

# AN ANALYSIS OF LONG TERM EVOLUTION OF THE ITALIAN GOVERNMENT BOND WHOLESALE SECONDARY MARKET LIQUIDITY

## *Fixed Income Market Colloquium*

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A look at **long term trends** of MTS cash **liquidity** (2006-2017). If, when and how liquidity changed.

Liquidity long term trends and *market making*: if and how the evolution of liquidity affected **market making strategies**.

Liquidity long term trends and **large trades execution**.

New regulation and market competition are currently the two main forces driving down *market making* profitability. A first empirical test based on the impact of a change in the **market making rules** set by the Treasury.

1.

## THE LONG TERM TRENDS OF MTS CASH LIQUIDITY (2006-2017)

# METHODOLOGY: DATABASE AND BENCHMARKING

## Database

- Period: February 1, **2006** –April 30, **2017**
  1. Snapshots of the order book of the BTP 10y benchmark. Frequency **5 minutes**, from 9,00 am to 5,00 pm
  2. Whole trading activity: deals on BTP 10y benchmark and area

## BTP 10 yr benchmark

- It corresponds with the BTP on-the-run from the settlement date of the **second auction** (in order to consider only bonds with a large enough outstanding volume)

# METHODOLOGY: LIQUIDITY MEASURES

- An analysis on market microstructure could be conducted from **several perspectives** (quoting activity, trading volumes, prices resiliency). We have analyzed all these aspects, computing more than **50 measures**, such as:

## Quoting

- Bid ask spread
- Volumes quoted
- Number of proposals
- Book quotes standard deviation
- Slope

## Resiliency

- Price impact on best price
- Price impact on volume weighted price

## Trading

- Traded volume
- Block trades volume
- Average deal size

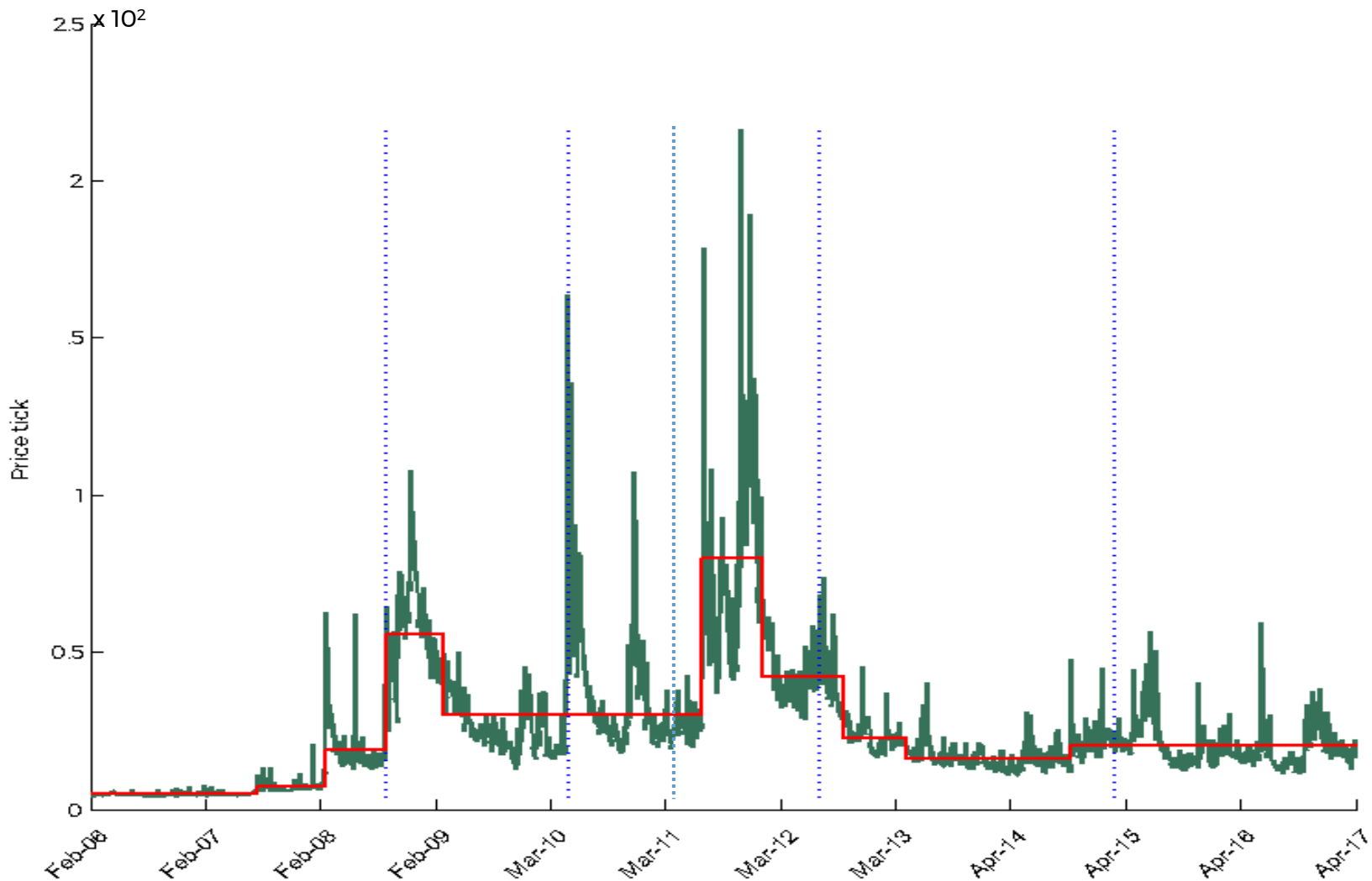
# METHODOLOGY: TEST OF STRUCTURAL BREAKS

## Bai and Perron test (1998, 2003)

- The test detects the **structural breaks**: jumps and breaks in slow-moving trends
- The underlying **assumption**: the level of liquidity fluctuates around a stable mean
- The test does **not require a priori knowledge** of the **number** and the **timing** of the **breaks**

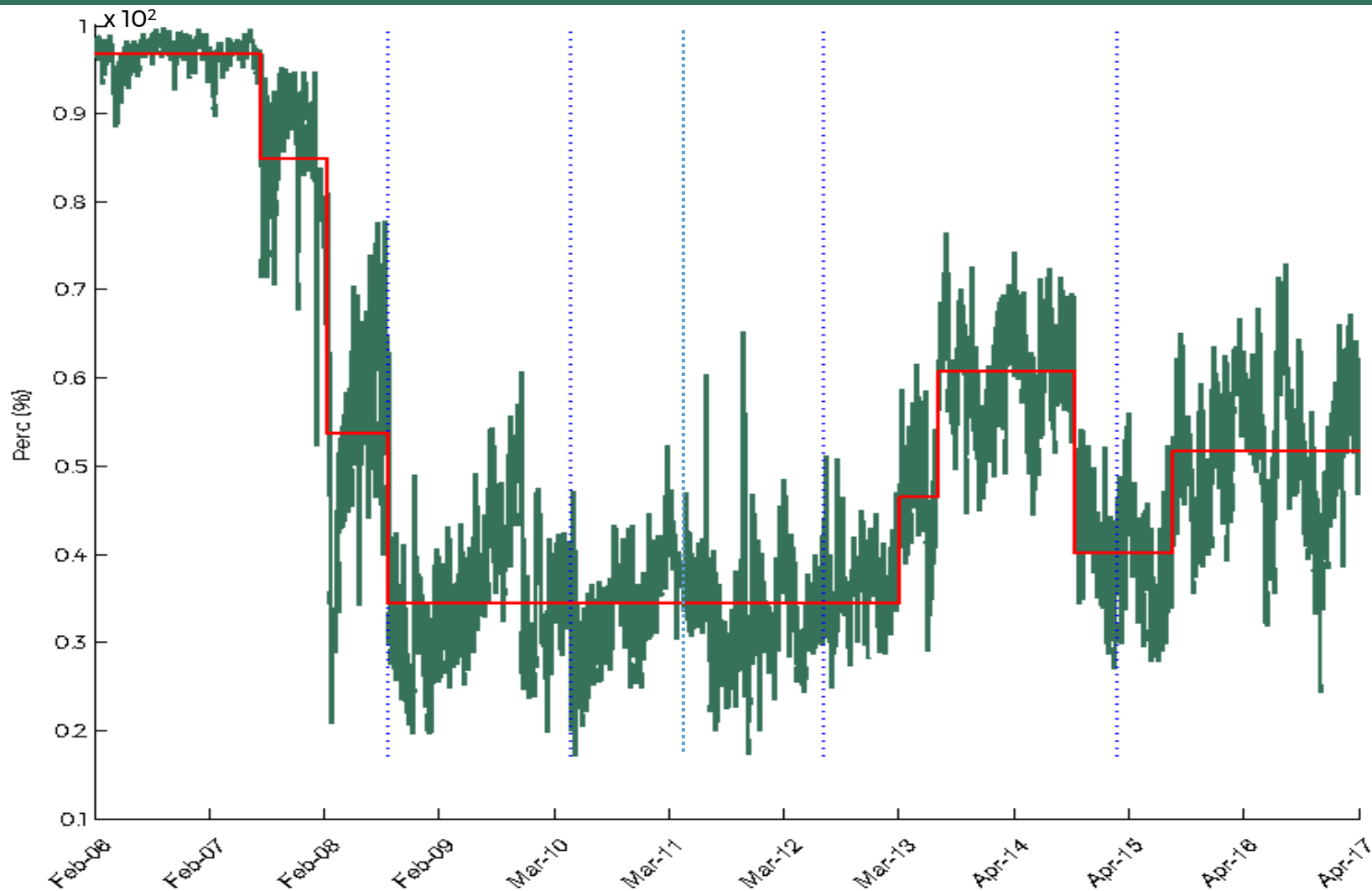
# VOLUME WEIGHTED BID ASK SPREAD

## - breaks and dates



Num	1°	2°	3°	4°	5°	6°	7°	8°	9°
Date	Jul 07	Mar 08	Sep 08	Mar 09	Jul 11	Jan 12	Oct 12	Apr 13	Oct 14

# QUOTED VOLUME ON THE THREE BEST PRICES / TOTAL QUOTED VOLUME - breaks and dates



Num	1°	2°	3°	4°	5°	6°	7°	8°	9°
Date	Jul 07	Mar 08	Sep 08	Mar 13	Aug 13	Oct 14	Sep 15		



# SLOPE - Definition

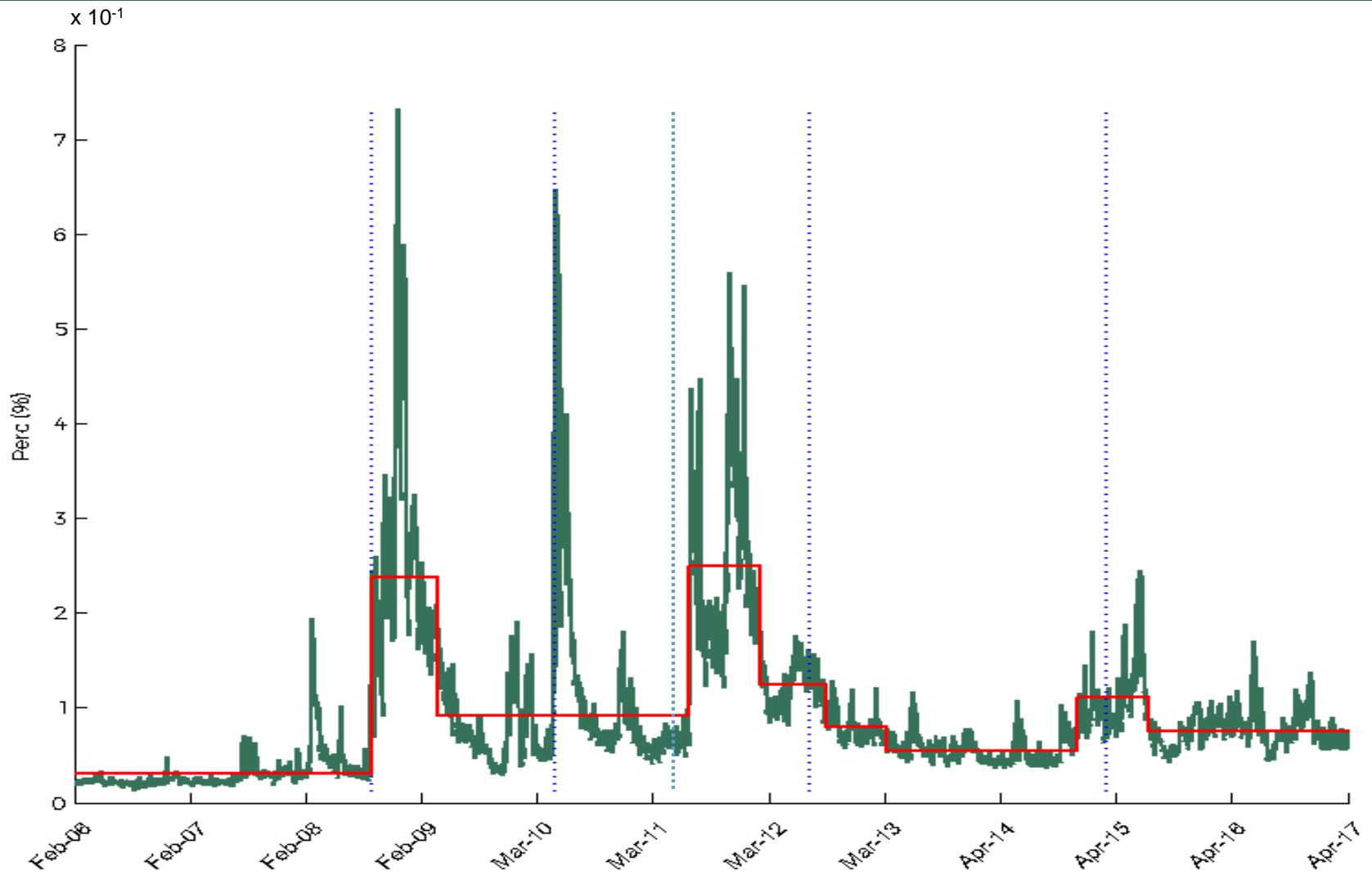
## Formula

$$\text{SLOPE BID (ASK)} = \frac{\text{BEST BID (ASK)} - \text{LAST BID (ASK)}}{\text{TOTAL VOL. BID (ASK)} - \text{VOL. BEST BID (ASK)}}$$

## Interpretation

Slope measures the average change in marginal quoted price a dealer has to bear for trading an additional unit above the best size.

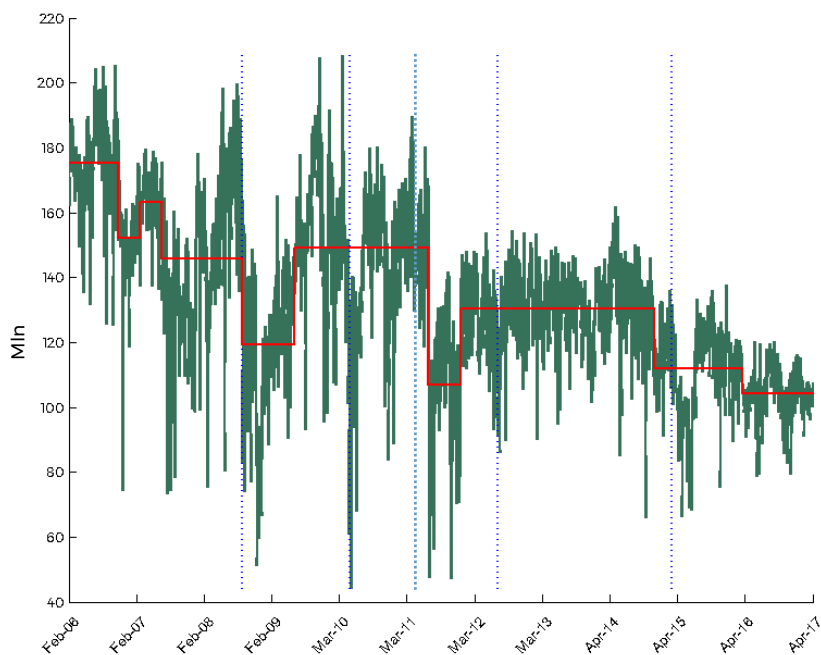
# SLOPE - Breaks and dates



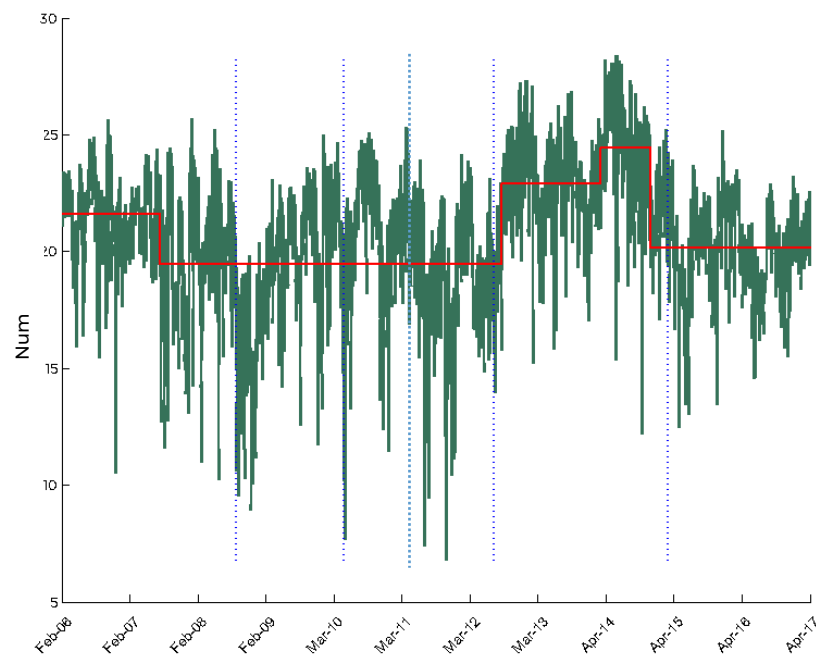
Num	1°	2°	3°	4°	5°	6°	7°	8°	9°
Date	Sep 08	Apr 09	Jul 11	Feb 12	Sep 12	Apr 13	Oct 14	Jul 15	


# TOTAL QUOTED VOLUME AND NUMBER OF PROPOSALS

## Quoted volume



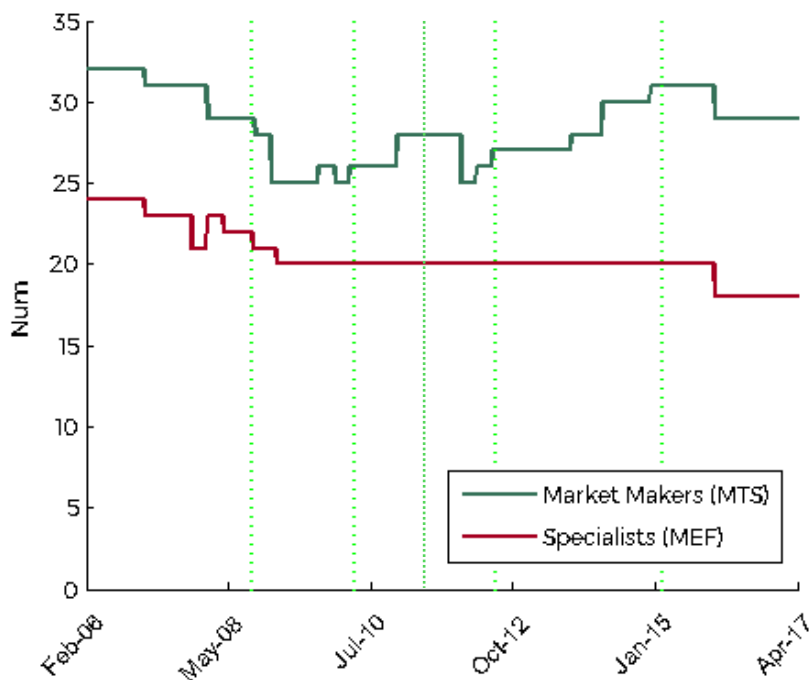
## Number of proposals



- Proposals steady or rising, but total quoted volume on the downward trend  the average size of proposals declined. What drives the number of proposals?

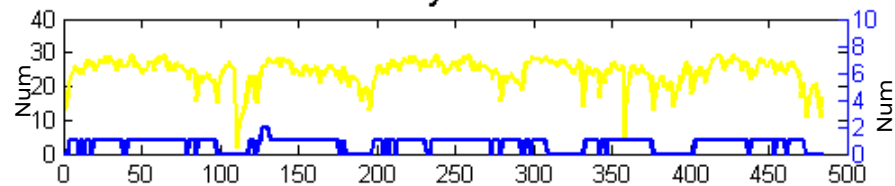
# THE ROLE OF DOUBLE QUOTES AND NUMBER OF MM

## Num MM and Specialists

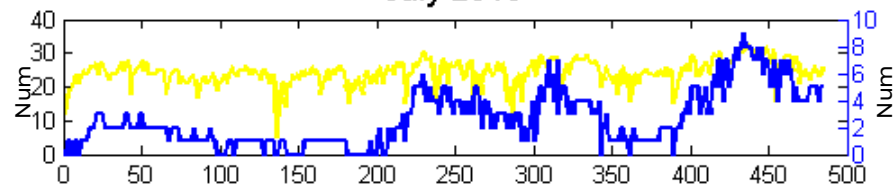


## Double Quotes

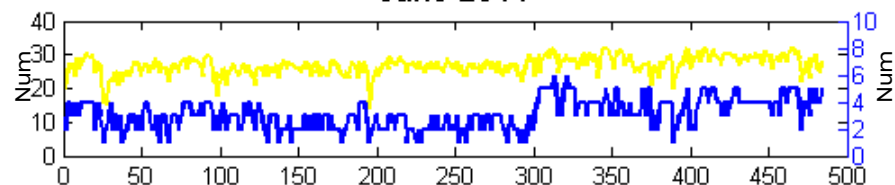
May 2008



July 2010



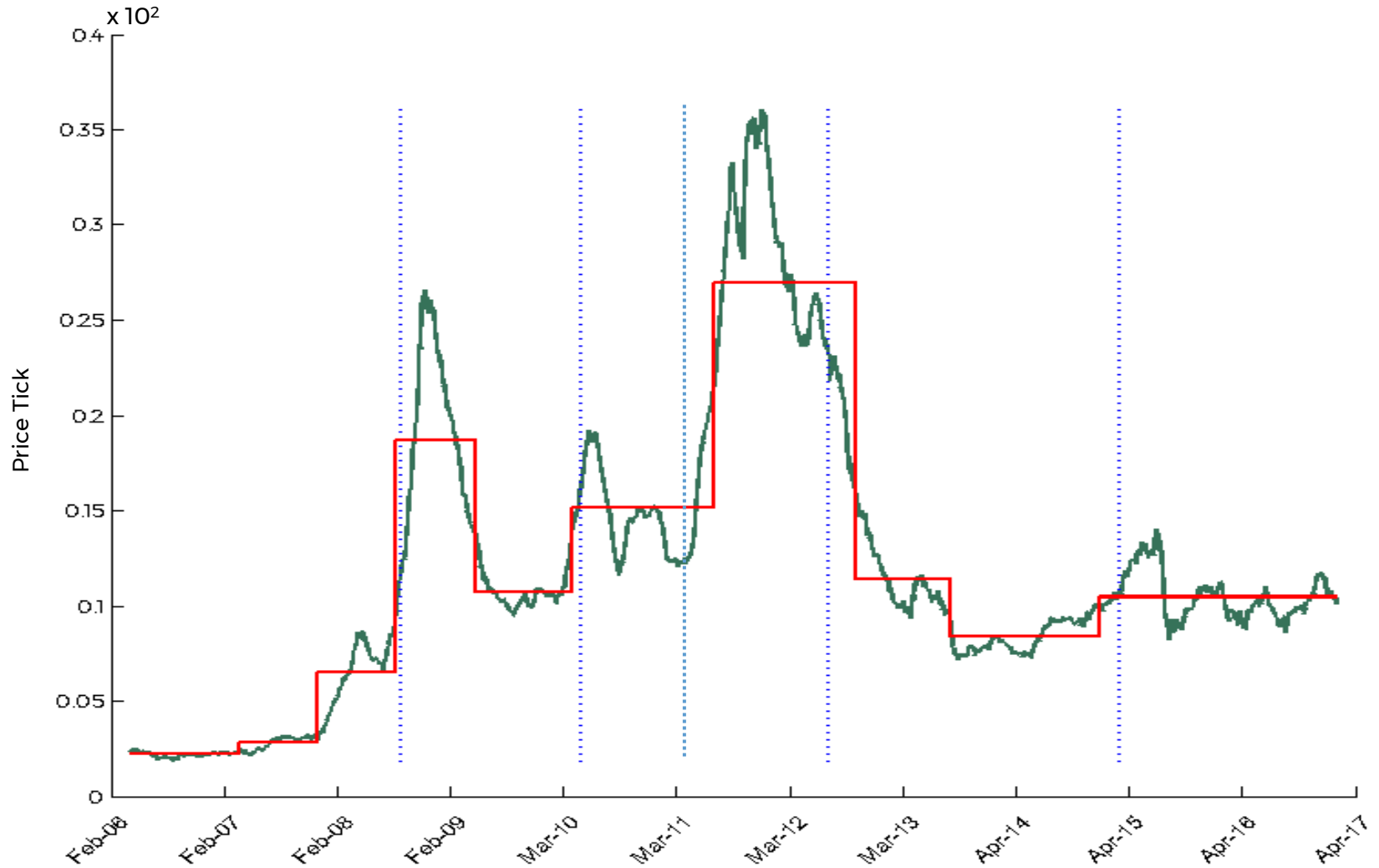
June 2014



— Num of quoted proposals — Num of double quotes

- Overtime an increased use of double quotes. Why?

# PRICE IMPACT ON VOLUME WEIGHTED PRICE



Num	1°	2°	3°	4°	5°	6°	7°	8°	9°
Date	Mar 07	Dic 07	Ago 08	Mar 09	Feb 10	Jun 11	Oct 12	Aug 13	Jan 15

# LIQUIDITY AND RELEVANT EVENTS

- Summary of the weeks with the highest number of measures with a structural break, according to the type of event.

Week	Number of measures with a break	Sign (Increase/decrease in mkt liquidity)	US/UK Financial Crisis	EU peripherals credit risk (non IT)	Italian credit risk	Global markets volatility
July 23, 2007	9	-	Yes	No	No	No
Feb 25, 2008	10	-	Yes	No	No	No
Sep 08, 2008	5	-	Yes	No	No	No
Sep 15, 2008	6	-	Yes	No	No	No
July 20, 2009	5	+	Yes	No	No	No
Apr 12, 2010	5	-	No	Yes	No	No
July 04, 2011	5	-	No	No	Yes	No
Jan 02, 2012	5	+	No	No	Yes	No
Sep 10, 2012	7	+	No	Yes	No	No
Oct 13, 2014	9	-	No	No	No	Yes
Aug 31, 2015	5	+	No	No	No	Yes

# TO SUM UP

## HAS MICRO-LIQUIDITY CHANGED?

Yes! We detect at least **3** different **phases** in market liquidity:

- 2006 – 2007, **perfect** market conditions
- 2008 – 2012, high **instability** and volatility in the market microstructure conditions
- 2013 – 2017, more stability, but **2006-2007** conditions **were never fully recovered**
- The **drop in liquidity in 2007-2008** has been much more intense than in 2011-12

## WHEN?

- **US/UK financial crisis** (July 2007, Feb 2008, Sep 2008)
- **EU sovereign debt crisis** (May 2010, July 2011, Sep 2012)
- **Episodic events** (Oct 2014, Sep 2015)

## HOW?

- Negative **jumps** vs **slow-moving positive** trends

2.

THE LIQUIDITY LONG TERM TRENDS  
AND *MARKET MAKING* STRATEGIES



# QUADRATURA: A NEW MEASURE BASED ON QUOTES TO CHECK THE SYMMETRY OF THE BOOK (I)

This measure combines **tightness** and **depth**.

Given:

$P_{B1}$  = Best Bid ,  $P_{A1}$  = Best Ask,

$P_{BM}$  = Bid of the median quoted size and  $P_{AM}$  = Ask of the median quoted size

$$\text{QUADRATURA BID(Qb)} = \frac{P_{B1} - P_{BM}}{P_{A1} - P_{B1}} \text{ and } \text{QUADRATURA ASK(Qa)} = \frac{P_{AM} - P_{A1}}{P_{A1} - P_{B1}}$$

Quadratura is defined as:

$$\text{QUADRATURA} = \frac{\text{QUADRATURA BID}}{\text{QUADRATURA ASK}} = \frac{P_{B1} - P_{BM}}{P_{AM} - P_{A1}}$$

# QUADRATURA: A NEW MEASURE BASED ON QUOTES TO CHECK THE SYMMETRY OF THE BOOK (II)

BID		BTP 10Y	ASK	
Quant	Price		Price	Quant
<b>10</b>	<b>99.90</b>		<b>100.05</b>	<b>20</b>
20	99.89		<b>100.06</b>	<b>35</b>
<b>50</b>	<b>99.87</b>		100.07	30
15	99.85		100.08	15
5	99.80			

$$P_{B1} = 99.90$$

$$P_{A1} = 100.05$$

$$P_{BM} = 99.87$$

$$P_{AM} = 100.06$$

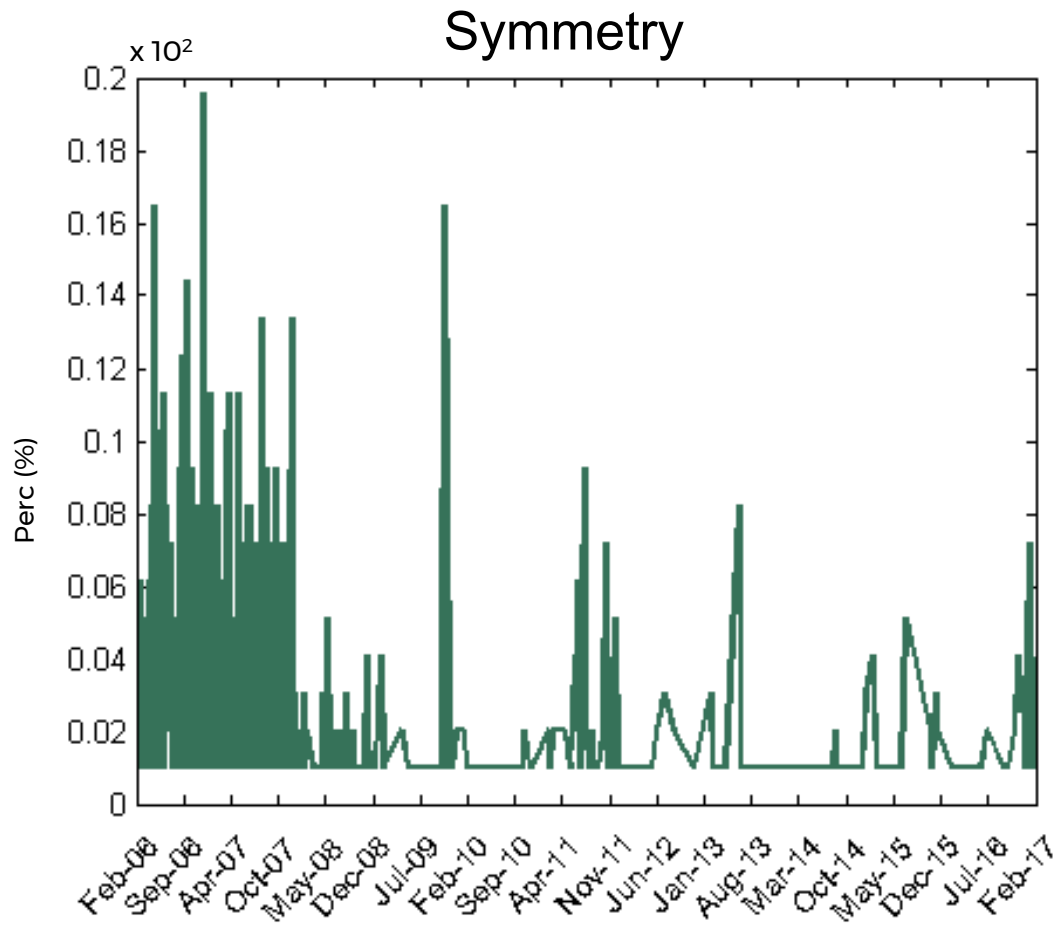
$$Q_b = \frac{P_{B1} - P_{BM}}{P_{A1} - P_{B1}} = \frac{99.90 - 99.87}{100.05 - 99.90} = 0,20$$

$$Q_a = \frac{P_{AM} - P_{A1}}{P_{A1} - P_{B1}} = \frac{100.06 - 100.05}{100.05 - 99.90} = 0,06$$

$$Q = \frac{Q_b}{Q_a} = 3$$

# SYMMETRY FREQUENCY (% on a daily basis)

- When  $Q=1$ , there is symmetry between bid and ask side of the order book



# TESTING BID ASK SYMMETRY ON THE OTHER MEASURES

- We computed the **differences** between the bid side and the ask side for each measure.
- On these series, we applied the **Augmented Dickey Fuller** test in order to test the stationarity condition.
- In the whole set of measures, we can **reject** the null hypothesis of a **unit root**.
- The test does not detect **any** stable **effects** of the **PSPP** on the daily symmetry of the measures.

# TO SUM UP

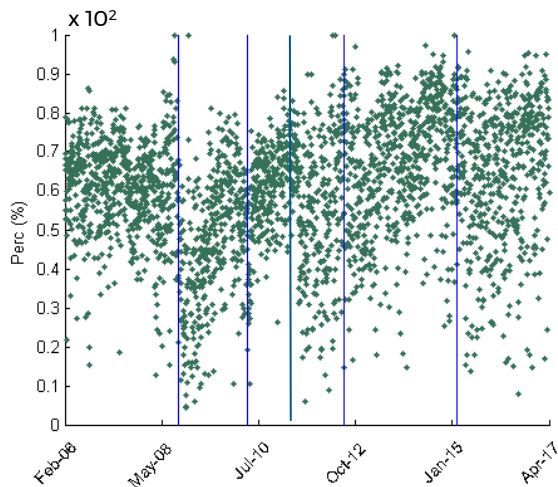
- During 2006-2007, in addition to the highest level of tightness, there was **perfect intraday symmetry** between bid and ask sides.
- Persistent periods of intraday perfect symmetry have not occurred anymore.
- Based on **daily averages**, however market microstructure shows a substantial **symmetry** in quoting and trading activities.
- Our conclusions are about the whole market activity. *A priori*, we cannot rule out that market makers act asymmetrically.
- The **PSPP** has **not caused** any relevant **effects** on the market **symmetry**

3.

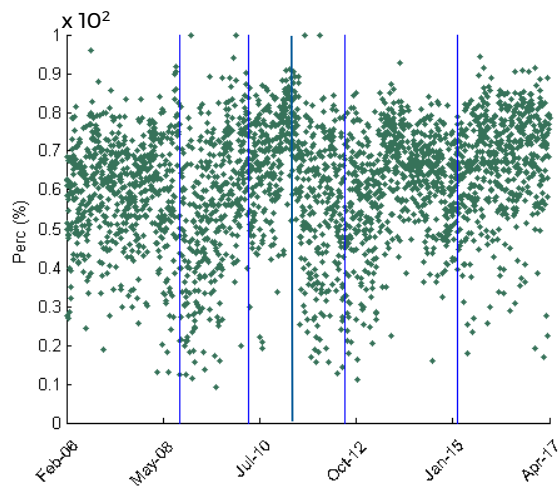
LIQUIDITY LONG TERM TRENDS AND  
LARGE TRADE EXECUTION

# TRADES: LARGE SIZE AND BLOCK TRADES

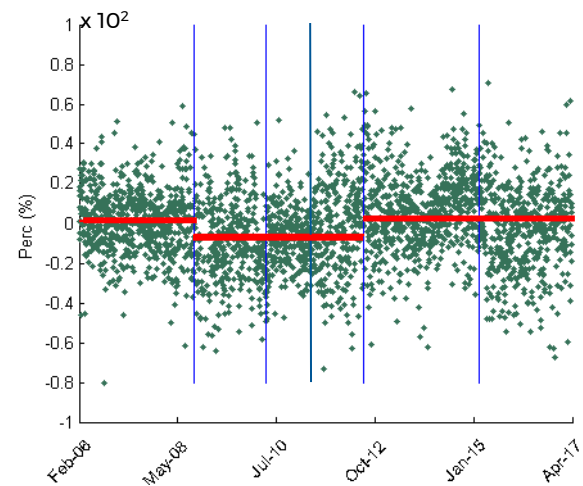
## Trades Area 10y, >7.5mm



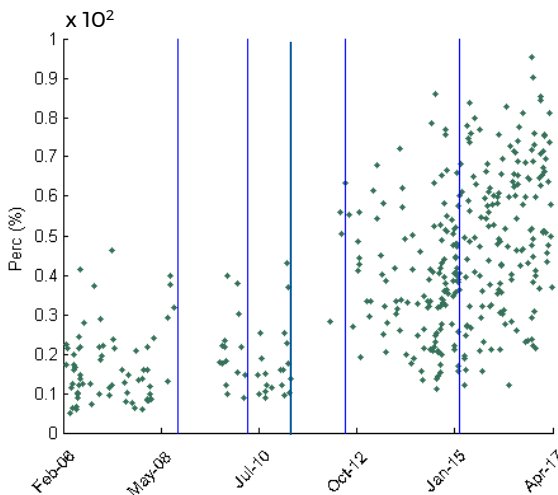
## Trades Area 5y, >7.5mm



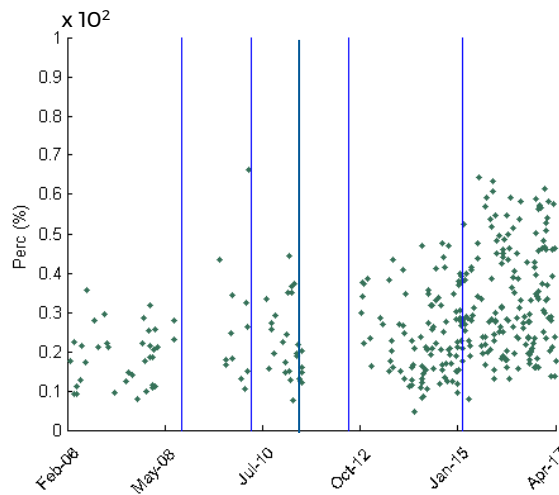
## 10y - 5y



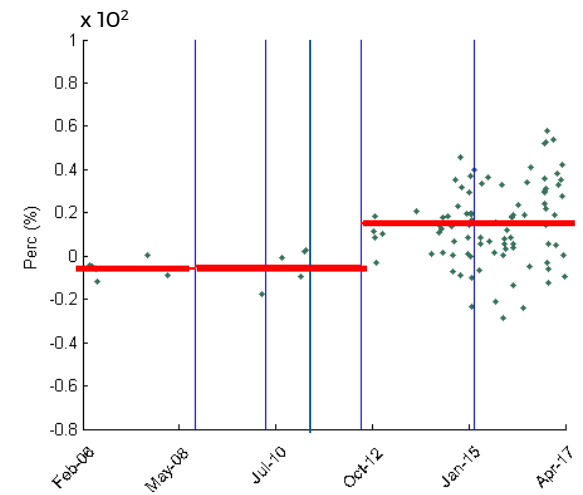
## Trades Area 10y, >100mm



## Trades Area 5y, >100mm

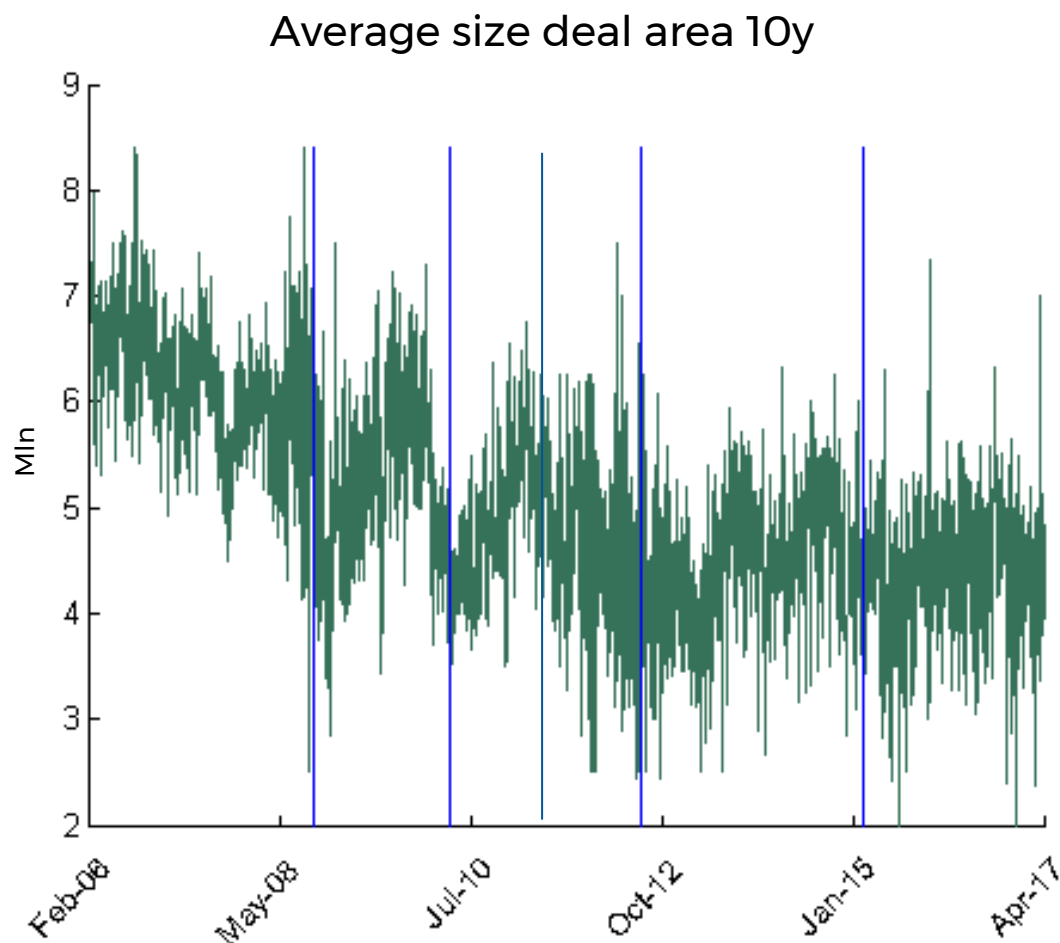


## 10y - 5y



# TRADES: AVERAGE SIZE

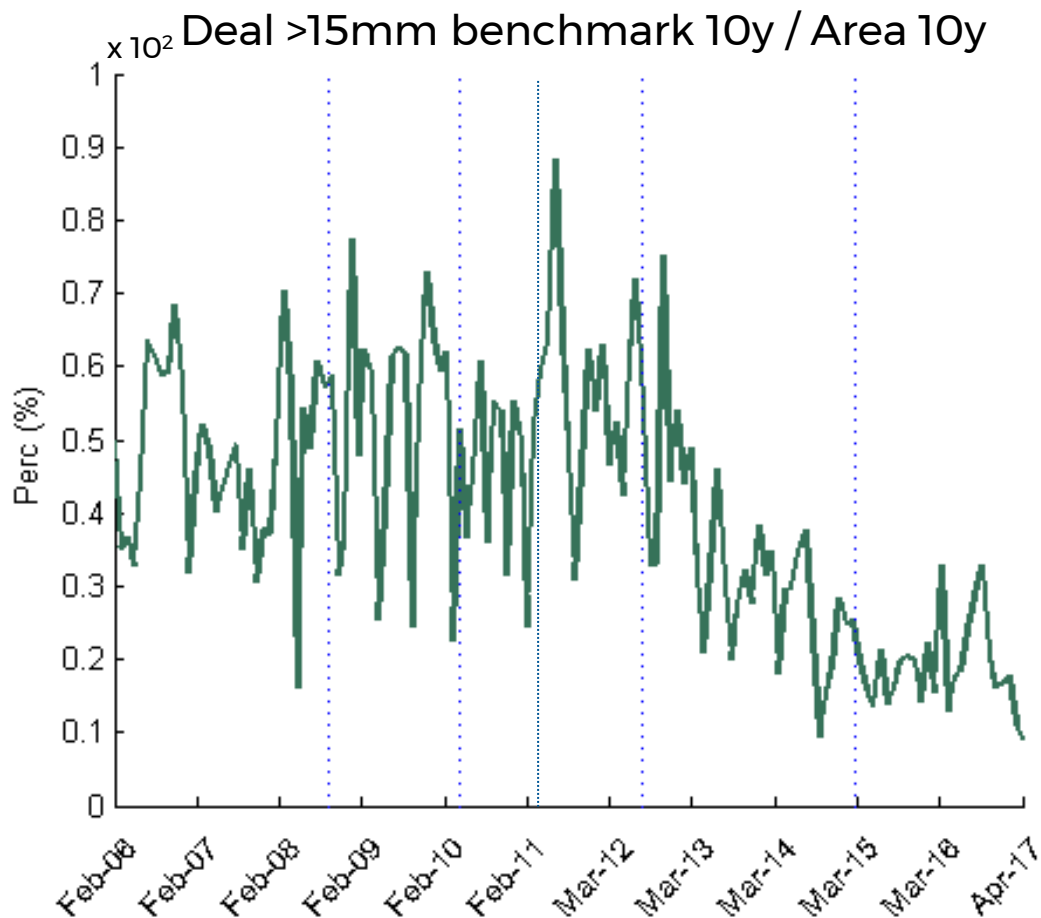
- Consistently with the evolution of the average quoted volume, the average size of the deals **has decreased**.





# TRADES: THE ROLE OF THE BENCHMARK

- The *market share* of the 10yr benchmark wrt the 10yr area (>8,5yr and < 11.5yr) has decreased after 2013. Has the liquidity on **BTP Futures** played a role?





# TO SUM UP

- During **stressed** periods (September 2008, summer 2011) the **trading** activity on MTS **declines drastically**.
- Some differences in trading BTPs of area 5yr and area 10yr exist (BTP Future role?).
- In the last years, dealers trading approach on the 10yr area has changed:
  - the **execution** of **large deals** (>100 mln) has increased;
  - the activity on **off-the-run** BTPs has increased (wrt the benchmark);
  - market makers have developed electronic systems for **automatic hedging**.

4.

Regulation, market competition and *market making* activity.

An empirical test on the impact of a change in PDs evaluation criteria set by the Treasury

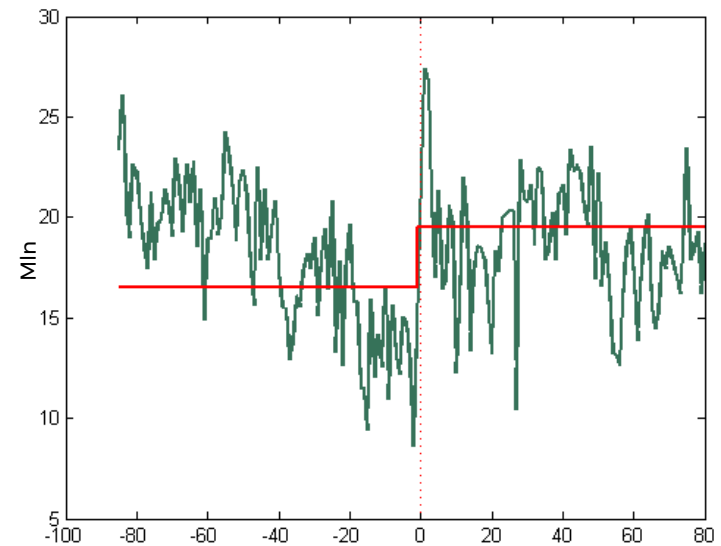
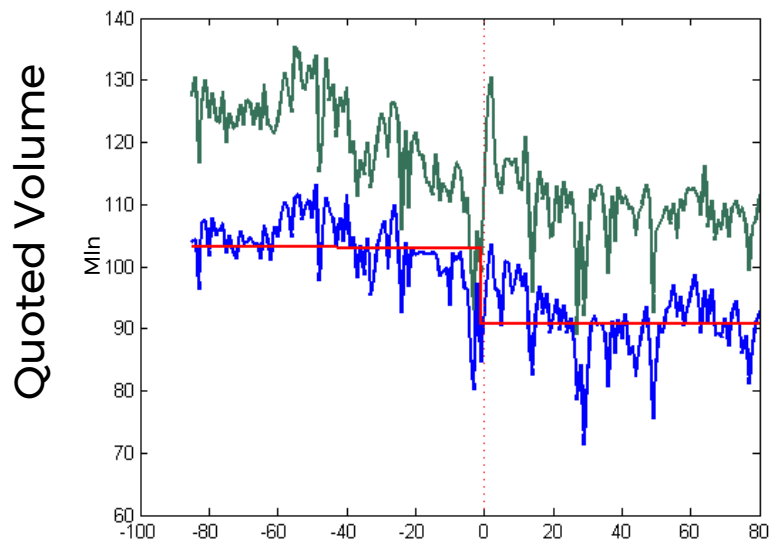
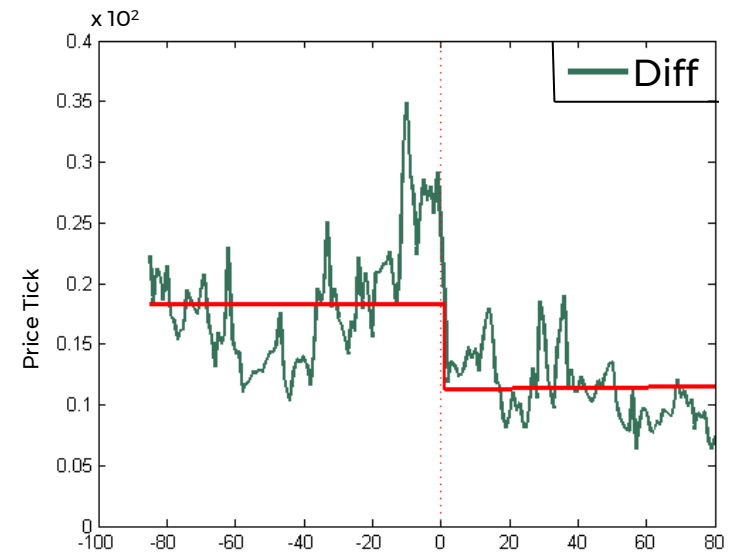
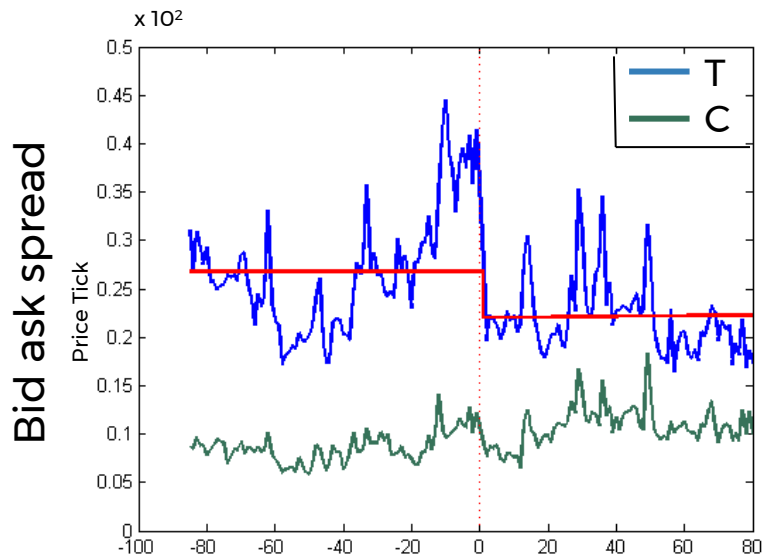
# PDs EVALUATION RULES AND MARKET COMPETITION

- Until December 2015, in order to evaluate the **quotation quality** of each PD, the Italian Treasury considered only proposals associated with visible quantities equal to at least 5 mln.
- Starting from January 2016, this **rule was changed**: for BTPs with maturity longer than 10 yr, also proposals associated to quotes smaller than 5 mln (2 mln is the minimum quantity) were considered.
- We have tried to test the impact of this change on PDs' behavior in order to gauge the relevance of balance sheet/capital constraints.

# PDs EVALUATION RULES AND MARKET COMPETITION

- Looking at the period September 2015 – April 2016, we select two groups of BTPs:
  1. The **Treatment group** (T): the first seven BTPs that had a residual maturity longer than 10yr during the whole period considered.
  2. The **Control group** (C): the first seven BTPs that had a residual maturity equal or smaller than 10yr during the whole period considered.
- Did PDs modify their quoting activity in the less constrained group?

# PDs EVALUATION RULES AND MARKET COMPETITION



# RESULTS

- In correspondence of the **threshold** (Jan 2016), the **bid ask spread** of BTPs of the Treatment group (T-group) **tightened 8 price ticks** vs the Control group (C-group) .
- The total **quoted volume** of the T-group **declined 3 mln** vs the C-group.
- The reduction in the quoted volume of T-group vs the C-group is extremely limited. *A priori*, the maximum reduction one could have expected is around 54 mln (18 PDs that can reduce their quoted volume from 5 mln to 2 mln).
- In this case, **market competition prevails** over balance sheet and capital constraints.



# THANKS!

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