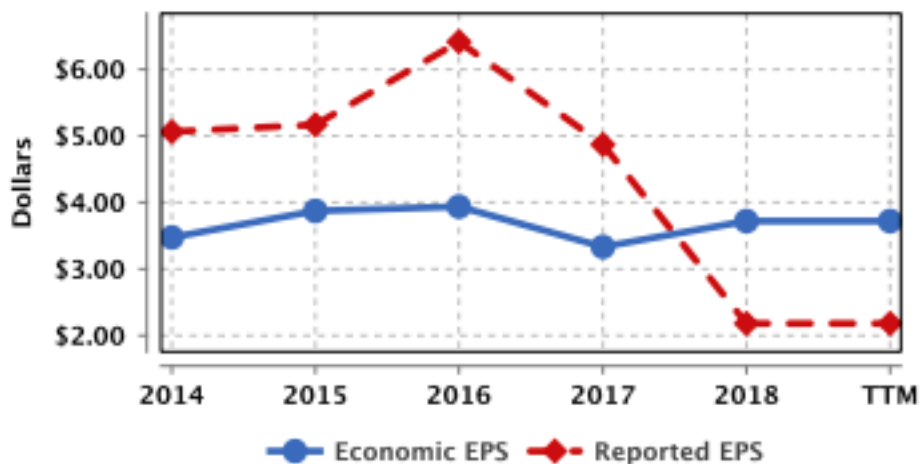
# **Part IV**

## **Get Better Research – for free!**

# GET RESEARCH ON ECONOMIC EARNINGS

## Compare reported vs economic results

### Accounting vs Economic Earnings



### Earnings & Valuation Diligence Summary

- ALV's accounting earnings understate its economic earnings, which equal  $(\text{ROIC} - \text{WACC}) * \text{Average Invested Capital}$ .
- For ALV, we made a total of \$3,302 million in income statement and balance sheet adjustments to convert accounting earnings to economic earnings in FY18.
- We made \$2,821 million in adjustments in our DCF valuation of the stock.
- See Appendix 1 for details on our calculations of key metrics and Appendices 2 and 3 for details on our [adjustments](#).

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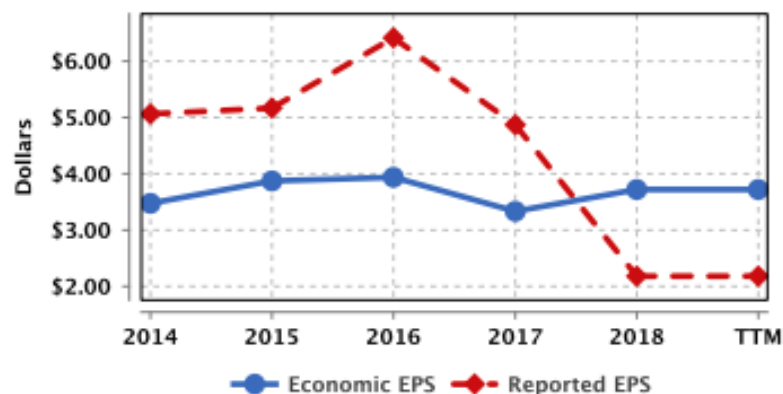
# SEE HOW ECONOMIC EARNINGS AFFECT VALUATION

## Get more details on drivers of value

### Investment Rating Details

Risk/Reward Rating	Quality of Earnings		Valuation		
	Economic vs Reported EPS	Return on Invested Capital (ROIC)	FCF Yield	Price-to-EBV Ratio	Growth Appreciation Period (yrs)
Very Unattractive	Misleading Trend	Bottom Quintile	<-5%	> 3.5 or -1 < 0	> 50
Unattractive	False Positive	4th Quintile	-5%<-1%	2.4 < 3.5 or < -1	20 < 50
Neutral	Neutral EE	3rd Quintile	-1%<3%	1.6 < 2.4	10 < 20
Attractive	Positive EE	2nd Quintile	3%<10%	1.1 < 1.6	3 < 10
Very Attractive	Rising EE	Top Quintile	>10%	0 < 1.1	0 < 3
Actual Values	\$3.72 vs. \$2.18	12%	17%	0.9	< 1
Sector ETF (XLY)	Positive EE	17%	3%	4.3	37
S&P 500 ETF (SPY)	Positive EE	18%	2%	2.4	39

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Analyst  
Notes

Upgraded from Attractive 2/22/19  
Cause: Improved Profitability  
New 10-K 2/22/19  
New Forecast 2/25/19  
Added to the Dividend Growth Model Portfolio  
Feb 2019

### ROBO-ANALYST RESEARCH

Closing Price as of 02/27/2019: \$83.27

Dividend Yield: 3.0%

Period End Date: 12/31/2018

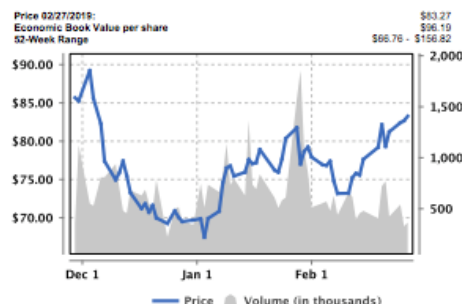
## Autoliv Inc. (ALV)

NYSE - Consumer Cyclical

### Investment Recommendation

- We strongly recommend investors buy ALV.
- ALV earns our Very Attractive rating. See Investment Rating Details below.
- A Very Attractive rating means this stock has superior upside potential with low downside risk.
- ALV ranks in the 99th percentile of the 2750+ stocks we cover.
- Ranks 3rd out of 433 Consumer Cyclical Sector stocks.

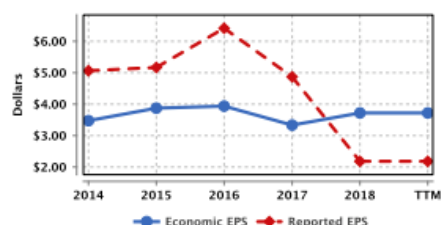
### Very Attractive



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### Stock Performance

Year to Date	19.5%
Last 30 Days	1.8%
Last 60 Days	19.8%
Last 90 Days	(2.8%)
Last Year	(41.7%)

### Key Market Statistics

Enterprise Value (MM)	\$9,715
Market Value (MM)	\$7,257
EV/EBITDA	7.41
EBV per Share	\$96.19
Shares Outstanding (Thousands)	87,149
P/E (TTM)	38.18

### About New Constructs

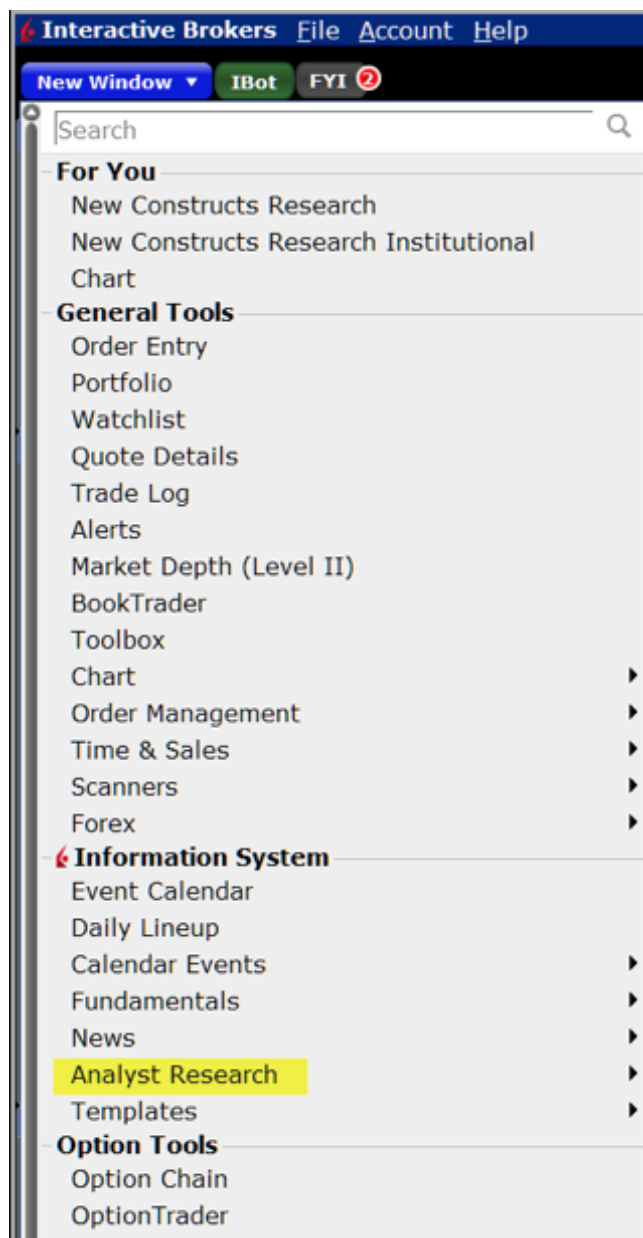
New Constructs is an independent equity research firm powered by machine learning. Ernst & Young demonstrated the superiority of our ROIC methodology, data & models. See our website for details.

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

# GET OUR RESEARCH ON IBKR

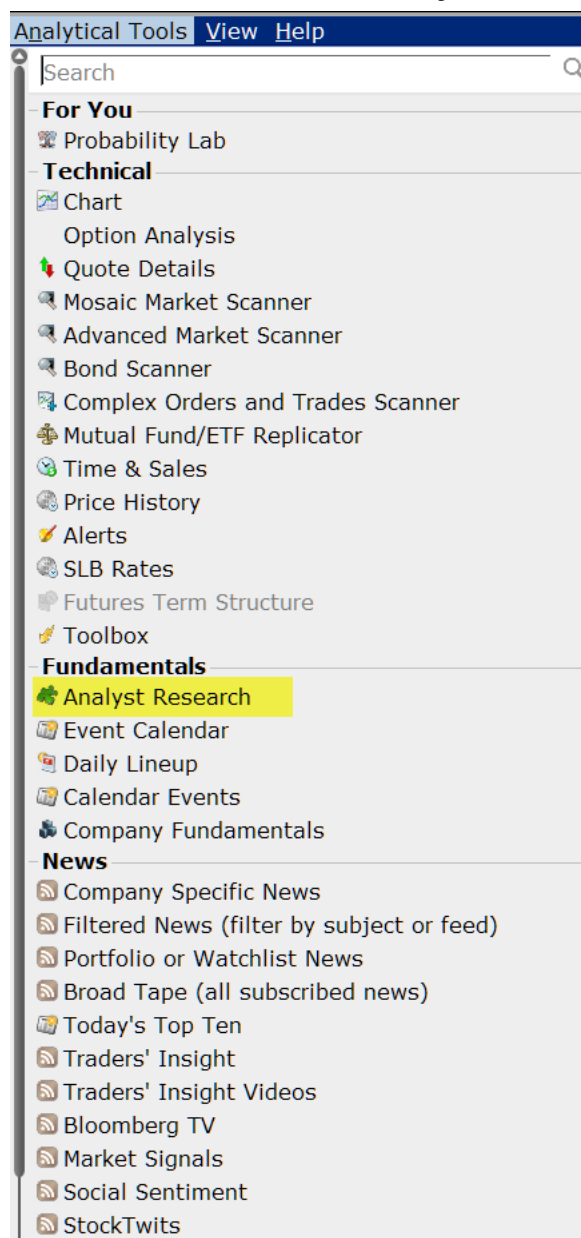
Find us on either platform

## Mosaic



Source: Trader Workstation, Interactive Brokers

## Classic Analyst



Source: Trader Workstation, Interactive Brokers



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The screenshot shows a window titled "News" with a "Company News" dropdown menu. The window contains a list of news items, each with a stock ticker, a report title, and a date. The list is scrollable, and a "Load more messages..." link is at the bottom. The source is cited as "Source: Trader Workstation, Interactive Brokers".

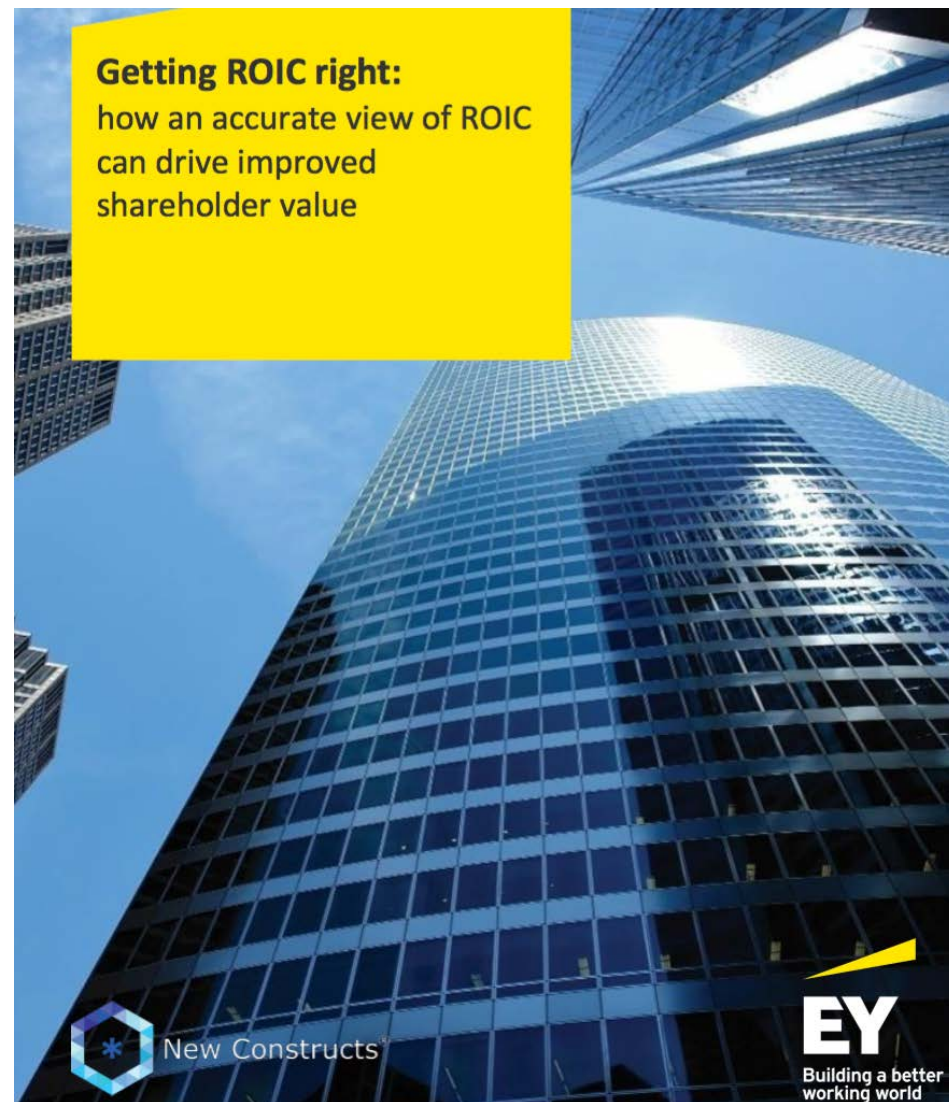
Stock Ticker	Report Title	Date
MEIGX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
MITGX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
MRLSX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
MVCAX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
NSCCX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
PEIIX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
PMVAX	Fundamental Value Research & Predictive Rating	01/10/19
PWDIX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
RICAX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
RTDAX	Fundamental Value Research & Predictive Rating	01/10/19
RYAWX	Fundamental Value Research & Predictive Rating	01/10/19
SCURX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
SLCGX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
SSUAX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
TILGX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
TWHIX	Fundamental Value Research & Predictive Rating	01/10/19
WEQCX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
VFAIX	Upgrade: Fundamental Value Research & Predictive Rating	01/10/19
WPVLX	Downgrade: Fundamental Value Research & Predictive Rating	01/10/19
CSCO	Forensic Stock Earnings & Valuation	01/10/19
WTLVX	Upgrade: Fundamental Value Research & Predictive Rating	01/09/19

[Load more messages...](#)

Source: Trader Workstation, Interactive Brokers

- It's not often that a big 4 accounting firm like E&Y features the material superiority of a research firm's analytics.
- The white paper provides specific examples for specific companies.
- Google "Revenue 48,778", "long-term debt 16,215" to see which company is "Peer 1".

Click [here](#) for a copy.



# POWERFUL RESEARCH AUTOMATION HAS ARRIVED

## Technology Provides Only Solution Big Data

## Harvard Business School Case Study features our Research Automation technology. “Disrupting Fundamental Analysis with Robo-Analysts”

Click [here](#) for a copy.



### New Constructs: Disrupting Fundamental Analysis with Robo-Analysts

CEO David Trainer and COO Lee Moneta-Koehler of New Constructs had just met with a potential client. Their pitch was simple: New Constructs “leverages the only parsing technology capable of reviewing every detail of every 10-K and 10-Q” to deliver quality fundamental analysis at scale. After the presentation, the client responded, “You know, you might be right. Your data probably is better. But, as long as everybody’s using the same bad data, I’m OK with that.” This was a familiar response to Trainer and Moneta-Koehler: they were frustrated by investors who did not see the value of New Constructs’ data or technology. They were concerned about the role of quality fundamental analysis in a market increasingly focused on more technical and other short-term trading strategies.

#### New Constructs

Trainer began working on Wall Street at Credit Suisse First Boston (CSFB) as a stock analyst in 1996, where he honed his skills in financial modeling and fundamental analysis. At CSFB, he spearheaded an effort to develop a consistent framework for measuring, comparing, and analyzing the economic earnings and profitability across all firms and industries globally. After reading through thousands of corporate filings, he realized that “the complexities of what’s going on in modern day business are so much greater than what the current accounting standards can capture in the income statement and balance sheet.” To construct a more accurate economic picture of the firm and to facilitate more meaningful comparisons of performance, his financial models incorporated quantitative details hidden in footnotes and the management’s discussion and analysis (MD&A) section, such as operating lease obligations or components of income or expenses that are transitory in nature.

Although these adjustments were often meaningful to his overall assessment of a firm’s operating performance and valuation, integrating these details into financial models was not the norm among many sell-side analysts. Trainer believed this was due to a few reasons. For one, the increasing length and complexity of corporate filings and the differences in the application of accounting rules across firms for similar transactions made the execution of such detailed financial models impractical. Even for Trainer, this mode of analysis was difficult to scale.

Professor Charles C.Y. Wang and Research Associate Kyle Thomas prepared this case. It was reviewed and approved before publication by a company designate. Funding for the development of this case was provided by Harvard Business School and not by the company. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

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### The Relation between Earnings and Future Cash Flows: A New Perspective\*

Ethan Rouen  
*Harvard Business School*

Eric So  
*Massachusetts Institute of Technology  
Sloan School of Management*

Charles C.Y. Wang  
*Harvard Business School*

July 2018

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#### Abstract

We provide new evidence on the usefulness of financial accounting in valuation analysis. A fundamental assumption in the use of GAAP financial statements for valuation is that accrual-based measures of firms' performance convey information about future cash flows incremental to current cash flows. However, recent evidence casts doubt on this assumption. We revisit this issue using a novel dataset that details *all* quantitative disclosures in firms' annual reports and identifies non-core revenues and expenses from net income, including those reported on the income statement and those hidden in the footnotes or the MD&A. Using these data to adjust GAAP net income, we show the resulting measure of core earnings offers forecasting power for future cash flows and earnings that are incremental to traditional measures of performance. These adjustments also better explain contemporaneous market prices and returns. Together, our results suggest that accounting information remains relevant for valuation and highlight the importance of careful accounting analysis for distilling information relevant for forecasting future performance.



## Quotes from the initial draft of the paper:

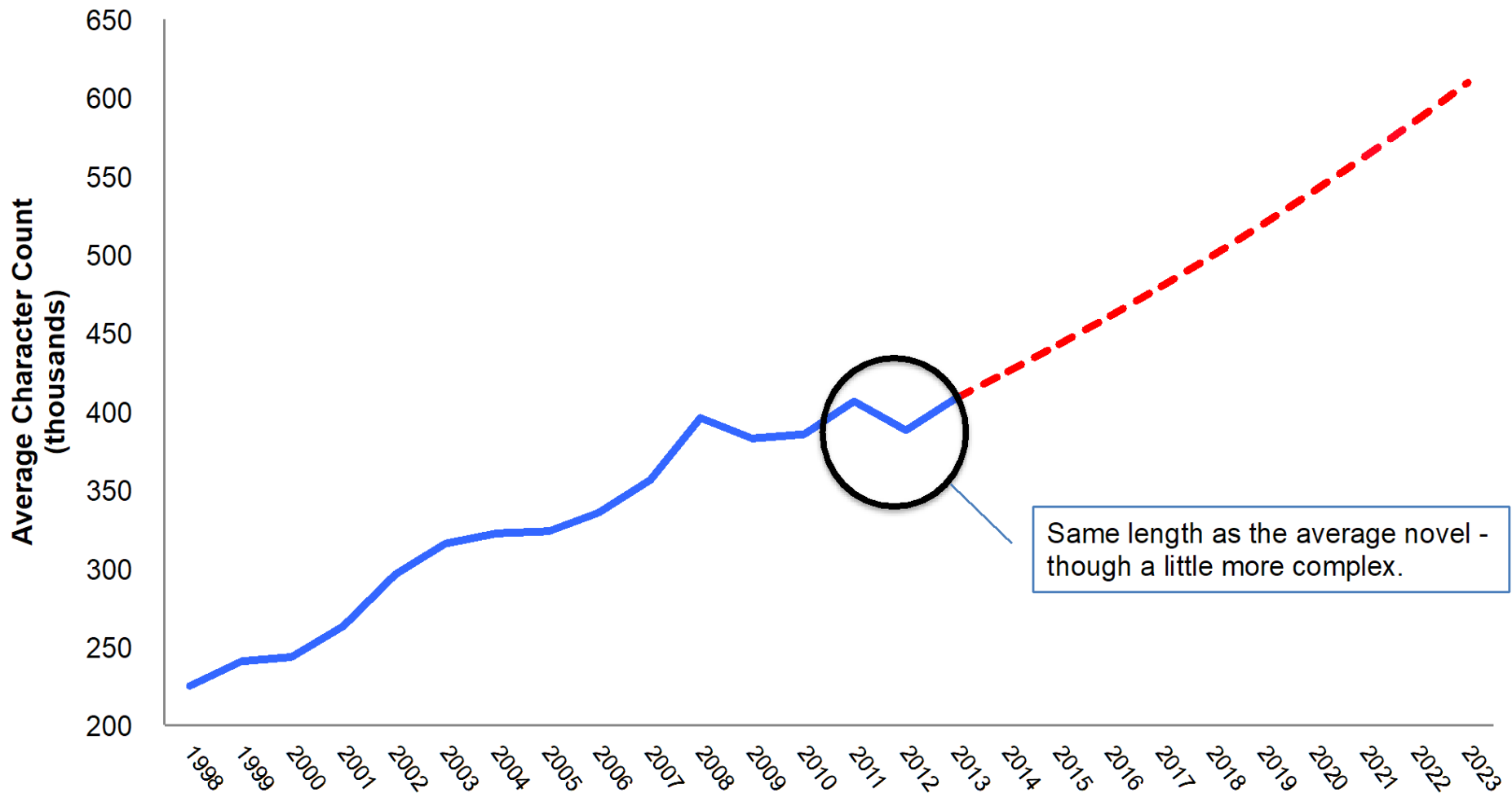
- “this paper serves as a warning for researchers seeking to examine the value relevance of earnings.”
- “Data aggregators like Compustat do not appear to collect and provide data on many non-operating or less persistent income-related items, even when managers make these adjustments in non-GAAP disclosures.”
- “We find that, in many instances, Compustat does not report these disclosures—which can appear on the income statement as a separate line item or in the footnotes or the MD&A—in any of its fields.”
- “These shortcomings make it difficult for users to construct a complete picture of a firm’s earnings, but taking additional steps to adjust to GAAP net income can provide valuable insights.”

# Part V

## Why you need protection now more than ever.

# FILINGS GETTING LONGER & LONGER

## Keeping Up With Disclosures Is Nearly Impossible



\*This graph was created based on information collected and analyzed by New Constructs, LLC. New Constructs regularly gathers information from over 3,000 companies' 10Ks, including the Notes to the Financial Statements and MD&A.

# DISCLOSURE TRENDS ARE NOT YOUR FRIEND

## More Data, More Noise, More Complexity

- Filings have grown to **200+ pages**  
*(That's longer than the average novel.)*
- Increasingly complex and time-consuming work
- Accounting rules are constantly changing





# RISE ABOVE RECORD LEVELS OF NOISE

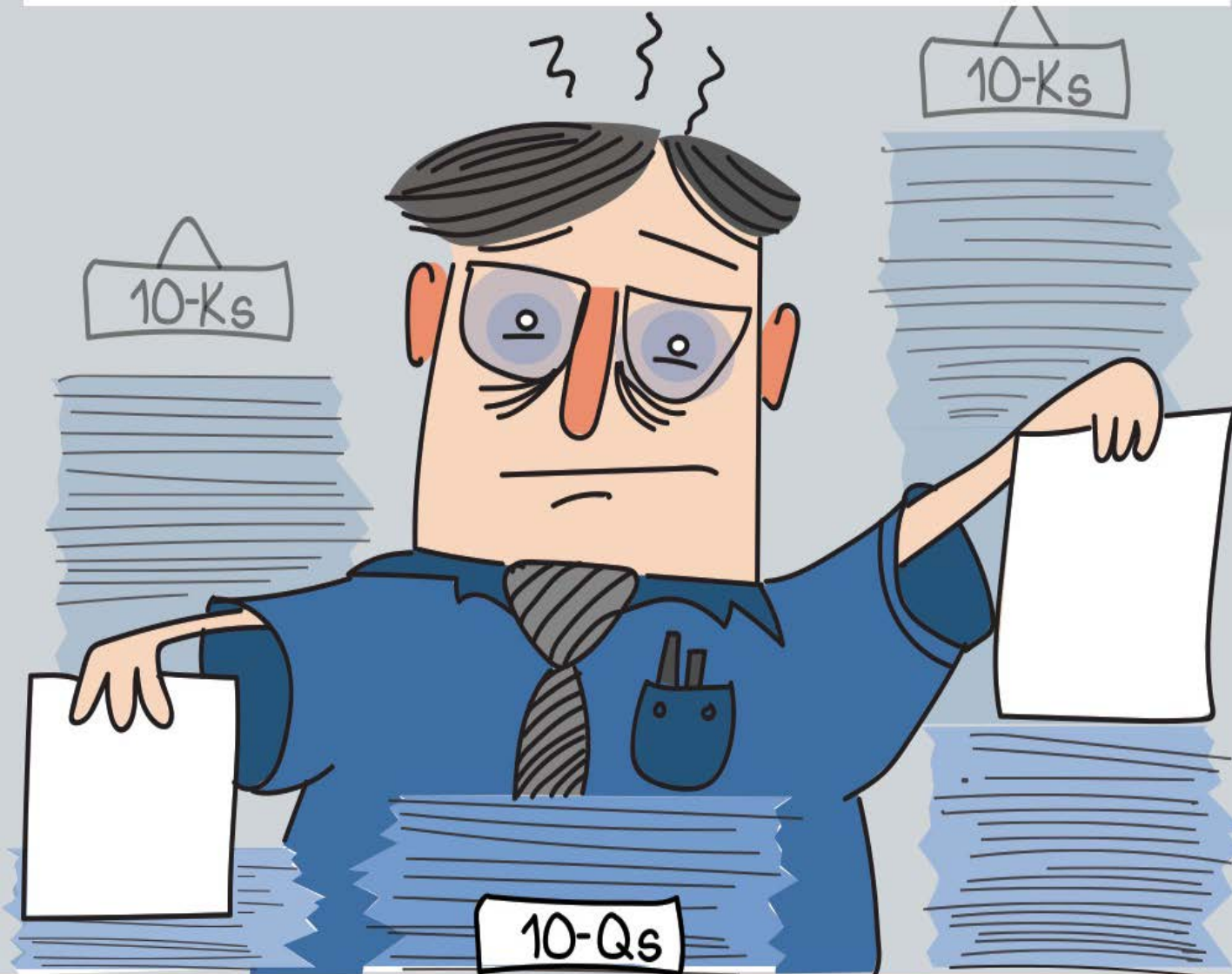
## Superior Research Gives You an Edge



# TECHNOLOGY TO CLOSE THE RESEARCH GAP

## Machine are better than humans at some things

WHO HAS TIME TO READ 200+ PAGE FILINGS?



# MACHINE LEARNING FROM EXPERTS

Human-Validated Parsing Instructions from 140,000+ Filings

OUR FORENSIC EXPERTS  
USE CUTTING-EDGE TECH  
TO SHINE A LIGHT IN THE  
DARK CORNERS OF  
FINANCIAL FOOTNOTES.

FINANCIAL FOOTNOTES  
→ MATTER ←  
DILIGENCE MATTERS

DATA  
QUALITY

—VALUE INVESTING 2.0—  
MACHINE LEARNING FROM EXPERTS

# GET THE DILIGENCE YOU DESERVE

LEVERAGE THE LATEST TECHNOLOGY AND GET AN EDGE  
WITH OUR RESEARCH ON STOCKS, ETFS AND MUTUAL FUNDS



# Appendix



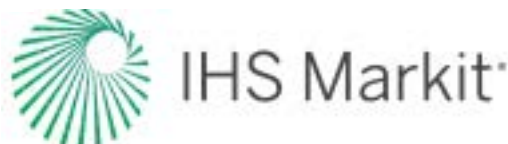
# SUCCESS WITH ELITE INSTITUTIONAL CLIENTS

## Self-Directed Clients Are Natural Fit for Simpler Products

- Top hedge fund and institutional money managers
- Top wealth management firms
- Top advisors
- Top accounting, insurance & consulting firms



Harvard Business School  
&  
MIT Sloan



# HOW THE WEALTH INDUSTRY WORKS WITH US

## Multiple models, Great Flexibility

- **Institutions:** full access to models and tool, including database feeds. Directly access thru our website



- **Advisors/RIAs:** firm or group-wide access to unlimited research. Direct access via our website or thru partners.



- **Retail:** individual sign up for Gold, Platinum or Pro subscriptions. Direct access via our website or thru partners.

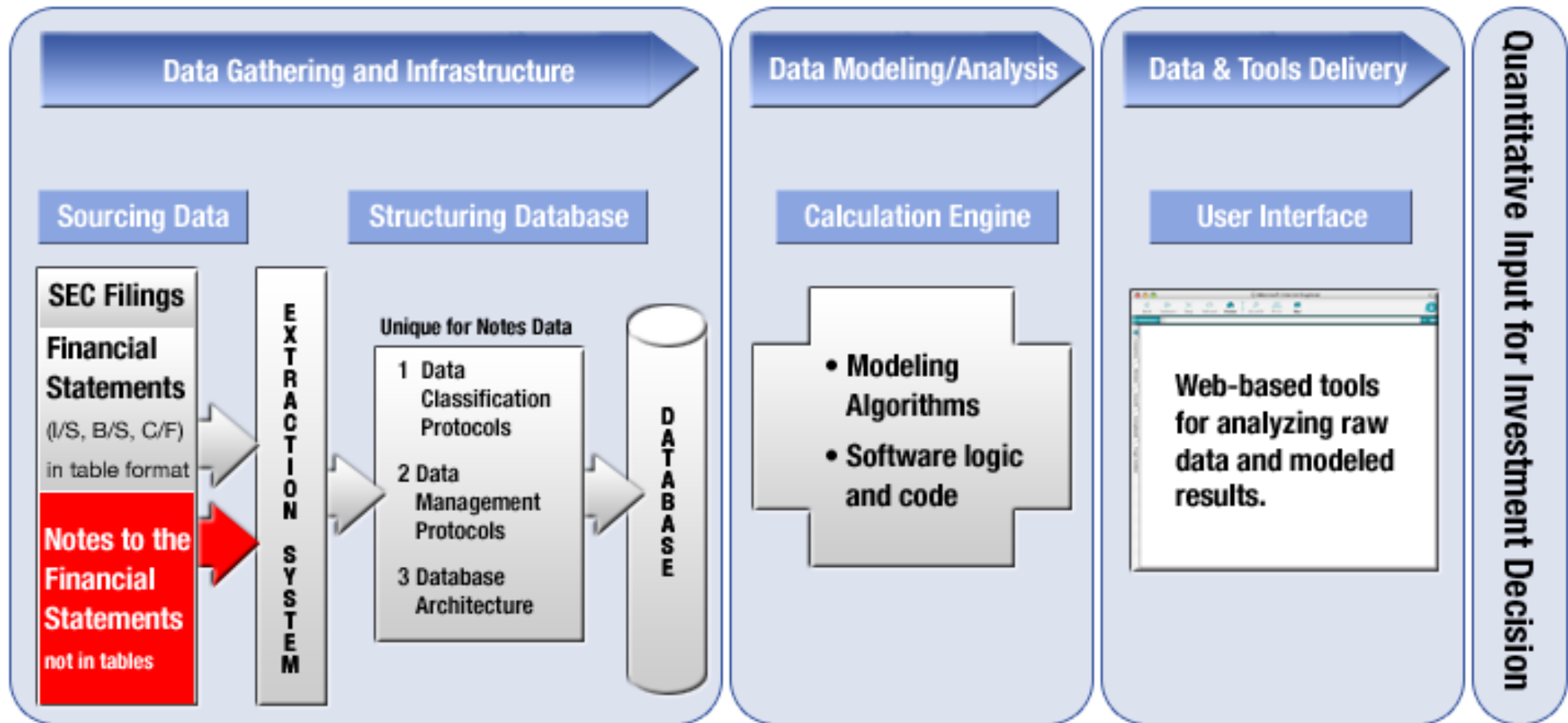


- **Consultants/Corporates:** custom engagements focused on enterprise value optimization and investor relations strategy. Direct access via our website along with custom work and consultation via partners.



# RESEARCH TECHNOLOGY PLATFORM

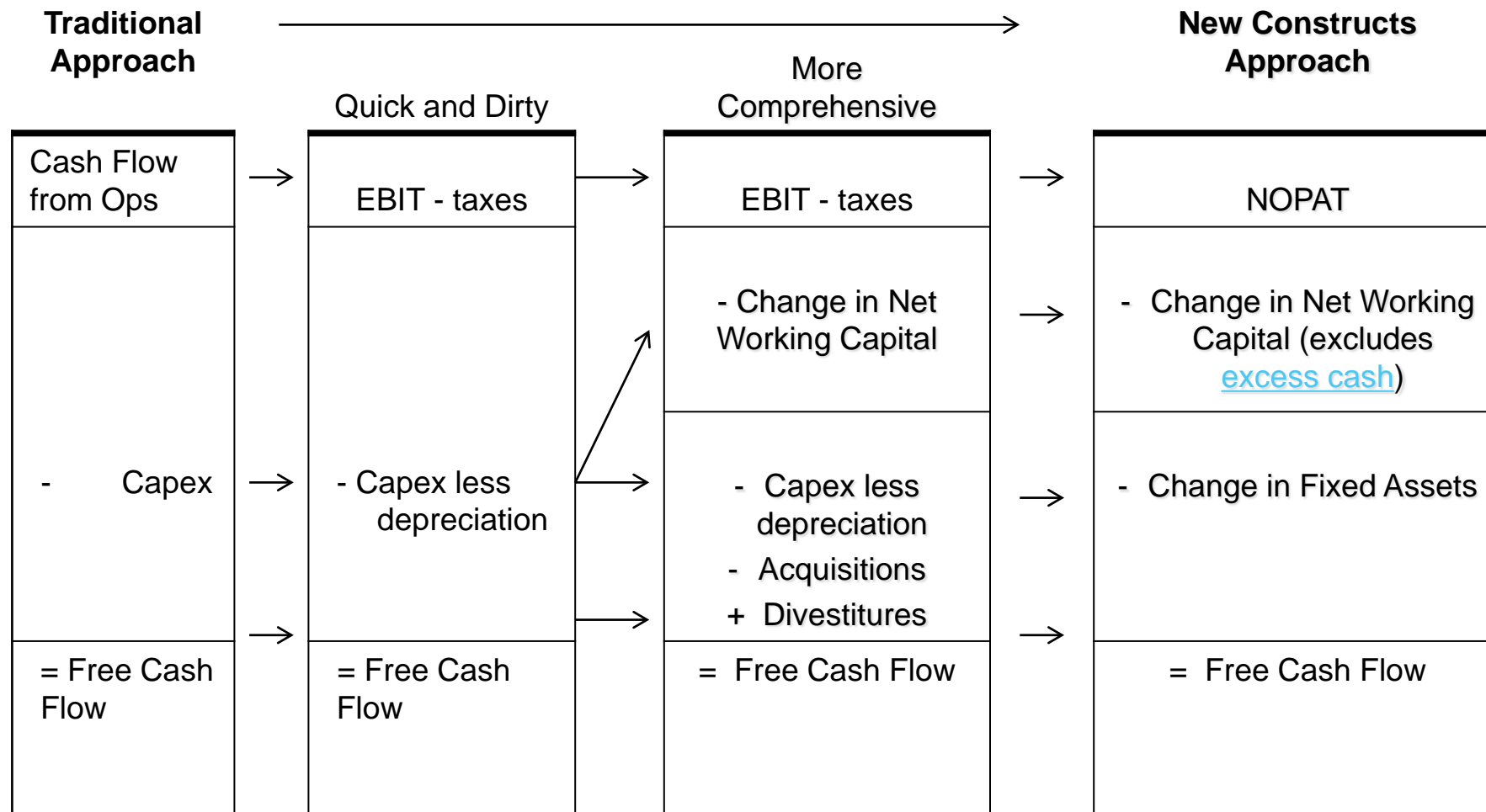
## Data Collection & Modeling Under One Roof



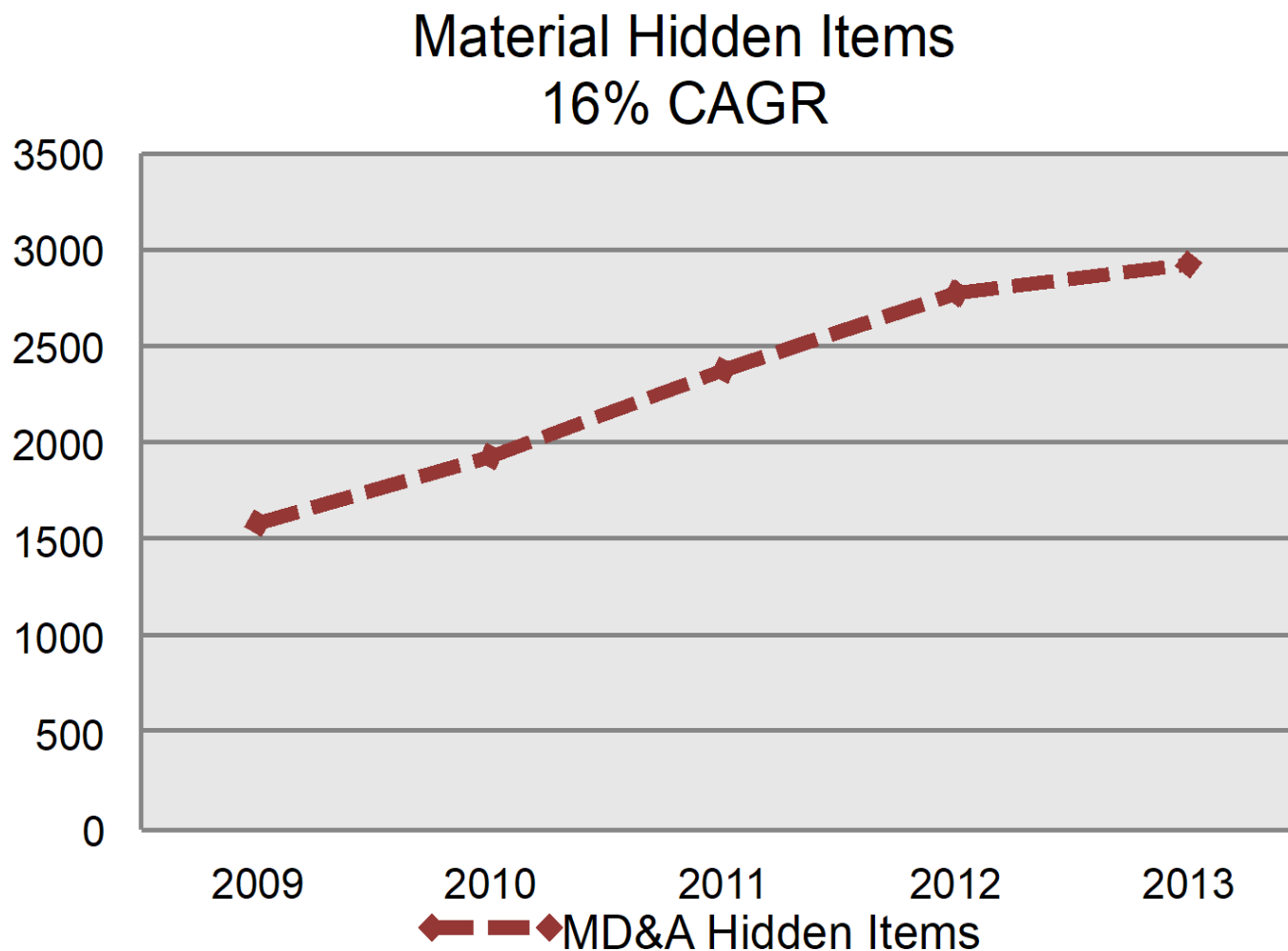
We created our own data collection technology to provide high integrity models to clients. Traditional data feeds are not trustworthy for sophisticated financial modeling.



## Free Cash Flow: NOPAT minus Change in Invested Capital *How We Compare to traditional approaches to FCF*



# BIGGER HAYSTACKS, MORE NEEDLES



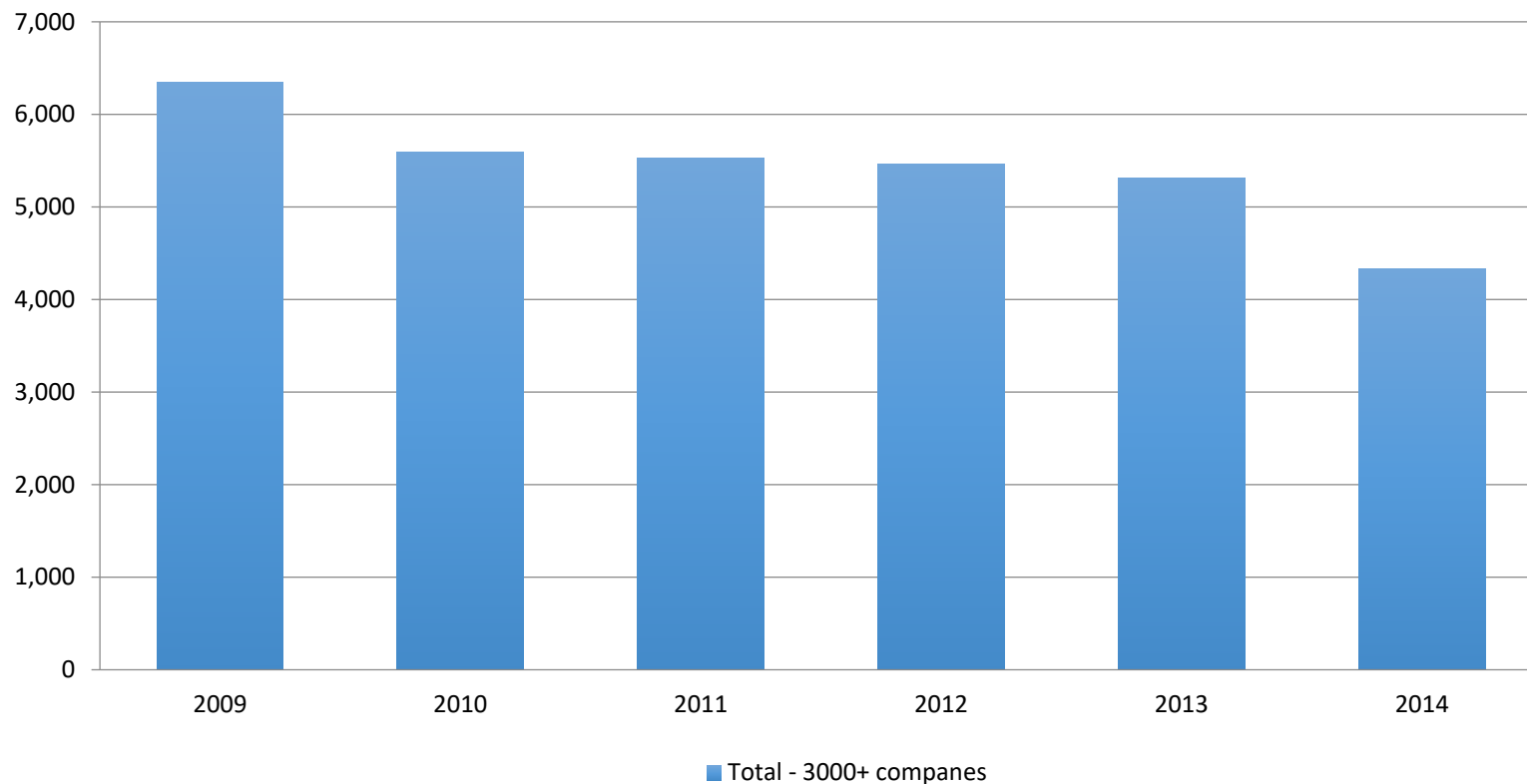
Items found only in the MD&A (e.g. gains, charges, deferred items, etc) that distort income statement results are rising rapidly.

# ASSET WRITE-DOWNS ARE A RED FLAG

## 32,583

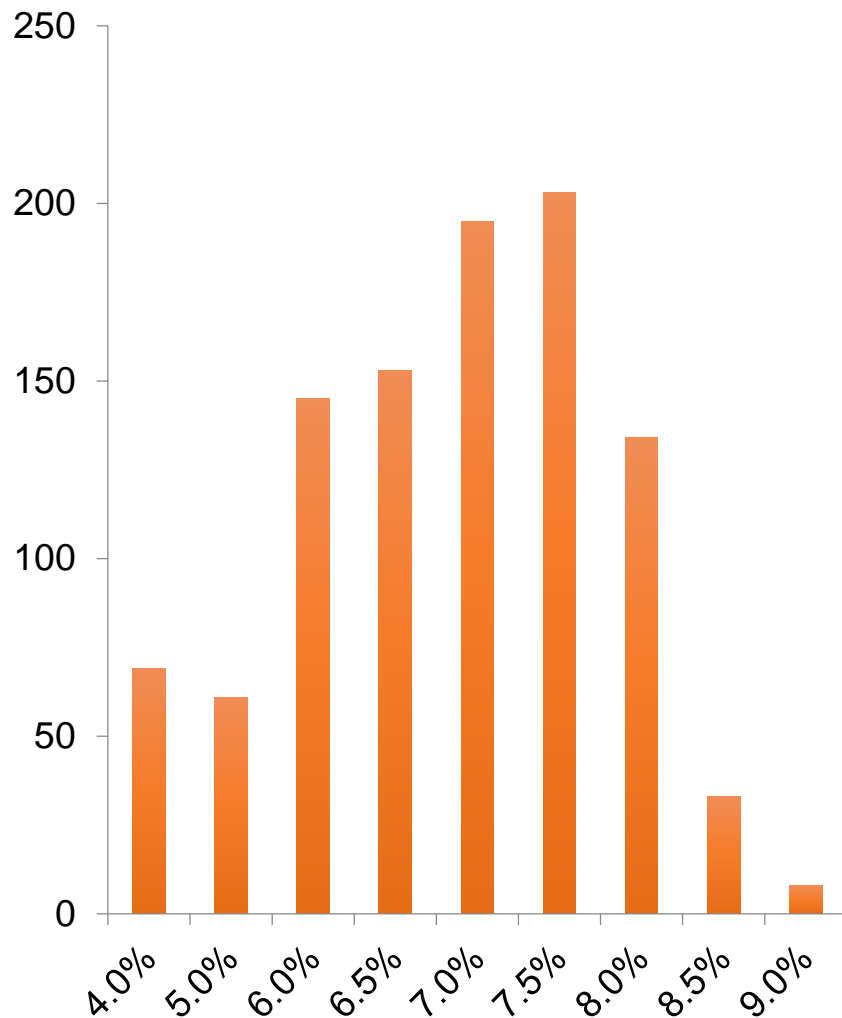
Over the last 5+ Years, we found 32,583 write-downs.

# of Write-Downs



\*This graph was created based on information collected and analyzed by New Constructs, LLC. New Constructs regularly gathers information from over 3,000 companies' 10Ks, including the Notes to the Financial Statements and MD&A.

## Distribution of Return On Plan Asset Assumptions



*Auditors & investors need to know this data.*

- Raising the expected Return on Plan Assets (EROPA) reduces reported pension expense.
- The mean EROPA for 2014 was 6.5%. Roughly 55% of companies expect a long-term return on plan assets between 6.5% and 7.5%.
- Virtusa Corp (VRTU) has the most aggressive assumptions, with EROPA of 10.38%, followed by Exlservice Holdings (EXLS) at 9%.

\*This graph was created based on information collected and analyzed by New Constructs, LLC. New Constructs regularly gathers information from over 3,000 companies' 10Ks, including the Notes to the Financial Statements and MD&A.

New Constructs has no trading, corporate or banking ties – no conflicts.

- *Morningstar gets paid by fund companies. Fund companies must license ratings from Morningstar to use them in marketing materials.*

New Constructs = unadulterated expertise in accounting, finance and SEC filings.

# HOW HAS INVESTING CHANGED OVER THE YEARS?

## Shorter Holding Periods for Stocks

- Until mid-1960's average holding period was seven years
- Today, average holding period is less than one year and annual portfolio turnover is more than 100%<sup>1</sup>

## Major Reactions to Quarterly Earnings

- Stock prices make large moves in response to earnings surprises
- Suggests that long-term cash flows are less important

## Amateur Individual Investors - Growth Market

- Schwab, TD Waterhouse, Scottrade
- Day trading

## Media - Growth Market

- TV: Mad Money, CNBC Squawk Box, and Squawk on the Street
- Print: Wall Street Journal, Investors Business Daily, local newspapers
- Web: Motley Fool, TheStreet.Com, CBS MarketWatch

<sup>1</sup>Rappaport, Alfred. "The Economics of Short-Term Performance Obsession." *Financial Analysts Journal*, vol. 61, no. 3 (May/June): 65-79.

## Speculator

“If you are a speculator, your decision to buy or sell is based on what you believe about the near-term direction of price.”

- Ben Graham

“...speculation is the activity of forecasting the psychology of the market.”

- John Maynard Keynes

Vs.

## Investor

“If you are an investor, your decision to buy and sell is based on the underlying economics of the stock you own.”

- Ben Graham

“Investing is an activity of forecasting the yield on assets over the life of the asset...”

- John Maynard Keynes

# ONLY 3 WAYS TO BEAT THE MARKET

## Better Data - difficult and expensive to obtain

- Gathering and analyzing data from the Notes to the Financial Statements provides a competitive advantage.

## Better Analysis - not just your neighbor, one must out-think the entire market

- Better data means better models.
- Better models provide better analysis.

## Better Discipline - stick to your guns, don't follow the herd.

- Long and short strategy is built on specific, quantifiable thresholds derived from a model we can trust.
- Our models do all the number crunching to supply our human capital with superior information and decision-making capabilities.



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