CLAIMS

What is claimed is:

1. A method of quantifying temporal fairness on electronic trading venues, the method being implemented on a computer system having one or more physical processors programmed with computer program instructions that, when executed by the one or more physical processors, cause the computer system to perform the method, the method comprising:

obtaining, by the computer system, market activity information associated with a first market participant and a second market participant;

determining, by the computer system, based on the market activity information, a first plurality of time deltas that each indicate an amount of time in which the first market participant has temporally beaten the second market participant with respect to market activity related to an instrument traded on the electronic trading venue;

determining, by the computer system, based on the market activity information, a second plurality of time deltas that each indicate an amount of time in which the second market participant has temporally beaten the first market participant with respect to the market activity related to the instrument traded on the electronic trading venue; ~~and~~

determining, by the computer system, a quantified level of temporal fairness with respect to the first market participant and the second market participant on the electronic trading venue based on the first plurality of time deltas and the second plurality of time deltas~~.~~;

batching, by the computer system, a set of orders received within a time period determined based on the quantified level of temporal fairness;

randomly selecting, by the computer system, an order from the batched set of orders; and

processing, by the computer system, the randomly selected order before remaining orders in the batched set of orders;

~~2. The method of claim 1,~~ wherein determining the quantified level of temporal fairness comprises:

identifying, by the computer system, from among the first plurality of time deltas and the second plurality of time deltas, a minimum time delta upon which the quantified level of temporal fairness is based.

~~3~~2. The method of claim ~~2~~1, wherein identifying the minimum time delta comprises:

calculating, by the computer system, a first actual value based on a number of the first plurality of time deltas that are greater than the minimum time delta, a number of the first plurality of time deltas that are less than or equal to the minimum time delta, and a number of the second plurality of time deltas that are less than or equal to the minimum time delta;

calculating, by the computer system, a second actual value based on a number of the second plurality of time deltas that are greater than the minimum time delta, the number of the first plurality of time deltas that are less than or equal to the minimum time delta, and the number of the second plurality of time deltas that are less than or equal to the minimum time delta; and

determining, by the computer system, whether the first actual value and the second actual value are each statistically equal to an expected value indicative of a temporally fair electronic trading venue, wherein the minimum time delta is identified based on a determination that the first actual value and the second actual value are each statistically equal to the expected value.

43. The method of claim ~~3~~2, wherein identifying the minimum time delta comprises:

testing, by the computer system, each of the first plurality of time deltas and the second plurality of time deltas to identify the minimum time delta.

~~5~~4. The method of claim 1, wherein the market activity comprises a market update transmitted to the first market participant or the second market participant such that the first plurality of time deltas each relate to an amount of time in which the first market participant was sent the market update before the second market participant.

~~6~~5. The method of claim 1, wherein the market activity comprises a market order received from the first market participant or the second market participant, and wherein determining a quantified level of temporal fairness with respect to the first market participant and the second market participant on the electronic trading venue comprises quantifying a level in which a first market order received from the first market participant overtakes, or is reordered with respect to, a second market order received from the second market participant.

~~7~~6. The method of claim 1, the method further comprising:

determining, by the computer system, a ~~minimum~~ value of a latency floor based on the minimum time delta, wherein the value of the latency floor comprises the time period determined based on the quantified level of temporal fairness.

~~8~~7. The method of claim 1, wherein obtaining the market activity information comprises:

~~identifying, by the computer system, a time period within which to analyze market activity.~~

~~9. The method of claim 1, wherein obtaining the market activity information comprises:~~

identifying, by the computer system, the first market participant and the second market participant based on a first connection from the first market participant to a component of the electronic trading venue associated with the computer system and a second connection from the second market participant to the component of the electronic trading venue.

~~10~~8. The method of claim 1, wherein the market activity information is further associated with a third market participant, the method further comprising:

determining, by the computer system, based on the market activity information, a third plurality of time deltas that each indicate an amount of time in which the third market participant has temporally beaten the first market participant with respect to the market activity related to the instrument traded on the electronic trading venue;

determining, by the computer system, based on the market activity information, a fourth plurality of time deltas that each indicate an amount of time in which the first market participant has temporally beaten the third market participant with respect to the market activity related to the instrument traded on the electronic trading venue;

determining, by the computer system, based on the market activity information, a fifth plurality of time deltas that each indicate an amount of time in which the third market participant has temporally beaten the second market participant with respect to the market activity related to the instrument traded on the electronic trading venue;

determining, by the computer system, based on the market activity information, a sixth plurality of time deltas that each indicate an amount of time in which the second market

participant has temporally beaten the third market participant with respect to the market activity related to the instrument traded on the electronic trading venue,

wherein determining the quantified level of temporal fairness comprises determining the quantified level of temporal fairness with respect to the first market participant, the second market participant, and the third market participant on the electronic trading venue based on the first plurality of time deltas, the second plurality of time deltas, ~~and~~ the third plurality of time deltas, the fourth plurality of time deltas, the fifth plurality of time deltas, and the sixth plurality of time deltas.

~~11~~9. The method of claim 1, wherein the market activity information comprises market data update information~~, relating to the instrument,~~ sent to market participants, wherein the market data update information is related to the instrument,

wherein determining the first plurality of time deltas comprises: determining, by the computer system, based on the market data update information, a first time delta that indicates a first amount of time in which the first market participant is sent a first market data update, relating to the instrument, before the second market participant, wherein the first plurality of time deltas is determined based on the first time delta; and

wherein determining the second plurality of time deltas comprises: determining, by the computer system, based on the market data update information, a second time delta that indicates a second amount of time in which the second market participant is sent a second market data update, relating to the instrument, before the first market participant, wherein the second plurality of time deltas is determined based on the second time delta.

~~12~~10. The method of claim 1, wherein the market activity information comprises order processing information used to determine whether an order from a first market participant overtakes an order from a second market participant and vice versa, wherein a given order overtakes another order when the given order is received after the other order but is processed before the other order;

wherein determining the first plurality of time deltas comprises: determining, by the computer system, a first time delta that indicates a first amount of time relating to a first order, relating to the instrument, from the first market participant that overtakes a second order, relating

to the instrument, from the second market participant, wherein the first plurality of time deltas is determined based on the first time delta;

wherein determining the second plurality of time deltas comprises: determining, by the computer system, a second time delta that indicates a second amount of time relating to a third order from the second market participant that overtakes a fourth order from the first market participant, wherein the second plurality of time deltas is determined based on the second time delta;

and wherein the method further comprises:

determining, by the computer system, a third plurality of time deltas that each indicate an amount of time in which an order, relating to the instrument, is received from the first market participant before another order, relating to the instrument, is received from the second market participant, regardless of whether the other order overtakes the order; and

determining, by the computer system, a fourth plurality of time deltas that each indicate an amount of time in which a particular order, relating to the instrument, is received from the second market participant before another particular order, relating to the instrument, is received from the first market participant, regardless of whether the other particular order overtakes the particular order, wherein the quantified level of temporal fairness is based further on the third plurality of time deltas and the fourth plurality of time deltas.

11. The method of claim 1, wherein randomly selecting the order from the batched set of orders comprises:

generating, by the computer system, a list of market participants from which the batched set of orders were received; and

shuffling, by the computer system, the list of market participants to create a random ordering of the market participants, wherein the order from the batched set of orders is selected based on the random ordering of the market participants.

~~13~~12. A system of quantifying temporal fairness on electronic trading venues, the system comprising:

a computer system having one or more physical processors programmed with computer program instructions that, when executed by the one or more physical processors, cause the computer system to:

obtain market activity information associated with a first market participant and a second market participant;

determine, based on the market activity information, a first plurality of time deltas that each indicate an amount of time in which the first market participant has temporally beaten the second market participant with respect to market activity related to an instrument traded on the electronic trading venue;

determine, based on the market activity information, a second plurality of time deltas that each indicate an amount of time in which the second market participant has temporally beaten the first market participant with respect to the market activity related to the instrument traded on the electronic trading venue; ~~and~~

determine a quantified level of temporal fairness with respect to the first market participant and the second market participant on the electronic trading venue based on the first plurality of time deltas and the second plurality of time deltas~~.~~;

batch a set of orders received within a time period determined based on the quantified level of temporal fairness;

randomly select an order from the batched set of orders; and

process the randomly selected order before remaining orders in the batched set of orders;

~~14. The system of claim 13,~~ wherein to determine the quantified level of temporal fairness, the computer system is further programmed to:

identify, from among the first plurality of time deltas and the second plurality of time deltas, a minimum time delta upon which the quantified level of temporal fairness is based.

~~15~~13. The system of claim ~~14~~12, wherein to identify the minimum time delta, the computer system is further programmed to:

calculate a first actual value based on a number of the first plurality of time deltas that are greater than the minimum time delta, a number of the first plurality of time deltas that are less

than or equal to the minimum time delta, and a number of the second plurality of time deltas that are less than or equal to the minimum time delta;

calculate a second actual value based on a number of the second plurality of time deltas that are greater than the minimum time delta, the number of the first plurality of time deltas that are less than or equal to the minimum time delta, and the number of the second plurality of time deltas that are less than or equal to the minimum time delta; and

determine whether the first actual value and the second actual value are each statistically equal to an expected value indicative of a temporally fair electronic trading venue, wherein the minimum time delta is identified based on a determination that the first actual value and the second actual value are each statistically equal to the expected value.

~~16~~14. The system of claim ~~15~~13, wherein to identify the minimum time delta, the computer system is further programmed to:

test each of the first plurality of time deltas and the second plurality of time deltas to identify the minimum time delta.

~~17~~15. The system of claim ~~13~~12, wherein the market activity comprises a market update transmitted to the first market participant or the second market participant such that the first plurality of time deltas each relate to an amount of time in which the first market participant was sent the market update before the second market participant.

~~18~~16. The system of claim ~~13~~12, wherein the market activity comprises a market order received from the first market participant or the second market participant, and wherein determining a quantified level of temporal fairness with respect to the first market participant and the second market participant on the electronic trading venue comprises quantifying a level in which a first market order received from the first market participant overtakes, or is reordered with respect to, a second market order received from the second market participant.

~~19~~17. The system of claim ~~13~~12, wherein the computer system is further programmed to:

determine a ~~minimum~~ value of a latency floor based on the minimum time delta, wherein the value of the latency floor comprises the lime period determined based on the quantified level of temporal fairness.

~~20~~18. The system of claim ~~13~~12, wherein to obtain the market activity information, the computer system is further programmed to:

~~identify a time period within which to analyze market activity.~~

~~21. The system of claim 13, wherein to obtain the market activity information, the computer system is further programmed to:~~

identify the first market participant and the second market participant based on a first connection from the first market participant to a component of the electronic trading venue associated with the computer system and a second connection from the second market participant to the component of the electronic trading venue.

~~22~~19. The system of claim ~~13~~12, wherein the market activity information is further associated with a third market participant, and wherein the computer system is further programmed to:

determine, based on the market activity information, a third plurality of time deltas that each indicate an amount of time in which the third market participant has temporally beaten the first market participant with respect to the market activity related to the instrument traded on the electronic trading venue;

determine, based on the market activity information, a fourth plurality of time deltas that each indicate an amount of time in which the first market participant has temporally beaten the third market participant with respect to the market activity related to the instrument traded on the electronic trading venue;

determine, based on the market activity information, a fifth plurality of time deltas that each indicate an amount of time in which the third market participant has temporally beaten the second market participant with respect to the market activity related to the instrument traded on the electronic trading venue;

determine, based on the market activity information, a sixth plurality of time deltas that each indicate an amount of time in which the second market participant has temporally beaten

the third market participant with respect to the market activity related to the instrument traded on the electronic trading venue,

wherein determining the quantified level of temporal fairness comprises determining the quantified level of temporal fairness with respect to the first market participant, the second market participant, and the third market participant on the electronic trading venue based on the first plurality of time deltas, the second plurality of time deltas, ~~and~~ the third plurality of time deltas, the fourth plurality of time deltas, the fifth plurality of time deltas, and the sixth plurality of time deltas.

~~23~~20. The system of claim ~~13~~12, wherein the market activity information comprises market data update information~~, relating to the instrument,~~ sent to market participants, wherein the market data update information is related to the instrument,

wherein to determine the first plurality of time deltas, the computer system is further programmed to: determine, based on the market data update information, a first time delta that indicates a first amount of time in which the first market participant is sent a first market data update, relating to the instrument, before the second market participant, wherein the first plurality of time deltas is determined based on the first time delta; and

wherein to determine the second plurality of time deltas, the computer system is further programmed to: determine, based on the market data update information, a second time delta that indicates a second amount of time in which the second market participant is sent a second market data update, relating to the instrument, before the first market participant, wherein the second plurality of time deltas is determined based on the second time delta.

~~24~~21. The system of claim ~~13~~12, wherein the market activity information comprises order processing information used to determine whether an order from a first market participant overtakes an order from a second market participant and vice versa, wherein a given order overtakes another order when the given order is received after the other order but is processed before the other order;

wherein to determine the first plurality of time deltas, the computer system is further programmed to: determine a first time delta that indicates a first amount of time relating to a first order, relating to the instrument, from the first market participant that overtakes a second order,

relating to the instrument, from the second market participant, wherein the first plurality of time deltas is determined based on the first time delta;

wherein to determine the second plurality of time deltas, the computer system is further programmed to: determine a second time delta that indicates a second amount of time relating to a third order from the second market participant that overtakes a fourth order from the first market participant, wherein the second plurality of time deltas is determined based on the second time delta;

and wherein the computer system is further programmed to:

determine a third plurality of time deltas that each indicate an amount of time in which an order, relating to the instrument, is received from the first market participant before another order, relating to the instrument, is received from the second market participant, regardless of whether the other order overtakes the order; and

determine a fourth plurality of time deltas that each indicate an amount of time in which a particular order, relating to the instrument, is received from the second market participant before another particular order, relating to the instrument, is received from the first market participant, regardless of whether the other particular order overtakes the particular order, wherein the quantified level of temporal fairness is based further on the third plurality of time deltas and the fourth plurality of time deltas.

22. The system of claim 12, wherein to randomly select the order from the batched set of orders, the computer system is further programmed to:

generate a list of market participants from which the batched set of orders were received; and

shuffle the list of market participants to create a random ordering of the market participants, wherein the order from the batched set of orders is selected based on the random ordering of the market participants.