Counted and weighed silver: 
the fragmentation of coins in early medieval 
East Central Europe 

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The background

Silver was apparently a major means of exchange from the ninth to the eleventh century. Several hundred hoards were found around the Baltic Sea and in Eastern Europe.¹ We know of more than 150,000 dirhams (Arab silver coins) of the ninth and tenth centuries from them.² The number of West European coins (mostly German and English) of the tenth and eleventh centuries is even greater.³ By means of these coins silver was “imported” to East, North and East Central Europe. Most of the silver jewellery, which is preserved in hoards and graves of the Viking age,⁴ was made from this imported silver.⁵

The silver economy started in the ninth century.⁶ A basic precondition for it was the establishment of “ports of trade” or *emporia* along the coasts of the Baltic Sea. They began earlier than modern archaeologists thought several decades ago: dendrochronological data from Haithabu (?), Groß Strömkendorf and Menzlin indicate the existence of settlements as early as the first half or the middle of the eighth century.⁷ During the ninth century the influx of a great deal of eastern and some western silver reached only the regions near the sea coasts. In the tenth century, the extent and intensity of circulation and exchange increased rapidly,⁸ and they formed a basis for economic development and political power in Denmark, Sweden and Poland.⁹

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³ Wiechmann 1996, 83, 89.
⁴ Eilbracht 1999.
⁵ Steuer/Stern/Goldenberg 2002, 142 fig. 6.
⁹ Brather 1999.
As a means of payment, the respective amount of silver had to be determined for every transaction. Small numbers of coins could be counted: while no one in North and East Central Europe could read Arab letters, the value of a standardised coin like the dirham was probably well-known. Greater numbers of coins as well as different pieces of silver – coin fragments, jewellery, and ingots – needed to be weighed if one wanted to know their value in grams of silver. Was there a major change from counting Arab coins in the ninth century to weighing silver in the tenth, and finally, once again to counting coins in the eleventh century?10

The hacksilver period: the tenth and eleventh centuries

From the late ninth to the early eleventh century, the hoards mostly contain both coins and jewellery. This clearly indicates that silver itself was the main thing – the standard of exchange. During the eleventh century, the proportion of coins increased rapidly (Fig. 1), reaching nearly 100 % in the mid-eleventh century – indicating a transition to a coin-based monetary system. Regional differences in time can be observed. For instance, the influx of coins was probably low in South Sweden (Skåne),11 but in hoards from Gotland coins were always predominant, thus showing a specific situation on this island.

Coins and jewellery were often cut or broken to smaller pieces. The fragmentation of coins and of jewellery must have started at the same time – in Schleswig-Holstein around 90012 just as in South Sweden,13 but on Gotland only in the mid-tenth century.14 If one looks at the finds in detail it becomes apparent that after 850 at least some finds contain fragmented coins and jewellery (Fig. 2). The fragmentation reached its height in the late tenth century, as a diagram for Schleswig-Holstein shows, while the peak for South Sweden15 and Gotland16 was in the first half of the eleventh century; the so-called Islamic silver crisis (the sudden end of the influx of Arab coins to Europe) is thought to be the main reason for the intense cutting.17 Jewellery was cut several decades longer than coins, but this could be due to the smaller normal weight of the coins, which was

10 Steuer/Stern/Goldenberg 2002, 136 fig. 2.
12 Wiechmann 1996, 180. Before 825 there is no fragmentation (ibid., 182).
13 Ibid., 182; Hårdh 1976, 135. Despite two finds there are no older hoards (Hårdh 1976, 25, 40) which makes the beginning of fragmentation unclear; it could have started before 900.
16 Lundström 1973, 32.
17 Wiechmann 1986, 182.
Fig. 1. Proportion of coins in hoards from South Sweden, Gotland and Schleswig-Holstein. The graph shows a large number of jewellery during the tenth century. After the year 1000, mostly coins were hoarded.

Fig. 2. Proportion of fragmented coins and jewellery in hoards from Schleswig-Holstein. Fragmentation started in the last third of the ninth century and had its peak during the tenth century. In the first half of the eleventh century, only jewellery was cut while coins remained mostly uncut. No column for a hoard means there were no fragments in it.
about 1.2 g in the eleventh century. Probably it was more important to cut the heavier pieces of jewellery than the lightweight coins, and the jewellery fragments mostly had the same weight as the coins. A listing of bigger hoards south of the Baltic Sea demonstrates that in some cases in the tenth century nearly all of the coins were cut or broken (Fig. 3). At the same time there were other hoards without fragments – like the find from Klukowicze (after 901/910?).18 In the following century most of the coins remained uncut, but there are some exceptions to the rule.19 The ending of cutting apparently corresponds with the establishment of local minting in Denmark, Sweden and Poland.20

The dirhams in particular with their exact date allow us to ask if there is any connection between the date of minting and the cutting. For West European coins, it is sometimes very problematic to establish a solid chronology. But the dirhams represent the most fragmented coins and therefore are a reliable sample. The analysis shows no

18 See the corpora that have a sufficient number of tenth-century hoards without fragments: Kiersnowska/Kiersnowski 1959; Kiersnowski 1964; Gupieniec/Kiersnowska/Kiersnowski 1965; Haisig/Kiersnowski/Reyman 1966.

19 The finds from Schwaan, Prenzlau I and Stolpe II with more than 50 % fragmented coins Kilger 2000, no. 6.05, 2.78, 6.60).

20 Suchodolski 1971.
Fig. 4. Four coin hoards of the tenth century, composition per decade and proportion of fragmentation (in black; only datable fragments can be shown). 1. Klukowicze (after 901/910); 2. Giekau (after 921/922); 3. Łabędzie II (after 929/942); 4. Maurzyce-Ruszków (after 971/976). During the tenth century, the proportion of fragmented coins (the cut pieces of jewellery in the same hoards are not shown here) tends to be much higher than during the previous century, but the Klukowicze hoard is not the only exception.
Fig. 5. Proportions of different fragmentation of coins in hoards from West Slavonic areas (1) and from South Sweden (2). The fragments of the Swedish finds show a tendency to the weight of whole coins (slightly over 1 g) as early as in the years around 1000, while this development took place half a century later in the areas south of the Baltic Sea. In previous times (eighth/ninth centuries), roughly the same weight was equivalent to half a dirham, but some hoards represent exceptions.
direct relation between the date of minting and fragmentation (Fig. 421), although older coins seem to have been cut more frequently than more recent ones, and they have more nicks, notches and pecks. But diverging from this general trend, the hoards from Giekau and Łabędzie II contain coins that were nearly completely cut from the last decade prior to their supposed deposition.

The weight of the fragments differed of course, and specific patterns appear over time. Small fragments below 1 g peaked in the tenth century. After AD 1000 most coins had a weight of about 1 g or a little bit more, and therefore the graph is misleading in some way for the more recent phase (Fig. 5.1). The dirhams from the Wieschendorf and Giekau hoards were cut in half and mostly quarter coins, and they mark the beginning of an intense phase of fragmentation. The weight of these fragments corresponds in some way with that of West European denars and the “Hedeby half bracteates”, which is perhaps not just a coincidence. Some South Swedish hoards suggest a strong tendency to whole coins – now West European denars instead of Arab dirhams – in the late tenth and early eleventh centuries (Fig. 5.2). The fragments of jewellery indicate a similar development, leading to a weight equivalent to whole coins (Fig. 6).

Previously, in the tenth century, fragmentation produced smaller pieces. Did the weight of these pieces correspond to that of whole coins or to that of weights used? Both possibilities may have played a role, and it is hard to decide between the two explanations. On the one hand, the fragments have no precise weight but show some accumulations, and therefore precise measure cannot be calculated on this basis. On the other hand, the weight measures probably did not differ very much from the weight of the coins. Heiko Steuer suggests a basis of 4.25 g, which is approximately the weight of the Arab (golden) dinar, which further goes back to the Byzantine solidus. Half a dirham is roughly as heavy as a West European denar. The lightest weights known so far have 0.355 g, which is about an eighth of a dirham. Probably there were different regional weight systems around the Baltic Sea, and this makes the picture more complicated.

21 Differences to graphs already published by the author are due to a different way of counting the decades. In this graph the decades are counted from ...0 to ...9.
22 Wiechmann 1996, 165.
23 Ibid., 175.
24 Ibid., 170-182.
25 Hårdh 1976, 141.
26 Steuer 1997, 283.
27 Idem 1987, 463.
The proportion of fragments seems to be an indicator of intensive circulation, a frequent exchange and perhaps the existence of a local market. But most likely the lack of new coins could lead – in some regions and during specific time spans – to an intense cutting as well. In this case fragmentation would have been due much more to a crisis than to a developed and prospering economy. Thus several reasons could result in coin fragmentation, and this makes the reconstruction of patterns of fragmentation a task requiring great skill.

Weights and balances were used to weigh the silver. They came into widespread use in the late ninth century (Fig. 7). Collapsible balances and small cubo-octahedral bronze weights (Steuer’s type A, less than 5 g) could measure with an accuracy of less than 1 % or up to 0.1 g. The bigger spherical bronze-covered iron weights with flattened poles (Steuer’s type B, more than 4 g up to 100 g) served for larger sums of money, and perhaps “weighing primarily was used for larger transactions”. Different weight systems or the lack of standardised weights made it necessary that both partners of a transaction used their own weights (which could be referred to as “counter-weigh-
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But what can we expect for the earlier period, the first two thirds of the ninth century? There were only a few weights and balances, a few pieces of jewellery or some ingots in the hoards, and only a few fragments. Does this mean that dirhams were counted?\(^{33}\)

The beginnings: 800-870

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\(^{32}\) Steuer 1987, 499-500.

\(^{33}\) Steuer/Stern/Goldenberg 2002, 136 fig. 2.

\(^{34}\) Steuer 1987, 460, 487 fig. 9-10; \textit{idem} 1997, 229 fig. 165, 320 fig. 232.
Fig. 8. Four coin hoards of the early ninth century, composition per decade and proportion of fragmentation (in black; only datable fragments are shown). 1. Prerow (after 803/814); 2. Braniewo (after 816/817); 3. Mokajmy-Sójki (after 817/818); 4. Ramsowo (after 828/829). The deposits from Braniewo and Ramsowo have only whole dirhams, while the Prerow hoard has some fragments, and surprisingly the find from Mokajmy-Sójki consists of fragments only.
from the Middle East.\textsuperscript{35} Some other kinds of weights – namely, lead weights – are found in the Baltic,\textsuperscript{36} but they are, as often suggested, perhaps primarily used by craftsmen to produce special alloys. Some balances of older western types, which could not be folded up, still remained in use in the early ninth century.\textsuperscript{37} When the silver and especially the coins could not be weighed, then they had to be counted. Transactions could only be made by this method.\textsuperscript{38}

In this case one would expect whole and complete coins only in the hoards, and the hoards from Braniewo and Ramsowo are good examples (Fig. 8). But a sufficient number of early ninth century hoards contain fragmented dirhams. The Prerow hoard is a very early example, and its proportion of fragmented and whole coins is similar to that of other hoards sixty to eighty years later. Nevertheless one has to bear in mind that the diagrams only show the datable dirhams. Many small fragments cannot be dated\textsuperscript{39} and are therefore omitted here. The Pinnow hoard, for instance, includes several hundreds of fragments (Fig. 9).\textsuperscript{40} In the end there are more fragmented dirhams than shown here.

In general, however, the percentage of fragmented coins is much smaller in the ninth than in the tenth century. This is not surprising, because the circulation was much more intense after 900 as the much higher number of hoards from this time suggests. But the main evidence is the weights and balances themselves. They apparently were used for weighing the silver, and therefore an intense cutting seems to be a logical consequence. Otherwise, if there were only some irregular weights in the early ninth century, how could one explain the regular fragmentation, even if it concerns only a small number of dirhams?

One explanation could be that the cutting and breaking of dirhams was not carried out in the Baltic regions. If this is the case, previously fragmented dirhams must have been brought from the Middle East into Europe, or the fragmentation occurred during circulation in Eastern Europe (modern Ukraine and Russia)\textsuperscript{41}. This is not unlikely, because fragmentation is known from Near Eastern hoards,\textsuperscript{42} and the large number of Islamic coin weights demonstrates that coins were weighed even in the Arab economy.\textsuperscript{43}

\textsuperscript{35} *Idem* 1987, 460, 474-479.
\textsuperscript{36} Sometimes these other weights dominated, as the many finds from Birka and Uppåkra indicate (Gustin 2004, 89-96).
\textsuperscript{37} Six of them are known from Haithabu; Steuer 1987, 459 note 192.
\textsuperscript{38} Steuer/Stern/Goldenberg 2002, 136 fig. 2.
\textsuperscript{39} The same is true for the tenth century. For instance the many hundred fragments in the Opalenie hoard cannot be analysed chronologically (Kiersnowska/Kiersnowski 1959, 78).
\textsuperscript{40} Kiersnowska/Kiersnowski 1959, 82; Nützel 1890, 276.
\textsuperscript{41} Metcalf 1997, 333.
\textsuperscript{42} Ilisch 1990.
\textsuperscript{43} Bates 1981.
Fig. 9. Four coin hoards of the late ninth century, composition by decade and proportion of fragmentation (in black; only datable fragments can be shown). 1. Pinnow (after 862/864); 2. Karnice (after 867/868); 3. Czechów (after 882/883); 4. Drohiczyn II (after 893/894). All these hoards of the second half of the ninth century have a small but steady proportion of fragmented dirhams, but at the same time there are other hoards without fragments.
The chronology of the fragmented dirhams is not a good basis to decide where the fragmentation took place; the diagrams (Figs. 8 and 9) demonstrate that all coins were cut roughly in the same percentage with just a slight tendency to a greater extent with older dirhams because they circulated for a longer time. Probably there must have been some regular patterns in the “imported” fragments, which made it possible to estimate their weight and value. This idea leads to a second possible interpretation. Regular fragmentation could have been made even within Europe, and then weights and balances would not have been necessary. One could imagine that half a dirham, a quarter, an eighth, and perhaps a sixteenth (0.18 g) of a dirham could be identified, and the same is true for a division in thirds (Fig. 10). Interestingly, we have even found fragments with a size of about two-thirds of a coin (Fig. 11.2).^{44}

One should not overestimate the accuracy of such a “regular” fragmentation,^{45} but perhaps it was exact enough under the given economic circumstances. Even whole dirhams had no perfect weight. A dirham should have weighed nearly 3 g, but – as an arbitrary example – the dirhams of the Klukowicze hoard weigh between 2.5 g and 3.5 g (Fig. 11.3), which is no more accurate than any halving could be. The hoard from Giekau belonging to the early tenth century contains a significant number of quarter

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44 Sperber 1996, 110 suggests that – besides the dirham weight – the gold weight of about 4.26 g could have been the basis for the cutting.
45 “The boundary between regular and irregular fractions is somewhat subjective” (Metcalf 1997, 303).
Fig. 11. Weights of coins and their fragments. The dirhams from Janów Pomorski (1) are highly fragmented, mostly weighing less than half a gram. For the hoard from Czechów (2), dated to 882/883, mainly the weights of whole dirhams are published; for the fragments their proportion is given schematically (white columns). The hoard from Klukowicze (3), dated to 901/910, has – except from a few smaller pieces – only whole dirhams, which have a weight between 2.5 and 3.5 g normally. The dirhams in the Giekau hoard (4), dated to 921/922, were mostly cut, and most of the fragments weigh about 0.7 g, i.e. a quarter of a dirham.
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dirhams (of about 0.75 g), while half of a dirham is not a common weight (Fig. 11.4) or usually cut further. Besides this, there are many probable “irregular” fractions we do not understand.\(^{46}\) Because only a few hoards are published in such detail, it is impossible to get an overview to what extent there are regular fragments in the ninth-century hoards. Incidentally, some “irregular” weights are in fact counterfeit dirhams as we see in the nine coins from Haithabu which have only 2.3 g of tin and lead instead of nearly 3 g of silver.\(^{47}\)

A basic methodological question concerns the reliability of chronology. 1: Although the hoards are dated by the most recent coin(s) – and although pieces of jewellery could sometimes give a more recent date – it could have taken a specific period of time until the silver was collected and buried. In these cases the coins (e.g. of the ninth century) would have been used longer, and perhaps measured by tenth-century weights and balances. But the larger number of ninth-century hoards and stratigraphical observations from the emporia make such a chronological difference unlikely. 2: The chronology of weights and balances depends on combinations with dirhams. Because of a deficiency of minting in the Near East only some mid-ninth-century dirhams reached Europe,\(^{48}\) and this fact makes the dating of the earliest weights and balances somewhat uncertain. It may have been one or more decades earlier than 880/890, as Steuer suggests,\(^{49}\) but the arrival of these instruments could probably not have taken place before 860/870.

A special situation could have existed in the south-east Baltic. The excavations in Janów Pomorski, probably Truso (near Elbląg), brought to light 270 dirhams and four West European coins, all minted before 850;\(^{50}\) 15 of the analysed eastern coins are complete, 195 fragmented (Fig. 11.1).\(^{51}\) This is a very high proportion of coins from an early ninth-century find.\(^{52}\) Yet some of the whole coins have a hole.\(^{53}\) Probably they were worn as pendants, thus indicating a date perhaps much later than the minting. A hoard some 10 km away shows the same composition: all dirhams in the Mokajm-Sójki find, with a most recent coin from 817/818, are cut or broken (Fig. 8), and most of them are smaller than half a dirham.\(^{54}\) In Truso half and quarter dirhams and even much

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46 Furthermore the effect of corrosion has to be examined.
48 Brather 1997, 89 fig. 3; Noonan 1986.
49 Steuer 1987, 460, 462, 487, fig. 9-10; idem 1997, 229 fig. 165, 320 fig. 232.
51 Bartczak/Jagodziński/Suchodolski 2004, 46.
52 Perhaps modern agriculture has had some influence on the fragmentation, while the plough destroyed the archaeological features.
53 Mainly the West European and the very old Sassanian coins (Bartczak/Jagodziński/Suchodolski 2004, 29 fig. 3. 23, 33 fig. 4, 34 fig. 5, 36 fig. 6, 38 fig. 8).
54 Kiersnowska/Kiersnowski 1959, 70.
smaller fragments appear. 55 Interestingly, no hoards of the tenth century are known from the region, and probably there was no influx of Arab silver after 900 between the rivers Vistula and Neman. But from Truso about 300 weights and some balances were uncovered during modern excavations, 56 and they mainly belong to the tenth century along with other “imports” showing ongoing trade connections. Because the archaeological features are badly damaged, if not destroyed, one cannot assess if coins and weights belong to the same period, or in other words, if the old coins circulated even in the tenth century.

In sum it becomes clear that fragmented dirhams are far from being an exception in the early ninth century (Figs 3 and 4). And as far as we currently know there were no sufficient weights and balances to determine the value of fragmented coins. For this reason, it is possible that fragmentation was carried out elsewhere. Fragments of eighth-century dirhams that came to the Baltic regions only after 800 may indicate cutting in the Near East, but of course older coins could have been cut later. Moreover, specific dirhams seem not to have been preferred (chronologically or with respect to specific mints) when coins needed to be cut. The dirham finds from Truso as well as the interesting hoard from Mokajmy-Sójki should indicate that at least part of the fragmentation was carried out in the Baltic. How this worked if one had to “pay” by such small pieces without weights and balances remains a task for further research.

But there are some weights and balances. Lead weights, which have their main distribution around the North Sea, 57 are known from several places – Helgö 58, Åhus 59, Uppåkra 60, Birka 61, Paviken 62, Haithabu 63, Kaupang 64, Groß Strömkendorf 65 and Truso 66. The pieces of lead normally have a simple flat and cylindrical form; their shape and weight do not seem to follow any rules, 67 while the cubo-octahedral and spherical

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56 Bartczak/Jagodziński/Suchodolski 2004, 22.
57 Steuer 1987, 460-461.
58 Kyhlberg 1980, 291-293. Nearly all eighth- and ninth-century dirhams from Helgö were cut, often into very small pieces (Hovén 1986).
59 Callmer 1984, 74.
60 Gustin 1999, 261 fig. 10; idem 2004, 89-96.
61 Kyhlberg 1986, 153-154; Gustin 1999, 256-257 fig. 4-6; idem 2004, 89-96. Mainly from the “Black Earth” (Svarta Jorden).
62 Idem 1999, 255 fig. 3.
63 Steuer 1987, 461.
64 Unpublished; pers. communication Dagfinn Skre; http://www.kaupang.uio.no/dokumenter/aarsb_2001/kapittel4.htm.
65 Unpublished; pers. communication Hauke Jöns.
66 Unpublished; pers. communication Marek Jagodziński and Heiko Steuer.
weights apparently do. For this reason, a systematic overview is missing, and this situation makes a detailed analysis a future task. That craftsmen mainly used lead weights to produce specific alloys is just a suggestion. The lack of pure metals (with the possible exception of gold) could mean that the mixture of alloys was more a product of trial-and-error than of exact measurement of different metal pieces. In this case there would be no reason to assume that the lead weights were not used for silver coins. Even their missing “standardisation” would not have been an obstacle. Just as with the later weights, both partners of a transaction must have used their own weights to come to an agreement by checking the differences with reference to foreign weights (instead of having an overall standard of weights).

Conclusions

The “regular” fragmentation in ninth-century hoards raises some doubts if dirhams were normally counted before the late ninth century. But the interpretation remains uncertain. 1: It is – without autopsy – impossible to be sure if the fragments were cut or broken, and some fragmentation could be the result of damage during the uncovering of a specific hoard. 2: Because for most hoards only the number of whole and fragmented dirhams is given in publications, it would be necessary to weigh all the pieces. Then it will become clear if there are regular fragments, which perhaps were counted. 3: We cannot know where fragmentation was carried out – in East Central Europe, indicating an intense circulation, or already in the East, and then providing no information about the monetary situation around the Baltic Sea?

Normally it can be assumed that the composition of hoards reflects the “money” in circulation. Nevertheless we have to be aware that at least in some places or regions “a hoarder might have preferred whole dirhams or large fragments”68. This would explain the coexistence of hoards both with and without fragments. There is another reason to suppose that the actual fragmentation was more intense than the known material suggests. If only whole coins are known today from hoards uncovered in the nineteenth century or even earlier, this might be a result of the interest of (public and private) coin collectors who were primarily interested in “nice” specimens and perhaps threw away the fragments.

If the chronology of dirham hoards69 and of weights and balances70 is right, then we need an explanation for the ninth-century fragments. Wherever they had been cut, how could they have been used as a means of payment? Were they counted because there

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68 Metcalf 1997, 305.
69 Normally based on the most recent coin.
70 Depending on the dirhams.
were no sufficient weights? Or were the cylindrical lead weights at least sometimes used to measure the silver, which seems to be the most likely interpretation? In the case of Truso it must be asked moreover what did they weigh on the many weights found from the tenth century, a period without any coins on site (as far as we know today). Amber may be a possible answer.

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71 At the same time craftsmen may have used them.


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