Package 'r2dii.analysis'

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Title Measure Climate Scenario Alignment of Corporate Loans

Version 0.1.12

Description These tools help you to assess if a corporate lending portfolio aligns with climate goals. They summarize key climate indicators attributed to the portfolio (e.g. production, emission factors), and calculate alignment targets based on climate scenarios. They implement in R the last step of the free software 'PACTA' (Paris Agreement Capital Transition Assessment; <https://2degrees-investing.org/>). Financial institutions use 'PACTA' to study how their capital allocation decisions align with climate change mitigation goals.

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URL https://github.com/2DegreesInvesting/r2dii.analysis

BugReports https://github.com/2DegreesInvesting/r2dii.analysis/issues

Depends R (>= 3.4)

Imports dplyr (>= 0.8.5), glue, magrittr, r2dii.data, rlang (>= 0.1.2), tidyr, tidyselect, zoo

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R topics documented:

`join_ald_scenario` *Join a data-loanbook object to the ald and scenario*

Description

`join_ald_scenario()` is a simple wrapper of several calls to dplyr::join_*(), forming the master dataset to be used in later steps of the analysis.

Usage

```
join_ald_scenario(
  data,
  ald,
  scenario,
  region_isos = r2dii.data::region_isos,
  add_green_technologies = FALSE
)
```

Arguments

`data`	A data frame like the output of `r2dii.match::prioritize`.
`ald`	An asset level data frame like r2dii.data::ald_demo.
`scenario`	A scenario data frame like r2dii.data::scenario_demo_2020.
`region_isos`	A data frame like r2dii.data::region_isos (default).
`add_green_technologies`	Logical vector of length 1. `FALSE` defaults to outputting only technologies that are present in both `data` and `ald`. Set to `FALSE` to add rows of all possible green technologies (with 0 production).

Value

Returns a fully joined data frame, linking portfolio, ald and scenario.

See Also

Other utility functions: `summarize_weighted_production()`

Examples

```
installed <- requireNamespace("r2dii.data", quietly = TRUE) &&
  requireNamespace("r2dii.match", quietly = TRUE)

if (installed) {
  library(r2dii.data)
  library(r2dii.match)

  valid_matches <- match_name(loanbook_demo, ald_demo) %>%
    # WARNING: Remember to validate matches (see `?prioritize`)
    prioritize()

  valid_matches %>%
    join_ald_scenario(
      ald = ald_demo,
      scenario = scenario_demo_2020,
      region_isos = region_isos_demo
    )
}
```

`summarize_weighted_production` *Summaries based on the weight of each loan per sector per year*

Description

Based on on the weight of each loan per sector per year, `summarize_weighted_production()` and `summarize_weighted_percent_change()` summarize the production and percent-change, respectively.

Usage

```
summarize_weighted_production(data, ..., use_credit_limit = FALSE)

summarize_weighted_percent_change(data, ..., use_credit_limit = FALSE)
```

Arguments

`data`	A data frame like the output of `join_ald_scenario()`.
`...`	Variables to group by.
`use_credit_limit`	Logical vector of length 1. `FALSE` defaults to using the column `loan_size_outstanding`. Set to `TRUE` to instead use the column `loan_size_credit_limit`.

Value

A tibble with the same groups as the input (if any) and columns: `sector`, `technology`, and `year`; and `weighted_production` or `weighted_production` for `summarize_weighted_production()` and `summarize_weighted_percent_change()`, respectively.

Warning

The percent-change analysis excludes companies with 0 production. percent-change is undefined for companies that have no initial production; including such companies would cause percent-change percentage to be infinite, which is wrong.

See Also

join_ald_scenario().

Other utility functions: join_ald_scenario()

Examples

```
installed <- requireNamespace("r2dii.data", quietly = TRUE) &&
  requireNamespace("r2dii.match", quietly = TRUE)
if (installed) {
  library(r2dii.data)
  library(r2dii.match)

  loanbook <- head(loanbook_demo, 150)
  ald <- head(ald_demo, 100)
  master <- loanbook %>%
    match_name(ald) %>%
    prioritize() %>%
    join_ald_scenario(
      ald = ald,
      scenario = scenario_demo_2020,
      region_isos = region_isos_demo
    )

  summarize_weighted_production(master)

  summarize_weighted_production(master, use_credit_limit = TRUE)

  summarize_weighted_percent_change(master)

  summarize_weighted_percent_change(master, use_credit_limit = TRUE)
}
```

---

target_market_share *Add targets for production, using the market share approach*

Description

This function calculates the portfolio-level production targets, as calculated using the market share approach applied to each relevant climate production forecast.

Usage

```
target_market_share(
  data,
  ald,
  scenario,
  region_isos = r2dii.data::region_isos,
  use_credit_limit = FALSE,
  by_company = FALSE,
  weight_production = TRUE
)
```

Arguments

data	A "data.frame" like the output of r2dii.match::prioritize.
ald	An asset level data frame like r2dii.data::ald_demo.
scenario	A scenario data frame like r2dii.data::scenario_demo_2020.
region_isos	A data frame like r2dii.data::region_isos (default).
use_credit_limit	Logical vector of length 1. FALSE defaults to using the column loan_size_outstanding. Set to TRUE to use the column loan_size_credit_limit instead.
by_company	Logical vector of length 1. FALSE defaults to outputting production_value at the portfolio-level. Set to TRUE to output production_value at the company-level.
weight_production	Logical vector of length 1. TRUE defaults to outputting production, weighted by relative loan-size. Set to FALSE to output the unweighted production values.

Value

A tibble including the summarized columns metric, production and technology_share. If by_company = TRUE, the output will also have the column name_ald.

Handling grouped data

This function ignores existing groups and outputs ungrouped data.

See Also

Other functions to calculate scenario targets: target_sda()

Examples

```
installed <- requireNamespace("r2dii.data", quietly = TRUE) &&
  requireNamespace("r2dii.match", quietly = TRUE)

if (installed) {
  library(r2dii.data)
  library(r2dii.match)
```

```
  loanbook <- head(loanbook_demo, 100)
  ald <- head(ald_demo, 100)

  matched <- loanbook %>%
    match_name(ald) %>%
    prioritize()

  # Calculate targets at portfolio level
  matched %>%
    target_market_share(
      ald = ald,
      scenario = scenario_demo_2020,
      region_isos = region_isos_demo
    )

  # Calculate targets at company level
  matched %>%
    target_market_share(
      ald = ald,
      scenario = scenario_demo_2020,
      region_isos = region_isos_demo,
      by_company = TRUE
    )

  matched %>%
    target_market_share(
      ald = ald,
      scenario = scenario_demo_2020,
      region_isos = region_isos_demo,
      # Calculate unweighted targets
      weight_production = FALSE
    )
}
```

`target_sda` *Add targets for CO2 emissions per unit production at the portfolio level, using the SDA approach*

Description

This function calculates targets of CO2 emissions per unit production at the portfolio-level, otherwise referred to as "emissions factors". It uses the sectoral-decarbonization approach (SDA) to calculate these targets.

Usage

```
target_sda(
  data,
  ald,
```

```
  co2_intensity_scenario,
  use_credit_limit = FALSE,
  by_company = FALSE
)
```

Arguments

data	A dataframe like the output of `r2dii.match::prioritize()`.
ald	An asset-level data frame like r2dii.data::ald_demo.
co2_intensity_scenario	A scenario data frame like r2dii.data::co2_intensity_scenario_demo.
use_credit_limit	Logical vector of length 1. `FALSE` defaults to using the column `loan_size_outstanding`. Set to `TRUE` to instead use the column `loan_size_credit_limit`.
by_company	Logical vector of length 1. `FALSE` defaults to outputting `weighted_production_value` at the portfolio-level. Set to `TRUE` to output `weighted_production_value` at the company-level.

Value

A tibble with the CO2 emissions factors attributed to the portfolio. These values include the portfolio's actual projected CO2 emissions factors, the scenario pathway CO2 emissions factors and the SDA calculated portfolio target emissions factors (see column `emission_factor_metric`).

Handling grouped data

This function ignores existing groups and outputs ungrouped data.

See Also

Other functions to calculate scenario targets: `target_market_share()`

Examples

```
installed <- requireNamespace("r2dii.match", quietly = TRUE) &&
  requireNamespace("r2dii.data", quietly = TRUE)
if (installed) {
  library(r2dii.match)
  library(r2dii.data)

  # Example datasets from r2dii.data
  loanbook <- head(loanbook_demo, 150)
  ald <- head(ald_demo, 100)

  co2_scenario <- co2_intensity_scenario_demo

  # WARNING: Remember to validate matches (see `?prioritize`)
  matched <- prioritize(match_name(loanbook, ald))

  # You may need to clean your data
```

```
  anyNA(ald$emission_factor)
  try(target_sda(matched, ald, co2_intensity_scenario = co2_scenario))

  ald2 <- subset(ald, !is.na(emission_factor))
  anyNA(ald2$emission_factor)

  out <- target_sda(matched, ald2, co2_intensity_scenario = co2_scenario)

  # The output includes the portfolio's actual projected emissions factors, the
  # scenario pathway emissions factors, and the portfolio's target emissions
  # factors.
  out

  # Split-view by metric
  split(out, out$emission_factor_metric)

  # Calculate company-level targets
  out <- target_sda(
    matched, ald2,
    co2_intensity_scenario = co2_scenario,
    by_company = TRUE
  )
  out
}
```

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