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CORRELATION OF TWO CHRONOLOGICAL DISTRIBUTIONS OF THE EXTANT ROMAN BRONZE COINS

Abstract. We present a comparison of two chronological distributions of coins, minted in the period AD 50-500:

1. The chronological distribution of the coins, excavated in Bulgaria and published in the Proceedings of the (Bulgarian) Archaeological Society (PAS) during the period 1910–1920 and in the Proceedings of the (Bulgarian) Archaeological Institute (PAI) during the period 1921–1959. The studied material consists of over 280000 coins from more than 1050 coin finds, which in our view is large enough to give an adequate picture in a first approximation of the chronological distribution of all coins excavated in the Bulgarian lands during the period 1910–1959.

2. The chronological distribution of the extant Roman bronze coins, on the base of the information about their prices from the catalogue of David Sear "Roman Coins and Their Values".

The high correlation of these two chronological distributions leads to the conclusion that they both give a good approximation of the real distribution of the extant Roman coins from the stated period AD 100–500, and in particular that the coin finds from the territory of present Bulgaria give a good representation for the general picture of the coin finds from the territory of the whole Roman Empire.

On our opinion it also gives a plausible picture of the monetary circulation in the Eastern part of the Balkan Peninsula during the different historical periods.

1. Introduction

The old coins excavated in a given country are important source of information about its past. They bring information about the welfare of its population, its trade centers, trade relations with other countries, religion, the names and the titles of its rulers, etc.

We ought to add to the above that the coins are a reliable "dating element" for other archaeological evidence, found together with them. Therefore the old coins are object of special interest not only for numismatic collectors, but also for archaeologists and historians.

Is it possible the quantity of the found coins, struck by a given ruler, to give us certain objective information about the monetary circulation during his reign, and thus about the intensity of the trade relations in his country and between it and other countries? We support the positive answer (with some reservations of little importance) to this question, argued by A. P. Kazhdan in [5]. To obtain, however, the needed information one has to handle in a proper way the data about the coin finds. We do this, applying the modern computing technology to the ideas of A. T. Fomenko about his concept of the so called "volume function" introduced in Fomenko in [1] and [2] (for more details see the paper of Fomenko and Rachev [3]). We ought to stress that it is spoken about a research involving hundreds of thousands of coins; it is clear that the past attempts of the scientists to make such investigations have raised problems. To achieve our goals we used the Chronological Distribution of Coins described in

the paper of J. Tabov, K. Vasilev and A. Velchev [10], which is similar to the "volume function" of A. T. Fomenko. The publications of A. T. Fomenko and S. T. Rachev [3]; J. Tabov [9]; J. Tabov, K. Vassilev and A. Velchev [11] and [12]; J. Tabov and L. Tabova [10], etc contain analogous constructions and applications of functions, which describe the chronological distributions of information of different kind.

2. Data Description and Chronological distribution of the coins found in Bulgaria

Our sources of information for the chronological distribution of coins, excavated in Bulgaria are the Proceedings of the (Bulgarian) Archaeological Society (PAS) [6] during the period 1910–1920 and the Proceedings of the (Bulgarian) Archaeological Institute (PAI) [5] during the period 1921–1959. In a certain sense PAS has been continued by PAI. For the studied period these journals were the only scientific ones, in which regular reports of Bulgarian archaeologists on excavations and finds in Bulgaria have been published. We have extracted data about more than 280000 old coins grouped in more than 1050 finds from these journals. The high scientific verification of our data is based on this approach. There are no repeatedly reported finds, which might occur if for example additional information from newspapers or other journals is used.

It is important to note that most of these coins are bronze.

The details of the construction of the desired Chronological distribution of coin finds are described in the paper by J. Tabov, K. Vassilev and A. Velchev [13]; the graph of the distribution is shown in Figure 1.

3. Data Description and Chronological distribution of the extant Roman bronze coins

Rome has had political and economic control over the Bulgarian lands for a long time. A great part of the old coins found in Bulgaria (about 2/3; see Vassilev, Velchev and Tabov, 2005) are Roman. This fact justifies the great interest of the Bulgarian researchers in Roman coins – gold and silver, bronze, and copper.

In another paper [4] we obtained an approximate "comparative" estimate of the quantities of extant Roman "bronze" coins (by saying "bronze" we mean any coins other than gold and silver ones). The research was based on the information published in the catalogue of D. Sear [8]. In this catalogue about 4330 different coins, dated to the period 269 B.C. – 518 A.D., are represented together with their numismatic values (prices). 2465 of them are "bronze" coins and we consider only these ones.

To build the desired Chronological Distribution, we need to know the approximate relative number of coins of each kind.

To obtain the approximate relative number of coins of each particular kind we are interested in, we used indirect information – the market price of the coins. As the commerce with coins has a long lasting tradition, the pricing therein follows curtain rules. The numismatic value of a coin, which to a great extent forms its market price, depends on many factors, among which is the number of the coins for each particular kind, as well. Other factors also influence the price, like the time when the coins are emitted, the material of which they are made, the nominal values of the coins, their subject and iconographic characteristics, the data obtained from the find, if the coin served payments or was used for ceremonial purposes, etc.

We assumed that the main factor in determining the price of a coin is the number of coins found that are the same as this coin. In other words, the bigger the number of the extant

coins of a certain kind, the lower the price of each of these coins. Furthermore, we have a reason to suppose that the relation "price-number of coins" is near to reverse proportion. Therefore we considered a model of chronological distribution of the coins constructed under the assumption of the inverse proportion $f(x)=k/x$, where the number of coins $f(x)$ depends on the catalogue price x; here k is an appropriately selected constant.
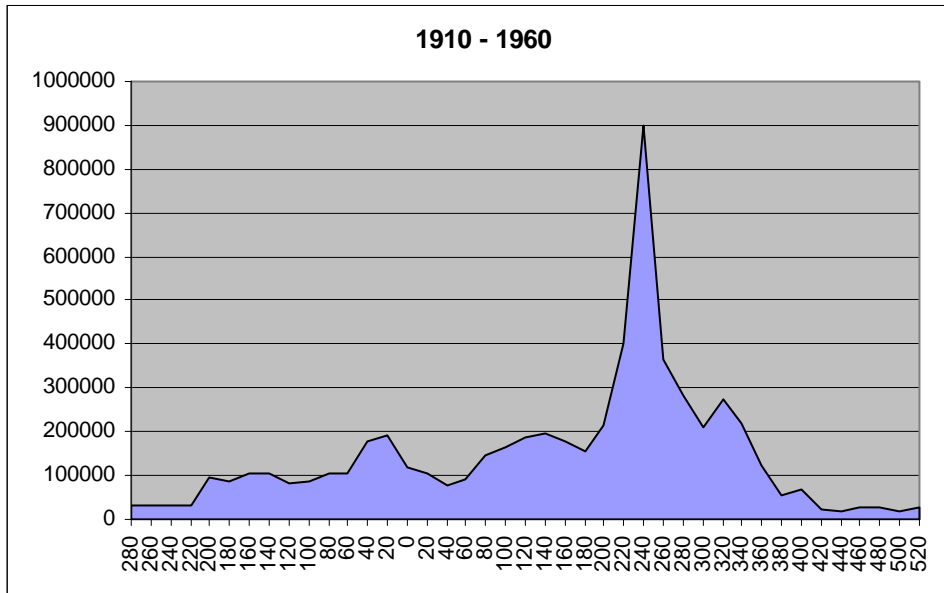

Figure 1. The graph of the Chronological Distribution of coins
minted in the period 280 BC – AD 520, found in Bulgaria
and published 1910-1959 [13]. Most of these coins are bronze.

Let us once again emphasize the fact that by the means of this method we cannot "count" the coins; we obtain only a rough picture of the distribution over time of the studied coins, i.e. taking into account the maxima and minima, the periods of increasing and decreasing we can make comparisons between the different periods.
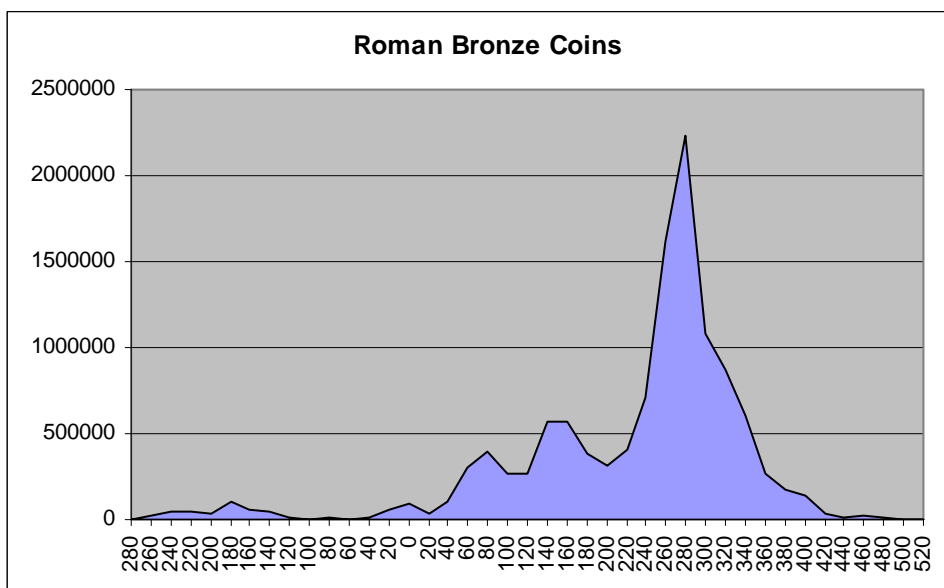

Figure 2. The graph of the Chronological Distribution
of the extant Roman bronze coins according to the catalogue of D. Sear [8].

The "visual representation" of the chronological distribution of the extant Roman bronze coins, presented in authors' paper [4], is given here in Figure 2.
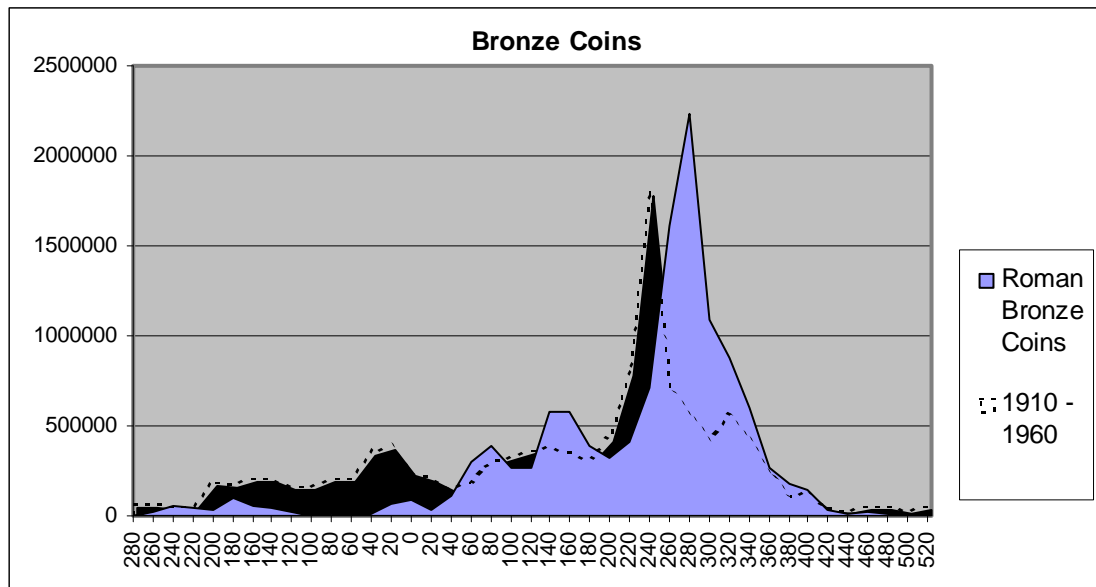

Figure 3. Comparison of the Chronological Distribution of coins
minted in the period 280 BC – AD 520, found in Bulgaria and published 1910–1959
with the Chronological Distribution of the extant Roman bronze coins
according to the catalogue of D. Sear [8].

4. Comparison of the two Chronological Distributions

The direct observation of the graphs in Figure 1 and Figure 2 shows that their shapes are similar. In Figure 3 these graphs are plotted on a common diagram. From the obtained picture it is evident that they are in a good correlation.

This fact leads to the following conclusions:

1. Both approaches used in the construction of the two chronological distributions of coins considered above give good approximations of the real distribution of the extant Roman coins from the stated period AD 100–500.

2. The quantity of coins found on the territory of present Bulgaria gives a good representation for the general picture of the number of coins found on the territory of the whole Roman Empire.

3. It is quite probable that each of the two chronological distributions considered above gives a plausible picture of the monetary circulation in the Eastern part of the Balkan Peninsula during the different historical periods.

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