Who should pay for ESG ratings?

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▶ ESG ratings agencies: **two third** follow an **"investors pay"** business model and only **one out of three** an **"issuer-pays"** model (Survey evidence from the European Securities and Markets Authority (2022))
Why?

This Paper's Research Questions

▶ Can we explain the difference between who pays for credit ratings and who pays for ESG ratings?

▶ Why are some ESG ratings sold to investors, while others are sold to firms?

▶ Does this difference affect firms stock prices?

▶ Does it influence firms' incentives to improve their ESG performance?

This paper

With a noisy rational expectation model we show that two dimensions are crucial to determine whether ESG rating agencies sell their information to the issuers or to the investors:

- ▶ The fraction of investors who care about the firm's ESG performance

- ▶ The expected level of the firm ESG performance

Key Findings

1. In equilibrium the RA's business model is:
   - ▶ **Issuer pays**, if:
     - ▶ The fraction (ω) of socially responsible investors is large enough.
     - ▶ The firm's expected emission ($\bar{e}$) are relatively low.
   - ▶ **Investors pay**, if:
     - ▶ The fraction (ω) of socially responsible investors is small enough.
     - ▶ The firm's expected emission ($\bar{e}$) are relatively high.

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2. ESG ratings' expected equilibrium stock price impact is:
   - ▶ Positive when the "issuer pays" model emerges.
   - ▶ Tends to be negative when the "investors pay" model emerges.
3. ESG ratings' expected equilibrium impact on ESG performance is:
   - ▶ Positive no matter the RA's business model.
   - ▶ Maximum when there is a mix of both normal and socially responsible investors .

Roadmap

- Literature

- The model

- Key results and intuition

- Conclusion

Related literature

- Credit rating theories: Skreta and Veldkamp 2009, Bolton et al. 2012, Manso 2013. . . .

- Transparency and greenwhashing: Goldstein et al. 2021, Chen 2023, Cartellier et al. 2024. . . .

- Impact Finance: Heinkel et al. 2001, onward. . . .

- ESG rating theory: Azarmusa and Shapiro (2025)

The Model

▶ Static noisy rational expectations equilibrium à la Grossman–Stiglitz with three main twists:

  ▶ **Firm generating cashflow and emission**

  ▶ **Normal and socially responsible Investors**

  ▶ **Rating Agency (RA) measuring and disclosing firm emissions**

The Firm's Cash-Flows and Emissions

The firm is characterized by financial cash-flows $\tilde{v}$ and emissions $\tilde{e}$.

- **Cash-Flows:**

$$\tilde{V} = \underbrace{\tilde{v}}_{\text{Gross cash-flows}} - \underbrace{\pi_{\text{issuer}}}_{\text{Rating fee}}$$

  where:

  - $\tilde{v}$: exogenous, $\sim N\left(\bar{v}, \sigma_v^2\right)$ with $\bar{v} > 0$, $\sigma_v^2 > 0$;

- **Emissions:**

  - $\tilde{e}$: exogenous, $\sim N\left(\bar{e}, \sigma_e^2\right)$ with $\overline{e} > 0$, $\sigma_e^2 > 0$.

  - $Cov(\tilde{v}, \tilde{e}) = 0$

Firm's Choice Space and Objective

▶ The **Firm's objective:** maximize the expected trading price of its shares, denoted by $\overline{P}$.

▶ The **Firm's choices:** Purchase or not the rating shall the RA opt for the "issuer pay" business model.

▶ The **Firm is uninformed:** it does not observe the realization of $\tilde{e}$ before making its choice.

Investors

- Mass 1 of competitive rational investors of two types: normal or socially responsible

    - Investors may invest in risk-free asset with $r_f = 0$ and in $n \in \mathbf{R}$ shares of the firm

    - $1 - \omega \in (0,1)$ of Normal investors maximize $E\left(-e^{-\gamma \tilde{W}_N}\right)$

    - Mass $\omega \in (0,1)$ of SR investors maximize $E\left(-e^{-\gamma\left(\tilde{W}_S - n_S \tilde{e}\right)}\right)$

- Noise traders exogenously demand $\tilde{z}$ shares of stock at market price

    - $\tilde{z} \sim N\left(0, \sigma_z^2\right)$ with $\sigma_z^2 > 0$ and $\sigma_{ez} = \sigma_{vz} = 0$

Ex-ante SR investors value the asset less than normal investors:

▶ SR investors suffer from expected emission $\bar{e}$, whereas N-investors do not.

▶ The asset is more risky for SR investors than for normal investors:

$$\underbrace{Var(\tilde{V} + \tilde{e}) = \sigma_v^2 + \sigma_e^2}_{\text{Risk of the asset for SR investor}} \quad > \quad \underbrace{\sigma_v^2 = Var(\tilde{V})}_{\text{Risk of the asset for a normal investor}}$$
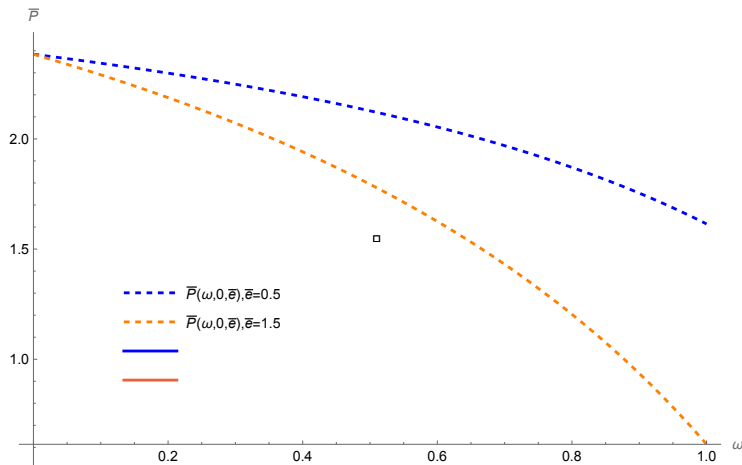
Effect on the Expected Stock Price of ω and $\bar{e}$

Figure: Firm's expected price when there is no information about $\tilde{e}$, as a function of ω for $\bar{e} = 0.5$ (blue line) and $\bar{e} = 1.5$ (yellow line)

Rating Agency (RA)

- The RA observes $\tilde{e}$ (at no cost) and sells a truthful report before trading begins.

- RA's objective: choose the business model that maximizes its revenue.

Credit rating is a limit case

▶ When $\omega = 1$ all investors care about the RA information $\tilde{e}$

$$\Rightarrow$$

The case $\omega = 1$ is equivalent to $\tilde{e}$ being a cash-flow and the RA being a credit rating agency providing cash-flows information.

▶ Remark: S&P, Moody's and Fitch follow the "issuer pay" busines model model

Timing

1. The RA chooses a business model: "issuer pays" or "investors pay."

2.Iss "Issuer pays":
   - ▶ If the firm and the RA agree on a rating fee, then RA observes $\tilde{e}$ and reveals it to all investors ($q = 1$).
   - ▶ If firm-RA negotiation fails, then $\tilde{e}$ remains undisclosed ($q = 0$)

2.Inv "Investors pay,": the RA sets the report price π_{investor}. As endogenous fraction $q = q(\pi_{\text{investor}})$ of socially responsible investors purchase the report to learn $\tilde{e}$.

3. Rational investors submit limit orders, noise traders submit market orders, and the market clears.

4. Uncertainty is resolved and payoffs are realized.

Effect on the Expected Stock Price of Publicly Disclosing $\tilde{e}$
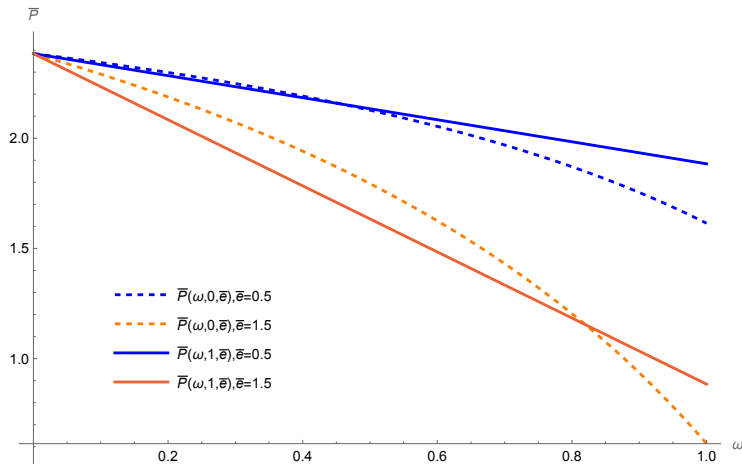
Figure: **Expected price with full vs no information:** Dashed lines: $q = 0$, no information about $\tilde{e}$, Thick lines: $q = 1$ public information about $\tilde{e}$

Disclosing $\tilde{e}$ reduces the risk of long and short positions in the stock for SR investors:

Stock Price Effect of Disclosing $\tilde{e}$ to Investors when ω is large

Disclosing $\tilde{e}$ reduces the risk of long and short positions in the stock for SR investors:

When most investors are SR investors (ω is large):

- ▶ The stock's equilibrium price is primarily determined by the preferences of SR investors.
- ▶ At this price, SR investors hold the asset.
- ▶ Disclosure of $\tilde{e}$ makes SR investors long position less risky,

$$\text{Var}[\tilde{V} - \tilde{e} \mid \tilde{e} = e] = \sigma_v^2 \; < \; \text{Var}[\tilde{V} - \tilde{e}] = \sigma_v^2 + \sigma_e^2$$

  and they demand even more of the asset.
- ▶ **If ω is large $\Rightarrow$ Disclosing $\tilde{e}$ increases the expected stock price $\Rightarrow$ Firms are willing to pay the RA for such service**

Stock Price Effect of Disclosing $\tilde{e}$ to Investors when ω is small

When most investors are normal investors (ω is small):

- ▶ The stock's equilibrium price is primarily determined by the preferences of normal investors who value the asset more than SR investors on average.

- ▶ At this price, SR investors tend to short sell — especially when the firm's expected emission $\overline{e}$ is high.

- ▶ Disclosure of $\tilde{e}$ makes SR investors short position less risky,

$$\mathsf{Var}[\tilde{V} - \tilde{e} \mid \tilde{e} = e] = \sigma_v^2 \; < \; \mathsf{Var}[\tilde{V} - \tilde{e}] = \sigma_v^2 + \sigma_e^2$$

  and they short even more of the asset.

- ▶ **If ω is small $\Rightarrow$ Disclosing $\tilde{e}$ reduces the expected stock price $\Rightarrow$ firms will not pay a RA for such service**

When does informing SR investors of $\tilde{e}$ increase the expected stock price?
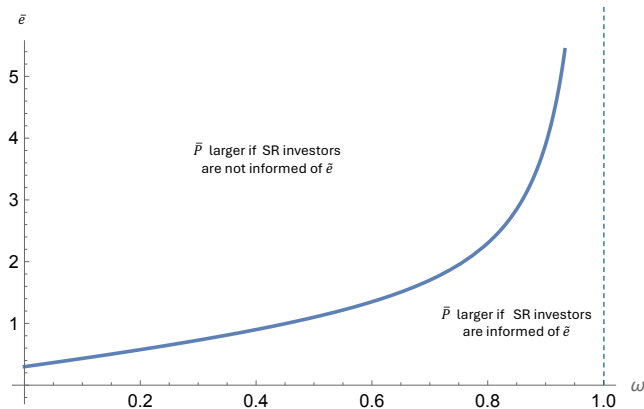
Issuer Pays

Firm and RA bargaining on how to share the expected surplus from disclosing $\tilde{e}$ to all investors :

$$\overbrace{\underbrace{\overline{P}(\omega, 1, \overline{e})}_{\text{Expected price if all SR investors know } \tilde{e}} \quad - \quad \underbrace{\overline{P}(\omega, 0, \overline{e})}_{\text{Expected price if no SR investors know } \tilde{e}}}^{\text{Expected change in price from informing investors}}$$

The RA's bargaining power is denoted by $\lambda \in [0, 1]$
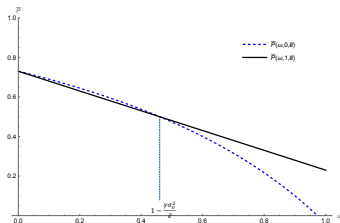
RA revenue in the issuer pay model
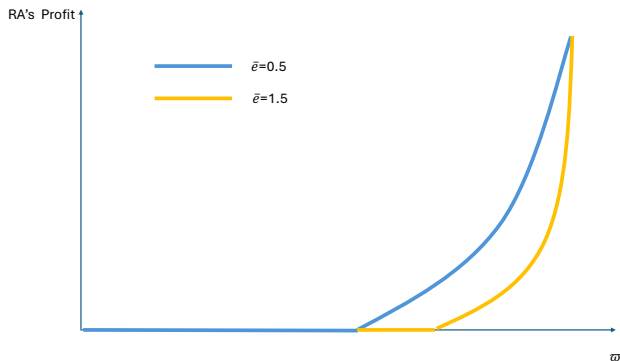
Figure: RA's revenue in the "issuer pay" model. Parameters: $\sigma_v^2 = \sigma_e^2 = 0.1$, $\gamma = 3$,

Investors Pay

1. The RA sets a subscription price $\pi_{\text{investors}}$ for the information letter.

2. The RA observes $\tilde{e}$ and discloses it only to those investors who subscribed.

▶ SR investors subscribe to reduce uncertainty on their long or short positions.
Those who do not subscribe use equilibrium prices to guess $\tilde{e}$.

▶ The more investors subscribe $\Rightarrow$ the more information about $\tilde{e}$ is incorporated into the equilibrium stock price. $\Rightarrow$ The less each investor is individually willing to pay for the newsletter.

▶ The RA chooses $\pi_{\text{investors}}$ to maximize its revenue:

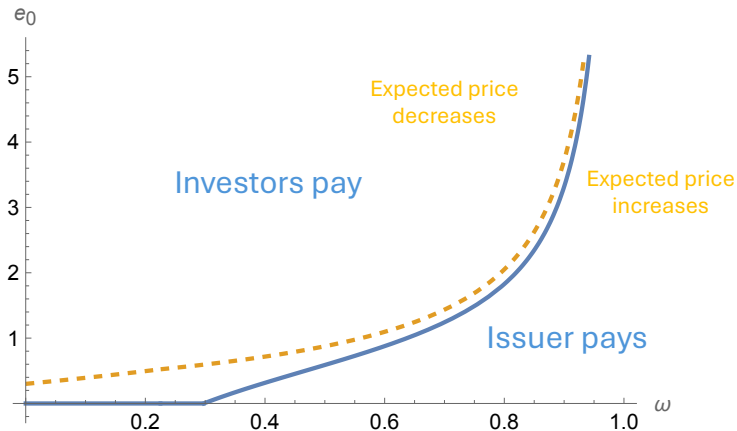# RA's revenue in the investors pay model
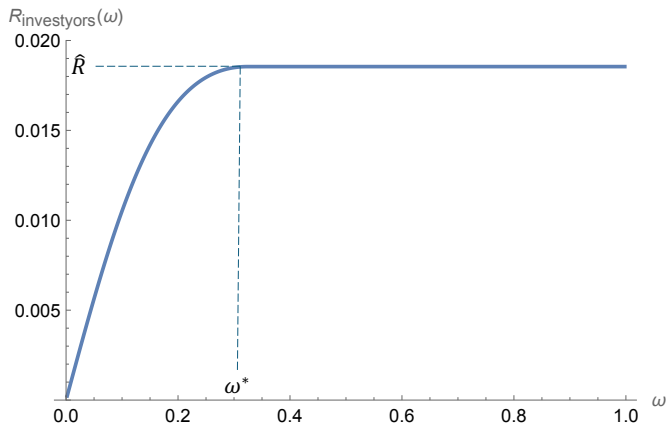
Figure: Parameters: $\sigma_v = \sigma_e = 0.3$, $\sigma_z = 0.03$, $\gamma = 3$.

RA's business model choice
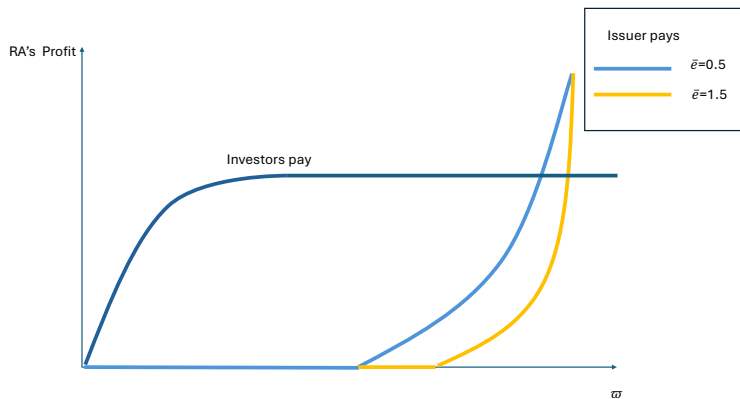
RA business model and firm prices

Endogenous Firm Choice of $\bar{e}$

Suppose that after the RA chooses the business model, the firm can invest to affect $\bar{e}$.

Cash-Flows:

$$\tilde{V} = \underbrace{\tilde{v}}_{\text{Gross cash-flows}} - \underbrace{c(e_0 - \bar{e})^2}_{\text{Emission abatement cost}} - \underbrace{\pi_{\text{issuer}}}_{\text{Rating fee}}$$
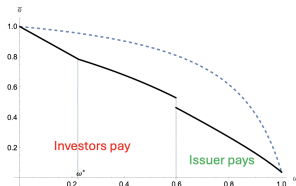
Firms know that their stock price decreases with $\bar{e}$ — especially when the share of SR investors is high. $\Rightarrow$ This creates an incentive to abate emissions.

- Firms abate even in the absence of a rating agency,
- But abate more in the presence of a RA, i.e., when they expect information about $\tilde{e}$ to be circulated.
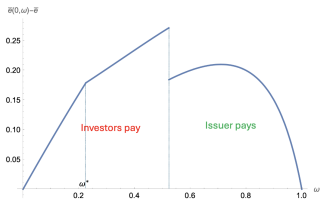
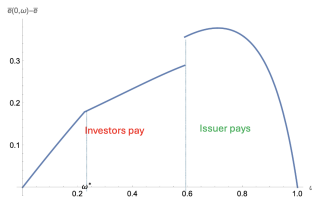# Firm Endogenous Emission and Abatement
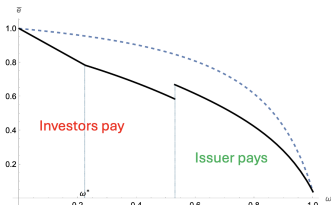
(a) Emission level $\lambda = 0.5$.

(b) Emission level for $\lambda = 0.1$.
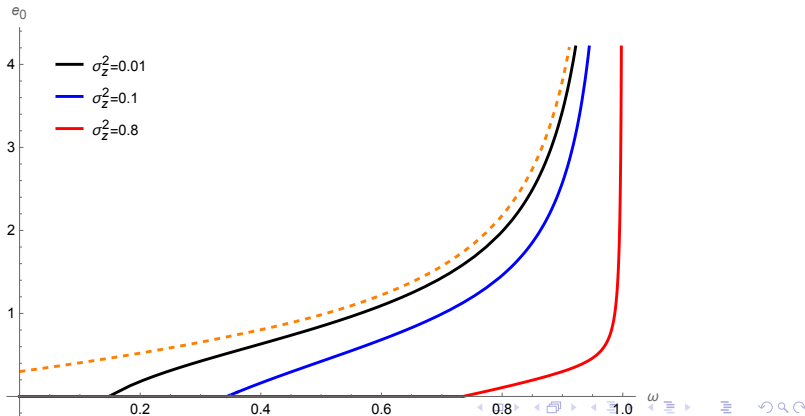
(c) RA abatement impact for $\lambda = 0.5$.

(d) RA abatement impact for $\lambda = 0.1$.

The effect of market liquidity

Increase liquidity: $\sigma_z^2 \uparrow \Rightarrow$ prices are less sensitive to trades, $\Rightarrow$

- ▶ Informed investor can exploit more their information: "Investors pay" is more profitable for the RA.
- ▶ Public information moves less prices: "Issuer pays" is less profitable for the RA.

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Testable Implications

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2. Credit rating agencies should follow the issuer-pay model.
3. The investor-pay model should be observed more for RAs specialized in brown, liquid sectors:
   - where firms do not want to pay for ratings,
   - where private information is more profitable as trades do not move prices significantly.

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2. Credit rating agencies should follow the issuer-pay model.

3. The investor-pay model should be observed more for RAs specialized in brown, liquid sectors:
   - where firms do not want to pay for ratings,
   - where private information is more profitable as trades do not move prices significantly.

4. The issuer-pay model should be observed more in green, illiquid sectors:
   - where firms do want to pay for ratings,
   - where private information is less profitable as trades move prices significantly.

Testable Implications

1. An increase in transparency in the ESG dimension should lead to a rise in the prices of firms in relatively green sectors and a decrease in the prices of firms in relatively brown sectors.
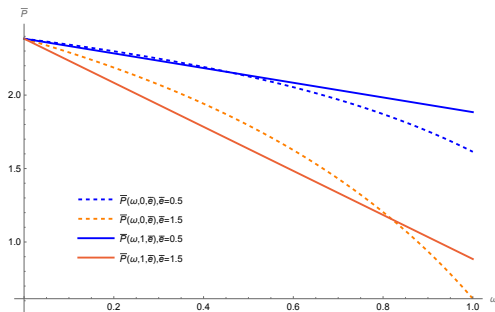
2. Brown sectors are expected to be the most opposed to policies requiring ESG disclosure.

Conclusion

▶ First economic model of choice of business model by a rating agency that encompasses both ESG and credit ratings

   ▶ Prediction of model consistent with motivating empirical evidence on ESG vs. credit ratings

   ▶ Additional predictions: when should "issuer pays" vs. "investors pay" prevail + impact on incentives to invest in ESG

THANK YOU!

Correlation between $\tilde{e}$ and $\tilde{v}$

▶ Information about $\tilde{e}$ helps estimate $\tilde{v}$ more accurately.

▶ Both SR and normal investors are interested in learning about $\tilde{v}$ (though it matters more for SR investors).

▶ The model is equivalent to credit rating when $\omega = 1$ (only SR investors) and when $\omega = 0$ (only normal investors).

▶ The informativeness of the price may increase or decrease depending on the sign of $\sigma_{e,v}$:

  ▶ $\sigma_{e,v} > 0$: High emissions are associated with high cash flows $\Rightarrow$ informed normal investors tend to buy when informed SR investors sell $\Rightarrow$ trader flows are less informative overall.

  ▶ $\sigma_{e,v} < 0$: High emissions are associated with low cash flows $\Rightarrow$ informed traders (both SR and normal investors) trade in the same direction $\Rightarrow$ trader flows are more informative.
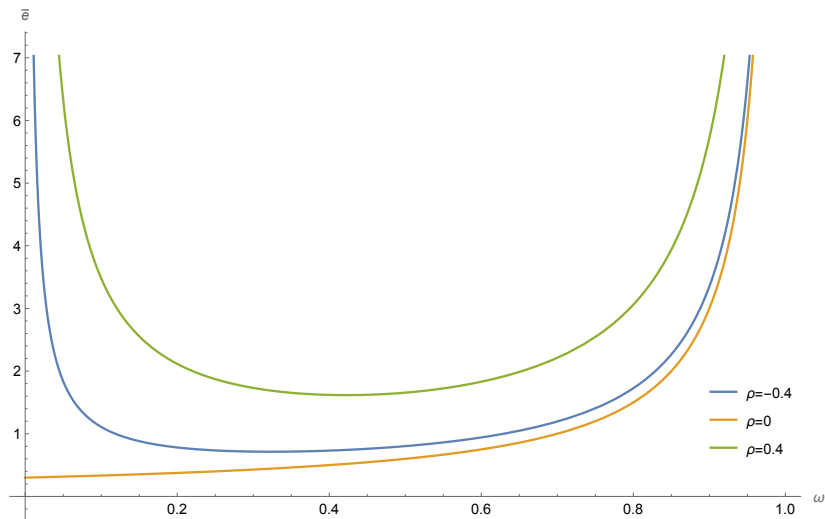
RA's Revenue from Issuer pays
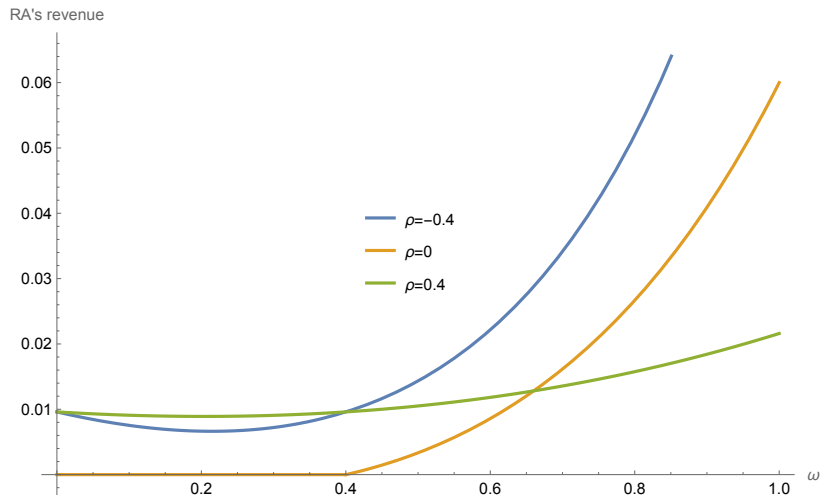
RA's Revenue from investors pay
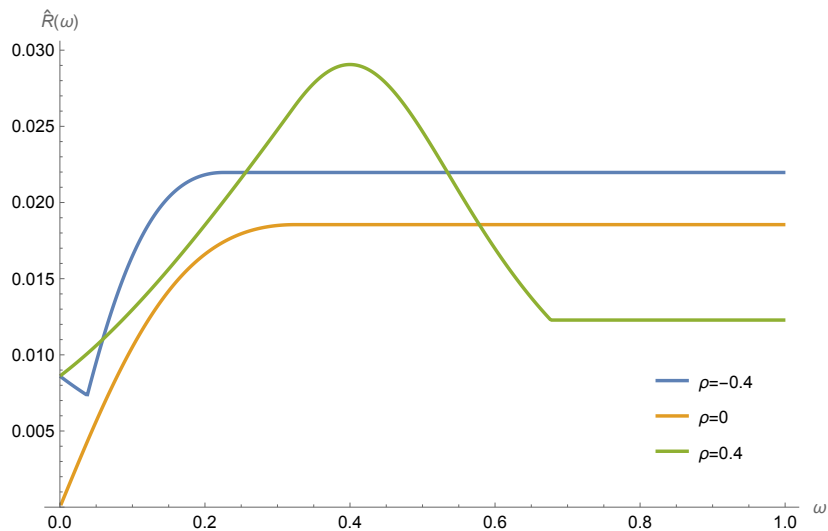
Positive price reaction to information

Overall Effect of Correlation on RA Business Model

▶ The RA opts for an issuer-pays model in a credit-rating-like setting, where investors have homogeneous preferences for information about $\tilde{e}$.

▶ The RA opts for an investor-pays model when preferences for information about $\tilde{e}$ are heterogeneous.

▶ The effect of $\bar{e}$ on the RA's choice of business model is the same as in the case where $\sigma_{e,v} = 0$.

Effect of RA on social welfare

- ▶ RA gains
- ▶ Firms, depending on how brown they are might lose or gain from presence of ESG ratings.
- ▶ N-Investors: can gain or lose
- ▶ SR investors: can gain or lose

SR investors demand

- $q :=$ Endogenous fraction of SR investors who are informed of $\tilde{e}$

- An SR investors informed of $\tilde{e} = e$ demands

$$n_{S,I}(P, e) = \frac{E[\tilde{V} - P - e]}{\gamma \, Var[\tilde{V}]}$$

- An uninformed SR investors demands guess $\tilde{e}$ from the equilibrium price (if $q > 0$) and demands

$$n_{S,I}(P) = \frac{E[\tilde{V} - P - \tilde{e}|P]}{\gamma \, Var[\tilde{V} - \tilde{e}|P]}$$

Stock Market Equilibrium

Suppose a fraction q of the SR investors are informed.

▶ **Share market clearing condition:**

$$\underbrace{(1-\omega)n_N(P)}_{\text{Normal investors}} + \underbrace{q\omega n_{S,I}(P,e)}_{\text{Informed SR investors}} + \underbrace{(1-q)\omega n_{S,U}(P)}_{\text{Uninformed SR investors}}$$

$$= \underbrace{1-\tilde{z}}_{\text{Supply not absorbed by noise traders}}$$

▶ **Expected equilibrium stock price:** $\overline{P}(\omega, q, \overline{e})$ is the expected price when a fraction q of the ω SR investors observe $\tilde{e}$, while the others observe only $E[\tilde{e}] = \overline{e}$.

$$\overline{P}(\omega, q, \overline{e}): \quad \downarrow \omega, \quad \downarrow \overline{e}$$

Issuer Pays: equilibrium

Lemma

▶ If $\overline{e} < \frac{\gamma \sigma_v^2}{1-\omega}$ then surplus is positive and

    ▶ The RA asks

$$\pi_{issuer} = \lambda(P(\omega, 1, \overline{e}) - \overline{P}(\omega, 1, \overline{e}))$$

$$\frac{\pi_{issuer}}{\omega} \uparrow \omega$$

    ▶ The firm purchases the rating

    ▶ The firm share expected equilibrium price is

$$\overline{P}_{issuer}(\omega, \overline{e}) := \lambda \overline{P}(\omega, 0, \overline{e}) + (1 - \lambda) \overline{P}(\omega, 1, \overline{e})$$

    Increasing in ω and decreasing in $\overline{e}$ and λ .

▶ If $\overline{e} \geq \frac{\gamma \sigma_v^2}{1-\omega}$ then surplus is negative and the firm does not purchase the rating.

Investors Pay: Equilibrium

Lemma

There is $\omega^* \in (0,1)$ such that

- *RA set $\pi_{investors}$ so that the mass of subscriber is $\min\{\omega, \omega^*\}$:*

$$q = 1 \text{ for } \omega < \omega^*$$

$$q = \frac{\omega^*}{\omega} \text{ for } \omega \geq \omega^*$$

- *RA's revenue is*
  - *positive for all ω*
  - *Capped at for $\omega > \omega^*$*
  - *not affected by $\overline{e}$.*