Zero-intelligence agents

La structure est plus forte que la rationalité

« Standard economic theory is built on two specific assumptions: utility-maximizing behavior and the institution of Walrasian tatonnement. Becker showed that the market-level predictions of economic theory are consistent with individual behavior more general than utility maximization, whereas Smith showed that such predictions are consistent with trading mechanisms more general than Walrasian tatonnement. »

« In its first-order magnitude, allocative efficiency seems to be a characteristic of the market structure and the environment; rationality of individual traders account for a relatively small fraction (second- or third-order magnitude) of the efficiency. » (Gode and Sunders, 1993)

Une comparaison homme et machine

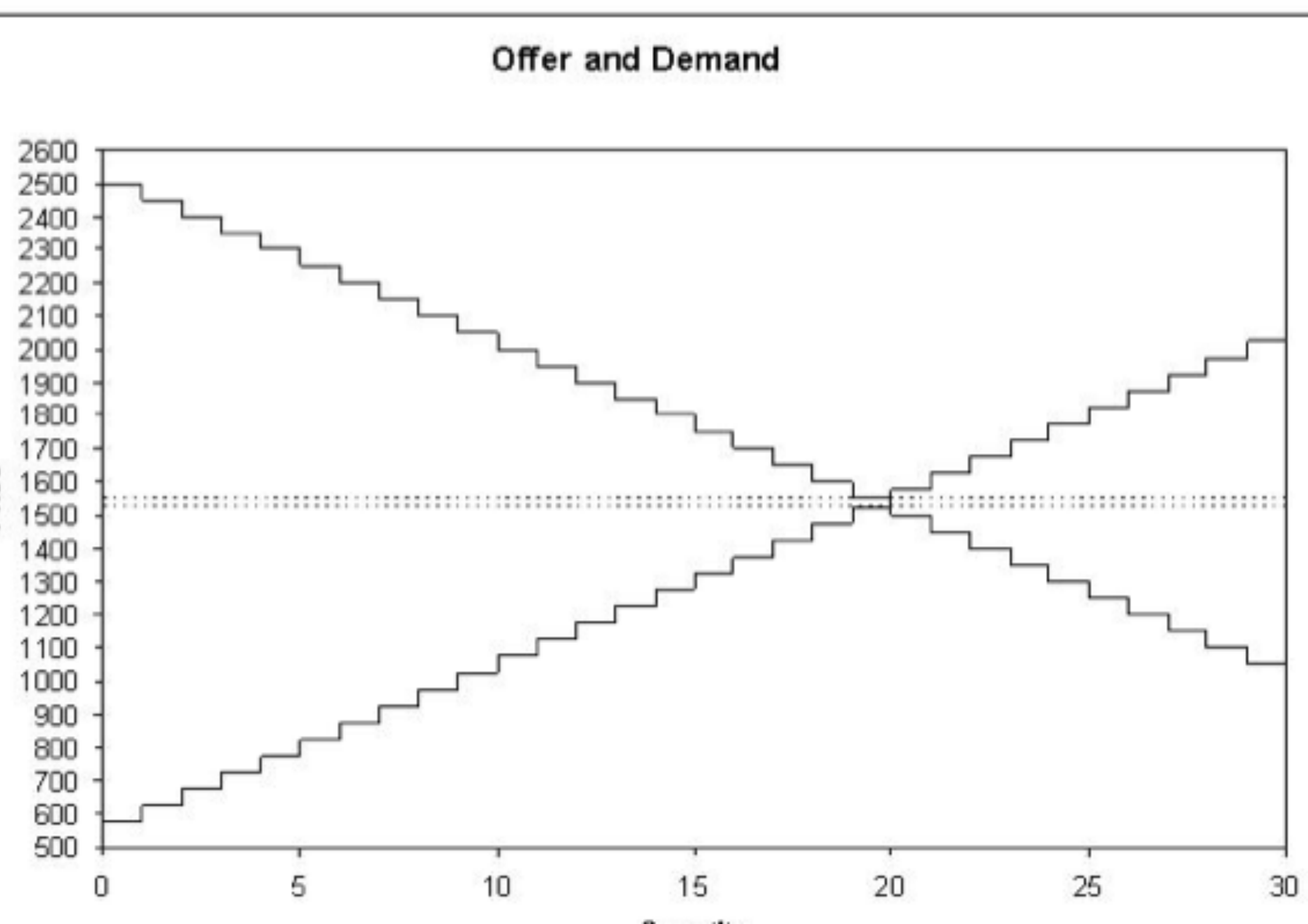
Mécanisme de double enchère: bids (acheteurs) et asks (vendeurs) soumises n'importe quand

- sur beaucoup de grands marchés financiers

Expériences humaines

- des résultats très marqués de convergence

ZI - agents


Offer and Demand
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30

Importance du traitement d'information sur les indicateurs du mar
(convergence, efficacité) ??

periences (Smith, Plott)

ng:

Acheteurs, vendeurs

Communication via ordinateurs (information contrôlées)

Temps limité pour les transactions

Prix limites sont informations privées

ervation:

Nombre de transactions qui ont lieu

Convergence

Efficacité(surplus)

odels (dynamiques):

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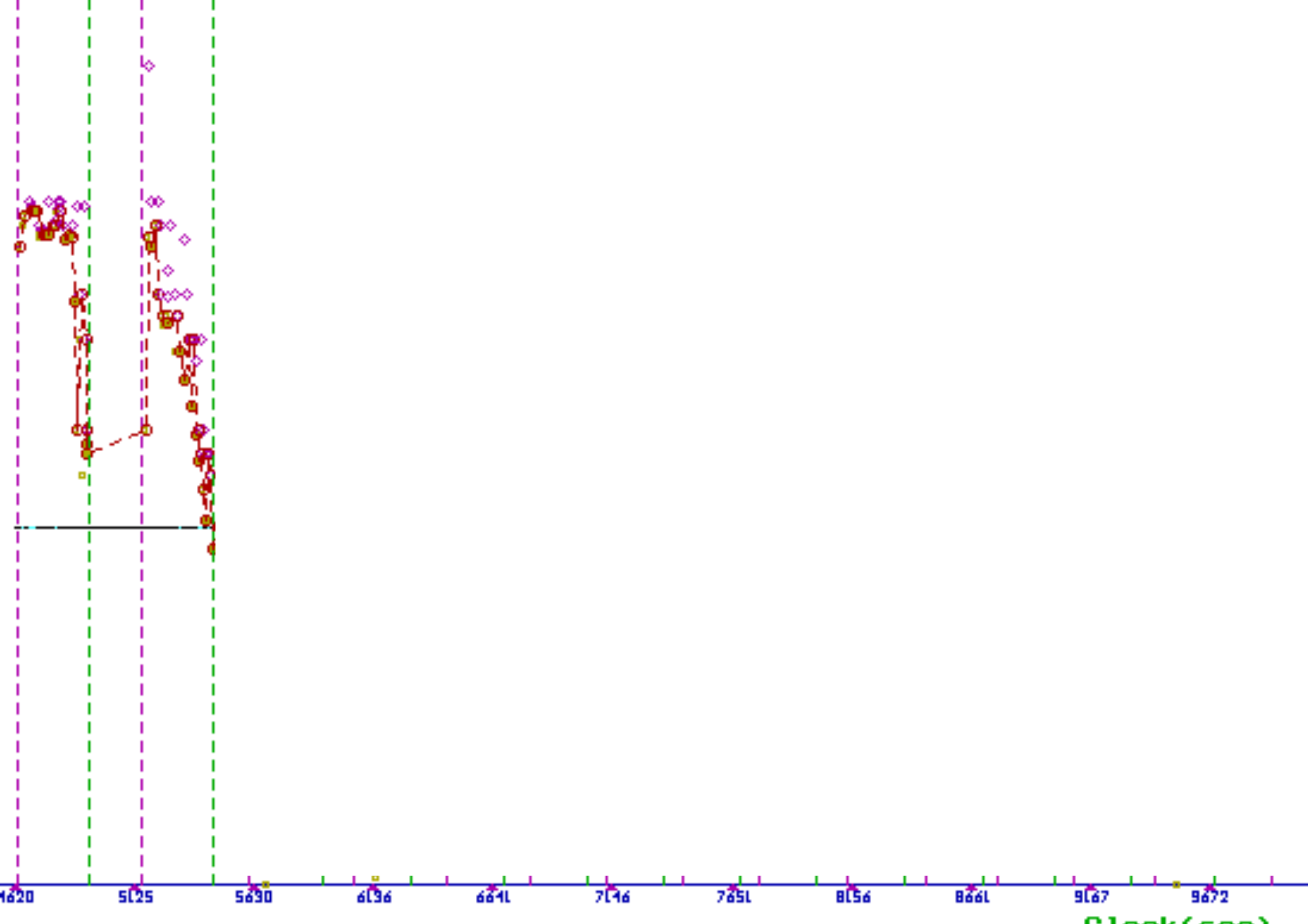
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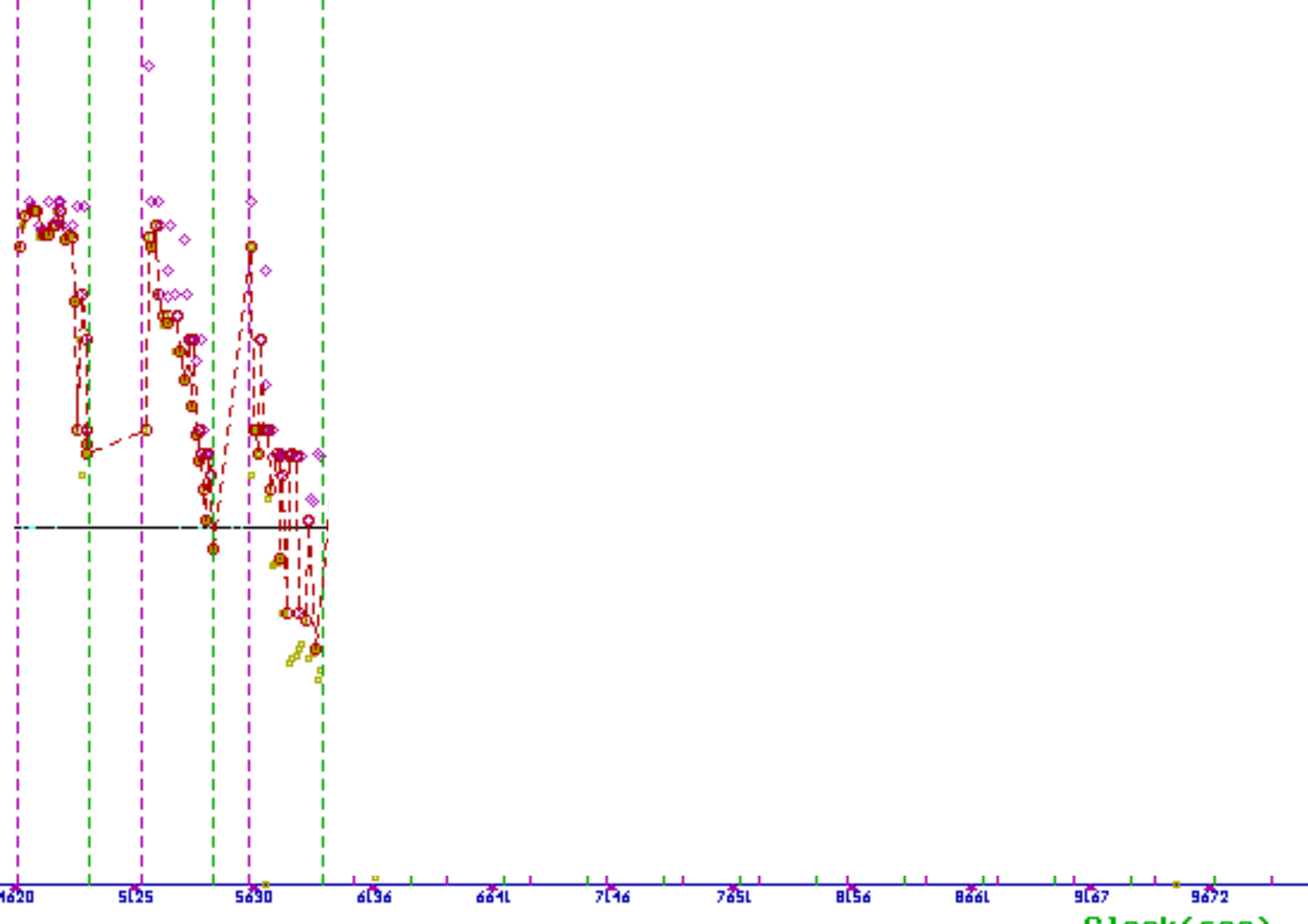
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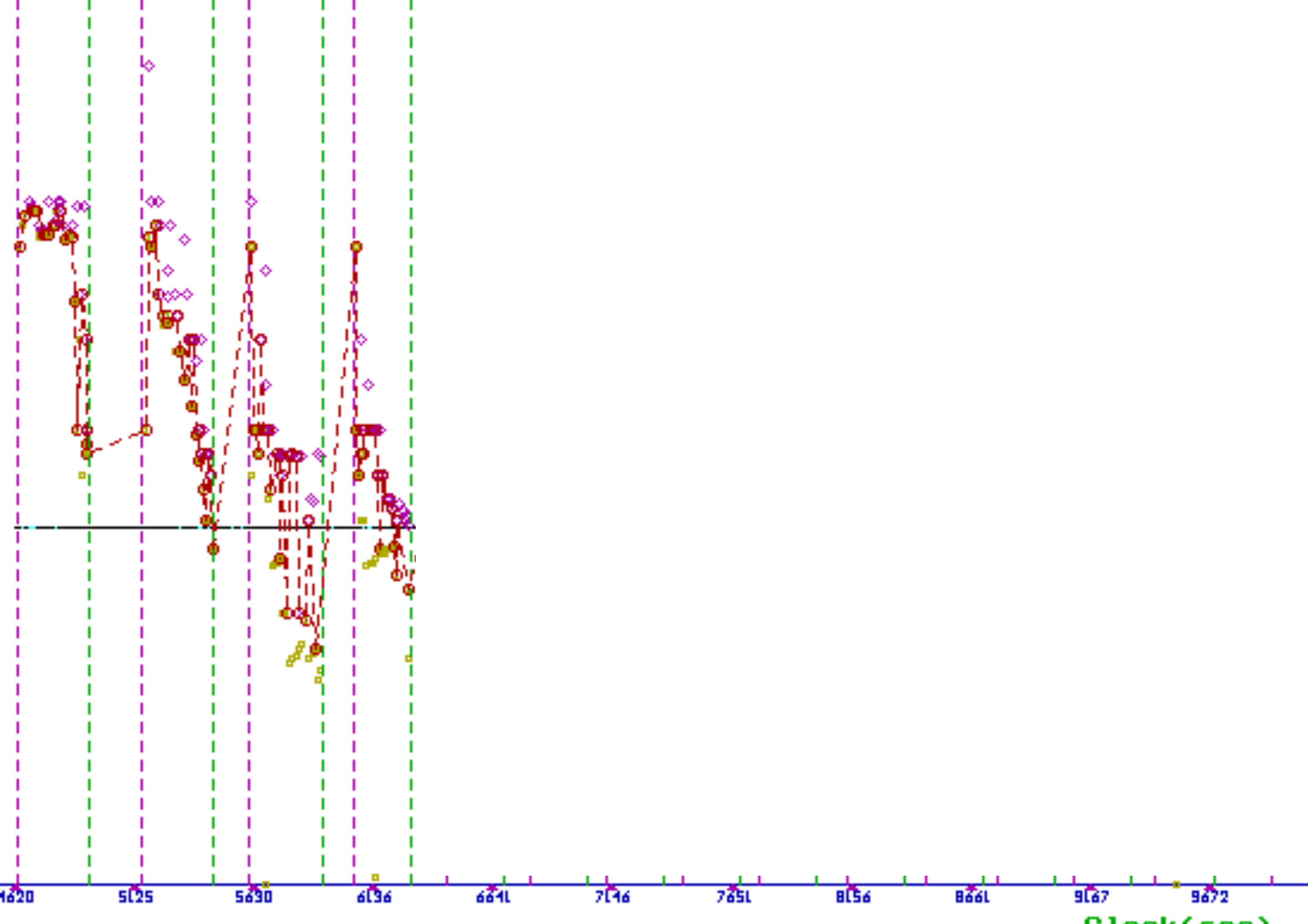
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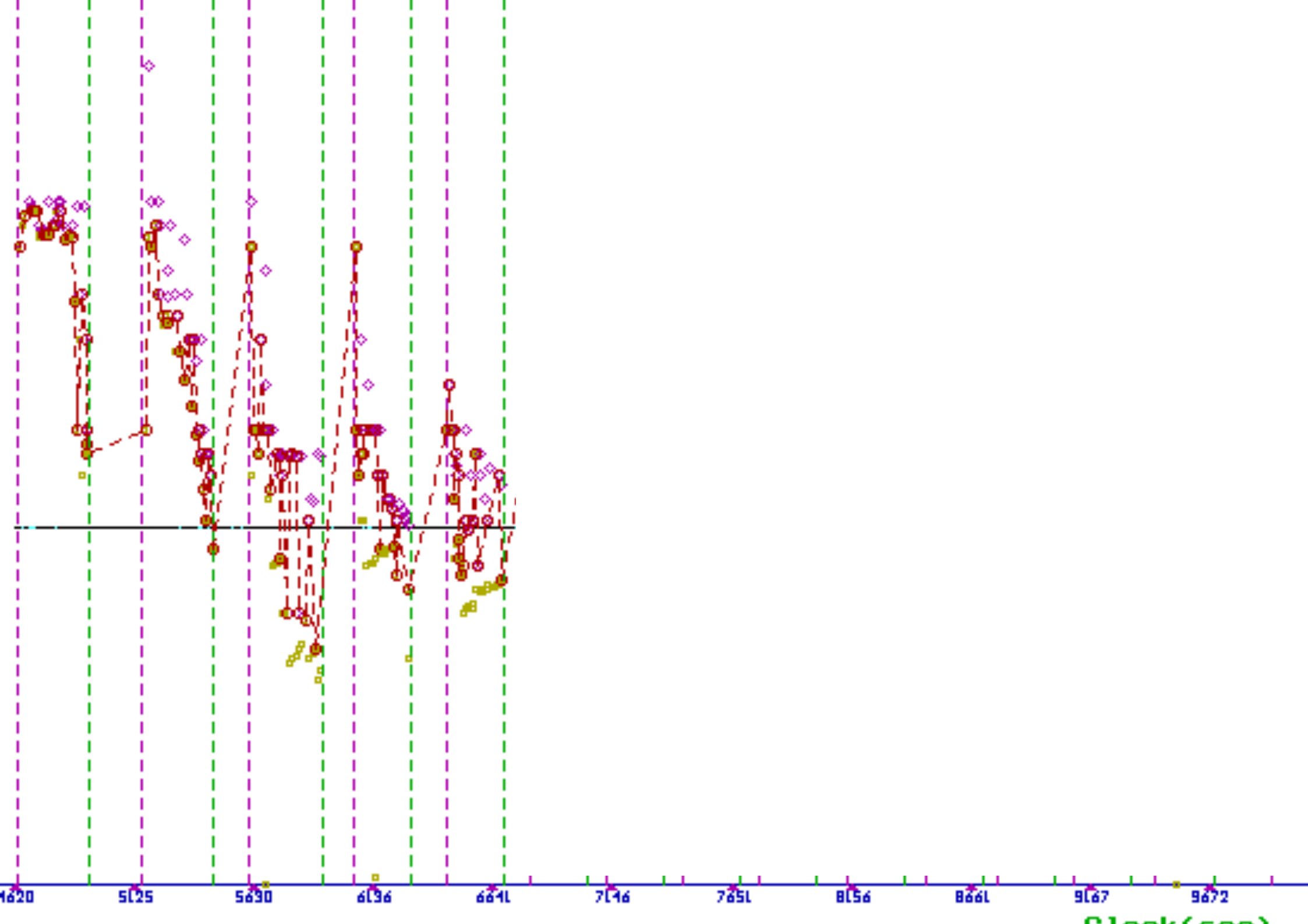
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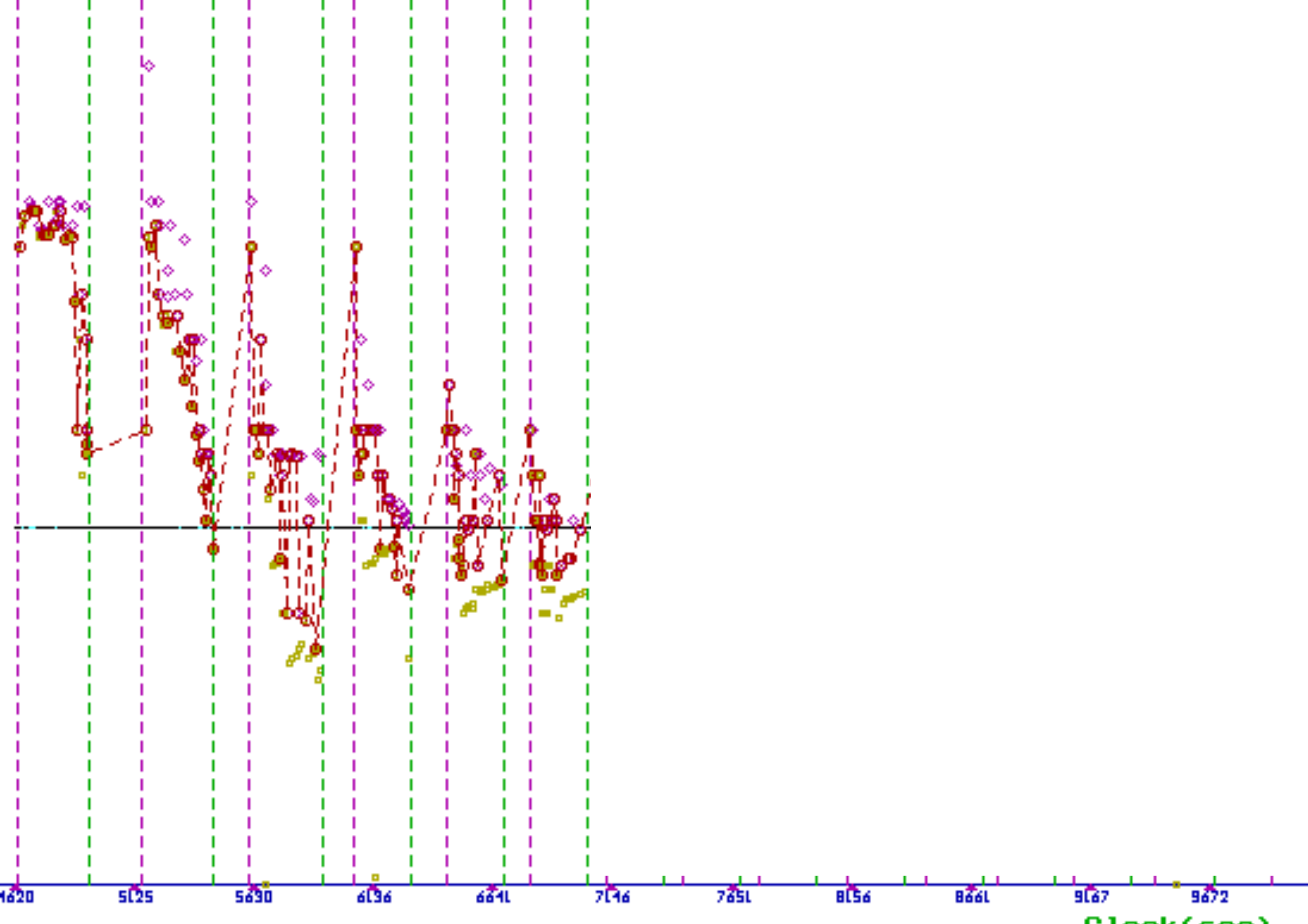
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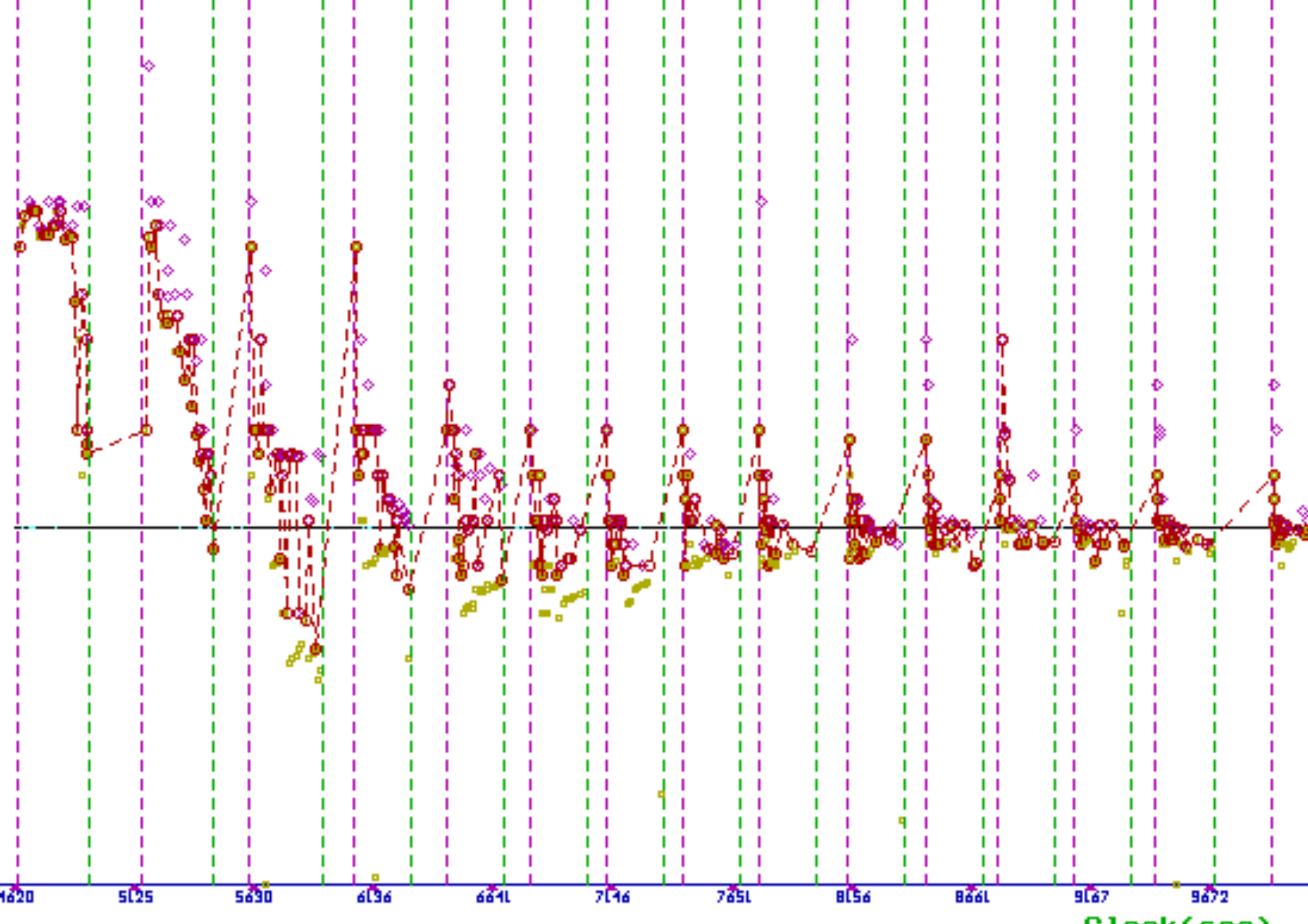
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Humains

12 humains (6 vendeurs and 6 acheteurs) en enchère répétée - 6 fois 4 minutes d'interaction

- Valeur limite privée pour les acheteurs
- Coût privé pour les vendeurs

Contrainte de budget : coûts et gains doivent s'équilibrer

Zero-Intelligence

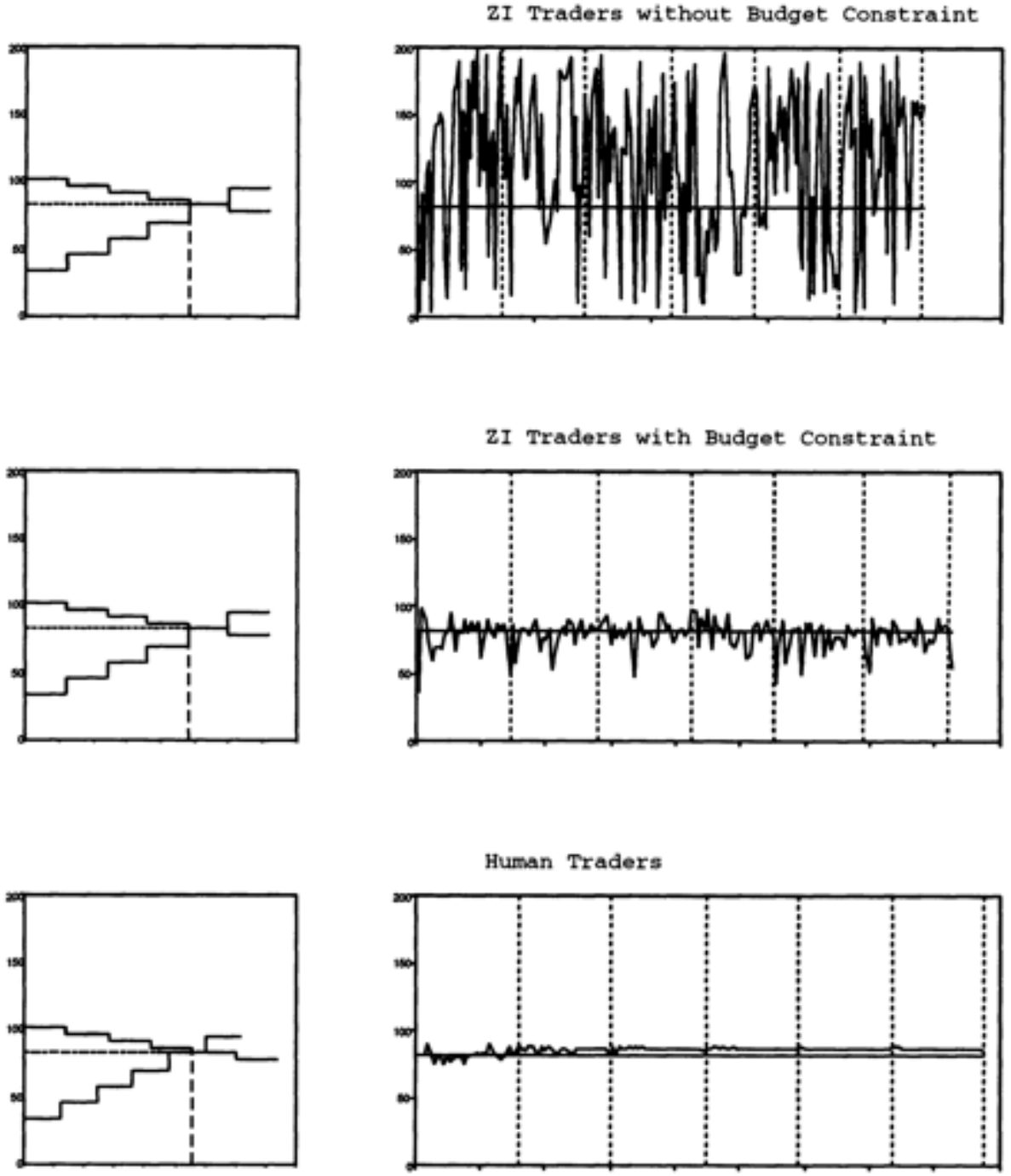
12 ZI-agents (6 vendeurs and 6 acheteurs) en enchère répétée - 6 fois30 secondes d'interaction

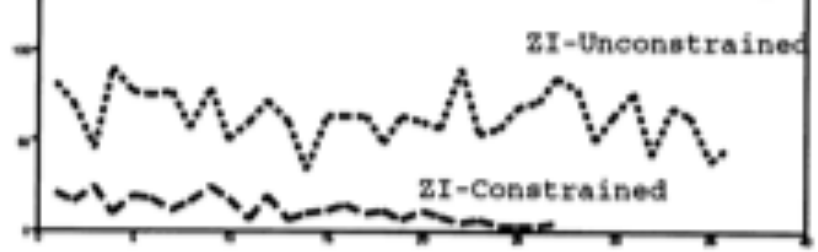
- Valeur limite privée pour les acheteurs
- Coût privé pour les vendeurs

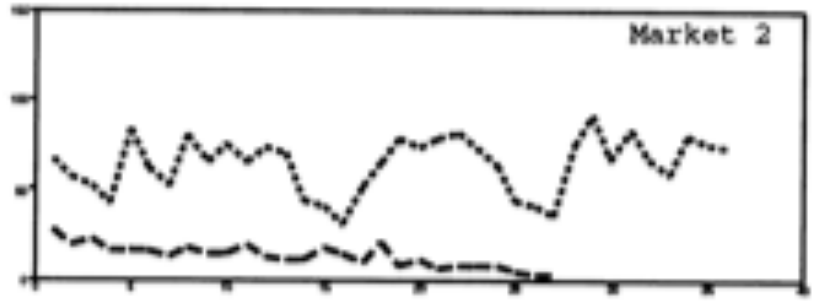
v1: contrainte de budget : ne peuvent pas faire d'offre hors respect de la contrainte (ZI-C)

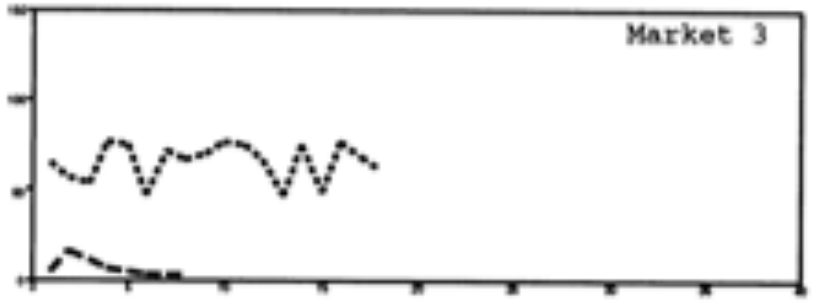
v2: libérés de la discipline de marché : peuvent vendre / acheter à perte

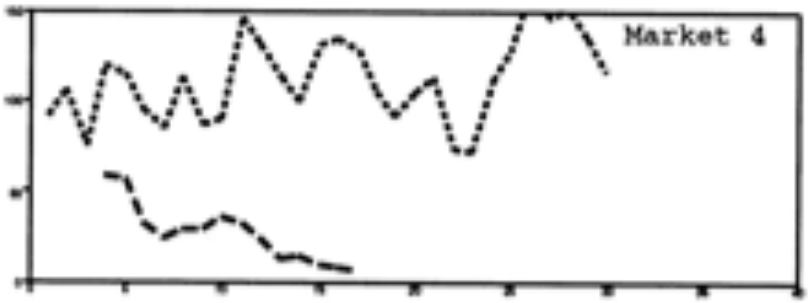
Demand function and behavior




ZI-Unconstrained
ZI-Constrained


Market 2


Market 3


Market 4

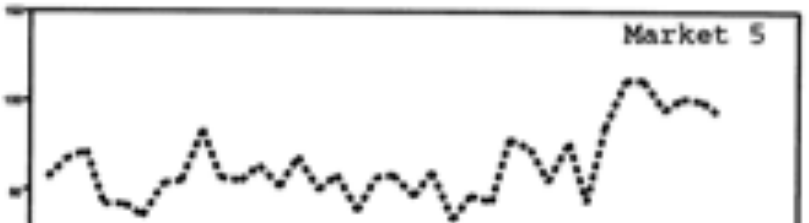

Market 5

TABLE 2

Mean Efficiency of Markets in Figure 7

Traders	Market 1	Market 2	Market 3	Market 4	Market 5
ZI-U	90.0	90.0	76.7	48.8	86.0
ZI-C	99.9	99.2	99.0	98.2	97.1
Human	99.7	99.1	100.0	99.1	90.2

?

Rôle de l’intelligence ?

Rôle de la structure ?

structure > intelligence

Différence entre avec et sans intelligence ? - ZI-C

- Pas d'apprentissage d'un pas de temps à l'autre
- Performance de marché proche du sujet humain tandis que se fait une réduction de l'ensemble des possibles
- Pas besoin de faire une hypothèse de rationalité, motivation, mémoire, apprentissage

Différence avec et sans structure ? - ZI-U

- Pas de convergence du tout
- Très loin de l'efficacité

TABLE 3

AVERAGE OF THE ROOT MEAN SQUARED DIFFERENCE IN PROFITS IN FIGURE 8

aders	Market 1	Market 2	Market 3	Market 4	Market 5
U	225.48	253.12	90.54	363.80	156.28
C	28.53	49.81	15.90	60.47	19.07
man	18.67	28.74	8.23	15.37	30.69

profit is plus homogène parmi les agents « intelligen

Can we still use efficiency as a sign of rationality ?

« Finally, our results may help reconcile the predictions of neoclassical economic theory with its behavioral critique. Economic models assume utility-maximizing agents to derive market equilibria and their welfare implications. Since such maximization is not always consistent with direct observations of individual behavior, some social scientists doubt the validity of the market-level implications of models based on the maximization assumption. Our results suggest that such maximization at the individual level is unnecessary for the extraction of surplus in aggregate.' Adam Smith's invisible hand may be more powerful than some may have thought: when embodied in market mechanisms such as a double auction, it may

Discussion possible

« Continuously refreshed redemption values and costs » Brewer, Huang, Nelson and Plott, 2002

Plusieurs biens définis par une carte coût – valeur de réserve

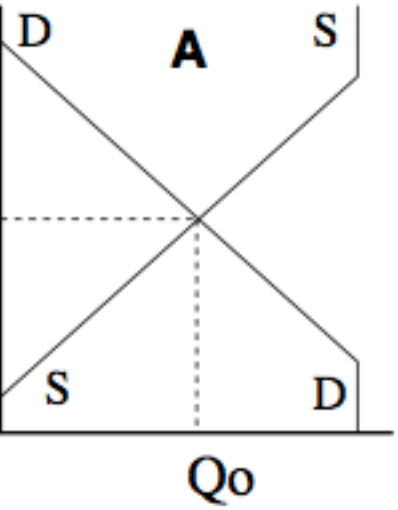
Quand le bien est vendu, la carte est donnée à un autre couple acheteur / vendeur > la fonction de demande ne diminue pas…

Autre discussion

Cliff and Bruten, 1997

La forme de la courbe de demande diffère

Calcul probabiliste ex ante pour connaître la possibilité ou non de la convergence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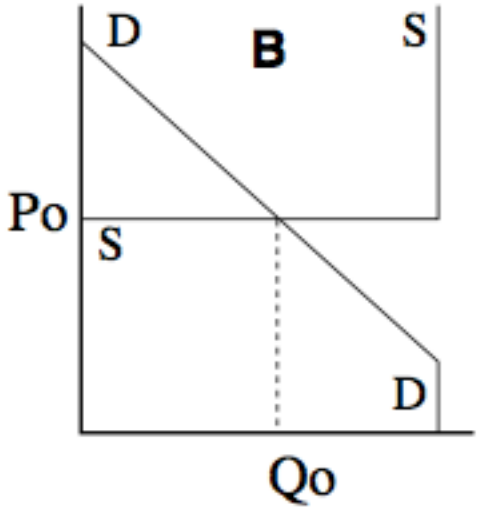
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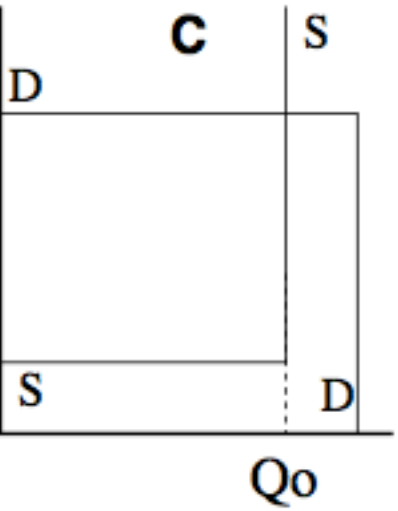
C
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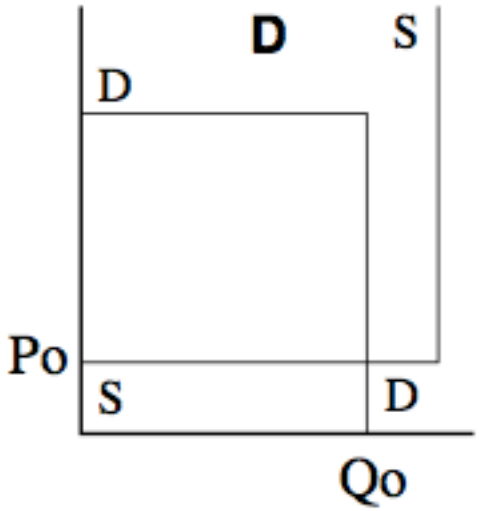
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D
Po
S
D
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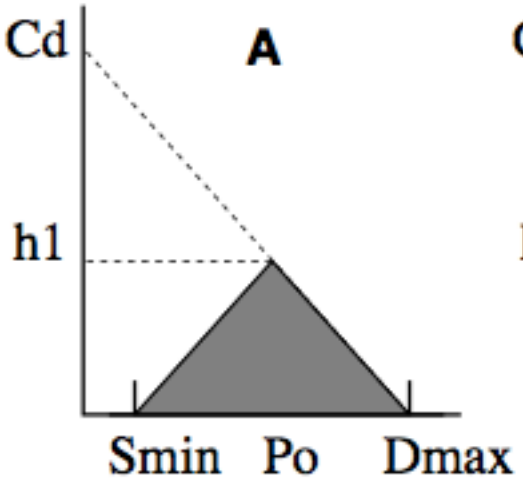
Cd
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h1
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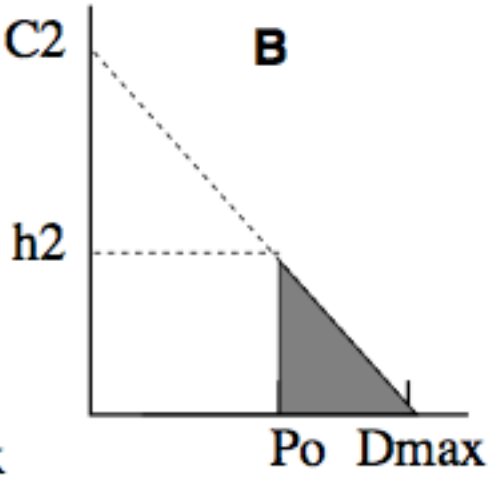
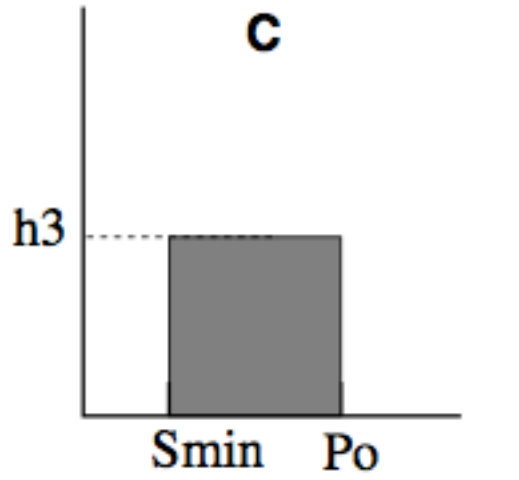
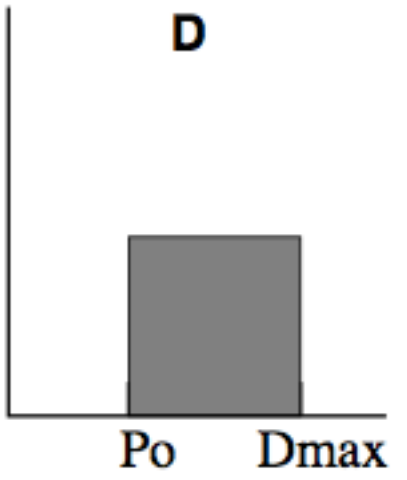

C2
B
h2
Po
Dmax


C
h3
Smin
Po


D
Po
Dmax

n environments with continuously refreshed supply and demand, markets populated y humans differ from markets populated by ZI robots as follows:

. (a) *transaction prices in markets populated by humans tend to converge whereas in markets populated by ZI robots transaction prices do not converge*

. (b) *relative to theV-CE price, extramarginal trades decrease over time in markets populated by humans, whereas in markets populated by ZI robots the ratio of extramarginal trades remains constant*

. (c) *the distribution of transaction prices is more tightly peaked in markets populated by humans and does not exhibit the stepped artifacts of ZI robot pricing distributions.*

. (d) *peaks of the observed distribution of transaction prices are in different locations in the two types of markets*

hree equilibrium concepts can be identified with the literature. Two of these are appropriate to environment
ith continuously refreshed supply and demand. We will call these models the *Traditional Supply and*
emand, the Instantaneous Competitive Equilibrium (I-CE) and *Velocity based Competitive Equilibrium* (V-
E) models. Different supply and demand curves are used in the two models, as stated below:

.2.1. T-CE model. *Traditional supply and demand*—the supply and demand curves are computed from the
edemption values and costs that existed at the beginning of a period. Clearly the concept of a period is
eeded. Since periods do not exist in the environment we study, this model is listed only for completeness.

.2.2. I-CE model. *Instantaneous supply and demand*—The instantaneous supply and demand curves are
omputed from the private market orders that exist in the market at an instant. In a traditional environment
ese curves change after each trade. In an overlapping generations environment the I-CE has been developed
nd studied by Aliprantis and Plott (1992). In a continuously refreshed environment the instantaneous supply
nd demand curves are stationary. The intersection of instantaneous supply and demand curves determines th
ompetitive equilibrium.

.2.3. V-CE model. *Velocity-based (ex-post) supply and demand*—the supply and demand curves are adjuste
ex-post) to take account of the number of times a particular supply or demand unit appeared in the private
arket of some participant (velocity). The intersection of adjusted supply and adjusted demand determines th
quilibrium. This model cannot be determined ex-ante, because the velocities are only known ex-post.