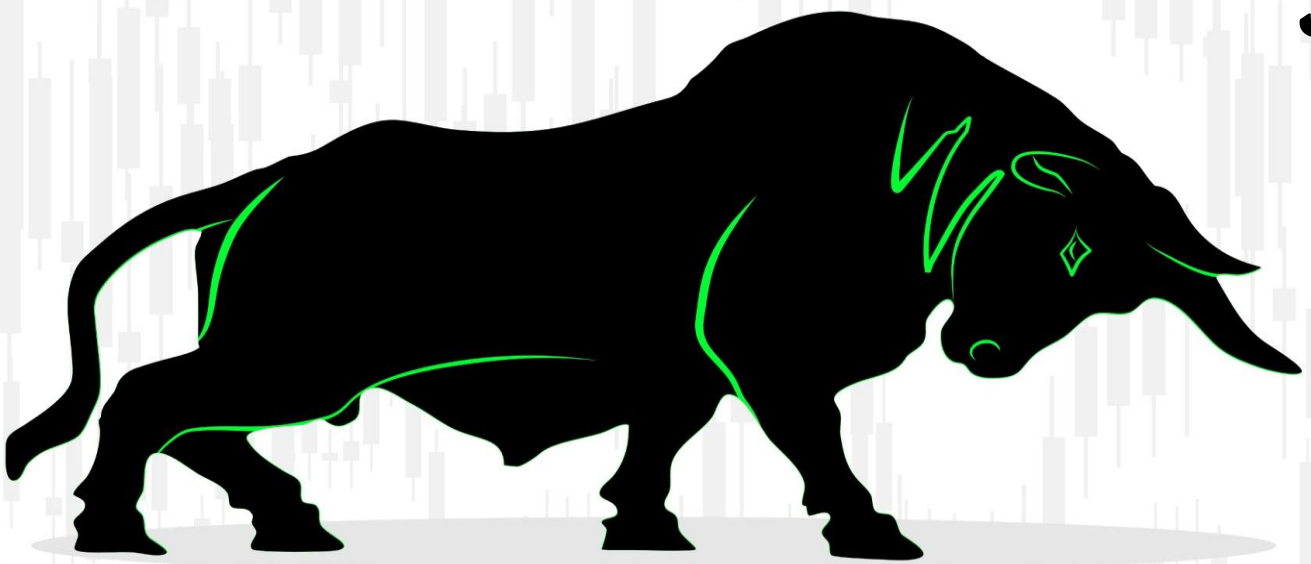
How to Calculate Returns on Shorts

Sometimes you feel like a bull…
Sometimes you don't



Calculating returns on shorts is a *tad* controversial

We'll contrast the approaches and offer our

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Calculating returns on shorts is a *tad* controversial

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Quick background

- Bulls: those who expect markets or securities to rise
- Bears: those who expect markets or securities to drop
- Bulls *buy long,* while
- Bears *sell short*.

Selling short

- You sell something you don't own
- E.g., sell 1,000 shares of APPL
- But how can you sell something you don't own?
- By borrowing the shares
- Borrowing is typically done via a broker or custodian, who holds shares owned by other investors, who are *long* the stock, and are willing to lend their shares to short sellers
- In return, they will receive interest on this loan, plus

The short seller

- Borrows the shares, with the anticipation they will return them by buying them at a lower price, thus making a profit on the difference
  - E.g., they sell APPL at $200,
  - Buy it at $150
  - Thus, make $50 per share

But what if the price doesn't drop?

- Then they may get *squeezed,* and may be forced to buy the shares at a higher price, and suffer a loss.
  - E.g., they sell APPL short at $200,
  - The price rises to $225; they buy at $225 to return the share they borrowed,
  - Thus losing $25 per share
- In addition, they must
  - Pay the party that loaned them the shares interest on the loan
  - Plus pay them for any dividends that were paid during the period the shares were borrowed

An alternative to borrowing shares: *Selling against the box*

- Sometimes, the short seller <u>owns</u> the shares, and wants to continue to own them
  - Why? [cue audience participation]
- In this case, they can borrow against their own shares
- They will remain the owner of record

The question we will deal with:

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How to calculate the return on a short position

A topic we haven't seen much about

- What I've learned,
- actually, what I've known,
- there are two very different *schools of thought* on this topic

Let's begin with returns on longs

- Consider this:
  - V_0 (beginning value) = $100
  - V_E (ending value) = $90
- The investor's position dropped in value, from $100 to $90. What's the return?

$$R = \frac{V_E - V_0}{V_0} = \frac{90 - 100}{100} - 10\%$$

- We were hoping the price would increase
- It decreased, so our return is negative

Had the value increased

- For example:
  - V_0 (beginning value) = \$100
  - V_E (ending value) = \$110
- The investor's position increased in value, from \$100 to \$110. So, our return is positive:

$$R = \frac{110 - 100}{100} = 10\%$$

- Our positive return reflects our desired outcome: that the share price increased in value.

Now, let's consider this from a short seller's perspective

- Our scenario:
  - V_0 (beginning value) = -$100 [negative because we're short]
  - V_E (ending value) = -$90
- The investor's position increased in value, from -$100 to -$90.
- As a short-seller, <u>this is</u> what we want to happen, right?

Calculating the return on our short position

- Let's use our standard Modified Dietz formula

$$r = \frac{V_E - V_0 - \sum C_i}{V_0 + \sum W_i C_i}$$

- Since there are no cash flows, we can simplify it:

$$r = \frac{V_E - V_0}{V_0}$$

Calculating the return on our short position

- We now plug in our values $R = \frac{V_E - V_0}{V_0} = \frac{-90-(-100)}{-100} = -10\%$

- Does this make any sense?
- We made $10 a share on our short position, since the share price dropped from $100 to $90
- And yet, we get a negative return?

Let's consider this scenario

- Our scenario:
  - V_0 (beginning value) = -$100
  - V_E (ending value) = -$110
- The share price went up, so our investor's position decreased in value, from -$100 to -$110.
- We're down $10 per share.
- As a short-seller, this is not what we want to happen
- What's our return?

Calculating the return on our short position

- We now plug in our values $R = \frac{V_E - V_0}{V_0} = \frac{-110 - (-100)}{-100} = 10\%$

- Does this make any sense?
- We lost $10 a share on our short position, since the share price increased from $100 to $110
- And yet, we get a positive return?

A thought!
Let's take the absolute value of the denominator

- Our first scenario: $R = \frac{V_E - V_0}{|V_0|} = \frac{-90-(-100)}{100} = 10\%$

- And our second: $R = \frac{-110-(-100)}{|-100|} = -10\%$

- Don't these results make more sense?

$$Contribution = w_i r_i$$

CONTRIBUTION

$$Contribution = w_i r_i$$

The argument is that what appear to be nonsensical returns are, in fact, correct

- And we will see this when we calculate contribution.

$$Contribution = w_i r_i$$

Calculating contribution

- Our first scenario:

$$R = \frac{V_E - V_0}{V_0} = \frac{-90-(-100)}{-100} = -10\%$$

- Our weight is -20%.
- Plugging our values into our contribution formula:

$$Contribution = w_i r_i = -20\% \times (-10\%) = 2.00\%$$

- Our short position contributed 2.00% to our return
- That is, because the share price dropped in value, we benefitted, and this is shown in contribution

Calculating contribution

- Our second scenario:

$$R = \frac{V_E - V_0}{V_0} = \frac{-110 - (-100)}{-100} = 10\%$$

- Again, our weight is -20%.
- Plugging our values into our contribution formula:

$$Contribution = w_i r_i = -20\% \times 10\% = -2.00\%$$

- Our short position cost our return 2.00%
- That is, because the share price increased in value, we suffered, and this is shown in contribution

LET'S CONSIDER A

CASE STUDY

THE SPRATS

The Sprats

- Jack Sprat, and his wife Jane, could not agree on anything
- When they dine out, they only order one steak between them, since he would only eat the lean meat, while she would only eat the fat.
- He's a conservative; she's a liberal.
- He prefers air travel, while she prefers to travel by train.
- When it comes to the investment market, they have opposing views: what he likes, she shorts, and vice versa

The Sprats' Recent Positions & Returns

	Jack's Portfolio				Jane's Portfolio			
	AMZN	**APPL**	**MSFT**	**XON**	**AMZN**	**APPL**	**MSFT**	**XON**
Starting Price	225.00	200.00	500.00	110.00	225.00	200.00	500.00	110.00
Strategy	Long	Long	Short	Short	Short	Short	Long	Long
# Shares	100.00	100.00	-100.00	-100.00	-100.00	-100.00	100.00	100.00
Starting Value	22,500	20,000	-50,000	-11,000	-22,500	-20,000	50,000	11,000
Ending Price	247.50	190.00	525.00	106.70	247.50	190.00	525.00	106.70
Ending Value	24,750	19,000	-52,500	-10,670	-24,750	-19,000	52,500	10,670
$\text{Return}_{\text{LongFormula}}$	10.00%	-5.00%	5.00%	-3.00%	10.00%	-5.00%	5.00%	-3.00%

- For the first time in a long time, they agree on something:
  The returns on their short positions make no sense!

A review of their short returns: first, Jack

	Jack's Portfolio			Jane's Portfolio	
	MSFT	XON		AMZN	APPL
Starting Price	500.00	110.00		225.00	200.00
Strategy	Short	Short		Short	Short
# Shares	-100.00	-100.00		-100.00	-100.00
Starting Value	-50,000	-11,000		-22,500	-20,000
Ending Price	525.00	106.70		247.50	190.00
Ending Value	-52,500	-10,670		-24,750	-19,000
$Return_{LongFormula}$	5.00%	-3.00%		10.00%	-5.00%

- Jack shorted Exxon Mobil, whose value dropped by 3%; but instead of being rewarded with a positive return, it's negative.
- He also shorted Microsoft, whose value increased by 5%. He expected to see this reflected as a negative return, but instead he sees a positive one.

A review of their short returns; and now, Jane

	Jack's Portfolio		Jane's Portfolio	
	MSFT	XON	AMZN	APPL
Starting Price	500.00	110.00	225.00	200.00
Strategy	Short	Short	Short	Short
# Shares	-100.00	-100.00	-100.00	-100.00
Starting Value	-50,000	-11,000	-22,500	-20,000
Ending Price	525.00	106.70	247.50	190.00
Ending Value	-52,500	-10,670	-24,750	-19,000
$Return_{LongFormula}$	5.00%	-3.00%	10.00%	-5.00%

- Jane's shorting of Apple should have resulted in a positive sign, since it dropped in value by 5 percent, meaning she was seeing the value of her short position increase; but instead, she's penalized with a return carrying a negative sign.
- And her short position in Amazon, which went in the opposite direction of her bet (by increasing by 10%, meaning a significant "paper loss" for her), carries a positive sign.

Let's hear from their financial advisor

- Frustrated, they called their financial advisor, who informed them that these returns are, in fact, correct; they simply don't appreciate that by using the same formula as is used for their long positions, they are reflecting what is actually happening to the stock.
- They didn't quite get this, saying that their short positions were meant to go in the opposite direction of the stock price.
- The advisor then provided them with a contribution report which she was sure would make this all make sense to Jack and Jane.

The contribution report makes an appearance

The contribution report makes an appearance

	Jack's Contribution Report		
Longs	**Weights**	**Returns**	**Contribution**
AMZN	52.94%	10.00%	5.29%
APPL	47.06%	-5.00%	-2.35%
	100.00%	2.94%	2.94%
Shorts	**Weights**	**Returns**	**Contribution**
MSFT	-81.97%	5.00%	-4.10%
XON	-18.03%	-3.00%	0.54%
	-100.00%	-3.56%	-3.56%

	Jane's Contribution Report		
Longs	**Weights**	**Returns**	**Contribution**
MSFT	81.97%	5.00%	4.10%
XON	18.03%	-3.00%	-0.54%
	100.00%	3.56%	3.56%
Shorts	**Weights**	**Returns**	**Contribution**
AMZN	-52.94%	10.00%	-5.29%
APPL	-47.06%	-5.00%	2.35%
	-100.00%	-2.94%	-2.94%

- Jack could see that his short position in Microsoft, while carrying a positive return, shows a negative contribution effect to the overall short return, while Exxon, which showed a negative return reports a positive contribution effect.
- Jane, too, could see that while the return for Amazon is positive, it detracts from the overall contribution while Apple, which has a negative return, provides a contribution effect.

Now, are Mr. & Mrs. Sprat satisfied?

	Jack's Contribution Report		
Longs	**Weights**	**Returns**	**Contribution**
AMZN	52.94%	10.00%	5.29%
APPL	47.06%	-5.00%	-2.35%
	100.00%	2.94%	2.94%
Shorts	**Weights**	**Returns**	**Contribution**
MSFT	-81.97%	5.00%	-4.10%
XON	-18.03%	-3.00%	0.54%
	-100.00%	-3.56%	-3.56%

	Jane's Contribution Report		
Longs	**Weights**	**Returns**	**Contribution**
MSFT	81.97%	5.00%	4.10%
XON	18.03%	-3.00%	-0.54%
	100.00%	3.56%	3.56%
Shorts	**Weights**	**Returns**	**Contribution**
AMZN	-52.94%	10.00%	-5.29%
APPL	-47.06%	-5.00%	2.35%
	-100.00%	-2.94%	-2.94%

- Actually, no!
- But why not?

They're still frustrated …

- The returns on their short positions still make no sense; they are far from intuitive, and run in the opposite direction of their expectations.
- They rarely, if ever, look at a contribution report, but chiefly rely on their returns to gauge how their investments are doing.
- What they and most investors understand, or at least think they understand, is rates of return.
  - When a "bet" pays off, they expect to see a positive return; when it doesn't, they expect to be penalized with a negative return.
  - Seeing the complete opposite for their short positions is surprising, confusing, and frustrating for them.

What they want to see

- They asked the advisor a rather simple question: why can't the returns be as they would expect:
  - For Jack: instead of +5%, show −5% for Microsoft (whose value dropped, as he had hoped), and instead of −3%, report +3% for Exxon (whose value went in the opposite direction of what he wanted)
  - For Jane: instead of +10%, report −10% for Amazon (whose value increased, thus providing her with an unrealized loss), and instead of −5%, show +5% for Apple, whose value dropped as she had been betting on)
- and provide contribution independently, with the results the as is typically shown [and as we previously saw]?
- Surely this can be done.

My response

- First, we're not talking about contribution: we're talking about an investment's return.
- It seems nonsensical to tell an investor that when a security's price, that they have shorted, drops in value, their return should be negative, especially since the drop in price is what they're wagering on, so their expectation is to see a positive return.
- Likewise, if that price goes up in value, which is completely in conflict with what they want to see, they don't expect to see a positive return, which implies success.
- Rather, they are expecting to see a negative result.

My response

- If I short a stock, and it drops in value, and I am making money on it: that's a positive event, not a negative one.
- If I short a stock, and its price increases, then I'm losing money, so why would I want to see this shown as a positive event, since it's costing me money.
- When it comes to contribution,
  - First, it is not reported nearly as often as returns
  - And frequently, only the "winners" and "losers" are shown
  - And even if all securities are, we can adjust the short returns so they yield the contribution results we expect

It’s rather simple

- When calculating the return on a short position, use the absolute value of the denominator
- When calculating the return for contribution, don’t use absolute value
- This way, the results of both will make sense.

What do others think?

What do others think?

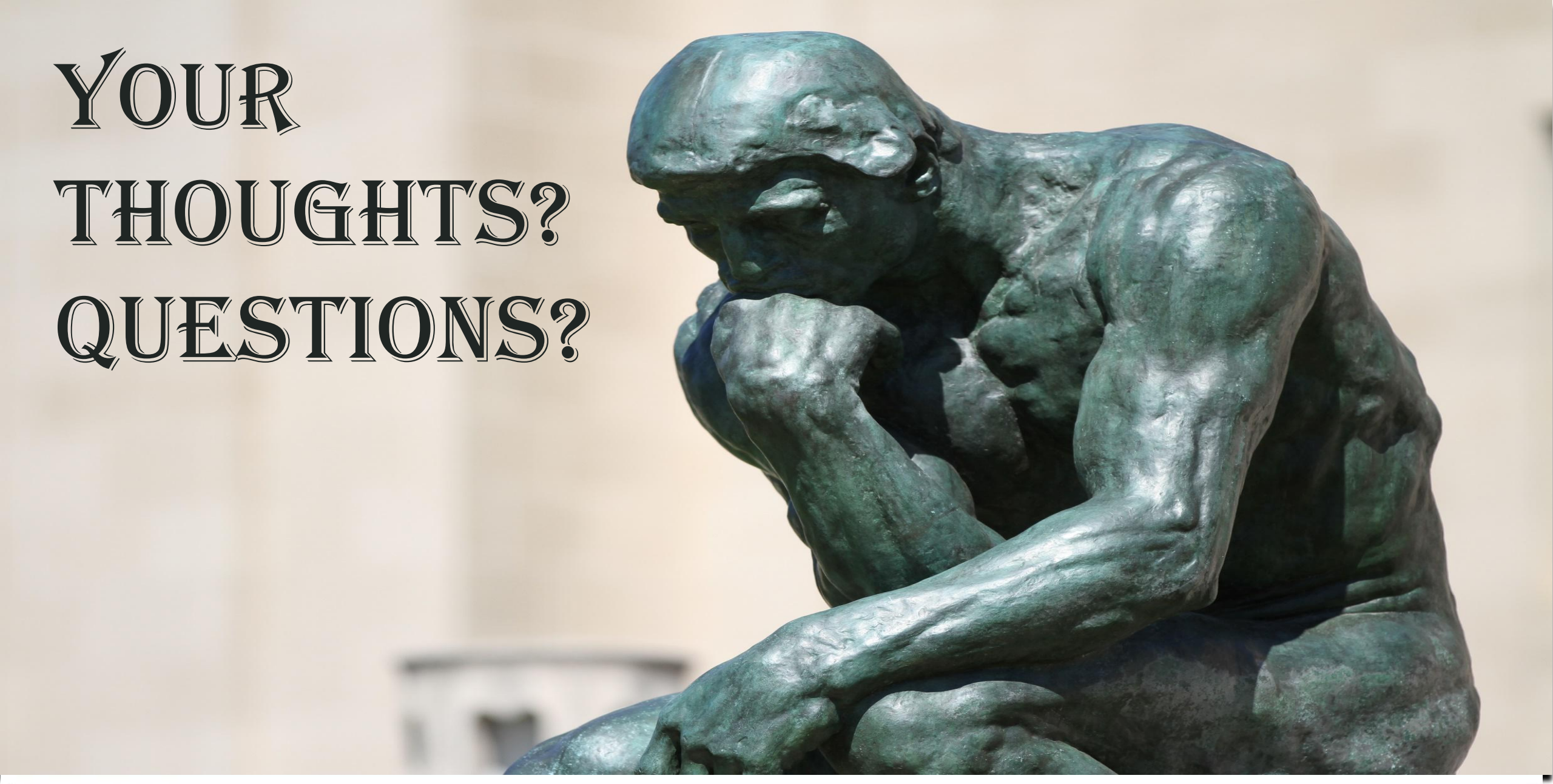
- Three groups were surveyed:
  - Members of the Performance Measurement Forum and Asset Owners' Round Table
  - Software vendors
  - The LinkedIn community

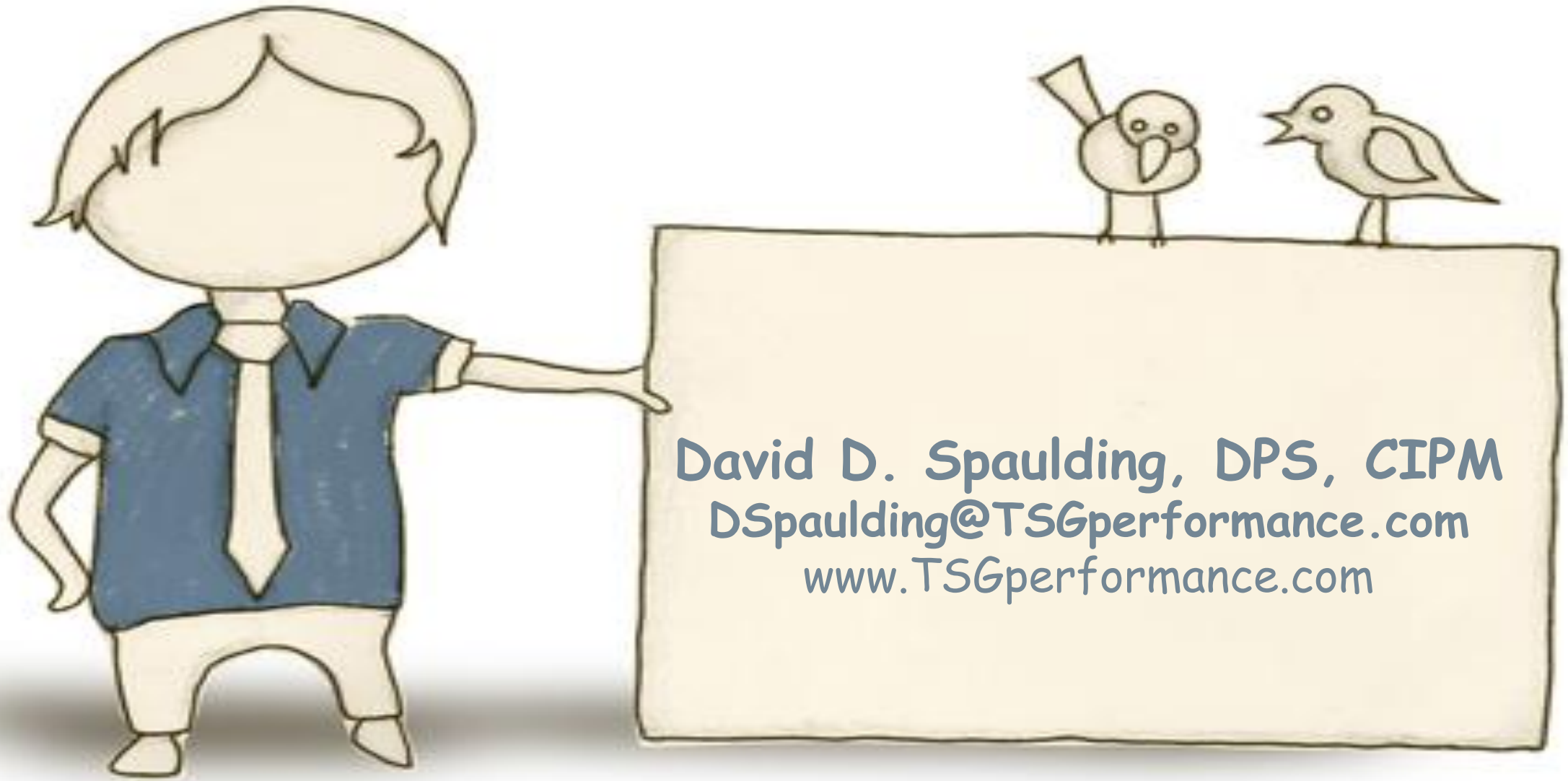
	Forum/AORT	Software Vendors	LinkedIn
Favor Using Absolute Value	38.5%	42.9%	84.7%
Favor Using Same Formula as Longs	61.5%	57.1%	15.3%
Number of Participants	13	14	72

SUMMARY

- **There's enough confusion: why make it more so with non-sensical results**
- **Contribution shouldn't decide how our returns should be calculated and reported**

Your thoughts? Questions?





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