Barra Europe Equity Model (EUE4)

Frequently Asked Questions

May 2014

Contents

msci.com

msci.com

An MSCI Brand

General FAQs

1. What are the major highlights of the Barra Equity Model (EUE4)?

Major highlights of EUE4 include:

- **Coverage of 34 countries in Western and Eastern Europe.**

- **Full coverage of the MSCI Europe Index and the MSCI FM Central & Eastern Europe & CIS Index.**

- **As of March 2013, 17,000+ assets covered,** including ADRs and GDRs, cross-listed securities, and 2,500+ frontier market securities.

- **Daily model updates,** which includes factor exposures, covariance matrices, and specific risk forecasts.

- **Optimization Bias Adjustment** to reduce bias within the factor covariance matrix by scaling up where risk is under-forecast and scaling down where risk is over-forecast.

- **Volatility Regime Adjustment (VRA)** to calibrate factor volatilities to current levels, resulting in faster response to market trends. VRA reduces the under-prediction of risk when entering a period of increased volatility and the over-prediction of risk when exiting a period of elevated volatility.

- **Updated specific risk model,** incorporating Volatility Regime Adjustment and Bayesian Adjustment techniques for greater forecast accuracy.

- 1**1 style factors to model risk sources not captured by market or industry factors**. The enhanced style factor structure includes separate Beta and Residual Volatility factors (replacing the EUE3 Volatility factor), Non-linear Size, and a Value factor split into three separate factors: Book-to-Price, Earnings Yield, and Dividend-to-Price.

- **Base, UK-derived, and Eastern Europe-derived** versions to cater to different investment perspectives.

- **Daily model history dating back to January 1995.**

- **29 industries based on GICS®.**

- **Available in Long-, Short-, and Daily-horizon versions.**

- **Available in Barra Portfolio Manager, Barra Aegis, and Barra Models Direct.**

2. If I am a EUE3 client, will I be automatically upgraded to EUE4?

No, if you would like to subscribe to EUE4, contact MSCI Client Service.

3. Is EUE3 going to be discontinued?

No, EUE3 will still run in parallel to EUE4. We currently do not have any plans to decommission EUE3.

4. Which horizon of EUE4 should I use?

EUE4L, the long horizon of the model, is intended for investors with investment horizons greater than 6 months and provides the most stable risk forecasts. EUE4S, the short version of the model, is designed for most accurate forecasts at the one-month horizon. EUE4D, the daily version of the model, provides the most accurate risk forecasts for very short horizons such as 1 day.

5. What is the difference between the base version and the derived versions?

The difference between the base and derived models is summarized below.

Model Codes	Industries Covered	Market Factor	History Start Date
EUE4BAS	29 Industry Factors based on GICS®	Europe	30-Dec-1994
EUE4DUK	29 Industry covered based GICS® Each industry has a set of two factors, one representing the UK Industry and the other representing the Continental Europe Industry	UK Continental Europe	30-Dec-1994
EUE4DEE	29 Industry covered based GICS® Each industry has a set of two factors, one representing the Eastern Europe Industry and the other representing the Western Europe Industry	Eastern Europe Western Europe	30-Dec-1994 Eastern Europe factors start 31-Dec-1996

All model combinations of the investment horizon and version include the same asset universe. Estimation Universe is also identical between versions.

Each version is available in three horizons with a total of 9 available choices.

Model Codes	Description
EUE4BAS<L/S/D>	Europe Equity Model Base Model <Long/Short/Daily>
EUE4DUK<L/S/D>	Europe Equity Model Derived-UK <Long/Short/Daily>
EUE4DEE<L/S/D>	Europe Equity Model Derived-Eastern Europe <Long/Short/Daily>

6. Which markets are covered in EUE4?

EUE4 Country Coverage				
Austria	Denmark	Hungary	Netherlands	Slovenia
Belgium	Estonia	Iceland	Norway	Spain
Bosnia and Herzegovina	Euro	Ireland	Poland	Sweden
Bulgaria	Finland	Italy	Portugal	Switzerland
Croatia	France	Kazakhstan	Romania	Turkey
Cyprus	Germany	Latvia	Russia	Ukraine
Czech Republic	Greece	Lithuania	Serbia	United Kingdom

7. Are there any new frontier markets covered in EUE4 that were not previously covered in EUE3?

We have added coverage for Bosnia and Herzegovina, Bulgaria, Kazakhstan, Serbia, and Ukraine.

8. What type of data is delivered in EUE4?

We deliver the following set of data for EUE4:

Market Data	Model Data
Market Identifiers	Factor Exposures**
Descriptive data	Factor Covariances* (also pre-VRA Covariance and Unadjusted Covariance)
Closing Price	Total Risk*
Daily and Monthly Asset Returns	Linked Specific Risk*
Exchange Rates	Historical Beta*
Dividend Yield	Predicted Beta (Local and Global)*
	Factor Returns**
	Asset Specific Returns**
	Estimation Universe

*Choice of 9 versions – EUE4BASL, EUE4BASS, EUE4BASD, EUE4DEEL, EUE4DEES, EUE4DEED, EUE4DUKL, EUE4DUKS, EUE4DUKD

**Choice of 3 versions – EUE4BAS, EUE4DEE, EUE4DUK

Exchange Traded Funds (ETFs) are included in the standard package.

9. What is the difference between the coverage universe and the estimation universe? What is the estimation universe for EUE4?

Coverage universe is the set of all securities for which the model provides risk forecasts. Estimation universe, by contrast, is the subset of stocks that is used to actually estimate the model.

The EUE4 estimation universe utilizes the MSCI All Country Europe Investable Markets Index (AC Europe IMI), which aims to reflect the full breadth of investment opportunities within developed and emerging markets by targeting 99 percent of the float-adjusted market capitalization.

In addition, because EUE4 also covers frontier markets, MSCI Frontier Markets (FM) Index constituents are automatically included in the estimation universe. However, some of these countries have too little coverage in the MSCI FM Index. We thus add stocks with relatively higher liquidity to improve the estimation universe coverage for these countries.

10. What is Optimization Bias Adjustment?

The Optimization Bias Adjustment methodology improves risk forecasts for optimized portfolios. It helps reduce the forecasting bias within the factor covariance matrix by scaling up the risk when it is under forecast and scaling it down when the risk is over forecast.

For more details, refer to the USE4 Model Methodology Notes.

6 of 15
msci.com

11. What is Volatility Regime Adjustment?

The Volatility Regime Adjustment methodology calibrates factor volatilities to current levels. It aims to reduce the under-prediction of risk when entering a regime of increased volatility and the over prediction of risk when exiting a period of elevated volatility, thus resulting in a faster response to market trends.

For more details, refer to the USE4 Model Methodology Notes.

12. How does EUE4 treat public holidays?

EUE4 is a daily updated model and it covers developed, emerging, and frontier markets for Europe and CIS region, therefore there are no gaps in the delivery of model data. We deliver model data on all weekdays even if the majority of the markets in the model are closed.

13. How is the specific risk model built for EUE4?

The EUE4 model uses daily specific returns and combines time series estimation with a structural component similar to the EUE3 model. The model now adds a Bayesian shrinkage technique, which has been designed to reduce the effect of over-predicting the risk of high volatility stocks or under-predicting the risk of low volatility stocks. In addition, we apply Volatility Regime Adjustment to the specific risk forecasts.

For more information, refer to the EUE4 Model Empirical Notes.

14. Which types of assets are covered in EUE4?

EUE4 covers the following assets:

- Stocks

- ADRs

- GDRs

- Cross-listed assets

- Exchange Traded Funds (ETFs)

- Equity Index Futures (only in Aegis and Barra Portfolio Manager)

15. How does EUE4 cover ADRs/GDRs and Cross-listed assets?

The country of exposure of a depositary receipt (DR) or a cross-listed asset is determined by its root ID. To determine an asset's root ID, MSCI Barra uses a set of pre-defined rules.

16. What are synthetic assets and where are they used?

Synthetic assets provide users the flexibility to choose a different country of exposure for a cross-listed or depositary receipt (DR) asset.

Generally, MSCI uses pre-assigned MSCI countries for cross-listed or DR assets. However, some clients may prefer a different country of exposure for these assets. In such cases, a synthetic asset is created with essentially the same characteristics as its underlying assets, but with a different

country and currency of exposure. Some risk index exposures for synthetic assets may change if those exposures are standardized within the country of exposure. Attributes that are not dependent on country of exposure, such as specific risk, do not change.

Synthetic assets can be identified by their modified Barra ID. A synthetic asset ID matches the underlying asset's ID, except for the third letter, which is replaced by the letter Q or Z. For example, HSBC has a Barra ID of HKGAAU1 and an exposure to Great Britain, but a synthetic ID of HKQAAU1 with an exposure to Hong Kong.

For more information, see Understanding Barra Synthetic Assets.

17. What are market factors? What are the market factors in the base and derived version?

The Market Factors in EUE4 are similar to the World factor in the Barra Global Equity Model (GEM3). All equity assets have unit exposure to the Europe Market factor in the Base Model or to either the Home or Ex-Home Market factors in the derived models.

For details, refer to the EUE4 Empirical Notes.

18. What happens when countries transition to Euro?

The legacy currency continues to appear in the covariance matrix and factor returns files although that data starts matching the Euro factor when the transition is made. The risk-free rate for the currency gets replaced by the Euro's risk-free rate. Prices and capitalization for assets in those countries will be quoted in the Euro. Note that the historical data does not get reposted and continues to show the legacy currency.

19. Why is Euro available as an analysis numeraire prior to introduction of the Euro?

Prior to its introduction, the Euro's proxy is the Deutsche Mark, which is the base currency for the model for this period.

20. Is EUE4 available in the Barra Integrated Model (BIM)? If not, when will EUE4 be available in BIM?

Currently, only EUE3 is available in the Barra Integrated model BIM301. The EUE4 model will be added to the next version of BIM.

21. Will EUE4 be available on Factset?

Yes, EUE4 is available on Factset. For more information, contact MSCI Client Service.

22. Does MSCI have a statistical model that can be used with the EUE4?

Yes, EUE4 can be used together with the Europe Stochastic Factor Model (EURS1). Using both models together can uncover hidden sources of risk that may not be captured by any single model at any given point in time. For more information, contact MSCI Client Service.

Models Direct FAQs

1. In which format are the EUE4 flat files released?

The EUE4 flat files are released in two different formats. To see the layout of the flat files, refer to:

- SM/GM File Format Guide (|-delimited database friendly format)
- Legacy File Format Guide (Barra's traditional *.csv format)

2. Where can I get sample files?

Sample files for EUE4 are available along with supporting documentation in the Models Direct Library.

3. How are the EUE4 Models Direct files different from EUE3 Models Direct files?

A key difference is that EUE4 updates full model data daily whereas EUE3 updates covariances daily and exposures monthly. Because EUE4 is a daily model, certain monthly files will no longer be delivered in the GM format. In addition, the EUE4 factor order in the GM files is now consistent with the factor order in all the new Barra models, which is:

1. Risk Indices

2. Industries

3. Countries

4. Currencies

5. Market (Europe/UK-Continental Europe/Eastern Europe-Western Europe)

The EUE4 legacy format files also use an updated format that is shared with GEM3 and used as a standard for all the new global/regional models.

For further details, see the SM/GM File Format Guide and Legacy File Format Guide.

4. From where can I download the EUE4 flat files?

Ongoing data is delivered to your ftp account at ftp.barra.com.

EUE4 model data in Models Direct is delivered in both the Barra formats: Legacy and Standard Format (GM). You can find your required files in the following directories on the ftp site:

- Monthly (GM) and Daily (GMD) packages including ETF files are located under: */eue4*
- Monthly legacy files are located under: /eue4
- Daily legacy files are located under: /eue4/daily

5. How much history is available? How can historical data be accessed?

History back to 30-Dec-1994 is available for all model versions/horizons. Historical data will get accessed using a special ftp account. To receive model history, contact MSCI Client Service.

msci.com

6. What is the estimated file size of the model?

For full history back to 3-Dec-1994 all 9 model versions, following are the file sizes:

- Daily GMD packages-66.7 Gigabytes

- Monthly GM packages-0.55 Gigabytes

For EUE4BAS per model horizon L/S/D, following are the file sizes:

- Daily GMD Packages-7.41 Gigabytes

- Monthly GM Packages-62.57 Megabytes

For EUE4DEE and EUE4DUK, following are the file sizes:

- Daily GMD Packages-8.46 Gigabytes per model horizon L/S/D.

- Monthly GM Packages-71.38 Megabytes

For any additional year of history, you should spare between 0.90 and 1.25 Gigabytes of additional space.

7. How will the daily files be delivered to users and at what time?

The ongoing daily files will be uploaded to the ftp site under the */eue4* directory. The target delivery time for EUE4 flat files is 06:00 a.m. GMT. End of month files will be published the 2nd calendar day after last trading day of previous month before 6 a.m.

8. How often will files get purged from the ftp site?

Files older than 95 calendar days are removed from the FTP site, inclusive of files in the root directory, and files in the /bime or any /[model] or /[model]_daily folders. (e.g. /gem3, use3s_daily). Certain files that are delivered infrequently or only once per model release remain on the site past 95 days.

9. The previous Europe Equity model, EUE3, includes additional G7 currencies for Models Direct clients. What additional currencies are covered in EUE4?

In Barra Models Direct, EUE3 includes additional currency factors for Australia, Canada and Japan. In addition, New Zealand and Singapore are included in EUE4.

10. Why are certain factors missing from older dates in the historical data?

Several Eastern European countries do not have a history in the model going back to 30-Dec-1994. For a list of these countries, refer to the EUE4 Datasheets. In addition to the country and currency factor returns missing for these factors, any other factor dependent on this data may have a short history too. For example, the Eastern Europe market factor and the Eastern Europe Industries factors in the EUE4DEE files do not start until 31-Dec-1996, when a large number of Eastern European countries enter the model. Note that in the GM format, factors appear in the Covariance matrix and Factor return files only after their start date. In legacy format, all factors are present in the Covariance matrix (rows/columns with zeros if the factor does not yet exist in the model) and Factor returns files (empty cells for missing values).

msci.com

11. What is the procedure to pick up new assets? How are intra-month asset additions handled?

Because EUE4 is a full daily updated model, there is no such thing as intra-month asset additions. The model picks up new assets on a daily basis and calculates exposures, total risk, and specific risk figures for new asset additions.

12. What is the difference between the historical beta and predicted (fundamental) beta fields?

Historical beta is computed as the slope coefficient in a time-series regression of excess stock return against the cap-weighted excess return of the estimation universe. This approach is robust for liquid assets with sufficiently long history but has the following drawbacks:

- It tends to underestimate the Beta of illiquid assets which trade rarely and,

- It is not practical to estimate the Beta of recent IPO-s.

To circumvent these difficulties, beta priors were introduced in EUE4 to blend the beta of recent IPO-s and illiquid assets. The prior is the cap-weighted GICS sector average Beta of liquid stocks with sufficiently long return history.

For more information regarding historical beta, refer to the EUE4 Empirical Notes.

Predicted betas are calculated using the asset's exposures and the factor covariance matrix as input. These betas are calculated using the estimation universe as the market. The global predicted beta uses the entire estimation universe whereas the local one uses only the estimation universe assets belonging to the asset's country of exposure. Details are available in Predicted Beta Notes.

Historical betas and predicted betas are calculated daily in EUE4.

13. What is the difference between local and global predicted beta fields?

Local predicted beta is the predicted beta calculated against the estimation universe assets that have same country of exposure as the asset analyzed. As a result, it excludes any current effects. On the other hand, global predicted beta is calculated using the entire estimation universe of the model as the market (with Euro as the base currency).

14. How are currency factor returns calculated?

EUE4 calculates currency factor returns from currency X's perspective, using the following formula:

$$r_c(t) = \frac{FX_c(t_0)/FX_N(t_0)}{FX_c(t)/FX_N(t)} - 1 + RFR_c(t_0) - RFR_N(t_0)$$

where,

$r_c(t) = currency\ factor\ return\ for\ ABC\ currency\ for\ time\ t$

$FX_c(t_0) = exchange\ rate\ \ of\ foreign\ currency\ for\ time\ zero$

$FX_N(t_0) = exchange\ rate\ of\ local\ currency\ for\ time\ zero$

$FX_c(t) = exchange\ rate\ of\ foreign\ currency\ for\ time\ t$

$FX_N(t) = exchange\ rate\ of\ local\ currency\ for\ time\ t$

msci.com

$RFR_c(t_0) = foreign\ risk\ free\ rate\ at\ time\ zero$

$RFR_N(t_0) = local\ risk\ free\ rate\ at\ time\ zero$

For example, to calculate factor returns for 3/31/2008, the model uses the 3/31 rates for time t and 2/29 rates for time t-1. To calculate daily factor returns, the model converts the annualized monthly risk-free rates to the daily horizon using 252 trading days. To calculate monthly factor returns, the model compounds daily factor returns in EUE4 rather than running a separate monthly regression.

In the EUE4 model, currency factor returns are calculated from the Euro's perspective.

15. Why are there gaps in the UK Equity factor return in EUE4DUK model's files when on the same day, there are returns for Continental Europe factor?

These days correspond to UK Market holidays so there is no data to calculate the HOME factor's returns.

16. How are the ETF risk and beta values calculated in Models Direct?

The ETF beta and yield values are a weighted sum of the asset-level beta and yield values. All missing beta values are replaced by 1 and the missing yield values by 0. Both predicted and historical betas are the global betas, not local betas. An ETF's specific risk value is a weighted value of the asset-level specific risk numbers and the linked specific risk is ignored in this calculation. The total and specific risk values are available.

17. Are there any differences between GEM2 and EUE4 flat files? What about GEM3 and EUE4?

GEM2 is a model with risk (total and specific), asset exposures, and factor covariances updated on a monthly basis. EUE4 and GEM3 deliver similar sets of data fully updated on a daily basis.

18. As a EUE4 GM files client, can I use the same ID history in EUE3 and EUE4?

Yes, you can use the EUE4 Asset ID and Asset Identity files for both models. The reason behind this is that Asset ID and Asset Identity file in EUE3 is a subset of the files delivered in EUE4.

19. What GMD daily data is delivered in EUE4?

The following set of data is delivered in the GMD_EUE4<BAS/DEE/DUK><L/S/D>_100_yymmdd.zip package:

- EUE4<BAS/DEE/DUK><L/S/D>_100_Asset_Data.yyyymmdd
- EUE4<BAS/DEE/DUK><L/S/D>_100_Asset_Exposure.yyyymmdd
- EUE4<BAS/DEE/DUK><L/S/D>_100_Asset_GLBeta.yyyymmdd
- EUE4<BAS/DEE/DUK><L/S/D>_100_Asset_LSR.yyyymmdd
- EUE4<BAS/DEE/DUK><L/S/D>_100_Covariance.yyyymmdd

msci.com

- EUE4<BAS/DEE/DUK><L/S/D>_100_DlyFacRet.yyyymmdd

- EUE4<BAS/DEE/DUK>_100_Asset_DlySpecRet.yyyymmdd

- EUE4_Asset_ID.yyyymmdd

- EUE4_Asset_Identity.yyyymmdd

- EUE4_Daily_Asset_Price.yyyymmdd

- EUE4_ESTU_POR.yyyymmdd

- EUE4_Rates.yyyymmdd

20. Why do some IDs differ between the EUE3 and EUE4 legacy-formatted files?

Like every legacy-formatted file, the RSK file is a snapshot in time. Historical files are never updated with ID corrections until a history refresh. So, some EUE4 IDs are different because EUE4 is newer. You can check the Asset_ID file for a cumulative history of ID changes.

21. As a BIM301L/S client, can I use the same ID history in BIM and EUE4?

EUE4 covers some frontier market assets that are not delivered in BIM. We are currently working on integrating all Asset ID and Asset Identity file information for all models in one single set of files that will be used as a security identifier master for all Barra Equity Models.

Aegis FAQs

1. Do I need to upgrade my Aegis version to use EUE4 model?

EUE4 can only be accessed in Aegis versions 4.3 or later. To get the latest functionality, we recommend you download the latest Aegis version, which is Aegis 4.4.3.

2. How much history is available? How can historical data be accessed?

The initial release of EUE4 includes only the ongoing data downloads. Additional historical data dating back to January 1995 for daily and monthly frequencies will be available in May 2013.

3. Where can I find a description of the portfolios supplied with EUE4?

For a list of portfolios supplied with EUE4, see the Aegis Benchmarks on the MSCI Client Support site. In addition to portfolios supplied with the EUE3 model, we now deliver a number of MSCI Frontier Market portfolios for the Europe and CIS regions.

4. How much portfolio history is provided with EUE4?

For more information on start dates, see the Aegis Benchmarks on the Barra Support site.

Barra Portfolio Manager FAQs

1. How much history is available?

The initial release of EUE4 includes only the ongoing data downloads with limited history (up to 13 months). Additional historical data dating back to January 2003 will be available before July 2013.

2. How much portfolio history is provided with EUE4?

For information about the history provided with EUE4, refer the MSCI Client Support site.

3. How do I get access to EUE4 in Barra Portfolio Manager?

To get permissions for EUE4 in Barra Portfolio Manager, contact your account manager.

Client Service Information is Available 24 Hours a Day

clientservice@msci.com

Americas		Europe, Middle East & Africa		Asia Pacific	
Americas	1.888.588.4567 (toll free)	Cape Town	+ 27.21.673.0100	China North	10800.852.1032 (toll free)
Atlanta	+ 1.404.551.3212	Frankfurt	+ 49.69.133.859.00	China South	10800.152.1032 (toll free)
Boston	+ 1.617.532.0920	Geneva	+ 41.22.817.9777	Hong Kong	+ 852.2844.9333
Chicago	+ 1.312.675.0545	London	+ 44.20.7618.2222	Seoul	00798.8521.3392 (toll free)
Monterrey	+ 52.81.1253.4020	Milan	+ 39.02.5849.0415	Singapore	800.852.3749 (toll free)
New York	+ 1.212.804.3901	Paris	0800.91.59.17 (toll free)	Sydney	+ 61.2.9033.9333
San Francisco	+ 1.415.836.8800			Taiwan	008.0112.7513 (toll free)
Sao Paulo	+ 55.11.3706.1360			Tokyo	+ 81.3.5290.1555
Toronto	+ 1.416.628.1007				

Notice and Disclaimer

About MSCI

MSCI Inc. is a leading provider of investment decision support tools to investors globally, including asset managers, banks, hedge funds and pension funds. MSCI products and services include indexes, portfolio risk and performance analytics, and governance tools.

The company's flagship product offerings are: the MSCI indexes with approximately USD 7.5 trillion estimated to be benchmarked to them on a worldwide basis[1]; Barra multi-asset class factor models, portfolio risk and performance analytics; RiskMetrics multi-asset class market and credit risk analytics; IPD real estate information, indexes and analytics; MSCI ESG (environmental, social and governance) Research screening, analysis and ratings; ISS corporate governance research, data and outsourced proxy voting and reporting services; and FEA valuation models and risk management software for the energy and commodities markets. MSCI is headquartered in New York, with research and commercial offices around the world.

[1] As of March 31, 2013, as reported on July 31, 2013 by eVestment, Lipper and Bloomberg   Jan 2014