

# Special Techniques for Special Events

**Bruno Dupire**

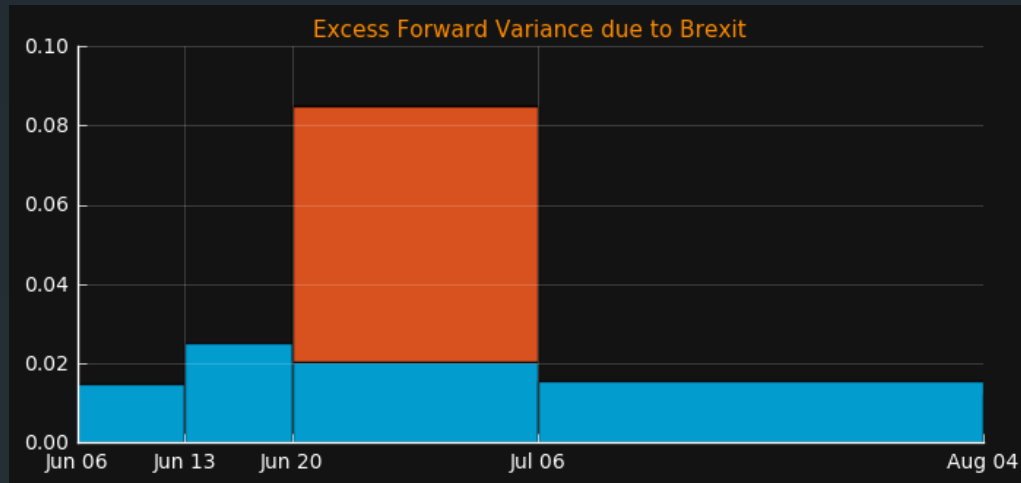
Head of Quantitative Research  
Bloomberg L.P.

NYU, April 28, 2017

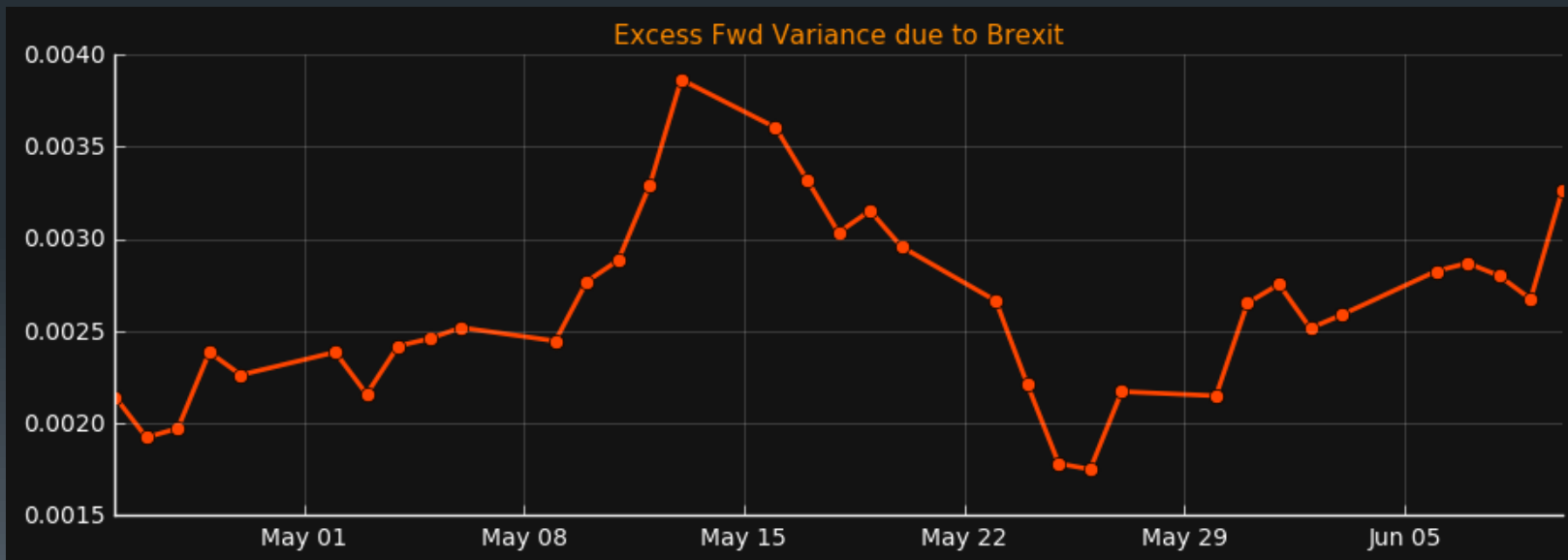
# I. Brexit



# Excess Forward Variance

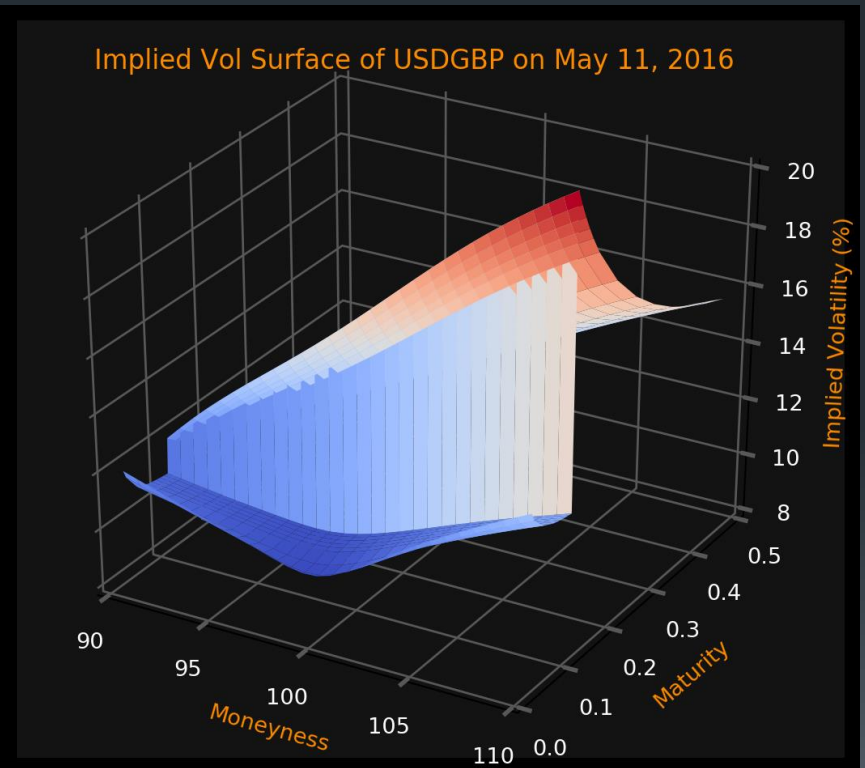
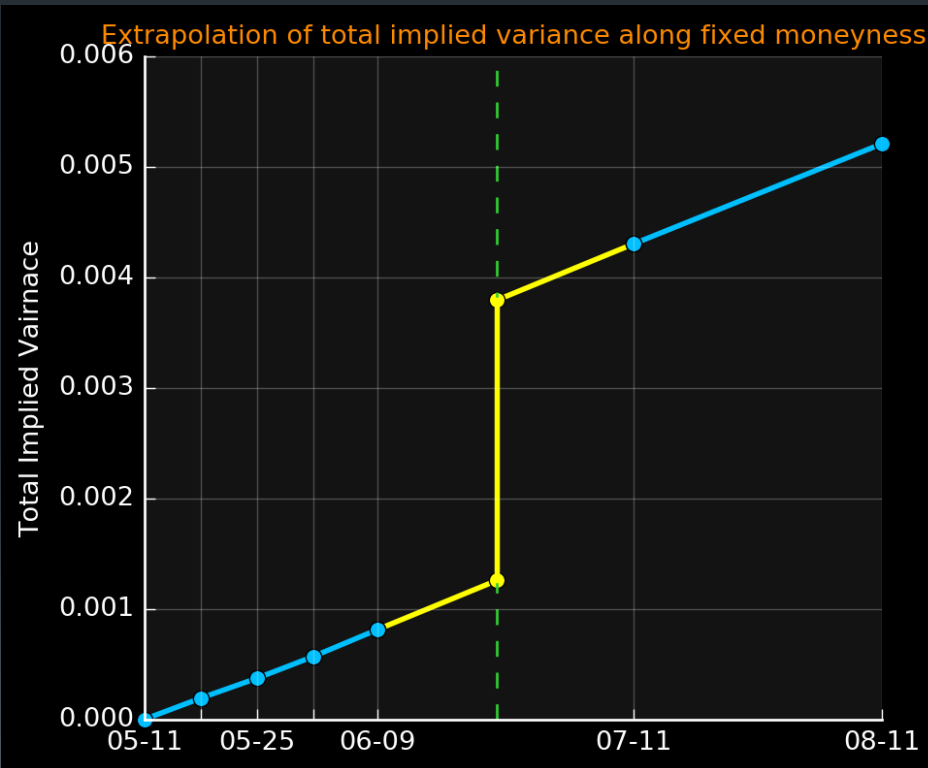


Good indicator of the market expectation on the uncertainties caused by Brexit



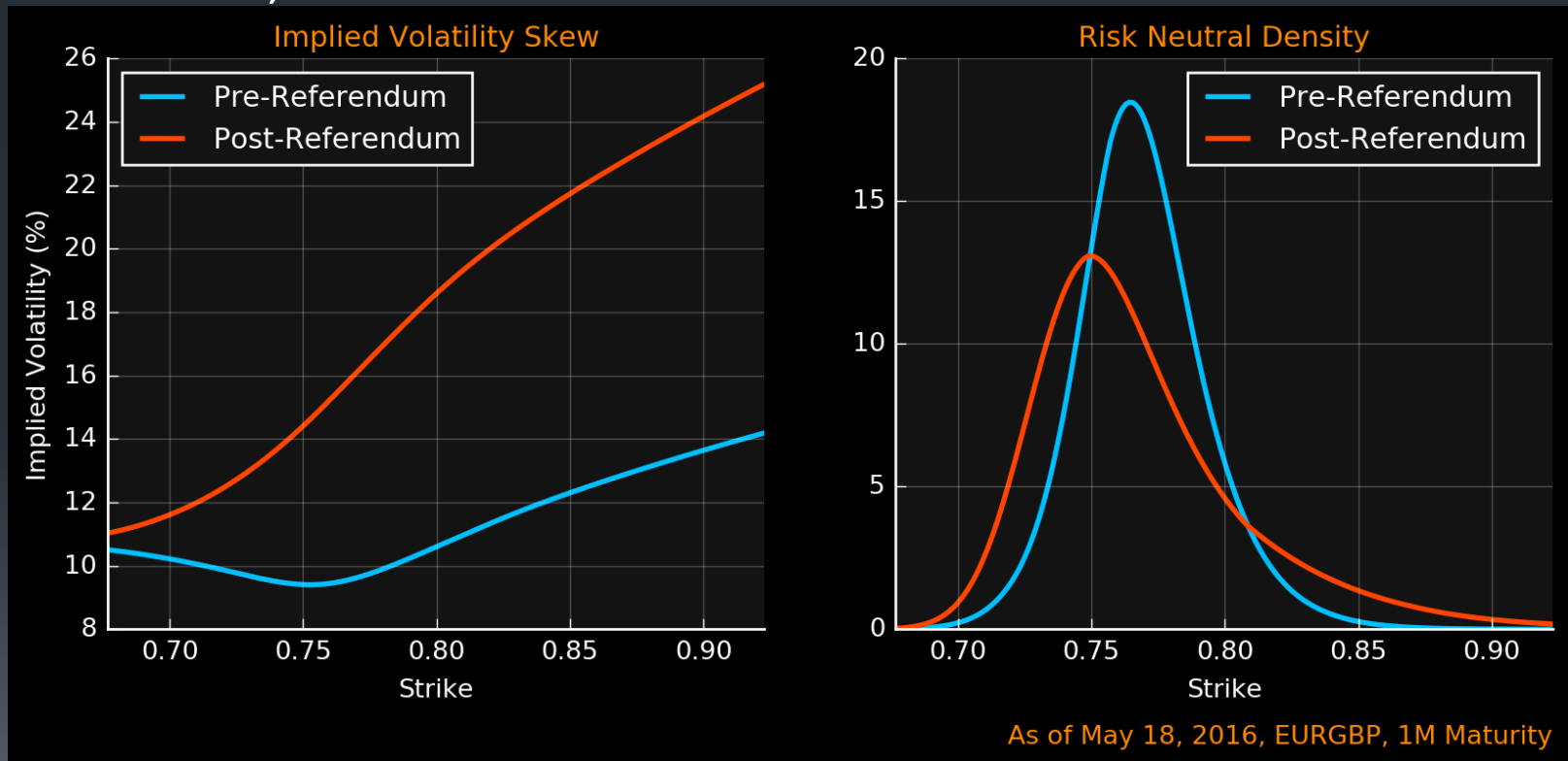
# Extrapolation

- 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

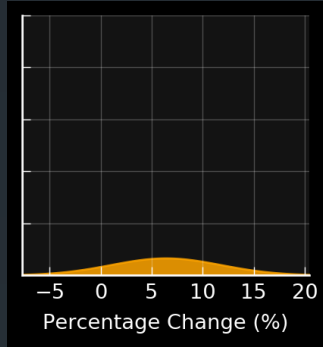
- Dramatic change of implied skew before and after the referendum
- As of May 18, 2016, what was expected to happen on June 23, 2016?



# Binary outcome

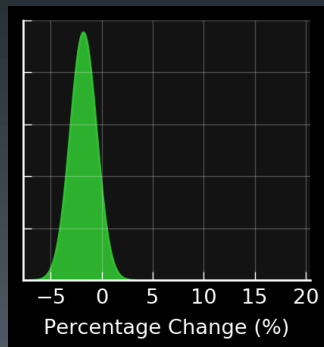
## Brexit

EURGBP expected to increase  
More volatile

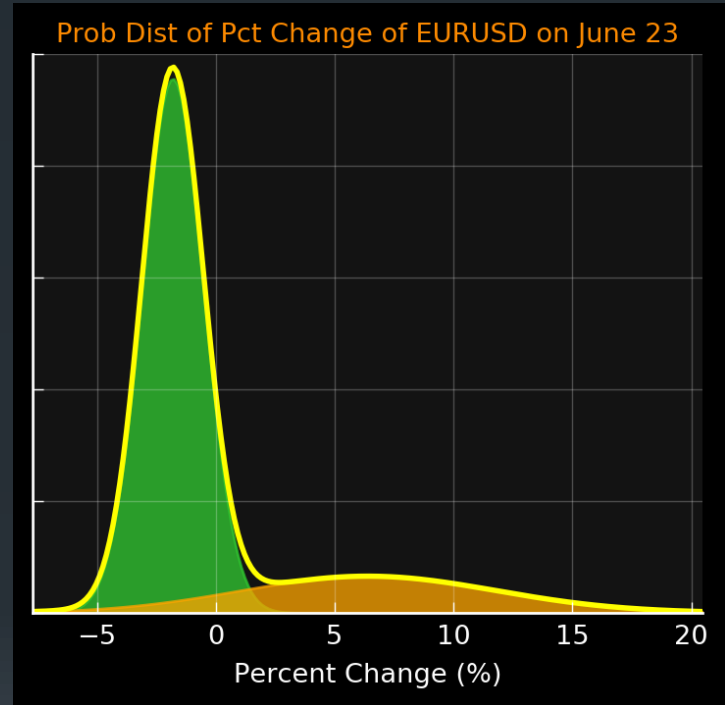


## Bremain

EURGBP expected to drop  
Less volatile



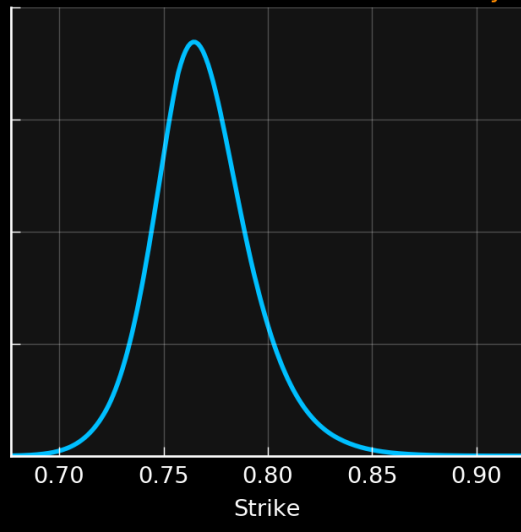
Binary  
Outcome



# Calibration

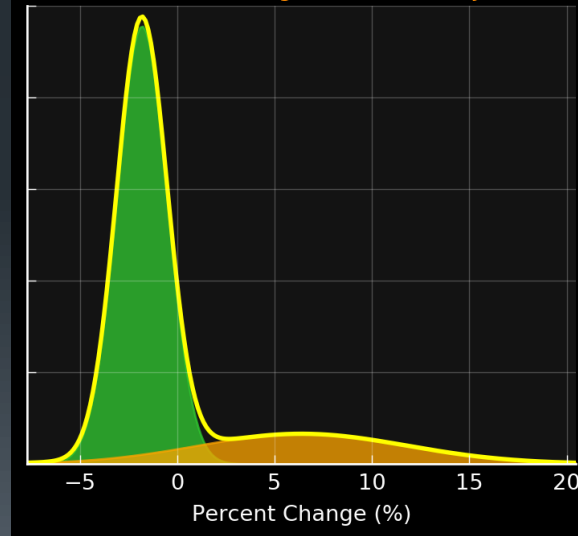
- The parameters of the bimodal Gaussian distribution are calibrated to be consistent with the market observations of pre- and post-referendum densities
- The probabilities of Brexit/Bremain, the expected changes of the exchange rates upon Brexit/Bremain are derived in a consistent manner

Pre-Referendum Risk Neutral Density



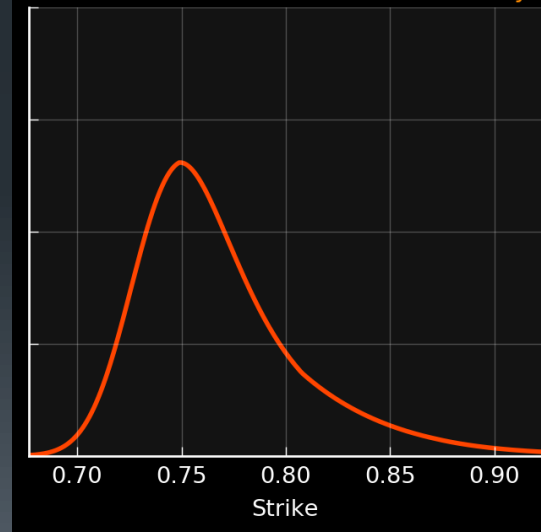
+

Prob Dist of Pct Change of EURUSD on June 23



=

Post-Referendum Risk Neutral Density

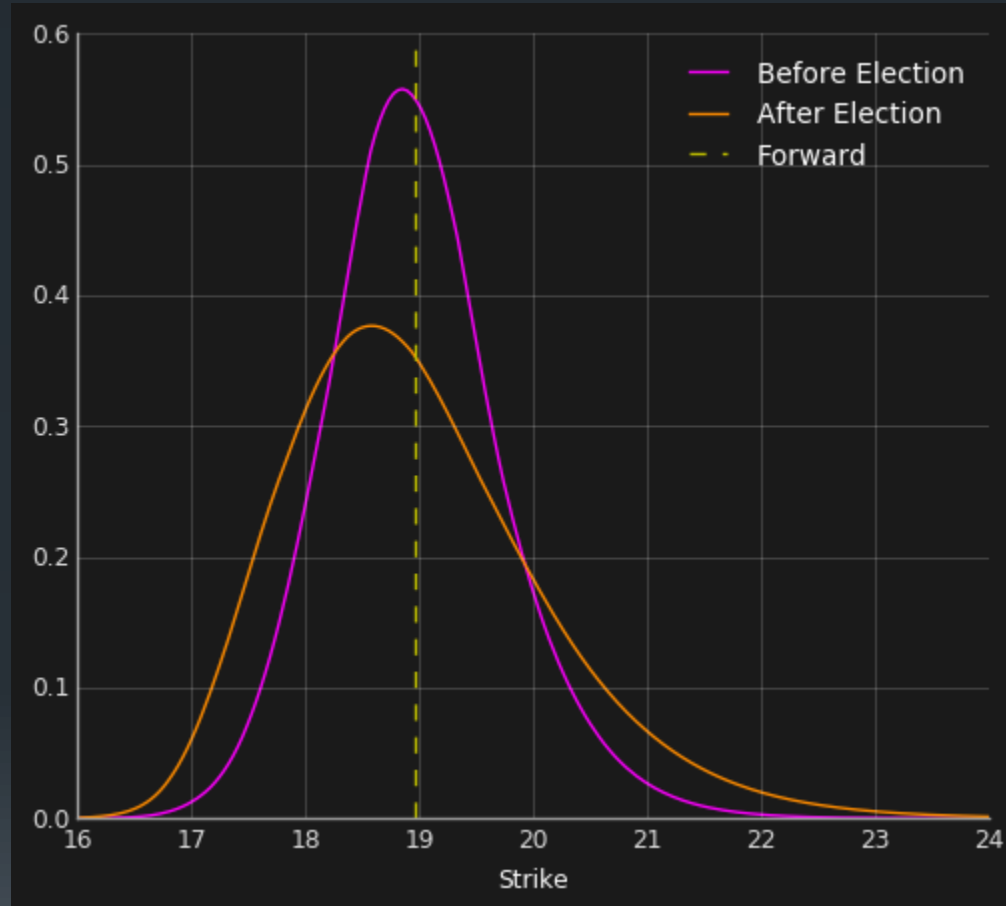




## II. US ELECTION



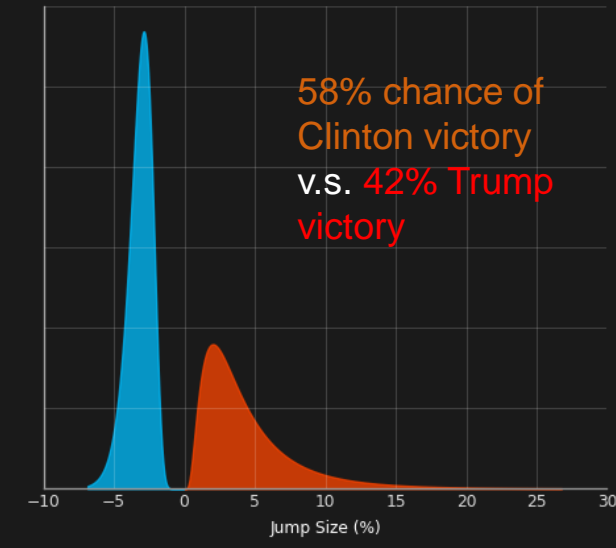
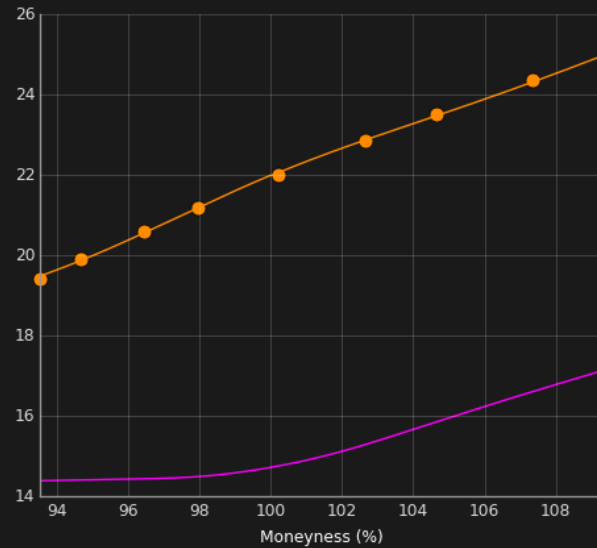
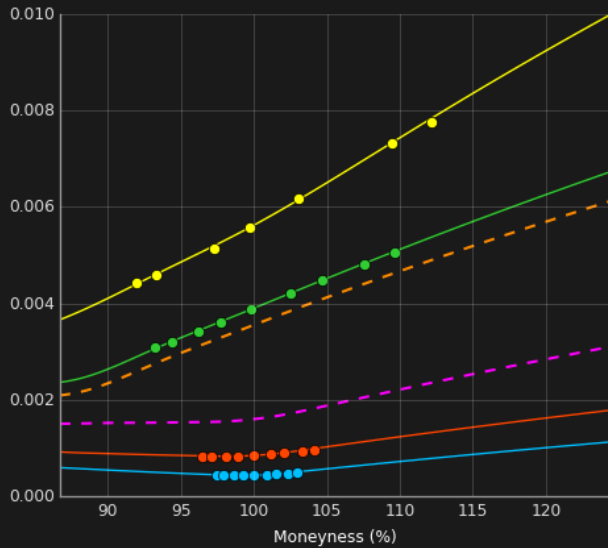
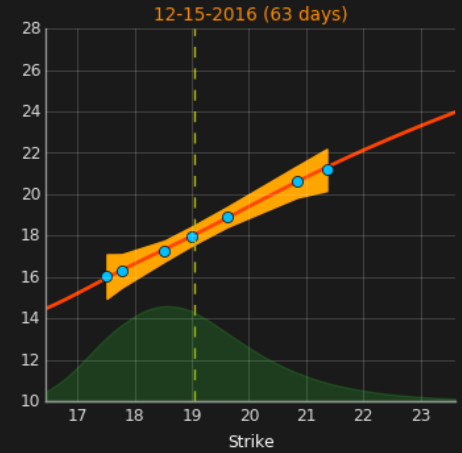
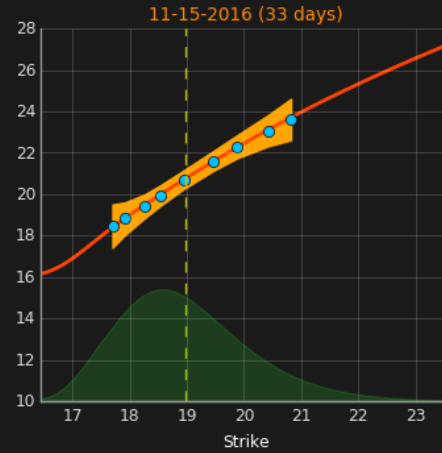
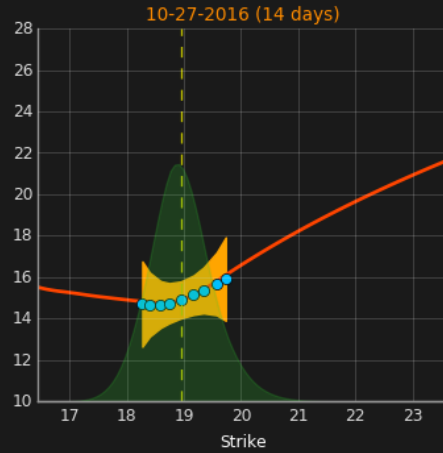
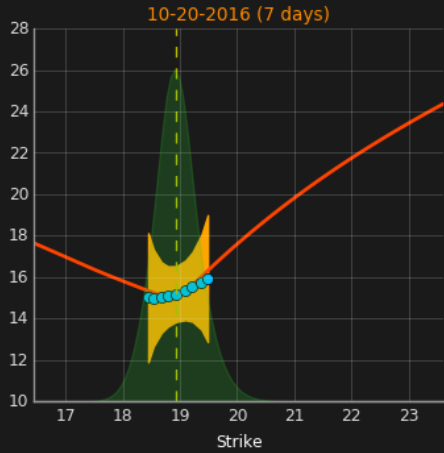
# US ELECTION 2016



As of Date: Oct 13, 2016

# US ELECTION 2016

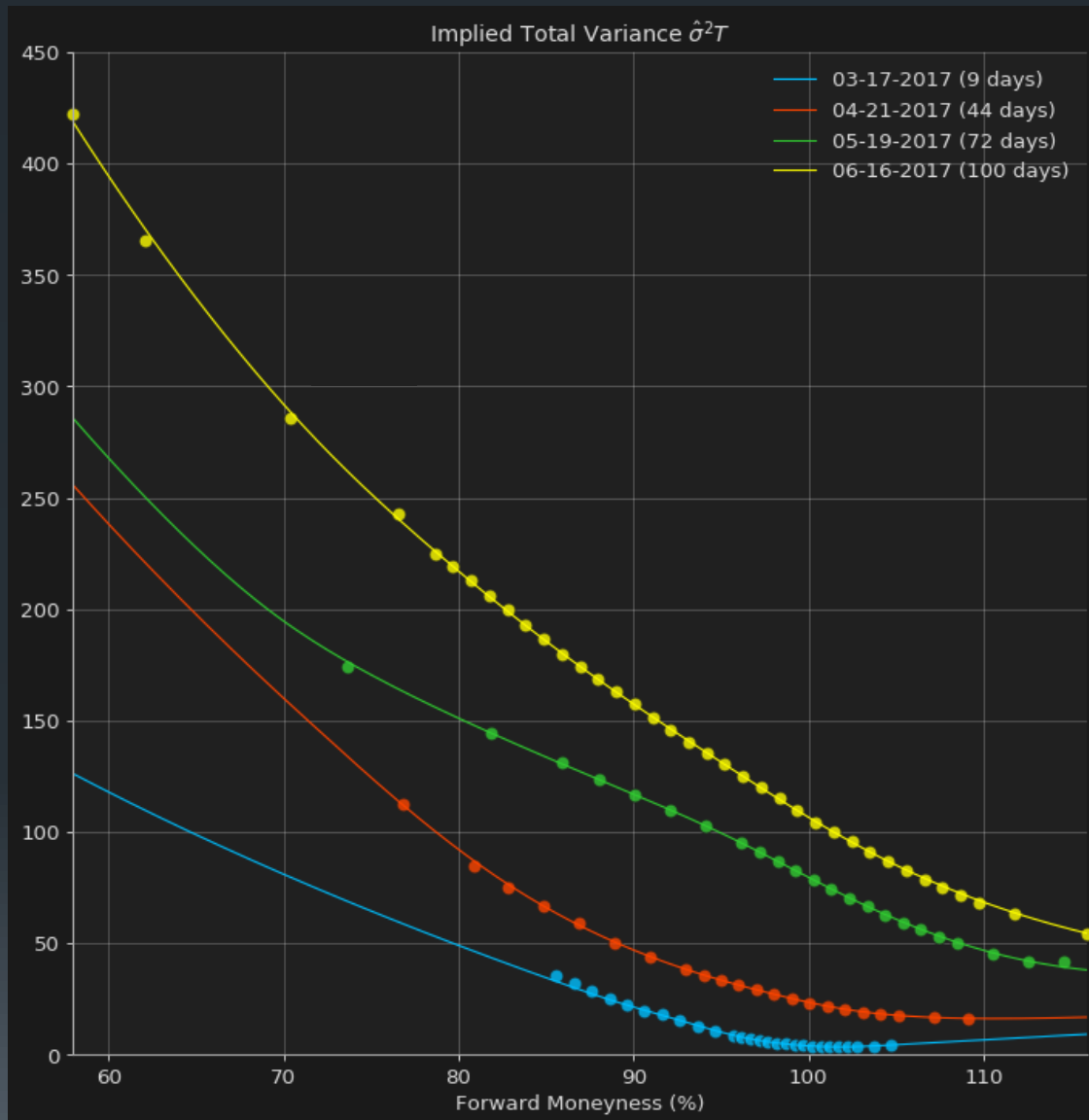
As of Date: Oct 13, 2016





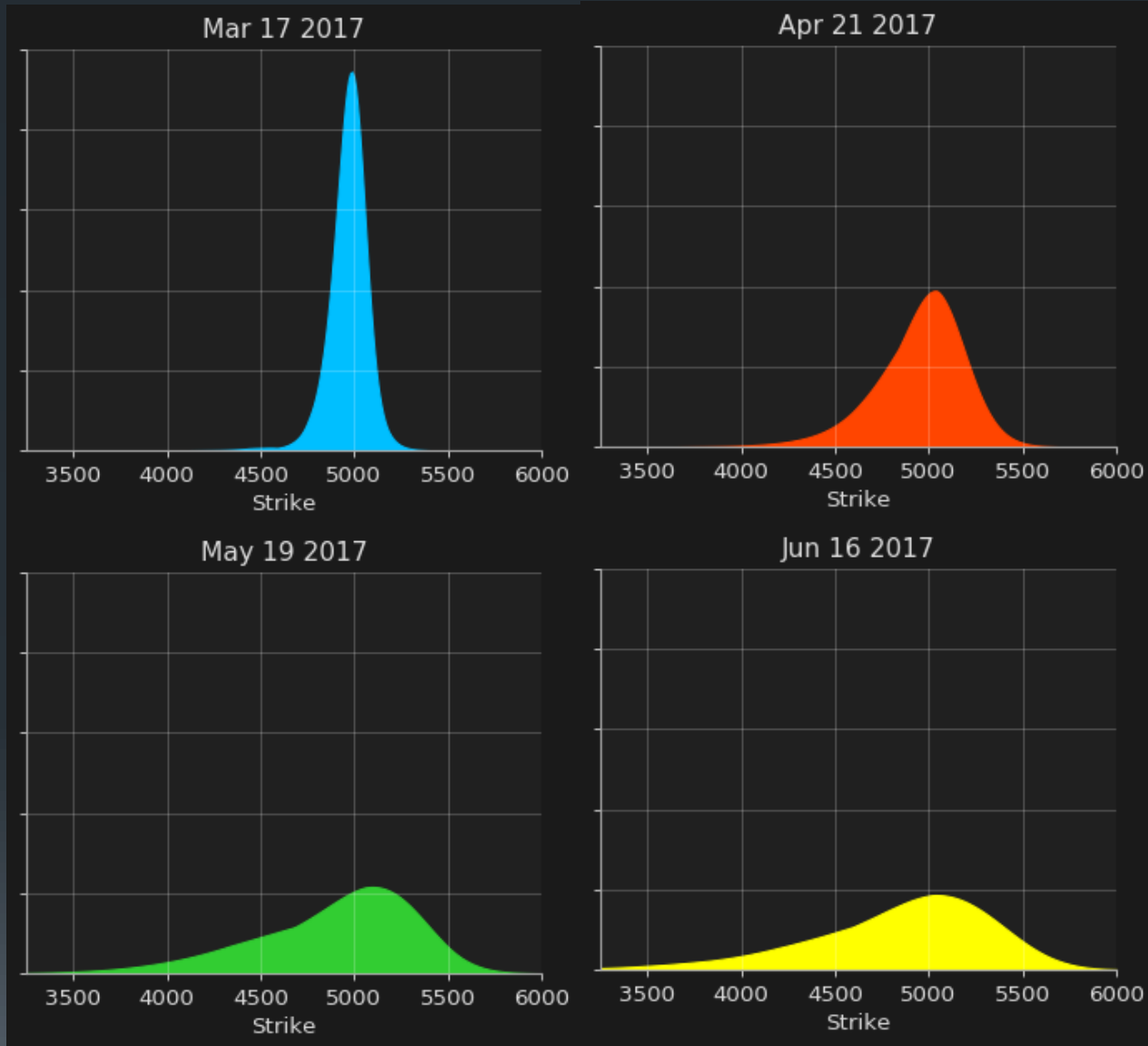
# III. FRENCH ELECTION

# French Election 2017



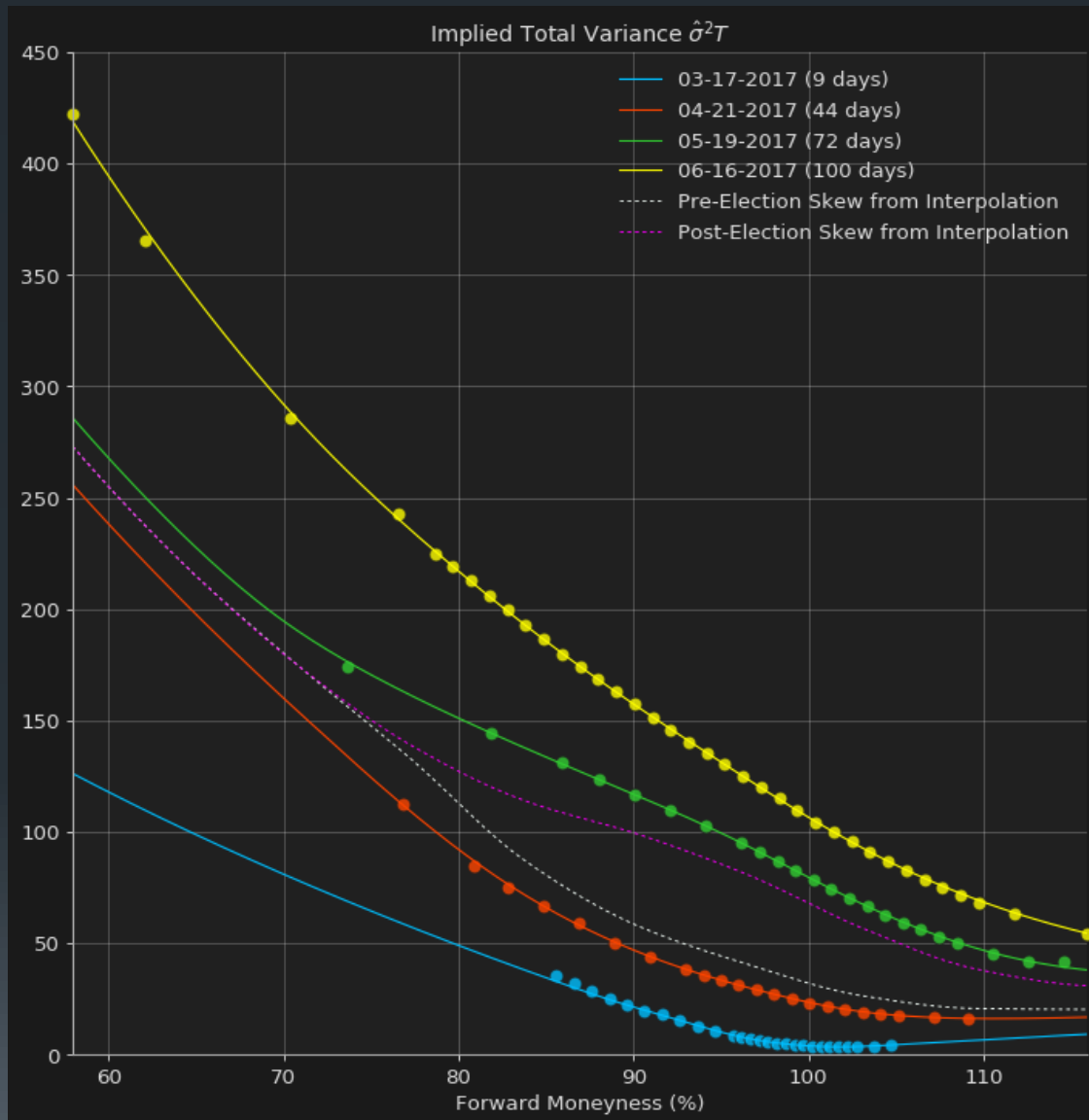
Ticker: CAC Index  
As of Date: Mar 8, 2017

# French Election 2017



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

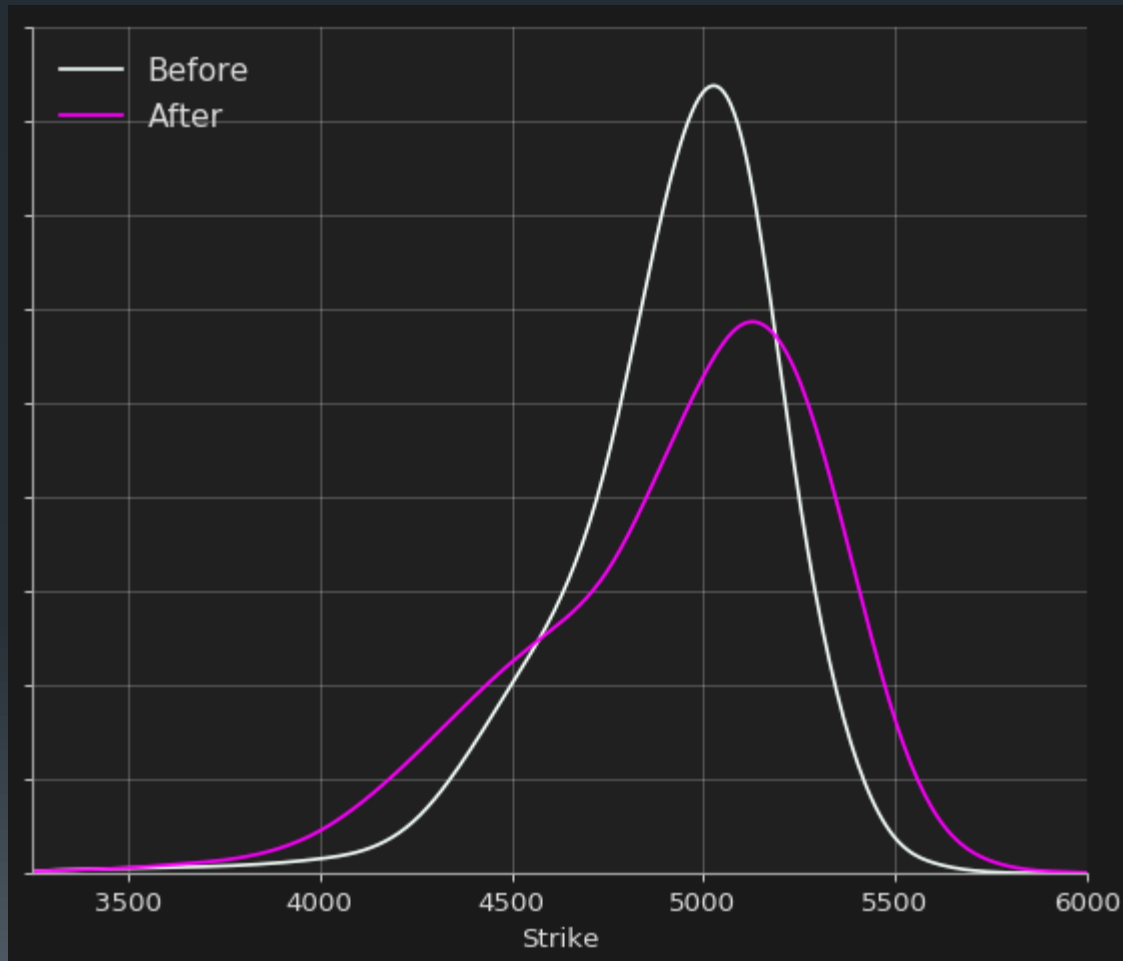
# French Election 2017



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 Election 2017



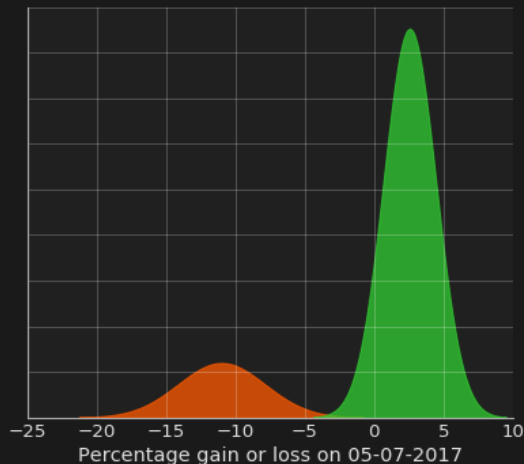
## French Presidential Election 2017

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.

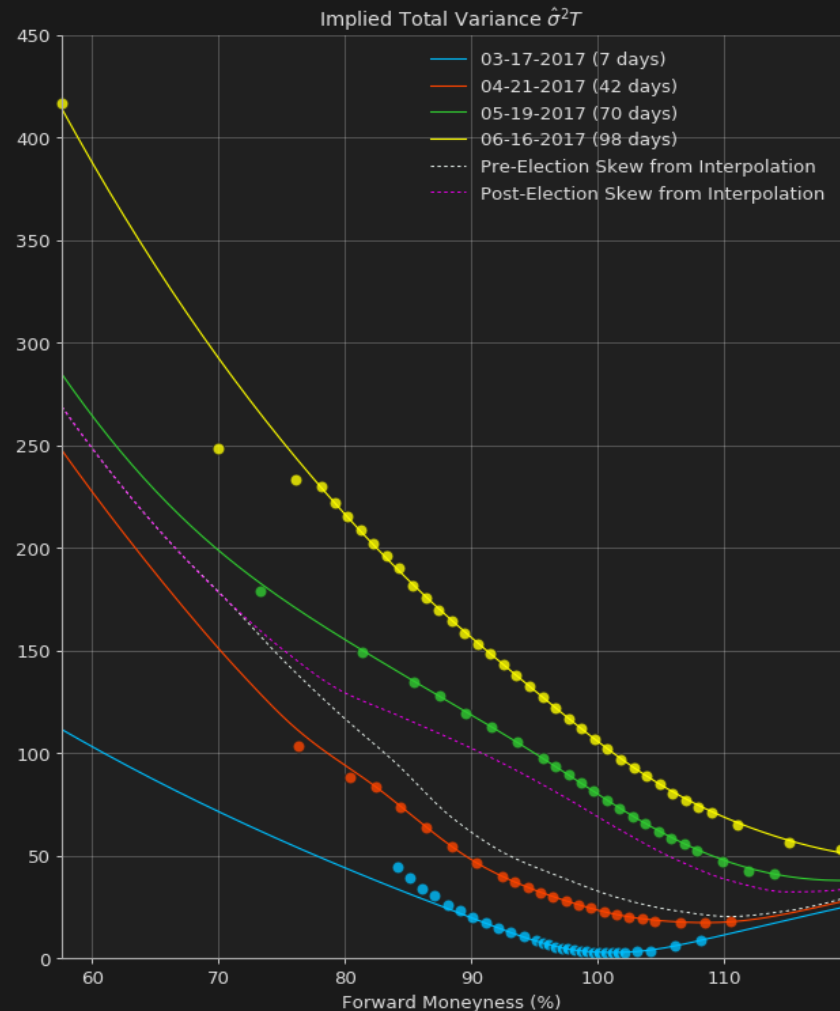
Underlying Ticker: CAC Index  
 As Of Date: 03-10-2017  
 Jump Distribution: Bimodal Gaussian

GO

	Prob (%)	Mean (%)	Std (%)
Outcome 1	18.87	-11.03	3.14
Outcome 2	81.13	2.57	1.90

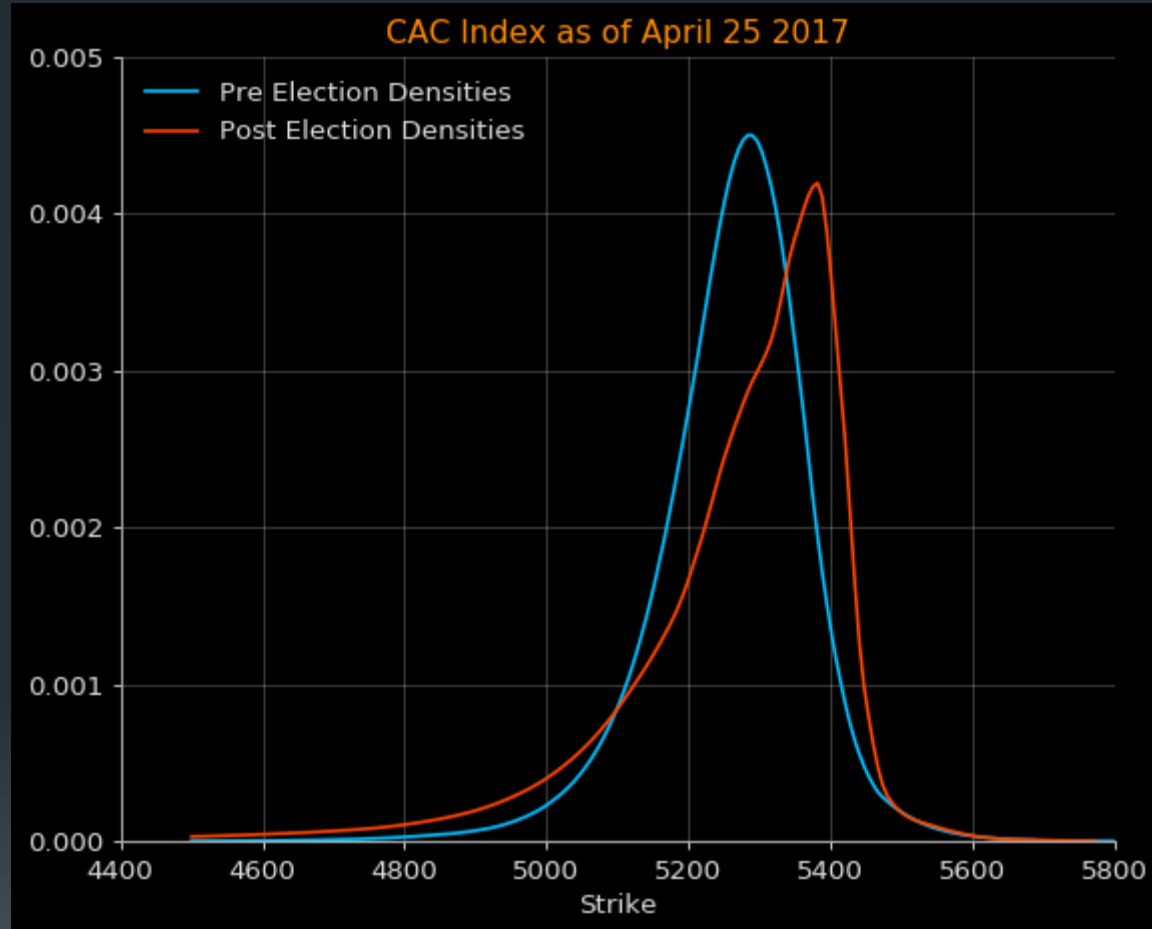


+ Calibration details



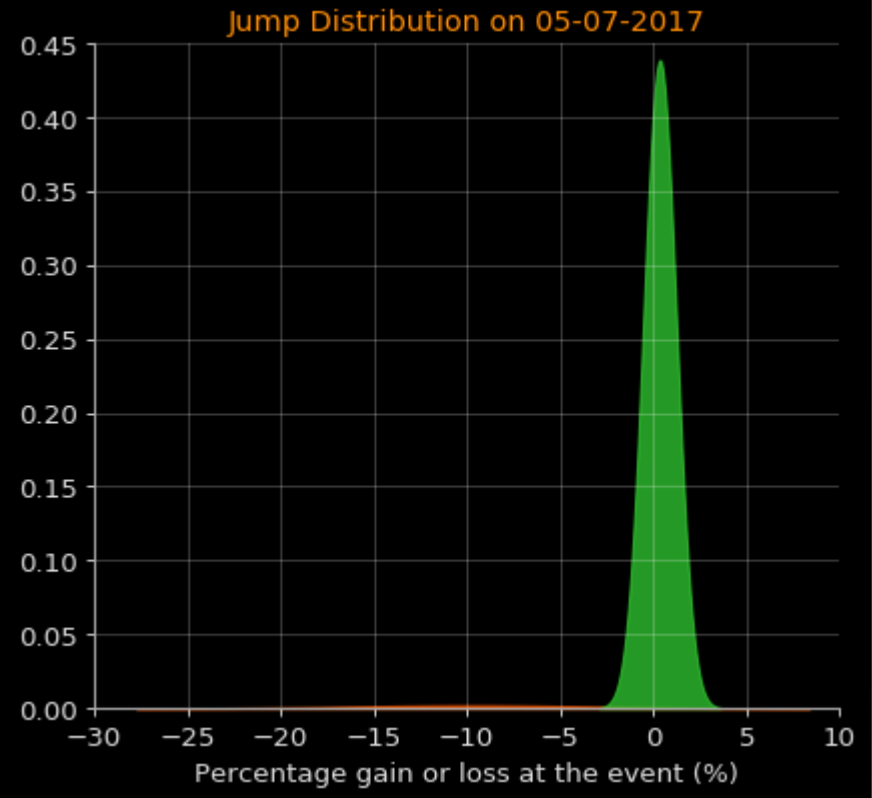
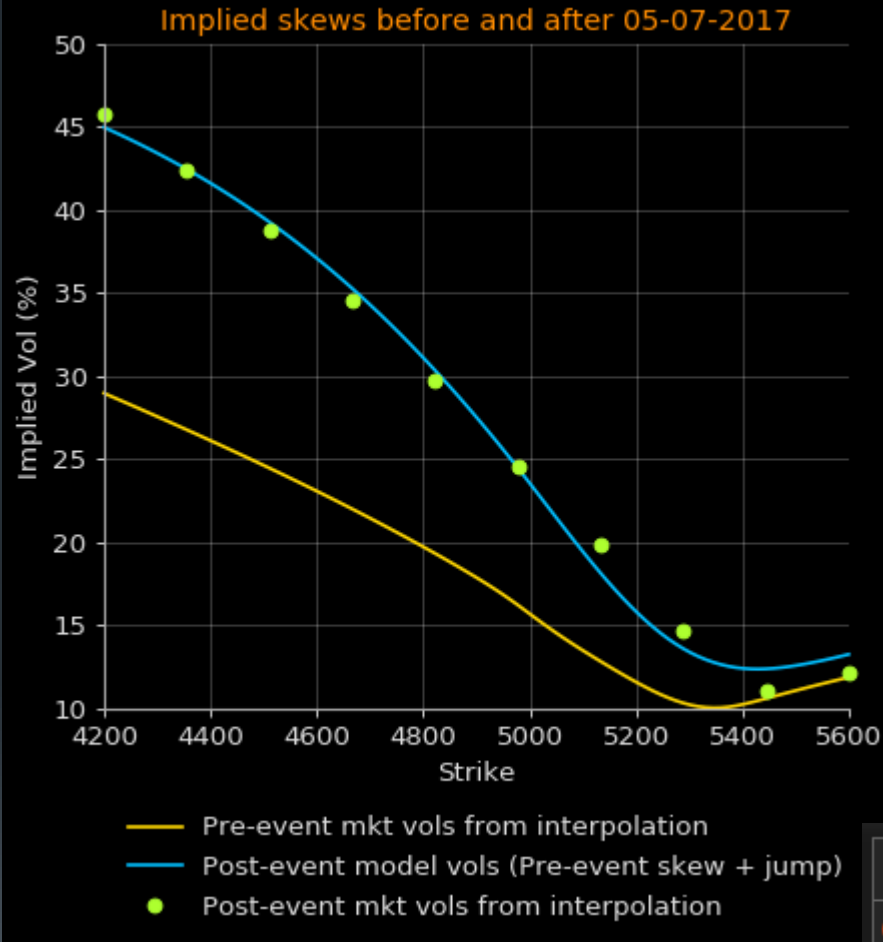


# Cac index 04-25-2017



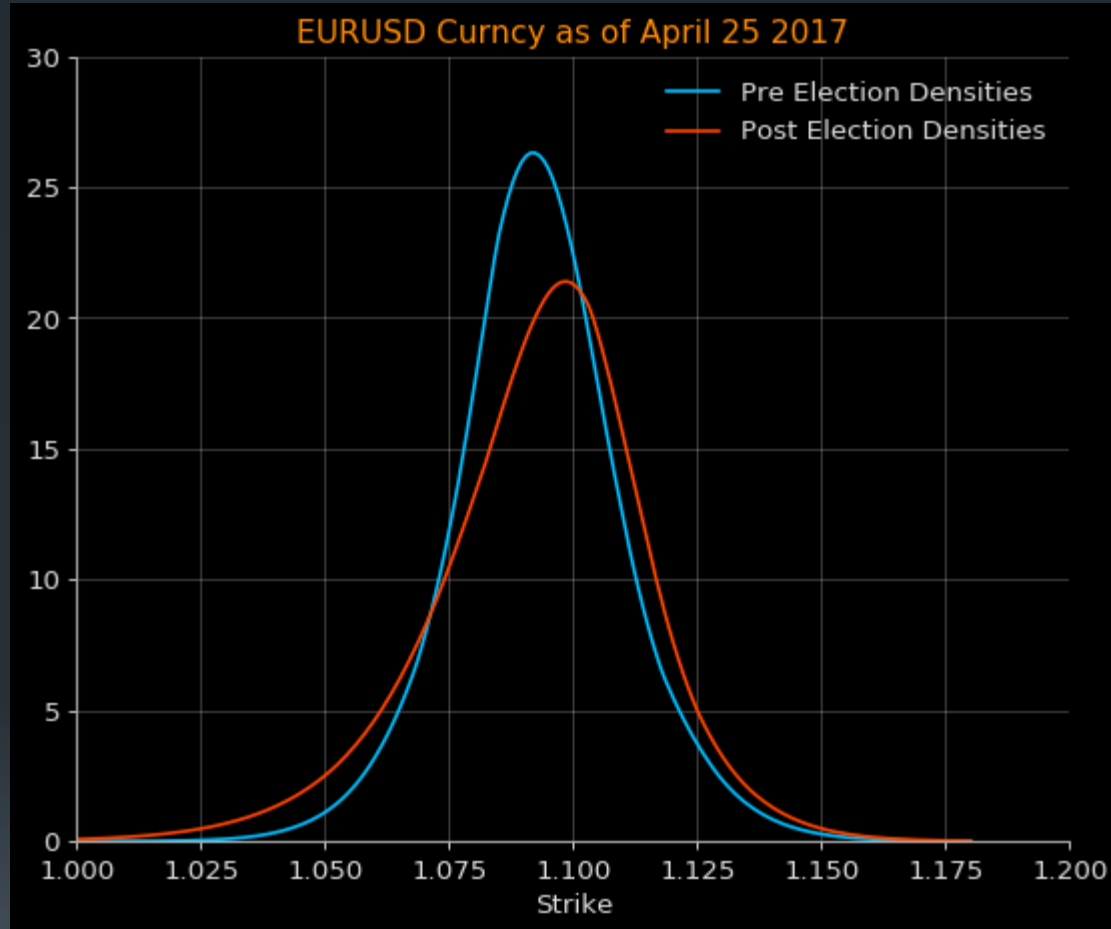
# Cac index 04-25-2017

## Bimodal Gaussian



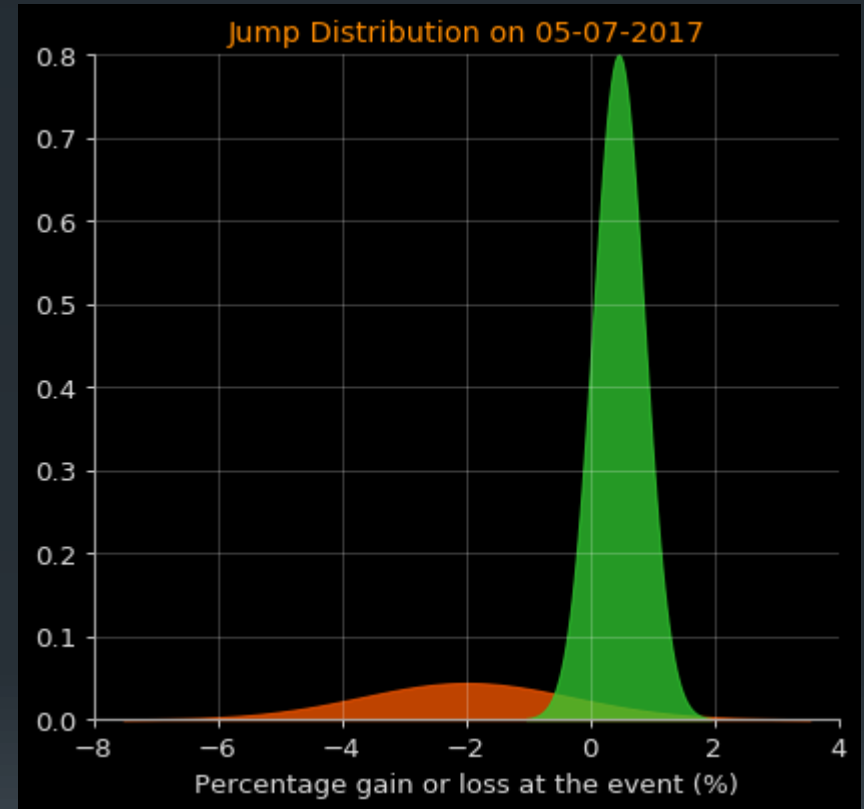
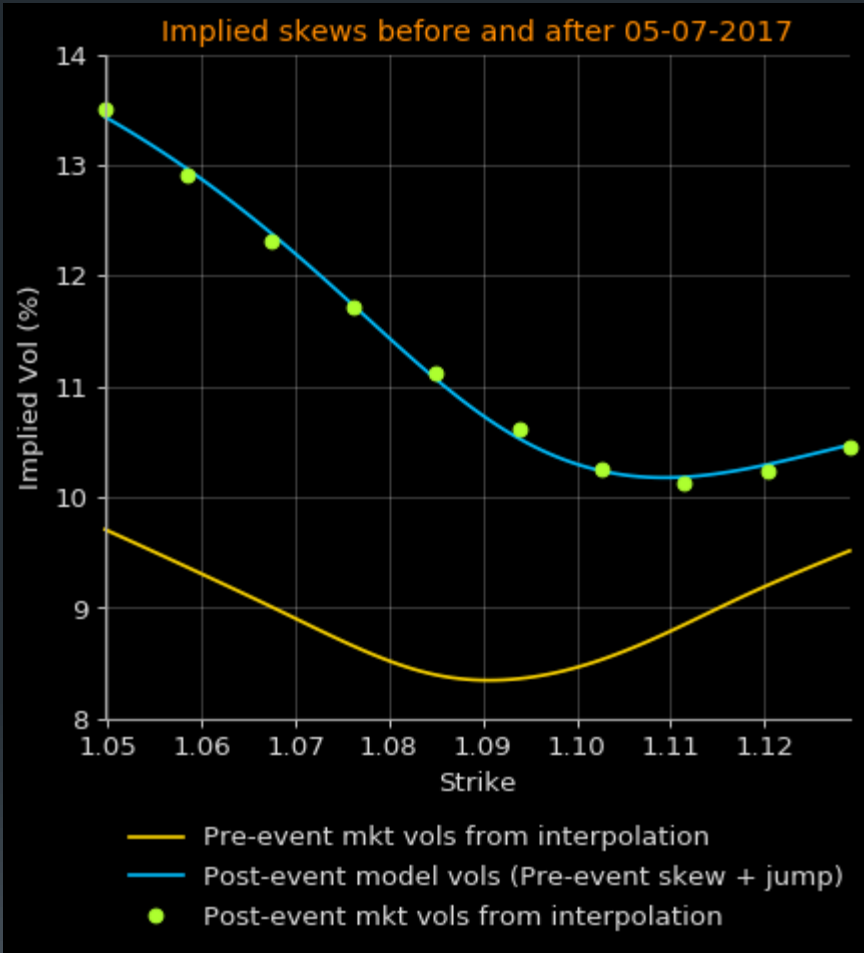
	Prob (%)	Mean (%)	Std (%)
Outcome 1	3.49	-9.69	6.55
Outcome 2	96.51	0.35	0.88

# Eurusd 04-25-2017



# Eurusd 04-25-2017

## Bimodal Gaussian



	Prob (%)	Mean (%)	Std (%)
Outcome 1	18.63	-1.99	1.69
Outcome 2	81.37	0.46	0.41