

IOC Competitiveness Score A (Close-to-)Zero-Knowledge KPI

Methodology for Measuring Latency
Competitiveness

27/09/24

Can Measure Speed but what Matters in Rank

Participants' Toolbox:

Own latency

- pure wire-to-wire (t11-to-t1)
- infra/connectivity (t9d-to-t11 and t3a-to-t3n)
- Hit rate

Competitors latency

- Winner's latency (for lost races)
- N-1 trades (latency of fastest loser)
- ExchangeOrdID (# of losers)

Want to know:

Where do I rank?

How many people ahead/behind?

What is the gap?

Is someone faster? How many?

TMI

Challenges

- Data not deterministic
 - Participant A is not always faster than B in races where both participate.
- Data incomplete
 - no (or little) data for all possible pairs of participants
- Data „inconsistent“
 - not necessarily transitive, i.e., $A > B > C$ need not imply $A > C$

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David's score: a more appropriate dominance ranking method than Clutton-Brock et al.'s index

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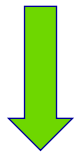
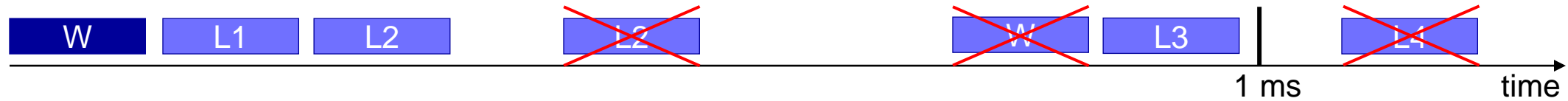
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There are many procedures, of varying complexity, for ranking the members of a social group in a dominance hierarchy (reviewed by de Vries 1998; also Jameson

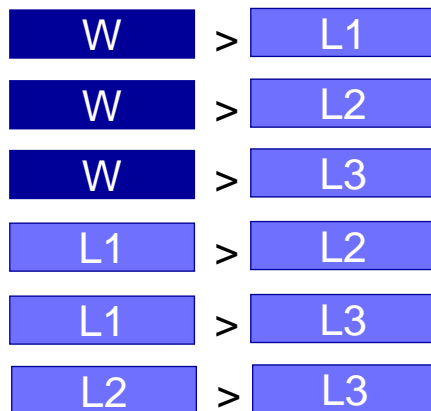
scoring (David 1987), whereas CBI lacks this desirable property. We therefore recommend that DS should always be used in preference to CBI when calculating

Winners and Losers

Race



Dyadic Interactions



Wins & Losses

#wins	Loser				
	W	L1	L2	L3	L4
Winner	W	1	1	1	0
L1	0		1	1	0
L2	0	0		1	0
L3	0	0	0		0
L4	0	0	0	0	



Dominance Matrix

p _{win}	Loser				
	W	L1	L2	L3	L4
Winner	W	.55	.55	.55	
L1	.45		.55	.55	
L2	.45	.45		.55	
L3	.45	.45	.45		
L4					

* biased towards 50% based on binomial CDF

David's Score

$$DS_k = w_k + w'_k - l_k - l'_k$$

$w_k = \sum_j p_{kj}$
sum of my win percentages

$w'_k = \sum_j p_{kj} * w_j$
sum of my win percentages (weighted by win percentage)

$l_k = \sum_i p_{ik}$
sum of others' win percentages

$l'_k = \sum_i p_{ik} l_i$
sum of others' win percentages (weighted by winpercentage)

Normalize:

$$\widetilde{DS}_k = 100 * \frac{DS_k - LB}{UB - LB}$$

Lower bound (LB): Score of hypothetical perpetual loser

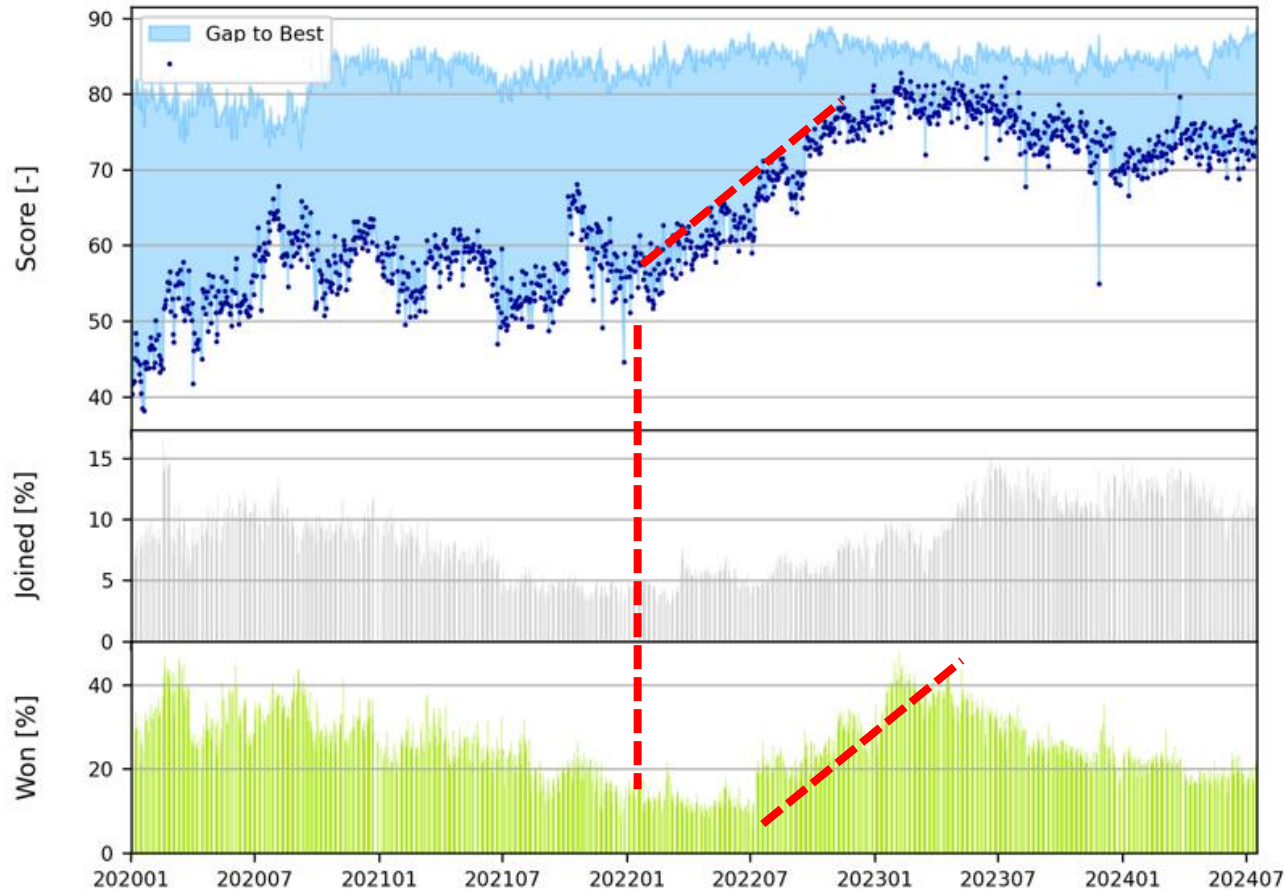
Upper bound (UB): Score of hypothetical consistent winner

Reference: David, H.A. (1988) *The Method of Paired Comparisons*. Charles Griffin & Company, London.

Properties

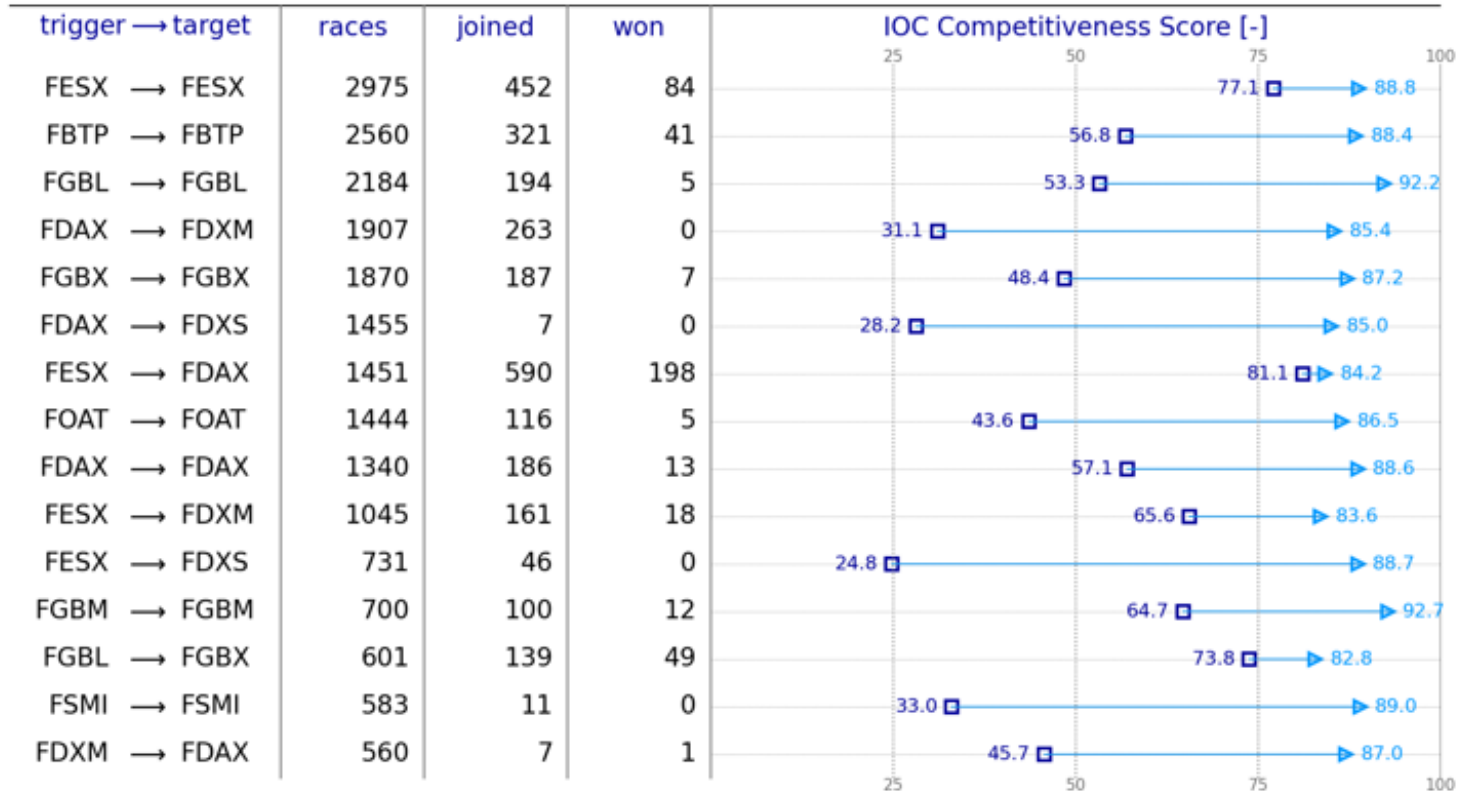
- Wins against more competitive losers raise score.
- Additional losers increase score.
- Moving ahead amongst losers improves score.
- No information about latency differences (and not needed).
- No information about number of participants.
- No information about rank (not even 1st).
- can use any subset of trades (by winner latency, by time, by trigger/target, ...).
- Score depends on competitiveness of races joined.
- Point-in-time value not useful, only trend.
- shares a lot of properties with ELO score from chess.

Synthetic Examples



- Track competitiveness over time.
- More granular than hit rate.
- In example: Competitiveness increases before improvement in hit rate is seen.

Subscores



Score can be computed for arbitrary subset of races.

- by winner's reaction time
- by trigger/target
- Over date/time ranges
- by traded instrument
- by trigger size
- by trade size
- ...

Delivery

Anticipated Options:

- Part of „Private HPT“ offering
- A7
- Both
- Neither
- Other
- None

Thank you!

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