

The skin-in-the-game bond

A novel sustainable capital instrument



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Outline of the presentation

1. Motivation
2. Features of the Skin-in-the-game Bond
3. Valuation of the Skin-in-the-game Bond
4. Data Example

Motivation

Introduction

The **skin-in-the-game** bond is a **sustainable capital** instrument.

Sustainable investing refers to the process of taking due account of environmental (E), but also social (S) and corporate governance (G) considerations in investment decision-making [1].

A person having **skin-in-the-game** is directly involved in and affected by an action and its negative consequences, especially financially [2].

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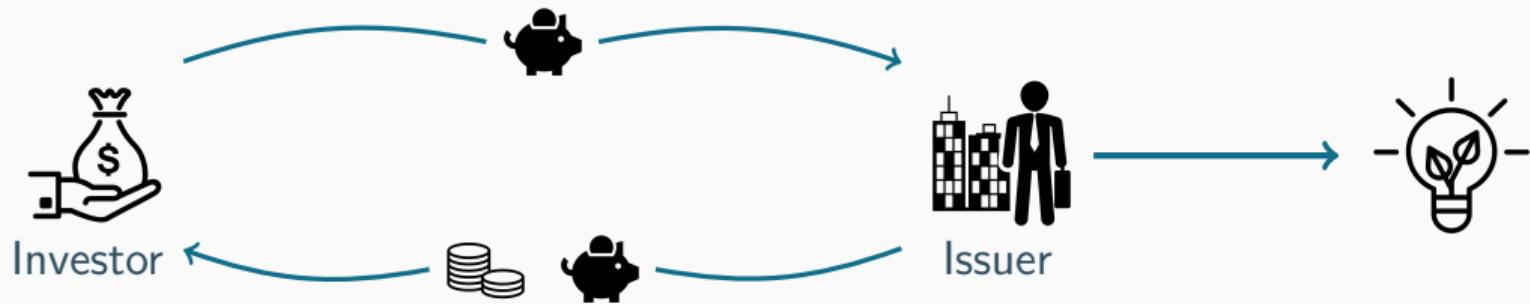
A person having **skin-in-the-game** is directly involved in and affected by an action and its negative consequences, especially financially [2].

→ Lack of skin-in-the-game may cause moral hazard.

e.g. 2008 financial crisis, Deepwater Horizon oil spill ...

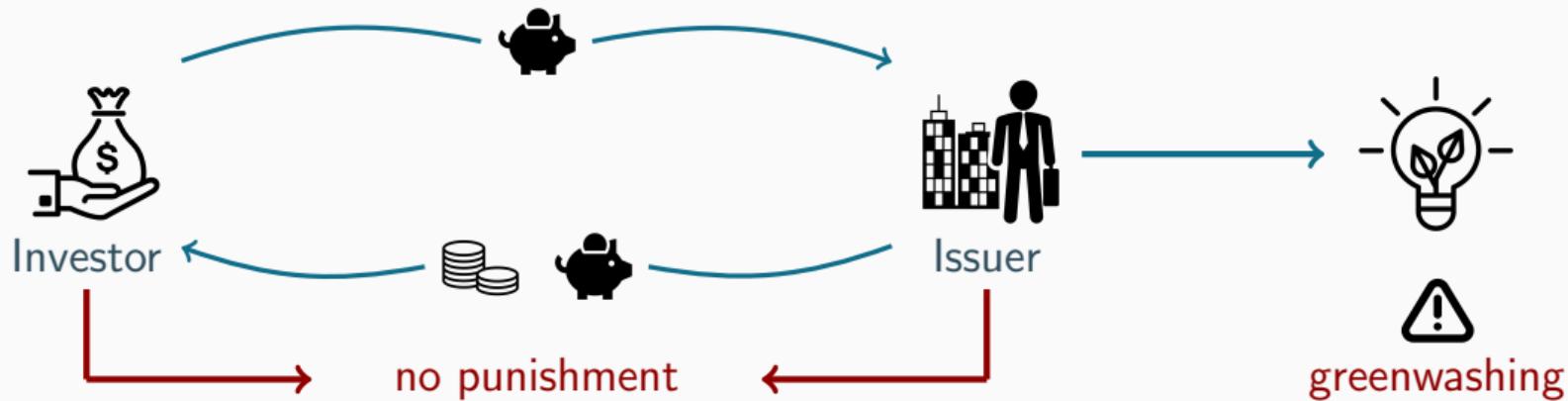
Sustainable investing: green, social and sustainability bonds

Green, social and sustainability bonds are issued with the purpose of financing resp. a green project, social project or combination of both [3].



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→ Both issuer and investor do **not** have skin-in-the-game.

Sustainable investing: sustainability-linked bonds

Sustainability-linked bonds have varying financial characteristics, depending on whether the issuer achieves predefined sustainability objectives [4].

Example - energy company **Enel** [5]

- ▶ Bonds were first issued in September 2019.
- ▶ Sustainable targets related to greenhouse gas emission and renewable energy.
- ▶ The bond's coupon increases if Enel fails to reach the sustainable targets.

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→ The **issuer** has **skin-in-the-game**.

→ The **investor** has **no skin-in-the-game**.

Sustainable investing: skin-in-the-game bond

Which parties do have skin-in-the-game in sustainable investing?

	Issuer	Investor
Green, Social or Sustainability bond	✗	✗
Sustainability-linked bond	✓	✗
Skin-in-the-game bond	✓	✓

The skin-in-the-game bond is built on the principle that both parties, issuer and investor, should have skin-in-the-game and suffer if sustainability promises are not delivered.

Features of the Skin-in-the-game Bond

The design of the skin-in-the-game bond

Contingent Convertible [6]

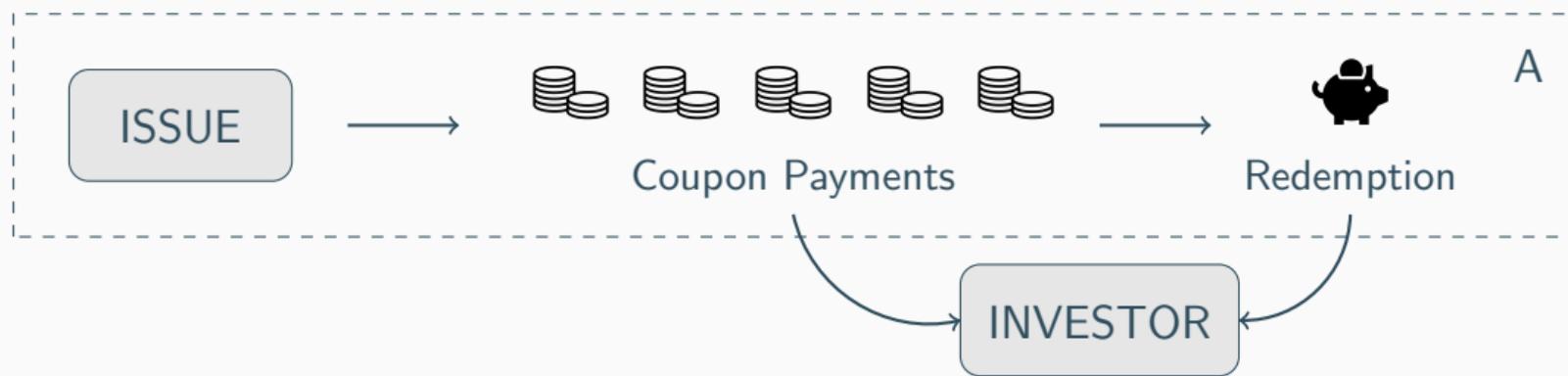
Issuer	financial institution
Benchmark	related to the capital level
Trigger event	benchmark below a fixed threshold
Trigger consequence	(part of) the face value is withheld
Withheld part	to the issuer

The design of the skin-in-the-game bond

	Contingent Convertible [6]	Skin-in-the-game Bond
Issuer	financial institution	company in any sector
Benchmark	related to the capital level	related to the broad concept of sustainability (E,S,G)
Trigger event		benchmark below a fixed threshold
Trigger consequence		(part of) the face value is withheld
Withheld part	to the issuer	to an external fund

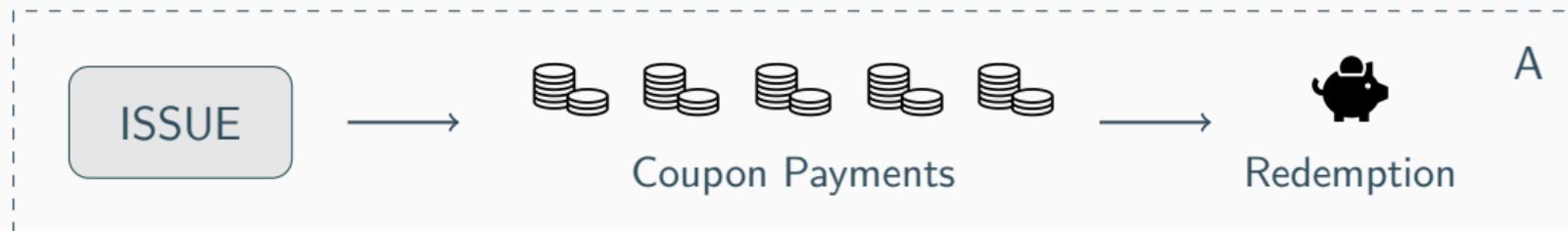
The skin-in-the-game bond's life cycle

Scenario A: **no trigger** event.

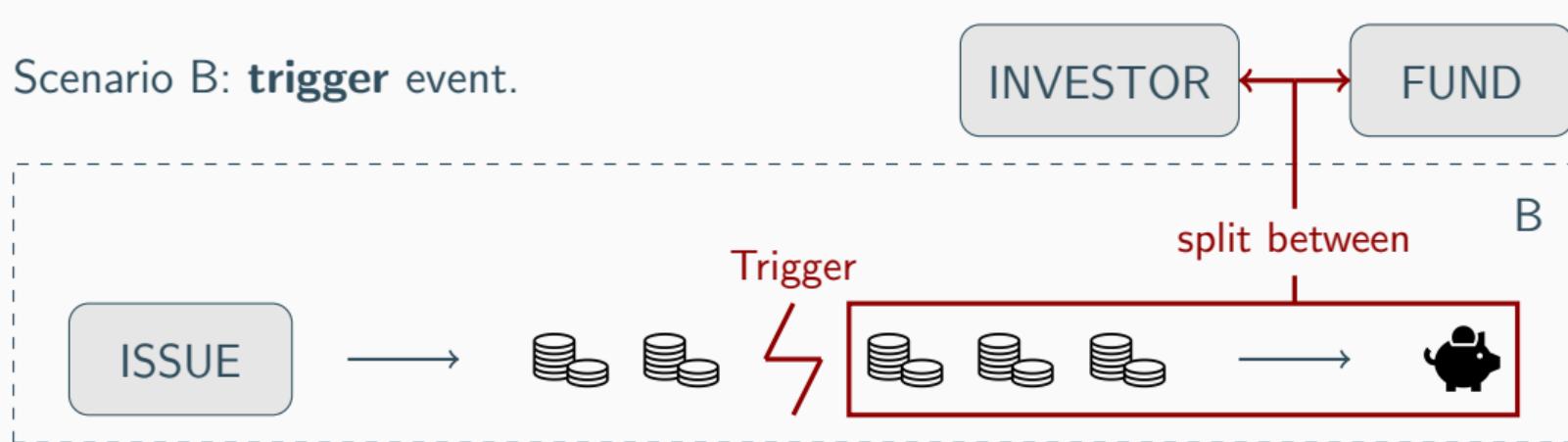


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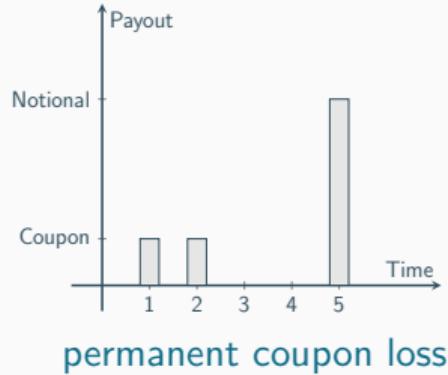
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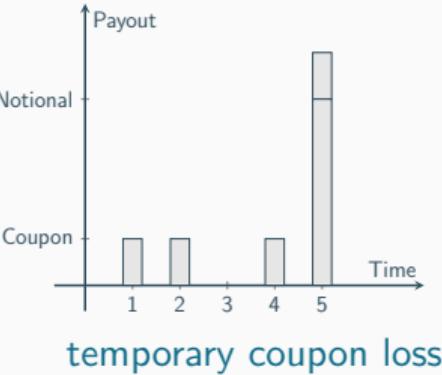
Scenario B: **trigger** event.



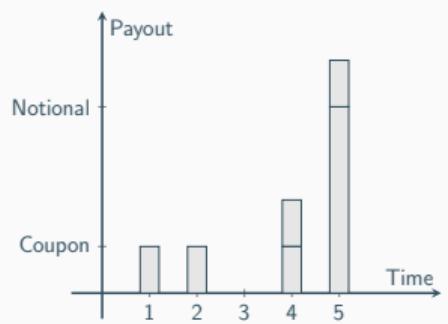
Examples of trigger penalties



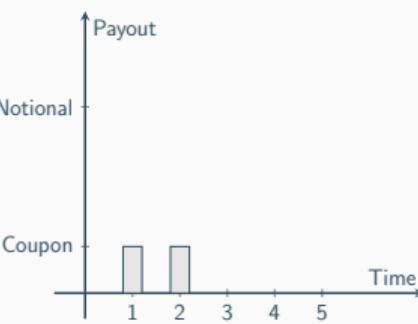
permanent coupon loss



temporary coupon loss



coupon withholding



full write-down

Advantages

1. The **investor** has skin-in-the-game.
 - ▶ speculate on meeting the E, S and/or G related goals
 - ▶ cash-in an above risk-free coupon
2. The **issuer** has skin-in-the-game.
 - ▶ clear market driven incentive to optimize the level of the benchmark
 - ▶ excessive risk-taking and mismanagement are immediately punished
 - cost of capital increases
 - reputational risk
3. External **fund** makes sure that issuer is not exempt from payment and it may be used to cover costs related to trigger event.
 - e.g. oil spill, nuclear event ...

Valuation of the Skin-in-the-game Bond

The valuation of a skin-in-the-game bond

Standard corporate bond

- ▶ subject to the issuer's bankruptcy risk
- ▶ offers a **yield** $c = r + c_s$, with r the risk-free rate and c_s the credit spread

Skin-in-the-game bond

- ▶ trigger characteristic increases the probability for the investor to suffer a loss on the invested amount
- ▶ to compensate, a higher **yield** $c = r + c_s + t_s$ is offered, with t_s the trigger spread

The valuation of a skin-in-the-game bond

The **price** P of the bond is determined as

$$P = \sum_{t=1}^T \frac{\mathbb{E}_Q[C_t]}{(1 + r + c_s)^t} := N,$$

with T the maturity, C_t the cash-flow at time t , Q the pricing measure, and N the notional.

$\mathbb{E}_Q[C_t]$ depends on the **trigger probability** PT_t and the trigger spread t_s :

$$\mathbb{E}_Q[C_t] = PT_t \cdot 0 + (1 - PT_t) \cdot c \cdot N = (1 - PT_t) \cdot (r + c_s + t_s) \cdot N.$$

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—————> If we estimate PT_t , we can **calculate** t_s , assuming r, c_s known.

Data Example

The ESG skin-in-the-game bond

The ESG skin-in-the-game bond uses the **ESG rating of a company**, provided by a particular rating agency¹, **as the benchmark** underlying the trigger mechanism of the bond.

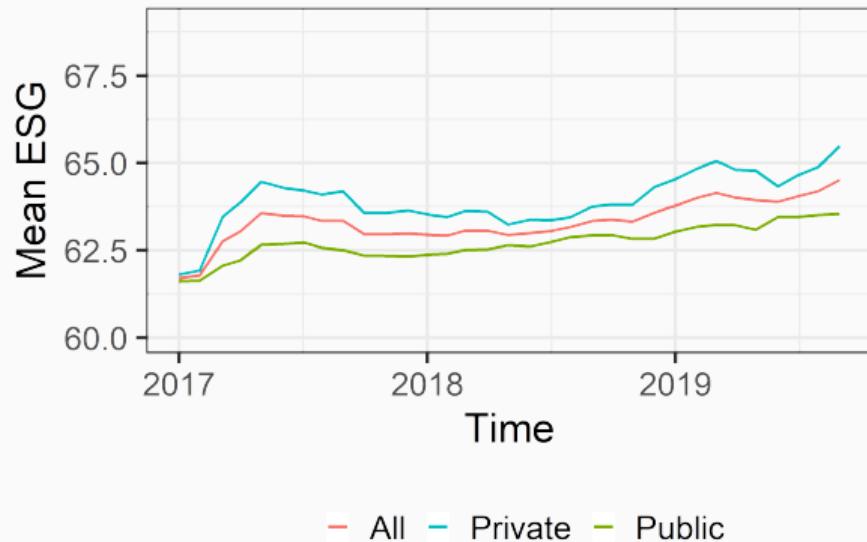
- ▶ The trigger probability is determined by the probability that the issuing firm's ESG rating drops to or below the trigger level.
- ▶ Historical ESG data is used to estimate the trigger probability.

¹Due to the differences across the ratings published by various ESG rating providers, the ESG skin-in-the-game bond should merely be seen as an illustrative example [7].

ESG data

Data is provided by **Sustainalytics**.

- ▶ monthly data between January 2017 and September 2019
- ▶ companies are subdivided into public or private and grouped into 11 sectors
- ▶ ESG score between 0 and 100, higher score means better ESG practice



The trigger probability (1)

We exploit the literature on credit ratings [8, 9] to estimate trigger probabilities.

Step 1 Transform the raw ratings into **ESG rating categories** [10].

Rating category	C	CCC	B	BB	BBB	A	AAA
Raw score	0-48	48-54	54-61	61-69	69-74	74-79	79-100

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Step 2 Under the time-homogeneous, first-order Markov assumption, estimate a **transition probability matrix**, per company type and sector.

ESG skin-in-the-game bond characteristics

The trigger spread depends on the bond's characteristics. We look at a specific example.

Characteristics	Bond-specific values
issuer	public firm in communication services sector
risk-free rate r	0.010
credit spread c_s	0.025
duration	5 years
notional N	100
coupon frequency	annual
initial rating	A
trigger level	BB
trigger penalty	permanent coupon loss

The trigger probability (2)

One-year transition matrix for a public firm in the communication services sector.

	C	CCC	B	BB	BBB	A	AAA
C	0.53213	0.18029	0.22725	0.05577	0.00409	0.00042	0.00005
CCC	0.12705	0.47922	0.30573	0.08110	0.00618	0.00065	0.00007
B	0.06587	0.10967	0.51331	0.27567	0.03119	0.00379	0.00050
BB	0.00884	0.02761	0.12200	0.67539	0.14099	0.02163	0.00355
BBB	0.00089	0.00364	0.01845	0.19021	0.62482	0.13169	0.03031
A	0.00009	0.00048	0.00263	0.03941	0.25367	0.58823	0.11549
AAA	0.00002	0.00012	0.00064	0.01078	0.08476	0.19875	0.70492

Step 3 Calculate the **trigger probability** based on transition probability matrix.

$$\text{e.g. } PT_1 = 0.03941 + 0.00263 + 0.00048 + 0.00009 = 0.04261.$$

The trigger probability (3)

Step 4 Transform \mathcal{P} to \mathcal{Q} .

- ▶ transition probabilities based on historical data are under measure \mathcal{P}
- ▶ pricing requires probabilities under pricing measure \mathcal{Q}
- ▶ use transformation from Cariboni et al. [11]

	Year 1	Year 2	Year 3	Year 4	Year 5
$PT^{\mathcal{P}}$	0.04261	0.12309	0.20974	0.29175	0.36613
$PT^{\mathcal{Q}}$	0.10174	0.21241	0.30324	0.37521	0.43258

The trigger probability (4)

Step 5 Calculate the **trigger spread**.

$$\begin{aligned} P &= \sum_{t=1}^T \frac{\mathbb{E}_{\mathcal{Q}}[C_t]}{(1+r+c_s)^t} \\ &= \frac{0.89826cN}{1.035} + \frac{0.78759cN}{1.035^2} + \frac{0.69676cN}{1.035^3} + \frac{0.62479cN}{1.035^4} + \frac{0.56742cN + N}{1.035^4} \\ &= N = 100. \end{aligned}$$

We find $c = 0.048567$, with $r = 0.010$, and $c_s = 0.025$, this results in

$$t_s = \mathbf{0.013567}.$$

Discussion on the trigger spread (1)

Trigger spread (bps) for a 5-year ESG skin-in-the-game bond with annual coupon payment, permanent coupon loss, and trigger level (column). The issuer has initial rating (row).

	C	CCC	B	BB	BBB	A
CCC	173					
B	107	223				
BB	40	90	228			
BBB	15	35	84	300		
A	6	16	39	136	424	
AAA	4	8	21	75	222	459



Discussion on the trigger spread (2)

- ▶ The trigger penalty has a large impact on the trigger spread.
 - smallest spreads for a temporary coupon loss and coupon withholding penalty
 - largest spreads for a full write-down penalty
- ▶ Calculations are done for an average company within a specific sector. In reality, market mechanism will charge different yields for different companies.
 - lower yield if it is likely that promises are fulfilled
 - higher yield if it is likely that promises turn out differently than promoted

Conclusion

We argue for the **skin-in-the-game bond** as a sustainable capital instrument with an embedded financial penalty related to E, S and/or G promises.

1. clear incentives to the **issuer** to reduce excessive risk-taking, reach sustainability goals and bring transparency
2. mechanism for **investors** to gain above risk-free returns in compensation for clearly upfront specified risks

→ skin-in-the-game is enforced and moral hazard risk is reduced

Thank you!



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