

SRE Economics Lecture 10

Financing Sustainable Real Estate at the Portfolio Level

Siqi Zheng

(MIT Center for Real Estate)

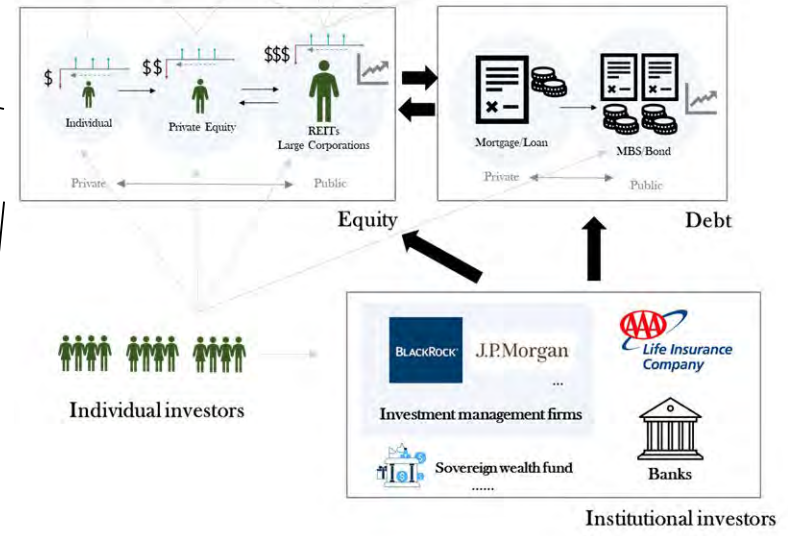
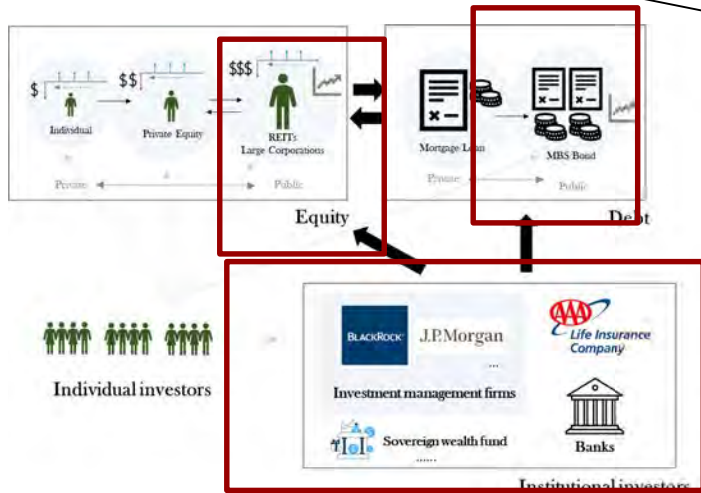
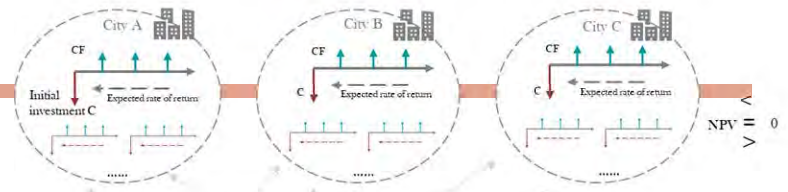
1

Knowledge Structure

- Where we are for this class?
Portfolio finance!



End users



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	Private	Public
Equity	<ul style="list-style-type: none"> • Private Property Assets • PE 	<ul style="list-style-type: none"> • REITs • Stock
Debt	<ul style="list-style-type: none"> • Mortgage • Loan 	<ul style="list-style-type: none"> • Bond • MBS



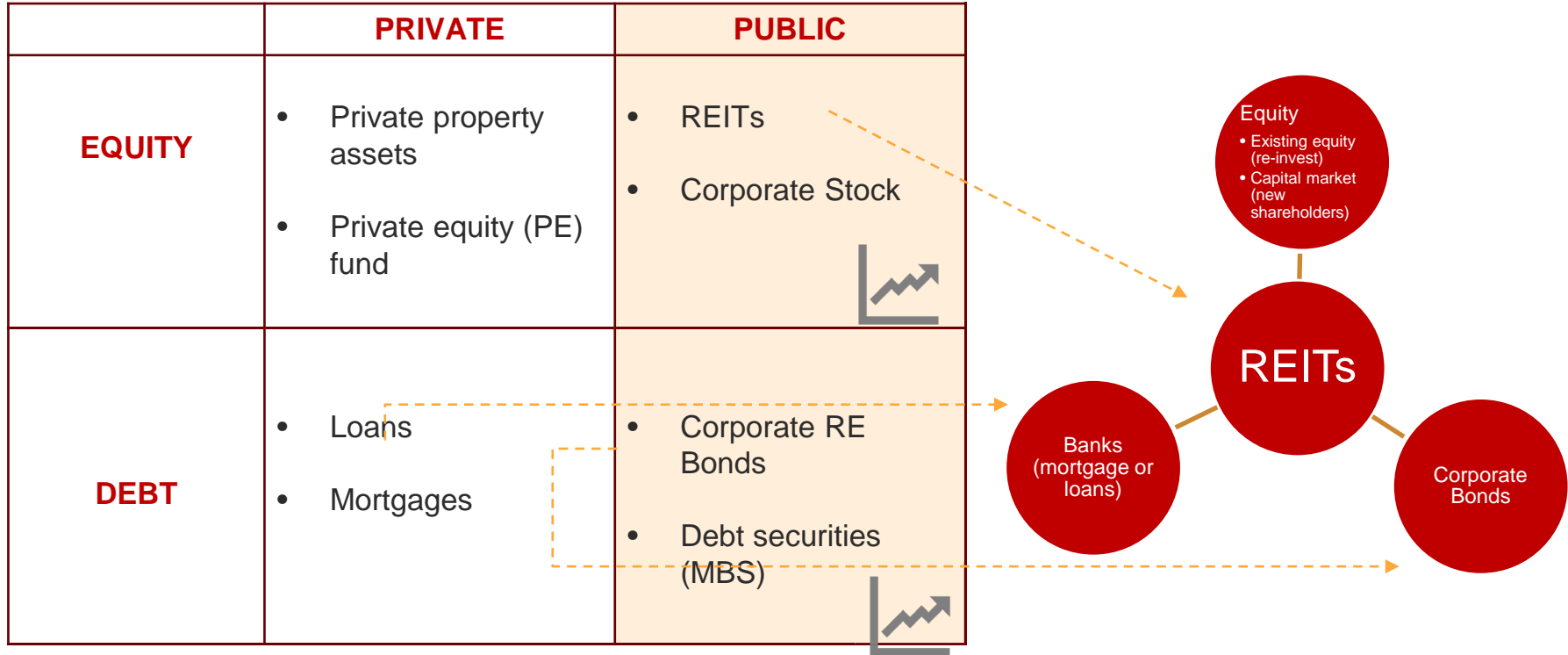
$r = WACC$ (weighted average cost of capital)

Outline

- Sustainable real estate investments at portfolio level
 - Equity: Real Estate Investment Trusts (REITs)
 - Debt: Green Bond
- Benchmarking & Disclosure

Real Estate Investment Trusts (REITs)

There Are Multiple Ways to Invest in Real Estate beyond Buying a Building



Basic Structure of REITs

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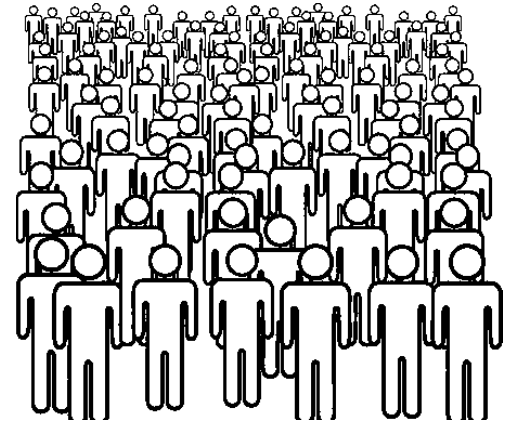
Real Estate Investment Trust

Income generating real estate properties
(Rents + Value Appreciation)



REITs are legally obliged to **distribute** 90% of their Income

Investors



75% Income be generated by **Real Estate** (rents/interest)
Assets must be **Real Estate** assets (Buildings/mortgages)

Portfolio Investments in Real Estate

Real Estate Investment Trust VS Direct Real Estate

	Advantages	Disadvantages
Direct Real Estate [Buying a Building]	<ul style="list-style-type: none">• High level of control over decisions• High exposure to desired market• No intermediaries	<ul style="list-style-type: none">• Low liquidity• High upfront investments• High risk• Requires high effort/knowledge in process selecting right properties
REITs	<ul style="list-style-type: none">• Highly liquid• Transparency of reporting• Easier to diversify portfolio• Long term returns similar to underlying real estate asset	<ul style="list-style-type: none">• High correlation in the short term with stock markets• Lower control

Countries and Regionals that have Adopted the US REIT Approach

Countries and Regions that Have Adopted the U.S. REIT Approach



CHINA EXPANDS REIT REGIME TO INCLUDE MALLS AND DEPARTMENT STORES

2023/03/27 BY BEATRICE LAFORGA — LEAVE A COMMENT



The revised REIT policy could provide opportunities for developers like Dalian Wanda Group (Getty Images)

China has expanded its pilot program for publicly traded real estate investment trusts (REITs) to include shopping malls and other retail properties, as authorities continue to expand access to liquidity for companies in the property sector.

With the country's public REIT regime approaching its second birthday, the China Securities Regulatory Commission on Friday published new rules allowing for real estate investment trusts listed on mainland stock exchanges to include "consumer-related infrastructure projects," such as department stores, shopping centres, farmer's markets and other retail properties.

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Push from Institutional Investors

64% of REIT by equity market capitalization has disclosed carbon targets in 2021, a sharp increase from 46% in 2020 (NAREIT, 2022).

Some of the most pro-ESG investors are from northern and western European countries; Middle East sovereign wealth funds care the least about ESG issues; while American institutional investors sit in the middle.

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Central bank of Norway



Dutch pension fund investment company



European multinational insurance and asset management company with HQs in Germany



Global real estate securities manager with HQs in Sydney



Canadian real estate investment and asset management company with HQs in Montreal



Canadian pension plan investment board

Doing Well by Doing Good? Evidence from Green REITs

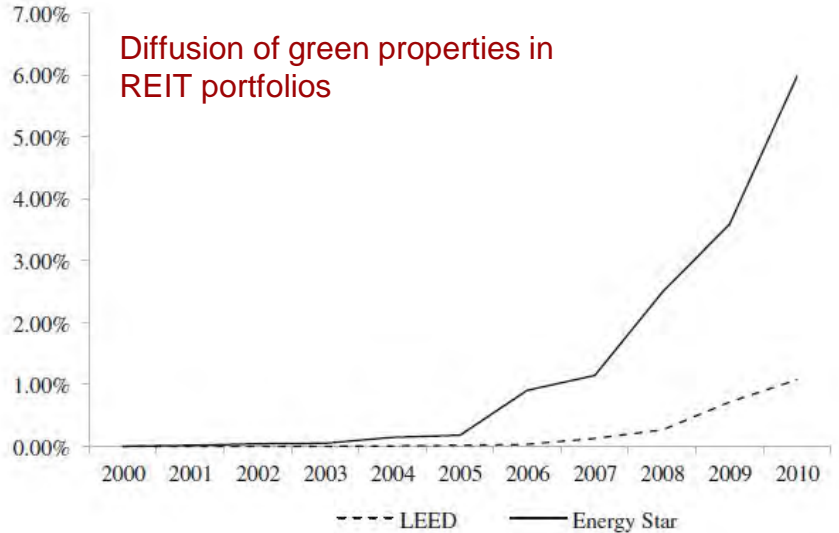
Do green assets generate higher return?

Eichholtz et al (2012) connect the number of buildings that are green certified in REIT's to find:

- Those REITs have larger share of green buildings have higher return on equity (ROE) or return on assets (ROA)
- They also have better stock performance in US stock market

Endogeneity problem:

- Reverse causality/Omitted variable bias
Well-performing companies generate higher cash flow and have excess cash that can be spend on green investments.



Source: Eichholtz, P., Kok, N., & Yonder, E. (2012). Portfolio greenness and the financial performance of REITs. *Journal of International Money and Finance*, 31(7), 1911-1929. Courtesy of Elsevier, Inc., <https://www.sciencedirect.com>. Used with permission.

Doing Well by Doing Good? Evidence from Green REITs

Green portfolios are more profitable portfolios.

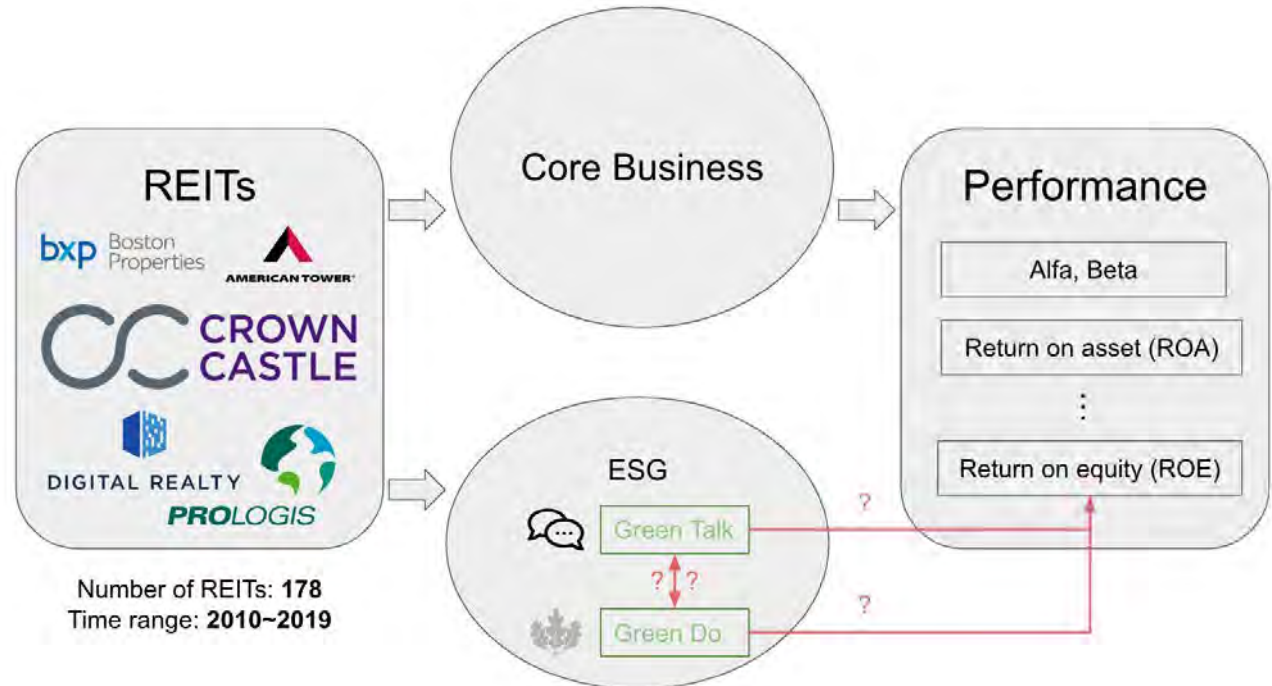
An increase of 1% of LEED assets of REITs:

- Operating performance
 - 3.5% increase in **return on assets**
 - 7.9% increase in **return on equity**
- Stock performance
 - Lower market beta (a risk measure)** by 0.14 (energy price, business cycle, regulations)

Variables	LEED (1)
<i>Panel A: return on assets</i>	
Number of certified properties (predicted)	3.42*** [1.26]
Sq.ft. of certified properties (predicted)	
Total assets (log)	-0.33** [0.15]
Real estate investment growth (percent)	-0.01 [0.01]
Price-Book ratio	0.01*** [0.00]
Age	0.06*** [0.02]
Property type controls	Y
Year-fixed effects	Y
Constant	Y
Observations	972
Log (likelihood)	-2927
Hansen J (Prob.)	0.36
Kleibergen-Paap (prob.)	0.00
<i>Panel B: return on equity</i>	
Number of certified properties (predicted)	7.92*** [2.99]
Sq.ft. of certified properties (predicted)	
Total assets (log)	-0.32 [0.53]
Real estate investment growth (percent)	-0.02 [0.03]
Price-Book ratio	0.02*** [0.01]
Age	0.09* [0.05]
Property type controls	Y
Year-fixed effects	Y
Constant	Y
Observations	972
Log (likelihood)	-3869
Hansen J (prob.)	0.72
Kleibergen-Paap (prob.)	0.00

Variables	LEED (1)
<i>Panel B: Beta</i>	
Number of certified properties (predicted)	-0.140** [0.063]
Sq.ft. of certified properties (predicted)	
Total assets (log)	0.194*** [0.009]
Real estate investment growth (percent)	-0.001** [0.000]
Debt ratio	-0.225*** [0.081]
Price-Book ratio	0.000*** [0.000]
Age	0.001 [0.001]
Property type controls	Y
Year-fixed effects	Y
Constant	Y
Observations	716
Log (likelihood)	9.563
Hansen J (prob.)	0.85
Kleibergen-Paap (prob.)	0.00

Our New Project: “Green Talking” and “Green Doing”



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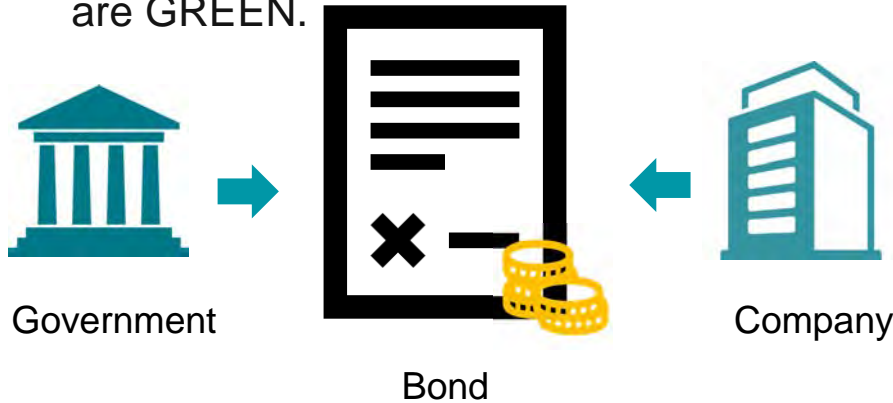
Outline

- Sustainable real estate investments at portfolio level
 - Equity: Real Estate Investment Trusts (REITs)
 - Debt: Green Bond
- Drivers of sustainable real estate investments
 - Why do institutional investors care about sustainability and climate risks?
 - Benchmarking & Disclosure

Green Bonds

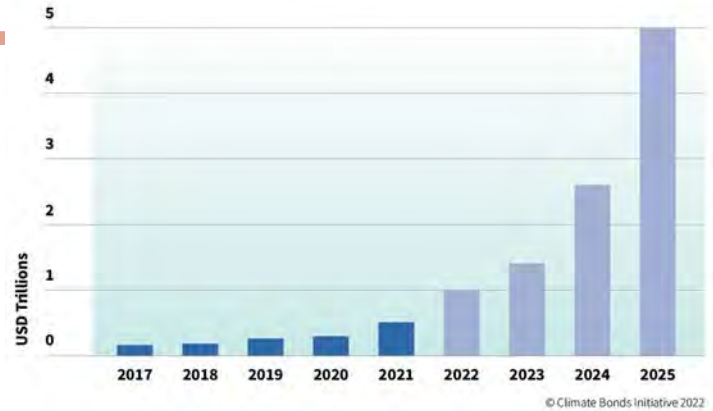
Green bonds:

- Issued by governments or companies.
- Only fund businesses or projects that are GREEN.

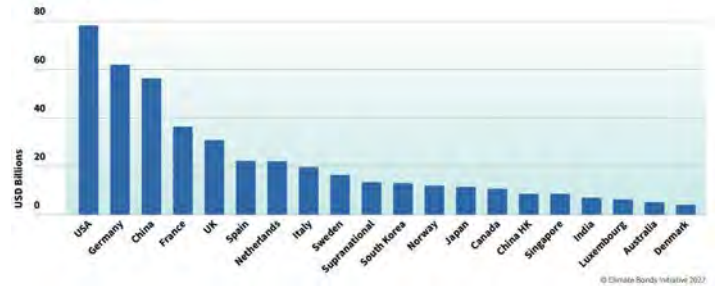


Promise to repay in the future with interest % in exchange for money to be used now for income-generating activities.

Green Bond Issuance (USD Trillion)



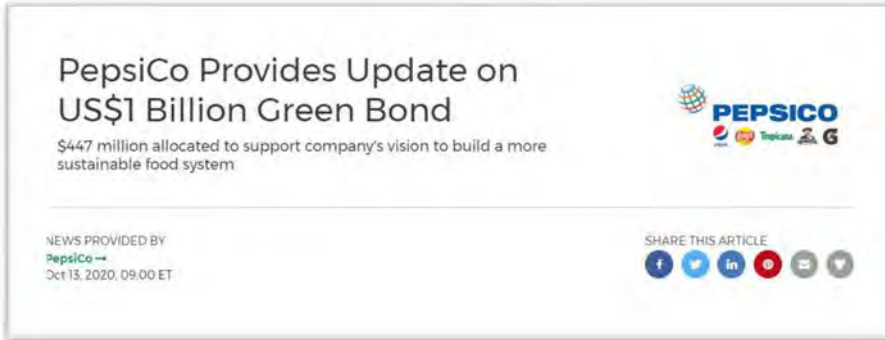
Top Twenty Countries



Source: <https://www.climatebonds.net/2022/01/500bn-green-issuance-2021-social-and-sustainable-acceleration-annual-green-1tn-sight-market> © Climate Bonds. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

Green Bonds

- Diverse issuers



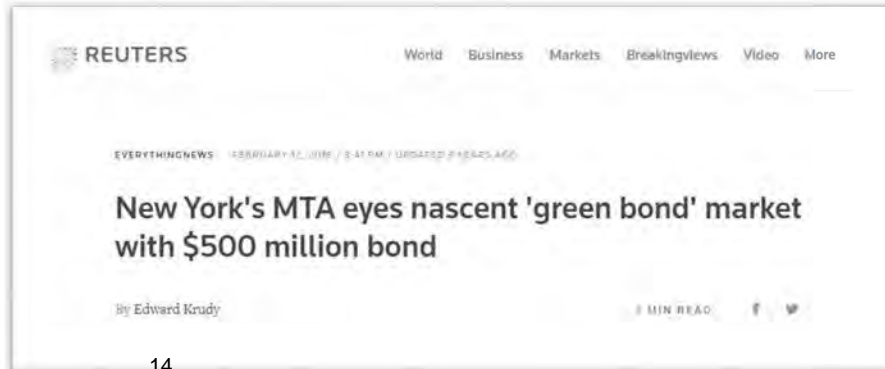
PepsiCo Provides Update on US\$1 Billion Green Bond

\$447 million allocated to support company's vision to build a more sustainable food system

NEWS PROVIDED BY
PepsiCo
Oct 13, 2020, 09:00 ET

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New York's MTA eyes nascent 'green bond' market with \$500 million bond

By Edward Krudy

1 MIN READ



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PRESS RELEASE | March 17, 2021

Apple's \$4.7 billion Green Bond spend is helping to create 1.2 gigawatts of clean power

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ESG Today

JPMorgan Invests \$1 Billion Green Bond Proceeds in Renewable Energy, Avoiding Nearly 2M Tons of CO2

Posted by Mark Segal | Sep 23, 2021 | Energy Transition, Environment, Sustainable Finance | 0



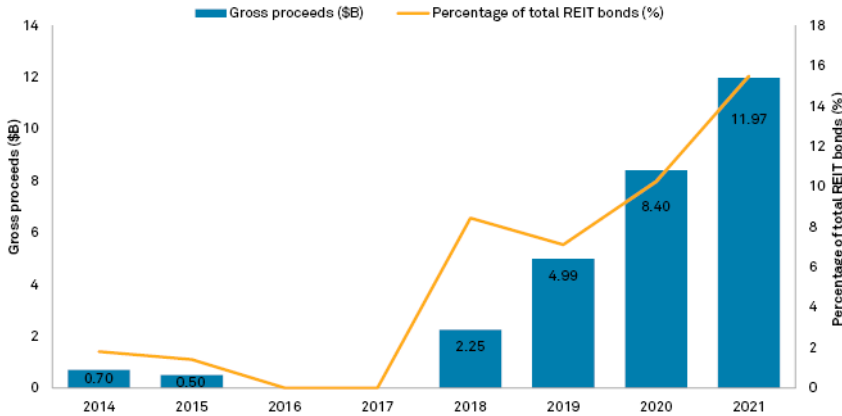
DOW JONES NEWSWIRES

Denmark Plans DKK65 Bln Govt Bond Issue in 2022; New Green Bond, New Linker to Come

Green Bonds for REITs

- Green bonds growing as a share of REIT debt issuance

US REIT green bond issuance by year



Data compiled Jan. 28, 2022.
Includes senior debt bond issuances by S&P Global Market Intelligence-covered equity REITs completed between Jan. 1, 2014, and Dec. 31, 2021, with an intended use of proceeds related primarily to green projects.
Source: S&P Global Market Intelligence

Source: <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/green-bond-issuance-by-us-reits-grew-in-2021-68335451>

Green bond issuances by US REITs in 2021

Company (ticker)	Property focus	Offering completion date	Gross proceeds (\$M)	Coupon rate (%)	Treasury spread ¹ (pps)
Healthpeak Properties Inc. (PEAK)	Healthcare	11/15/21	500.0	2.125	0.7
Host Hotels & Resorts Inc. (HST)	Hotel	11/08/21	450.0	2.900	1.6
AvalonBay Communities Inc. (AVB)	Multifamily	11/08/21	400.0	1.900	0.6
Duke Realty Corp. (DRE)	Industrial	11/01/21	500.0	2.250	0.8
W. P. Carey Inc. (WPC)	Diversified	10/05/21	350.0	2.450	1.0
Kilroy Realty Corp. (KRC)	Office	09/23/21	450.0	2.650	1.3
Boston Properties Inc. (BXP)	Office	09/15/21	850.0	2.450	1.2
AvalonBay Communities Inc. (AVB)	Multifamily	09/08/21	700.0	2.050	0.7
Rexford Industrial Realty Inc. (REXR)	Industrial	08/04/21	400.0	2.150	1.1
Equity Residential (EQR)	Multifamily	08/03/21	500.0	1.850	0.7
Terreno Realty Corp. (TRNO)	Industrial	07/15/21	100.0	2.410	NA
Realty Income Corp. (O)	Single tenant	07/08/21	550.6	1.125	NA
Realty Income Corp. (O)	Single tenant	07/08/21	481.8	1.750	NA
Healthpeak Properties Inc. (PEAK)	Healthcare	06/30/21	450.0	1.350	0.5
Vornado Realty Trust (VNO)	Office	05/13/21	400.0	2.150	1.4
Vornado Realty Trust (VNO)	Office	05/13/21	350.0	3.400	1.8
Equinix Inc. (EQIX)	Data center	05/03/21	1,000.0	2.500	1.0
Boston Properties Inc. (BXP)	Office	03/02/21	850.0	2.550	1.2
Equinix Inc. (EQIX)	Data center	02/24/21	606.6	0.250	NA
Equinix Inc. (EQIX)	Data center	02/24/21	728.0	1.000	NA
Alexandria Real Estate Equities Inc. (ARE)	Office	02/03/21	900.0	2.000	0.9
Duke Realty Corp. (DRE)	Industrial	01/11/21	450.0	1.750	0.7

Data compiled Jan. 28, 2022.

NA = not available

Includes senior debt issuances by publicly traded U.S. equity REITs completed between Jan. 1, 2021, and Dec. 31, 2021, with an intended use of proceeds related primarily to green projects.

¹ Represents the difference in yield between the underlying debt security and a U.S. Treasury note with the same maturity date at the time of issuance.

Source: S&P Global Market Intelligence


Green Bonds for REITs

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Boston Properties Prices \$850.0 Million
Offering of Green Bonds; Elects to Redeem
\$1.0 Billion of Senior Unsecured Notes Due
February 2023

September 15, 2021

 PDF Version

- BXP green bond history: \$1.0 billion in Nov 2018, \$850.0 million in June 2019, \$850.0 million in March 2021, \$850.0 million in Sep 2021.
- The 12-year bond deal priced at a spread of 115 basis points above Treasuries to yield 2.45%.
- Expect to use proceeds to repay outstanding corporate debt coming due and to fund or refinance eligible U.S. green projects.

The Greenness of REITs Helps Lower Bond Spread

Asset level: lower mortgage spread

The spreads of mortgages on environmental certified buildings are 24 to 29 basis points lower. (translates into a reduction of \$147,000 to \$206,000 interest payment for an average commercial building)

Portfolio level: lower bond spread

Doubling a portfolio's share of certified buildings (an average REIT from 3 to 6 percent) lowers the bond spread by 21 to 74 basis points.

Table 2
Environmental Certification and Mortgage Spreads OLS Regressions (2006–2015).

VARIABLES	(3)	(4)	(5)	(6)
Environmental Certification (1=yes)	-0.243** [0.110]	-0.246** [0.110]	-0.285** [0.133]	-0.269* [0.141]
Year-Fixed Effects	Yes	Yes	Yes	Yes
State-Fixed Effects	Yes	Yes	Yes	Yes
Asset Type-Fixed Effects	Yes	Yes	Yes	Yes
Firm-Fixed Effects	No	No	No	Yes
Observations	5596	5596	2889	2889
Adjusted R-squared	0.514	0.514	0.537	0.646

(column 3-6: different controls)

Table 3
Environmental Certification and Corporate Bond Spreads OLS, 2-Stage GMM, and Change by Year Regressions (2006–2015).

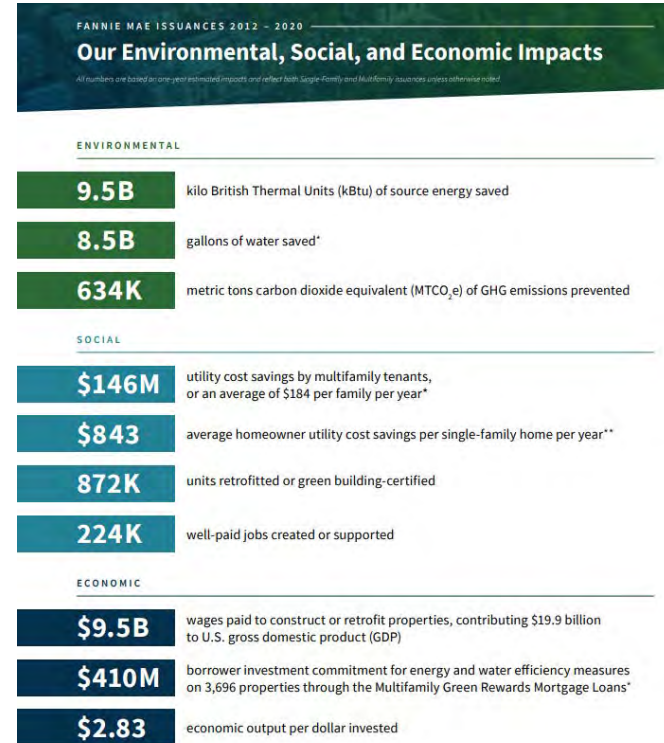
VARIABLES	(1)	(2)	(3)	(4)
		OLS		2-Stage GMM
Green Share (in logs)	-0.093* [0.049]	-0.211*** [0.057]	-0.160 [0.357]	-0.738*** [0.161]
Year-Fixed Effects	Yes	Yes	Yes	Yes
Asset Type-Fixed Effects	Yes	Yes	Yes	Yes
Observations	240	1628	240	1628
Adjusted R-squared	0.741	0.833	0.731	0.817
Hansen J (prob.)			0.034	0.518
Kleibergen Paap (prob.)			0.287	0.000

(column 1 and 3 are origination; column 2 and 4 are secondary markets)

Another example: Fannie Mae Multifamily Green Bonds

- Fannie Mae:
Leading provider of financing. Own 21% of the outstanding debt on multifamily properties in US.
- Green Financing products
 - (1) **Green Rewards Mortgage Loan**
Eligibility: Properties retrofitting existing properties and can reduce energy and water consumption by a combined minimum of 30% (at least 15% from energy).
 - (2) **Green Building Certification Mortgage Loan**
Eligibility: New construction property awarded by green building certifications recognized by Fannie Mae.

A loan that uses the above green financing products is eligible to be securitized as a **Fannie Mae Green Bond**.



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Green Bonds: How to signal the market Greenness?

- Green bonds: the money raised from investors is used exclusively to finance projects that have a positive environmental impact, such as green buildings
- Major investors from asset managers to insurers and pension are demanding them
- EU deal: orders exceeded the securities available by more than 11 times
- Green bond principles (avoid greenwashing) – making false or misleading claims about the underlying asset



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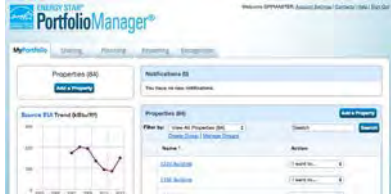
Outline

- Sustainable real estate investments at portfolio level
 - Portfolio investment (diversity) makes sense
 - Sustainable portfolio makes sense: equity and debt
- **Benchmarking & Disclosure**

Data, Measurement, and Benchmarking

Data acquisition:

Incorporate language into lease to obligate the tenants to share utility data [EPA Portfolio Manager]



Data integration and visualization: energy, emissions, and water data for third party validation.

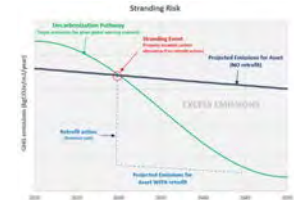
Third-party assurance (“audit”): The assurance process includes sampling and verifying the data and issuing an assurance opinion.



Scope 1-3 emissions calculation: [Quantis], [One Click LCA], and [EC3]



Portfolio evaluation framework and benchmarking



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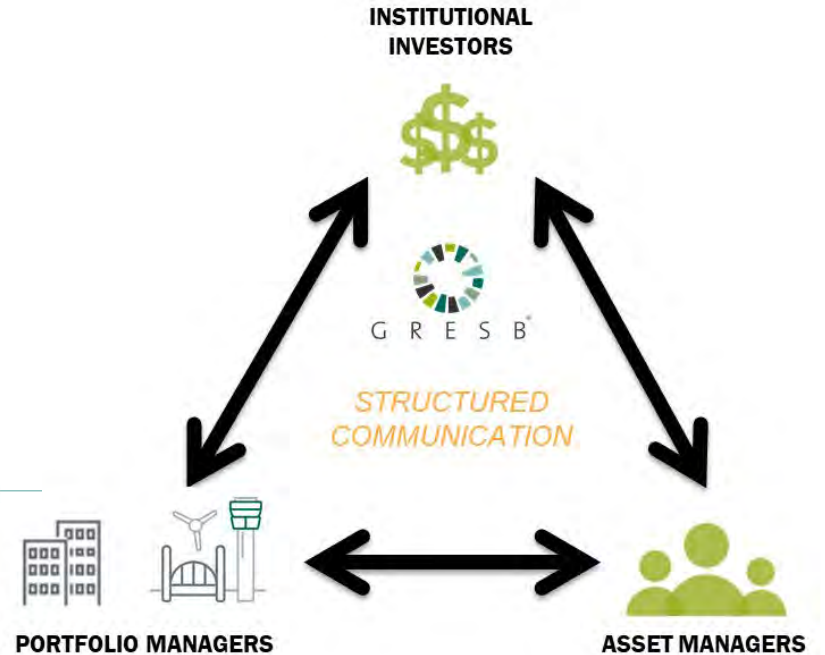
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Solving information asymmetry: Benchmarking and Disclosure

Global Real Estate Sustainability Benchmark



Assess and **benchmark** ESG performance of real assets, providing **standardized** and **validated** data to capital markets.



GRESB: Real Estate Assessment



Management Component

Leadership	Policies	Reporting	Risk Management	Stakeholder Engagement

Performance Component

Risk Assessment	Targets	Tenants & Community	Energy	Greenhouse Gas Emissions
Water	Waste	Data Monitoring & Review	Building Certifications	

Development Component

ESG Requirements	Materials	Building Certifications	Energy
Water	Waste	Stakeholder Engagement	

GRESB: Real Estate Assessment



Standing Investments Benchmark

PERFORMANCE COMPONENT
(70% score)

MANAGEMENT COMPONENT
(30% score)

DEVELOPMENT COMPONENT
(70% score)

Real Estate Development Benchmark



Development Benchmark

Real Estate Standing Investment Benchmark



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GRESB: Benchmark Report

Kilroy Realty Corporation
Kilroy Realty Corporation

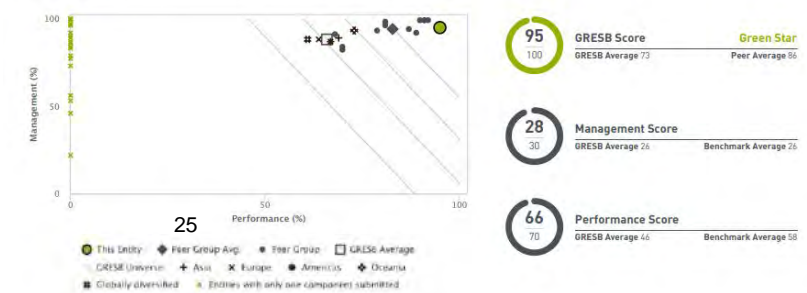


Rankings



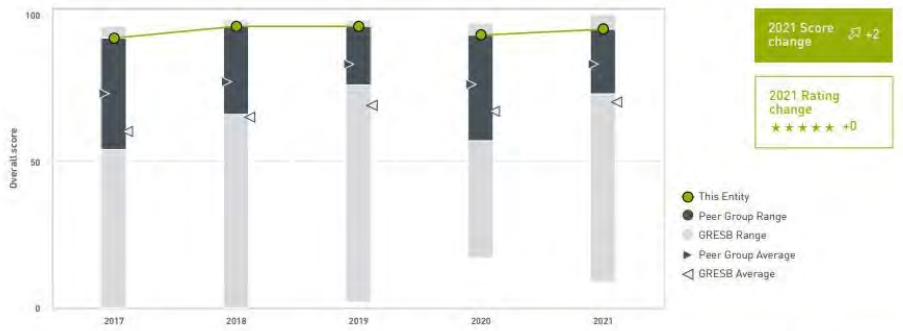
Comparisons against peer groups

GRESB Model



Example: Kilroy Realty Corporation ([source](#))

Trend Trend analysis



Note: In 2020, the GRESB Assessment structure fundamentally changed, establishing a new baseline for measuring Performance. As a result, GRESB advises against a direct comparison between 2020 GRESB Scores and prior year results. For more information, see the 2020 Benchmark Reports.

Aspect, Strengths & Opportunities Score by category

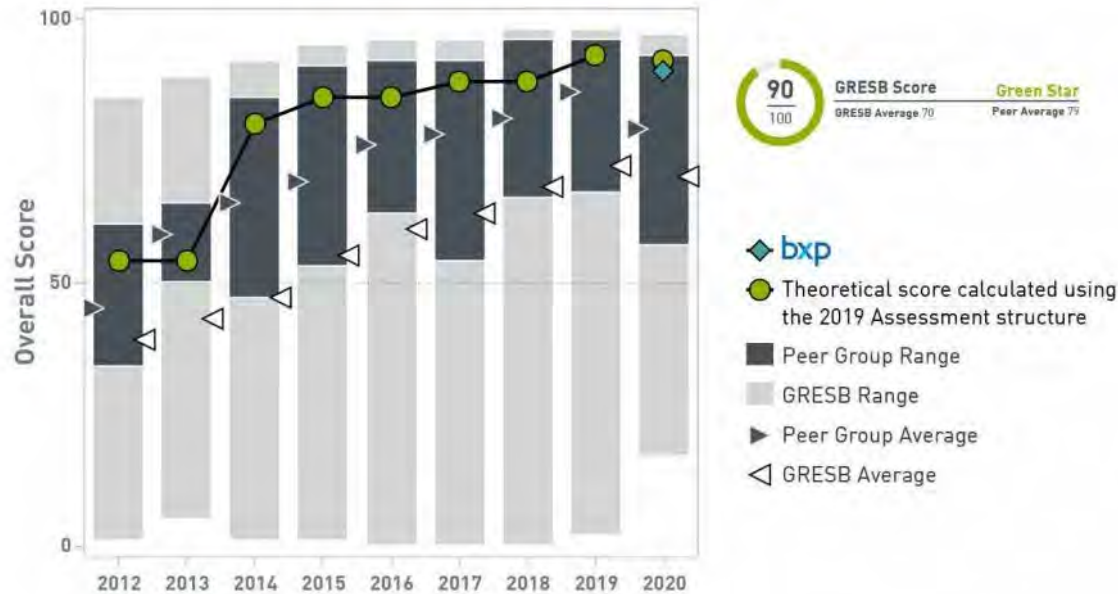


MANAGEMENT COMPONENT
Americas | Listed (97 entities)

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GRESB: Benchmark Report

Example: Boston Properties ([source](#))



Private Equity Real Estate Return and GRESB rating

How GRESB ESG disclosure impact private equity real estate return?

- Substantial adoption of GRESB in private (non-listed) funds/firms.
- GRESB participation and performance are both significant predictors of fund returns.

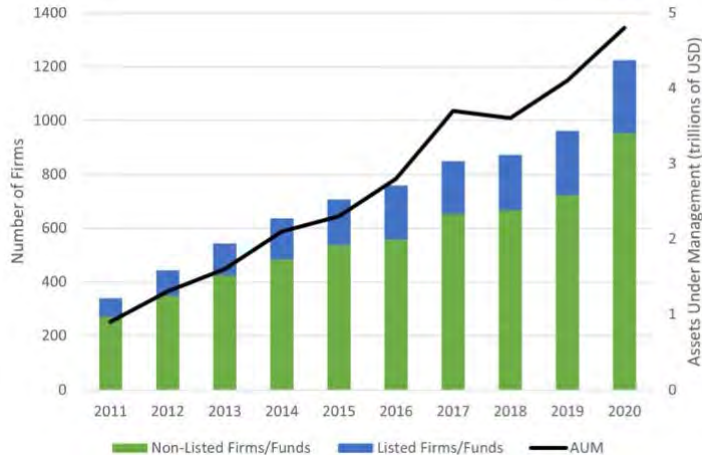


Table 2 All models are estimated using Fama-MacBeth regressions with Newey-West standard errors. The dependent variable in all estimations is *Total Return*. *GRESB* is a dummy variable tracking GRESB Real Estate Assessment participation and *GRESB Score* represents the earned score on that Assessment, scaling from zero to five. The omitted category for model estimations (1), (2), and (3) is *Past Return*, which is included in model estimations (4), (5), and (6). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively

	(1)	(2)	(3)	(4)	(5)	(6)
<i>GRESB</i>		0.339*** (3.25)			0.349*** (3.38)	
<i>GRESB Score</i>			0.077*** (3.39)			0.090*** (4.48)

Devine, A., Sanderford, A., & Wang, C. (2022). Sustainability and Private Equity Real Estate Returns. *Journal of Real Estate Finance and Economics*. © Elsevier Inc. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

REITs Performance and GRESB rating

How GRESB ESG disclosure impact REIT performance?

- GRESB ESG disclosure levels are positively associated with REITs' operational performance (ROA and ROE), while less salient for stock market performance.

Table 3: Regression estimates for overall GRESB score and financial performance

Dependent variable	(1) log ROA	(2) log ROA	(3) log ROE	(4) log ROE	(5) log stock return	(6) log stock return
Estimation method	Fixed effects	Heckman	Fixed effects	Heckman	Fixed effects	Heckman
ln_GRESB score	0.0126** (2.30)	0.0133** (2.74)	0.0329** (2.71)	0.0345** (3.15)	0.000153 (1.51)	0.000161* (1.75)

REIT Financing and GRESB rating

How GRESB ESG disclosure impact debt financing for green REITs?

- Strong, negative relation between ESG disclosure level and the interest payments for REITs
- Higher corporate credit ratings (i.e., S&P's AAA, BBB,...)

Table 2 Cost of debt and ESG disclosure

Variables	Weighted average interest rate		Interest to-debt ratio	
	(1)	(2)	(3)	(4)
	Coefficient	<i>t</i> -Statistic	Coefficient	<i>t</i> -Statistic
ESG disclosure level—B	0.427***	3.00	0.439***	3.12
ESG disclosure level—C	0.508***	2.88	0.608***	4.06
ESG disclosure level—D	0.715***	3.57	0.885***	3.92
ESG disclosure level—E	1.067***	3.67	1.371***	5.39

Feng, Z. and Wu, Z., 2021. ESG disclosure, REIT debt financing and firm value. *The Journal of Real Estate Finance and Economics*, pp.1-35. © Springer Nature. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

Disclosure and Reporting: TCFD

Figure 1

Climate-Related Risks, Opportunities, and Financial Impact



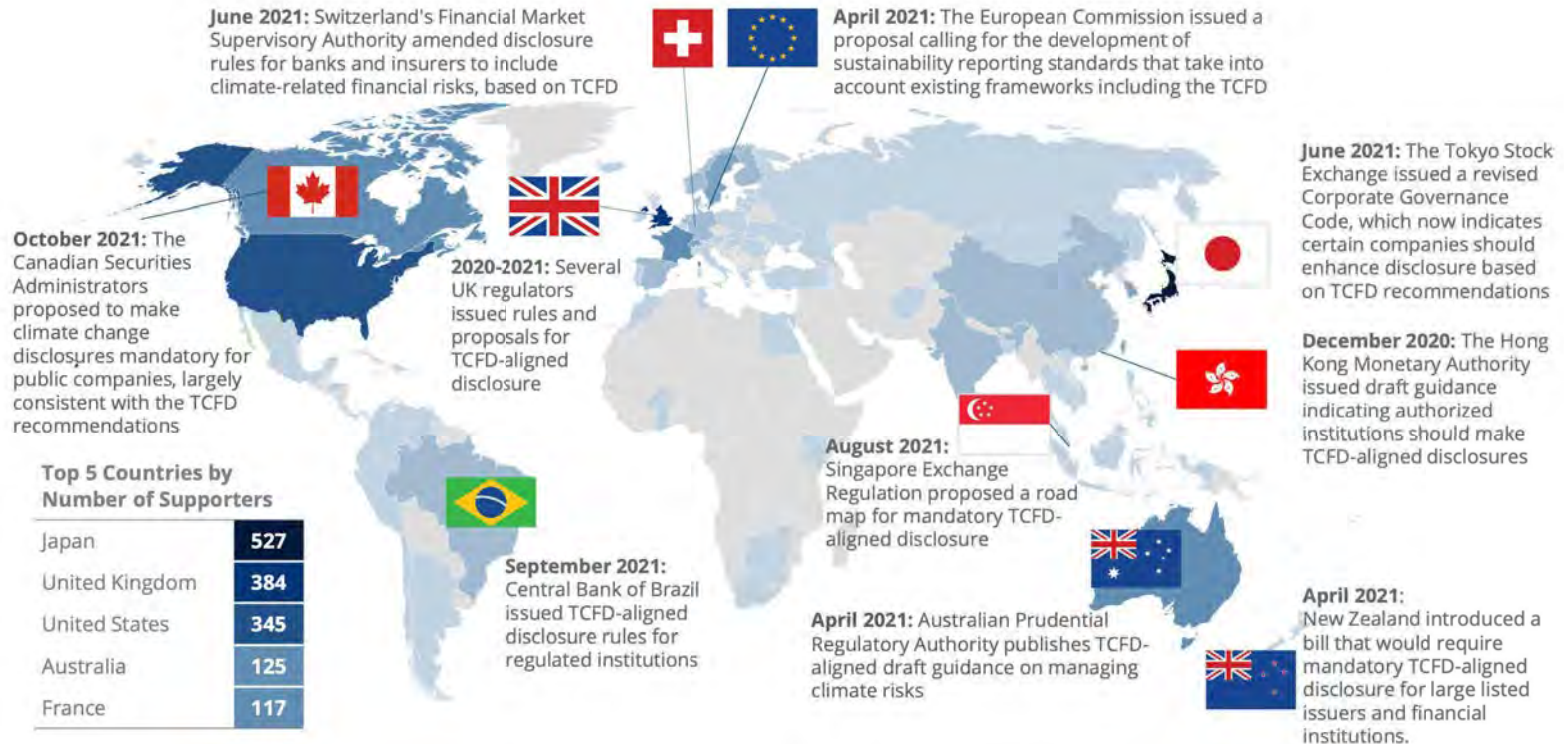
Disclosure and Reporting: TCFD

Solving information asymmetries: The role of reporting

Table A1
TCFD Recommendations and Supporting Recommended Disclosures

Governance	Strategy	Risk Management	Metrics and Targets
Disclose the company's governance around climate-related risks and opportunities.	Disclose the actual and potential impacts of climate-related risks and opportunities on the company's businesses, strategy, and financial planning where such information is material.	Disclose how the company identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.
a) Describe the board's oversight of climate-related risks and opportunities.	a) Describe the climate-related risks and opportunities the company has identified over the short, medium, and long term.	a) Describe the company's processes for identifying and assessing climate-related risks.	a) Disclose the metrics used by the company to assess climate-related risks and opportunities in line with its strategy and risk management process.
b) Describe management's role in assessing and managing climate-related risks and opportunities.	b) Describe the impact of climate-related risks and opportunities on the company's businesses, strategy, and financial planning.	b) Describe the company's processes for managing climate-related risks.	b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.
	c) Describe the resilience of the company's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the company's overall risk management.	c) Describe the targets used by the company to manage climate-related risks and opportunities and performance against targets.

Countries mandating climate risk disclosures



Top 5 Countries by Number of Supporters

Japan	527
United Kingdom	384
United States	345
Australia	125
France	117



ESG Confusion

Professor Roberto Rigobon at MIT Sloan:

<https://mitsloan.mit.edu/sustainability-initiative/aggregate-confusion-project>

- **ESG data are noisy and unreliable.** The correlation among six prominent ratings agencies (KLD, Sustainalytics, Moody's ESG (Vigeo-Eiris), S&P Global (RobecoSAM), Refinitiv (Asset4), and MSCI) was on average 0.54. In comparison, mainstream credit ratings from Moody's and Standard & Poor's are correlated at 0.92.
- Three factors driving ratings divergence: **Scope, Measurement, Weights Divergence.**
- **Rater effect:** A rater's overall view of a firm influences the measurement of specific categories.

Correlations between ESG ratings at the aggregate rating level (ESG) and at the level of the environmental dimension (E), the social dimension (S), and the governance dimension (G) using the common sample. The results are similar using pairwise common samples based on the full sample. SA, SP, MO, RE, KL, and MS are short for Sustainalytics, S&P Global, Moody's ESG, Refinitiv, KLD, and MSCI, respectively.

	KL SA	KL MO	KL SP	KL RE	KL MS	SA MO	SA SP	SA RE	SA MS	MO SP	MO RE	MO MS	SP RE	SP MS	RE MS	Average
ESG	0.53	0.49	0.44	0.42	0.53	0.71	0.67	0.67	0.46	0.7	0.69	0.42	0.62	0.38	0.38	0.54
E	0.59	0.55	0.54	0.54	0.37	0.68	0.66	0.64	0.37	0.73	0.66	0.35	0.7	0.29	0.23	0.53
S	0.31	0.33	0.21	0.22	0.41	0.58	0.55	0.55	0.27	0.68	0.66	0.28	0.65	0.26	0.27	0.42
G	0.02	0.01	-0.01	-0.05	0.16	0.54	0.51	0.49	0.16	0.76	0.76	0.14	0.79	0.11	0.07	0.30

ESG Confusion

- Propose two noise-correction procedures (instrument ESG ratings with ratings of other ESG rating agencies)
- After correcting for attenuation bias of ESG noises, the effect of ESG performance on stock returns is stronger than previously estimated.

Region	Rater	OLS			Pruned IV			Ftest
		Coeffs	StdErr		Coeffs	StdErr	Valid IV	
EUR	ISS	0.152	0.071	**	0.137	0.054	***	1258
	MSCI	0.123	0.053	**	0.194	0.071	***	1029
	Refinitiv	0.012	0.066		0.183	0.071	***	1660
	RepRisk	0.146	0.069	**	0.333	0.072	***	432
	S&P Global	0.122	0.083		0.055	0.055		1296
	Sustainalytics	0.123	0.076		0.237	0.071	***	881
	TVL	0.039	0.066		0.634	0.071	***	125
	Moody's	0.027	0.076		0.220	0.071	***	1874

- Other ongoing ESG improvement: <https://mitsloan.mit.edu/ideas-made-to-matter/why-sustainable-business-needs-better-esg-ratings>

Berg, F., Koelbel, J. F., Pavlova, A., & Rigobon, R. (2022). ESG confusion and stock returns: Tackling the problem of noise (No. w30562). National Bureau of Economic Research. Table © the authors. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

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