High Frequency Traders and Asset Prices

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A lot of recent public interest in `high frequency trading.'
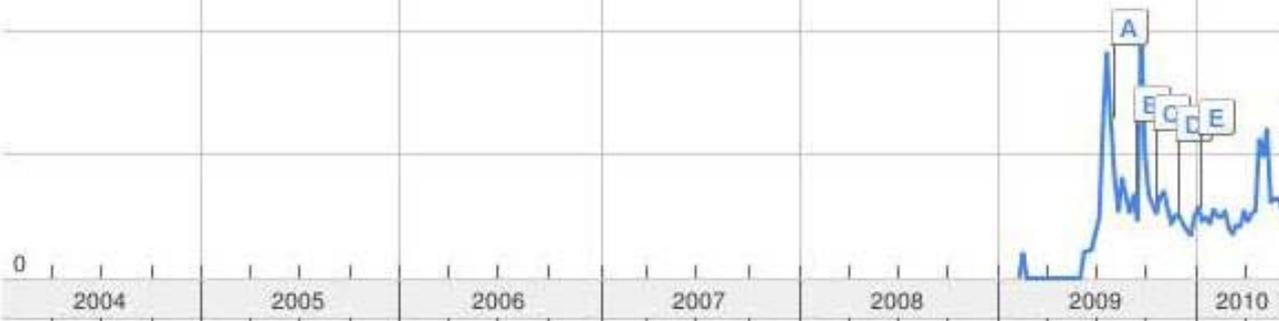
What is High Frequency Trading?

High frequency trading (HFT) typically refers to trading activity that employs extremely fast automated programs for creating, routing, canceling, modifying, and executing orders in electronic markets.

High frequency traders submit and cancel a massive number of orders and execute a large number of trades, trade in and out of positions very quickly, and end each trading day without a significant open position.

HFT is estimated to account for more than half of the trading volume on equity and derivatives exchanges (organized as electronic limit order markets).

What valuable services do high frequency traders provide?

Liquidity? Price discovery? At what cost? Who pays for it and how?
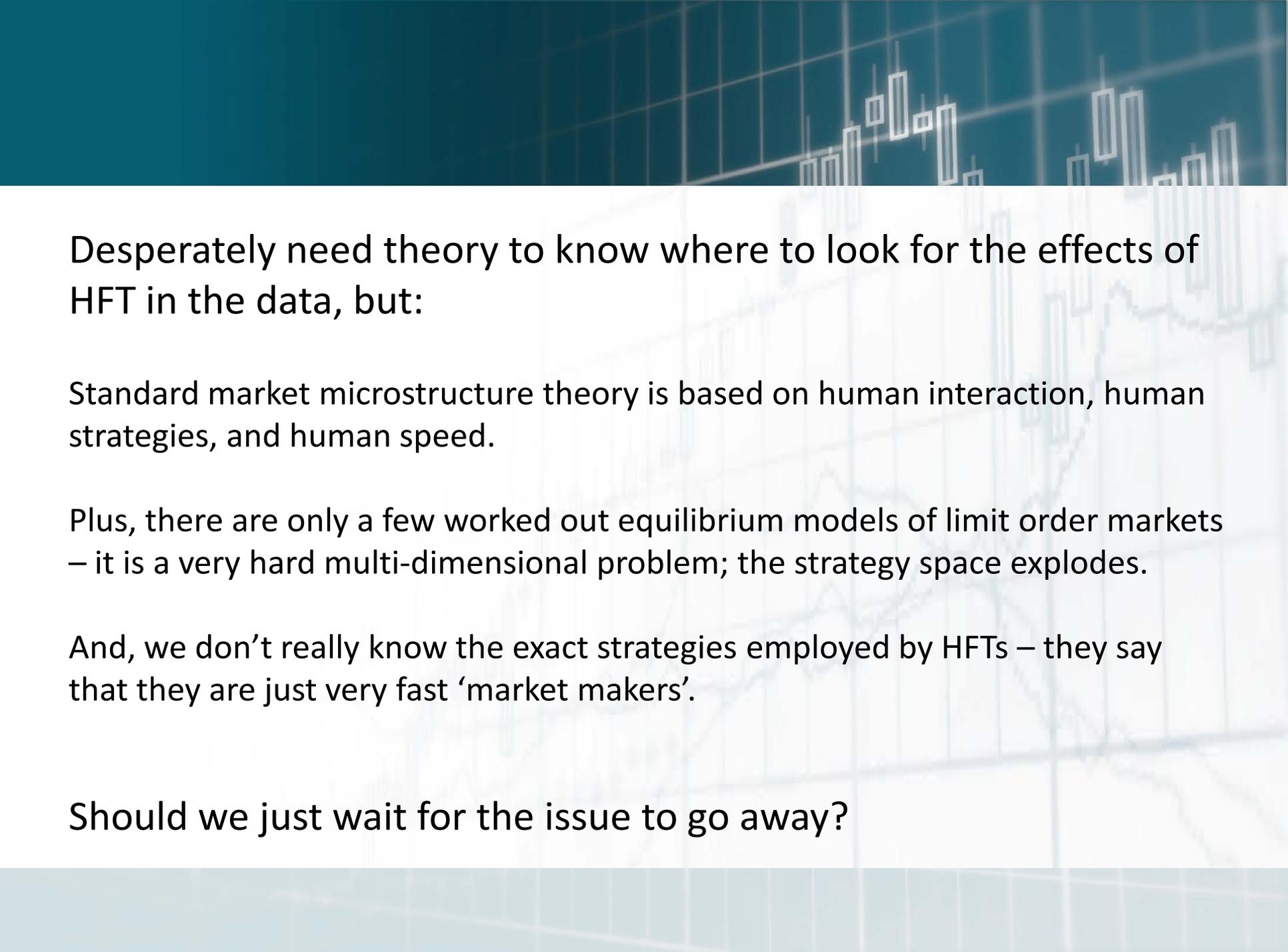
Desperately need theory to know where to look for the effects of HFT in the data, but:

Standard market microstructure theory is based on human interaction, human strategies, and human speed.

Plus, there are only a few worked out equilibrium models of limit order markets – it is a very hard multi-dimensional problem; the strategy space explodes.

And, we don't really know the exact strategies employed by HFTs – they say that they are just very fast 'market makers'.

Should we just wait for the issue to go away?
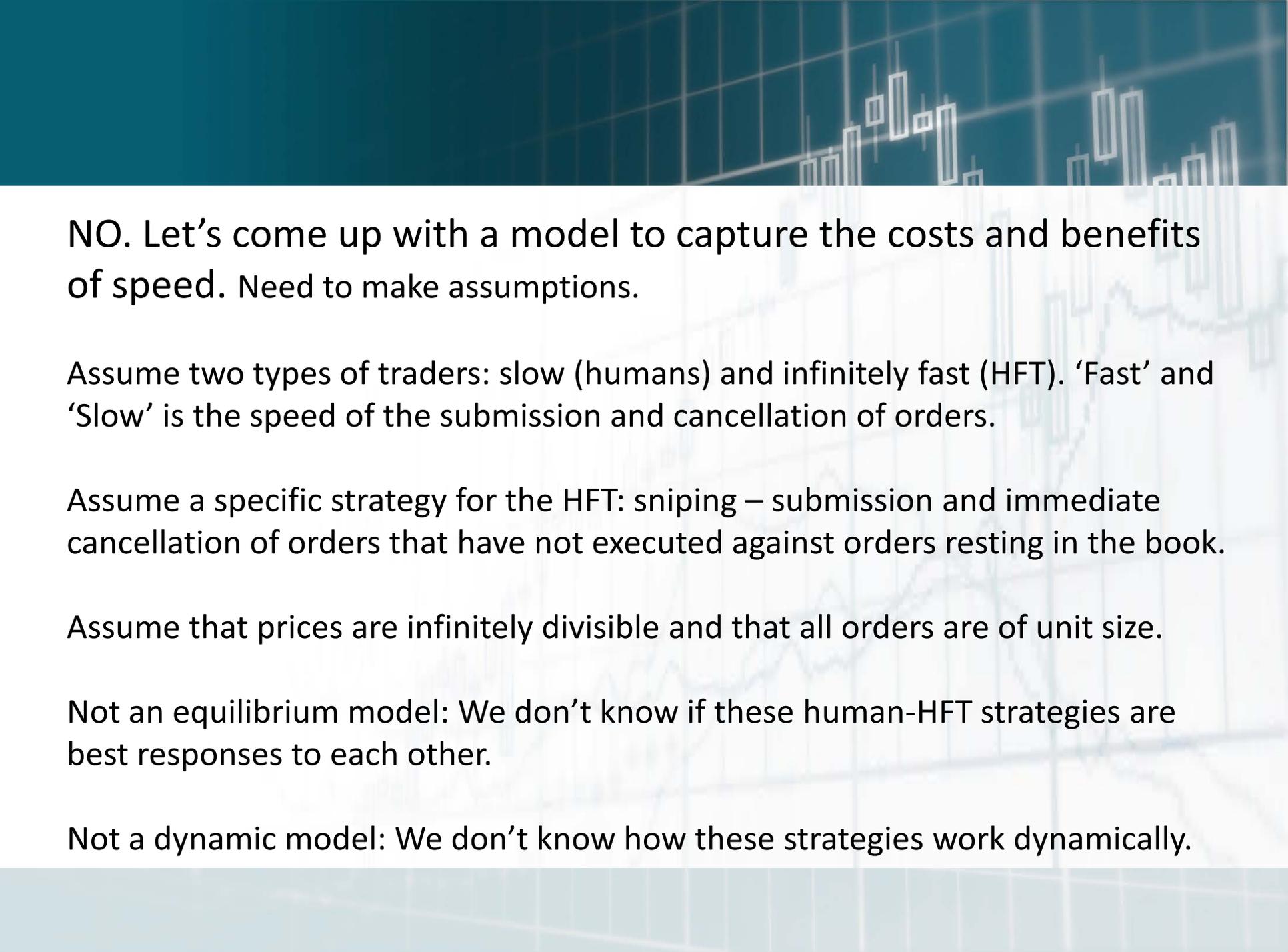
NO. Let's come up with a model to capture the costs and benefits of speed. Need to make assumptions.

Assume two types of traders: slow (humans) and infinitely fast (HFT). 'Fast' and 'Slow' is the speed of the submission and cancellation of orders.

Assume a specific strategy for the HFT: sniping – submission and immediate cancellation of orders that have not executed against orders resting in the book.

Assume that prices are infinitely divisible and that all orders are of unit size.

Not an equilibrium model: We don't know if these human-HFT strategies are best responses to each other.

Not a dynamic model: We don't know how these strategies work dynamically.
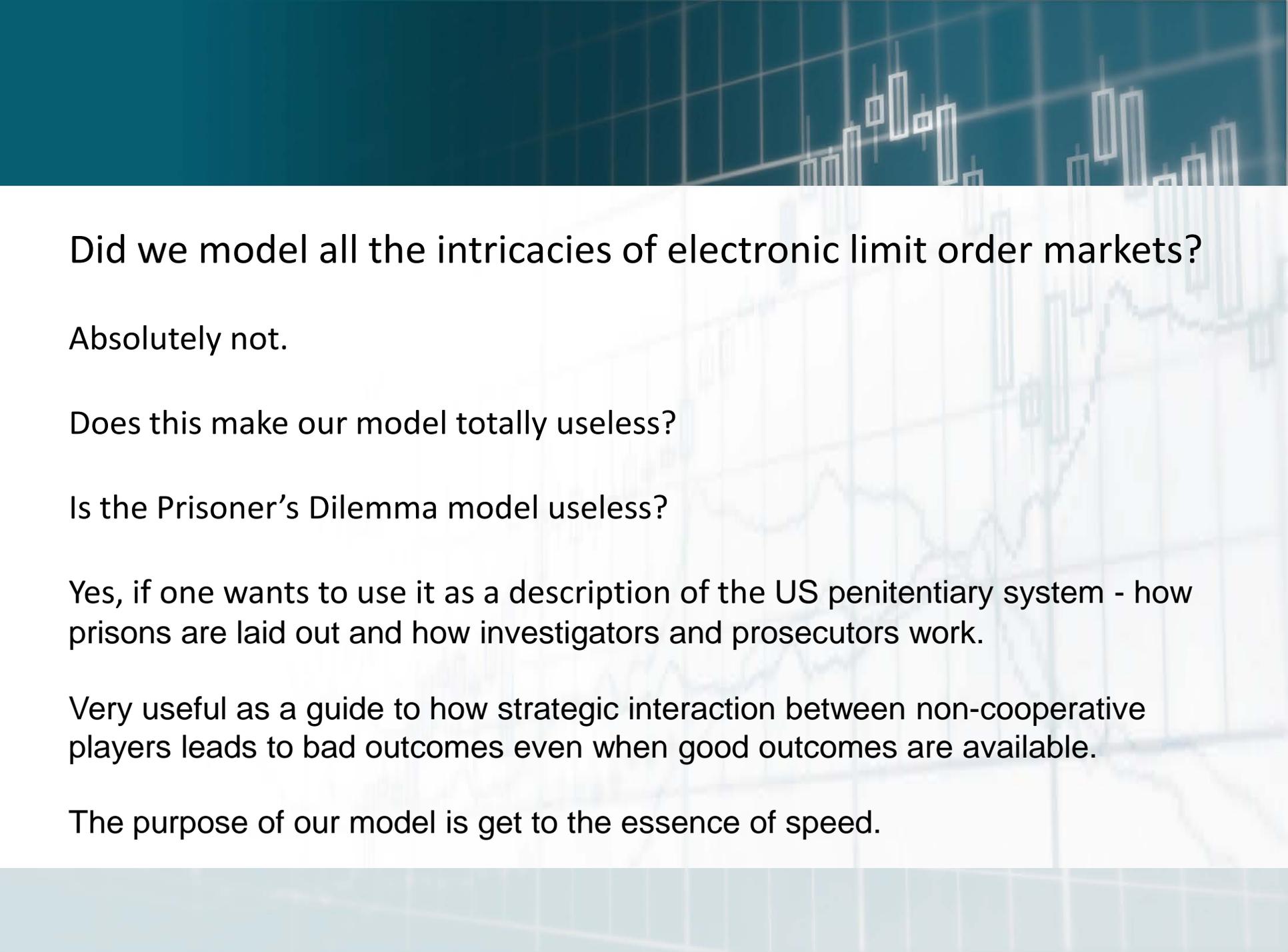
Did we model all the intricacies of electronic limit order markets?

Absolutely not.

Does this make our model totally useless?

Is the Prisoner's Dilemma model useless?

Yes, if one wants to use it as a description of the US penitentiary system - how prisons are laid out and how investigators and prosecutors work.

Very useful as a guide to how strategic interaction between non-cooperative players leads to bad outcomes even when good outcomes are available.

The purpose of our model is get to the essence of speed.
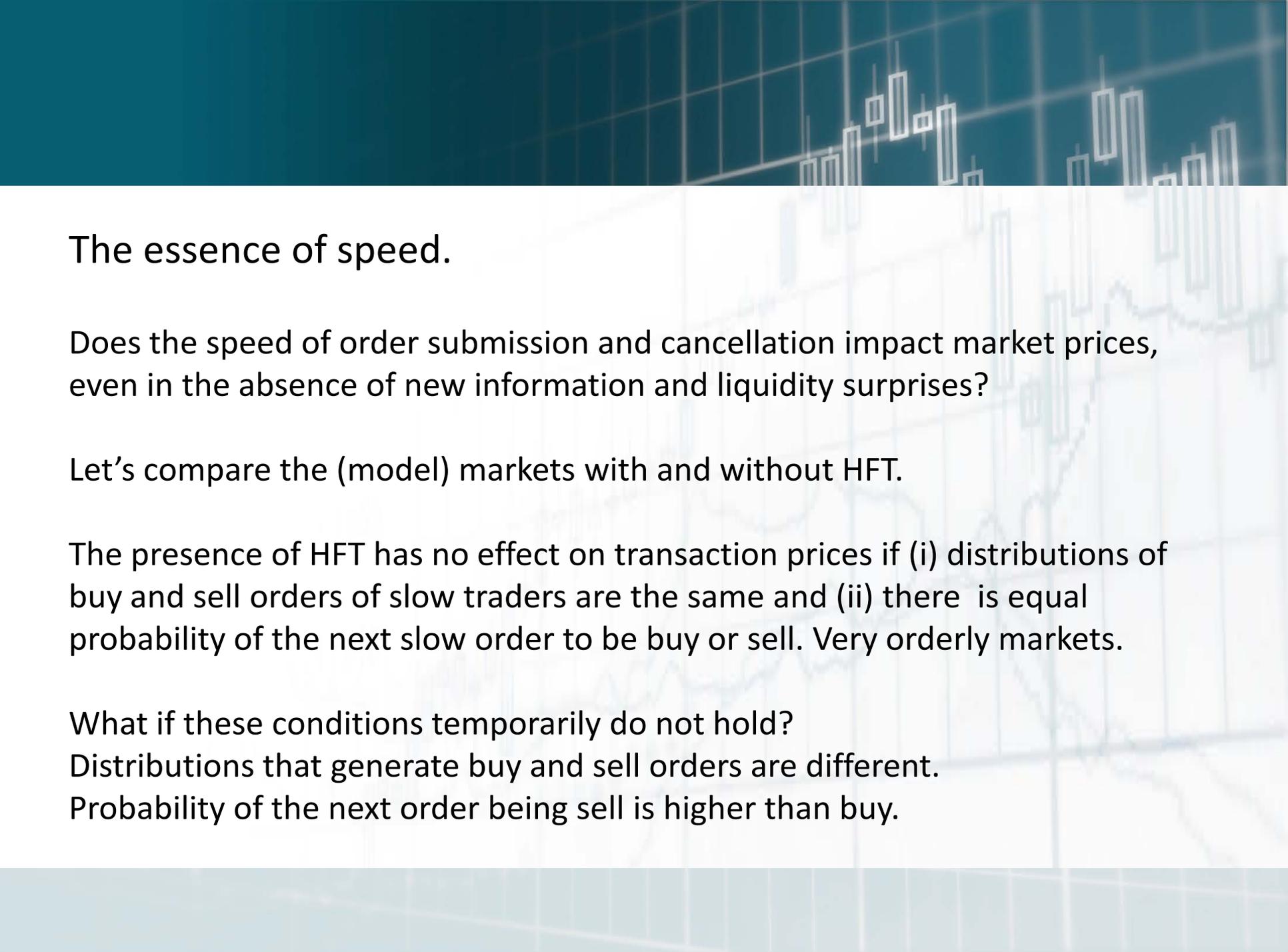
The essence of speed.

Does the speed of order submission and cancellation impact market prices, even in the absence of new information and liquidity surprises?

Let's compare the (model) markets with and without HFT.

The presence of HFT has no effect on transaction prices if (i) distributions of buy and sell orders of slow traders are the same and (ii) there is equal probability of the next slow order to be buy or sell. Very orderly markets.

What if these conditions temporarily do not hold?
Distributions that generate buy and sell orders are different.
Probability of the next order being sell is higher than buy.

Hard to imagine? Well...

May 6, 2010, June 2010 E-mini S&P 500
Five Best Bid/Offer Quantities
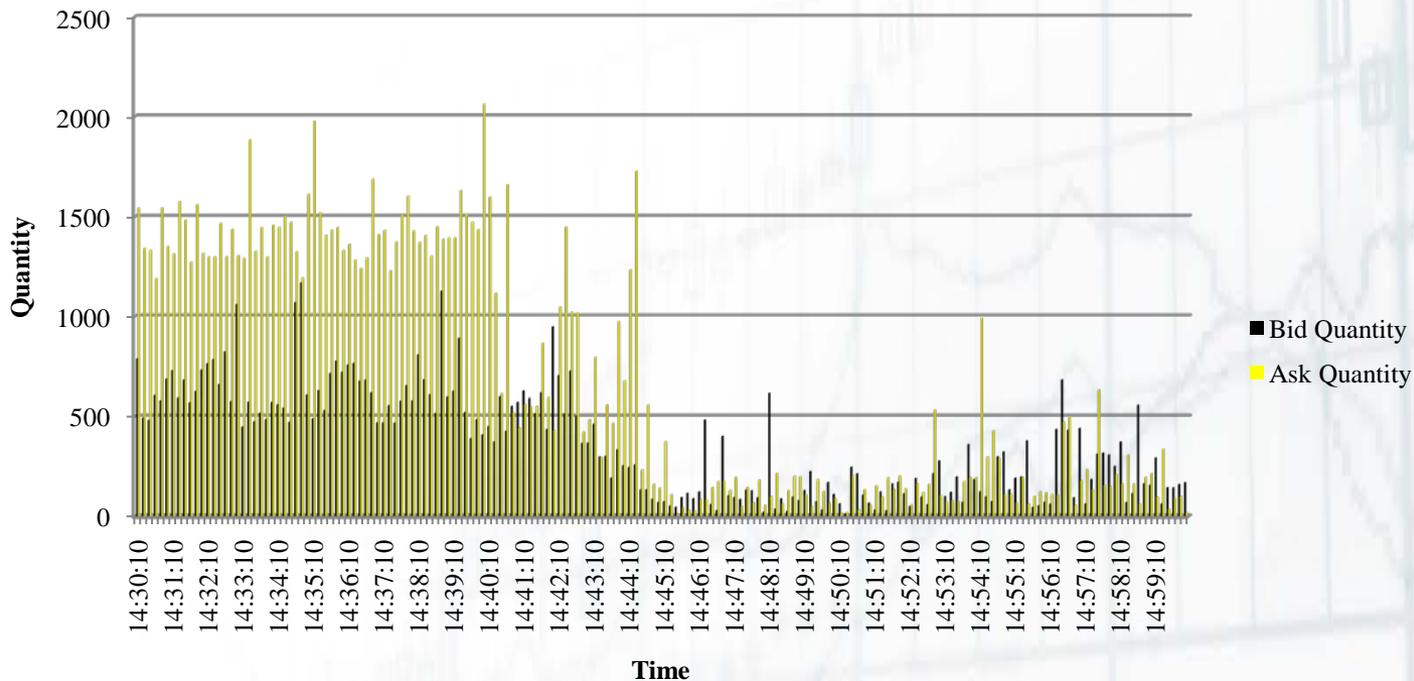
Source: CME Group. Reproduced in the Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues on Preliminary Findings Regarding the Market Events of May 6, 2010.
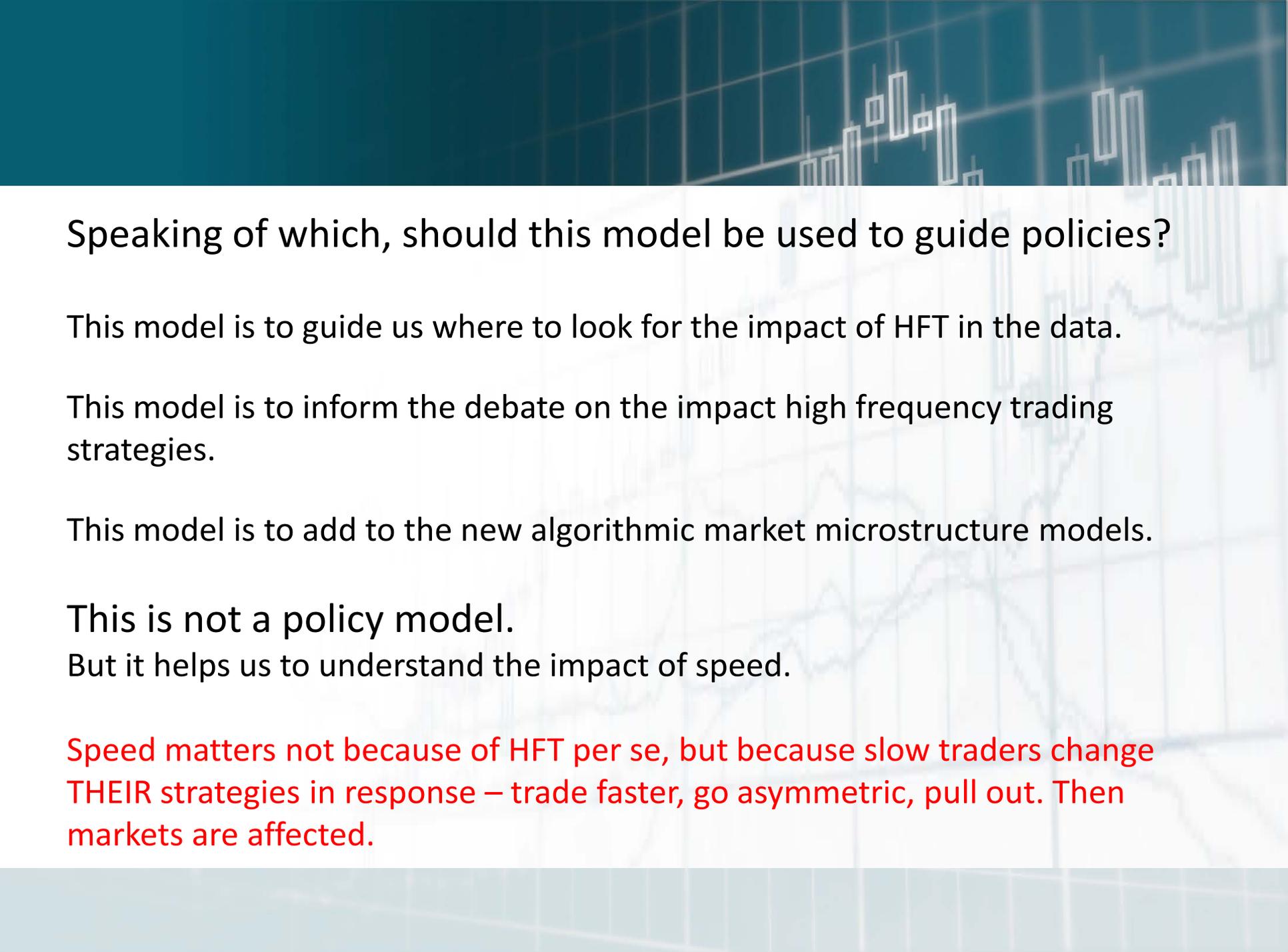
Speaking of which, should this model be used to guide policies?

This model is to guide us where to look for the impact of HFT in the data.

This model is to inform the debate on the impact high frequency trading strategies.

This model is to add to the new algorithmic market microstructure models.

This is not a policy model.
But it helps us to understand the impact of speed.

Speed matters not because of HFT per se, but because slow traders change THEIR strategies in response – trade faster, go asymmetric, pull out. Then markets are affected.