

# Toxic Arbitrage and Price Discovery

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# Price Discovery

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  - ▶ What market provides the best estimate of the true value?
  - ▶ What is the effect of abandoning trade if other markets remain open?
  - ▶ How should different markets be regulated?

## Brazilian Real/US Dollar

- ▶ Ventura and Garcia (2012) and Garcia et al. (2015) show that price discovery in the BRL/USD exchange rate takes place in BMEF USD-futures
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- ▶ BRL-futures traded in the Chicago have widely been ignored
- ▶ Does relevant information arrive in Chicago first?
  - ▶ High market entry costs in Brazil
  - ▶ Close access to US information in Chicago
  - ▶ Chicago Mercantile Exchange as largest futures market
  - ▶ Low liquidity and volume in BRL-futures market

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- ▶ VAR based, either mid price or matched trades
- ▶ Frequency dependence (between 5 seconds and 30 minutes)
- ▶ Standard procedures such as IS and CS rely on sufficient liquidity in both markets
- ▶ And yet, literature finds importance of low volume (mini) contracts for price discovery
  - ▶ index futures (Wang et al. (2013))
  - ▶ gold futures (Pavabutr and Chaihetphon (2010))



# This Paper

- ▶ Develop a new measure for price discovery based on occurrence of toxic arbitrage opportunities
- ▶ Show that standard procedures perform worse and often overestimate importance of low liquidity markets
- ▶ Find that the Brazilian Real price discovery does in fact take place almost solely in São Paulo
- ▶ This is in line with market participants' expectation and experience

# Outline

Motivation

Toxic Arbitrage

Data

Toxic Arbitrage Information Share

Application

Conclusion

## Toxic Arbitrage Opportunities

- ▶ Foucault et al. (2016) introduce the concept of *toxic arbitrage* vs. *non-toxic arbitrage*
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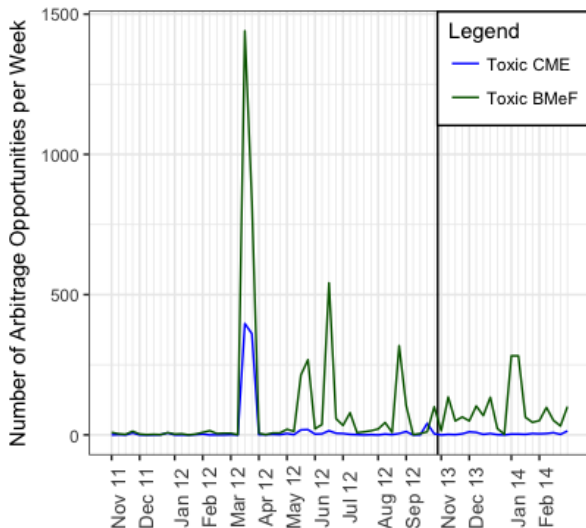
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- ▶ Intuition: more toxic arbitrage opportunities from  $B \rightarrow C$  than  $C \rightarrow B$  highlight higher importance of  $B$  than  $C$  for price discovery

## Dataset

- ▶ Brazilian Real futures in CME (USA); US Dollar futures in BMeF (Brazil)
- ▶ Contracts are two sides of the same coin BRL/USD futures
- ▶ Contracts traded in CME is on average 7% of BMeF trading volume
- ▶ 11.2011 - 9.2012; 11.2013 - 2.2014 → 248 trading days where both markets are open
- ▶ 14,268 arbitrage opportunities (1.2% of the observed time), half of which toxic



# Occurrence of Toxic Arbitrage Opportunities



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  - ▶ Problem 2: the price impact of information also matters
- ▶ The TAIS corrects the relative frequency to avoid both problems

# Full disclosure

- ▶ Disadvantages:
  - ▶ We need an underlying distribution of information arrival: Gaussian
  - ▶ Assumption that this distribution does not change over time
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  - ▶ Estimate of transaction fees necessary
- ▶ Advantages:
  - ▶ The TAIS is model based (though the logic does not rely on the model assumptions)
  - ▶ It provides an alternative approach avoiding VAR assumptions
  - ▶ No dependence on frequency
  - ▶ No dependence on liquidity

## Results

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<b>CS</b>	0.27	0.90	0.97	0.91	0.99	1.00
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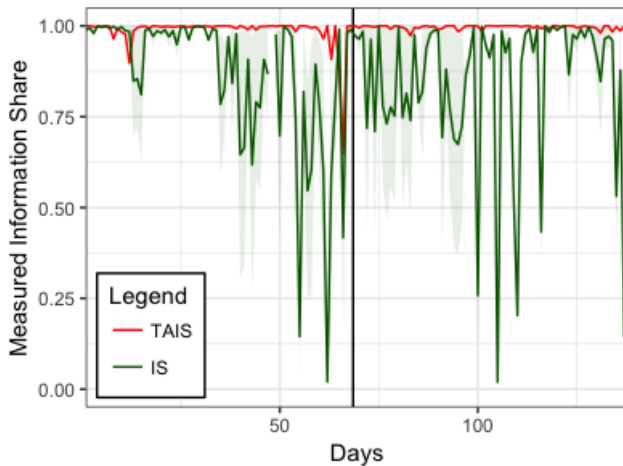
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<b>Bias</b>	-0.72	-0.13	-0.09	-0.05	0.00	0.00

## Price discovery over time



# Conclusion

- ▶ Use the concept of toxic arbitrage to investigate price discovery
- ▶ Introduce a model based toxic arbitrage information share (TAIS)
- ▶ Simulations indicate a better performance of the TAIS in low liquidity environments
- ▶ The results support the idea that toxic arbitrage opportunities are information driven
- ▶ Application for BRL/USD futures leads to results in line with market participants views and indicates a bias by standard procedures with regard to the less liquid market

Thank you for your attention!