xignite

Corporate Actions Handling in Xignite GlobalHistorical v3

Introduction

Adjustments to historical prices for the corporate actions can be important to normalize historical pricing data for any time-series analysis of portfolio holdings or equity markets in general. Adjusted historical prices allow easy computation for portfolio performance calculations such as total returns, price return as well as for charting, backtesting and other analytics calculations.

We designed how XigniteGlobalHistorical adjusts prices for corporate actions so that Xignite customer can easily:

- Calculate total returns
- Calculate price returns
- Chart adjusted historical prices showing a smooth trend over time
- Perform backtesting of trading strategies using adjusted historical pricing data
- Compute or retrieve other price analytics data points more accurately, such as PE Ratio, moving averages on price and volume, percent changes etc.

Using unadjusted time series data may not be that useful if not adjusted for corporate action events over time. For example, comparing unadjusted closing price on IPO day for eBay Inc (Nasdaq: EBAY) of **$47.38** on 9/24/1998 to the current price of **$32.49** (on Sept 12, 2016) will give you the false impression of negative returns over close to 18-years. In reality, if you compare against the adjusted price of **$0.83** on 9/24/1998, the eBay stock has realized an annualized rate of return of **21.17%** compounded annually. The adjusted price reflects normalized historical price adjusted for distributions to investors such as cash dividends, PayPal spinoff as well as the stock splits that happened during the history to stock.

Adjustment Principles

- Adjustment factor is applied to unadjusted prices before the EX-distribution date.
- We store the original ratios (the numerator and denominator) rather than a computed adjustment factor for each event, as a result we do not propagate rounding error.
- Adjusted volume is calculated by multiplying the unadjusted volume by the corresponding cumulative adjustment factor.
- Volume is **only** adjusted for the corporate events that change the shares outstanding of the security on the EX date. For example, historical volume is adjusted for stock splits and stock dividends (bonus shares), but does not require adjustment for the corporate actions such as cash dividend and spin-offs that changes the company assets but not the shares outstanding of the particular instrument.
- If there are multiple corporate actions on the same EX date, individual adjustment factors are multiplied to compute the cumulative adjustment factor.
- If there are multiple ordinary cash dividends on the same EX date (not so common), we sum up the multiple cash dividends to compute a single adjustment factor.

Adjust Methods Supported

XigniteGlobalHistorical support following adjustment methods (API input parameter named as AdjustmentMethod) and the correspond definitions are below:

1. **All -** Price and volume data points are adjusted for all the corporate actions that are currently supported and applicable for the adjustment.
2. **PriceReturn -** Price and volume data points are adjusted for all the corporate actions except the adjustment for ordinary cash dividends.
3. **None -** No adjustment is applied. Unadjusted price and volume data is returned.

Note: “CumulativeAdjustmentFactor” field in the API output contains the combined adjustment factor applied in calculating the adjusted price for respective date.

The next section explains the adjustment calculations and the methodology used for all the supported corporate actions.

Adjustment Methodology

Cash Dividends

Xignite adjusts for ordinary cash dividends using the **proportional dividend** adjustments approach. Meaning, we calculate an “adjustment factor” that captures drop in the stock price and we use that factor in computing a consistent time series of adjusted stock prices. Proportional dividend adjustments ensure that percent return calculations are consistent across dividend events. In combination with split adjustments described below, these calculations are consistent with the Center for Research in Security Prices (CRSP) methodology.

Proportional dividend adjustments are based on both the amount of the dividend and the closing price on the pay date, and requires calculating a dividend adjustment factor on the pay date as such:

Dividend adjustment factor =
(Previous day closing price - Dividend amount) / (Previous day closing price)

Proportional dividend adjusted historical prices are calculated by multiplying this dividend adjustment factor against the actual historical prices prior to the dividend pay date.

Extraordinary Cash Dividend

The Xignite adjustment computation for extraordinary cash dividends is same as ordinary cash dividends, i.e., using proportional dividend adjustment as outlined in the previous section. By computing and storing this adjustment ratio separately from ordinary cash dividends, we provide the customer the flexibility to choose an adjustment method that fits into their use case. For example, for price return calculations purpose, we support adjustment method **"PriceReturn"** that allows customer to get historical price adjusted for all the corporate actions including extraordinary cash dividends but excluding the ordinary cash dividends.

Stock Splits & Reverse Splits

Split adjustments are fairly straight-forward and performed by applying a split factor, which is the ratio of the number of shares that a shareholder would hold prior to the ex-date to the number of shares that that shareholder would hold after the ex-date.

Historical split-adjusted prices, are calculated by multiplying the actual historical price by the Split factor. For example, a 2-for-1 stock split is represented by a Split factor of 0.5, which means the split-adjusted historical price prior to the split is 50% of the historical market price. Similarly, a 1-for-4 reverse stock split is represented by a Split factor of 4, which means the split-adjusted historical price prior to the split is 4 times the historical market price.

Stock Dividends

Sometimes companies issue dividends in the form of stock instead of cash. Stock dividend distribution involves each of the shareholders receiving new shares in proportion to their current ownership.

The net effect of this corporate action is a decrease in the assets that each share represents and an increase in the number of shares outstanding, by exactly the same ratio as the stock distribution issued.

$$Adjustment\ Factor = Old\ Float / New\ Float$$
$$= (Previous\ Shares) / (Previous\ Shares + New\ Shares\ Issued)$$

$$Adjusted\ Price = Unadjusted\ Price * Adjustment\ Factor$$
$$Adjusted\ Volume = Unadjusted\ Volume / Adjustment\ Factor$$

Note that there is no change in the investor's percentage ownership and shareholder dollar value as a result of this corporate action.

Stock dividends in some countries is also known as "**Bonus shares" or "Scrip issue."**

Bonus Shares (or Scrip issue)

Bonus shares or Scrip issues of same class shares are handled exactly same was as Stock Dividends

as explained above. Adjustment factor calculations for bonus share distributions involving different class share is done similar to "Stock Distributions - Different Class Shares" explained below.

Stock Distributions - Different Class Shares

Sometimes companies issue stock distribution in the form of a different share class. This is becoming more common recently as a way for founders to retain control in the company by introducing new non-voting share classes. For example, Google was trading under the class A shares until recently as April 2014 when the company decided to introduce Google Class C shares. The Google Class C were issued and distributed to existing Class A shareholder in the form of 1:1 stock distribution (which on surface may look similar to 1 for 1 stock split). Google A shares get one vote, C shares get none and B shares get 10 votes. Anyone who held A shares at the time of the split got an equal number of C shares but their voting power did not increase.

Similar to Google, Zillow also introduced new class C shares in 2015 and distributed 2 shares of Class C for each share Class A (again, it may look 2:1 stock split on the surface but it is not). Stock Split is a split on the same class share and results in increase in shares outstanding. In stock distributions of different class shares, new shares of different class are introduced so it doesn't impact shares outstanding of current class share. Hence, no adjustment to historical volume is required.

Another important thing to note here is that in both these cases, the original Class A symbols (GOOG in case of Google, Z in case of Zillow) was reused for the newly introduced Class C shares and Class A shares were given new symbols for trading (GOOGL in case of Google Class A, ZG in case of Zillow). So if you retrieve the history of GOOG (current Class C Symbol), the history only starts from April 2014 onwards. For current Class A Symbol GOOGL, the history goes back as early as when it started trading (Sept, 2004).

Xignite calculation methodology to handle the stock distribution is technically very similar to a Spinoff stock distribution as explained in the next section. The only difference is that the closing price used in Spinoff adjustment factor computation is from the spun-off entity versus the closing price of the different class stock being distributed in this case.

$$Adj\ Factor\ =\ \frac{(Previous\ Closing\ Price)\ -\ \{\ (Previous\ Closing\ Price\ of\ the\ distribution\ shares)*\ Distribution\ Ratio\}}{(Previous\ Closing\ Price)}$$

Note

- ***Previous Closing Price*** *in the formula above is the Closing price on T-1, assuming T is the EX Date of the stock distribution corporate action*
- *In case the distributed shares are issued first time in the market, the closing price is used from the when-issued instrument on T-1 (from the last trading day of the when-issued instrument).*

*Adjusted Price = Unadjusted Price * Adj Factor*

Spinoffs (a.k.a Demergers)

A **spinoff** is the creation of an independent **company** through the sale or distribution of new shares of an existing business or division of a parent **company**. Companies wishing to streamline their operations often sell less productive or unrelated subsidiary businesses as spinoffs. Spinoffs are becoming more and more common recently. In the year 2015 alone, there were close to 50 spinoffs in US market.

In a **spinoff event**, shares of the spun-off entity are distributed to the equity shareholders of the parent organization at a ratio established by the parent. For example, in eBay/PayPal spinoff case,1 share of Paypal was distributed for every share of eBay.

In economic terms, a spinoff is equivalent to a dividend payout with the exception that the dividend payment is in the form of new-company stock just being floated in the market. The number of shares of the parent company before/after the spinoff event remains the same, so there is no adjustment required to historical volume data point. On the Ex date of the spinoff event, the price of the parent company drops by the value of the new spunoff company. Since the part of the company value has spun-off into a separate company, the historical prices of the parent company prior to EX date requires an adjustment to the prices.

Xignite computes the spinoff adjustment factor similar to the approach used above for Stock Distribution - Different Class Shares except that the closing prices from when-issued spunoff instrument is used for the calculation. The calculation is also similar to cash dividend adjustment factor in the sense the value of the child spunoff company is subtracted from the parent company value to arrive at the adjustment factor.

$$Adj\ Factor\ =\ \frac{(Previous\ Closing\ Price)\ -\ \{\ (Closing\ Price\ of\ Spun\text{-}off\ "when\text{-}issued"\ instrument) * Spunoff\ Ratio\}}{(Previous\ Closing\ Price)}$$

Note

- ***Previous Closing Price*** *in the formula above is the Closing price on T-1 of the parent company, assuming T is the EX Date of the* ***Spinoff*** *corporate action*

$$Adjusted\ Price = Unadjusted\ Price * Adj\ Factor$$

Mergers and Acquisitions

The vast majority of mergers are actually acquisitions in which one company acquires the other. Since the acquiring company is using its assets to purchase a new asset (another company), typically no adjustment is required to the historical prices of the surviving company. The acquired company's history stops on the last trading day of that entity.

Some of merger cases are "merger-of-equals" and are complex in nature. These mergers often involve business restructuring and significant changes to the capital structure resulting in a formation of a new entity all together. Also, the distributions to existing shareholders often involves both cash and stock components in the new entity. In such cases, Xignite does not compute the adjustment factors and stitch the history. Customers are still able to pull the adjusted historical prices of the individual companies pre-merger and complete adjusted history of the new entity post-merger.

Share repurchase (a.k.a Buybacks)

Buybacks involves companies offering cash to shareholder in return of the stock. Since the share repurchase results in company using some of cash assets to purchase back the stock, so it doesn't really impact its value in the market. Hence, no adjustment is required for the share repurchase (buybacks).

Appendix 1: Example Adjustment factor calculations

Example 1: 2-for-1 stock split on Day 4

Day	**Closing price**	**Split factor**	**Split-adjusted price**
1	$12.00		$12.00 x 0.5 = **$6.00**
2	$11.00		$11.00 x 0.5 = **$5.50**
3	$11.50		$11.50 x 0.5 = **$5.75**
4	$6.00 (2:1 split)	0.5	**$6.00**
5	$6.25		**$6.25**

Example 2: 1-for-4 stock split on Day 4

Day	**Closing price**	**Split factor**	**Split-adjusted price**
1	$12.00		$12.00 x 4 = **$48.00**
2	$12.50		$12.50 x 4 = **$50.00**
3	$12.25		$12.25 x 4 = **$49.00**
4	$50.00 (1:4 split)	4	**$50.00**
5	$50.25		**$50.25**

Example 3: $1 dividend on Day 4

Day	**Closing price**	**Dividend**	**Dividend adjustment factor**	**Proportional adjusted price**
1	$10.50			$10.50 x 0.9 = **$9.45**
2	$10.75			$10.75 x 0.9 = **$9.68**
3	$10.25			$10.25 x 0.9 = **$9.23**
4	$10.00	$1.00	($10.25 - $1)/$10.25 = 0.90	**$10.00**
5	$9.75			**$9.75**

Multiple adjustments

There may be more than one split or dividend corporate action over a given time range, in which case some historical prices can be adjusted by the cumulative effect of multiple corporate actions. For illustrative purposes, below are examples adjusting for multiple splits and dividends.

Example 4: Multiple splits - Day 4 2-for-1 split, Day 7 1-for-4 split

Day	**Closing price**	**Split factor**	**Split-adjusted price**
1	$12.00		$12.00 x 4 x 0.5 = **$24.00**
2	$11.00		$11.00 x 4 x 0.5 = **$22.00**
3	$11.50		$11.50 x 4 x 0.5 = **$23.00**
4	$6.00 (2:1 split)	0.5	$6.00 x 4 = **$24.00**
5	$6.50		$6.50 x 4 = **$26.00**
6	$6.25		$6.25 x 4 = **$25.00**
7	$24.25 (1:4 split)	4	**$24.25**
8	$25.00		**$25.00**

Example 5: Multiple dividends - Day 3 $1.50 dividend, Day 7 $1 dividend

Day	Closing price	Dividend	Dividend adjustment factor	Proportional adjusted price
1	$11.75			$11.75 x 0.9 x 0.88 = **$9.31**
2	$12.00			$12 x 0.9 x 0.88 = **$9.50**
3	$11.00	$1.50	($12 - $1.50)/$12 = 0.88	$11 x 0.9 = **$9.46**
4	$10.50			$10.50 x 0.9 = **$9.45**
5	$10.75			$10.75 x 0.9 = **$9.68**
6	$10.25			$10.25 x 0.9 = **$9.23**
7	$10.00	$1.00	($10.25 - $1)/$10.25 = 0.9	**$10.00**

Example 6: Splits and dividends - Day 3 2-for-1 split, Day 7 $1 dividend

Day	Closing price	Split factor	Dividend	Dividend adjustment factor	Proportional adjusted price
1	$21.75				$21.75 x 0.5 x 0.9 = **$9.79**
2	$22.00				$22.00 x 0.5 x 0.9 = **$9.9**
3	$11.00 (2:1 split)	0.5			$11 x 0.9 = **$9.46**
4	$10.50				$10.50 x 0.9 = **$9.45**
5	$10.75				$10.75 x 0.9 = **$9.68**
6	$10.25				$10.25 x 0.9 = **$9.23**
7	$10.00		$1.00	($10.25 - $1)/$10.25 = 0.9	**$10.00**

Example 7: Google Class C Stock distribution (EX-Date: 4/3/2014, 1 GOOG share for 1 GOOGL)

Date	**Closing price GOOGL (Cls A)**	**Closing Price GOOG (Cls C - WI)**	**Adjustment Factor**	**Adjusted price GOOGL**
3/31/2014	$1114.51			1114.51 * 0.5005 = **$557.81**
4/1/2014	$1134.89			$1134.89 * 0.5005 = **$568.01**
4/2/2014 [T-1]	$1135.1	$567 *	(1135.1-$567)/1135.1 **= 0.5005**	$1135.1 * 0.5005= **$568.1**
4/3/2014 [EX-Date, T]	$571.5		1	**$571.5**
4/4/2014	$545.25		1	**$545.25**

* Price on the last trading day of “when-issued” period

Example 8: PayPal Spinoff from eBay (EX Date: 7/20/2015, 1 PYPL Share for 1 EBAY)

Date	**Closing price EBAY**	**Closing Price PYPL - WI**	**Adjustment Factor**	**Adjusted price EBAY**
7/16/2015	$65.59			65.59 * 0.4209 **= $27.61**
7/17/2015 **[T-1]**	$66.29	$38.39*	(66.29-38.39)/66.29 =0.4209	$66.29 * 0.4209 = **27.90**
4/20/2015 [EX-Date, T]	$28.57		1	**$28.57**
4/21/2015	$28.60		1	**$28.60**

* Price on the last trading day of “when-issued” period