The October 2016 sterling flash crash

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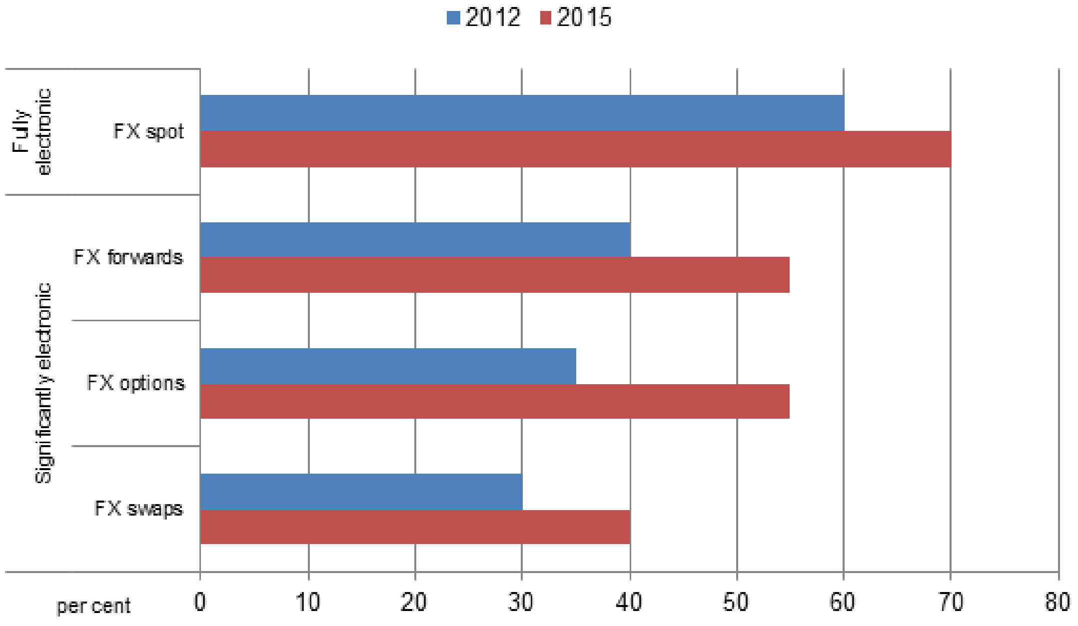
Outline

- *Background: flash episodes and the growth of electronic trading*
- *7 October 2016: what happened?*
- *What have we learnt?*
- *Implications for financial stability*

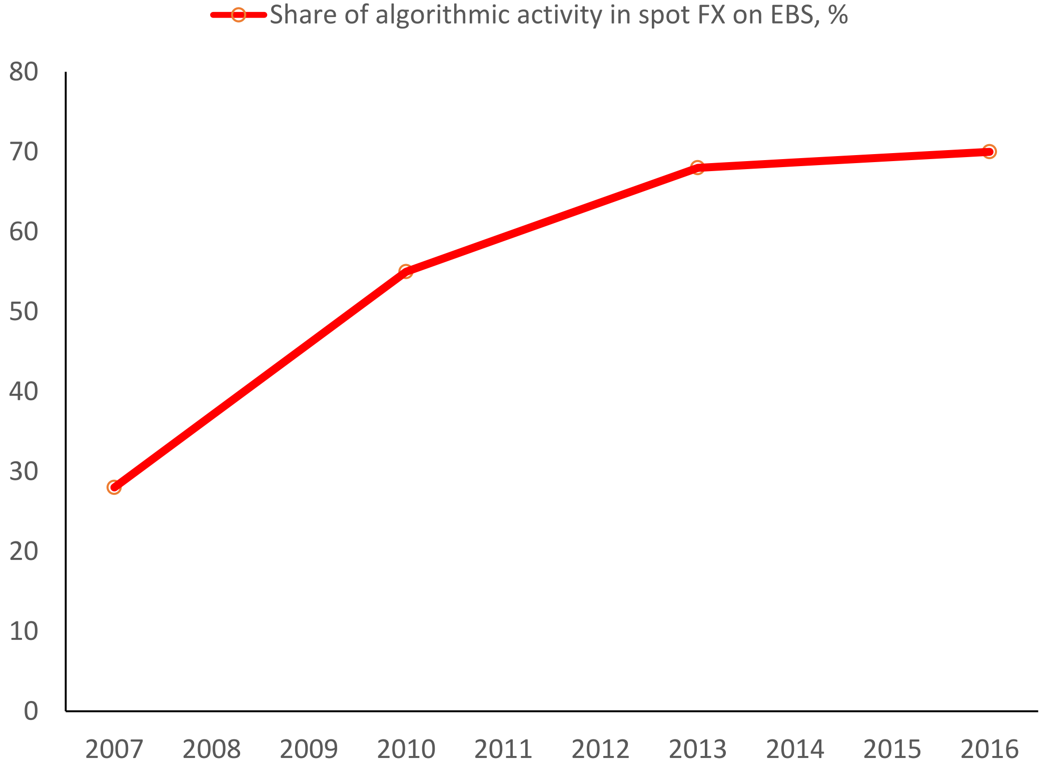
Background: the increasing speed of markets

Recent increase in FX trading via electronic platforms



Source: Greenwich Associates (2014); McKinsey & Company and Greenwich Associates (2013)

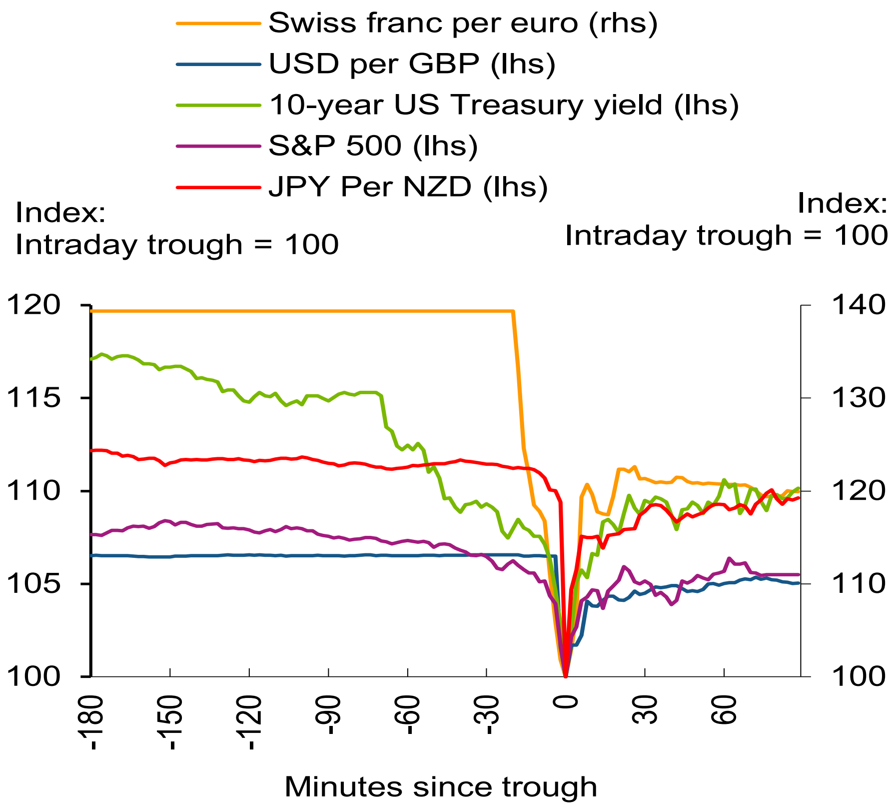
Share of algorithmic activity in foreign exchange



- Increase in electronic trading and transparency has led to growth of algo trading…

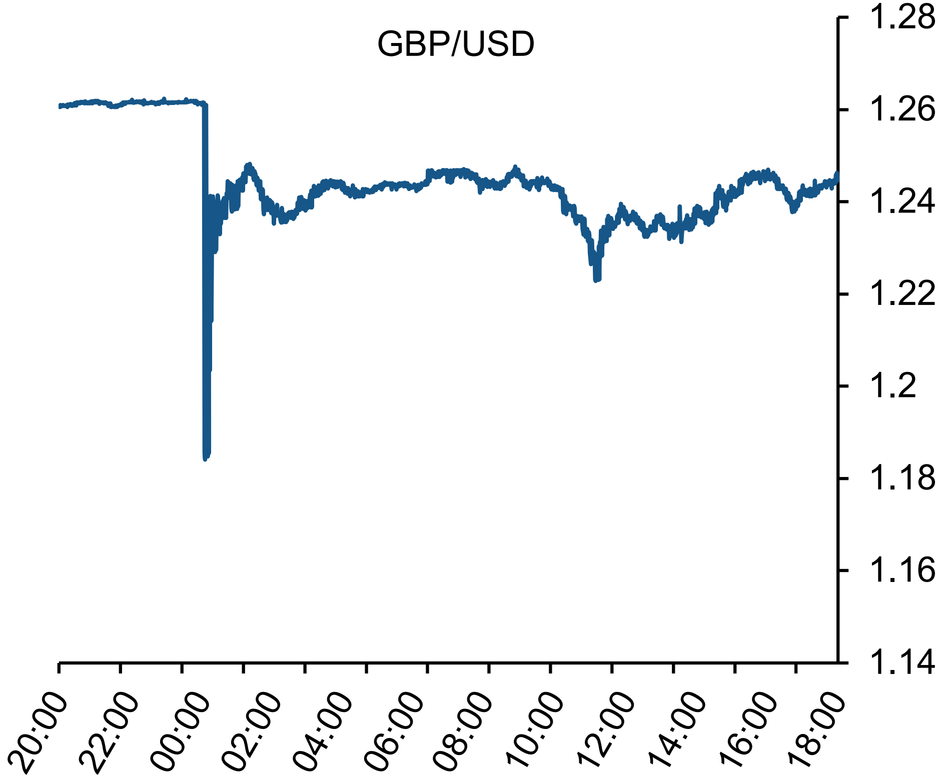
Background: Sterling joins the flash crash club

Selected intraday movements



Source: Bloomberg. US equity markets flash-crash 6 May 2010 (Maroon), US Treasury market flash-rally 15 Oct 2014 (Green), removal of the Swiss franc peg to the euro 15 Jan 2015 (Orange), New Zealand dollar flash-crash 24 Aug 2015 (Red) and Sterling flash crash 7 Oct 2016 (Blue).

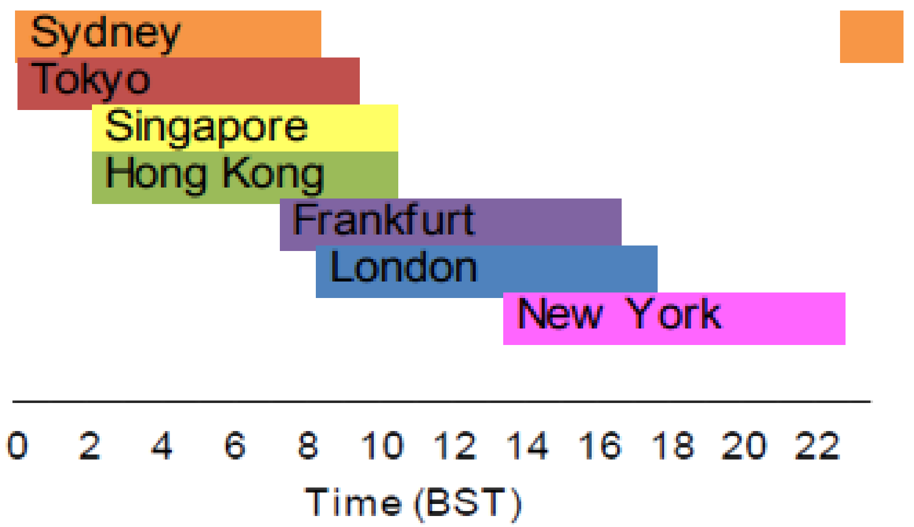
GBP/USD 7 October 2016



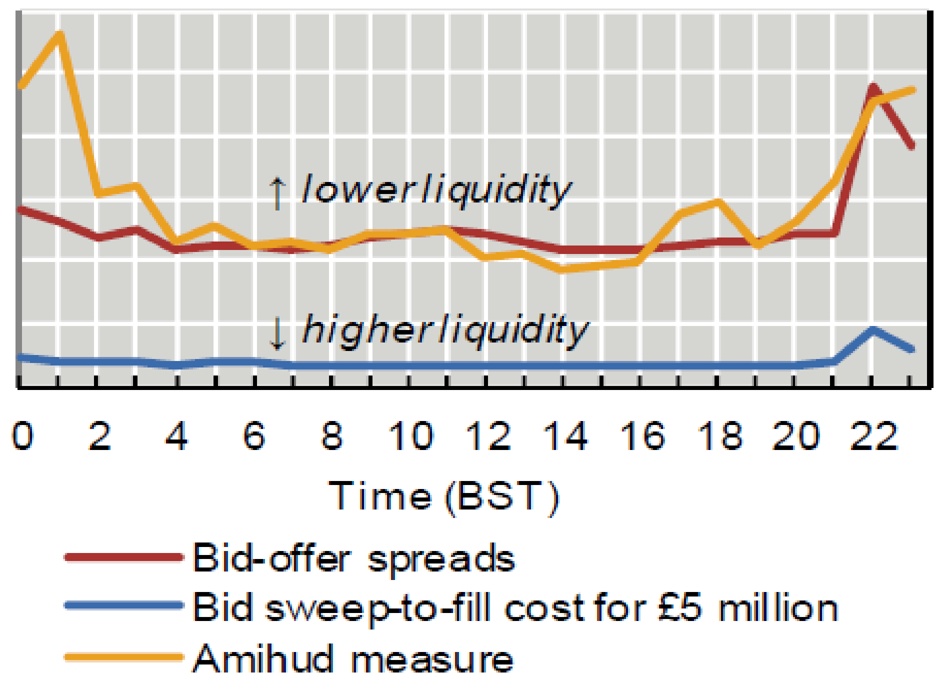
Source: Bloomberg.

A typically illiquid time of day

Trading hours in large FX trading jurisdictions



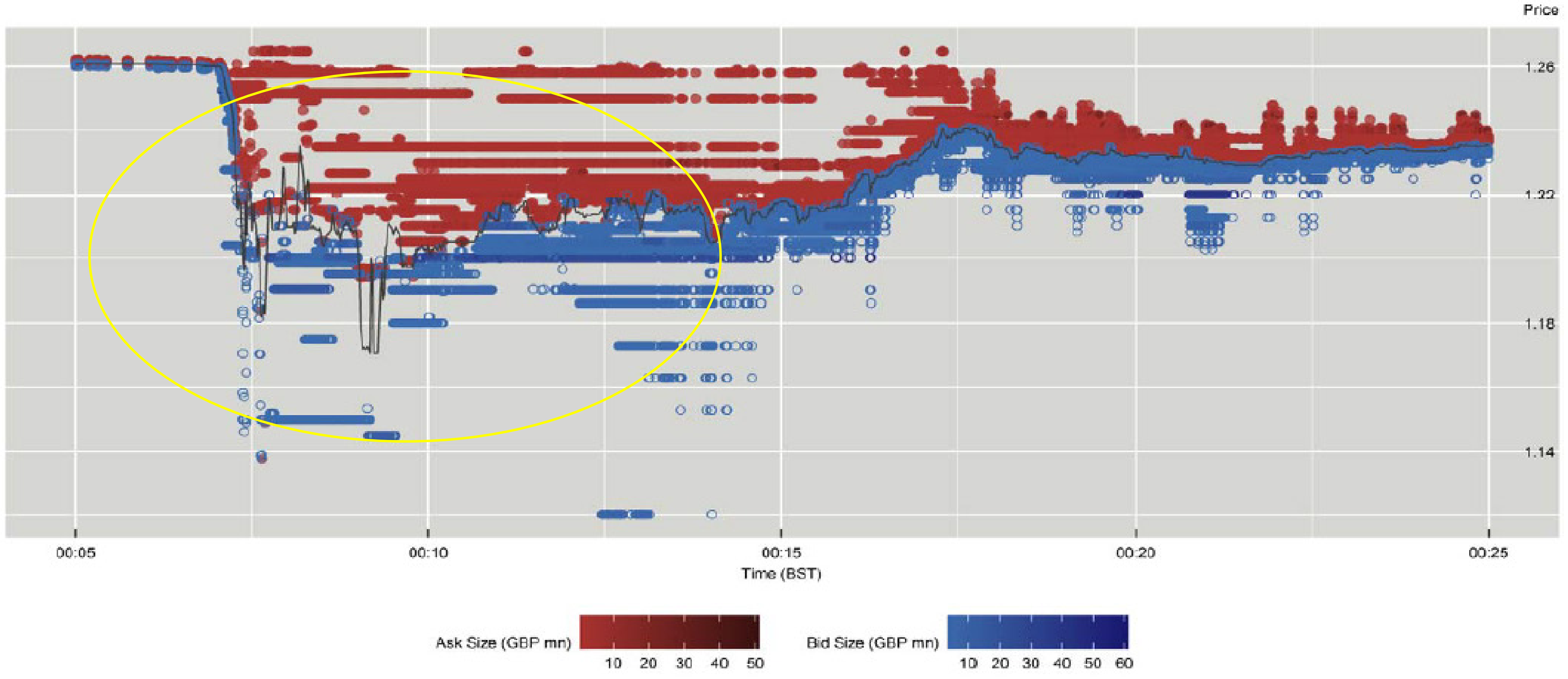
Measures of intraday liquidity in GBP/USD on Thomson Reuters Matching Platform



Source: BIS
These measures are presented without scale for confidentiality reasons.
Sweep-to-fill costs are calculated as the weighted average spread (from the implied mid-price) required to buy or sell a given quantity of sterling (£5 million here) versus the dollar.

7 October 2016: What happened? (2)

Thomson Reuters Matching GBP/USD order book behaviour[1]

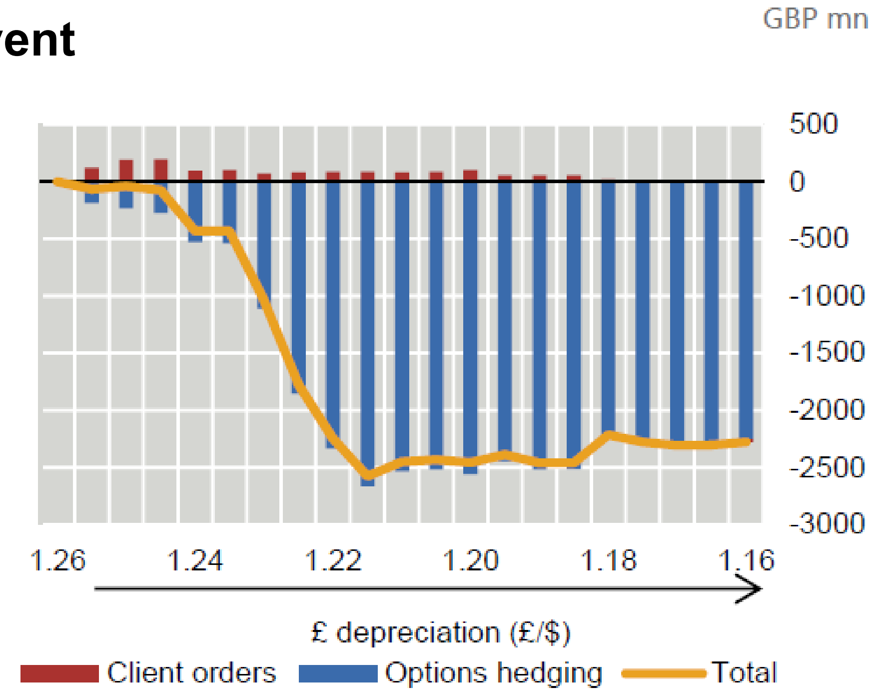


[1] The blue and red circles here represent resting bid and offer limit orders, respectively, in the order book. The black line represents the implied mid-price, and the intensity of the blue and red colours signifies the size of the order.

Sources: Bank of England calculations; Thomson Reuters.

What have we learnt? Liquidity demand

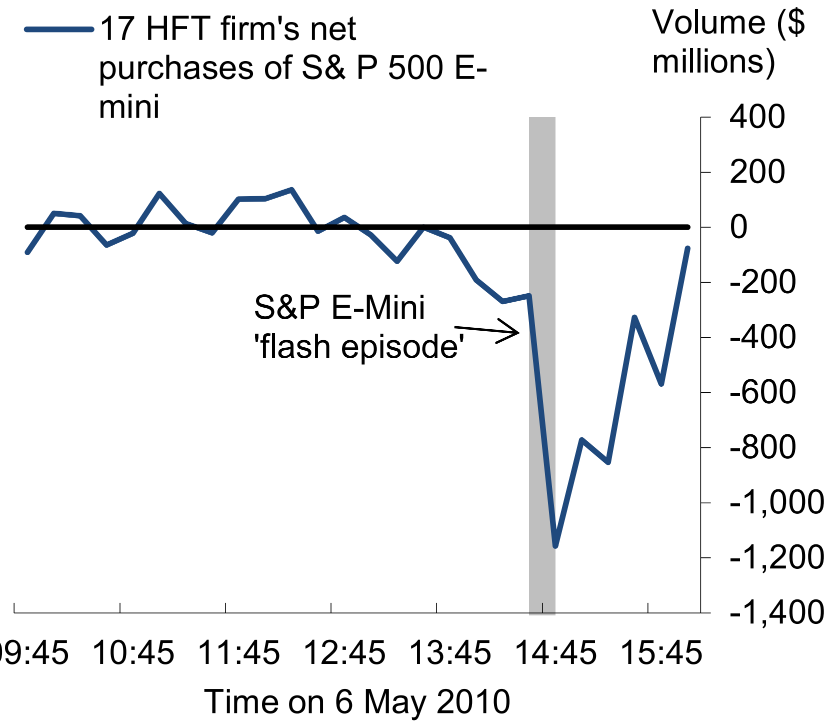
Cumulative net potential selling needs from options hedging and client orders – October 2016 GBP event



[1] Data are as of New York close of business on 6 October.

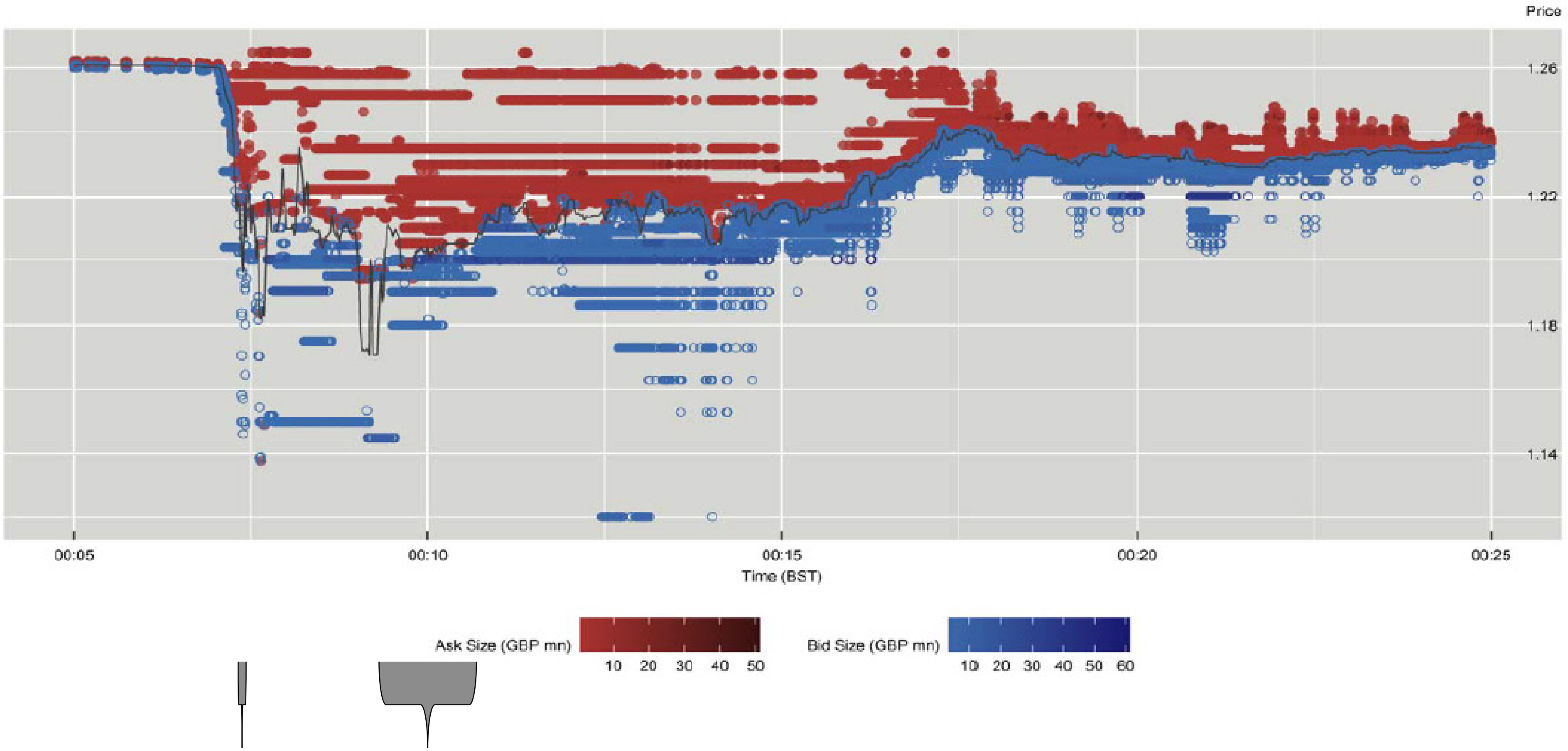
Source: Bank of England calculations.

Aggressive selling in S&P 500 E-mini futures on 6 May 2010



Source: CFTC & SEC, 2010.
1. The series shows the total volume of executed trades (net buy and sell) that resulted from passive orders less the total traded volume that was executed as a result of aggressive orders (net buy and sell).

What have we learnt? Liquidity supply



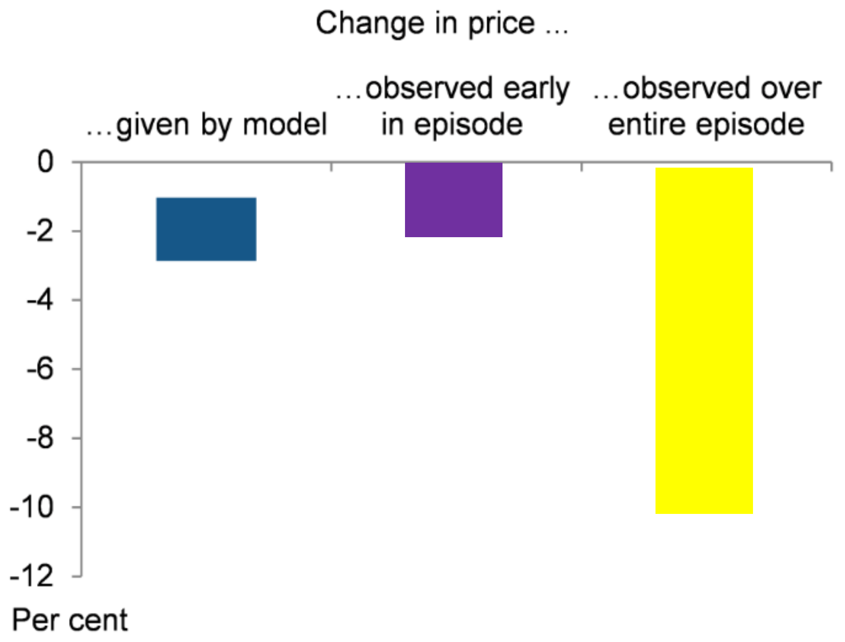
00:07:15 - 10 second 'pause' on CME

00:09:29 - Further 2 minute trading halt on CME

Change in price exceeded estimated price impact

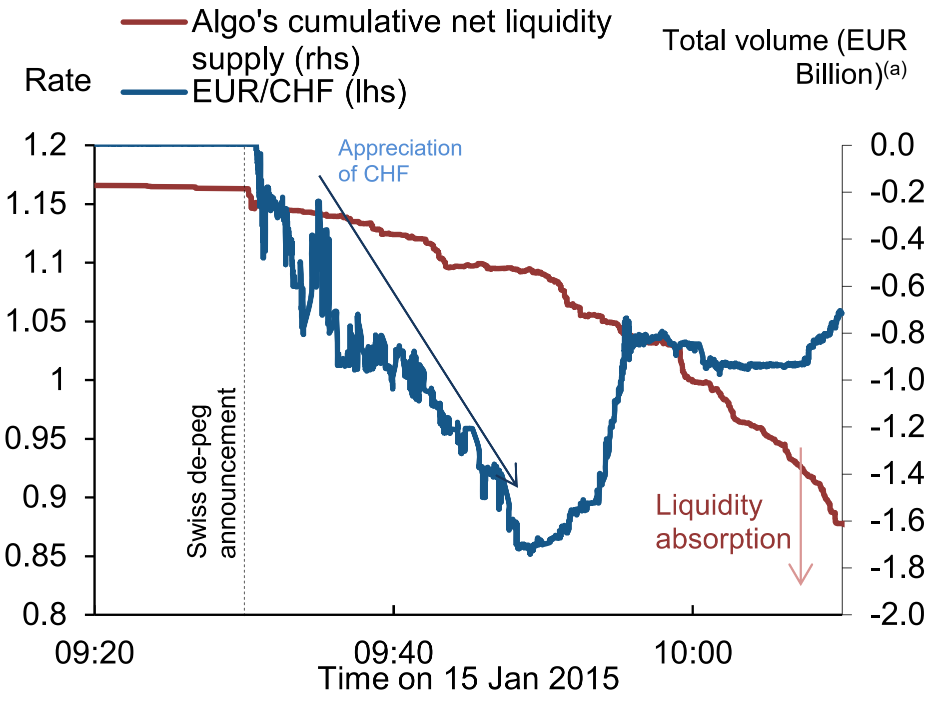
- **Hard question.** Need measure of price impact that is:
  - Robust to splitting of parent orders
  - Need price impact function that applies at any time of day (i.e. is in 'volume time')
- Based on Kyle and Obizhaeva (2016) (in equity markets)
- Initial fall in price up to 00:007:15 consistent with volume of sell orders…
- …but *subsequent* fall goes beyond that consistent with estimates of price impact
- **Pause in trading on CME may have led to withdrawal of liquidity by market makers on Thomson Reuters**

(In)consistencies between observed changes in price and those expected given order flow



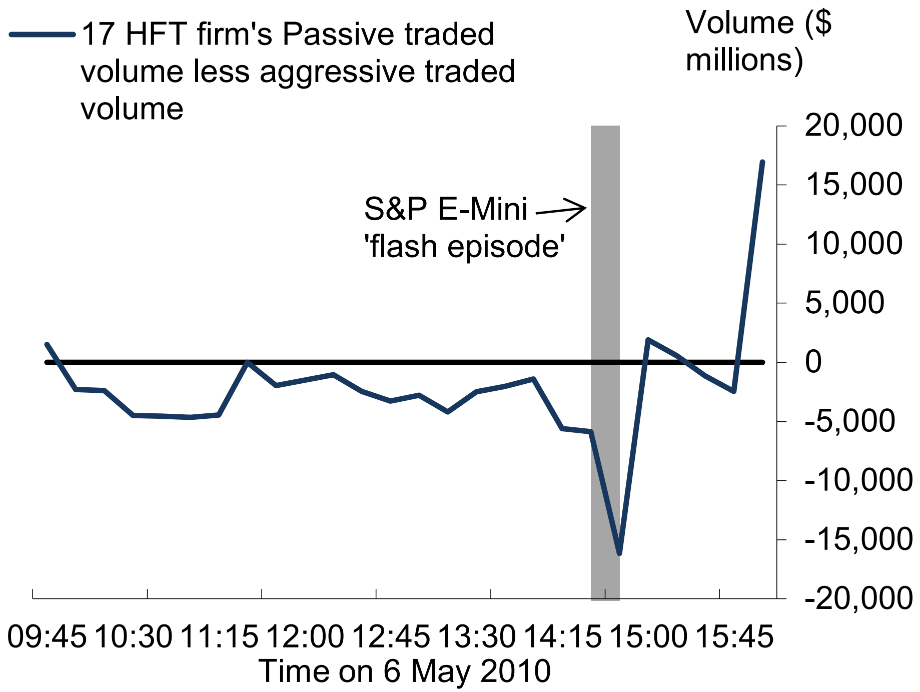
What have we learnt? Liquidity supply

Liquidity provision by algorithmic traders in… EUR/CHF on 15 Jan 2015



Source: Breedon et al, forthcoming, Bloomberg
Cumulative liquidity provision is defined as the total volume of limit orders less market orders.

S&P 500 E-mini future on 6 May 2010



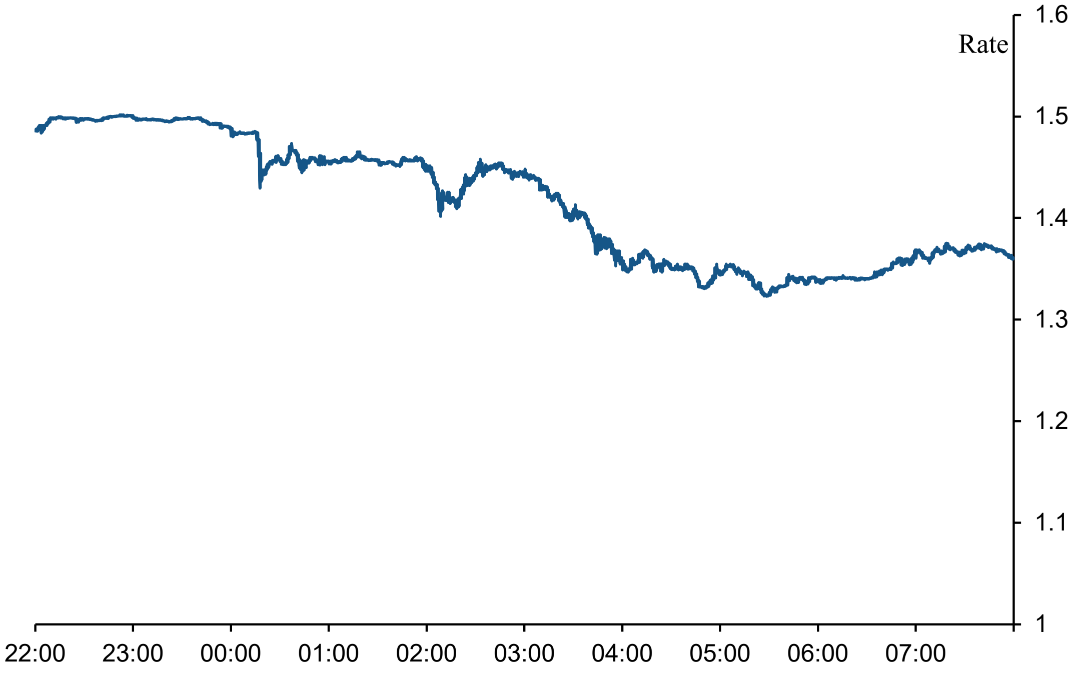
Source: CFTC & SEC, 2010.
The series shows the total volume of executed trades that resulted from passive orders less the total traded volume that was executed as a result of aggressive orders.

What have we learnt? Summary

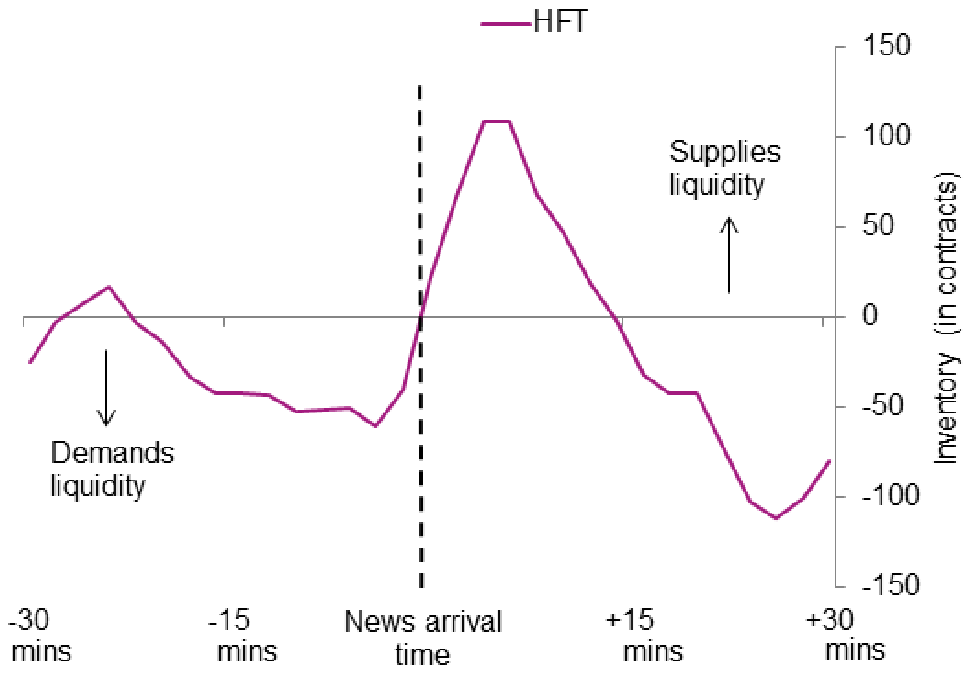
- Flash crashes seem to be trigged by:
  - Following **trades that are large, relative to liquidity conditions** (Sterling flash crash (October 2016); S&P 500 E-mini futures (May 2010))
  - Unanticipated **change in market fundamentals** (Removal of Swiss franc peg to euro (Jan 2015))
- Algo trading then amplifies: withdrawing bids and selling into falling markets
- Role of circuit breakers

Anticipated shocks play out differently

GBP/USD on 23/24 June 2016 – EU referendum



Net algo liquidity provision following negative news



Source: Hautsch Noe and Zhang 2016

1. Net liquidity provision is defined as passive net contracts purchased less aggressive net contracts purchased in a falling market. An increase shows passive orders outpacing aggressive orders in a positive direction (i.e that counters the falling market)
2. For 914 identified macroeconomic news events on the Eurex futures market.

So what? Implications for financial stability

- 10 minutes of market risk does not make a systemic risk

- But how could it?
    - By occurring close to end-of-day, leading to margin calls
    - By reducing confidence in markets, increasing risk premia
    - By causing material losses for systemic institutions
    - By triggering circuit breakers that cause spill-overs to other markets

Q&A