OVERCONFIDENCE

The Impact of Overconfidence on Financial Decision-making

EE434 SEM1/2022
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Overconfidence & Excessive trading

Overconfident Traders: A Simple Model

Objective: To illustrate that the overconfidence of investors leads to excessive trading

Overconfident Traders: A Simple Model

q_i — individual demand; p — mkt. price; v_i; q_n

The individual demand for a particular security will be a function of the investor's estimate of the security's intrinsic value, v_i.

Let q_n equal the number of shares that an investor would hold if price and value were equivalent.

If value > (<) price, the investor will want to hold more (less) than q_n shares.

if $v_i = p \Rightarrow$ investor will hold q_n

$v_i > p$ (undervalued) $\Rightarrow > q_n$

$v_i < p$ (overvalued) $\Rightarrow < q_n$

Overconfident Traders: A Simple Model

What is the mechanism for individual's value estimation?

When estimating value, an investor uses two items of information:

- his own opinion: an individual's prior estimate of value, v_i^*
- the market price p, which is the weighted average of all investors' opinions.

prior value

mkt price : everyone's opinion

$$v_i = a_i v_i^* + (1 - a_i)p, \qquad 0 \le a_i \le 1$$

a_i↑ overconfidence ↑

v_i is the posterior estimate of value of investor i.

a_i is the weight investor i puts on his prior relative to the market price.

The higher a_i is, the higher is the weight an investor puts on his prior own opinion, hence **the higher level of overconfidence** (e.g. via better-than-average effect/miscalibration).

Overconfident Traders: Individual demand

Suppose the individual demand function is:

$$q_i = q_n + \theta(v_i - p), \quad \theta > 0$$

$v_i = p \Rightarrow q_i = q_n$

$v_i > p \Rightarrow q_i > q_n$

$v_i < p \Rightarrow q_i < q_n$

q_i is investor i's demand and θ is the sensitivity of demand to a **difference** between the posterior value estimate and price.

Hence,

$$q_i = q_n + \theta a_i (v_i^* - p)$$

$$v_i = a_i v_i^* + (1-a_i)p$$

$$q_i = q_n + \theta(v_i - p)$$

$$q_i = q_n + \theta(a_i v_i^* + (1-a_i)p - p)$$

$$q_i = q_n + \theta(a_i v_i^* - a_i p)$$

Individual demand's function :

$$q_i = q_n + \theta a_i (v_i^* - p)$$

$$\frac{\partial q_i}{\partial p} = -\theta a_i$$

$$E_p = \frac{\partial q_i}{\partial p} \cdot \frac{p}{q_i} = -\theta a_i \frac{p}{q_i}$$

Individual inverse demand's function :

$$\theta a_i p = q_n + \theta a_i v_i^* - q_i$$

$$p = \left[\frac{q_n}{\theta a_i} + v_i^*\right] - \frac{1}{\theta a_i} q_i$$

$a_i \uparrow$ (overconfidence level ↑) → the inverse demand fn will be flatter

investor 1
well-calibrated
PC
$q_1 = 100 = q_n$
$a_1 = 0$

investor 2
low overconfidence
LOC
$p = 20 - 0.1 q_2$
$a_2 > 0$

investor 3
high overconfidence
HOC
$p = 15 - 0.05 q_3$
$a_3 > a_2$

Overconfident Traders: Individual demand

From $q_i = q_n + \theta a_i (v_i^* - p)$,

$$\frac{\partial q_i}{\partial p} = -\theta a_i$$

The higher the investor's level of overconfidence, a_i, the more responsive demand is to changes in price.

Overconfident Traders: Price sensitivity

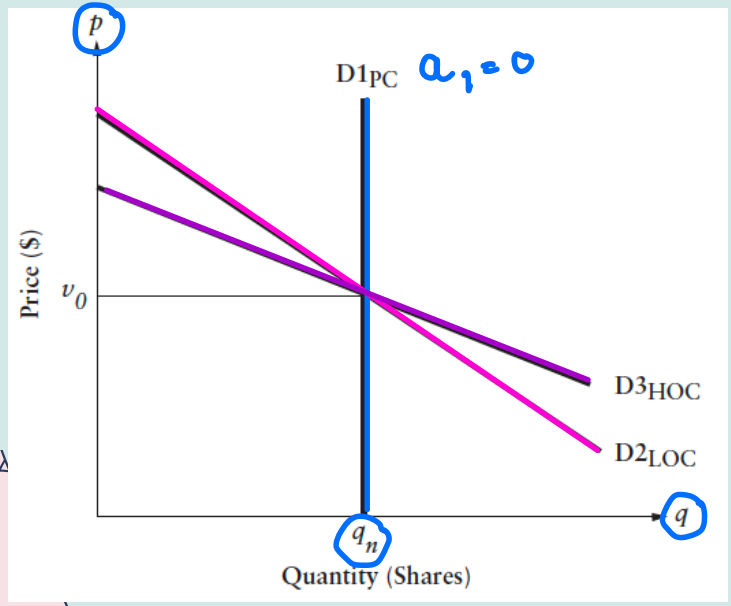
The higher the investor's level of overconfidence (a_i) is, the flatter is the demand curve.

And as a_i moves toward zero, the demand curve becomes close to vertical.

$D1_{PC}$ Demand of a proper-calibrated individual, $a_1 = 0$

$D2_{LOC}$ Demand of a low-overconfidence individual, $a_2 > 0$, who pays *some* attention to her own opinion, i.e. the prior v_2^*

$D3_{LOC}$ Demand of a high-overconfidence individual, $a_3 > a_2$, who pays *most* attention to her own opinion, i.e. the prior v_3^*, and puts less weight on market price than investor 2.



$p = 15 - 0.05 q_3$, $a_3 > a_2$

$p = 20 - 0.1 q_2$, a_2

investor 1	investor 2	investor 3
well-calibrated	low overconfidence	high overconfidence
PC	LOC	HOC
$q_1 = 100 = q_n$	$p = 20 - 0.1 q_2$	$p = 15 - 0.05 q_3$
$a_1 = 0$	$a_2 > 0$	$a_3 > a_2$
$q_1 = 100$	$0.1 q_2 = 20 - p$	$0.05 q_3 = 15 - p$
	$q_2 = 200 - 10p$	$q_3 = 300 - 20p$

Mkt. Demand $Q^D = q_1 + q_2 + q_3$

$= 100 + 200 - 10p + 300 - 20p$

$Q^D = 600 - 30p$; Mkt. Demand for the price range that everyone has demand.

Mkt. Supply $Q^S = 300$

$Q^D = Q^S$

$600 - 30p = 300$

$p^* = 10 \Rightarrow$

$q_1^* = 100$

$q_2^* = 200 - 10(10) = 100$

$q_3^* = 300 - 20(10) = 100$

Benchmark case

What if $v_3^* \uparrow$, ...

What if $a_2 \uparrow$, ...

$$q_{fi} = q_{fn} + \theta a_i (v_i^* - p)$$

Three investor :

$$q_1 = q_{fn} + \theta a_1 (v_1^* - p) \quad (1.)$$

$$q_2 = q_{fn} + \theta a_2 (v_2^* - p) \quad (2.)$$

$$q_3 = q_{fn} + \theta a_3 (v_3^* - p) \quad (3.)$$

Mkt. Demand :

$$Q^D = q_1 + q_2 + q_3$$

$$Q^D = 3q_{fn} + \theta a_1 v_1^* + \theta a_2 v_2^* + \theta a_3 v_3^* - (\theta a_1 + \theta a_2 + \theta a_3) p$$

$$Q^D = 3q_{fn} + \theta (a_1 v_1^* + a_2 v_2^* + a_3 v_3^*) - \theta (a_1 + a_2 + a_3) p$$

Mkt. Supply : $\underline{Q^S}$

Mkt. equilibrium : $Q^D = Q^S$

$$3q_{fn} + \theta (a_1 v_1^* + a_2 v_2^* + a_3 v_3^*) - \theta (a_1 + a_2 + a_3) p = \underline{Q^S}$$

$$p^* = \frac{3q_{fn} + \theta (a_1 v_1^* + a_2 v_2^* + a_3 v_3^*) - \underline{Q^S}}{\theta (a_1 + a_2 + a_3)}$$

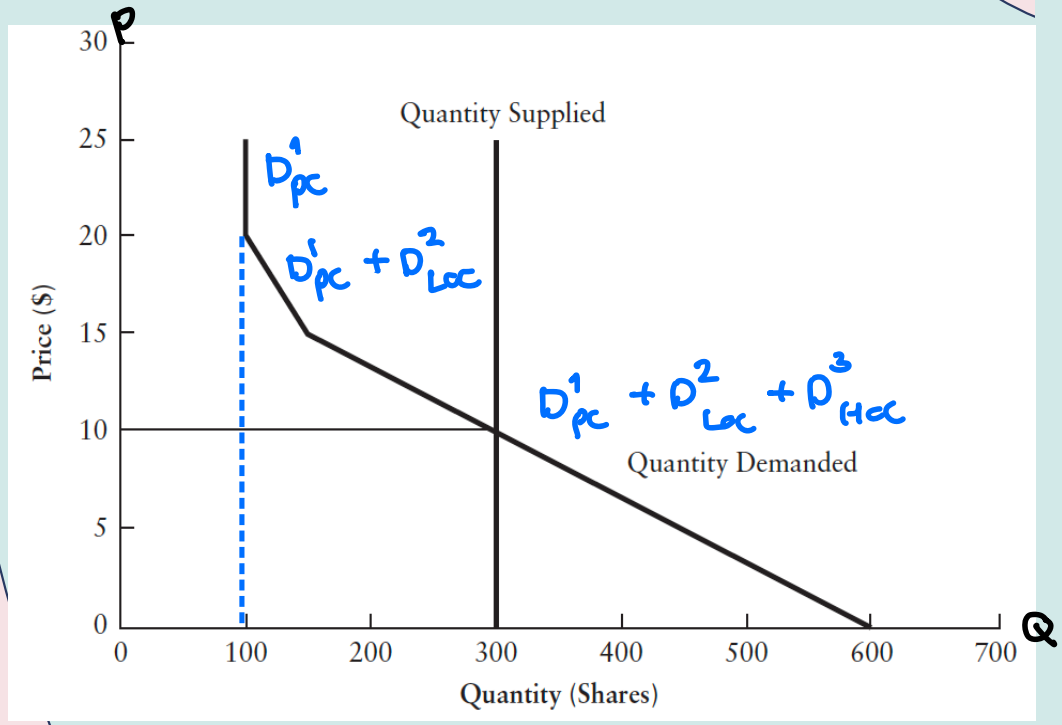
- Highly overconfident person can drive mkt. price.

- equilibrium price is a function of prior values & level of overconfidence of every investor
- quality of mkt. price in reflecting fundamental value

Overconfident Traders: Market Demand & Market Supply

Assume Aggregate Supply = 300

Mkt price is a function of individuals' priors.



$$D1_{PC} : q_1 = 100$$
$$D2_{LOC} : p = 20 - 0.1q_2$$
$$D3_{LOC} : p = 15 - 0.05q_3$$
$$p^* = 10, q_n^* = q_1 = q_2^* = q_3^* = 100$$

Overconfident Traders: Change in the prior value

Periodically, investors reassess their prior value estimates.
Many will do so when material news arrives.

Let's suppose that one investor alters her value estimate after a thorough (second) analysis of the stock.

Specifically, suppose Investor 2 believes that the security has become more valuable.

We operationalize this by a $5 parallel shift in the demand curve of Investor 2.

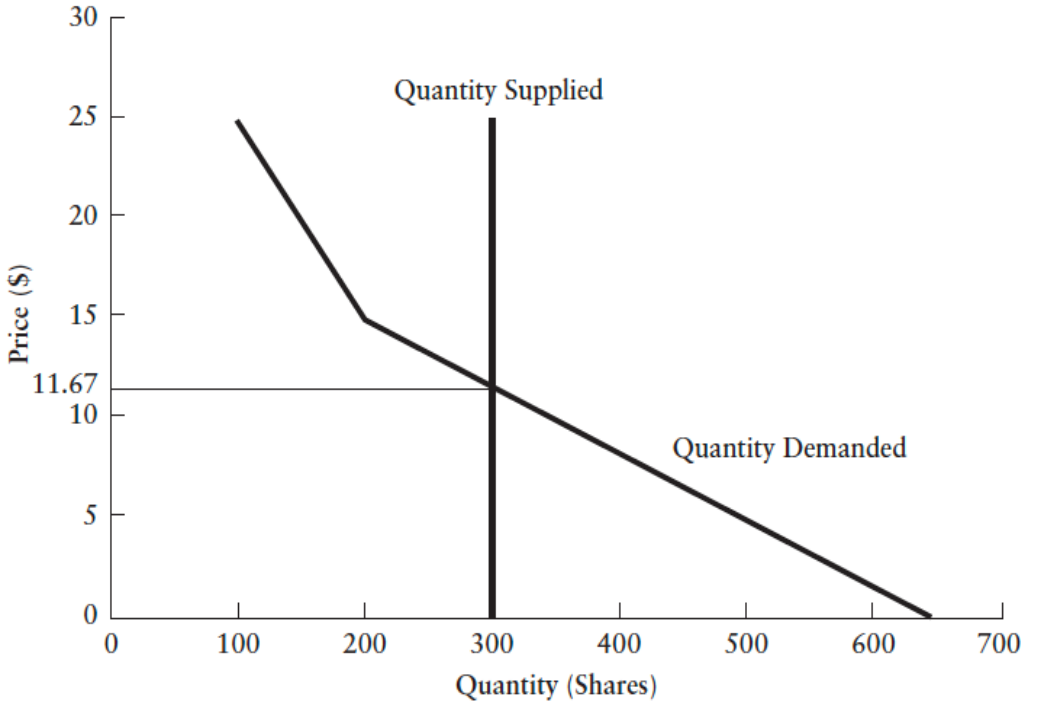
That is, v_2^* increases by $5.

The new demand curve for investor 2 is:

$$D2'_{LOC} : p = 25 - 0.1q_2$$

Overconfident Traders: Change in the prior value

The updated aggregate demand curve and the new market equilibrium



Market price increases.
Equilibrium quantity share of investor 2 increases.
Equilibrium quantity share of investor 3 decreases.

$$q_1^* = 100, q^{*\prime}{}_2 = 133.3, q^{*\prime}{}_3 = 66.6$$

Market price is a function of weighted average of the three prior value estimates.

Overconfident Traders:
Change in the prior value & Change in overconfidence level

If investor Investor 2 is both more overconfident than before and she also increases her estimate of value by $5.

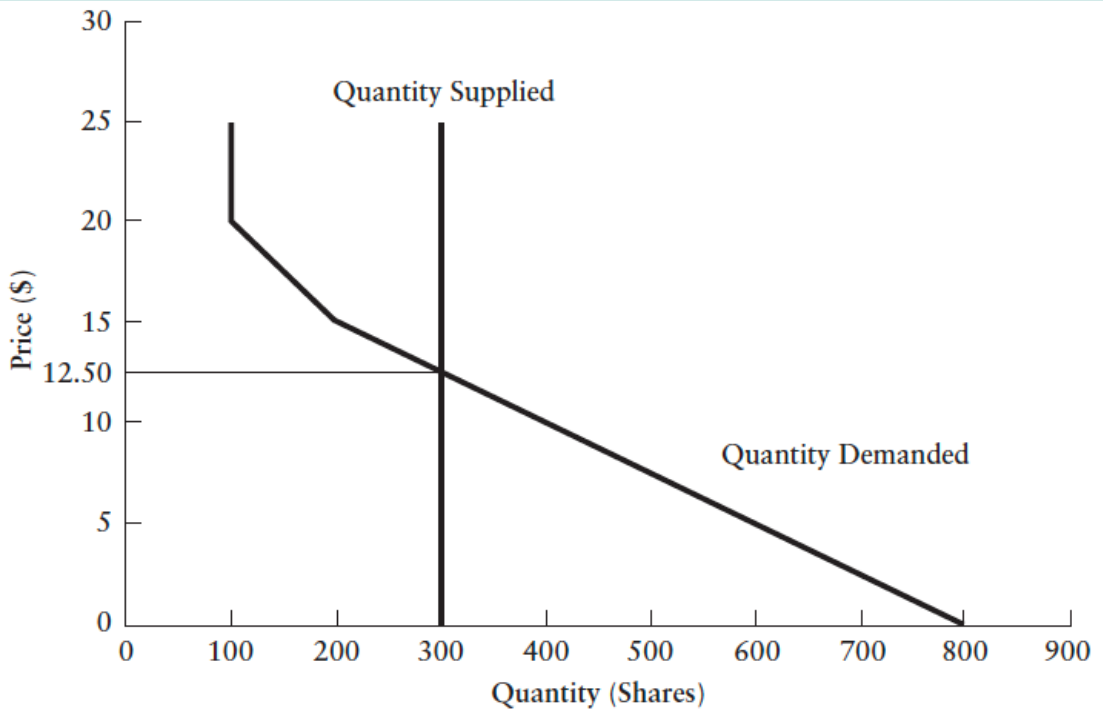
The new demand curve for investor 2 is:

$$D2''_{LOC} : p = 20 - 0.05q_2$$

Investor 2 with the extreme view (high valuation of security), being more overconfident than before, is more willing to trust her opinion and transact on this basis.

Overconfident Traders:
Change in the prior value & Change in overconfidence level

The updated (again) aggregate demand curve and the new(er) market equilibrium



Market price increases (even more).
Equilibrium quantity share of investor 2 increases.
Equilibrium quantity share of investor 3 decreases.

$$q_1^* = 100, q^{*\prime}{}_2 = 150, q^{*\prime}{}_3 = 50$$

The price is still a weighted average of the three value estimates, but the investor with the extreme view exerts a greater influence on it because of her willingness to trade more.

Overconfident Traders:
Change in the prior value & Change in overconfidence level

✓ The price volatility increases with overconfidence.

The same value revision led to a greater price change when one of the traders was more overconfident.

✓ Overconfidence induces trading activity.

Suppose all investors begin with 100 shares (the initial situation).
In Scenario 1, Investor 2, increases her holding to 133.33 shares, which is accommodated by a 33.33 sale by Investor 3.
In Scenario 3, Investor 2 increases her holding to 150 shares, for a net purchase of 50 shares, which is accommodated by a 50 share sale by Investor 3.

Volume, Volatility, Price, and Profit When All Traders Are Above Average (Odean, 1998)

- Expected trading volume increases as overconfidence increases.
- Price volatility increases with overconfidence.
- Overconfidence worsens the quality of prices, which means they are less likely to be accurate estimates of value.

  Divergent views sometimes receive a lot of weight if the trader in question is well capitalized and overconfident.

Odean, T., 1998, "Volume, volatility, price and profit when all traders are above average," Journal of Finance 53, 1887–1934.

Volume, Volatility, Price, and Profit When All Traders Are Above Average (Odean, 1998)

- Overconfident traders have lower expected utility than do those who are properly calibrated.

Overconfident traders hold underdiversified portfolios.

Individual investors, those who trade more actively fare worse than those who trade less (because of the cost of trading) (Barber&Odean, 2000).

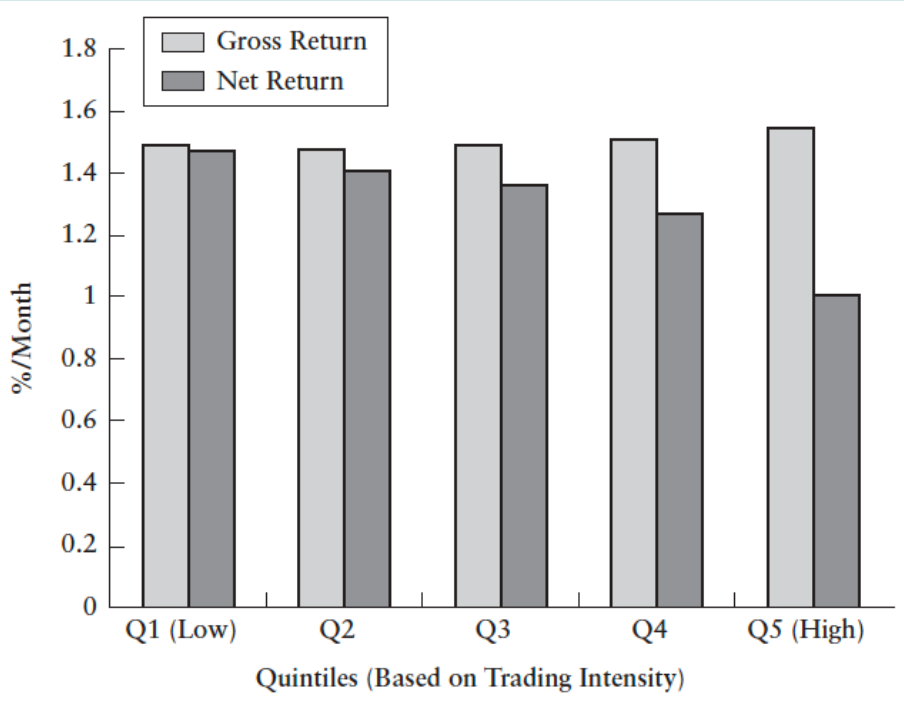
- Overconfident traders can cause markets to:

(1) underreact to the information of rational traders;
(2) underreact to abstract, statistical, and highly relevant information
(3) overreact to salient, anecdotal, and less relevant information

Odean, T., 1998, "Volume, volatility, price and profit when all traders are above average," Journal of Finance 53, 1887–1934.

Barber, B.M. and Odean, T. (2000), Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. The Journal of Finance, 55: 773-806.

Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors (Barber&Odean, 2000)



Was all this trading worthwhile?
Was it based on superior information, or was it based on the perception of superior information?

While the additional trading did lead to a very slight improvement in gross performance, net performance suffered.

Barber, B.M. and Odean, T. (2000), Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. The Journal of Finance, 55: 773-806.

Sensation seeking?

- Mark Grinblatt and Matti Keloharju documented that trading activity, based on a comprehensive dataset of equity trading data in Finland, is positively related to overconfidence and sensation seeking.

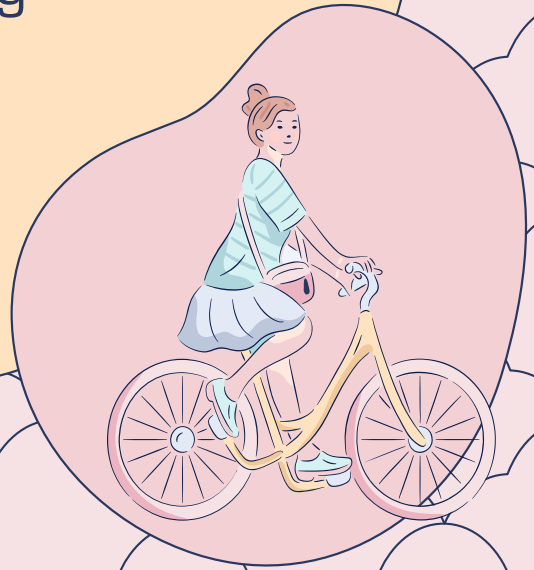
GRINBLATT, M. and KELOHARJU, M. (2009), Sensation Seeking, Overconfidence, and Trading Activity. The Journal of Finance, 64: 549-578.

Sensation seeking?

- Sensation seeking is a personality trait whose four dimensions are:
  - thrill and adventure seeking (i.e., a desire to engage in thrilling and even dangerous activities);
  - experience seeking (i.e., the desire to have new and exciting experiences, even if illegal);
  - disinhibition (i.e. poor self-regulation or the inability to control oneself);
  - boredom susceptibility (i.e., dislike of repetition of experience).

GRINBLATT, M. and KELOHARJU, M. (2009), Sensation Seeking, Overconfidence, and Trading Activity. The Journal of Finance, 64: 549-578.

Underdiversification and Excessive Risk Taking



Underdiversification

Goetzmann & Kumar (2008) shows that U.S. individual investors hold under-diversified portfolios, where the level of under-diversification is greater among investors who are:

- younger,
- low-income,
- less-educated, and
- less financially sophisticated investors (less likely to trade options, to engage in short-selling, and have less investment experience).

Goetzmann, W. N., and A. Kumar, 2005, "Equity portfolio diversification," Review of Finance 12, 433–463.

Underdiversification

The level of under-diversification correlates with:

- over-confidence,
- trend-following behavior,
- home bias
- the overweighting of stocks with higher volatility and higher skewness

Only small subset of investors under-diversify because of superior information.

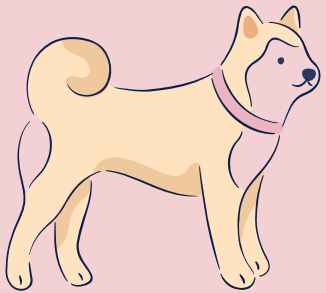
Goetzmann, W. N., and A. Kumar, 2005, "Equity portfolio diversification," Review of Finance 12, 433–463.

Underdiversification

Underdiversification is virtually the same as to taking on risk for which there is no apparent reward.

Goetzmann, W. N., and A. Kumar, 2005, "Equity portfolio diversification," Review of Finance 12, 433–463.

Disposition effect and Overconfidence

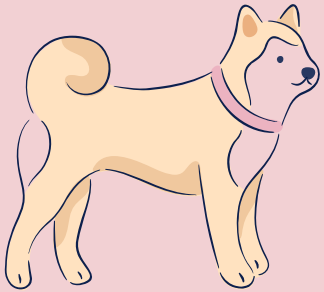


Disposition effect

- Disposition effect might also be associated with overconfidence.

- An overconfident trader:
  - overly wedded to prior beliefs,
  - may discount negative public information that pushes down prices,
  - thus holding on to losers and taking on excessive risk.

THANKS!



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