New Features in Eventus® 8.0

The following features are new since Eventus 7.0. Eventus for WRDS and other annual subscribers received access to a subset of these features in interim releases 7.5, 7.6 and 7.7.

- Compatible with both current and last year's CRSP U.S. Stock Databases. (Eventus 7.x does not support the new daily calendar structure in the CRSP databases updated through 2005 or later. CRSP implemented the new calendar to accommodate data back to 1925. The new calendar is used even in the new Z-cut version of the database with data starting in 1962.)

- Event studies can use an arbitrary number of user-supplied factors in a linear model framework similar to the traditional market model. Include the factor returns in a SAS data set and point to the data set using the new Eventus statement option MYFACTORS=library.dataset. Each row of the data set must contain the calendar date of the returns in SAS date variable form and the factor returns in variables Factor1-Factor$n$, where n is the number of factors to be used in the event study model. To run an event study using the factors, specify FACTORS=n TWOSTEP on the Evtstudy statement. Note that n is the number of factors in addition to the market factor; to suppress the inclusion of the market index in the model, specify the Evtstudy statement option NOMARKET. To run a calendar-time portfolio regression, which does not use a separate estimation period and represents the abnormal return as the intercept of a single portfolio-level regression, omit the TWOSTEP option.

- Event studies can incorporate user-supplied "companion portfolios," or characteristic-dependent indexes in lieu of a market-wide index. To use this feature, create two SAS data sets. The first is the companion index return data set. It must contain one observation (row) for each day or month (or other interval as allowed in SASNONCRSP mode.) The date of the observation must be a SAS date variable named CALDT. Use the first of the month as the date of all monthly observations. The companion portfolio returns must be in sequentially numbered variables named CmpIdxR1-CmpIdxRk, where $k \leq 400$ is the number of portfolios. For example, decile portfolios returns would be in variables CmpIdxR1-CmpIdxR10. The order in which underlying portfolios are represented by the numbered variables is up to the user to decide and keep track of. The second data set, the portfolio assignments data set, must contain three variables: the PERMNO or non-CRSP issue key, YY, and Portfolio_Number. YY is the four-digit year, or the month or quarter, of the portfolio assignment. Represent a month or quarter using 12Y–(12–M) or 4Y–(4–Q), where Y is the four-digit year, M is the month (1=January, 12=December) and Q is the quarter number. For example, May 2000 is 12(2000)–(12–5)= 23,993 and third quarter 1970 is 4(1970)–(4–3)= 7879. Portfolio_Number is the integer portfolio number, corresponding to the CmpIdxRk variable numbers, to which the security is assigned in the year, month or quarter. For

example, with yearly assignments, an observation containing 54017, 1973 and 47 as the values of PERMNO, YY and Portfolio_Number respectively means that Eventus should substitute CmpIdxR47 for the market return used with PERMNO 54017 for all dates in 1973.

The portfolio assignments data set must be indexed by a composite SAS data set index named ISSUYRKEY that indexes by PERMNO (or other issue key in SAS-NONCRSP mode) and YY in that order. To create the index when creating the data set in a data step, use the data set option INDEX=, for example:

```
data myports(index=(issuyrkey=(permno yy)));
```

To index an existing data set, use PROC SQL, for example:

```
proc sql; create index issuyrkey on work.myports(permno,yy); quit;
```

A future release of Eventus will create the data set index automatically.

Point to the companion index return data set using the new Eventus statement option MyCompanionIdx=*library.member*. If the assignment interval is monthly or quarterly, specify MyCompanionFreq=MONTH or MyCompanion-Freq=QUARTER. If desired, specify a label for the class of companion portfolios using MyCompanionLabel=*label,* where *label* may not contain blanks. The default is My_Companion_Index.

Point to the portfolio assignment data set using the Eventus statement option Port1DS=*library.member*. (That's the digit one in the option keyword.)

The Request statement option Companion must be present for Eventus to use the companion portfolio returns. A simple program could look like:

```
eventus monthly mycompanionidx=work.mycmrets port1ds=work.myports;
   request companion;
   windows (-1,0) (-3,3) ;
   evtstudy;
```

- Event studies using CRSP can incorporate a user-supplied, non-CRSP market index without the inconvenience of moving the whole study to SASNONCRSP mode. This new feature supports a single market-wide index; also please see our new companion portfolio facility above. The user-supplied index takes the place of the CRSP value-weighted index. Place the index returns in a SAS data set that has one observation (row) for each day or month. The date of the observation must be a SAS date variable named CALDT. Use the first of the month as the date of all monthly observations. Point to the data set using the new Eventus statement option MyVWIndex=*library.member*. If desired, use MyVWLa-bel=*label* to specify a custom label for the index; no blanks are allowed. The default label is My_VW_Index. Finally, specify either of the Evtstudy statement options Value or Both; without one of these options, only the CRSP equal-weighted index will be used. A simple program could look like:

```
eventus myvwindex=work.russell1k;
   request;
   windows (-1,0) (-3,3) ;
   evtstudy value;
```

- The Evtstudy statement can output "window" cumulative or compounded abnormal returns directly to a SAS data set or ASCII file, often avoiding the need to run the separate Extract statement. Specify the Evtstudy statement option OUTWIN=library.member (e.g., outwin=work.windowcars) to create a SAS data set or FILEWIN=filename to create an ASCII file. Enclose filename in quotes if it contains blanks or if a full path is being provided. Filename may be a SAS file shortcut instead of a literal file name.

- The Extract statement is still available and has been improved. The old syntax still works, or specify Evtstudy statement-like options to select benchmarks, e.g., Raw, CP, MAR, MM, FF or FFM. More than one at a time may be specified, unlike versions 7.6 and earlier where only one benchmark type could be extracted at a time. The specified benchmarks must be present in the original event study to work in Extract. The BOTH, VALUE or EQUAL options may be used, when applicable, to select between results using value-weighted and equal-weighted indexes. The specified market index distinction must have been present in the original event study. For example, the only situation where one could choose any one of BOTH, VALUE or EQUAL would be where the BOTH option appeared on the EVTSTUDY statement.

- Time-series graphs of return, abnormal return, cumulative and compounded return, cumulative and compounded abnormal return are now available using the PLOT option on the Evtstudy statement.

- Fama-French three-factor model can be used as a general stock-by-stock benchmark model, not just with calendar-time portfolio regression and Ibbotson RATS approaches, using the FAMAFRENCH TWOSTEP option combination on the Evtstudy statement.

  The option combination FAMAFRENCH TWOSTEP selects the Fama-French (1993) three-factor model as the return-generating process using a separate estimation period. The model is:

  $$R_{jt} = \alpha_j + \beta_j R_{mt} + s_j SMB_t + h_j HML_t + \varepsilon_{jt}.$$

  where R_{jt} is the rate of return of the common stock of the jth firm on day t; R_{mt} is the rate of return of a market index on day t; SMB_t is the average return on small market-capitalization portfolios minus the average return on three large market-capitalization portfolios; HML_t is the average return on two high book-to-market equity portfolios minus the average return on two low book-to-market equity portfolios; ε_{jt} is a random variable that, by construction, must have an expected value of zero, and is assumed to be uncorrelated with R_{mt}, uncorrelated with R_{kt} for k≠j, not autocorrelated, and homoscedastic. See Fama and French (1993) for a detailed description of SMB_t and HML_t. β_j is a parameter that measures the sensitivity of R_{jt} to the return on the market index; s_j measures the sensitivity of R_{jt} to the difference between small and large capitalization stock returns; and h_j measures the sensitivity of R_{jt} to the difference between value and growth stock returns.

  The average abnormal return, cumulative abnormal return, buy-and-hold abnormal return and related concepts are analogous to those defined in the market model section of Appendix A.

- The momentum factor suggested by Carhart (1997) can be added to the Fama-French three-factor model using the MOMENTUM option (in addition to the FAMAFRENCH option, and other desired options such as TWOSTEP or IRATS) on the Evtstudy statement.

Option combination	Procedure
FAMAFRENCH MOMENTUM	Four-factor calendar-time portfolio regression
FAMAFRENCH IRATS MOMENTUM	Four-factor Ibbotson RATS regression
FAMAFRENCH TWOSTEP MOMENTUM	Four-factor stock-by-stock benchmark model

- When the OUTWIN= option is specified on the Evtstudy statement, and the Patell (default), Standardized Cross-Sectional, EGLS or Collins-Dent test is used in the event study, the output data set will include WLS weights and standardized CARs by default. One can still use WPREFIX= to specify a variable name prefix for the weights, but it is no longer necessary; the default prefix is CARWeight. The prefix for the standardized CARs is SCAR. To suppress weights and standardized CARs when using OUTWIN= with eligible tests, specify WEIGHTS=0 on the Evtstudy statement.

- New features are available for the Extract statement, which is no longer needed but still available for compatibility with earlier versions. (Extract's functionality is now available through the new OUTWIN= and FILEWIN= options of the Evtstudy statement.) When the OUTSAS= option is specified and the Patell (default), Standardized Cross-Sectional, EGLS or Collins-Dent test was used in the original event study, specifying the WEIGHTS option on the Extract statement will add WLS weights and standardized CARs to the output data set. One can still use WPREFIX= as in earlier versions to select weights and specify a variable name prefix, but it is no longer necessary; if WEIGHTS is specified, the default prefix is CARWeight. The prefix for the standardized CARs is SCAR.

- When the Request statement option CUSIPERM is specified, most listing output and output data sets now include the original CUSIP from the request file. In data sets, the variable name is Request_File_CUSIP.

- Trading-cost adjustment using Nasdaq bid and ask data, introduced in Eventus 7.0, now can be reversed (establish position at bid, liquidate at ask), or made conditional in conjunction with the SHORT option (open long positions at the ask, open short positions at the bid). The TRADINGCOST option of the Evtstudy statement, introduced in Eventus 7.0, now accepts the arguments =REVERSE and =LONGSHORT to implement the above functions.

  When you specify TRADINGCOST=REVERSE, the first return is adjusted by assuming that the security is purchased at the bid price; the final return is adjusted by assuming that the security is sold at the ask price.

  The TRADINGCOST=LONGSHORT specification is for use when the SHORT option appears on the REQUEST statement and the sample contains a mixture of securities held long and short. It performs the buy at the ask, sell at the bid adjustment described in the User's Guide for securities held long, and the reverse

adjustment described above for securities held short. In this context, the reverse adjustment can be interpreted as "sell short at the bid, buy back at the ask."

- The RUNNING option introduced in Eventus 7.0 now creates running compounded abnormal returns when the BUYHOLD option is in effect. Previously running *cumulative* abnormal returns were created regardless of BUYHOLD.

- The SIZEINDX=OWNSYSTEM, BETAINDEX=OWNSYSTEM and STDINDEX=OWNSYSTEM options select size decile, beta decile and standard deviation decile portfolios, respectively, as market index replacements. NYSE-AMEX decile portfolios are selected used for NYSE and AMEX stocks and Nasdaq portfolios for Nasdaq stocks. For SIZEINDX, the OWNSYTEM differs from OWNMARKET in that the latter selects NYSE decile portfolios for NYSE stocks and AMEX decile portfolios for AMEX stocks.

- Eventus internally checks SASNONCRSP mini-database data sets and stops and prints a log message if the data sets do not meet requirements. Such checking will not necessarily find all problems, so users still should take care in building the data sets.

- SASNONCRSP mini-database data sets no longer need to be indexed before use with Eventus. Eventus will index the data sets if necessary.

- The SASNONCRSP mini-database header data set (HEADDS= specification) is no longer needed. Eventus internally creates a temporary header data set.

- The new Eventus statement option NOMINICHECK, for use in conjunction with the SASNONCRSP option, causes Eventus to skip the new mini-database integrity checks, skip checking for and building missing data set indexes, and skip building a temporary header data set (requiring the user to supply one and use the HEADDS option). The NOMINICHECK option may improve performance for runs with larger mini-databases but places the burden on the user to ensure the correct mini-database format.

- The ESTINTER option, which allows different data frequencies to be used for the estimation period and event period, now is allowed in more situations than before. The FFF_EST= option, which works like the FFF= option, has been introduced to specify Fama-French factor input data for the estimation period frequency.

- The comparison-period mean and raw returns benchmarks, selected by the Evtstudy statement options CP and RAW, now are available when the VALUE option also is in effect. Previously the CP and RAW options were available only with the BOTH option or the default equal-weighted index.

- Several messages displayed in the SAS log have been edited for clarity, and new messages introduced to provide additional information. Several labels and head-

ings in listing output and variable name labels in output data sets have been enhanced also.

- When the event date from the request file is altered by an AUTODATE, SHIFT1 or SHIFT2 option, or by a non-daily data frequency option such as MONTHLY, the original event date is stored under the variable name Original_*name* where *name* is the corresponding event date variable Eventdat, Eventda1, Eventda2, CRSPday, CRSPday1 or CRSPday2 as documented in the *User's Guide.*

- The various types of market capitalization (size) decile portfolios are more clearly distinguished in the output.

- When the user specifies a SIZEINDX, BETAINDEX or STDINDEX option in an event study, the capitalization decile or risk decile number appears in the parameter estimates section of the printed output (unless PAGE=TALL is specified, or the parameter estimates section is suppressed with the NOPLIST option or NOPRINT option).

- When the user specifies a SIZEINDX, BETAINDEX or STDINDEX option in a Returns statement run with the VSAS option, the capitalization decile number or risk decile number appears in the output SAS data set under the variable (column) name __CAP__. (This has been done for event studies since several releases ago, but is new for the Returns statement output.)

- The PVALUE option of the EVTSTUDY statement prints numeric p-values instead of significance symbols.

- The STACK option of the EVTSTUDY statement has been completely redesigned and now prints medians below means and numeric p-values below test statistics. It is no longer considered experimental.

- New and old in version 8.0: The event study output now flags the positive:negative abnormal return count with symbols like <<< and >>> to indicate the significance and direction of the generalized sign test. This was a feature of Eventus 6.x output that several users requested be brought back.

- The option NONAMES is now available on the PRICES, RETURNS and VOLUME statements. It has the same effect as the longstanding EVTSTUDY statement option of the same name: it suppresses the listing of names and data availability that appears by default in the Output window or .lst file. This can be useful for very large data extractions.

- The variable _WEIGHT_ in output data sets has been changed from five characters to 14 characters and now provides a more specific description of non-default indices or decile portfolios.

- The WINDOWS statement for non-TWIN event studies is not sensitive to spacing. As long as the word `windows` is followed by at least one blank, zero or more blanks may appear inside and between window specifications.

- Event date labels ("descriptors") for TWIN event studies can be up to 64 characters (letters, number, underscores) each. Blanks also are allowed if the entire label is enclosed in a SAS %str function, for example
  `windows event1=%str(Merger Announcement) event2=Cancellation;`

- In monthly event studies with CRSP data, calendar event dates in a SAS data set request file can be any day of the month. Previously, calendar dates in a text request file could be any day but a SAS data set request file for monthly runs had to contain first-of-month dates.

Eventus 8.0 is compatible with SAS version 9.1.x. For single-fee, single-version perpetual licensees, compatibility with changes that SAS Institute may make to SAS 9.x through mid-2008 will be maintained. Our annual Eventus subscribers always have access to our latest updates and version upgrades at no further charge during the paid license subscription period.