# Consistent Good News and Inconsistent Bad News

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# FAKE NEWS!

Charles Babbage, *Reflections on the Decline of Science in England* (1830)

- Hoaxing: "Such frauds are far from justifiable; the only excuse which has been made for them is, when they have been practised on scientific academies which had reached the period of dotage."
- Forging: "differs from hoaxing, inasmuch as in the latter the deceit is intended to last for a time, and then be discovered, to the ridicule of those who have credited it; whereas the forger is one who, wishing to acquire a reputation for science, records observations which he has never made."
- Trimming: "consists in clipping off little bits here and there from those observations which differ most in excess from the mean, and in sticking them on to those which are too small."
- Cooking: "...make multitudes of observations, and out of these to select those only which agree, or very nearly agree"

# Selective news distortion

Global warming skeptic

- More effective to downplay evidence for global warming?
- Or to exaggerate evidence against global warming?

Partisan pollster

- More persuasive to make favorable poll more favorable?
- Or to make unfavorable poll less unfavorable?

Manager of multiple projects

- Put more effort into helping better projects?
- Or more effort into shoring up weaker projects?

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# News is more convincing when it is more consistent

How much we update our beliefs upon seeing news/data depends on how precise the data is

- We are often unsure of the amount of noise in the data and estimate noise using the data sample itself
- Seems more consistent data should be from a less noisy process

Overall things going well

- Want good signals to look more reliable – want more consistency
- So focus attention on shoring up worst news

Overall things going poorly

- Want bad signals to seem less reliable – want less consistency
- So focus attention on boosting best (or least bad) news

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# Overview of presentation

- More consistent news $\Longrightarrow$ news mean is more precise signal of state
- More precise signal $\Longrightarrow$ stronger updating about state
- Mean-variance news preferences (MVNP)
- What distortions are most persuasive with MVNP?
- Equilibrium when distortion is anticipated
- Applications and extensions
- Explanation for some behavioral biases?
- Empirical application to corporate earnings

# Model framework

True state of the world $q$ is uncertain

- Prior $f(q)$ known by sender and receiver
- Prior estimate is $\mu = E[q]$

Sender learns signals (news) $x = (x_1, ..., x_n)$, with $x_i = q + \varepsilon_i$

- Sender may or may not know $q$
- Both know noise iid, $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$
- But variance of noise uncertain, $\sigma_\varepsilon \sim H$

News has mean $\overline{x}$, s.d. $s$

- Receiver action increasing in $E[q|\overline{x}, s]$
- Sender wants a higher action by receiver
- Can distort $x$ subject to constraints

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# Does sender want higher or lower $s$?

If news is good, $\overline{x} > \mu$, want the news to be more persuasive

- Lower $s$ should imply $\overline{x}$ is more precise signal of $q$
- More precise signal of $q$ should raise $E[q|\overline{x}, s]$ more

If news is bad, $\overline{x} < \mu$, want the news to be less persuasive

- Higher $s$ should imply $\overline{x}$ is less precise signal of $q$
- Less precise signal of $q$ should lower $E[q|\overline{x}, s]$ less

Prove these intuitions hold for symmetric, logconcave $f$

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- And want higher $s$ (less consistency) for bad news

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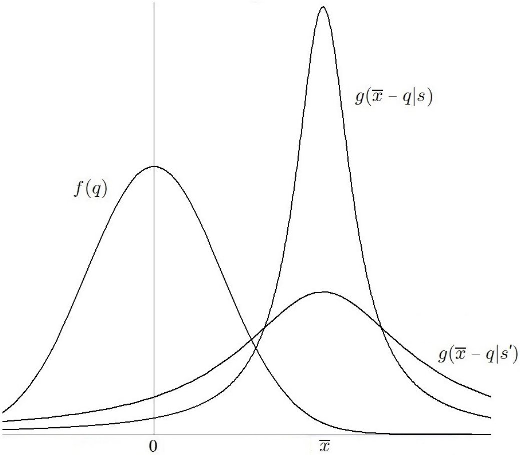


Prior and news distributions

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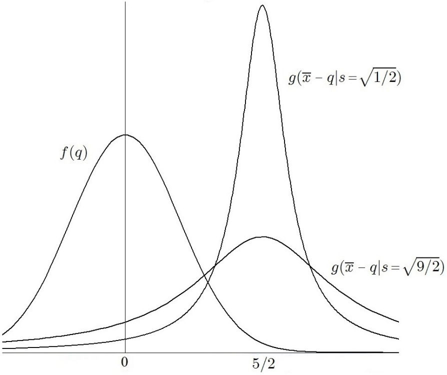
$x = (1,4)$ or $x = (2,3)$ better?

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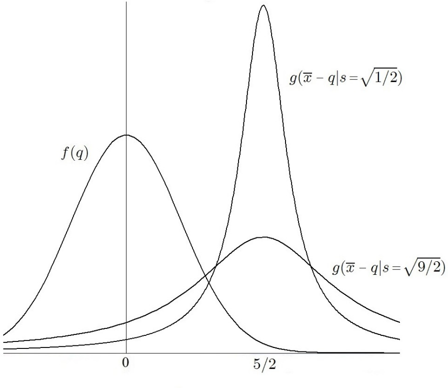


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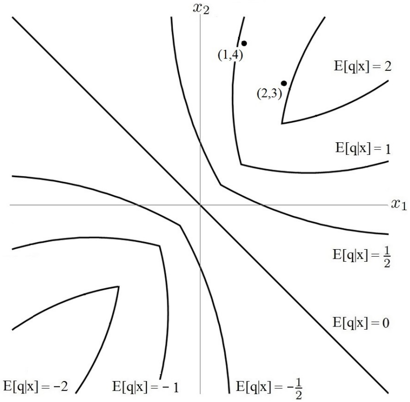
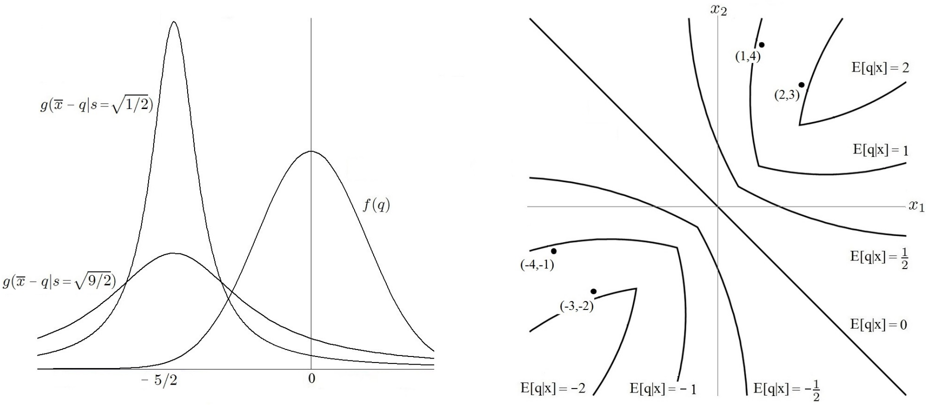



b) Posterior mean

# $f \sim N(0,2), h = 1/\sigma_\varepsilon^2, n = 2$

$x = (-4, -1)$ or $x = (-3, -2)$ better?




a) Prior and news distributions

b) Posterior mean

# Does lower $s$ imply $\overline{x}$ is more precise signal of $q$?

News distribution can be ordered by "Uniform Variability"

$$g(\overline{x}-q|s) = \int_0^\infty \frac{1}{\left(\sigma_\varepsilon\sqrt{2\pi}\right)^n} e^{-\frac{ns^2+n(\overline{x}-q)^2}{2\sigma_\varepsilon^2}} dH(\sigma_\varepsilon)$$

$g(\overline{x}-q|s') \succ_{UV} g(\overline{x}-q|s)$ if $g(\overline{x}-q|s)/g(\overline{x}-q|s')$ rises then falls

- $g(\overline{x}-q|s) \succ_{MLR} g(\overline{x}-q|s')$ below mode
- $g(\overline{x}-q|s') \succ_{MLR} g(\overline{x}-q|s)$ above mode

**Lemma (Consistency implies precision)**

*Suppose for a given $q$ that $x_i = q + \varepsilon_i$ for $i = 1, ..., n$ where i.i.d. $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$ and $\sigma_\varepsilon^2$ has independent non-degenerate distribution $H$. Then $g(\overline{x}-q|s') \succ_{UV} g(\overline{x}-q|s)$ for $s' > s$.*

# Does more precise signal $\overline{x}$ have more effect on $E[q|\overline{x}, s]$?

Requires some conditions:

- Already have symmetry and quasiconcavity of $g$ from normal $\varepsilon_i$
- And have uniform variability ordering that implies MLR dominance on either side of mode of $g$
- Additionally assume $f$ is symmetric and logconcave

Strong conditions but need symmetry and quasiconcavity of $f$ and $g$ just to ensure $\overline{x}' > \overline{x}$ implies $E[q|\overline{x}', s] \geq E[q|\overline{x}, s]$ (Chambers and Healy, 2012)

**Lemma (Precision implies strength)**

*Suppose $g(q-y|\rho)$ is a symmetric quasiconcave density with support on the real line where $g(q-y|\rho') \succ_{UV} g(q-y|\rho)$ for $\rho' > \rho$, and $f(q)$ is independent, symmetric, and logconcave with support on the real line. Then $E[q|y,\rho'] > E[q|y,\rho]$ if $y < \mu$; $E[q|y,\rho'] = E[q|y,\rho]$ if $y = \mu$; and $E[q|y,\rho'] < E[q|y,\rho]$ if $y > \mu$.*

# Putting these two results together...

**Proposition (Consistency implies strength)**

*Suppose for a given $q$ that $x_i = q + \varepsilon_i$ for $i = 1, ..., n$ where i.i.d. $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$ and $\sigma_\varepsilon^2$ has independent non-degenerate distribution $H$, and $f(q)$ is independent, symmetric, and logconcave with support on the real line. Then $\frac{d}{ds}E[q|\overline{x}, s] > 0$ if $\overline{x} < \mu$; $\frac{d}{ds}E[q|\overline{x}, s] = 0$ if $\overline{x} = \mu$; and $\frac{d}{ds}E[q|\overline{x}, s] < 0$ if $\overline{x} > \mu$.*

# Mean-variance news preferences for sender

If sender payoff $U$ is increasing function of $E[q|\overline{x}, s]$ then Prop 1 implies

$$\begin{aligned} U_s(\overline{x}, s) &> 0 \text{ for } \overline{x} < \mu \\ U_s(\overline{x}, s) &= 0 \text{ for } \overline{x} = \mu \\ U_s(\overline{x}, s) &< 0 \text{ for } \overline{x} > \mu \end{aligned} \tag{MVNP}$$

Going forward assume $U(\overline{x}, s)$ satisfies (MVNP)

- Showed holds if $U$ is increasing function of $E[q|\overline{x}, s]$
- Will show holds if $U$ is increasing function of $\Pr[q > \mu|\overline{x}, s]$

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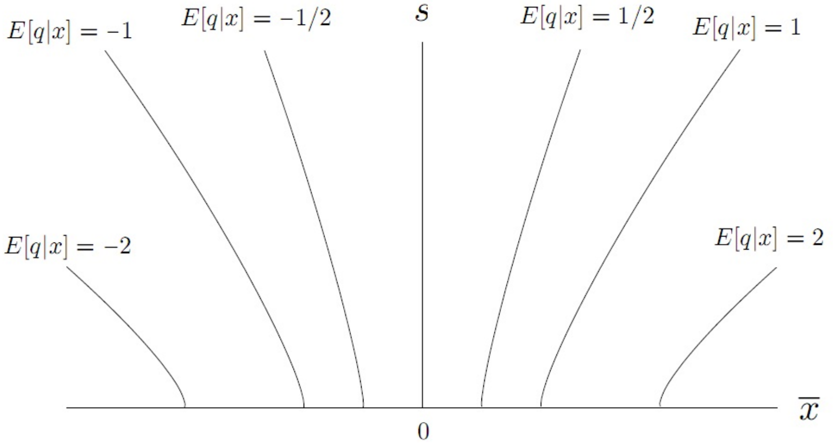

# What distortions benefit sender the most?

$$\frac{d\overline{x}}{dx_i} = \frac{1}{n}, \quad \frac{ds}{dx_i} = \frac{x_i - \overline{x}}{(n-1)s}$$

- Raising any news increases $\overline{x}$ the same
- Raising the lowest news decreases $s$ the most
- Raising the best news increases $s$ the most
- So raise lowest if $\overline{x} > \mu$ and highest if $\overline{x} < \mu$

**Proposition (Persuasiveness)**

*For $U$ satisfying (MVNP) and $x_i < x_j$, $\frac{dU(\overline{x},s)}{dx_i} \geq \frac{dU(\overline{x},s)}{dx_j}$ if $\overline{x} \geq \mu$, and $\frac{dU(\overline{x},s)}{dx_i} \leq \frac{dU(\overline{x},s)}{dx_j}$ if $\overline{x} \leq \mu$.*

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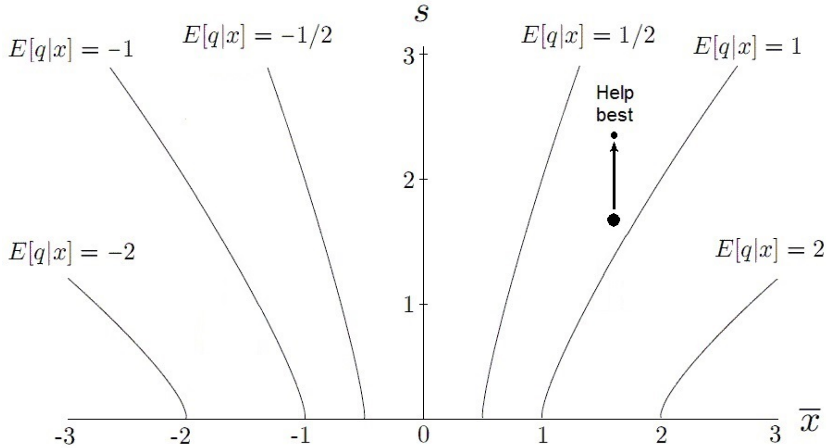
# Suppose can distort news but mean is the same

Good news: Help best at expense of worst?



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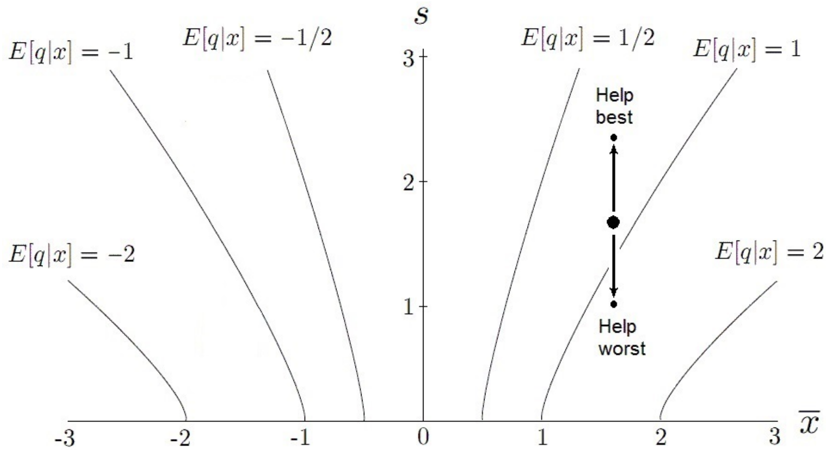

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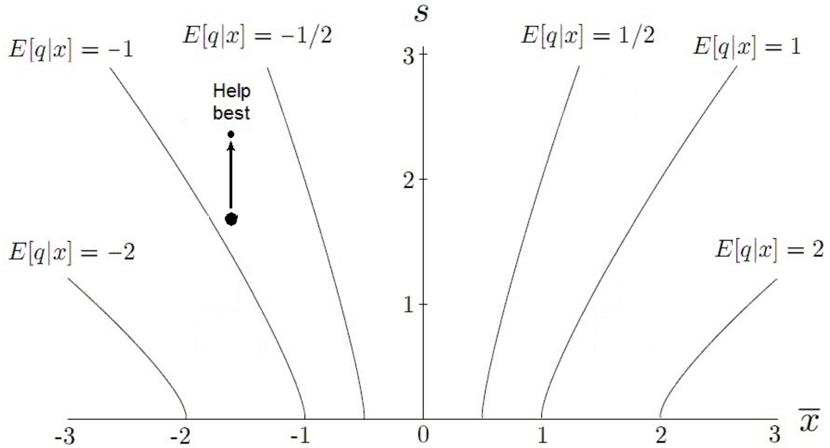

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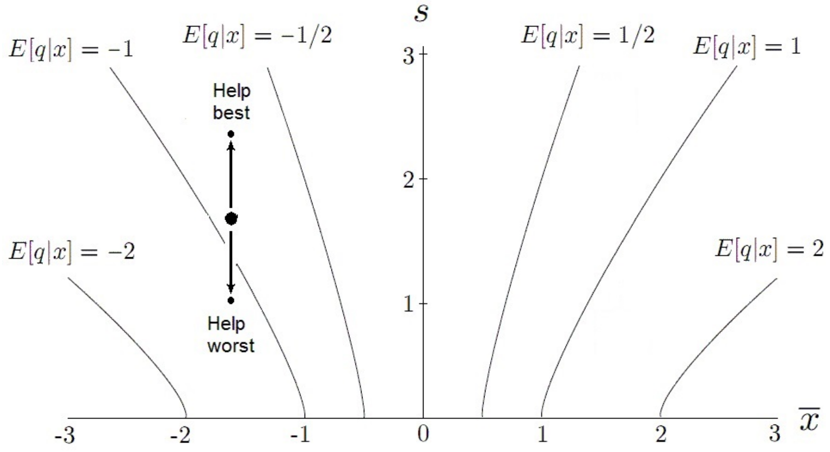
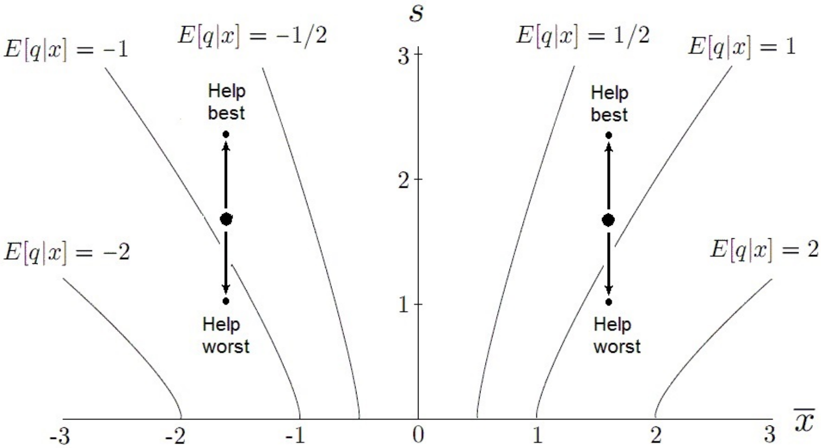


# Suppose can distort news but mean is the same

Help best of the bad news, help worst of the good news



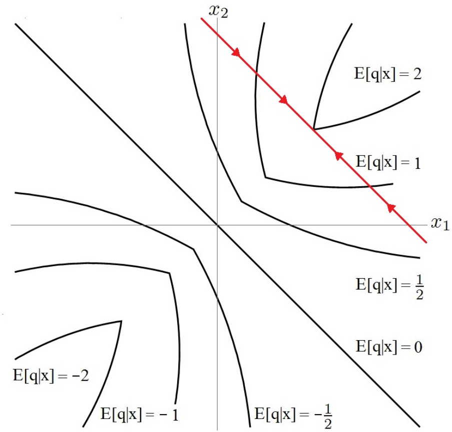
# News distortion subject to constraints

First suppose receivers are naive

- Sender reports $\widetilde{x}$
- Receiver believes $x = \widetilde{x}$
- Distortion from $x$ to $\widetilde{x}$ is costless
- Constant mean constraint, $\sum_i \widetilde{x}_i - x_i = 0$
- Maximum distortion $d$ constraint, $\sum_i |\widetilde{x}_i - x_i| \leq d$
- Distributions are common knowledge

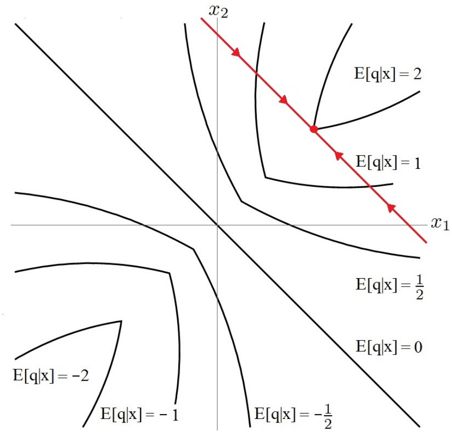
Suppose $d = 1, \overline{x} = 2$

$x_2 - x_1 \geq d$ set $(\widetilde{x}_1, \widetilde{x}_2) = (x_1 + d/2, x_2 - d/2)$



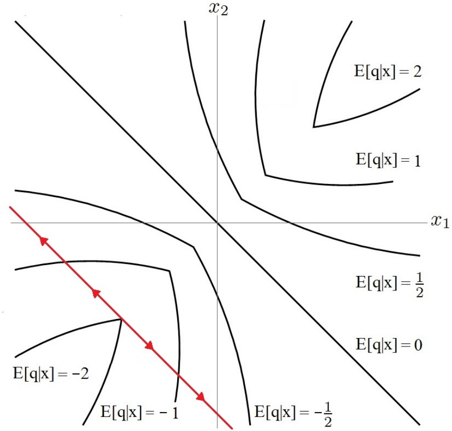
Suppose $d = 1, \overline{x} = 2$

$x_2 - x_1 < d$ set $(\widetilde{x}_1, \widetilde{x}_2) = (\overline{x}, \overline{x})$



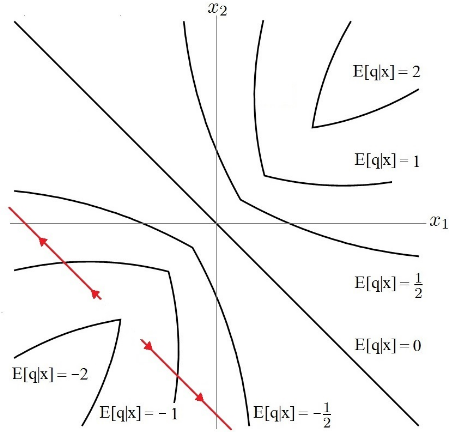
Suppose $d = 1, \overline{x} = -2$

Set $(\widetilde{x}_1, \widetilde{x}_2) = (x_1 - d/2, x_2 + d/2)$

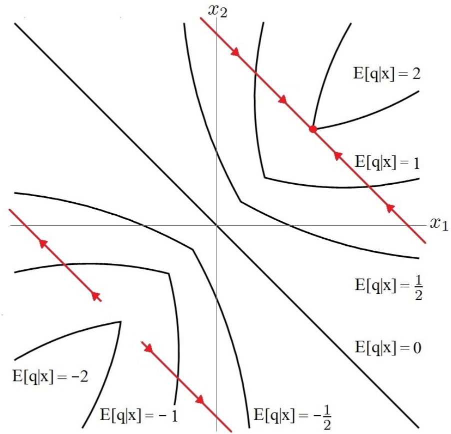


Suppose $d = 1, \overline{x} = -2$

Never observe $|\widetilde{x}_1 - \widetilde{x}_2| < d$



# Suppose $d = 1$



# What if the receiver has rational expectations (PBE)?

Receiver beliefs based on sender's strategy and distributions if possible
If $\widetilde{x}$ in range where strategy $\widetilde{x}(x)$ is one-to-one

- Invert back true state $x$ from $\widetilde{x}$
- No loss in information

If $\widetilde{x}$ in range where pooling

- Weight the possible types based on distributions
- Some loss in information

If report $\widetilde{x}$ is off the equilibrium path

- Apply D1 refinement – receiver beliefs put all weight on type who would deviate for largest set of rationalizable payoffs

# What if the receiver has rational expectations (PBE)?

For $\overline{x} > \mu$:

- If $\widetilde{x}_2 - \widetilde{x}_1 > 0$ receiver infers $x_2 - x_1 = \widetilde{x}_2 - \widetilde{x}_1 + d$
  - Inferred difference is bigger from any other feasible report
- If $\widetilde{x}_2 - \widetilde{x}_1 = 0$ receiver infers $x_2 - x_1 \leq d$ (pooling region)
  - Inferred difference is bigger from any other feasible report

For $\overline{x} < \mu$:

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  - Type $\widetilde{x}_2 = \widetilde{x}_1$ is worst off in eq so has most incentive to deviate
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# Optimal sender strategy for naive receiver case is also PBE

For $\overline{x} \leq \mu$ move outlying points further away

- Never observe $\sum_i |\widetilde{x}_i - \overline{x}| < d$

For $\overline{x} > \mu$ move in outlying points, pooling as hit inner points

- Observe all $\widetilde{x}_i = \overline{x}$ if $\sum_i |x_i - \overline{x}| < d$
- If $\sum_i |x_i - \overline{x}| > d$ let $l$ be largest $k$ such that $\sum_{i=1}^{k}(x_k - x_i) \leq d/2$ and let $h$ be smallest $k$ such that $\sum_{i=k}^{n}(x_i - x_k) = d/2$
- Let $\overline{x}_l = x_l + (d/2 - \sum_{i=1}^{l}(x_l - x_i))/l$ and $\overline{x}_h = x_h - (d/2 - \sum_{i=h}^{n}(x_i - x_h))/(n - h + 1)$.

**Proposition (Optimal and equilibrium distortion)**

*(i) Assume the receiver is naive. If $\overline{x} < \mu$ then the sender's optimal strategy is $\widetilde{x}_1 = x_1 - d/2, \widetilde{x}_n = x_n + d/2$, and $\widetilde{x}_i = x_i$ for $i \neq 1, n$. If $\overline{x} > \mu$ then (a) if $\sum_i |x_i - \overline{x}| \leq d$ then $\widetilde{x}_i = \overline{x}$ for all $i$; (b) if $\sum_i |x_i - \overline{x}| > d$ then $\widetilde{x}_i = \overline{x}_l$ for $i \leq l$, $\widetilde{x}_i = \overline{x}_h$ for $i \geq h$, and $\widetilde{x}_i = x_i$ for $l < i < h$. (ii) Assume the receiver is sophisticated. Then the sender's strategy in (i) is a perfect Bayesian equilibrium that survives D1.*

# What news patterns indicate distortion?

Without distortion:

- $\overline{x}$ and $s$ should be uncorrelated overall by symmetry assumptions

With optimal distortion:

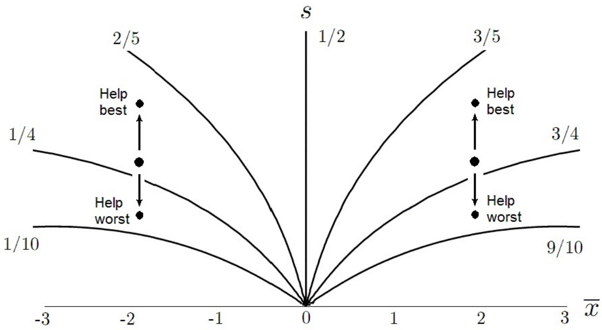
- $s(\widetilde{x}) < s(x)$ for $\overline{x} > \mu$
- $s(\widetilde{x}) > s(x)$ for $\overline{x} < \mu$

So observed $s(\widetilde{x})$ should be lower when news is good

**Proposition (Testable implication)**

*The distortion strategy in Proposition 3 implies that, in expectation, $s(\widetilde{x})$ is higher when $\overline{x} < \mu$ than when $\overline{x} > \mu$.*

# Extension – Posterior probability

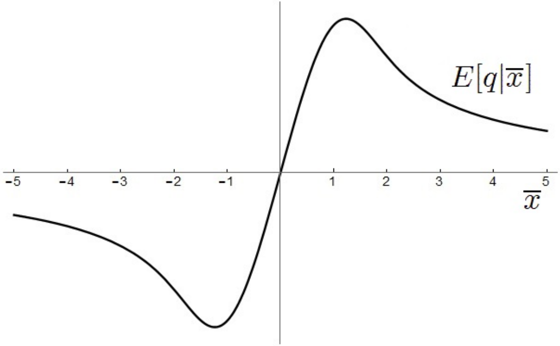



**Result**

*The posterior probability satisfies* $\frac{d}{ds}\Pr\left[q > \mu | \overline{x}, s\right] > 0$ *if* $\overline{x} < \mu$; $\frac{d}{ds}\Pr[q > \mu | \overline{x}, s] = 0$ *if* $\overline{x} = \mu$; *and* $\frac{d}{ds}\Pr[q > \mu | \overline{x}, s] < 0$ *if* $\overline{x} > \mu$.

# Extension – Too good to be true

- News can be "too good to be true": Dawid (1975), O'Hagan (1979), Subramanyan (1996), Kirschenheiter and Melumad (2002)
- Signal $\overline{x}$ can become less credible so posterior reverts to prior
- But can manipulate both $\overline{x}$ and $s$ by selective distortion of $x$
    - Raise highest $x_i$ – data doubly less credible as both $s$ and $\overline{x}$ rise
    - Raise lowest $x_i$ – decrease in $s$ helps credibility while raising $\overline{x}$



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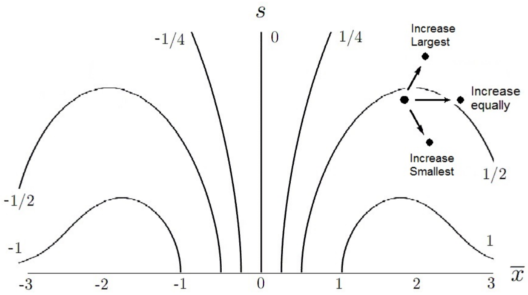
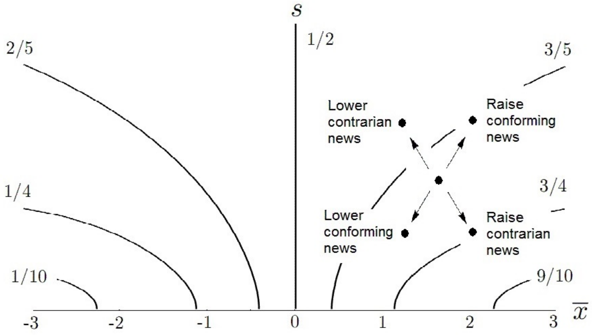



## Result

*(i) If* $\frac{d}{d\overline{x}}E[q|\overline{x},s] \geq 0$ *then* $\frac{d}{dx_i}E[q|\overline{x},s] > 0$ *for all* $x_i < \overline{x}$*, and if* $\frac{d}{d\overline{x}}E[q|\overline{x},s] \leq 0$ *then* $\frac{d}{dx_i}E[q|\overline{x},s] < 0$ *for all* $x_i > \overline{x}$*. (ii) For any* $d > 0$*, there almost surely exists a distortion* $\widetilde{x}$ *such that* $\overline{\widetilde{x}} > \overline{x}$ *and* $E[q|\overline{\widetilde{x}},\widetilde{s}] > E[q|\overline{x},s]$*, and an alternative distortion* $\widetilde{x}'$ *such that* $\overline{\widetilde{x}}' < \overline{x}$ *and* $E[q|\overline{\widetilde{x}}',\widetilde{s}'] < E[q|\overline{x},s]$*.*

# Application – Contrarian news distortion

Persuasion probability, $P = \frac{e^{E[q|\overline{x},s]}}{1+e^{E[q|\overline{x},s]}}$




## Result

*Suppose the persuasion probability $P(\overline{x}, s)$ satisfies (MVNP). For either side of a debate, $U = P$ or $U = 1 - P$, distorting contrarian news is more effective than distorting conforming news.*

# Extension – Risk aversion

Mean variance preferences

- Risk averse investor or other decision maker
- True state of the world is $q$ but uncertain
- Suppose distribution of $q$ summarized by mean and variance
- Then risk averse investor prefers higher mean and lower variance

Mean-variance news preferences different

- Preferences are over distribution of news not over $q$
- And sender preferences may differ from receiver's
- We concentrate on patterns when have risk neutrality
- But if receiver is risk averse and sender utility is increasing in receiver's then risk aversion can counteract preference for low $s$ when $\overline{x} < \mu$

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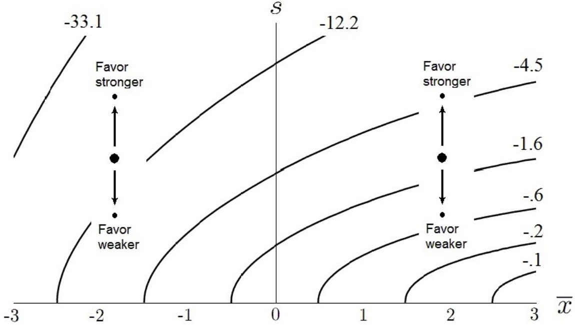
# Extension – Risk aversion

Expected utility, $U = E\left[-e^{-q}|\overline{x}, s\right]$




## Result

*Suppose $U$ is an increasing function of $E\left[u(q)|\overline{x}, s\right]$ where $u$ is increasing. (i) For $u$ concave $U_s < 0$ if $\overline{x} \geq \mu$; (ii) for $u$ convex $U_s > 0$ if $\overline{x} \leq \mu$; and (iii) for $u$ linear $U_s \geq 0$ if $\overline{x} \leq \mu$ and $U_s \leq 0$ if $\overline{x} \geq \mu$.*

# Extension – Asymmetric news weights

Base model assumes iid $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$

- So each piece of news weighted equally
- For segment earnings makes sense if segments similarly sized
- But what if some segments are larger?

Let $x_i = e_i / a_i + \varepsilon_i$ where $e_i$ is earnings, $a_i$ assets, and $\varepsilon_i \sim N(0, \sigma_\varepsilon^2 / a_i)$

- So larger segments have proportionaly less variable ROA
- Follows if segments are aggregates of many i.i.d. projects
- Calculate weighted mean $\overline{x}_w$ and weighted s.d. $s_w$
- $U(\overline{x}_w, s_w) = E[q|\overline{x}_w, s_w]$ has same properties as $U(\overline{x}, s) = E[q|\overline{x}, s]$
- And relative distortion incentives are same

$$\frac{d}{de_i}\overline{x}_w = \frac{1}{A}, \ \frac{d}{de_i}s_w = \frac{\frac{n}{A}\left(x_i - \overline{x}_w\right)}{(n-1)\, s}$$

- So same prediction of lower (weighted) s.d. when news is good

# Preview of empirical tests

Managers of conglomerate firms report performance across business segments

- Managers can distort the consistency of reported segment earnings using discretion over the allocation of shared costs
- We find that reported segment earnings are more consistent when overall firm news is good and less consistent when firm news is bad

The variance of news may be higher during bad times for other reasons

- Don't find the same patterns for:
  - Segment **sales** which are more difficult to distort because sales are reported prior to the deduction of allocated costs
  - Matched segments based on industry
- Less consistent with conservatism, write-downs, proprietary costs

# Test model predictions using segment earnings

**Model prediction:** $\widetilde{s} < s$ **for** $\overline{x} > E[q]$ **and** $\widetilde{s} > s$ **for** $\overline{x} < E[q]$

The manager simultaneously reports earnings for each segment

- Segment earnings (profits) = sales - costs
- Managers can flexibly allocate shared costs across segments

Segment earnings are an important source of firm news

- Epstein and Palepu (1999) survey of 140 star sell-side analysts: Segment performance data is the most useful data for their investment decisions, followed by the three financial statements

# Relation to the model

We model distortion under a fixed mean and total distortion constraint

- Total earnings are approximately fixed each period and managers can allocate a limited amount of costs flexibly across segments

Unlike manipulation of overall firm earnings, distortion of the consistency of segment earnings does not directly limit distortion next period

- Of course, dynamic considerations may still apply
- We abstract away from dynamic concerns and consider a manager who wants to improve short-run perceptions of her managerial ability, e.g., to improve the probability of receiving an outside offer

# Discretion in the reporting of segment earnings

While regulated under SFAS No. 14 (1976-1997) and SFAS No. 131 (1997+), there is substantial discretion in segment reporting

GE's 2015 Q2 10Q:

- *Segment profit is determined based on internal performance measures ... the CEO may exclude matters such as charges for restructuring; rationalization and other similar expenses; acquisition costs and other related charges; technology and product development costs; certain gains and losses from acquisitions or dispositions; and litigation settlements.*
- *Segment profit excludes or includes interest and other financial charges and income taxes according to how a particular segment's management is measured ... corporate costs, such as shared services, employee benefits and information technology are allocated to our segments based on usage.*

# Emphasis on consistency or inconsistency

Good news

- Walmart Q2 2015: *Each of our segments contributes to the Company's operating results differently, but each has generally maintained a* ***consistent*** *contribution rate to the Company's net sales and operating income.*
- Morgan Stanley Q1 2014: *We generated higher year-over-year revenues in* ***all three*** *of our business segments, demonstrating the momentum we have built* ***across the Firm****.*

Bad news

- HP Q3 2015 (after negative performance in 5 out of 6 segments): *HP delivered results in the third quarter that reflect very strong performance in our Enterprise Group.*

# Measures of segment and firm news

- Compustat segments data: Segment $i$ in firm $j$ in year $t$
- We focus on scaled earnings (ROA): Commonly used and comparable across firms and segments of different sizes

$$\text{segment news } x_{ijt} \equiv \frac{e_{ijt}}{a_{ijt}}$$

- Let $\overline{x}_{jt}$ and $s_{jt}$ be the weighted mean and s.d. of $x_{ijt}$
  - Weight by relative segment sizes $\frac{a_{ijt}}{A_{jt}}$
  - Model predictions extend to a setting with weights
- $\overline{x}_{jt}$ equals firm-level ROA, which remains constant if costs are shifted across segments

# A benchmark null hypothesis

Model prediction: $s_{jt}$ lower when $\overline{x}_{jt}$ is good news

But consistency may vary with firm-level news for other natural reasons

- Bad times may just be more volatile

Many alternative explanations should also apply to segment sales

- Sales are *more difficult* to distort because sales are reported prior to the deduction of costs
- Leads to a *conservative benchmark*: Managers can still distort the consistency of segment sales through transfer pricing or the targeted allocation of effort and resources

# Summary statistics

| | Mean | Std. dev. | p25 | p50 | p75 |
|---|---|---|---|---|---|
| Number of segments | 2.575 | 0.936 | 2 | 2 | 3 |
| Firm earnings ( = mean earnings) | 0.134 | 0.146 | 0.067 | 0.129 | 0.199 |
| Std. dev. earnings | 0.115 | 0.133 | 0.037 | 0.076 | 0.141 |
| Log std. dev. earnings | -2.705 | 1.145 | -3.309 | -2.582 | -1.962 |
| Firm sales ( = mean sales) | 1.657 | 0.951 | 1.054 | 1.511 | 2.020 |
| Std. dev. sales | 0.545 | 0.573 | 0.184 | 0.371 | 0.701 |
| Log std. dev. sales | -1.117 | 1.134 | -1.694 | -0.991 | -0.356 |
| Good firm news (dummy) | 0.496 | | | | |
| Good relative firm news (dummy) | 0.558 | | | | |
| Firm earnings > 0 (dummy) | 0.895 | | | | |
| Δ Firm earnings (continuous) | 0.013 | 0.097 | -0.021 | 0.014 | 0.047 |
| Firm relative earnings (continuous) | 0.012 | 0.249 | -0.052 | 0.008 | 0.073 |

Years 1976-2014; 4297 firms; 23,276 firm-years; 60,085 firm-segment-years

# Consistency of segment earnings

| | SD Earnings | SD Sales | Abnormal SD Earnings | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Good firm news | -0.0975*** | 0.0146 | -0.111*** | -0.0884*** |
| | (0.0150) | (0.0138) | (0.0179) | (0.0198) |
| Cost assumption | | | Prop | Ind adj |
| Control for mean | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.0643 | 0.129 | 0.179 | 0.0231 |
| Obs | 23276 | 23276 | 23276 | 23276 |

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Columns 3 & 4: Good firm news (when firm earnings exceeds the level in the previous year) corresponds to a 9-11% decline in the s.d. of segment earnings

# Consistency of relative segment earnings

Redefine $x_{it} \equiv \frac{e_{ijt}}{a_{ijt}} - m_{it}$, where $m_{it}$ is the mean earnings for the segment's associated SIC2 industry in year $t$

| | SD Relative Earnings | SD Relative Sales | Abnormal SD Relative Earnings | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Good relative firm news | -0.282*** | -0.126*** | -0.180*** | -0.149*** |
| | (0.0260) | (0.0236) | (0.0300) | (0.0324) |
| Cost assumption | | | Prop | Ind adj |
| Control for mean | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.0669 | 0.119 | 0.0728 | 0.0292 |
| Obs | 23276 | 23276 | 23275 | 23276 |

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| | (0.0260) | (0.0236) | (0.0300) | (0.0324) |
| Cost assumption | | | Prop | Ind adj |
| Control for mean | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.0669 | 0.119 | 0.0728 | 0.0292 |
| Obs | 23276 | 23276 | 23275 | 23276 |

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| Cost assumption | | | Prop | Ind adj |
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| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.0669 | 0.119 | 0.0728 | 0.0292 |
| Obs | 23276 | 23276 | 23275 | 23276 |

Column 3 & 4: Good firm news (when firm earnings exceeds the value-weighted mean of the firm's associated industries) corresponds to a 15-18% decline in the s.d. of relative segment earnings

# Placebo test: Consistency of matched segment earnings

- For each segment-year corresponding to a multi-segment firm, we match to a single segment firm
  - Same year and SIC2 industry
  - Nearest neighbor in terms lagged EBIT, assets, and sales
- Matched placebo firms mechanically cannot shift resources across segments
- If our results are driven by industry trends among connected segments during good vs. bad times, we should find similar results with matched placebo segments

# Placebo test: Consistency of matched segment earnings

| | SD Earnings | SD Sales | Abnormal SD Earnings | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Good firm news | 0.0232 | 0.00911 | 0.0176 | 0.0287 |
| | (0.0184) | (0.0166) | (0.0222) | (0.0244) |
| Cost assumption | | | Prop | Ind adj |
| Control for mean | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.0119 | 0.0825 | 0.211 | 0.0353 |
| Obs | 17192 | 17191 | 17192 | 17192 |

The s.d. of matched segment earnings and sales do not vary significantly with firm-level news

# Other determinants of earnings reporting?

- **Conservatism, impairments/write-downs**: Cost shock to one segment can increase $s$ and lower $\overline{x}$
- **Proprietary costs**: Hiding good performance in one segment to avoid competition may lead to a negative relation between $\overline{x}$ and $s$

| | Abnormal SD Earnings | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Good firm sales news | -0.171*** | -0.128*** | | | | |
| | (0.0237) | (0.0285) | | | | |
| Good firm news (excl worst perf seg) | | | -0.0914*** | -0.0714*** | | |
| | | | (0.0198) | (0.0221) | | |
| Good firm news (excl best perf seg) | | | | | -0.150*** | -0.124*** |
| | | | | | (0.0183) | (0.0199) |
| Cost assumption | Prop | Ind adj | Prop | Ind adj | Prop | Ind adj |
| Control for mean | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.179 | 0.0234 | 0.178 | 0.0226 | 0.186 | 0.0277 |
| Obs | 23276 | 23276 | 23276 | 23276 | 23276 | 23276 |

But, similar relation between $s$ and firm-level news when the measure of firm news is not related to a negative cost shock or performance in the best segment

# FAKE NEWS!

Charles Babbage, *Reflections on the Decline of Science in England* (1830)

- Hoaxing: "Such frauds are far from justifiable; the only excuse which has been made for them is, when they have been practised on scientific academies which had reached the period of dotage."
- Forging: "differs from hoaxing, inasmuch as in the latter the deceit is intended to last for a time, and then be discovered, to the ridicule of those who have credited it; whereas the forger is one who, wishing to acquire a reputation for science, records observations which he has never made."
- Trimming: "consists in clipping off little bits here and there from those observations which differ most in excess from the mean, and in sticking them on to those which are too small."
- Cooking: "...make multitudes of observations, and out of these to select those only which agree, or very nearly agree"

# Behavioral implications

What if we don't include the differential variance effects of news?

- People overly impressed by confirming news?
- People overreact to small changes in news?
- Correlation neglect?
- Persuasion bias?
- Risk aversion in good news, risk loving in bad news?
- ??