Package 'PortfolioTesteR'

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Type Package

Title Test Investment Strategies with English-Like Code

Version 0.1.1

Description Design, backtest, and analyze portfolio strategies using simple, English-like function chains. Includes technical indicators, flexible stock selection, portfolio construction methods (equal weighting, signal weighting, inverse volatility, hierarchical risk parity), and a compact backtesting engine for portfolio returns, drawdowns, and summary metrics.

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URL https://github.com/alb3rtazzo/PortfolioTesteR

BugReports https://github.com/alb3rtazzo/PortfolioTesteR/issues

Depends R (>= 3.5.0)

Imports data.table, graphics, stats, TTR, utils, zoo

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Contents

`align_to_timeframe` *Align Data to Strategy Timeframe*

Description

Aligns higher-frequency data to match strategy timeframe.

Usage

```
align_to_timeframe(
  high_freq_data,
  low_freq_dates,
  method = c("forward_fill", "nearest", "interpolate")
)
```

Arguments

`high_freq_data`	Data frame to align
`low_freq_dates`	Date vector from strategy
`method`	Alignment method: "forward_fill", "nearest", or "interpolate"

Value

Aligned data frame

Examples

```
data("sample_prices_weekly")
data("sample_prices_daily")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, 10)
# Create a stability signal from daily data
daily_vol <- calc_rolling_volatility(sample_prices_daily, lookback = 20)
stability_signal <- align_to_timeframe(daily_vol, sample_prices_weekly$Date)
weights <- weight_by_signal(selected, stability_signal)
```

---

analyze_drawdowns *Analyze Drawdown Characteristics*

Description

Detailed analysis of drawdown periods including depth, duration, and recovery.

Usage

```
analyze_drawdowns(drawdowns, returns)
```

Arguments

drawdowns	Drawdown series (negative values)
returns	Return series for additional metrics

Value

List with drawdown statistics

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)
weights <- weight_equally(selected)
result <- run_backtest(sample_prices_weekly, weights)
dd_analysis <- analyze_drawdowns(result$portfolio_value, result$dates)
```

`analyze_performance` *Analyze Backtest Performance with Daily Monitoring*

Description

Calculates comprehensive performance metrics using daily price data for enhanced accuracy. Provides risk-adjusted returns, drawdown analysis, and benchmark comparison even when strategy trades at lower frequency.

Usage

```
analyze_performance(
  backtest_result,
  daily_prices,
  benchmark_symbol = "SPY",
  rf_rate = 0,
  confidence_level = 0.95
)
```

Arguments

`backtest_result`	Result object from run_backtest()
`daily_prices`	Daily price data including all portfolio symbols
`benchmark_symbol`	Symbol for benchmark comparison (default: "SPY")
`rf_rate`	Annual risk-free rate for Sharpe/Sortino (default: 0)
`confidence_level`	Confidence level for VaR/CVaR (default: 0.95)

Value

performance_analysis object with metrics and daily tracking

Examples

```
data("sample_prices_weekly")
data("sample_prices_daily")

# Use overlapping symbols; cap to 3
syms_all <- intersect(names(sample_prices_weekly)[-1], names(sample_prices_daily)[-1])
stopifnot(length(syms_all) >= 1)
syms <- syms_all[seq_len(min(3L, length(syms_all)))]

# Subset weekly (strategy) and daily (monitoring) to the same symbols
P <- sample_prices_weekly[, c("Date", syms), with = FALSE]
D <- sample_prices_daily[,  c("Date", syms), with = FALSE]
```

```
# Simple end-to-end example
mom <- calc_momentum(P, lookback = 12)
sel <- filter_top_n(mom, n = 3)
W   <- weight_equally(sel)
res <- run_backtest(P, W)

# Pick a benchmark that is guaranteed to exist in D
perf <- analyze_performance(res, D, benchmark_symbol = syms[1])
print(perf)
summary(perf)
```

`apply_regime` *Apply Market Regime Filter*

Description

Applies regime-based filtering. When regime is FALSE (e.g., bear market), all selections become 0, moving portfolio to cash.

Usage

```
apply_regime(selection_df, regime_condition, partial_weight = 0)
```

Arguments

`selection_df`	Binary selection matrix
`regime_condition`	Logical vector (TRUE = trade, FALSE = cash)
`partial_weight`	Fraction to hold when regime is FALSE (default: 0)

Value

Modified selection matrix respecting regime

Examples

```
data("sample_prices_weekly")
# Create selection
momentum <- calc_momentum(sample_prices_weekly, 12)
selected <- filter_top_n(momentum, 10)

# Only trade when SPY above 20-week MA
ma20 <- calc_moving_average(sample_prices_weekly, 20)
spy_regime <- sample_prices_weekly$SPY > ma20$SPY
spy_regime[is.na(spy_regime)] <- FALSE

regime_filtered <- apply_regime(selected, spy_regime)
```

as_selection *Convert Conditions to Selection Format*

Description

Converts condition matrices or data frames to standard selection format with Date column and binary values. Handles NA by converting to 0.

Usage

```
as_selection(condition_matrix, date_column = NULL)
```

Arguments

condition_matrix	Matrix or data frame with conditions
date_column	Optional Date vector if not in input

Value

Data.table in selection format (Date + binary columns)

Examples

```
data("sample_prices_weekly")
ma20 <- calc_moving_average(sample_prices_weekly, 20)
above_ma <- filter_above(calc_distance(sample_prices_weekly, ma20), 0)
selection <- as_selection(above_ma, sample_prices_weekly$Date)
```

backtest_metrics *Calculate Comprehensive Backtest Metrics*

Description

Computes performance metrics including Sharpe ratio, maximum drawdown, win rate, and other statistics from backtest results.

Usage

```
backtest_metrics(result)
```

Arguments

result	Backtest result object from run_backtest()

Value

List containing performance metrics

Examples

```
# Create a backtest result to use
data(sample_prices_weekly)
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)
weights <- weight_equally(selected)
result <- run_backtest(sample_prices_weekly, weights)

# Calculate metrics
metrics <- backtest_metrics(result)
print(metrics$sharpe_ratio)
```

---

calculate_drawdown_series

Calculate Drawdown Time Series

Description

Computes drawdown series from portfolio values.

Usage

```
calculate_drawdown_series(values)
```

Arguments

values	Numeric vector of portfolio values

Value

Numeric vector of drawdowns (as negative percentages)

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
sel <- filter_top_n(momentum, n = 10)
W   <- weight_equally(sel)
res <- run_backtest(sample_prices_weekly, W)
dd_series <- calculate_drawdown_series(res$portfolio_values)
dd_stats  <- analyze_drawdowns(dd_series, res$returns)
```

calc_cci *Calculate Commodity Channel Index (CCI)*

Description

Calculates CCI using closing prices. CCI measures deviation from average price. Values above 100 indicate overbought, below -100 indicate oversold.

Usage

```
calc_cci(data, period = 20)
```

Arguments

data	Data frame with Date column and price columns
period	CCI period (default: 20)

Value

Data.table with CCI values

Examples

```
data("sample_prices_weekly")
cci <- calc_cci(sample_prices_weekly, period = 20)
```

calc_distance *Calculate Distance from Reference*

Description

data("sample_prices_weekly") Calculates percentage distance between prices and reference values (typically moving averages).

Usage

```
calc_distance(price_df, reference_df)
```

Arguments

price_df	Data frame with price data
reference_df	Data frame with reference values (same structure)

Value

Data.table with percentage distances

Examples

```
data("sample_prices_weekly")
ma20 <- calc_moving_average(sample_prices_weekly, 20)
data("sample_prices_weekly")
distance <- calc_distance(sample_prices_weekly, ma20)
```

---

calc_market_breadth *Calculate Market Breadth Percentage*

Description

Measures the percentage of stocks meeting a condition (market participation). Useful for assessing market health and identifying broad vs narrow moves.

Usage

```
calc_market_breadth(condition_df, min_stocks = 10)
```

Arguments

condition_df	Data frame with Date column and TRUE/FALSE values
min_stocks	Minimum stocks required for valid calculation (default: 10)

Value

A data.table with Date and Breadth_[Sector] columns (0–100 scale)

Examples

```
# Percent of stocks above 200-day MA
data("sample_prices_weekly")
ma200 <- calc_moving_average(sample_prices_weekly, 200)
above_ma <- filter_above(calc_distance(sample_prices_weekly, ma200), 0)
breadth <- calc_market_breadth(above_ma)
```

---

calc_momentum *Calculate Price Momentum*

Description

Calculates momentum as the percentage change in price over a specified lookback period. Optimized using column-wise operations (25x faster).

Usage

```
calc_momentum(data, lookback = 12)
```

Arguments

data	A data.frame or data.table with Date column and price columns
lookback	Number of periods for momentum calculation (default: 12)

Value

Data.table with momentum values (0.1 = 10% increase)

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
```

---

calc_moving_average *Calculate Moving Average*

Description

Calculates simple moving average for each column in the data.

Usage

```
calc_moving_average(data, window = 20)
```

Arguments

data	Data frame with Date column and price columns
window	Number of periods for moving average (default: 20)

Value

Data.table with moving average values

Examples

```
data("sample_prices_weekly")
ma20 <- calc_moving_average(sample_prices_weekly, window = 20)
```

calc_relative_strength_rank

Calculate Cross-Sectional Ranking of Indicators

Description

Ranks each stock's indicator value against all other stocks on the same date. Enables relative strength strategies that adapt to market conditions. Optimized using matrix operations for 15x speedup.

Usage

```
calc_relative_strength_rank(
  indicator_df,
  method = c("percentile", "rank", "z-score")
)
```

Arguments

indicator_df	Data frame with Date column and indicator values
method	Ranking method: "percentile" (0-100), "rank" (1-N), or "z-score"

Value

Data frame with same structure containing ranks/scores

Examples

```
# Rank RSI across all stocks
data("sample_prices_weekly")
rsi <- calc_rsi(sample_prices_weekly, 14)
rsi_ranks <- calc_relative_strength_rank(rsi, method = "percentile")

# Find relatively overbought (top 10%)
relative_overbought <- filter_above(rsi_ranks, 90)
```

calc_rolling_volatility

Calculate Rolling Volatility

Description

Calculates rolling volatility using various methods including standard deviation, range-based, MAD, or absolute returns. Supports different lookback periods.

Usage

```
calc_rolling_volatility(data, lookback = 20, method = "std")
```

Arguments

data	Data frame with Date column and price columns
lookback	Number of periods for rolling calculation (default: 20)
method	Volatility calculation method: "std", "range", "mad", or "abs_return"

Value

Data frame with Date column and volatility values for each symbol

Examples

```
data("sample_prices_weekly")
# Standard deviation volatility
vol <- calc_rolling_volatility(sample_prices_weekly, lookback = 20)
# Range-based volatility
vol_range <- calc_rolling_volatility(sample_prices_weekly, lookback = 20, method = "range")
```

---

calc_rsi *Calculate Relative Strength Index (RSI)*

Description

Calculates RSI for each column. RSI ranges from 0-100. Above 70 indicates overbought, below 30 indicates oversold.

Usage

```
calc_rsi(data, period = 14)
```

Arguments

data	Data frame with Date column and price columns
period	RSI period (default: 14)

Value

Data.table with RSI values (0-100 range)

Examples

```
data("sample_prices_weekly")
rsi <- calc_rsi(sample_prices_weekly, period = 14)
overbought <- filter_above(rsi, 70)
```

`calc_sector_breadth` *Calculate Market Breadth by Sector*

Description

Measures participation within each sector separately, revealing which sectors have broad strength vs concentrated leadership. Optimized using pre-splitting for speed.

Usage

```
calc_sector_breadth(
  condition_df,
  sector_mapping,
  min_stocks_per_sector = 3,
  na_sector_action = c("exclude", "separate", "market")
)
```

Arguments

`condition_df`	Data frame with Date column and TRUE/FALSE values
`sector_mapping`	Data frame with `Symbol` and `Sector` columns.
`min_stocks_per_sector`	Minimum stocks for valid sector breadth (default: 3)
`na_sector_action`	How to handle unmapped stocks: "exclude", "separate", or "market"

Value

A `data.table` with `Date` and `Breadth_[Sector]` columns (0–100 scale)

Examples

```
data("sample_prices_weekly")
data("sample_sp500_sectors")
ma200 <- calc_moving_average(sample_prices_weekly, 200)
above_ma <- filter_above(calc_distance(sample_prices_weekly, ma200), 0)
sector_breadth <- calc_sector_breadth(above_ma, sample_sp500_sectors)
```

`calc_sector_relative_indicators` *Calculate Indicators Relative to Sector Average*

Description

Measures how each stock's indicator compares to its sector benchmark. Enables sector-neutral strategies and identifies sector outperformers.

Usage

```
calc_sector_relative_indicators(
  indicator_df,
  sector_mapping,
  method = c("difference", "ratio", "z-score"),
  benchmark = c("mean", "median"),
  ratio_threshold = 0.01,
  min_sector_size = 2
)
```

Arguments

`indicator_df`	Data frame with Date column and indicator values
`sector_mapping`	Data frame with `Symbol` and `Sector` columns.
`method`	"difference" (absolute), "ratio" (relative), or "z-score"
`benchmark`	"mean" or "median" sector average
`ratio_threshold`	Minimum denominator for ratio method (default: 0.01)
`min_sector_size`	Minimum stocks per sector (default: 2)

Value

Data frame with sector-relative values

Examples

```
# Find stocks outperforming their sector
data("sample_prices_weekly")
data("sample_sp500_sectors")
momentum <- calc_momentum(sample_prices_weekly, 12)
relative_momentum <- calc_sector_relative_indicators(
  momentum, sample_sp500_sectors, method = "difference"
)
```

calc_stochastic_d *Calculate Stochastic D Indicator*

Description

Calculates the Stochastic D indicator for momentum analysis. The %D line is the smoothed version of %K, commonly used for momentum signals in range 0-100.

Usage

```
calc_stochastic_d(data, k = 14, d = 3)
```

Arguments

data	Price data with Date column and symbol columns
k	Lookback period for stochastic K calculation
d	Smoothing period for D line

Value

Data.table with Stochastic D values for each symbol

Examples

```
data("sample_prices_weekly")
data(sample_prices_weekly)
data("sample_prices_weekly")
stoch_d <- calc_stochastic_d(sample_prices_weekly, k = 14, d = 3)
head(stoch_d)
```

combine_filters *Combine Multiple Filter Conditions*

Description

Combines multiple filter conditions using AND or OR logic.

Usage

```
combine_filters(..., op = "and", apply_when = NULL, debug = FALSE)
```

Arguments

...	Two or more filter data frames to combine
op	Operation: "and" or "or"
apply_when	Optional condition vector for conditional filtering
debug	Print debug information (default: FALSE)

Value

Combined binary selection matrix

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, 12)
rsi <- calc_rsi(sample_prices_weekly, 14)
# Create individual filters
high_momentum <- filter_above(momentum, 0.05)
moderate_rsi <- filter_between(rsi, 40, 60)
# Combine them
combined <- combine_filters(high_momentum, moderate_rsi, op = "and")
```

---

combine_weights *Combine Multiple Weighting Schemes*

Description

Blends multiple weight matrices with specified weights. Useful for multi-factor strategies that combine different allocation approaches. Optimized using matrix operations for 1000x+ speedup.

Usage

```
combine_weights(weight_matrices, weights = NULL)
```

Arguments

weight_matrices	List of weight data frames to combine
weights	Numeric vector of weights for each matrix (default: equal)

Value

Data.table with blended portfolio weights

Examples

```
data("sample_prices_weekly")
# Calculate signals
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)
volatility <- calc_rolling_volatility(sample_prices_weekly, lookback = 20)

# Combine momentum and low-vol weights
mom_weights <- weight_by_signal(selected, momentum)
vol_weights <- weight_by_signal(selected, invert_signal(volatility))
combined <- combine_weights(list(mom_weights, vol_weights), weights = c(0.7, 0.3))
```

convert_to_nweeks *Convert Data to N-Week Frequency*

Description

Resamples daily or weekly data to n-week periods. Handles week-ending calculations and various aggregation methods.

Usage

```
convert_to_nweeks(data, n = 1, method = "last")
```

Arguments

data	Data.table with Date column and price columns
n	Number of weeks to aggregate (default: 1 for weekly)
method	Aggregation method: "last" or "mean" (default: "last")

Value

Data.table resampled to n-week frequency

Examples

```
data("sample_prices_daily")
# Convert daily to weekly
weekly <- convert_to_nweeks(sample_prices_daily, n = 1)
# Convert to bi-weekly
biweekly <- convert_to_nweeks(sample_prices_daily, n = 2)
```

create_regime_buckets *Convert Continuous Indicator to Discrete Regimes*

Description

Transforms continuous indicators into discrete regime categories.

Usage

```
create_regime_buckets(
  indicator,
  breakpoints,
  labels = NULL,
  use_percentiles = FALSE
)
```

Arguments

indicator	Numeric vector or data frame with indicator values
breakpoints	Numeric vector of breakpoints
labels	Optional character vector of regime names
use_percentiles	Use percentiles instead of fixed breakpoints (default: FALSE)

Value

Integer vector of regime classifications

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, 10)
# Create VIX-like indicator from volatility
vol <- calc_rolling_volatility(sample_prices_weekly, lookback = 20)
vix_proxy <- vol$SPY * 100  # Scale to VIX-like values
regimes <- create_regime_buckets(vix_proxy, c(15, 25))
```

---

csv_adapter *Load Price Data from CSV File*

Description

Reads stock price data from CSV files with flexible column naming. Automatically standardizes to library format.

Usage

```
csv_adapter(
  file_path,
  date_col = "Date",
  symbol_col = "Symbol",
  price_col = "Price",
  frequency = "daily",
  symbol_order = NULL
)
```

Arguments

file_path	Path to CSV file
date_col	Name of date column (default: "date")
symbol_col	Name of symbol column (default: "symbol")
price_col	Name of price column (default: "close")
frequency	Target frequency: "daily" or "weekly" (default: "daily")
symbol_order	Optional vector to order symbols

Value

Data.table with Date column and price columns

Examples

```
# Create a temporary tidy CSV from included weekly sample data (offline, fast)
data("sample_prices_weekly")
PW <- as.data.frame(sample_prices_weekly)
syms <- setdiff(names(PW), "Date")[1:2]

stk  <- stack(PW[1:10, syms])
tidy <- data.frame(
  Date   = rep(PW$Date[1:10], times = length(syms)),
  Symbol = stk$ind,
  Price  = stk$values
)

tmp <- tempfile(fileext = ".csv")
write.csv(tidy, tmp, row.names = FALSE)
prices <- csv_adapter(tmp)
head(prices)
unlink(tmp)
```

---

download_sp500_sectors

Download S&P 500 Sector Mappings from Wikipedia

Description

Scrapes current S&P 500 constituent list with sector classifications from Wikipedia and returns as a data.table.

Usage

```
download_sp500_sectors()
```

Value

Data.table with columns: Symbol, Security, Sector, SubIndustry, Industry

Examples

```
sectors <- download_sp500_sectors()
head(sectors)
```

ensure_dt_copy *Ensure Data.Table Without Mutation*

Description

Converts input to data.table if needed, always returning a copy to prevent accidental data mutation. Core safety function used throughout the library.

Usage

```
ensure_dt_copy(data)
```

Arguments

data	Data.frame or data.table

Value

Copy of data as data.table

Examples

```
data("sample_prices_weekly")
dt <- ensure_dt_copy(sample_prices_weekly)  # Safe to modify dt
```

filter_above *Filter Stocks Above Threshold*

Description

Convenience function to select stocks with signal above a value.

Usage

```
filter_above(signal_df, value)
```

Arguments

signal_df	Data frame with signal values
value	Threshold value

Value

Binary selection matrix

Examples

```
data("sample_prices_weekly")
rsi <- calc_rsi(sample_prices_weekly, 14)
high_rsi <- filter_above(rsi, 70)
```

`filter_below` *Filter Stocks Below Threshold*

Description

Convenience function to select stocks with signal below a value.

Usage

```
filter_below(signal_df, value)
```

Arguments

`signal_df`	Data frame with signal values
`value`	Threshold value

Value

Binary selection matrix

Examples

```
data("sample_prices_weekly")
rsi <- calc_rsi(sample_prices_weekly, 14)
oversold <- filter_below(rsi, 30)
```

`filter_between` *Filter Stocks Between Two Values*

Description

Selects stocks with signal values between lower and upper bounds.

Usage

```
filter_between(signal_df, lower, upper)
```

Arguments

`signal_df`	Data frame with signal values
`lower`	Lower bound (inclusive)
`upper`	Upper bound (inclusive)

Value

Binary selection matrix

Examples

```
data("sample_prices_weekly")
rsi <- calc_rsi(sample_prices_weekly, 14)
# Select stocks with RSI between 30 and 70
neutral_rsi <- filter_between(rsi, 30, 70)
```

---

filter_by_percentile *Filter by Percentile*

Description

Select securities in the top or bottom X percentile. More intuitive than filter_top_n when universe size varies.

Usage

```
filter_by_percentile(signal_df, percentile, type = c("top", "bottom"))
```

Arguments

signal_df	DataFrame with signal values
percentile	Percentile threshold (0-100)
type	"top" for highest signals, "bottom" for lowest

Value

Binary selection matrix

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, 12)
# Select top 20th percentile
top_20pct <- filter_by_percentile(momentum, 20, type = "top")
```

filter_rank *Select Top or Bottom N Stocks by Signal*

Description

Selects the top N (best) or worst N stocks based on signal strength. Optimized using matrix operations for 5-10x speedup.

Usage

```
filter_rank(signal_df, n, type = c("top", "worst"))
```

Arguments

signal_df	Data frame with Date column and signal values
n	Number of stocks to select
type	"top" for highest values, "worst" for lowest values

Value

Binary selection matrix (1 = selected, 0 = not selected)

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, 12)
# Select 10 highest momentum stocks
top10 <- filter_rank(momentum, 10, type = "top")
```

filter_threshold *Filter by Threshold Value*

Description

Selects stocks above or below a threshold value.

Usage

```
filter_threshold(signal_df, value, type = c("above", "below"))
```

Arguments

signal_df	Data frame with signal values
value	Threshold value
type	"above" or "below"

Value

Binary selection matrix

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, 12)
# Select stocks with positive momentum
positive <- filter_threshold(momentum, 0, type = "above")
```

`filter_top_n` *Select Top N Stocks by Signal Value*

Description

Most commonly used filter function. Selects top N (highest) or bottom N (lowest) stocks by signal value. Optimized for 5-10x faster performance.

Usage

```
filter_top_n(signal_df, n, ascending = FALSE)
```

Arguments

`signal_df`	Data frame with Date column and signal values
`n`	Number of stocks to select
`ascending`	FALSE (default) selects highest, TRUE selects lowest

Value

Binary selection matrix (1 = selected, 0 = not selected)

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, 12)
# Select 10 highest momentum stocks
top_momentum <- filter_top_n(momentum, n = 10)
```

`filter_top_n_where` *Select Top N from Qualified Stocks*

Description

Selects top N stocks by signal, but only from those meeting a condition. Combines qualification and ranking in one step.

Usage

```
filter_top_n_where(
  signal_df,
  n,
  condition_df,
  min_qualified = 1,
  ascending = FALSE
)
```

Arguments

`signal_df`	Signal values for ranking
`n`	Number to select
`condition_df`	Binary matrix of qualified stocks
`min_qualified`	Minimum qualified stocks required (default: 1)
`ascending`	FALSE for highest, TRUE for lowest

Value

Binary selection matrix

Examples

```
data("sample_prices_weekly")
# Calculate indicators
momentum <- calc_momentum(sample_prices_weekly, 12)
ma20 <- calc_moving_average(sample_prices_weekly, 20)
distance_from_ma <- calc_distance(sample_prices_weekly, ma20)

# Top 10 momentum stocks from those above MA
above_ma <- filter_above(distance_from_ma, 0)
top_qualified <- filter_top_n_where(momentum, 10, above_ma)
```

get_data_frequency *Detect Data Frequency from Dates*

Description

Automatically detects whether data is daily, weekly, monthly, or quarterly based on date spacing.

Usage

```
get_data_frequency(dates)
```

Arguments

dates	Vector of Date objects

Value

Character string: "daily", "weekly", "monthly", or "quarterly"

Examples

```
data("sample_prices_weekly")
freq <- get_data_frequency(sample_prices_weekly$Date)
```

invert_signal *Invert Signal Values for Preference Reversal*

Description

Transforms signal values using (1 - value) to reverse preference direction. Useful when high values indicate something to avoid. For example, inverting volatility makes low-vol stocks appear as high signals.

Usage

```
invert_signal(signal_df)
```

Arguments

signal_df	Data frame with Date column and signal columns

Value

Data frame with inverted signal values

Examples

```
data("sample_prices_weekly")
# Prefer low volatility stocks
volatility <- calc_rolling_volatility(sample_prices_weekly, 20)
stability_signal <- invert_signal(volatility)
# Select top 10 momentum stocks first
momentum <- calc_momentum(sample_prices_weekly, 12)
selected <- filter_top_n(momentum, 10)
# Weight by inverted volatility (low vol = high weight)
weights <- weight_by_signal(selected, stability_signal)
```

---

limit_positions *Limit the number of positions in a selection matrix*

Description

This function enforces position limits, keeping only the top N securities when more are selected.

Usage

```
limit_positions(
  selection_df,
  max_positions,
  ranking_signal = NULL,
  verbose = FALSE
)
```

Arguments

selection_df	Binary selection matrix
max_positions	Maximum number of positions allowed
ranking_signal	DataFrame with values for ranking (if NULL, selections are random)
verbose	Print information about position limiting (default: FALSE)

Value

Selection matrix with at most max_positions securities selected per period

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, 12)
# Create a selection of top 30 stocks
my_selections <- filter_top_n(momentum, 30)
# Limit to 20 positions, ranked by momentum
concentrated <- limit_positions(my_selections, 20, momentum)
# Limit to 10 positions, keeping existing selections randomly
limited <- limit_positions(my_selections, 10)
```

list_examples *List available example scripts*

Description

Shows all example scripts included with the PortfolioTesteR package. These examples demonstrate various strategy patterns and library functions.

Usage

```
list_examples()
```

Value

Character vector of example filenames

Examples

```
# See available examples
list_examples()

# Run a specific example
# run_example("example_momentum_basic.R")
```

load_mixed_symbols *Load Mixed Symbols Including VIX*

Description

Handles loading regular stocks and VIX together, with VIX loaded separately without auto-update to avoid issues.

Usage

```
load_mixed_symbols(
  db_path,
  symbols,
  start_date,
  end_date,
  frequency = "weekly",
  use_adjusted = TRUE
)
```

Arguments

db_path	Path to SQLite database
symbols	Character vector including regular stocks and optionally "VIX"
start_date	Start date for data
end_date	End date for data
frequency	Data frequency (default: "weekly")
use_adjusted	Use adjusted prices (default: TRUE)

Value

data.table with all symbols properly loaded

Examples

```
mixed <- load_mixed_symbols(
  db_path  = "sp500.db",
  symbols  = c("AAPL", "MSFT", "VIX"),
  start_date = "2020-01-01",
  end_date   = "2020-12-31",
  frequency  = "weekly"
)
head(mixed)
```

---

manual_adapter *Adapter for User-Provided Data*

Description

Simple adapter for when users provide their own data frame. Ensures proper Date formatting and sorting.

Usage

```
manual_adapter(data, date_col = "Date")
```

Arguments

data	User-provided data frame
date_col	Name of date column (default: "Date")

Value

Standardized data.table

Examples

```
# Use your own data frame
data("sample_prices_weekly")
my_prices <- manual_adapter(sample_prices_weekly)
```

---

metric_sharpe *Calculate Sharpe Ratio with Frequency Detection*

Description

Calculate Sharpe Ratio with Frequency Detection

Usage

```
metric_sharpe(bt)
```

Arguments

bt	Backtest result object with $returns and (optionally) $dates

Value

Annualized Sharpe ratio

---

plot.backtest_result *Plot Backtest Results*

Description

S3 plot method for visualizing backtest performance.

Usage

```
## S3 method for class 'backtest_result'
plot(x, type = "performance", ...)
```

Arguments

x	backtest_result object
type	Plot type: "performance", "drawdown", "weights", or "all"
...	Additional plotting parameters

Value

NULL (creates plot)

Examples

```
data("sample_prices_weekly")
mom <- calc_momentum(sample_prices_weekly, lookback = 12)
sel <- filter_top_n(mom, n = 10)
W   <- weight_equally(sel)
res <- run_backtest(sample_prices_weekly, W)
if (interactive()) plot(res, type = "performance")
```

`plot.performance_analysis` *Plot Performance Analysis Results*

Description

S3 method for visualizing performance metrics. Supports multiple plot types including summary dashboard, return distributions, risk evolution, and rolling statistics.

Usage

```
## S3 method for class 'performance_analysis'
plot(x, type = "summary", ...)
```

Arguments

`x`	performance_analysis object
`type`	Plot type: "summary", "returns", "risk", "drawdown"
`...`	Additional plotting parameters

Value

NULL (creates plot)

Examples

```
data("sample_prices_weekly")
data("sample_prices_daily")
syms_all <- intersect(names(sample_prices_weekly)[-1], names(sample_prices_daily)[-1])
syms <- syms_all[seq_len(min(3L, length(syms_all)))]
P <- sample_prices_weekly[, c("Date", syms), with = FALSE]
D <- sample_prices_daily[,  c("Date", syms), with = FALSE]
mom <- calc_momentum(P, lookback = 12)
sel <- filter_top_n(mom, n = 3)
W   <- weight_equally(sel)
res <- run_backtest(P, W)
perf <- analyze_performance(res, D, benchmark_symbol = syms[1])
if (interactive()) {
  plot(perf, type = "summary")
}
```

print.backtest_result *Print Backtest Results*

Description

S3 print method for backtest results. Shows key performance metrics.

Usage

```
## S3 method for class 'backtest_result'
print(x, ...)
```

Arguments

x	backtest_result object
...	Additional arguments (unused)

Value

Invisible copy of x

Examples

```
data("sample_prices_weekly")
mom <- calc_momentum(sample_prices_weekly, lookback = 12)
sel <- filter_top_n(mom, n = 10)
W   <- weight_equally(sel)
res <- run_backtest(sample_prices_weekly, W)
print(res)
```

print.param_grid_result *Print a param_grid_result*

Description

Print a param_grid_result

Usage

```
## S3 method for class 'param_grid_result'
print(x, ...)
```

Arguments

x	A `param_grid_result` object returned by `run_param_grid()`.
...	Additional arguments passed to methods (ignored).

Value

Invisibly returns x.

`print.performance_analysis` *Print Performance Analysis Results*

Description

S3 method for printing performance analysis with key metrics including risk-adjusted returns, drawdown statistics, and benchmark comparison.

Usage

```
## S3 method for class 'performance_analysis'
print(x, ...)
```

Arguments

x	performance_analysis object
...	Additional arguments (unused)

Value

Invisible copy of x

Examples

```
data("sample_prices_weekly")
data("sample_prices_daily")
syms_all <- intersect(names(sample_prices_weekly)[-1], names(sample_prices_daily)[-1])
syms <- syms_all[seq_len(min(3L, length(syms_all)))]
P <- sample_prices_weekly[, c("Date", syms), with = FALSE]
D <- sample_prices_daily[,  c("Date", syms), with = FALSE]
mom <- calc_momentum(P, lookback = 12)
sel <- filter_top_n(mom, n = 3)
W   <- weight_equally(sel)
res <- run_backtest(P, W)
perf <- analyze_performance(res, D, benchmark_symbol = syms[1])
print(perf)  # or just: perf
```

print.wf_optimization_result *Print a wf_optimization_result*

Description

Print a wf_optimization_result

Usage

```
## S3 method for class 'wf_optimization_result'
print(x, ...)
```

Arguments

x	A wf_optimization_result object returned by run_walk_forward().
...	Additional arguments passed to methods (ignored).

Value

Invisibly returns x.

rank_within_sector *Rank Indicators Within Each Sector*

Description

Ranks stocks within their sector for sector-neutral strategies. Enables selecting best stocks from each sector regardless of sector performance. Optimized using matrix operations within groups.

Usage

```
rank_within_sector(
  indicator_df,
  sector_mapping,
  method = c("percentile", "rank", "z-score"),
  min_sector_size = 3
)
```

Arguments

indicator_df	Data frame with Date column and indicator values
sector_mapping	Data frame with Symbol and Sector columns.
method	"percentile" (0-100), "rank" (1-N), or "z-score"
min_sector_size	Minimum stocks per sector (default: 3)

Value

Data frame with within-sector ranks/scores

Examples

```
data("sample_prices_weekly")
data("sample_sp500_sectors")
momentum <- calc_momentum(sample_prices_weekly, 12)
sector_ranks <- rank_within_sector(momentum, sample_sp500_sectors)
```

---

run_backtest *Run Portfolio Backtest*

Description

Main backtesting engine that simulates portfolio performance over time. Handles position tracking, transaction costs, and performance calculation.

Usage

```
run_backtest(
  prices,
  weights,
  initial_capital = 1e+05,
  name = "Strategy",
  verbose = FALSE,
  stop_loss = NULL,
  stop_monitoring_prices = NULL
)
```

Arguments

prices	Price data (data.frame with Date column)
weights	Weight matrix from weighting functions
initial_capital	Starting capital (default: 100000)
name	Strategy name for reporting
verbose	Print progress messages (default: FALSE)
stop_loss	Optional stop loss percentage as decimal
stop_monitoring_prices	Optional daily prices for stop monitoring

Value

backtest_result object with performance metrics

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)
weights <- weight_equally(selected)
result <- run_backtest(sample_prices_weekly, weights)
```

---

run_example *Run an Example Script*

Description

Executes an example script bundled in the package `inst/examples/` folder.

Usage

```
run_example(example_name, echo = TRUE)
```

Arguments

`example_name`	Character scalar with the example filename (e.g. `"basic.R"`).
`echo`	Logical; print code as it runs (default `TRUE`).

Value

Invisibly returns `NULL`. Runs the example for its side effects.

Examples

```
# Example (requires a real file under inst/examples):
# run_example("basic.R")
```

---

run_param_grid *Run Parameter Grid Optimization (safe + ergonomic)*

Description

Run Parameter Grid Optimization (safe + ergonomic)

Usage

```
run_param_grid(
  prices,
  grid,
  builder,
  metric = NULL,
  name_prefix = "Strategy",
  verbose = FALSE,
  light_mode = TRUE,
  precompute_returns = TRUE,
  builder_args = list(),
  n_cores = 1
)
```

Arguments

prices	Data frame with Date + symbol columns
grid	Data frame (each row = a combo) OR a **named list** of vectors
builder	Function(prices, params, ...) -> weights (Date + symbols)
metric	Scoring function(backtest) -> numeric. Defaults to metric_sharpe.
name_prefix	String prefix for backtest names
verbose	Logical
light_mode	Logical: speed-ups in backtest
precompute_returns	Logical: precompute log-returns once (light_mode only)
builder_args	List of extra args forwarded to builder (e.g., caches)
n_cores	Integer (kept for API compatibility; ignored here)

Value

param_grid_result

---

run_walk_forward *Walk-Forward Optimization Analysis*

Description

Runs rolling IS/OOS optimization, reselects params each window, and backtests OOS performance (optionally with warmup tails).

Usage

```
run_walk_forward(
  prices,
  grid,
  builder,
  metric = NULL,
  is_periods = 52,
  oos_periods = 13,
  step = NULL,
  warmup_periods = 0,
  verbose = FALSE,
  light_mode = TRUE,
  precompute_all = TRUE,
  builder_args = list(),
  n_cores = 1
)
```

Arguments

`prices`	Data frame with Date column and symbol columns
`grid`	Data frame OR named list; each row/combination is a parameter set
`builder`	Function(prices, params, ...) -> weights data.frame (Date + assets)
`metric`	Function(backtest_result) -> scalar score (higher is better). Defaults to `metric_sharpe` if omitted/NULL.
`is_periods`	Integer, number of in-sample periods
`oos_periods`	Integer, number of out-of-sample periods
`step`	Integer, step size for rolling windows (default = oos_periods)
`warmup_periods`	Integer, warmup periods appended before each OOS
`verbose`	Logical, print progress
`light_mode`	Logical, passed to run_param_grid (kept for compatibility)
`precompute_all`	Logical, precompute indicators once and slice per window
`builder_args`	List, extra args passed to builder (e.g., indicator_cache)
`n_cores`	Integer (kept for API compatibility; ignored here)

Value

An object of class `wf_optimization_result`.

safe_divide *Safe Division with NA and Zero Handling*

Description

Performs division with automatic handling of NA values, zeros, and infinity. Returns 0 for division by zero and NA cases.

Usage

```
safe_divide(numerator, denominator)
```

Arguments

numerator	Numeric vector
denominator	Numeric vector

Value

Numeric vector with safe division results

Examples

```
safe_divide(c(10, 0, NA, 5), c(2, 0, 5, NA))  # Returns c(5, 0, 0, 0)
```

sample_prices_daily *Sample Daily Stock Prices*

Description

Daily closing prices for 20 stocks from 2017-2019. Contains the same symbols as sample_prices_weekly but at daily frequency for more granular analysis and performance calculations.

Usage

```
data(sample_prices_daily)
```

Format

A data.table with 754 rows and 21 columns:

Date Date object, trading date

AAPL Apple Inc. adjusted closing price

AMZN Amazon.com Inc. adjusted closing price

BA Boeing Co. adjusted closing price

BAC Bank of America Corp. adjusted closing price

... Additional stock symbols with adjusted closing prices

Source

Yahoo Finance historical data, adjusted for splits and dividends

Examples

```
data(sample_prices_daily)
head(sample_prices_daily)
# Get date range
range(sample_prices_daily$Date)
```

---

sample_prices_weekly *Sample Weekly Stock Prices*

Description

Weekly closing prices for 20 stocks from 2017-2019. Data includes major stocks from various sectors and is suitable for demonstrating backtesting and technical analysis functions.

Usage

```
data(sample_prices_weekly)
```

Format

A data.table with 158 rows and 21 columns:

Date Date object, weekly closing date (typically Friday)

AAPL Apple Inc. adjusted closing price

AMZN Amazon.com Inc. adjusted closing price

BA Boeing Co. adjusted closing price

BAC Bank of America Corp. adjusted closing price

... Additional stock symbols with adjusted closing prices

Source

Yahoo Finance historical data, adjusted for splits and dividends

Examples

```
data(sample_prices_weekly)
head(sample_prices_weekly)
# Calculate momentum
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
```

sample_sp500_sectors *S&P 500 Sector Mappings*

Description

Sector classifications for the stock symbols in the sample datasets. Note: ETFs (SPY, QQQ, etc.) are not included as they represent indices or sectors themselves rather than individual companies.

Usage

```
data(sample_sp500_sectors)
```

Format

A data.table with 18 rows and 2 columns:

Symbol Character, stock ticker symbol

Sector Character, GICS sector classification

Source

S&P 500 constituent data

Examples

```
data(sample_sp500_sectors)
head(sample_sp500_sectors)
# Count stocks per sector
table(sample_sp500_sectors$Sector)
```

sql_adapter *Load Price Data from SQL Database*

Description

Loads stock price data from SQLite database with automatic frequency conversion.

Usage

```
sql_adapter(
  db_path,
  symbols,
  start_date = NULL,
  end_date = NULL,
  auto_update = TRUE,
  frequency = "daily"
)
```

Arguments

db_path	Path to SQLite database file
symbols	Character vector of stock symbols to load
start_date	Start date (YYYY-MM-DD) or NULL
end_date	End date (YYYY-MM-DD) or NULL
auto_update	Auto-update database before loading (default: TRUE)
frequency	"daily", "weekly", or "monthly" (default: "daily")

Value

data.table with Date column and one column per symbol

Examples

```
prices <- sql_adapter(
  db_path   = "sp500.db",
  symbols   = c("AAPL", "MSFT"),
  start_date = "2020-01-01",
  end_date   = "2020-12-31",
  frequency  = "weekly"
)
head(prices)
```

---

sql_adapter_adjusted *Load Adjusted Price Data from SQL Database*

Description

Loads adjusted stock prices (for splits/dividends) from SQLite.

Usage

```
sql_adapter_adjusted(
  db_path,
  symbols,
  start_date = NULL,
  end_date = NULL,
  auto_update = FALSE,
  frequency = "daily",
  use_adjusted = TRUE
)
```

Arguments

db_path	Path to SQLite database file
symbols	Character vector of stock symbols to load
start_date	Start date (YYYY-MM-DD) or NULL
end_date	End date (YYYY-MM-DD) or NULL
auto_update	Auto-update database (default: FALSE)
frequency	"daily", "weekly", or "monthly" (default: "daily")
use_adjusted	Use adjusted prices if available (default: TRUE)

Value

data.table with Date column and adjusted prices per symbol

Examples

```
prices <- sql_adapter_adjusted(
  db_path   = "sp500.db",
  symbols   = c("AAPL", "MSFT"),
  start_date = "2020-01-01",
  end_date   = "2020-12-31",
  frequency  = "monthly"
)
head(prices)
```

---

summary.backtest_result

Summary method for backtest results

Description

Summary method for backtest results

Usage

```
## S3 method for class 'backtest_result'
summary(object, ...)
```

Arguments

object	A backtest_result object
...	Additional arguments (unused)

Value

Invisible copy of the object

switch_weights *Switch Between Weighting Schemes*

Description

Dynamically switches between two weighting schemes based on a signal. Enables tactical allocation changes.

Usage

```
switch_weights(weights_a, weights_b, use_b_condition, partial_blend = 1)
```

Arguments

weights_a	Primary weight matrix
weights_b	Alternative weight matrix
use_b_condition	Logical vector (TRUE = use weights_b)
partial_blend	Blend factor 0-1 (default: 1 = full switch)

Value

Combined weight matrix

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)
weights_equal <- weight_equally(selected)
weights_signal <- weight_by_signal(selected, momentum)

# Create switching signal (example: use SPY momentum as regime indicator)
spy_momentum <- momentum$SPY
switch_signal <- as.numeric(spy_momentum > median(spy_momentum, na.rm = TRUE))
switch_signal[is.na(switch_signal)] <- 0

# Switch between strategies
final_weights <- switch_weights(weights_equal, weights_signal, switch_signal)
```

update_vix_in_db *Update VIX data in database*

Description

Update VIX data in database

Usage

```
update_vix_in_db(db_path, from_date = NULL)
```

Arguments

db_path	Path to SQLite database
from_date	Start date for update (NULL = auto-detect)

Value

Number of rows updated (invisible)

validate_data_format *Validate Data Format for Library Functions*

Description

Checks that data meets library requirements: proper Date column, at least one symbol, correct data types. Prints diagnostic info.

Usage

```
validate_data_format(data)
```

Arguments

data	Data frame to validate

Value

TRUE if valid, stops with error if not

Examples

```
data("sample_prices_weekly")
# Check if data is properly formatted
validate_data_format(sample_prices_weekly)
```

`weight_by_hrp` *Hierarchical Risk Parity Weighting*

Description

Calculates portfolio weights using Hierarchical Risk Parity (HRP) methodology. HRP combines hierarchical clustering with risk-based allocation to create diversified portfolios that don't rely on unstable correlation matrix inversions.

Usage

```
weight_by_hrp(
  selected_df,
  prices_df,
  lookback_periods = 252,
  cluster_method = "ward.D2",
  distance_method = "euclidean",
  min_periods = 60,
  use_correlation = FALSE
)
```

Arguments

`selected_df`	Binary selection matrix (data.frame with Date column)
`prices_df`	Price data for covariance calculation (typically daily) Returns are calculated internally from prices
`lookback_periods`	Number of periods for covariance estimation (default: 252)
`cluster_method`	Clustering linkage method (default: "ward.D2")
`distance_method`	Distance measure for clustering (default: "euclidean")
`min_periods`	Minimum periods required for calculation (default: 60)
`use_correlation`	If TRUE, cluster on correlation instead of covariance

Details

The HRP algorithm:

1. Calculate returns from input prices
2. Compute covariance matrix from returns
3. Cluster assets based on distance matrix
4. Apply recursive bisection with inverse variance weighting
5. Results in naturally diversified portfolio without matrix inversion

The function accepts price data and calculates returns internally, matching the pattern of other library functions like calc_momentum().

Value

Weight matrix with same dates as selected_df

Examples

```
data("sample_prices_daily")
data("sample_prices_weekly")
# Create a selection first
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)

# Using daily prices for risk calculation
weights <- weight_by_hrp(selected, sample_prices_daily, lookback_periods = 252)

# Using correlation-based clustering
weights <- weight_by_hrp(selected, sample_prices_daily, use_correlation = TRUE)
```

---

weight_by_rank *Rank-Based Portfolio Weighting*

Description

Weights securities based on their rank rather than raw signal values. Useful when signal magnitudes are unreliable but ordering is meaningful.

Usage

```
weight_by_rank(
  selected_df,
  signal_df,
  method = c("linear", "exponential"),
  ascending = FALSE
)
```

Arguments

selected_df	Binary selection matrix
signal_df	Signal values for ranking
method	Weighting method: "linear" or "exponential"
ascending	Sort order for ranking (default: FALSE)

Value

Data.table with rank-based weights

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, 10)
# Linear rank weighting (best gets most)
weights <- weight_by_rank(selected, momentum, method = "linear")
# Exponential (heavy on top stocks)
weights_exp <- weight_by_rank(selected, momentum, method = "exponential")
```

---

weight_by_regime *Regime-Based Adaptive Weighting*

Description

Applies different weighting methods based on market regime classification. Enables adaptive strategies that change allocation approach in different market conditions.

Usage

```
weight_by_regime(
  selected_df,
  regime,
  weighting_configs,
  signal_df = NULL,
  vol_timeframe_data = NULL,
  strategy_timeframe_data = NULL
)
```

Arguments

selected_df	Binary selection matrix (1 = selected, 0 = not)
regime	Regime classification (integer values per period)
weighting_configs	List with method-specific parameters
signal_df	Signal values (required for signal/rank methods)
vol_timeframe_data	Volatility data (required for volatility method)
strategy_timeframe_data	Strategy timeframe alignment data

Value

Data.table with regime-adaptive weights

Examples

```
data("sample_prices_weekly")
# Create selection and signals
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)

# Create a simple regime (example: based on market trend)
ma20 <- calc_moving_average(sample_prices_weekly, 20)
spy_price <- sample_prices_weekly$SPY
spy_ma <- ma20$SPY
regime <- ifelse(spy_price > spy_ma, 1, 2)

# Different weights for bull/bear markets
weighting_configs <- list(
  "1" = list(method = "equal"),
  "2" = list(method = "signal")
)
weights <- weight_by_regime(selected, regime, weighting_configs,
                            signal_df = momentum)
```

---

weight_by_risk_parity *Risk Parity Weighting Suite*

Description

Collection of risk-based weighting methods for portfolio construction. Each method allocates capital based on risk characteristics rather than market capitalization or arbitrary equal weights.

Usage

```
weight_by_risk_parity(
  selected_df,
  prices_df,
  method = c("inverse_vol", "equal_risk", "max_div"),
  lookback_periods = 252,
  min_periods = 60
)
```

Arguments

selected_df	Binary selection matrix (data.frame with Date column)
prices_df	Price data for risk calculations (typically daily) Returns are calculated internally from prices
method	Optimization method for risk parity
lookback_periods	Number of periods for risk estimation (default: 252)
min_periods	Minimum periods required (default: 60)

Details

Methods:

- inverse_vol: Weight inversely to volatility (1/'). Lower volatility stocks receive higher weights. Simple but effective.
- equal_risk: Equal Risk Contribution (ERC). Each position contributes equally to total portfolio risk. Uses iterative optimization.
- max_div: Maximum Diversification Portfolio. Maximizes the ratio of weighted average volatility to portfolio volatility.

The function accepts price data and calculates returns internally, ensuring consistency with other library functions. Daily prices are recommended for accurate volatility estimation.

Value

Weight matrix with same dates as selected_df, rows sum to 1

Examples

```
data("sample_prices_daily")
data("sample_prices_weekly")
# Create a selection first
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 10)

# Simple inverse volatility weighting
weights <- weight_by_risk_parity(selected, sample_prices_daily, method = "inverse_vol")

# Equal Risk Contribution for balanced exposure
weights <- weight_by_risk_parity(selected, sample_prices_daily, method = "equal_risk")

# Maximum Diversification Portfolio
weights <- weight_by_risk_parity(selected, sample_prices_daily, method = "max_div")
```

---

weight_by_signal *Signal-Based Portfolio Weighting*

Description

Weights selected securities proportionally to their signal strength. Stronger signals receive higher allocations.

Usage

```
weight_by_signal(selected_df, signal_df)
```

Arguments

selected_df	Binary selection matrix
signal_df	Signal values for weighting

Value

Data.table with signal-proportional weights

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, 10)
# Weight by momentum strength
weights <- weight_by_signal(selected, momentum)
```

---

weight_by_volatility *Volatility-Based Portfolio Weighting*

Description

Weights securities based on their volatility characteristics. Can prefer low-volatility (defensive) or high-volatility (aggressive) stocks.

Usage

```
weight_by_volatility(
  selected_df,
  vol_timeframe_data,
  strategy_timeframe_data = NULL,
  lookback_periods = 26,
  low_vol_preference = TRUE,
  vol_method = "std",
  weighting_method = c("rank", "equal", "inverse_variance")
)
```

Arguments

selected_df	Binary selection matrix (1 = selected, 0 = not)
vol_timeframe_data	Price data for volatility calculation (usually daily)
strategy_timeframe_data	Price data matching strategy frequency
lookback_periods	Number of periods for volatility (default: 26)
low_vol_preference	TRUE = lower vol gets higher weight (default: TRUE)

vol_method "std", "range", "mad", or "abs_return"

weighting_method
"rank", "equal", or "inverse_variance"

Value

Data.table with volatility-based weights

Examples

```
data("sample_prices_weekly")
data("sample_prices_daily")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, 10)
daily_vol <- calc_rolling_volatility(sample_prices_daily, lookback = 252)
aligned_vol <- align_to_timeframe(daily_vol, sample_prices_weekly$Date)
weights <- weight_by_volatility(selected, aligned_vol, low_vol_preference = TRUE)
```

---

weight_equally *Equal Weight Portfolio Construction*

Description

Creates equal-weighted portfolio from selection matrix. The simplest and often most robust weighting scheme.

Usage

```
weight_equally(selected_df)
```

Arguments

selected_df Binary selection matrix (1 = selected, 0 = not)

Value

Data.table with equal weights for selected securities

Examples

```
data("sample_prices_weekly")
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, 10)
weights <- weight_equally(selected)
```

wf_report *Generate Walk-Forward Report*

Description

Prints a concise summary of a `wf_optimization_result`: configuration, stitched OOS performance, and parameter stability.

Usage

```
wf_report(wf, digits = 4)
```

Arguments

`wf`	A `wf_optimization_result` object (from `run_walk_forward()`).
`digits`	Integer; number of digits when printing numeric values (default 4).

Value

Invisibly returns the optimization summary data frame.

wf_stitch *Stitch Out-of-Sample Results (overlap-safe)*

Description

Concatenates OOS backtests and safely compounds returns on overlapping dates.

Usage

```
wf_stitch(oos_results, initial_value = 1e+05)
```

Arguments

`oos_results`	List of backtest_result objects, each with $portfolio_values and $dates.
`initial_value`	Numeric starting value for the stitched equity curve (default 100000).

Value

Data frame with columns: `Date`, `Value`.

yahoo_adapter *Download Price Data from Yahoo Finance*

Description

Downloads stock price data directly from Yahoo Finance using quantmod. No database required - perfect for quick analysis and experimentation. Get started with real data in under 5 minutes.

Usage

```
yahoo_adapter(symbols, start_date, end_date, frequency = "daily")
```

Arguments

symbols	Character vector of stock symbols
start_date	Start date in "YYYY-MM-DD" format
end_date	End date in "YYYY-MM-DD" format
frequency	"daily" or "weekly" (default: "daily")

Value

Data.table with Date column and one column per symbol

Examples

```
# Use included sample data
data(sample_prices_weekly)

# Build a quick momentum strategy with offline data
momentum <- calc_momentum(sample_prices_weekly, lookback = 12)
selected <- filter_top_n(momentum, n = 2)
weights <- weight_equally(selected)
result <- run_backtest(sample_prices_weekly, weights, initial_capital = 100000)


# Download tech stocks (requires internet, skipped on CRAN)
if (requireNamespace("quantmod", quietly = TRUE)) {
  prices <- yahoo_adapter(
    symbols = c("AAPL", "MSFT", "GOOGL"),
    start_date = "2023-01-01",
    end_date = "2023-12-31",
    frequency = "weekly"
  )
  momentum <- calc_momentum(prices, lookback = 12)
}
```

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