Special Techniques
for
Special Events

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1. Brexit
Excess Forward Variance

Good indicator of the market expectation on the uncertainties caused by Brexit
Extrapolation

- Plain vanilla options are usually quoted for standard tenors, 1W, 2W, 1M, ...
- Extrapolate from nearby market expiries to the referendum date
Pre and post referendum

- Dramatic change of implied skew before and after the referendum
- As of May 18, 2016, what was expected to happen on June 23, 2016?

### Implied Volatility Skew

- Pre-Referendum vs. Post-Referendum

### Risk Neutral Density

- Pre-Referendum vs. Post-Referendum

As of May 18, 2016, EURGBP, 1M Maturity
Binary outcome

**Brexit**
EURGBP expected to increase
More volatile

**Bremain**
EURGBP expected to drop
Less volatile

Prob Dist of Pct Change of EURUSD on June 23
Calibration

• The parameters of the bimodal Gaussian distribution are calibrated to be consistent with the market observations of pre- and post-referendum densities.

• The probabilities of Brexit/Bremain, the expected changes of the exchange rates upon Brexit/Bremain are derived in a consistent manner.
II. US ELECTION
US ELECTION 2016

As of Date: Oct 13, 2016
US ELECTION 2016

As of Date: Oct 13, 2016

58% chance of Clinton victory v.s. 42% Trump victory
III. FRENCH ELECTION
French Election 2017

Ticker: CAC Index
As of Date: Mar 8, 2017
French Election 2017

Mar 17 2017

Apr 21 2017

May 19 2017

Jun 16 2017

Ticker: CAC Index
As of Date: Mar 8, 2017
French Election 2017

Ticker: CAC Index
As of Date: Mar 8, 2017
French Election 2017

Risk-neutral densities immediately before and after the election (from interpolation)

Ticker: CAC Index
As of Date: Mar 8, 2017
French Presidential Election 2017

The second round of the election will be held on May 7, 2017. For the selected underlying security, we assume its price undergoes an instantaneous jump once the outcome of the election is known and the corresponding net return follows the selected distribution.

**Underlying Ticker**: CAC Index

**As Of Date**: 03-10-2017

**Jump Distribution**: Bimodal Gaussian

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Prob (%)</th>
<th>Mean (%)</th>
<th>Std (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome 1</td>
<td>18.87</td>
<td>-1.103</td>
<td>3.14</td>
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<tr>
<td>Outcome 2</td>
<td>81.13</td>
<td>2.57</td>
<td>1.90</td>
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Cac index 04-25-2017

![Graph showing CAC Index as of April 25, 2017 with pre and post election densities. The graph compares the density distribution of the index before and after an election, highlighting changes in market sentiment and stability.](image)
Cac index 04-25-2017

Bimodal Gaussian

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<tr>
<td>Outcome 1</td>
<td>3.49</td>
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<td>6.55</td>
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<tr>
<td>Outcome 2</td>
<td>96.51</td>
<td>0.35</td>
<td>0.88</td>
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EURUSD Currency as of April 25, 2017

- Pre Election Densities
- Post Election Densities
Eurusd 04-25-2017

Bimodal Gaussian

Left graph: Implied skews before and after 05-07-2017
- Yellow line: Pre-event mkt vols from interpolation
- Blue line: Post-event model vols (Pre-event skew + jump)
- Green dots: Post-event mkt vols from interpolation

Right graph: Jump Distribution on 05-07-2017
- Percentage gain or loss at the event (%)

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<td>-1.99</td>
<td>1.69</td>
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<tr>
<td>Outcome 2</td>
<td>81.37</td>
<td>0.46</td>
<td>0.41</td>
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