Schwab Equity Ratings Foundations

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Quantitative Factor Models

Purpose of Schwab Equity Ratings

Schwab Equity Ratings is a tool that can be used to help you with your investment decision making process. The ratings themselves are the culmination of several stock selection factors that have empirically demonstrated positive forecast powers for identifying stocks that may outperform over the next 12 months or more. Schwab Equity Ratings provide actionable buy, hold, or sell guidance on thousands of stocks each week. This information can serve as one input into your investment decision making process and should be considered in the context of all available financial data, news, and business prospects of a company you're considering investing in. Ultimately, Schwab provides this quantitative analysis as a potential means to help you achieve your financial goals.

Model Construction

The quantitative model underlying the ratings is constructed using multiple factors, which inherently belong to five investment concepts which are: Growth, Quality, Sentiment, Stability, and Valuation. Before we review the rationale for each of these components, let's review some definitions.

A factor is a quantitative algorithm designed to measure a financial signal that has shown a degree of forecast power in the past. There are five characteristics any factor must demonstrate to be accepted into our rigorous quantitatively designed model. These are:

- The factor must offer economic intuition
- The factor must be strong enough to overcome trading costs
- The time-series of its value shouldn't be highly correlated with other factors utilized in the model
- The factor should have a non-zero regression beta when averaged through time
- The factor should have low variance

These characteristics are explicitly followed in building the Schwab Equity Ratings model and although technical, provide the qualities inherent in many fundamental investment managers' investment philosophies.

An investment concept is the categorization of the factor type. A well-balanced model will have several different factors covering a selection of investment concepts that provide better forecast power when combined than they do individually.

Schwab Equity Ratings use a scale of A, B, C, D, and F, and are assigned to approximately 3,000 U.S.-traded stocks. The Schwab Equity Ratings model universe starts with the combined set of stocks in the Russell 3000 Index and the Standard & Poor's ("S&P") 500. Some exclusions are then applied. Schwab's research outlook is that A-rated stocks, on average, will strongly outperform, and F-rated stocks, on average, will strongly underperform the equities market during the next 12 months or more. The explanation and table below are included to assist you in using Schwab Equity Ratings as one component of your own research to evaluate stocks and investment opportunities.

Schwab Equity Rating	Percentile Ranking Distribution	Rank Translation	12 Month Return Outlook	General Buy/Hold/Sell Guidance
A	1–10	Top 10%	Strongly Outperform	Buy
B	11–30	Next 20%	Outperform	Buy
C	31–70	Next 40%	Market Perform	Hold
D	71–90	Next 20%	Underperform	Sell
F	91–100	Bottom 10%	Strongly Underperform	Sell

Limitations of Use

Esteemed scientist and Nobel Prize winner Niels Bohr once said, "Prediction is very difficult, especially if it's about the future." Forecasting equity markets is truly a difficult undertaking. Let's examine the reasons why.

Schwab Equity Ratings uses quantitative analyses in its modeling method. Most importantly, when considering any forecast of the equity markets, one must understand the U.S. equity markets are generally thought to be highly efficient and therefore difficult to forecast. Additionally, any limitations or inaccuracies in the analysis or model could affect the model's performance and the results investors may achieve. Models that appear to explain prior market data can fail to forecast future market events. While the data used in the models has been taken from sources Schwab believes to be reliable; its accuracy, completeness or interpretation cannot be guaranteed. Schwab Equity Ratings may not capture subjective, qualitative influences on return and risk such as changes in management, business and political trends, or legal and regulatory developments. Thus, it is important to conduct additional research prior to making an investment decision.

Model Components – Style (LCG, LCV, SCG, SCV) sub-models

Schwab Equity Ratings are based upon a disciplined, systematic approach that evaluates each stock based on a wide variety of criteria from five broad categories: Growth, Quality, Sentiment, Stability and Valuation. While each of these five factor perspectives is considered when ranking a stock, the individual factors and factor weights used to rate each stock are determined by its classification within one of the following nine groups: Large Cap Growth (LCG), Large Cap Value (LCV), Small Cap Growth (SCG), Small Cap Value (SCV), Banks, Diversified Financials, Insurance, Information Technology, or Biotechnology & Pharmaceuticals.

Growth Perspective

The Growth component underlying the rating is based on several historical growth rates of accounting variables and analyst estimated variables. Stocks with attributes such as high profitability growth, high expected dividend growth, and/or lower expected sales growth tend to have better Growth scores. Highly rated stocks with such scores may have the potential for price appreciation, as investors perceive that the growth potential from these companies is more favorable.

Dividend Growth 2-Year Forward

The Dividend Growth 2-Year Forward factor measures forecasted dividend growth. Dividends are often thought of as a measure of sustainable cash earnings and profitability. Stocks with greater growth tend to be positively related to future stock returns. The reason is that investors may underreact to the signal. Companies that can grow their dividend typically have a strong competitive economic position and are rewarded by income-oriented investors as they seek out such dividend growth. This factor favors companies with higher Dividend Growth prospects.

Dividend Growth 3-Year Trend

The Dividend Growth 3-Year Trend factor measures the slope of long-term historical dividend growth. The more positive and steeper the slope signifies sustainable cash earnings growth and profitability. Stocks with greater dividend growth trends tend to be positively related to future stock returns. Much like with other dividend growth factors, the rationale is that investors tend to underreact to the signal. Such under reaction may hinge on interpreting such trends as lowered payout ratios and management dividend smoothing. Companies that can grow their dividend typically have a strong competitive economic position and are rewarded by income-oriented investors as they seek out such growth. This factor favors companies with higher (and steeper) growth trajectories.

Return on Equity (ROE) 5-Year Trend

The Return on Equity (ROE) ratio is a profitability measure of companies. The long-term (5 year) ROE trend factor measures both growth and profitability. Stocks with better ROE trends tend to be positively related to future stock returns. The main reason is that investors seem to underreact to the long-term ROE trend. Therefore, a

positive ROE trend signifies sustained profitability, implying sustained earnings growth. This factor favors companies with better ROE trends.

<u>Sales Growth 1-Year Forward</u>

The Sales Growth 1-Year Forward factor measures expected business growth. Stocks with greater growth estimates tend to be negatively related to future stock returns. The main reason is that investors tend to be overly optimistic regarding the business prospects and extrapolate past growth, which tends to mean-revert, while underestimating the risks and uncertainties of the expected growth. This factor favors companies with lower sales growth estimates.

Quality Perspective

The Quality component underlying the rating is based on several operating performance measures derived from financial statement data. Stocks with attributes such as high profitability, high earnings quality, conservative investment spending and/or better operating efficiency tend to have better Quality scores. Highly rated stocks within this category may have the potential for price appreciation, as investors perceive that these companies have the financial strength to potentially weather a variety of economic scenarios.

<u>Accruals over Assets</u>

The Accruals over Assets factor constructs accruals as book value changes minus cash changes using balance sheet items only. The accruals anomaly suggests that a higher accruals ratio tend to be negatively related to future stock returns. The main reason is that stocks with high accruals are often associated with less persistent earnings, as accruals are more volatile and transient relative to the cash earnings. This factor prefers companies with fewer accruals relative to their total assets.

<u>Capital Intensity</u>

The Capital Intensity factor is based on the observation that the market tends to underreact to a company's growth building expenditures and discounts younger firms for their higher business risks. The negative relation between expenditures and returns are stronger in firms with larger cash flow and low debt ratios, which indicates they have larger discretionary spending. This factor also gauges a firm's life cycle relative to its capital spending. For example, younger firms tend to have capital expenditures in excess of depreciation as they invest for future business growth. However, in the aggregate, stock prices of younger firms tend to be more volatile and underperform their more established counterparts. This factor favors companies that have lower capital expenditures in relation to their depreciation and amortization expenses.

<u>Cash Flow Profitability</u>

The Cash Flow Profitability factor is based on the observation that strong profitability is positively related to future stock returns. Compared to common measures of profitability by ROE (i.e., net income/equity), cash-flow is a cleaner measure of profitability that avoids the potential mismeasurement of accrual accounting. Cash flow data exposes operating cash flows from financing, tax, investing, non-operating, and non-recurring activities, thus it delivers quality profitability information for modeling purposes. This factor favors companies that have healthy cash flows from operations in comparison to their stock price levels.

<u>Gross Profitability</u>

The Gross Profitability factor is based on the observation that strong income statement profitability is positively related to future stock returns. Compared to other measures of profitability that are earnings based, gross profitability is thought to be a cleaner measure which uses top line items from the income statement. Gross profitability is driven by both operating efficiency and velocity of business transactions. This factor prefers companies with high income generation in relation to their total assets.

Merton Distance to Default

The Merton Distance to Default factor is computed based on option theory, treating the equity value as an option on firm values with debt as a strike price or default threshold. The strength of this approach is that it extracts non-linear relationships from debt levels. It also requires only market data of equity volatility, risk-free rates, and nominal debt. The distance to default anomaly implies that smaller distance to default values tend to be negatively related to future stock returns. The main reason is that stocks with small distance to default have a higher probability of default. This factor favors companies with a larger distance to default.

Revenue per Employee

The Revenue per Employee factor is a human capital productivity measure. The human productivity anomaly implies that stocks with a higher ratio tend to be positively related to future stock returns. The rationale is that stocks with high human capital productivity are underappreciated by investors, and they are often associated with more efficient operations and less employee turnover. This factor favors companies with higher amounts of Revenue per Employee.

Sentiment Perspective

The Sentiment component underlying the rating is based on several measures of both long-term and short-term changes in investors' expectations. Stocks with attributes such as recently improving analysts' outlooks, strong and consistent price performance, and/or optimistic trading positions and trends tend to have better Sentiment scores. Highly rated stocks in this category may have the potential for outperformance, as investors become more aware of these companies' improving performance prospects.

Price Change Coherence

The Price Change Coherence factor is based on the observation that stock price movements that diverge directionally from an underlying index are negatively related to future stock returns, as this divergent price movement is an indicator of high stock-specific risk. At turning points in market momentum, this factor prefers stocks that make quick directional adjustments and stay in tandem with the market. While that preference makes sense if the market turns upward, it may seem counterintuitive to also favor stocks that fall in sync with a market that turns down. But stocks that buck a downward market reversal may be temporarily benefiting from the "disposition effect" – a behavioral tendency for investors to delay selling stocks with losses. These out-of-sync stocks eventually fall faster than the market as loss-averse investors throw in the towel and sell. In other words, a security's price may depend not only on its fundamentals, but also on the indexes it belongs to and on the types of investors trading it. Finally, when value and growth style performance diverge, this factor prefers stocks that move in sync with the more defensive value index, a preference that can help performance in down markets.

Price Momentum

The Price Momentum factor is based on the observation that past stock returns have often been positively related to future stock returns. This factor is a relative strength measure. Many competing explanations exist for the superior performance of stocks that exhibit relative strength, the most common being that the market tends to respond only gradually to new information. Investors often underreact to information about a firm's short-term prospects and often overreact to information about perceived long-term prospects, providing opportunities in the intermediate time horizon. In fact, research has shown that the price momentum effect is most prevalent at an intermediate horizon (6 – 18 months), but then reverses over longer-term periods such that prior long-term winners have lower subsequent returns than prior long-term losers. The behavioral finance theory for intermediate-term momentum is related to anchoring and conservatism bias, which leads investors to update their prior beliefs insufficiently—that is, to underreact—when they are exposed to new information about a firm. Longer-term reversal might be explained by representativeness bias (e.g., investors' belief that a big past winner must be a great stock), which causes big past winners to eventually become overvalued and subsequently underperform. Overall, this factor will reward consistent price appreciation over an eighteen-month time span.

Price Target Revision

The Price Target Revision factor is based on the observation that analyst actions, particularly changes in their opinions, are positively related to future stock returns. Analyst price target changes have historically been a useful forecaster of excess returns. Behavioral research has shown that in making price target changes, analysts tend to underreact to news, especially when lowering price targets. Generally, people tend to anchor on the most recent value of a series and make insufficient adjustments from it when changing their forecasts. In other words, adjustments from an anchor tend to be insufficient, which results in the need for further adjustments. Taken as a whole, this anchor-and-adjustment process makes changes in analyst price targets "work" for stock selection. This factor favors upward revisions in analyst's price targets.

Short Sentiment

The Short Sentiment factor is based on the observation that short interest levels tend to be negatively related to future stock returns. Short interest conveys the valuation sentiment of highly informed investors such as hedge funds. Short interest-based factors tend to have low correlations with other typically accounting-based or analyst expectation change measures. This factor prefers companies that have less short interest than their peers.

Short Sentiment Change

The Short Sentiment Change factor is based on the observation that changes in short interest are negatively related to future stock returns. Increases in short selling tend to push a stock's price down towards its intrinsic value. This factor measures the magnitude of change for short interest and will penalize companies that have accumulated more short interest over a one-year time span.

Stability Perspective

The Stability component underlying the rating is based on several performance variability measures derived from both financial statements and trading data. Stocks with attributes such as low sales volatilities and low trading volume turnovers tend to have better Stability scores. Highly rated stocks within this category may have the potential for price appreciation, as investors perceive that these companies deserve a premium for their steady business outcomes.

Coefficient of Sales Variation

The Coefficient of Sales Variation factor measures sales variability of stocks. Low sales variabilities tend to be positively related to future stock returns. The main reason is that stocks with less sales variabilities are often associated with stable sales and more persistent earnings. This factor is also sector neutralized to alleviate seasonality in sales. This factor favors stocks with lower sales variability.

Sales Growth Variance

The Sales Growth Variance factor measures variability of a stock's sales. Low sales variability tends to be positively related to future stock returns. The main reason is that stocks with low sales growth variability are often associated with stable sales and more persistent earnings. This factor is also sector neutralized to alleviate seasonality in sales. This factor favors stocks with stable sales growth.

Trading Volume Turnover

The Trading Volume Turnover factor is a measure of liquidity of stocks. Stocks with low liquidity tend to be positively related to future stock returns. The main reason is that investors holding low liquidity stock may require higher risk premium. Another possible explanation is that market wide information disseminates across stocks with lags for less liquid stocks. Therefore, their returns are higher as price adjustment from new information lags. This factor favors less liquid stocks.

Valuation Perspective

The Valuation component underlying the rating is based upon several value-oriented investment criteria. In general, stocks with attributes such as relatively high levels of free cash flow, operating income and expected future earnings tend to have better Valuation scores. Highly rated stocks with such scores may have the potential for price appreciation, as investors perceive that the current stock prices of these companies are too low relative to measures of investment value.

Forward Earnings Valuation

The Forward Earning Valuation factor is based on the observation that high ratios of forward earnings estimates over price tend to be positively related to future stock returns. The main reason is that stocks with high forward E/P (earnings-to-price) ratios are regarded as undervalued by investors and they often deliver earnings that exceeds market expectations. High E/P ratios may be indicative of stocks with more sustainable earnings levels than perceived, thus making them more likely to experience future turnarounds. This factor prefers stocks with lower prices relative to their earnings estimates.

Free Cash Flow Valuation

The Free Cash Flow Valuation factor is based on the observation that high ratios of free cash flow (FCF) over enterprise value (EV) tend to be positively related to future stock returns. The main reason is that stocks with high FCF/EV ratios may be undervalued by investors and have the potential to deliver earnings growth that exceeds market expectations. On the other hand, stocks with low FCF/EV ratios often fail to deliver expected high growth. This factor favors stocks with high free cash flows relative to their enterprise value.

Gross Cash Flow Valuation

The Gross Cash Flow Valuation factor is based on the observation that high ratios of gross cash flow (GCF) over enterprise value (EV) tend to be positively related to future stock returns. The main reason is that stocks with high GCF/EV ratios may be undervalued by investors and have the potential to deliver earnings growth that exceeds market expectations. On the other hand, stocks with low GCF/EV ratios often fail to deliver expected high growth. This factor prefers stocks with high gross cash flows relative to their enterprise value.

Income Valuation

The Income Valuation factor is based on the observation that earnings-to-price (E/P) ratios tend to be positively correlated to future stock returns. The main reason is that stocks with high E/P ratios often deliver earnings growth that exceeds the market's lower expectations, while stocks with low E/P ratios often fail to deliver high growth expectations. This factor thoughtfully improves upon the traditional E/P ratio by better capturing "core" operating earnings by using operating income instead of net income. Considering the entire capital structure in valuing a stock helps avoid "value traps" by penalizing highly leveraged companies. This factor favors companies that exhibit higher operating income in comparison to their market value.

Model Components – Industry sub-models

As previously mentioned, Schwab Equity Ratings are based upon a disciplined, systematic approach that evaluates each stock based on a wide variety of criteria from five broad categories: Growth, Quality, Sentiment, Stability and Valuation. As of April 2022, Schwab Equity Ratings created industry specific factors, which are only used to rate stocks found within Banks, Diversified Financials, or Biotechnology & Pharmaceuticals industries. These factors fall within the same five broad categories (Growth, Quality, Sentiment, Stability and Valuation) as the factors found within the Style sub-models.

Please note: Stocks rated by one of the industry specific models use industry specific factors *in addition to* factors found within the Style sub-models. Also, please be aware that there is overlap between the sub-model factors (Net Equity Issuance is found in all three, for example). Here is a list of the industry specific factors, with the category (Growth, Quality, etc.) noted after the factor name.

Banks Industry sub-model factors

Annual Dividend Growth (Growth)

Annual Dividend Growth measures the change in a firm's dividend payout policy. Corporate managers generally believe that their fiduciary responsibilities require them to distribute part of earnings to the stockholders in dividends, barring other compelling reasons to the contrary. However, managers also like to restrain current dividends to save some resources for next period to make up for any possible shortfall in future earnings. Hence, investors interpret a change in the dividend payout rate as a change in management's views about a firm's future profitability. Higher values of the factor are associated with higher returns, on average and over time.

Change in Unrealized Gains and Losses on Available for Sale Securities (Growth)

The securities portfolio of a bank is comprised of trading, held-to-maturity and available-for-sale securities. For securities that management intends to resell in the near term, "trading" securities, unrealized holding gains and losses are recognized in earnings. For securities that management intends to hold to maturity, held-to-maturity securities, unrealized holding gains and losses are not recognized in net income or other comprehensive income. Unrealized gains and losses on available-for-sale securities are included in Other Comprehensive Income and directly affect shareholders' equity but are not included in earnings. Unrealized gains and losses on available-for-sale securities predict next period realized gains and losses on available-for-sale securities and hence the future earnings change. This factor prefers banks with large and positive changes in unrealized gains and losses on marketable securities relative to total assets.

Demand Deposits and Change in Demand Deposits (Quality)

Deposits are the largest liability of a bank, but they are also the cheapest source of financing the bank's loan and securities portfolios. Moreover, the three largest components of deposits are demand, time, and savings deposits. The banks that have more demand deposits than their savings and time deposits are those that can finance their loan and securities portfolios in a more cost-efficient way. Hence, we capture the profitability of a bank from its balance sheet point of view in terms of its less costly demand deposits relative to its more costly time and saving deposits both at levels and changes. This factor prefers stocks with higher demand deposits as a proportion of total deposits or more positive change in this variable.

Interest Margin and Change in Interest Margin (Quality)

The top line profitability measure for banks is their interest margin which is the difference between their interest income that they generate from their loans and securities portfolios and the interest expense that they incur from their deposits and debt. The higher a bank's interest margin, the more profitable the bank, on average. We consider not only the level but also the annual change in interest margin, as banks that have increasing interest margins tend to continue to report increased interest margins in the future. This factor prefers stocks with higher interest margins or more positive change in interest margin.

Net Equity Issuance (Quality)

Firms have the option to finance their operations either by internally generated capital or externally raised capital. Using internal capital is a positive sign of the firms' profitability. In comparison, externally raised capital is costly and indicates that a firm may be over-investing. On average, firms that choose to finance their operations by internally generated capital are rewarded by investors in terms of future stock returns, and firms that choose external financing are not. This factor prefers companies that are issuing less or buying back more of their shares.

Non-Performing Loans, Change in Non-Performing Loans and Charge-Offs (Quality)

Loans make up a large share of a bank's assets and give rise to their largest accruals: loan loss provisions. Loan loss provisions are accrued expenses for the non-performing loans expected to be charged-off in the future. Hence the quality of a bank's loan portfolio mostly defines the quality of its financial statements in terms of its accruals. This series of factors rewards firms with lower non-performing assets, change in non-performing assets and change in charge offs.

Operational Efficiency (Quality)

The operating income for banks is generally defined in terms of their net interest income and non-interest income relative to their non-interest expense which mostly consists of worker wages and salaries. We define operational efficiency as the operating income generated per employee as a human capital productivity measure after considering its cost. Moreover, we consider not the current level, but the increase or decrease in operational efficiency of a bank relative to its peers. Higher values are preferred, on average.

Pre-Tax Pre-Provision Income Valuation (Valuation)

For banks, the largest portion of accruals come from loan loss provisions and income tax expenses. We can recover cash flow for banks by adding loan loss provisions and income tax expenses back to net income. Hence, we improve upon the traditional operating cash flow to market value of equity factor by considering the source of accruals most relevant for banks. This factor prefers bank stocks with lower prices relative to their pre-tax, pre-provision income.

Tangible Retained Income Valuation (Valuation)

Retained income is the accumulation of undistributed earnings and represents the historical net value generated by the firm. Contributed capital represents the net equity financing of the firm. While retained income captures desirable value generation, contributed capital captures undesirable external financing. We improve upon book value of equity to market value of equity in two ways. First, we only consider the retained income component of book value of equity, and second, we remove intangible assets from book value of equity relative to market value of equity. This factor prefers stocks with lower prices relative to their retained income net of intangible assets.

Diversified Financials Industry sub-model factors

Annual Dividend Growth (Growth)

Annual Dividend Growth measures the change in a firm's dividend payout policy. Corporate managers generally believe that their fiduciary responsibilities require them to distribute part of earnings to the stockholders in dividends, barring other compelling reasons to the contrary. However, managers also like to restrain current dividends to save some resources for next period to make up for any possible shortfall in future earnings. Hence, investors interpret a change in the dividend payout rate as a change in management's views about a firm's future profitability. Higher values of the factor are associated with higher returns, on average and over time.

Change in Unrealized Gains and Losses on Available for Sale Securities (Growth)

The securities portfolio of a bank is comprised of trading, held-to-maturity, and available-for-sale securities. For securities that management intends to resell in the near term, "trading" securities, unrealized holding gains and losses are recognized in earnings. For securities that management intends to hold to maturity, held-to-maturity securities, unrealized holding gains and losses are not recognized in net income or other comprehensive income. Unrealized gains and losses on available-for-sale securities are included in Other Comprehensive Income and directly affect shareholders' equity but are not included in earnings. Unrealized gains and losses on available-for-sale securities predict next period realized gains and losses on available-for-sale securities and hence the future earnings change. This factor prefers banks with large and positive changes in unrealized gains and losses on marketable securities relative to total assets.

Tangible Retained Income Valuation (Valuation)

Retained income is the accumulation of undistributed earnings and represents the historical net value generated by the firm. Contributed capital represents the net equity financing of the firm. While retained income captures desirable value generation, contributed capital captures undesirable external financing. We improve upon book value of equity to market value of equity in two ways. First, we only consider the retained income component of book value of equity, and second, we remove intangible assets from book value of equity relative to market value of equity. This factor prefers stocks with lower prices relative to their retained income net of intangible assets.

Biotechnology & Pharmaceuticals Industry sub-model factors

Long-Dated Earnings Growth Forecast (Growth)

Analysts' over optimistic growth expectations lead to lower future stock returns on average. Firms with high growth expectations are often overpriced and fail to live up to investor's lofty expectations. These stocks with high growth expectations are punished as growth reverts to the mean. Because many biopharma firms have negative earnings, longer term earnings are a critical input into valuing these firms. This factor favors company with lower growth expectations.

Return on Research & Development Expense (Quality)

Return on Research & Development ("R&D") Expense is a quality factor that attempts to measure the return or profitability of a firm's R&D expenditure. It divides forecast earnings by R&D expense. Because R&D expense is such a large part of a biopharma firm's income statement, the efficiency with which it spends its R&D and its ability to translate R&D spending into earnings is important relative to other firms. This factor prefers firms that generate high forecasted earnings relative to R&D expense.

Forecasted Earnings Momentum (Sentiment)

Forecasted earnings momentum is a sentiment factor based on changes over time in analyst earnings forecasts. It measures the 6-month change in the long-dated future earnings forecasts. Some investors tend to ignore forecasts for drug company earnings in forward years 4 and 5. These long-dated earnings forecasts are more prevalent in the biopharma space relative to other industries because near term earnings are often negative and product life cycles are longer for biopharma companies, hence the need for long-term forecasts. The factor rewards companies were long-dated earnings forecasts have increased.

R&D Adjusted Income to Market Value (Valuation)

GAAP accounting rules require the immediate expensing of Research & Development expense, thus reducing a firm's earnings. The more a firm spends on R&D, the lower will be its rank on valuation ratios such as Earnings to Price, all else equal. However, R&D expense can be thought of as an investment that should reap future benefits through the creation of internally generated intangible assets. By adding back R&D expense and a portion of Selling, General and Administrative (SG&A) expense to earnings, we reward firms for these investments. This factor prefers stocks with high R&D expense, SG&A expense, and income relative to market value.

Sales to Market Value (Valuation)

Valuation ratios such as Earnings to Price can be negative for young firms that are trying to grow their sales or don't yet have a product to sell or for growth firms that are investing heavily trying to grow their business. Rather than focusing on bottom line net income, sales to market value focusses on top line sales. Some biopharma firms do not yet have a viable product and hence have no sales. Relative to companies without sales, this factor rewards companies that have sales.

Sustainable Cash to Market Value (Valuation)

Strong cash positions provide an ability to capture available growth opportunities. Because many biopharma firms operate at a loss, they tend to hoard cash, making them appear to be more stable than they really are. In contrast, biopharma firms with stable, positive earnings carry relatively less cash. To make a better comparison of cash levels at loss making versus profitable firms, sustainable cash adjusts firm's cash levels by the amount of expected earnings. This factor prefers companies with either large cash stockpiles or large expected earnings relative to market value, implying sustainability of their businesses.

Information Technology Industry sub-model factors

Effective Tax Rate and Change in Effective Tax Rate (Growth)

The Effective Tax Rate (ETR) factor is the percentage of taxable income paid out as taxes and it can be used as a gauge of a firm's profitability and thus quality. Firms that pay a high effective tax rate generally have higher earnings quality than firms that have a low effective tax rate. Paying dividends is often viewed as a sign of quality, but not many growth-oriented Information Technology sector firms pay a dividend. Instead of looking at dividends for these firms, we can look at the effective tax rate as a proxy for profitability and substitute for paying dividends. Profitable and higher quality firms pay taxes and thus have a higher effective tax rate. It is also intuitive to think of the change in the effective tax rate as the first step toward generating an increase in the effective tax rate and thus an improvement in profitability.

Global Profit Shifting and Change in Global Profit Shifting (Quality)

The Global Profit Shifting (GPS) factor is based on the observation that multinational firms with high foreign tax expense less domestic tax expense scaled by cash underperform. Firms may attempt to lower their taxes by shifting profits to jurisdictions with low tax rates or tax havens. However, firms that do this typically have lower profitability in the future and their future stock returns may suffer. Firms with relatively high foreign tax expense are penalized by the market through lower stock returns, on average.

Intangible Adjusted Cash Flow to Book Equity (Quality)

Intangible Adjusted Cash Flow to Book Equity (IACF) is a quality measure that adjusts cash flows for investments in intangible assets such as knowledge capital and organizational capital. The cash flow profitability anomaly is based on the observation that strong profitability is related to higher average future stock returns. Compared to commonly measure of profitability by ROE (i.e., net income/equity), cash-flow can be a better measure as it may avoid potential problems stemming from accrual accounting.

Intangible Adjusted Retained Income to Market Value (Valuation)

Retained income is the accumulation of undistributed earnings and represents the historical value, net of dividends, generated by the firm. In addition, a firm's investments in research and development (knowledge capital) and selling, general, and administrative expenses (organizational capital) are expensed immediately even though they produce long-lived benefits to the firm that are valuable in terms of income generation and enhance firm quality. Moreover, information technology firms have significant intangible assets that mainly consists of goodwill that was capitalized because of acquisitions. Intangible assets are typically written down during crises times and put significant pressure on a firm's capital. We improve upon book value of equity to market value of equity by only considering the retained income component of book value of equity, we capitalize investments in knowledge and organizational capital and amortize them, and finally, we remove intangible assets from book value of equity.

Quarterly Earnings Surprise (Sentiment)

The Quarterly Earnings Surprise (QES) factor is based on the observation that investors tend to underreact to past earnings surprises and do not adequately adjust future earnings forecasts. Therefore, earning surprise exhibits a kind of momentum and tends to be serially correlated. Standard Unexpected Earning (SUE) is one common measure of earnings surprise. Post-earnings announcement drift (PEAD) is the name for the phenomena where stock prices tend to drift upward (downward) after the earnings announcement if the earnings are unexpectedly positive (negative).

Insurance Industry sub-model factors

Annual Dividend Growth (Growth)

Annual Dividend Growth measures the change in a firm's dividend payout policy. Corporate managers generally believe that their fiduciary responsibilities require them to distribute part of earnings to the stockholders in dividends, barring other compelling reasons to the contrary. However, managers also like to restrain current

dividends to save some resources for next period to make up for any possible shortfall in future earnings. Hence, investors interpret a change in the dividend payout rate as a change in management's views about a firm's future profitability. Higher values of the factor are associated with higher returns, on average and over time.

Deferred Charges to Underwriting Expense (Quality)

Deferred Acquisition Cost (DAC) to Underwriting Expense is an accounting quality measure for insurance companies. Deferred charges represent the accumulated costs of acquiring new insurance contracts and amortizing them over the duration of the contracts. Lower deferred charges in the numerator indicate a longer amortization period, which would mean a longer period of stable premium income. This is scaled by underwriting expense, which is the costs associated with underwriting activity in the period. So then, a lower ratio is associated with better returns because, all else equal, two companies with comparable underwriting expenses, but very different DACs would indicate both companies sold a similar number of policies but the one with the lower DAC will have a longer amortization period and therefore greater stability of premium income all else equal.

Insurance Reserves to Book Equity (Quality)

The insurance reserves to equity ratio is a safety or capital adequacy measure that indicates how well prepared an insurance company is to withstand losses, on average. Insurers assume and manage risk in return for a premium. The actual cost of each policy to the insurer is not known until after the policy period. An insurance reserve is the amount of funding set aside by an insurance company to meet any future claims it may have to payout. Furthermore, maintaining an adequate reserve level is important for an insurance company as it can affect their solvency if large claims are made.

Net Equity Issuance (Quality)

Firms have the option to finance their operations either by internally generated capital or externally raised capital. Using internal capital is a positive sign of the firms' profitability. In comparison, externally raised capital is costly and indicates that a firm is over-investing. As a result, while firms that choose to finance their operations by internally generated capital are rewarded by investors in terms of average future stock returns, firms that choose external financing are not. In addition, a share repurchase may be a signal of management confidence while the opposite is true for share issuance. We capture the extend of a firm's reliance on external financing by their change in shares outstanding.

Normalized Benefit Loss Expense (Quality)

This profitability ratio is an efficiency measure and a gauge at how good insurance companies are at underwriting. The ratio represents the amount paid to policy holders plus the future amount expected to be paid to policyholders minus the cost of selling those policies, all divided by the premiums earned and interest received. The lower the benefit expense and the lower the long-term reserve expense, the less risky the underwritten policies are. The higher the underwriting expense, the more policies written. In this case, a lower numerator would indicate a company underwrote a lot of safe policies.

Premiums Written Plus Reinsurance Reserves to Assets (Quality)

The Premiums Written plus Reinsurance Reserve to Total Assets ratio is a measure of how efficiently an insurance company is using its assets to generate business. It is similar to classical measures of efficiency such as an asset turnover ratio, which takes sales over assets, because premiums written plus reinsurance reserve can be thought of as the main driver of "sales" for an insurance firm. Higher values of the ratio are better and indicate more efficient or productive use of assets. In cases where Premiums Written is unavailable, a substitution is made using Premiums Earned, which is the portion of total premiums written needed to cover all expenses and benefits.

Quarterly Earnings Surprise (Sentiment)

The Quarterly Earnings Surprise (QES) factor is based on the observation that investors tend to underreact to past earnings surprises and do not adequately adjust future earnings forecasts. Therefore, earning surprise exhibits a kind of momentum and tends to be serially correlated. Standard Unexpected Earning (SUE) is one

common measure of earnings surprise. Post-earnings announcement drift (PEAD) is the name for the phenomena where stock prices tend to drift upward (downward) after the earnings announcement if the earnings are unexpectedly positive (negative).

Tangible Retained Income Valuation (Valuation)

Retained income is the accumulation of undistributed earnings and represents the historical net value generated by the firm. Contributed capital represents the net equity financing of the firm. While retained income captures desirable value generation, contributed capital captures undesirable external financing. We improve upon book value of equity to market value of equity in two ways. First, we only consider the retained income component of book value of equity, and second, we remove intangible assets from book value of equity relative to market value of equity. This factor prefers stocks with lower prices relative to their retained income net of intangible assets.

Supplemental Schwab Volatility Outlook

Volatility Outlook

Every investor is unique. We all have different financial goals and different levels of risk tolerance associated with achieving those goals. The classic example which highlights the differences between risk appetites compares someone close to retirement, guarding their nest egg, versus a young professional pursuing a selection of risky positions to invigorate their portfolio. Schwab Equity Ratings' Volatility Outlook metric provides some beneficial insights into the projected volatility of a particular stock to help our clients assess the goodness of fit for their unique financial goals.

Price volatility is taken as a measure of general risk to a stock. In the risk management industry, it's utilized as a proxy for risk simply because it's quantifiable. The price volatility may incorporate underlying; (1) market risk, (2) foreign currency exposure, (3) industry concentration, (4) interest rate risk, (5) credit risk, (6) issuer risk, (7) liquidity risk, (8) derivatives risk, (9) prepayment risk, (10) leverage risk, (11) emerging markets risk, (12) management risk (13) legislative risk, (14) short sales risk, (15) technology risk, (16) operational risk, etc. As you can tell from this dizzying array of concerns, measuring risk is not an easy undertaking.

While price volatility is a single aspect of a useful risk measure, it's not the total risk of an asset which would incorporate measures of all of the above risks and offer estimates as to the loss of earnings power of a company. However, most of these other risks are not easily quantifiable, hence we compute what we can and estimates of the future volatility of an asset are still a useful proxy for the riskiness of an asset, albeit with limitations.

In fact, empirical evidence has shown forecasting price volatility has higher level of success than does forecasting return. That is, one can forecast future volatility of a stock's price more correctly and more often, than one can forecast the future return of a stock. Schwab Equity Ratings' Price Volatility Risk measurement provides an objective view into obscure underlying risks. It provides a process for independently projecting the future price volatility of a stock to arm the intelligent investor in his or her decision making.

Why Does Price Volatility Matter?

Price volatility has both positive and negative connotations. Price movements on the upside are welcome, while price movements on the downside are disappointing. Volatility can exacerbate both these feelings of joy and despair in one's stock selection. A highly volatile stock may achieve greater highs, but also achieve greater lows.

It's important to note this volatility metric is not associated with the loss of quality of a company's earning power through economic or management decisions or changes. It's a quantitative measure of price fluctuation which is associated with what's known as "variance drain." Long term returns are pulled downward more than they ought to, simply due to high stock price volatility. This phenomenon should be considered when selecting high price volatility risk stocks. However, there are times when buying the higher volatility forecasted stock is ideal. For instance, when preferring growth stocks vs. value stocks as growth stocks often have more volatility. Some

industries like technology also have generally more volatility than say, utilities. Hence the volatility forecast is to be used as supplemental information to the SER rating when making security selection decisions.

Rating Distribution

Price Volatility Risk Classification	Percentile Ranking Distribution	Distribution of Rating Within A/B/C/D/F Rating Group	6-month Price Volatility Outlook
Low	1-33.33	Top 1/3rd	Low
Medium	33.34-66.66	Next 1/3rd	Medium
High	66.67-100	Bottom 1/3rd	High

Price Volatility Risk Metric Components

Return Volatility

The Return Volatility factor measures the one-year standard deviation of daily total return changes. This factor embodies the concept that a degree of idiosyncratic risk can be gauged by measuring price volatility. Stocks with lower standard deviations are favored in this factor. This is a timely factor as it reacts to daily changes in volatility. It also generally works well during periods of market turbulence.

Analyst Dispersion

The Analyst Dispersion factor embodies the concept of earnings forecast ability by measuring the dispersion in sell-side analyst estimates. The dispersion is calculated using Analysts' EPS estimates for the current fiscal year. Lower values are favored as greater dispersion in the estimates implies greater uncertainty about a company's future earnings. The factor is calculated by dividing the standard deviation of the individual analysts' current fiscal year EPS estimate by the mean estimate.

Betting Against Beta

Betting against beta factor involves calculating one year of log returns and correlating them against five years of log returns. Correlations tend to move more slowly than price volatilities. Lower values are favored. A minimum of 120 trading days is required for the volatility calculation and a minimum of 750 trading days is required for the correlation. To account for asynchronous trading a 3-day moving average is used in the calculation of correlations. This factor conveys the concept of covariation with the market and favors equities that are less sensitive to the market relative to others.

Summary

Schwab Equity Ratings provide objective and actionable guidance that works in conjunction with your own risk appetite levels. This ratings service is just one input in your investment decision making process. Schwab Equity Ratings can help provide your portfolio general guidance or find some attractive prospects. For more information on how to use Schwab Equity Ratings within your portfolio see "Managing a Stock Portfolio with Schwab Equity Ratings" on schwab.com.

Disclosures

Important disclosures about Schwab Equity Ratings

Schwab Equity Ratings and the general buy/hold/sell guidance are not personal recommendations for any particular investor or client and do not take into account the financial, investment, or other objectives or needs of, and may not be suitable for, any particular investor or client. Investors and clients should consider Schwab Equity Ratings as only a single factor in making their investment decision while taking into account the current market environment.

Schwab Equity Ratings are assigned to approximately 3,000 of the largest (by market capitalization) U.S. headquartered stocks using a scale of A, B, C, D and F. Schwab's outlook is that A-rated stocks, on average, will strongly outperform and F-rated stocks, on average, will strongly underperform the equities market over the next 12 months. Each of the approximately 3,000 stocks rated in the Schwab Equity Ratings universe is given a score that is derived from several research factors. The assignment of a final Schwab Equity Rating depends on how well a given stock scores on each of the factors and then how that stock stacks up against other stocks within the same sector and market cap group.

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Past performance is no guarantee of future results.

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