

# Glossary

**Abnormal earnings** See *residual income*.

**Abnormal return** The amount by which a security's actual return differs from its expected return, given the security's risk and the market's return.

**Absolute convergence** The idea that developing countries, regardless of their particular characteristics, will eventually catch up with the developed countries and match them in per capita output.

**Absolute valuation model** A model that specifies an asset's intrinsic value.

**Absolute version of PPP** An extension of the law of one price whereby the prices of goods and services will not differ internationally once exchange rates are considered.

**Accounting estimates** Estimates used in calculating the value of assets or liabilities and in the amount of revenue and expense to allocate to a period. Examples of accounting estimates include, among others, the useful lives of depreciable assets, the salvage value of depreciable assets, product returns, warranty costs, and the amount of uncollectible receivables.

**Accuracy** The percentage of correctly predicted classes out of total predictions. It is an overall performance metric in classification problems.

**Acquisition** When one company, the acquirer, purchases from the seller most or all of another company's (the target) shares to gain control of either an entire company, a segment of another company, or a specific group of assets in exchange for cash, stock, or the assumption of liabilities, alone or in combination. Once an acquisition is complete, the acquirer and target merge into a single entity and consolidate management, operations, and resources.

**Activation function** A functional part of a neural network's node that transforms the total net input received into the final output of the node. The activation function operates like a light dimmer switch that decreases or increases the strength of the input.

**Active factor risk** The contribution to active risk squared resulting from the portfolio's different-than-benchmark exposures relative to factors specified in the risk model.

**Active return** The return on a portfolio minus the return on the portfolio's benchmark.

**Active risk** The standard deviation of active returns.

**Active risk squared** The variance of active returns; active risk raised to the second power.

**Active share** A measure of how similar a portfolio is to its benchmark. A manager who precisely replicates the benchmark will have an active share of zero; a manager with no holdings in common with the benchmark will have an active share of one.

**Active specific risk** The contribution to active risk squared resulting from the portfolio's active weights on individual assets as those weights interact with assets' residual risk.

**Activist short selling** A hedge fund strategy in which the manager takes a short position in a given security and then publicly presents his/her research backing the short thesis.

**Adjustable rate** Interest rate for a mortgage or other loan that combines a fixed-rate period with a variable-rate period, which fluctuates based on market reference rates.

**Adjusted funds from operations** Funds from operations adjusted to remove any non-cash rent reported under straight-line rent accounting and to subtract maintenance-type capital expenditures and leasing costs, including leasing agents' commissions and tenants' improvement allowances.

**Adjusted present value** As an approach to valuing a company, the sum of the value of the company, assuming no use of debt, and the net present value of any effects of debt on company value.

**Adjusted  $R^2$**  Goodness-of-fit measure that adjusts the coefficient of determination,  $R^2$ , for the number of independent variables in the model.

**Advanced set** An arrangement in which the reference interest rate is set at the time the money is deposited.

**Advanced settled** An arrangement in which a forward rate agreement (FRA) expires and settles at the same time, at the FRA expiration date.

**Agglomerative clustering** A bottom-up hierarchical clustering method that begins with each observation being treated as its own cluster. The algorithm finds the two closest clusters, based on some measure of distance (similarity), and combines them into one new larger cluster. This process is repeated iteratively until all observations are clumped into a single large cluster.

**Akaike's information criterion (AIC)** A statistic used to compare sets of independent variables for explaining a dependent variable. It is preferred for finding the model that is best suited for prediction.

**Allowance for loan losses** A balance sheet account; it is a contra asset account to loans.

**Alpha** The return on an asset in excess of the asset's required rate of return. Sometimes referred to as an *abnormal return*.

**American Depositary Receipt** A negotiable certificate issued by a depositary bank that represents ownership in a non-US company's deposited equity (i.e., equity held in custody by the depositary bank in the company's home market).

**Analysis of variance (ANOVA)** A table that presents the sums of squares, degrees of freedom, mean squares, and F-statistic for a regression model.

**Application programming interface (API)** A set of well-defined methods of communication between various software components and typically used for accessing external data.

**Appraisals** Professional estimates of current market value for a real estate property.

**Arbitrage** (1) The simultaneous purchase of an undervalued asset or portfolio and sale of an overvalued but equivalent asset or portfolio in order to obtain a riskless profit on the price differential. Taking advantage of a market inefficiency in a risk-free manner. (2) The condition in a financial market in which equivalent assets or combinations of assets sell for two different prices, creating an

opportunity to profit at no risk with no commitment of money. In a well-functioning financial market, few arbitrage opportunities are possible. (3) A risk-free operation that earns an expected positive net profit but requires no net investment of money.

**Arbitrage opportunity** An opportunity to conduct an arbitrage; an opportunity to earn an expected positive net profit without risk and with no net investment of money.

**Arbitrage portfolio** The portfolio that exploits an arbitrage opportunity.

**Arbitrage-free models** Term structure models that project future interest rate paths that emanate from the existing term structure. Resulting prices are based on a no-arbitrage condition.

**Arbitrage-free valuation** An approach to valuation that determines security values consistent with the absence of any opportunity to earn riskless profits without any net investment of money.

**Arm's-length transaction** Both buyer and seller act independently without any preexisting relationship that may sway their decision making.

**Asset-based approach** Approach that values a private company based on the values of the underlying assets of the entity less the value of any related liabilities.

**Asset-based valuation** An approach to valuing natural resource companies that estimates company value on the basis of the market value of the natural resources the company controls.

**At market contract** When a forward contract is established, the forward price is negotiated so that the market value of the forward contract on the initiation date is zero.

**Authorized participants** (APs) A special group of institutional investors who are authorized by the ETF issuer to participate in the creation/redemption process. APs are large broker/dealers, often market makers.

**Autocorrelations** The correlations of a time series with its own past values.

**Autoregressive model (AR)** A time series regressed on its own past values in which the independent variable is a lagged value of the dependent variable.

**Back-testing** The process that approximates the real-life investment process, using historical data, to assess whether an investment strategy would have produced desirable results.

**Backward propagation** The process of adjusting weights in a neural network, to reduce total error of the network, by moving backward through the network's layers.

**Backwardation** A downward-sloping, or inverted, forward curve in a futures market.

**Bag-of-words (BOW)** A collection of a distinct set of tokens from all the texts in a sample dataset. BOW does not capture the position or sequence of words present in the text.

**Balance sheet restructuring** Altering the composition of the balance sheet by either shifting the asset composition, changing the capital structure, or both.

**Bankruptcy** Legal proceedings, which vary by jurisdiction, allowing a firm whose liabilities exceed its assets to restructure existing debt obligations or liquidate assets in an orderly manner.

**Barbell portfolio** Fixed-income portfolio that combines short and long maturities.

**Base error** Model error due to randomness in the data.

**Basic earnings per share** (EPS) Net earnings available to common shareholders (i.e., net income minus preferred dividends) divided by the weighted average number of common shares outstanding during the period.

**Basis** The difference between the spot price and the futures price. As the maturity date of the futures contract nears, the basis converges toward zero.

**Basis trade** A trade based on the pricing of credit in the bond market versus the price of the same credit in the CDS market. To execute a basis trade, go long the "underpriced" credit and short the "overpriced" credit. A profit is realized as the implied credit prices converge.

**Bearish flattening** Term structure shift in which short-term bond yields rise more than long-term bond yields, resulting in a flatter yield curve.

**Benchmark value of the multiple** In using the method of comparables, the value of a price multiple for the comparison asset; when we have comparison assets (a group), the mean or median value of the multiple for the group of assets.

**Bias error** Describes the degree to which a model fits the training data. Algorithms with erroneous assumptions produce high bias error with poor approximation, causing underfitting and high in-sample error.

**Bill-and-hold basis** Sales on a bill-and-hold basis involve selling products but not delivering those products until a later date.

**Blockage factor** An illiquidity discount that occurs when an investor sells a large amount of stock relative to its trading volume (assuming it is not large enough to constitute a controlling ownership).

**Bond indenture** A legal document between a bond issuer and investors that governs each party's rights and responsibilities.

**Bond risk premium** The expected excess return of a default-free long-term bond less that of an equivalent short-term bond.

**Bond yield plus risk premium (BYPRP) approach** An estimate of the cost of common equity that is produced by summing the before-tax cost of debt and a risk premium that captures the additional yield on a company's stock relative to its bonds.

**Bonus issue of shares** A type of dividend in which a company distributes additional shares of its common stock to shareholders instead of cash.

**Book value** Shareholders' equity (total assets minus total liabilities) minus the value of preferred stock; common shareholders' equity.

**Book value of equity** Shareholders' equity (total assets minus total liabilities) minus the value of preferred stock; common shareholders' equity.

**Book value per share** The amount of book value (also called carrying value) of common equity per share of common stock, calculated by dividing the book value of shareholders' equity by the number of shares of common stock outstanding.

**Bootstrap aggregating (or bagging)** A technique whereby the original training dataset is used to generate  $n$  new training datasets or bags of data. Each new bag of data is generated by random sampling with replacement from the initial training set.

**Bootstrapping** The use of a forward substitution process to determine zero-coupon rates by using the par yields and solving for the zero-coupon rates one by one, from the shortest to longest maturities.

- Breakup value** The value derived using a sum-of-the-parts valuation.
- Breusch–Godfrey (BG) test** A test used to detect autocorrelated residuals up to a predesignated order of the lagged residuals.
- Breusch–Pagan (BP) test** A test for the presence of heteroskedasticity in a regression.
- Bullet portfolio** A fixed-income portfolio concentrated in a single maturity.
- Bullish flattening** Term structure change in which the yield curve flattens in response to a greater decline in long-term rates than short-term rates.
- Bullish steepening** Term structure change in which short-term rates fall by more than long-term yields, resulting in a steeper term structure.
- Buy-side analysts** Analysts who work for investment management firms, trusts, bank trust departments, and similar institutions.
- Buyback** A transaction in which a company buys back its own shares. Unlike stock dividends and stock splits, share repurchases use corporate cash.
- Callable bond** A bond containing an embedded call option that gives the issuer the right to buy the bond back from the investor at specified prices on predetermined dates.
- Canceled shares** Shares that were issued, subsequently repurchased by the company, and then retired (cannot be reissued).
- Capital asset pricing model (CAPM)** An equation describing the expected return on any asset (or portfolio) as a linear function of its beta relative to the market portfolio.
- Capital charge** The company's total cost of capital in money terms.
- Capital deepening** An increase in the capital-to-labor ratio.
- Capitalization rate** The rate used to discount expected NOI, which combines the required rate of return on similar properties with an implied constant growth rate.
- Capitalized cash flow method** In the context of private company valuation, a valuation model based on an assumption of a constant growth rate of free cash flow to the firm or a constant growth rate of free cash flow to equity. Also called *capitalized cash flow model*.
- Capped floater** Floating-rate bond with a cap provision that prevents the coupon rate from increasing above a specified maximum rate. It protects the issuer against rising interest rates.
- Carry arbitrage model** A no-arbitrage approach in which the underlying instrument is either bought or sold along with an opposite position in a forward contract.
- Carry benefits** Benefits that arise from owning certain underlyings; for example, dividends, foreign interest, and bond coupon payments.
- Carry costs** Costs that arise from owning certain underlyings. They are generally a function of the physical characteristics of the underlying asset and also the interest forgone on the funds tied up in the asset.
- Cash available for distribution** See *adjusted funds from operations*.
- Cash settlement** A procedure used in certain derivative transactions that specifies that the long and short parties settle the derivative's difference in value between them by making a cash payment.
- Catalyst** An event or piece of information that causes the marketplace to re-evaluate the prospects of a company.
- CDS spread** A periodic premium paid by the buyer to the seller that serves as a return over a market reference rate required to protect against credit risk.
- Ceiling analysis** A systematic process of evaluating different components in the pipeline of model building. It helps to understand what part of the pipeline can potentially improve in performance by further tuning.
- Centroid** The center of a cluster formed using the *k*-means clustering algorithm.
- Chain rule of forecasting** A forecasting process in which the next period's value as predicted by the forecasting equation is substituted into the right-hand side of the equation to give a predicted value two periods ahead.
- Cheapest-to-deliver** The debt instrument that can be purchased and delivered at the lowest cost yet has the same seniority as the reference obligation.
- Classification and regression tree** A supervised machine learning technique that can be applied to predict either a categorical target variable, producing a classification tree, or a continuous target variable, producing a regression tree. CART is commonly applied to binary classification or regression.
- Clean surplus relation** The relationship between earnings, dividends, and book value in which ending book value is equal to the beginning book value plus earnings less dividends, apart from ownership transactions.
- Closed DB plan** A DB plan that is not accepting new enrollees.
- Club convergence** The idea that only rich and middle-income countries sharing a set of favorable attributes (i.e., are members of the "club") will converge to the income level of the richest countries.
- Cluster** A subset of observations from a dataset such that all the observations within the same cluster are deemed "similar."
- Clustering** The sorting of observations into groups (clusters) such that observations in the same cluster are more similar to each other than they are to observations in other clusters.
- Cobb–Douglas production function** A function of the form  $Y = K^\alpha L^{1-\alpha}$  relating output (*Y*) to labor (*L*) and capital (*K*) inputs.
- Coefficient of determination** A measure of how well data points fit a linear statistical model, indicated in percentage terms from 0 to 100%. Also known as *R-squared* ( $R^2$ ).
- Cointegrated** Describes two time series that have a long-term financial or economic relationship such that they do not diverge from each other without bound in the long run.
- Collateral return** The component of the total return on a commodity futures position attributable to the yield for the bonds or cash used to maintain the futures position. Also called *collateral yield*.
- Collection frequency (CF)** The number of times a given word appears in the whole corpus (i.e., collection of sentences) divided by the total number of words in the corpus.
- Commodity swap** A type of swap involving the exchange of payments over multiple dates as determined by specified reference prices or indexes relating to commodities.
- Company fundamental factors** Factors related to the company's internal performance, such as factors relating to earnings growth, earnings variability, earnings momentum, and financial leverage.
- Company share-related factors** Valuation measures and other factors related to share price or the trading characteristics of the shares, such as earnings yield, dividend yield, and book-to-market value.

- Comparables** Assets used as benchmarks when applying the method of comparables to value an asset. Also called *comps*, *guideline assets*, or *guideline companies*.
- Compiled financial statements** Financial statements that are not accompanied by an auditor's opinion letter.
- Complexity** A term referring to the number of features, parameters, or branches in a model and to whether the model is linear or non-linear (non-linear is more complex).
- Composite variable** A variable that combines two or more variables that are statistically strongly related to each other.
- Comprehensive income** All changes in equity other than contributions by, and distributions to, owners; income under clean surplus accounting; includes all changes in equity during a period except those resulting from investments by owners and distributions to owners. Comprehensive income equals net income plus other comprehensive income.
- Comps** Assets used as benchmarks when applying the method of comparables to value an asset.
- Concentrated ownership** Ownership structure consisting of an individual shareholder or a group (controlling shareholders) with the ability to exercise control over the corporation.
- Conditional convergence** The idea that convergence of per capita income is conditional on the countries having the same savings rate, population growth rate, and production function.
- Conditional heteroskedasticity** A condition in which the variance of residuals of a regression are correlated with the value of the independent variables.
- Conditional VaR (CVaR)** The weighted average of all loss outcomes in the statistical (i.e., return) distribution that exceed the VaR loss. Thus, CVaR is a more comprehensive measure of tail loss than VaR is. Sometimes referred to as the *expected tail loss* or *expected shortfall*.
- Confirmation bias** A type of cognitive bias that makes individuals view information that confirms beliefs they already hold as more salient.
- Confusion matrix** A grid used for error analysis in classification problems, it presents values for four evaluation metrics including true positive (TP), false positive (FP), true negative (TN), and false negative (FN).
- Conglomerate discount** When an issuer is trading at a valuation lower than the sum of its parts, which is generally the result of diseconomies of scale or scope or the result of the capital markets having overlooked the business and its prospects.
- Constant dividend payout ratio policy** A policy in which a constant percentage of net income is paid out in dividends.
- Constant returns to scale** The condition that if all inputs into the production process are increased by a given percentage, then output rises by that same percentage.
- Contango** Refers to spot price below forward price in a futures market.
- Contingent consideration** Potential future payments to the seller that are contingent on the achievement of certain agreed-on occurrences.
- Continuing earnings** Earnings excluding nonrecurring components. Also referred to as *core earnings*, *persistent earnings*, or *underlying earnings*.
- Continuing residual income** Residual income after the forecast horizon.
- Continuing value** The analyst's estimate of a stock's value at a particular point in the future.
- Contraction risk** The risk of earlier repayment of a mortgage-backed security than expected.
- Control premium** An increment or premium to value associated with a controlling ownership interest in a company.
- Convergence** The property by which as expiration approaches, the price of a newly created forward or futures contract will approach the price of a spot transaction. At expiration, a forward or futures contract is equivalent to a spot transaction in the underlying.
- Conversion period** The period over which a convertible bond may be exchanged for equity at a predetermined price.
- Conversion price** Predetermined share price at which convertible debt may be fully exchanged for common shares during the conversion period.
- Conversion rate (or ratio)** For a convertible bond, the number of shares of common stock that a bondholder receives from converting the bond into shares.
- Conversion value** The current contingency feature value derived by comparing a convertible bond's price with its value if a bondholder were to exchange bonds for shares.
- Convertible bond** A bond that gives the bondholder the right to exchange the bond for a specified number of common shares in the issuing company.
- Convexity** The second order, usually a positive change in the price of a bond for a given change in yield, which can be negative for a callable bond such as a high-yield bond.
- Core earnings** Earnings excluding nonrecurring components. Also referred to as *continuing earnings*, *persistent earnings*, or *underlying earnings*.
- Core real estate** Real estate investments in well-developed, stable-income-producing commercial and residential properties.
- Corpus** A collection of text data in any form, including list, matrix, or data table forms.
- Cost of carry model** A model that relates the forward price of an asset to the spot price by considering the cost of carry (also referred to as future-spot parity model).
- Cost of debt** The required return on debt financing for a company, such as when it issues a bond, takes out a bank loan, or leases an asset through a finance lease.
- Cost of equity** The return required by equity investors to compensate for both the time value of money and the risk. Also referred to as the required rate of return on common stock or the required return on equity.
- Cost restructuring** Actions to reduce costs by improving operational efficiency and profitability, often to raise margins to a historical level or to those of comparable industry peers.
- Country risk premium (CRP)** The additional return required by investors to compensate for the risk associated with investing in a foreign country relative to the investor's domestic market.
- Country risk rating (CRR)** The rating of a country based on many risk factors, including economic prosperity, political risk, and ESG risk.
- Covariance stationary** Describes a time series when its expected value and variance are constant and finite in all periods and when its covariance with itself for a fixed number of periods in the past or future is constant and finite in all periods.
- Covered bonds** A senior debt obligation of a financial institution that gives recourse to the originator/issuer and a predetermined underlying collateral pool.

- Covered interest rate parity** The relationship among the spot exchange rate, the forward exchange rate, and the interest rates in two currencies that ensures that the return on a hedged (i.e., covered) foreign risk-free investment is the same as the return on a domestic risk-free investment. Also called *interest rate parity*.
- Cox-Ingersoll-Ross model** A general equilibrium term structure model that assumes interest rates are mean reverting and interest rate volatility is directly related to the level of interest rates.
- Creation basket** The list of securities (and share amounts) the authorized participant (AP) must deliver to the ETF manager in exchange for ETF shares. The creation basket is published each business day.
- Creation units** Large blocks of ETF shares transacted between the authorized participant (AP) and the ETF manager that are usually but not always equal to 50,000 shares of the ETF.
- Creation/redemption** The process in which ETF shares are created or redeemed by authorized participants transacting with the ETF issuer.
- Credit correlation** The correlation of credit (or default) risks of the underlying single-name CDS contained in an index CDS.
- Credit curve** The credit spreads for a range of maturities of a company's debt.
- Credit default swap** A derivative contract between two parties in which the buyer makes a series of cash payments to the seller and receives a promise of compensation for credit losses resulting from the default.
- Credit derivative** A derivative instrument in which the underlying is a measure of the credit quality of a borrower.
- Credit event** An occurrence that triggers the settlement of a CDS contract, including failure to make a debt payment, debt restructuring, or a bankruptcy filing.
- Credit protection buyer** One party to a credit default swap; the buyer makes a series of cash payments to the seller and receives a promise of compensation for credit losses resulting from the default.
- Credit protection seller** One party to a credit default swap; the seller makes a promise to pay compensation for credit losses resulting from the default.
- Credit risk** The expected economic loss under a potential borrower default over the life of the contract.
- Credit spread** The compensation for the risk of default in a debt security, typically measured by the yield-to-maturity difference between a bond and a comparable government benchmark security.
- Credit valuation adjustment** The value of the credit risk of a bond in present value terms.
- Cross-sectional momentum** A managed futures trend following strategy implemented with a cross-section of assets (within an asset class) by going long those that are rising in price the most and by shorting those that are falling the most. This approach generally results in holding a net zero (market-neutral) position and works well when a market's out- or underperformance is a reliable predictor of its future performance.
- Cross-validation** A technique for estimating out-of-sample error directly by determining the error in validation samples.
- Cumulative preferred stock** Preferred stock that requires that the dividends be paid in full to preferred stock owners for any missed dividends prior to any payment of dividends to common stock owners.
- Current exchange rate** For accounting purposes, the spot exchange rate on the balance sheet date.
- Current rate method** Approach to translating foreign currency financial statements for consolidation in which all assets and liabilities are translated at the current exchange rate. The current rate method is the prevalent method of translation.
- Curvature** One of the three factors (the other two are level and steepness) that empirically explain most of the changes in the shape of the yield curve. A shock to the curvature factor affects mid-maturity interest rates, resulting in the term structure becoming either more or less hump-shaped.
- Curve trade** Buying a CDS of one maturity and selling a CDS on the same reference entity with a different maturity.
- Customer concentration risk** The risk associated with sales dependent on a few customers.
- Cyclical businesses** Businesses with high sensitivity to business- or industry-cycle influences.
- Data preparation (cleansing)** The process of examining, identifying, and mitigating (i.e., cleansing) errors in raw data.
- Data snooping** The subconscious or conscious manipulation of data in a way that produces a statistically significant result (i.e., the *p*-value is sufficiently small or the *t*-statistic sufficiently large to indicate statistical significance), such as by running multiple simulations and naively accepting the best result. Also known as *p*-hacking.
- Data wrangling (preprocessing)** This task performs transformations and critical processing steps on cleansed data to make the data ready for ML model training (i.e., preprocessing), and includes dealing with outliers, extracting useful variables from existing data points, and scaling the data.
- Debt service coverage ratio** A key indicator of credit performance equal to the ratio of net operating income to debt service.
- Dedicated short-selling** A hedge fund strategy in which the manager takes short-only positions in equities deemed to be expensively priced versus their deteriorating fundamental situations. Short exposures may vary only in terms of portfolio sizing by, at times, holding higher levels of cash.
- Deep learning** An area of artificial intelligence in which a system uses neural networks to perform multistage, non-linear data processing to identify patterns. Also called *deep learning nets*.
- Deep neural networks** Neural networks with many hidden layers—at least 2 but potentially more than 20—that have proven successful across a wide range of artificial intelligence applications.
- Default risk** See *credit risk*.
- Delta** The sensitivity of the derivative price to a small change in the value of the underlying asset.
- Dendrogram** A type of tree diagram used for visualizing a hierarchical cluster analysis; it highlights the hierarchical relationships among the clusters.
- Depository Trust and Clearinghouse Corporation** A US-headquartered entity providing post-trade clearing, settlement, and information services.
- Depreciable base** Total construction or original acquisition cost plus any property improvements less the cost of land written down over the estimated useful life, as in the case of a company's fixed assets.
- Diluted earnings per share** (Diluted EPS) Net income, minus preferred dividends, divided by the weighted average number of common shares outstanding considering all dilutive

securities (e.g., convertible debt and options); the EPS that would result if all dilutive securities were converted into common shares.

**Dilution** An increase in the number of shares outstanding from share issuance that decreases the percentage of shares owned by existing shareholders.

**Dimension reduction** A set of techniques for reducing the number of features in a dataset while retaining variation across observations to preserve the information contained in that variation.

**Diminishing marginal productivity** When each additional unit of an input, keeping the other inputs unchanged, increases output by a smaller increment.

**Direct capitalization method** Valuation approach that estimates the value of an income-producing property using a discounted cash flow approach based on a single year's net operating income.

**Discount** To reduce the value of a future payment in allowance for how far away it is in time; to calculate the present value of some future amount. Also, the amount by which an instrument is priced below its face (par) value.

**Discount factor** The price equivalent of a zero rate. Also may be stated as the present value of a currency unit on a future date.

**Discount for lack of control** An amount or percentage deducted from the pro rata share of 100% of the value of an equity interest in a business to reflect the absence of some or all of the powers of control.

**Discount for lack of marketability** An amount of percentage deducted from the value of an ownership interest to reflect the relative absence of marketability.

**Discount function** Discount factors for the range of all possible maturities. The spot curve can be derived from the discount function and vice versa.

**Discounted abnormal earnings model** A model of stock valuation that views intrinsic value of stock as the sum of book value per share plus the present value of the stock's expected future residual income per share.

**Discounted cash flow method** A valuation method involving a series of income projections discounted to the present with a terminal value.

**Discounted cash flow model** A model of intrinsic value that views the value of an asset as the present value of the asset's expected future cash flows.

**Dispersed ownership** Ownership structure consisting of many shareholders, none of which has the ability to individually exercise control over the corporation.

**Divestiture** When a seller sells a company, segment of a company, or group of assets to an acquirer. Once complete, control of the target is transferred to the acquirer.

**Dividend coverage ratio** The ratio of net income to dividends.

**Dividend discount model (DDM)** The model of the value of stock that is the present value of all future dividends, discounted at the required return on equity.

**Dividend displacement of earnings** The concept that dividends paid now displace earnings in all future periods.

**Dividend imputation tax system** A taxation system that effectively assures corporate profits distributed as dividends are taxed just once and at the shareholder's tax rate.

**Dividend index point** A measure of the quantity of dividends attributable to a particular index.

**Dividend payout ratio** The ratio of cash dividends paid to earnings for a period.

**Dividend policy** The strategy a company follows with regard to the amount and timing of dividend payments.

**Dividend rate** The annualized amount of the most recent dividend.

**Dividend recapitalization** A change in the mix of debt and equity outstanding for an existing corporate issuer which increases leverage via debt-financed dividends or share repurchases to benefit existing shareholders.

**Dividend yield** Annual dividends per share divided by share price.

**Dividends** Distributions of profits and/or net assets from a corporation to its shareholders. While often in cash, dividends can be also be paid in stock or assets, such as property.

**Divisive clustering** A top-down hierarchical clustering method that starts with all observations belonging to a single large cluster. The observations are then divided into two clusters based on some measure of distance (similarity). The algorithm then progressively partitions the intermediate clusters into smaller ones until each cluster contains only one observation.

**Document frequency (DF)** The number of documents (texts) that contain a particular token divided by the total number of documents. It is the simplest feature selection method and often performs well when many thousands of tokens are present.

**Document term matrix (DTM)** A matrix where each row belongs to a document (or text file), and each column represents a token (or term). The number of rows is equal to the number of documents (or text files) in a sample text dataset. The number of columns is equal to the number of tokens from the BOW built using all the documents in the sample dataset. The cells typically contain the counts of the number of times a token is present in each document.

**Dominance** An arbitrage opportunity when a financial asset with a risk-free payoff in the future must have a positive price today.

**Double taxation system** Corporate earnings are taxed twice when paid out as dividends. First, corporate pretax earnings are taxed regardless of whether they will be distributed as dividends or retained at the corporate level. Second, dividends are taxed again at the individual shareholder level.

**Downstream** A transaction between two related companies, an investor company (or a parent company) and an associate company (or a subsidiary) such that the investor company records a profit on its income statement. An example is a sale of inventory by the investor company to the associate or by a parent to a subsidiary company.

**Dual-class shares** Shares that grant one share class superior or even sole voting rights, whereas the other share class has inferior or no voting rights.

**Due diligence** Investigation and analysis in support of an investment action, decision, or recommendation.

**Dummy variable** An independent variable that takes a value of either 1 or 0, depending on a specified condition. Also known as an *indicator variable*.

**Duration** The first-order, linear change in a bond's price for a given yield change in yield, which is a negative or inverse relationship.

**Durbin-Watson (DW) test** A test for the presence of first-order serial correlation.

**Dutch disease** A situation in which currency appreciation driven by strong export demand for resources makes other segments of the economy (particularly manufacturing) globally uncompetitive.

- Earnings surprise** The difference between reported EPS and expected EPS. Also referred to as *unexpected earnings*.
- Earnings yield** EPS divided by price; the reciprocal of the P/E.
- Economic profit** Equal to accounting profit less the implicit opportunity costs not included in total accounting costs; the difference between total revenue (TR) and total cost (TC). Also called *abnormal profit* or *supernormal profit*.
- Economic sectors** Large industry groupings.
- Economic value added** (EVA<sup>®</sup>) A commercial implementation of the residual income concept; the computation of EVA<sup>®</sup> is the net operating profit after taxes minus the cost of capital, where these inputs are adjusted for a number of items.
- Edwards–Bell–Ohlson model** A model of stock valuation that views intrinsic value of stock as the sum of book value per share plus the present value of the stock's expected future residual income per share.
- Effective convexity** An interest rate risk statistic that measures the non-linear/second-order effect of changes in the benchmark yield curve on a bond's price.
- Effective duration** The sensitivity of the bond's price to an instantaneous parallel shift in a benchmark yield curve—for example, the government par curve.
- Effective gross income** Gross rent plus other income minus deductions for vacancies or concessions.
- Eigenvalue** A measure that gives the proportion of total variance in the initial dataset that is explained by each eigenvector.
- Eigenvector** A vector that defines new mutually uncorrelated composite variables that are linear combinations of the original features.
- Embedded options** Contingency provisions found in a bond's indenture representing rights that enable their holders to take advantage of interest rate movements. They can be exercised by the issuer, by the bondholder, or automatically depending on the course of interest rates.
- Ensemble learning** A technique of combining the predictions from a collection of models to achieve a more accurate prediction.
- Ensemble method** The method of combining multiple learning algorithms, as in ensemble learning.
- Enterprise value** A measure of a company's total market value from which the value of cash and short-term investments have been subtracted.
- Enterprise value multiple** A valuation multiple that relates the total market value of all sources of a company's capital (net of cash) to a measure of fundamental value for the entire company (such as a pre-interest earnings measure).
- Equity charge** The estimated cost of equity capital in money terms.
- Equity dividend rate** Equityholder return that considers the first-year return on equity on an income-producing property involving the before-tax cash flow divided by the property purchase price less the mortgage loan outstanding.
- Equity investment** A company purchasing another company's equity but less than 50% of its shares. The two companies maintain their independence, but the investor company has investment exposure to the investee and, in some cases depending on the size of the investment, can have representation on the investee's board of directors to influence operations.
- Equity REITs** REITs that primarily own and operate properties and distribute dividends to shareholders.
- Equity swap** A swap transaction in which at least one cash flow is tied to the return to an equity portfolio position, often an equity index.
- Error autocorrelations** The autocorrelations of the error term.
- ESG integration** The inclusion of ESG considerations within financial analysis and investment decisions. This may be done in various ways, tailored to the investment style and approach of the fund manager.
- Ex ante tracking error** A measure of the degree to which the performance of a given investment portfolio might be expected to deviate from its benchmark; also known as *relative VaR*.
- Ex ante version of PPP** The hypothesis that expected changes in the spot exchange rate are equal to expected differences in national inflation rates. An extension of relative purchasing power parity to expected future changes in the exchange rate.
- Ex-dividend** Trading ex-dividend refers to shares that no longer carry the right to the next dividend payment.
- Ex-dividend date** The first date that a share trades without (i.e., "ex") the right to receive the declared dividend for the period.
- Excess earnings method** Income approach that estimates the value of all intangible assets of the business by capitalizing future earnings in excess of the estimated return requirements associated with working capital and fixed assets.
- Excess tax benefit** The amount by which the tax deduction associated with a share-based award exceeds the cumulative share-based compensation expense recognized in accordance with US GAAP or IFRS. Excess tax benefits occur when the value of a share-based award at settlement exceeds the value at the grant date.
- Exercise value** The value of an option if it were exercised. Also sometimes called *intrinsic value*.
- Expanded CAPM** An adaptation of the CAPM that adds to the CAPM a premium for small size and company-specific risk.
- Expectations approach** A procedure for obtaining the value of an option derived from discounting at the risk-free rate its expected future payoff based on risk neutral probabilities.
- Expected exposure** The projected amount of money an investor could lose if an event of default occurs, before factoring in possible recovery.
- Expected shortfall** The average loss conditional on exceeding the VaR cutoff; sometimes referred to as *conditional VaR* or *expected tail loss*.
- Expected tail loss** See *conditional VaR*.
- Exploratory data analysis (EDA)** The preliminary step in data exploration, where graphs, charts, and other visualizations (heat maps and word clouds) as well as quantitative methods (descriptive statistics and central tendency measures) are used to observe and summarize data.
- Exposure to foreign exchange risk** The risk of a change in value of an asset or liability denominated in a foreign currency due to a change in exchange rates.
- Extendible bond** Bond with an embedded option that gives the bondholder the right to keep the bond for a number of years after maturity, possibly with a different coupon.
- Extension risk** The risk of later repayment of a mortgage-backed security than expected.
- Extra dividend** A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.

- F1 score** The harmonic mean of precision and recall. F1 score is a more appropriate overall performance metric (than accuracy) when there is unequal class distribution in the dataset and it is necessary to measure the equilibrium of precision and recall.
- Factor** A common or underlying element with which several variables are correlated.
- Factor betas** An asset's sensitivity to a particular factor; a measure of the response of return to each unit of increase in a factor, holding all other factors constant.
- Factor portfolio** See *pure factor portfolio*.
- Factor price** The expected return in excess of the risk-free rate for a portfolio with a sensitivity of 1 to one factor and a sensitivity of 0 to all other factors.
- Factor risk premium** The expected return in excess of the risk-free rate for a portfolio with a sensitivity of 1 to one factor and a sensitivity of 0 to all other factors. Also called *factor price*.
- Factor risk premiums** The expected return in excess of the risk-free rate for a portfolio with a sensitivity of 1 to one factor and a sensitivity of 0 to all other factors. Also called *factor price*.
- Failure to pay** When a borrower does not make a scheduled payment of principal or interest on any outstanding obligations after a grace period.
- Fair market value** The price, expressed in terms of cash equivalents, at which a property (asset) would change hands between a hypothetical willing and able buyer and a hypothetical willing and able seller, acting at "arm's length" in an open and unrestricted market, when neither is under compulsion to buy or sell and when both have reasonable knowledge of the relevant facts. Fair market value is most often used in a tax reporting context in the United States.
- Fair value** A market-based measure of an investment based on observable or derived assumptions to determine a price that market participants would use to exchange an asset or liability in an orderly transaction at a specific time.
- Fama–French models** Factor models that explain the drivers of returns related to three, four, or five factors.
- Feature engineering** A process of creating new features by changing or transforming existing features.
- Feature selection** A process whereby only pertinent features from the dataset are selected for model training. Selecting fewer features decreases model complexity and training time.
- Features** The independent variables ( $X$ 's) in a labeled dataset.
- Finance (or capital) lease** A lease that is viewed as a financing arrangement.
- Financial buyer** An owner seeking to earn investment returns from an existing company without identifying or capitalizing on synergies from a controlling interest.
- Financial leverage** The use of debt in the capital structure. Measured using ratios such as operating income to operating income less interest expense, total assets to total equity, or debt to equity.
- First-differencing** A transformation that subtracts the value of the time series in period  $t - 1$  from its value in period  $t$ .
- First-order serial correlation** The correlation of residuals with residuals adjacent in time.
- Fitting curve** A curve which shows in- and out-of-sample error rates ( $E_{in}$  and  $E_{out}$ ) on the  $y$ -axis plotted against model complexity on the  $x$ -axis.
- Fixed price tender offer** Offer made by a company to repurchase a specific number of shares at a fixed price that is typically at a premium to the current market price.
- Fixed-rate perpetual preferred stock** Non-convertible, non-callable preferred stock with a specified dividend rate that has a claim on earnings senior to the claim of common stock, and no maturity date.
- Flight to quality** During times of market stress, investors sell higher-risk asset classes such as stocks and commodities in favor of default-risk-free government bonds.
- Float** Amounts collected as premium and not yet paid out as benefits.
- Floored floater** Floating-rate bond with a floor provision that prevents the coupon rate from decreasing below a specified minimum rate. It protects the investor against declining interest rates.
- Flotation cost** Fees charged to companies by investment bankers and other costs associated with raising new capital.
- Forced conversion** For a convertible bond, when the issuer calls the bond and forces bondholders to convert their bonds into shares, which typically happens when the underlying share price increases above the conversion price.
- Foreign currency transactions** Transactions that are denominated in a currency other than a company's functional currency.
- Forward curve** The term structure of forward rates for loans made on a specific initiation date.
- Forward dividend yield** A dividend yield based on the anticipated dividend during the next 12 months.
- Forward P/E** A P/E calculated on the basis of a forecast of EPS; a stock's current price divided by next year's expected earnings.
- Forward price** Represents the price agreed upon in a forward contract to be exchanged at the contract's maturity date,  $T$ . This price is shown in equations as  $F_0(T)$ .
- Forward pricing model** The model that describes the valuation of forward contracts.
- Forward propagation** The process of adjusting weights in a neural network, to reduce total error of the network, by moving forward through the network's layers.
- Forward rate** An interest rate determined today for a loan that will be initiated in a future period.
- Forward rate agreement** An over-the-counter forward contract in which the underlying is an interest rate on a deposit. A forward rate agreement (FRA) calls for one party to make a fixed interest payment and the other to make an interest payment at a rate to be determined at contract expiration.
- Forward rate model** The forward pricing model expressed in terms of spot and forward interest rates.
- Forward rate parity** The proposition that the forward exchange rate is an unbiased predictor of the future spot exchange rate.
- Forward value** The monetary value of an existing forward contract.
- Forward-looking estimates** Estimates based on current and expectations. Also referred to as *ex ante* estimates.
- Franchising** A situation where an owner of an asset and associated intellectual property divests the asset and licenses intellectual property to a third-party operator (franchisee) in exchange for royalties. Franchisees operate under the constraints of a franchise agreement.
- Franking credit** A tax credit received by shareholders for the taxes that a corporation paid on its distributed earnings.



- Free cash flow to equity** The cash flow available to a company's common shareholders after all operating expenses, interest, and principal payments have been made and necessary investments in working and fixed capital have been made.
- Free cash flow to equity model** A model of stock valuation that views a stock's intrinsic value as the present value of expected future free cash flows to equity.
- Free cash flow to the firm** The cash flow available to the company's suppliers of capital after all operating expenses (including taxes) have been paid and necessary investments in working and fixed capital have been made.
- Free cash flow to the firm model** A model of stock valuation that views the value of a firm as the present value of expected future free cash flows to the firm.
- Frequency analysis** The process of quantifying how important tokens are in a sentence and in the corpus as a whole. It helps in filtering unnecessary tokens (or features).
- Frozen DB plan** A DB plan that is no longer accruing benefits for employee service.
- Fulcrum securities** Partially-in-the-money claims (not expected to be repaid in full) whose holders end up owning the reorganized company in a corporate reorganization situation.
- Functional currency** The currency of the primary economic environment in which an entity operates.
- Fund of funds** Funds that hold a portfolio of hedge funds; also called *funds of hedge funds*.
- Fundamental factor models** A multifactor model in which the factors are attributes of stocks or companies that are important in explaining cross-sectional differences in stock prices.
- Fundamentals** Economic characteristics of a business, such as profitability, financial strength, and risk.
- Funded status** The present value of the DB obligation less the fair value of plan assets (if any).
- Funds available for distribution** See *adjusted funds from operations*.
- Funds from operations** Net income (computed in accordance with generally accepted accounting principles) *plus* (1) gains and losses from sales of properties and (2) depreciation and amortization.
- Futures price** The pre-agreed price at which a futures contract buyer (seller) agrees to pay (receive) for the underlying at the maturity date of the futures contract.
- Futures value** The monetary value of an existing futures contract.
- FX carry trade** An investment strategy that involves taking long positions in high-yield currencies and short positions in low-yield currencies.
- Gamma** A numerical measure of how sensitive an option's delta (the sensitivity of the derivative's price) is to a change in the value of the underlying.
- General linear F-test** A test statistic used to assess the goodness of fit for an entire regression model, so it tests all independent variables in the model.
- Generalize** When a model retains its explanatory power when predicting out-of-sample (i.e., using new data).
- Global CAPM (GCAPM)** A single-factor model with a global index representing the single factor.
- Going-concern assumption** The assumption that the business will maintain its business activities into the foreseeable future.
- Going-concern value** A business's value under a going-concern assumption.
- Going-in cap rate** The capitalization rate based on the first year of ownership used to discount the initial annual cash flow from a real estate property.
- Goodwill** An intangible asset that represents the excess of the purchase price of an acquired company over the value of the net identifiable assets acquired.
- Gordon growth model** A DDM that assumes dividends grow at a constant rate into the future.
- Green bond** Bonds in which the proceeds are designated by issuers to fund a specific project or portfolio of projects that have environmental or climate benefits.
- Greenmail** The purchase of the accumulated shares of a hostile investor by a company that is targeted for takeover by that investor, usually at a substantial premium over market price.
- Greenwashing** The risk that a green bond's proceeds are not actually used for a beneficial environmental or climate-related project.
- Grid search** A method of systematically training a model by using various combinations of hyperparameter values, cross validating each model, and determining which combination of hyperparameter values ensures the best model performance.
- Gross domestic product** The market value of all final goods and services produced within the economy during a given period (output definition) or, equivalently, the aggregate income earned by all households, all companies, and the government within the economy during a given period (income definition).
- Gross potential rental income** Equal to the current market rent of a property at full occupancy.
- Gross rent** The average lease or rental price realized per square foot multiplied by the total rentable space.
- Ground truth** The known outcome (i.e., target variable) of each observation in a labelled dataset.
- Growth accounting equation** The production function written in the form of growth rates. For the basic Cobb–Douglas production function, it states that the growth rate of output equals the rate of technological change plus  $\alpha$  multiplied by the growth rate of capital plus  $(1 - \alpha)$  multiplied by the growth rate of labor.
- Guideline assets** Assets used as benchmarks when applying the method of comparables to value an asset.
- Guideline companies** Assets used as benchmarks when applying the method of comparables to value an asset.
- Guideline public companies** Public-company comparables for the company being valued.
- Guideline public company method** A variation of the market approach; establishes a value estimate based on the observed multiples from trading activity in the shares of public companies viewed as reasonably comparable to the subject private company.
- Guideline transactions method** A variation of the market approach; establishes a value estimate based on pricing multiples derived from the acquisition of control of entire public or private companies that were acquired.
- Hard-catalyst event-driven approach** An event-driven approach in which investments are made in reaction to an already announced corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) in which security prices related to the event have yet to fully converge.

- Harmonic mean** A type of weighted mean computed as the reciprocal of the arithmetic average of the reciprocals.
- Hazard rate** The probability that an event will occur, given that it has not already occurred.
- Hedonic index** A real estate index that is not based on repeat sales of the same property but, rather, that controls for differences in property characteristics, such as size, age, quality of construction, and location, for the properties sold in each period.
- Heteroskedastic** When the variance of the residuals differs across observations in a regression.
- Heteroskedasticity** Non-constant variance across all observations.
- Hierarchical clustering** An iterative unsupervised learning procedure used for building a hierarchy of clusters.
- High-leverage point** An observation of an independent variable that has an extreme value and is potentially influential.
- Historical exchange rates** For accounting purposes, the exchange rates that existed when the assets and liabilities were initially recorded.
- Historical scenario analysis** A technique for exploring the performance and risk of investment strategies in different structural regimes.
- Historical simulation** A simulation method that uses past return data and a random number generator that picks observations from the historical series to simulate an asset's future returns.
- Historical simulation method** The application of historical price changes to the current portfolio.
- Historical stress testing** The process that tests how investment strategies would perform under some of the most negative (i.e., adverse) combinations of events and scenarios.
- Holding period return** The single-period internal rate of return for a real estate property that includes property income and the change in property value over the period.
- Holdout samples** Data samples that are not used to train a model.
- Homoskedasticity** Constant variance across all observations.
- Horizontal ownership** Companies with mutual business interests (e.g., key customers or suppliers) that have cross-holding share arrangements with each other.
- Household formation** An economic statistic which tracks the establishment of new residences as a group of people (or household) decide to live together, which increases housing demand.
- Ho-Lee model** The first arbitrage-free term structure model. The model is calibrated to market data and uses a binomial lattice approach to generate a distribution of possible future interest rates.
- Human capital** The present value of an individual's future expected labor income.
- Hyperparameter** A parameter whose value must be set by the researcher before learning begins.
- I-spreads** Shortened form of "interpolated spreads" and a reference to a linearly interpolated yield.
- Illiquidity discount** A reduction or discount to value that reflects the lack of depth of trading or liquidity in that asset's market.
- Impairment** Diminishment in value as a result of carrying (book) value exceeding fair value and/or recoverable value.
- Impairment of capital rule** A legal restriction that dividends cannot exceed retained earnings.
- Implied volatility** The volatility that option traders use to price an option, implied by the price of the option and a particular option-pricing model.
- In-sample forecast errors** The residuals from a fitted time-series model within the sample period used to fit the model.
- iNAVs** "Indicated" net asset values are intraday "fair value" estimates of an ETF share based on its creation basket.
- Income approach** A valuation approach that values an asset as the present discounted value of the income expected from it. In the context of real estate, this approach estimates the value of a property based on an expected rate of return. The estimated value is the present value of the expected future income from the property, including proceeds from resale at the end of a typical investment holding period.
- Incremental borrowing rate (IBR)** The rate of interest that the lessee would have to pay to borrow using a collateralized loan over the same term as a lease.
- Incremental VaR (IVaR)** A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.
- Indenture** A written contract between a lender and borrower that specifies the terms of the loan, such as interest rate, interest payment schedule, or maturity.
- Independent board directors** Directors with no material relationship with the company with regard to employment, ownership, or remuneration.
- Index CDS** A type of credit default swap that involves a combination of borrowers.
- Indexed rents** Contractually agreed periodic rent changes based on an observed market variable, such as the consumer price index.
- Industry risk premium (IP)** The additional return that is required to bear industry-specific risk.
- Industry shocks** Unexpected changes to an industry from regulations or the legal environment, technology, or changes in the growth rate of the industry.
- Industry structure** An industry's underlying economic and technical characteristics.
- Influential observation** An observation in a statistical analysis whose inclusion may significantly alter regression results.
- Information gain** A metric which quantifies the amount of information that the feature holds about the response. Information gain can be regarded as a form of non-linear correlation between Y and X.
- Information ratio** The ratio of mean active return to standard deviation (active return).
- Insiders** Corporate managers and board directors who are also shareholders of a company.
- Intangible assets** Assets without a physical form, such as patents and trademarks.
- Inter-temporal rate of substitution** The ratio of the marginal utility of consumption  $s$  periods in the future (the numerator) to the marginal utility of consumption today (the denominator).
- Interaction term** A term that combines two or more independent variables and represents their joint influence on the dependent variable.
- Intercept dummy** An indicator variable that allows a single regression model to estimate two lines of best fit, each with differing intercepts, depending on whether the dummy takes a value of 1 or 0.

- Interest rate risk** The risk that interest rates will rise and therefore the market value of current portfolio holdings will fall so that their current yields to maturity then match comparable instruments in the marketplace.
- Interlocking directorates** Corporate structure in which individuals serve on the board of directors of multiple corporations.
- International CAPM (ICAPM)** A two-factor model with a global index and a wealth-weighted currency index.
- International Fisher effect** The proposition that nominal interest rate differentials across currencies are determined by expected inflation differentials.
- Intrinsic value** See *exercise value*.
- Inverse price ratio** The reciprocal of a price multiple—for example, in the case of a P/E, the “earnings yield” E/P (where P is share price and E is earnings per share).
- Investment value** The value to a specific buyer, taking account of potential synergies based on the investor’s requirements and expectations.
- ISDA Master Agreement** A standard or “master” agreement published by the International Swaps and Derivatives Association. The master agreement establishes the terms for each party involved in the transaction.
- Joint test of hypotheses** The test of hypotheses that specify values for two or more independent variables in the hypotheses.
- Joint venture** Two or more companies form and control a new, separate company to achieve a business objective. Each participant contributes assets, employees, know-how, or other resources to the joint venture company. The participants maintain their independence otherwise and continue to do business apart from the joint venture, but they share in the joint venture’s profits or losses.
- Justified (fundamental) P/E** The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.
- Justified price multiple** The estimated fair value of the price multiple, usually based on forecasted fundamentals or comparables.
- K-fold cross-validation** A technique in which data (excluding test sample and fresh data) are shuffled randomly and then are divided into  $k$  equal sub-samples, with  $k - 1$  samples used as training samples and one sample, the  $k$ th, used as a validation sample.
- K-means** A clustering algorithm that repeatedly partitions observations into a fixed number,  $k$ , of non-overlapping clusters.
- K-nearest neighbor** A supervised learning technique that classifies a new observation by finding similarities (“nearness”) between this new observation and the existing data.
- Kalotay–Williams–Fabozzi (KWF) model** An arbitrage-free term structure model that describes the dynamics of the log of the short rate and assumes constant drift, no mean reversion, and constant volatility.
- Key rate durations** Sensitivity of a bond’s price to changes in specific maturities on the benchmark yield curve. Also called *partial durations*.
- kth-order autocorrelation** The correlation between observations in a time series separated by  $k$  periods.
- Labeled dataset** A dataset that contains matched sets of observed inputs or features ( $X$ ’s) and the associated output or target ( $Y$ ).
- Labor force** Everyone of working age (ages 16 to 64) who either is employed or is available for work but not working.
- Labor force participation rate** The percentage of the working age population that is in the labor force.
- Labor productivity** The quantity of real GDP produced by an hour of labor. More generally, output per unit of labor input.
- Labor productivity growth accounting equation** States that potential GDP growth equals the growth rate of the labor input plus the growth rate of labor productivity.
- Lack of marketability discount** An extra return to investors to compensate for lack of a public market or lack of marketability.
- LASSO** Least absolute shrinkage and selection operator is a type of penalized regression which involves minimizing the sum of the absolute values of the regression coefficients. LASSO can also be used for regularization in neural networks.
- Law of one price** A principle that states that if two investments have the same or equivalent future cash flows regardless of what will happen in the future, then these two investments should have the same current price.
- Leading dividend yield** Forecasted dividends per share over the next year divided by current stock price.
- Leading P/E** A P/E calculated on the basis of a forecast of EPS; a stock’s current price divided by next year’s expected earnings.
- Learning curve** A curve that plots the accuracy rate ( $= 1 - \text{error rate}$ ) in the validation or test samples (i.e., out-of-sample) against the amount of data in the training sample, which is thus useful for describing under- and overfitting as a function of bias and variance errors.
- Learning rate** A parameter that affects the magnitude of adjustments in the weights in a neural network.
- Lessee** Tenant or property user that enters a lease with a property owner or lessor.
- Lessor** Property owner or manager that leases a property to a tenant or property user.
- Level** One of the three factors (the other two are steepness and curvature) that empirically explain most yield curve shape changes. A shock to the level factor changes the yield for all maturities by an almost identical amount.
- Leverage** A measure for identifying a potentially influential high-leverage point.
- Leveraged buyout (LBO)** A transaction in which a private acquirer uses equity and a high proportion of debt to acquire a public or private company in order to make changes to increase value over an investment period.
- Libor–OIS spread** The difference between Libor and the overnight indexed swap rate.
- Life settlement** The sale of a life insurance contract to a third party. The valuation of a life settlement typically requires detailed biometric analysis of the individual policyholder and an understanding of actuarial analysis.
- Likelihood ratio (LR) test** A method to assess the fit of logistic regression models that is based on the log-likelihood metric that describes the model’s fit to the data.
- Linear classifier** A binary classifier that makes its classification decision based on a linear combination of the features of each data point.
- Linear trend** A trend in which the dependent variable changes at a constant rate with time.
- Liquidating dividend** A dividend that is a return of capital rather than a distribution from earnings or retained earnings.
- Liquidation value** The value of a company if the company were dissolved and its assets sold individually.

- Liquidity preference theory** A term structure theory that asserts liquidity premiums exist to compensate investors for the added interest rate risk they face when lending long term.
- Liquidity premium** The compensation for liquidity risk that increases in proportion to the investment's illiquidity.
- Loan-to-value ratio** A primary measure of leverage involving the ratio of mortgage principal outstanding to the property's current value.
- Local currency** The currency of the country where a company is located.
- Local expectations theory** A term structure theory that contends the return for all bonds over short periods is the risk-free rate.
- Log odds** The natural log of the odds of an event or characteristic happening. Also known as the *logit function*.
- Log-linear model** With reference to time-series models, a model in which the growth rate of the time series as a function of time is constant.
- Logistic regression (logit)** A regression in which the dependent variable uses a logistic transformation of the event probability.
- Logistic transformation** The log of the probability of an occurrence of an event or characteristic divided by the probability of the event or characteristic not occurring.
- Long/short credit trade** A credit protection seller with respect to one entity combined with a credit protection buyer with respect to another entity.
- Look-ahead bias** The bias created by using information that was unknown or unavailable in the time periods over which backtesting is conducted. Survivorship bias is a type of look-ahead bias.
- Lookback period** The time period used to gather a historical data set.
- Loss given default** The amount that will be lost if a default occurs.
- Loss to lease** The difference between rental rates on existing leases and current market rents.
- Macroeconomic factor model** A multifactor model in which the factors are surprises in macroeconomic variables that significantly explain equity returns.
- Macroeconomic factors** Factors related to the economy, such as the inflation rate, industrial production, or economic sector membership.
- Majority shareholders** Shareholders that own more than 50% of a corporation's shares.
- Majority-vote classifier** A classifier that assigns to a new data point the predicted label with the most votes (i.e., occurrences).
- Marginal VaR (MVaR)** A measure of the effect of a small change in a position size on portfolio VaR.
- Market approach** Valuation approach that values an asset based on pricing multiples from sales of assets viewed as similar to the subject asset.
- Market condition** A performance condition that is related to the market price (or value) of the entity's equity instruments such as attaining a specified share price or a specified target based on the market price (or value) of the entity's equity instruments relative to an index of market prices of other companies.
- Market conditions** Interest rates, inflation rates, and other economic characteristics that comprise the macroeconomic environment.
- Market conversion premium per share** For a convertible bond, the difference between the market conversion price and the underlying share price, which allows investors to identify the premium or discount payable when buying a convertible bond rather than the underlying common stock.
- Market conversion premium ratio** For a convertible bond, the market conversion premium per share expressed as a percentage of the current market price of the shares.
- Market efficiency** A finance perspective on capital markets that deals with the relationship of price to intrinsic value. The traditional efficient markets formulation asserts that an asset's price is the best available estimate of its intrinsic value. The rational efficient markets formulation asserts that investors should expect to be rewarded for the costs of information gathering and analysis by higher gross returns.
- Market model** A regression model with the return on a stock as the dependent variable and the returns on a market index as the independent variable.
- Market value of invested capital** The market value of debt and equity.
- Mature growth rate** The earnings growth rate in a company's mature phase; an earnings growth rate that can be sustained long term.
- Maximum drawdown** The worst cumulative loss ever sustained by an asset or portfolio. More specifically, maximum drawdown is the difference between an asset's or a portfolio's maximum cumulative return and its subsequent lowest cumulative return.
- Maximum likelihood estimation (MLE)** A method that estimates values for the intercept and slope coefficients in a logistic regression that make the data in the regression sample most likely.
- Mean reversion** The tendency of a time series to fall when its level is above its mean and rise when its level is below its mean; a mean-reverting time series tends to return to its long-term mean.
- Metadata** Data that describes and gives information about other data.
- Method based on forecasted fundamentals** An approach to using price multiples that relates a price multiple to forecasts of fundamentals through a discounted cash flow model.
- Method of comparables** An approach to valuation that involves using a price multiple to evaluate whether an asset is relatively fairly valued, relatively undervalued, or relatively overvalued when compared to a benchmark value of the multiple.
- Minority interest** The proportion of the ownership of a subsidiary not held by the parent (controlling) company.
- Minority shareholders** Particular shareholders or a block of shareholders holding a small proportion of a company's outstanding shares, resulting in a limited ability to exercise control in voting activities.
- Mispricing** Any departure of the market price of an asset from the asset's estimated intrinsic value.
- Mixed-use development** Commercial real estate properties that combine more than one tenant type and economic use.
- Model specification** The set of independent variables included in a model and the model's functional form.
- Molodovsky effect** The observation that P/Es tend to be high on depressed EPS at the bottom of a business cycle and tend to be low on unusually high EPS at the top of a business cycle.

- Momentum indicators** Valuation indicators that relate either price or a fundamental (such as earnings) to the time series of their own past values (or in some cases to their expected value).
- Monetary assets and liabilities** Assets and liabilities with value equal to the amount of currency contracted for, a fixed amount of currency. Examples are cash, accounts receivable, accounts payable, bonds payable, and mortgages payable. Inventory is not a monetary asset. Most liabilities are monetary.
- Monetary/non-monetary method** Approach to translating foreign currency financial statements for consolidation in which monetary assets and liabilities are translated at the current exchange rate. Non-monetary assets and liabilities are translated at historical exchange rates (the exchange rates that existed when the assets and liabilities were acquired).
- Monetizing** Unwinding a position to either capture a gain or realize a loss.
- Monte Carlo simulation** A technique that uses the inverse transformation method for converting a randomly generated uniformly distributed number into a simulated value of a random variable of a desired distribution. Each key decision variable in a Monte Carlo simulation requires an assumed statistical distribution; this assumption facilitates incorporating non-normality, fat tails, and tail dependence as well as solving high-dimensionality problems.
- Multi-class trading** An equity market-neutral strategy that capitalizes on misalignment in prices and involves buying and selling different classes of shares of the same company, such as voting and non-voting shares.
- Multi-manager fund** Can be of two types—one is a multi-strategy fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund; the second type is a fund of hedge funds (or fund-of-funds) in which the manager allocates capital to separate, underlying hedge funds that themselves run a range of different strategies.
- Multi-strategy fund** A fund in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.
- Multicollinearity** When two or more independent variables are highly correlated with one another or are approximately linearly related.
- Multiple linear regression** Modeling and estimation method that uses two or more independent variables to describe the variation of the dependent variable. Also referred to as *multiple regression*.
- Mutual information** Measures how much information is contributed by a token to a class of texts. MI will be 0 if the token's distribution in all text classes is the same. MI approaches 1 as the token in any one class tends to occur more often in only that particular class of text.
- N-grams** A representation of word sequences. The length of a sequence varies from 1 to  $n$ . When one word is used, it is a unigram; a two-word sequence is a bigram; and a 3-word sequence is a trigram; and so on.
- n-Period moving average** The average of the current and immediately prior  $n - 1$  values of a time series.
- Naked credit default swap** A position where the owner of the CDS does not have a position in the underlying credit.
- Name entity recognition** An algorithm that analyzes individual tokens and their surrounding semantics while referring to its dictionary to tag an object class to the token.
- Negative serial correlation** A situation in which residuals are negatively related to other residuals.
- Nested models** Models in which one regression model has a subset of the independent variables of another regression model.
- Net asset balance sheet exposure** When assets translated at the current exchange rate are greater in amount than liabilities translated at the current exchange rate. Assets exposed to translation gains or losses exceed the exposed liabilities.
- Net asset value per share** Net asset value divided by the number of shares outstanding.
- Net liability balance sheet exposure** When liabilities translated at the current exchange rate are greater assets translated at the current exchange rate. Liabilities exposed to translation gains or losses exceed the exposed assets.
- Net operating income** A commonly used measure of income-producing property returns prior to the inclusion of financing costs or income taxes.
- Network externalities** The impact that users of a good, a service, or a technology have on other users of that product; it can be positive (e.g., a critical mass of users makes a product more useful) or negative (e.g., congestion makes the product less useful).
- Neural networks** A type of computer program design based on how the human brain learns and processes information.
- No-arbitrage approach** A procedure for obtaining the value of an option based on the creation of a portfolio that replicates the payoffs of the option and deriving the option value from the value of the replicating portfolio.
- No-growth company** A company without positive expected net present value projects.
- No-growth value per share** The value per share of a no-growth company, equal to the expected level amount of earnings divided by the stock's required rate of return.
- Non-cash rent** An amount equal to the difference between the average contractual rent over a lease term (the straight-line rent) and the cash rent actually paid during a period. This figure is one of the deductions made from FFO to calculate AFFO.
- Non-convergence trap** A situation in which a country remains relatively poor, or even falls further behind, because it fails to implement necessary institutional reforms and/or adopt leading technologies.
- Non-monetary assets and liabilities** Assets and liabilities that are not monetary assets and liabilities. Non-monetary assets include inventory, fixed assets, and intangibles, and non-monetary liabilities include deferred revenue.
- Non-renewable resources** Finite resources that are depleted once they are consumed; oil and coal are examples.
- Nonearning assets** Cash and investments (specifically cash, cash equivalents, and short-term investments).
- Normal EPS** The EPS that a business could achieve currently under mid-cyclical conditions. Also called *normalized EPS*.
- Normal Q-Q plot** A visual used to compare the distribution of the residuals from a regression to a theoretical normal distribution.
- Normalized earnings** The expected level of mid-cycle earnings for a company in the absence of any unusual or temporary factors that affect profitability (either positively or negatively).
- Normalized EPS** The EPS that a business could achieve currently under mid-cyclical conditions. Also called *normal EPS*.

- Normalized P/E** P/E based on normalized EPS data.
- Notional amount** The amount of protection being purchased in a CDS.
- NTM P/E** Next 12-month P/E: current market price divided by an estimated next 12-month EPS.
- Off-the-run** Seasoned government bonds that are often less liquid.
- Offshoring** Refers to relocating operations from one country to another, mainly to reduce costs through lower labor costs or to achieve economies of scale through centralization, but still maintaining operations within the corporation.
- Omitted variable bias** Bias resulting from the omission of an important independent variable from a regression model.
- On-the-run** Most recently issued, and liquid, government bonds.
- One hot encoding** The process by which categorical variables are converted into binary form (0 or 1) for machine reading. It is one of the most common methods for handling categorical features in text data.
- One-sided durations** Effective durations when interest rates go up or down, which are better at capturing the interest rate sensitivity of bonds with embedded options that do not react symmetrically to positive and negative changes in interest rates of the same magnitude.
- One-tier board** Board structure consisting of a single board of directors, composed of executive (internal) and non-executive (external) directors.
- Opportunistic real estate** Real estate investments primarily in commercial and/or residential properties involving major redevelopment, repurposing of assets, taking on large vacancies, or speculating on significant improvement in market conditions.
- Opportunity cost** Reflects the foregone opportunity of investing in a different asset. It is typically denoted by the risk-free rate of interest,  $r$ .
- Option-adjusted spread** Or OAS for a bond is its Z-spread adjusted for the value of an embedded option.
- Orderly liquidation value** The estimated gross amount of money that could be realized from the liquidation sale of an asset or assets, given a reasonable amount of time to find a purchaser or purchasers.
- Other comprehensive income** Changes to equity that bypass (are not reported in) the income statement; the difference between comprehensive income and net income.
- Other post-employment benefits (OPEB)** DB post-employment benefit plans other than plans that pay cash retirement benefits (e.g., retiree medical care benefit plans).
- Out-of-sample forecast errors** The differences between actual and predicted values of time series outside the sample period used to fit the model.
- Outlier** An observation that has an extreme value of the dependent variable and is potentially influential.
- Outsourcing** Shifting internal business services to a subcontractor that can offer services at lower costs by scaling to serve many clients.
- Overage rent** Contractual sale-based rental adjustments that result in higher rent if a tenant's sales exceed a pre-agreed minimum target.
- Overfitting** When a machine learning model learns the input and target dataset too precisely, making the system more likely to discover false relationships or unsubstantiated patterns that will lead to prediction errors.
- Overfunded plan** A DB plan with a positive funded status; the present value of the DB obligation is less than the fair value of plan assets.
- Overnight indexed swap (OIS) rate** An interest rate swap in which the periodic floating rate of the swap equals the geometric average of a daily unsecured overnight rate (or overnight index rate).
- Pairs trading** An equity market-neutral strategy that capitalizes on the misalignment in prices of pairs of similar under- and overvalued equities. The expectation is the differential valuations or trading relationships will revert to their long-term mean values or their fundamentally-correct trading relationships, with the long position rising and the short position declining in value.
- Par curve** A hypothetical yield curve for coupon-paying Treasury securities that assumes all securities are priced at par.
- Par swap** A swap in which the fixed rate is set so that no money is exchanged at contract initiation.
- Parametric method** A method of estimating VaR that uses the historical mean, standard deviation, and correlation of security price movements to estimate the portfolio VaR. Generally assumes a normal distribution but can be adapted to non-normal distributions with the addition of skewness and kurtosis. Sometimes called the *variance-covariance method* or the *analytical method*.
- Partial regression coefficient** Coefficient that describes the effect of a one-unit change in the independent variable on the dependent variable, holding all other independent variables constant. Also known as *partial slope coefficient*.
- Parts of speech** An algorithm that uses language structure and dictionaries to tag every token in the text with a corresponding part of speech (i.e., noun, verb, adjective, proper noun, etc.).
- Payout amount** The loss given default times the notional.
- Payout policy** The principles by which a company distributes cash to common shareholders by means of cash dividends and/or share repurchases.
- Payouts** Cash dividends and the value of shares repurchased in any given year.
- PEG ratio** The P/E-to-growth ratio, calculated as the stock's P/E divided by the expected earnings growth rate.
- Penalized regression** A regression that includes a constraint such that the regression coefficients are chosen to minimize the sum of squared residuals *plus* a penalty term that increases in size with the number of included features.
- Pension obligation** The present value, without deducting any plan assets, of expected future payments required to settle the obligation resulting from employee service in the current and prior periods.
- Perfect capital markets** Markets in which, by assumption, there are no taxes, no transaction costs, and no bankruptcy costs and in which all investors have equal ("symmetric") information.
- Performance condition** A vesting condition comprising a service condition and the meeting of a specified performance target during the service period. A performance target is typically defined as an accounting measure or a market condition.
- Performance shares** Shares used in a share-based compensation arrangement that have performance-based vesting conditions.

- Perpetuity** A perpetual annuity, or a set of never-ending level sequential cash flows, with the first cash flow occurring one period from now.
- Persistent earnings** Earnings excluding nonrecurring components. Also referred to as *core earnings*, *continuing earnings*, or *underlying earnings*.
- Physical settlement** Involves actual delivery of the debt instrument in exchange for a payment by the credit protection seller of the notional amount of the contract.
- Point-in-time data** Data consisting of the exact information available to market participants as of a given point in time. Point-in-time data is used to address look-ahead bias.
- Portfolio balance approach** A theory of exchange rate determination that emphasizes the portfolio investment decisions of global investors and the requirement that global investors willingly hold all outstanding securities denominated in each currency at prevailing prices and exchange rates.
- Positive serial correlation** A situation in which residuals are positively related to other residuals.
- Potential GDP** The maximum amount of output an economy can sustainably produce without inducing an increase in the inflation rate. The output level that corresponds to full employment with consistent wage and price expectations.
- Precision** In error analysis for classification problems it is ratio of correctly predicted positive classes to all predicted positive classes. Precision is useful in situations where the cost of false positives (FP), or Type I error, is high.
- Preferred habitat theory** A term structure theory that contends that investors have maturity preferences and require yield incentives before they will buy bonds outside of their preferred maturities.
- Premium leg** The series of payments the credit protection buyer promises to make to the credit protection seller.
- Premiums** Amounts paid by the purchaser of insurance products.
- Prepayment risk** The risk that the some or all of a mortgage-backed security's principal is repaid at a different speed than expected, either in the form of contraction risk (or earlier repayment than expected) or extension risk (later repayment).
- Present value model** A model of intrinsic value that views the value of an asset as the present value of the asset's expected future cash flows.
- Present value of growth opportunities** The difference between the actual value per share and the no-growth value per share. Also called *value of growth*.
- Presentation currency** The currency in which financial statement amounts are presented.
- Price momentum** A valuation indicator based on past price movement.
- Price multiples** The ratio of a stock's market price to some measure of value per share.
- Price-to-earnings ratio (P/E)** The ratio of share price to earnings per share.
- Priced risk** Risk for which investors demand compensation for bearing (e.g., equity risk, company-specific factors, macroeconomic factors).
- Principal components analysis (PCA)** An unsupervised ML technique used to transform highly correlated features of data into a few main, uncorrelated composite variables.
- Principle of no arbitrage** In well-functioning markets, prices will adjust until there are no arbitrage opportunities.
- Prior transaction method** A variation of the market approach; considers actual transactions in the stock of the subject private company.
- Private market value** The value derived using a sum-of-the-parts valuation.
- Pro forma financial statements** Financial statements that include the effect of a corporate restructuring.
- Probability of default** The likelihood that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.
- Probability of survival** The probability that a bond issuer will meet its contractual obligations on schedule.
- Projection error** The vertical (perpendicular) distance between a data point and a given principal component.
- Property classes** A relative ranking of properties based on a combination of features such as location, property age, local income levels, recent property appreciation, and relative condition.
- Property maintenance allowance** Expenses incurred to maintain a property's current level of income generation.
- Prospective P/E** A P/E calculated on the basis of a forecast of EPS; a stock's current price divided by next year's expected earnings.
- Protection leg** The contingent payment that the credit protection seller may have to make to the credit protection buyer.
- Protection period** Period during which a bond's issuer cannot call the bond.
- Provision for loan losses** An income statement expense account that increases the amount of the allowance for loan losses.
- Pruning** A regularization technique used in CART to reduce the size of the classification or regression tree—by pruning, or removing, sections of the tree that provide little classifying power.
- Purchasing power gain** A gain in value caused by changes in price levels. Monetary liabilities experience purchasing power gains during periods of inflation.
- Purchasing power loss** A loss in value caused by changes in price levels. Monetary assets experience purchasing power loss during periods of inflation.
- Purchasing power parity (PPP)** The idea that exchange rates move to equalize the purchasing power of different currencies.
- Pure expectations theory** A term structure theory that contends the forward rate is an unbiased predictor of the future spot rate. Also called the *unbiased expectations theory*.
- Pure factor portfolio** A portfolio with sensitivity of 1 to the factor in question and a sensitivity of 0 to all other factors.
- Putable bond** Bond that includes an embedded put option, which gives the bondholder the right to put back the bonds to the issuer prior to maturity, typically when interest rates have risen and higher-yielding bonds are available.
- Qualitative dependent variable** A dependent variable that is discrete (binary). Also known as a *categorical dependent variable*.
- Quality of earnings analysis** The investigation of issues relating to the accuracy of reported accounting results as reflections of economic performance. Quality of earnings analysis is broadly understood to include not only earnings management but also balance sheet management.
- Quantitative market-neutral** An approach to building market-neutral portfolios in which large numbers of securities are traded and positions are adjusted on a daily or even an hourly basis using algorithm-based models.

- Random forest classifier** A collection of a large number of decision trees trained via a bagging method.
- Random walk** A time series in which the value of the series in one period is the value of the series in the previous period plus an unpredictable random error.
- Rate implicit in the lease (RIIL)** The discount rate that equates the present value of the lease payment with the fair value of the leased asset, considering also the lessor's direct costs and the present value of the leased asset's residual value.
- Rational efficient markets formulation** See *market efficiency*.
- Readme files** Text files provided with raw data that contain information related to a data file. They are useful for understanding the data and how they can be interpreted correctly.
- Real estate cycle** Phases of recovery, expansion, oversupply, and recession that combine short-term adjustments in lease rates and occupancy in response to changing market conditions.
- Real estate investment trusts** Investment vehicles that directly own and operate real estate properties or debt investments and distribute dividends and other income to shareholders.
- Real estate operating companies** Corporate issuers whose primary activity is in the construction, development, operation, and servicing of real estate.
- Real interest rate parity** The proposition that real interest rates will converge to the same level across different markets.
- Real options** Refers to the right but not the obligation to take future action. The existence of such options may affect the value of a real estate investment.
- Rebalance return** A return from rebalancing the component weights of an index.
- Recall** Also known as *sensitivity*, in error analysis for classification problems it is the ratio of correctly predicted positive classes to all actual positive classes. Recall is useful in situations where the cost of false negatives (FN), or Type II error, is high.
- Recency bias** The behavioral tendency to place more relevance on recent events.
- Reconstitution** When dealers recombine appropriate individual zero-coupon securities and reproduce an underlying coupon Treasury.
- Recovery rate** The percentage of the loss recovered.
- Redemption basket** The list of securities (and share amounts) the authorized participant (AP) receives when it redeems ETF shares back to the ETF manager. The redemption basket is published each business day.
- Reference entity** The borrower (debt issuer) covered by a single-name CDS.
- Reference obligation** A particular debt instrument issued by the borrower that is the designated instrument being covered.
- Regime** The governing set of relationships (between variables) that stem from technological, political, legal, and regulatory environments. Changes in such environments or policy stances can be described as changes in regime.
- Regular expression (regex)** A series of texts that contains characters in a particular order. Regex is used to search for patterns of interest in a given text.
- Regularization** A term that describes methods for reducing statistical variability in high-dimensional data estimation problems.
- Reinforcement learning** Machine learning in which a computer learns from interacting with itself or data generated by the same algorithm.
- Reinvestment rate** A company's rate of investment in working capital and long-term assets necessary to maintain operations and support assumed growth.
- Related-party transactions** A business transaction between parties which share economic or other interests and may not take place at fair market value.
- Relative valuation models** A model that specifies an asset's value relative to the value of another asset.
- Relative value volatility arbitrage** A volatility trading strategy that aims to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.
- Relative VaR** The minimum portfolio loss expected to occur over a given time period at a specific confidence level based on a portfolio containing active positions minus benchmark holdings.
- Relative version of PPP** The hypothesis that changes in (nominal) exchange rates over time are equal to national inflation rate differentials.
- Relative-strength indicators** Valuation indicators that compare a stock's performance during a period either to its own past performance or to the performance of some group of stocks.
- Renewable resources** Resources that can be replenished, such as a forest.
- Rental price of capital** The cost per unit of time to rent a unit of capital.
- Reorganization** A court-supervised restructuring process available in some jurisdictions for companies facing insolvency from burdensome debt levels. A bankruptcy court assumes control of the company and oversees an orderly negotiation process between the company and its creditors for asset sales, conversion of debt to equity, refinancing, and so on.
- Repeat sales index** A real estate price index that relies on multiple sales of the same property.
- Replacement cost** Estimate of expenses associated with purchasing land and building a new property on a site with the same features and economic use as a property being appraised.
- Required rate of return on equity** The minimum rate of return required by an investor to invest in an asset, given the asset's riskiness. Also known as the required return on equity.
- Residual autocorrelations** The sample autocorrelations of the residuals.
- Residual income** Earnings for a given period, minus a deduction for common shareholders' opportunity cost in generating the earnings. Also called *economic profit* or *abnormal earnings*.
- Residual income model** (RIM) A model of stock valuation that views intrinsic value of stock as the sum of book value per share plus the present value of the stock's expected future residual income per share. Also called *discounted abnormal earnings model* or *Edwards–Bell–Ohlson model*.
- Restricted model** A regression model with a subset of the complete set of independent variables.
- Restricted stock** A share with selling or other restrictions, commonly used in share-based compensation arrangements with employees.



- Restricted stock units (RSUs)** An instrument used in share-based compensation plans that represents the right to receive a common share upon vesting. RSUs are not tradeable, nor do they have voting rights or participate in dividends.
- Restructuring** Reorganizing the capital structure of a firm.
- Return on invested capital** A measure of the profitability of a company relative to the amount of capital invested by the equity- and debtholders.
- Reverse carry arbitrage** A strategy involving the short sale of the underlying and an offsetting opposite position in the derivative.
- Reverse stock split** A reduction in the number of shares outstanding with a corresponding increase in share price but no change to the company's underlying fundamentals.
- Reverse stress testing** A risk management approach in which the user identifies key risk exposures in the portfolio and subjects those exposures to extreme market movements.
- Reviewed financial statements** A type of non-audited financial statements; typically provide an opinion letter with representations and assurances by the reviewing accountant that are less than those in audited financial statements.
- Rho** The change in a given derivative instrument for a given small change in the risk-free interest rate, holding everything else constant. Rho measures the sensitivity of the option to the risk-free interest rate.
- Risk budgeting** The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.
- Risk decomposition** The process of converting a set of holdings in a portfolio into a set of exposures to risk factors.
- Risk factors** Variables or characteristics with which individual asset returns are correlated. Sometimes referred to simply as *factors*.
- Risk parity** A portfolio allocation scheme that weights stocks or factors based on an equal risk contribution.
- Risk-based models** Models of the return on equity that identify risk factors or drivers and sensitivities of the return to these factors.
- Risk-free rate** The minimum rate of return expected on a security that has no default risk.
- Robust standard errors** Method for correcting residuals for conditional heteroskedasticity. Also known as *heteroskedasticity-consistent standard errors* or *White-corrected standard errors*.
- Roll** When an investor moves its investment position from an older series to the most current series.
- Roll return** The component of the return on a commodity futures contract attributable to rolling long futures positions forward through time. Also called *roll yield*.
- Rolling down the yield curve** A maturity trading strategy that involves buying bonds with a maturity longer than the intended investment horizon. Also called *riding the yield curve*.
- Rolling windows** A backtesting method that uses a rolling-window (or walk-forward) framework, rebalances the portfolio after each period, and then tracks performance over time. As new information arrives each period, the investment manager optimizes (revises and tunes) the model and readjusts stock positions.
- Rollover risk** The likelihood that a property owner will lose an existing tenant and forgo income until a new one is found.
- Root mean squared error (RMSE)** The square root of the average squared forecast error; used to compare the out-of-sample forecasting performance of forecasting models.
- Sale-leaseback** A situation in which a company sells the building it owns and occupies to a real estate investor and the company then signs a long-term lease with the buyer to continue to occupy the building. At the end of the lease, use of the property reverts to the landlord.
- Sales comparison approach** Real estate valuation approach that considers the price at which similar or comparable properties (comparables) are purchased and sold in the current market; also referred to as the *market approach*.
- Sales risk** The uncertainty regarding the price and number of units sold of a company's products.
- Scaled earnings surprise** Unexpected earnings divided by the standard deviation of analysts' earnings forecasts.
- Scaling** The process of adjusting the range of a feature by shifting and changing the scale of the data. Two of the most common ways of scaling are normalization and standardization.
- Scatterplot matrix** A visualization technique that shows the scatterplots between different sets of variables, often with the histogram for each variable on the diagonal. Also referred to as a *pairs plot*.
- Schwarz's Bayesian information criterion (BIC or SBC)** A statistic used to compare sets of independent variables for explaining a dependent variable. It is preferred for finding the model with the best goodness of fit.
- Scree plots** A plot that shows the proportion of total variance in the data explained by each principal component.
- Screening** The application of a set of criteria to reduce a set of potential investments to a smaller set having certain desired characteristics.
- Seasonality** A characteristic of a time series in which the data experience regular and predictable periodic changes; for example, fan sales are highest during the summer months.
- Secured overnight financing rate (SOFR)** A daily volume-weighted index of rates on qualified cash borrowings collateralized by US Treasuries that is expected to replace Libor as a floating reference rate for swaps.
- Security selection risk** See *active specific risk*.
- Segmented markets theory** A term structure theory that contends yields are solely a function of the supply and demand for funds of a particular maturity.
- Sell-side analysts** Analysts who work at brokerages.
- Sensitivity analysis** A form of analysis used to determine the impact of a change in one or more key variables affecting investment returns or valuation.
- Sentence length** The number of characters, including spaces, in a sentence.
- Serial correlation** A condition found most often in time series in which residuals are correlated across observations. Also known as *autocorrelation*.
- Serial-correlation consistent standard errors** Method for correcting serial correlation. Also known as *serial correlation and heteroskedasticity adjusted standard errors*, *Newey–West standard errors*, and *robust standard errors*.
- Service condition** A vesting condition that requires the employee to complete a period of service provision to the employer. A service condition does not require a performance target to be met.

- Settled in arrears** An arrangement in which the interest payment is made (i.e., settlement occurs) at the maturity of the underlying instrument.
- Settlement** The closing date at which the counterparties of a derivative contract exchange payment for the underlying as required by the contract.
- Shadow banking** Lending by financial institutions that are not regulated as banks.
- Shaping risk** The sensitivity of a bond's price to the changing shape of the yield curve.
- Share repurchase** A transaction in which a company buys back its own shares. Unlike stock dividends and stock splits, share repurchases use corporate cash.
- Shareholder activism** A range of actions by a corporation's shareholders that are intended to result in some change in the corporation, typically a change in the board of directors, management, or business strategy.
- Shareholders' equity** Assets less liabilities; the residual interest in the assets after subtracting the liabilities.
- Short biased** These strategies use quantitative, technical, and fundamental analysis to short overvalued equity securities with limited or no long-side exposures.
- Simulation** A technique for exploring how a target variable (e.g. portfolio returns) would perform in a hypothetical environment specified by the user, rather than a historical setting.
- Single-manager fund** A fund in which one portfolio manager or team of portfolio managers invests in one strategy or style.
- Single-name CDS** Credit default swap on one specific borrower.
- Sinking fund bond** A bond that requires the issuer to set aside funds over time to retire the bond issue, thus reducing credit risk.
- Size premium (SP)** Additional return compensation for bearing the additional risk associated with smaller companies.
- Slope dummy** An indicator variable that allows a single regression model to estimate two lines of best fit, each with differing slopes, depending on whether the dummy takes a value of 1 or 0.
- Soft margin classification** An adaptation in the support vector machine algorithm which adds a penalty to the objective function for observations in the training set that are misclassified.
- Soft-catalyst event-driven approach** An event-driven approach in which investments are made proactively in anticipation of a corporate event (mergers and acquisitions, bankruptcies, share issuances, buybacks, capital restructurings, re-organizations, accounting changes) that has yet to occur.
- Sovereign yield spread** The spread between the yield on a foreign country's sovereign bond and a similar-maturity domestic sovereign bond.
- Special dividend** A dividend paid by a company that does not pay dividends on a regular schedule, or a dividend that supplements regular cash dividends with an extra payment.
- Specific-company risk premium (SCRIP)** Additional return required by investors for bearing non-diversifiable company-specific risk.
- Spin off** When a company separates a distinct part of its business into a new, independent company. The term is used to describe both the transaction and the separated component, while the company that conducts the transaction and formerly owned the spin off is known as the parent.
- Split-rate tax system** In reference to corporate taxes, a split-rate system taxes earnings to be distributed as dividends at a different rate than earnings to be retained. Corporate profits distributed as dividends are taxed at a lower rate than those retained in the business.
- Spot curve** Yields-to-maturity on a series of default-risk-free zero-coupon bonds.
- Spot price** The current price of an asset or security. For commodities, the current price to deliver a physical commodity to a specific location or purchase and transport it away from a designated location.
- Spot rate** The interest rate that is determined today for a risk-free, single-unit payment at a specified future date.
- Spot yield curve** The term structure of spot rates for loans made today.
- Stabilized NOI** Normalized or expected long-term level of net operating income level used to value real estate properties.
- Stable dividend policy** A policy in which regular dividends are paid that reflect long-run expected earnings. In contrast to a constant dividend payout ratio policy, a stable dividend policy does not reflect short-term volatility in earnings.
- Standardized beta** With reference to fundamental factor models, the value of the attribute for an asset minus the average value of the attribute across all stocks, divided by the standard deviation of the attribute across all stocks.
- Standardized unexpected earnings** Unexpected earnings per share divided by the standard deviation of unexpected earnings per share over a specified prior time period.
- Statistical factor model** A multifactor model in which statistical methods are applied to a set of historical returns to determine portfolios that best explain either historical return covariances or variances.
- Steady-state rate of growth** The constant growth rate of output (or output per capita) that can or will be sustained indefinitely once it is reached. Key ratios, such as the capital-output ratio, are constant on the steady-state growth path.
- Steeptness** The difference between long-term and short-term yields that constitutes one of the three factors (the other two are level and curvature) that empirically explain most of the changes in the shape of the yield curve.
- Step-up clauses** Pre-specified contractual future rent increases.
- Stock dividend** A type of dividend in which a company distributes additional shares of its common stock to shareholders instead of cash.
- Stop-loss limit** Constraint used in risk management that requires a reduction in the size of a portfolio, or its complete liquidation, when a loss of a particular size occurs in a specified period.
- Straight bond** An underlying option-free bond with a specified issuer, issue date, maturity date, principal amount and repayment structure, coupon rate and payment structure, and currency denomination.
- Straight debt** Debt with no embedded options.
- Straight voting** A shareholder voting process in which shareholders receive one vote for each share owned.
- Straight-line rent** The average annual rent under a multi-year lease agreement that contains contractual increases in rent during the life of the lease.
- Straight-line rent adjustment** See *non-cash rent*.
- Stranded assets** A resource that is no longer economically valuable owing to changes in demand, regulations, or availability of substitutes—for example, a newly discovered oil well that will not be brought into production.

- Strategic buyer** An investor seeking to capitalize on synergies by extending the value creation process initiated by a GP, combining a business with another portfolio company, or taking other actions to increase firm value.
- Stress tests** A risk management technique that assesses the portfolio's response to extreme market movements.
- Stripping** A dealer's ability to separate a bond's individual cash flows and trade them as zero-coupon securities.
- Stub trading** An equity market-neutral strategy that capitalizes on misalignment in prices and entails buying and selling stock of a parent company and its subsidiaries, typically weighted by the percentage ownership of the parent company in the subsidiaries.
- Studentized deleted residual** A deleted residual divided by its estimated standard deviation.
- Studentized residuals**  $t$ -distributed statistics that are used to detect outliers.
- Subject property** A real estate property that is being appraised.
- Succession event** A change of corporate structure of the reference entity, such as through a merger, a divestiture, a spinoff, or any similar action, in which ultimate responsibility for the debt in question is unclear.
- Sum-of-the-parts valuation** A valuation approach that considers the value of a firm's business segments if they are sold separately.
- Summation operator** A functional part of a neural network's node that multiplies each input value received by a weight and sums the weighted values to form the total net input, which is then passed to the activation function.
- Supernormal growth** Above-average or abnormally high growth rate in earnings per share.
- Supervised learning** A type of machine learning in which the system attempts to learn to model relationships based on labeled training data.
- Support vector machine** A linear classifier that determines the hyperplane that optimally separates the observations into two sets of data points.
- Survivorship bias** Relates to the inclusion of only current investment funds in a database. As such, the returns of funds that are no longer available in the marketplace (have been liquidated) are excluded from the database. Also see *backfill bias*.
- Sustainable growth rate** The rate of dividend (and earnings) growth that can be sustained over time for a given level of return on equity, keeping the capital structure constant and without issuing additional common stock.
- Swap curve** The term structure of swap rates.
- Swap rate** The fixed rate to be paid by the fixed-rate payer specified in a swap contract.
- Swap rate curve** The term structure of swap rates.
- Swap spread** The difference between the fixed rate on an interest rate swap and the rate on a Treasury note with equivalent maturity; it reflects the general level of credit risk in the market.
- Synergies** The combination of two companies being more valuable than the sum of the parts. Generally, synergies take the form of lower costs ("cost synergies") or increased revenues ("revenue synergies") through combinations that generate lower costs or higher revenues, respectively.
- Systematic risk** Risk that affects the entire market or economy; it cannot be avoided and is inherent in the overall market. Systematic risk is also known as *non-diversifiable* or *market risk*.
- Tail risk** The possibility of extreme losses.
- Takeover premium** The amount by which the per-share takeover price exceeds the unaffected price expressed as a percentage of the unaffected price. It reflects the amount shareholders require to relinquish their control of the company to the acquirer.
- Tangible assets** Identifiable, physical assets such as property, plant, and equipment.
- Tangible book value per share** Common shareholders' equity minus intangible assets reported on the balance sheet, divided by the number of shares outstanding.
- Target** In machine learning, the dependent variable ( $Y$ ) in a labeled dataset; the company in a merger or acquisition that is being acquired.
- Target capital structure** Management's desired proportions of debt and equity financing, usually stated on a book value basis or indirectly using a financial leverage metric, such as net or gross debt to EBITDA or credit rating.
- Target payout ratio** A strategic corporate goal representing the long-term proportion of earnings that the company intends to distribute to shareholders as dividends.
- Taxable REIT subsidiaries** Subsidiaries that pay income taxes on earnings from non-REIT-qualifying activities, such as merchant development or third-party property management.
- Technical indicators** Momentum indicators based on price.
- TED spread** A measure of perceived credit risk determined as the difference between Libor and the T-bill yield of matching maturity.
- Temporal method** A variation of the monetary/non-monetary translation method that requires not only monetary assets and liabilities, but also non-monetary assets and liabilities that are measured at their current value on the balance sheet date to be translated at the current exchange rate. Assets and liabilities are translated at rates consistent with the timing of their measurement value. This method is typically used when the functional currency is other than the local currency.
- Term frequency (TF)** Ratio of the number of times a given token occurs in all the texts in the dataset to the total number of tokens in the dataset.
- Term premium** The additional return required by lenders to invest in a bond to maturity net of the expected return from continually reinvesting at the short-term rate over that same time horizon.
- Terminal cap rate** Capitalization rate for a real estate property used to discount a final projected NOI that typically incorporates a constant future growth rate.
- Terminal price multiples** The price multiple for a stock assumed to hold at a stated future time.
- Terminal share price** The share price at a particular point in the future.
- Terminal value of the stock** The analyst's estimate of a stock's value at a particular point in the future. Also called *continuing value of the stock*.
- Test sample** A data sample that is used to test a model's ability to predict well on new data.
- Theta** The change in a derivative instrument for a given small change in calendar time, holding everything else constant. Specifically, the theta calculation assumes nothing changes except calendar time. Theta also reflects the rate at which an option's time value decays.
- Time series** A set of observations on a variable's outcomes in different time periods.

- Time-series momentum** A managed futures trend following strategy in which managers go long assets that are rising in price and go short assets that are falling in price. The manager trades on an absolute basis, so be net long or net short depending on the current price trend of an asset. This approach works best when an asset's own past returns are a good predictor of its future returns.
- Tobin's  $q$**  The ratio of the market value of debt and equity to the replacement cost of total assets.
- Token** The equivalent of a word (or sometimes a character).
- Tokenization** The process of representing ownership rights to physical assets on a blockchain or distributed ledger.
- Total factor productivity (TFP)** A multiplicative scale factor that reflects the general level of productivity or technology in the economy. Changes in total factor productivity generate proportional changes in output for any input combination.
- Total invested capital** The sum of market value of common equity, book value of preferred equity, and face value of debt.
- Tracking error** The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk.
- Tracking risk** The standard deviation of the differences between a portfolio's returns and its benchmarks returns. Also called *tracking error*.
- Trailing dividend yield** The reciprocal of current market price divided by the most recent annualized dividend.
- Trailing P/E** A stock's current market price divided by the most recent four quarters of EPS (or the most recent two semi-annual periods for companies that report interim data semi-annually). Also called *current P/E*.
- Training sample** A data sample that is used to train a model.
- Tranche CDS** A type of credit default swap that covers a combination of borrowers but only up to pre-specified levels of losses.
- Transaction exposure** The risk of a change in value between the transaction date and the settlement date of an asset of liability denominated in a foreign currency.
- Treasury shares/stock** Shares that were issued and subsequently repurchased by the company.
- Trend** A long-term pattern of movement in a particular direction.
- Triangular arbitrage** An arbitrage transaction involving three currencies that attempts to exploit inconsistencies among pairwise exchange rates.
- Trimming** Also called truncation, it is the process of removing extreme values and outliers from a dataset.
- Two-tier board** Board structure consisting of a supervisory board that oversees a management board.
- Unbiased expectations theory** A term structure theory that contends the forward rate is an unbiased predictor of the future spot rate. Also called the *pure expectations theory*.
- Unconditional heteroskedasticity** When heteroskedasticity of the error variance is not correlated with the regression's independent variables.
- Uncovered interest rate parity** The proposition that the expected return on an uncovered (i.e., unhedged) foreign currency (risk-free) investment should equal the return on a comparable domestic currency investment.
- Underfunded plan** A DB plan with a negative funded status; the present value of the DB obligation is greater than the fair value of plan assets.
- Underlying earnings** Earnings excluding nonrecurring components. Also referred to as *continuing earnings*, *core earnings*, or *persistent earnings*.
- Unexpected earnings** The difference between reported EPS and expected EPS. Also referred to as an *earnings surprise*.
- Unfunded** Post-employment plans for which the sponsor has not set aside assets to pay benefits. Benefits for unfunded plans are paid from company cash.
- Unit root** A time series that is not covariance stationary is said to have a unit root.
- Units of comparison** Measure used to compare the current market value of real estate properties, such as purchase price per square meter or square foot of leasable area or total area.
- Unrestricted model** A regression model with the complete set of independent variables.
- Unsupervised learning** A type of machine learning in which the system tries to learn the structure of unlabeled data.
- Upfront payment** The difference between the credit spread and the standard rate paid by the protection buyer if the standard rate is insufficient to compensate the protection seller. Also called *upfront premium*.
- Upfront premium** See *upfront payment*.
- Upstream** A transaction between two related companies, an investor company (or a parent company) and an associate company (or a subsidiary company) such that the associate company records a profit on its income statement. An example is a sale of inventory by the associate to the investor company or by a subsidiary to a parent company.
- Validation sample** A data sample that is used to validate and tune a model.
- Valuation** The process of determining the value of an asset or service either on the basis of variables perceived to be related to future investment returns or on the basis of comparisons with closely similar assets.
- Value additivity** An arbitrage opportunity when the value of the whole equals the sum of the values of the parts.
- Value at risk (VaR)** The minimum loss that would be expected a certain percentage of the time over a certain period of time given the assumed market conditions.
- Value of growth** The difference between the actual value per share and the no-growth value per share.
- Variance error** Describes how much a model's results change in response to new data from validation and test samples. Unstable models pick up noise and produce high variance error, causing overfitting and high out-of-sample error.
- Variance inflation factor (VIF)** A statistic that quantifies the degree of multicollinearity in a model.
- Vasicek model** A partial equilibrium term structure model that assumes interest rates are mean reverting and interest rate volatility is constant.
- Vega** A measure of the sensitivity of an option's price to changes in the underlying's volatility.
- Vertical ownership** Ownership structure in which a company or group that has a controlling interest in two or more holding companies, which in turn have controlling interests in various operating companies.
- Vesting** The process of an employee becoming unconditionally entitled to, and an employer becoming obligated to pay, compensation.
- Visibility** The extent to which a company's operations are predictable with substantial confidence.
- Voting caps** Legal restrictions on the voting rights of large share positions.

**Web spidering (scraping or crawling) programs** Programs that extract raw content from a source, typically web pages.

**Weighted average cost of capital (WACC)** The expected cost of debt and equity weighted by the proportion of each used in a company's capital structure.

**Weighted harmonic mean** See *harmonic mean*.

**Winsorization** The process of replacing extreme values and outliers in a dataset with the maximum (for large value outliers) and minimum (for small value outliers) values of data points that are not outliers.

**Write-down** A reduction in the value of an asset as stated in the balance sheet.

**Yield curve factor model** A model or a description of yield curve movements that can be considered realistic when compared with historical data.

**Zero** A bond that does not pay a coupon but is priced at a discount and pays its full face value at maturity.

**Zero-coupon bonds** Bonds that do not pay interest during their life. They are issued at a discount to par value and redeemed at par. Also called pure discount bond.