

THE MONEY SIZE ILLUSION AS A BAROMETER OF CONFIDENCE? THE CASE OF HIGH INFLATION IN ISRAEL *

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Israel has known a very high inflation rate and two currency changes in the past five years. Coin size estimation by 97 subjects reveals a general tendency to underestimate sizes. The specific pattern of results suggests that coin size estimation is influenced by the subject's attitude towards the coin in question, that inflation and actual value of the coin are not the only determinants of that attitude, and that the attitude remains unchanged if the coin is removed from circulation.

Ever since Bruner and Goodman's work (1947), it has been known that the size of coins, like that of other valuable objects, is usually overestimated. A number of experiments over the years have confirmed this view (McCurdy 1956; Tajfel 1957; Dawson 1975).

The exceedingly high rate of inflation in Israel over the past years (monthly double-digit rate) has created a novel phenomenon: the public has lost its trust in the local currency. The Israeli currency is no longer considered as a store of value, and in many circumstances loses even the functions of means of payment and of unit of account: many prices are expressed and advertised in US dollars, and actual payment is often performed with the US currency. Countless jokes circulate, poking fun at the local currency. These circumstances prompted us to investigate whether the classic money size illusion is to be found in Israel.

Two recent studies bear upon this issue. Lea (1981) performed a small scale study in which subjects estimated the size of British coins under their pre- and post-decimalization names. Lea's own conclusion

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was that estimates under the old names were bigger, and attributed this to inflation. The argument implied is that when coins are given their old names, they are associated to their purchasing value at the time decimalization took place, which was about double the purchasing value at the time of the study, as a consequence of inflation. Careful study of Lea's figures indicates that the actual extent of over- and underestimation is very small, and that on average, there is underestimation both for old coins (-1%) and for the new ones (-4%).

In a study involving British banknotes, Furnham (1983) had subjects estimate the size of current notes, and found systematic small underestimations, of up to 3%. Moreover, when the comparison set consisted of only the old British pound (prior to decimalization) and the physically smaller new one, he found overestimation of the old note by about 10%, and underestimation of the new one by about the same extent. Furnham suggests that the actual increase in size which occurred together with decimalization was exaggerated by the subjects, as a consequence of the drop in value caused by inflation. This line of explanation is consonant with Tajfel's (1957) thesis, according to which differences in size which covary with differences in value tend to be accentuated in memory.

Studying the effect of currency change in Ireland, Smith et al. (1975) found that the introduction of one of the new coins led to its underestimation. No explanation was offered for the phenomenon. The authors also confirmed that the difference in size between coins is accentuated when it reflects their relative values, and may be reduced when the rank order of sizes and values conflict.

Unfortunately, these studies raise more questions than they are able to answer. Some of them have methodological weaknesses (number of subjects, number of coins, statistical analyses) but the real difficulty is the confounding of the variables of interest, namely; size, nominal value, purchasing value, and the effects of inflation. The current situation in Israel offers a unique opportunity in this regard. The Israeli currency was changed *twice* over the past five years. The first time, in October 1980, when the Israeli pound (IL) was replaced by the Israeli Sheqel (IS, 1 IS = 10 IL), and again in October 1985, with the change from the Israeli Sheqel to the New Sheqel (NS, 1 NS = 1000 IS). On both occasions, the more valuable coins were replaced by other coins of the same purchasing value, but with a lesser nominal value, while additional, more valuable coins were introduced.

We conducted our experiment soon after the NS was introduced and people had become familiar with the new coins (December 1985), at a time when inflation was practically halted, by Israeli standards, by the new policy of price freeze (0.5% monthly rate). This enabled us to perform a much wider range of comparisons than ever before. In addition, we introduced into our experimental design the telephone token, which is comparable to a coin and has of course maintained its value over the years.

The following working hypotheses based on this literature were formulated:

- H.1. *Inflation* leads to underestimation of the size of currency (IL and IS).
- H.2. *Currency change per se* (NS) will lead to underestimation of currency.
- H.3. The *size* of coins will affect the direction of misjudgment in such a way as to exaggerate the differences between them.
- H.3bis. The preceding relation will only hold when *size and purchase value* are positively correlated.
- H.4. More *valuable* coins will be judged larger in comparison to less valuable ones.
- H.5. Coins with higher *nominal value* will be judged larger than those of lesser face value.

Method

Subjects

Ninety-seven first and second year behavioral sciences students at Ben Gurion University participated in the experiment. Average age: ca. 20 years.

Procedure

The experiment was administered collectively. Every coin was evaluated as part of a comparison set. All of the items involved in the set were identified by projecting their designs (front and back) on a screen by an overhead projector. These designs were all drawn the same

size. Subjects received sheets of paper, on which were drawn sets of numbered circles. For each coin, the subjects were requested to locate on the sheet the drawn circle of the same size as the coin, and then copy the number of the selected size on a response sheet.

Design

The experiment was divided in three parts. During the first, the subjects compared coins of the same nominal value (1, 0.5, 0.1, and 0.01) for the three currencies (IL, IS, and NS) in a full factorial 3×4 design. The telephone token was added to the comparison set involving the units. The second part involved three estimations of an IS coin and the IL coin it replaced. The last part involved, similarly, three pairs of NS coins and the IS coin each replaced (see fig. 1).

Materials

The subjects received two sets of drawn circles. The first contained the circles to estimate the coins in the first part of the experiment. The other was a different set of circles, for use in the last two parts of the experiment. The use of two different sets served to prevent the subjects to remember, during the latter parts of the experiment, what judgments they had made during the first. The first set of circles contained 24 circles, numbered from 1 to 24, in four rows. The circles were in order of size, with radii from 11 mm to 34 mm, in intervals of 1 mm. The second set was ordered in three columns, and contained 20 circles, lettered (in hebrew) from A to T, and ranging from 13 mm to 22 mm, in intervals of 1 mm.

Results

Constant nominal value

Table 1 summarizes the results of the first part. As can be seen, underestimation is the rule: in ten out of twelve cases, the coins were underestimated. A two-way ANOVA (Currency \times Designation) was run, and yielded a very highly significant effect of Currency ($F(2,192) = 132, p < 0.0001$). The main effect of designation was also significant,

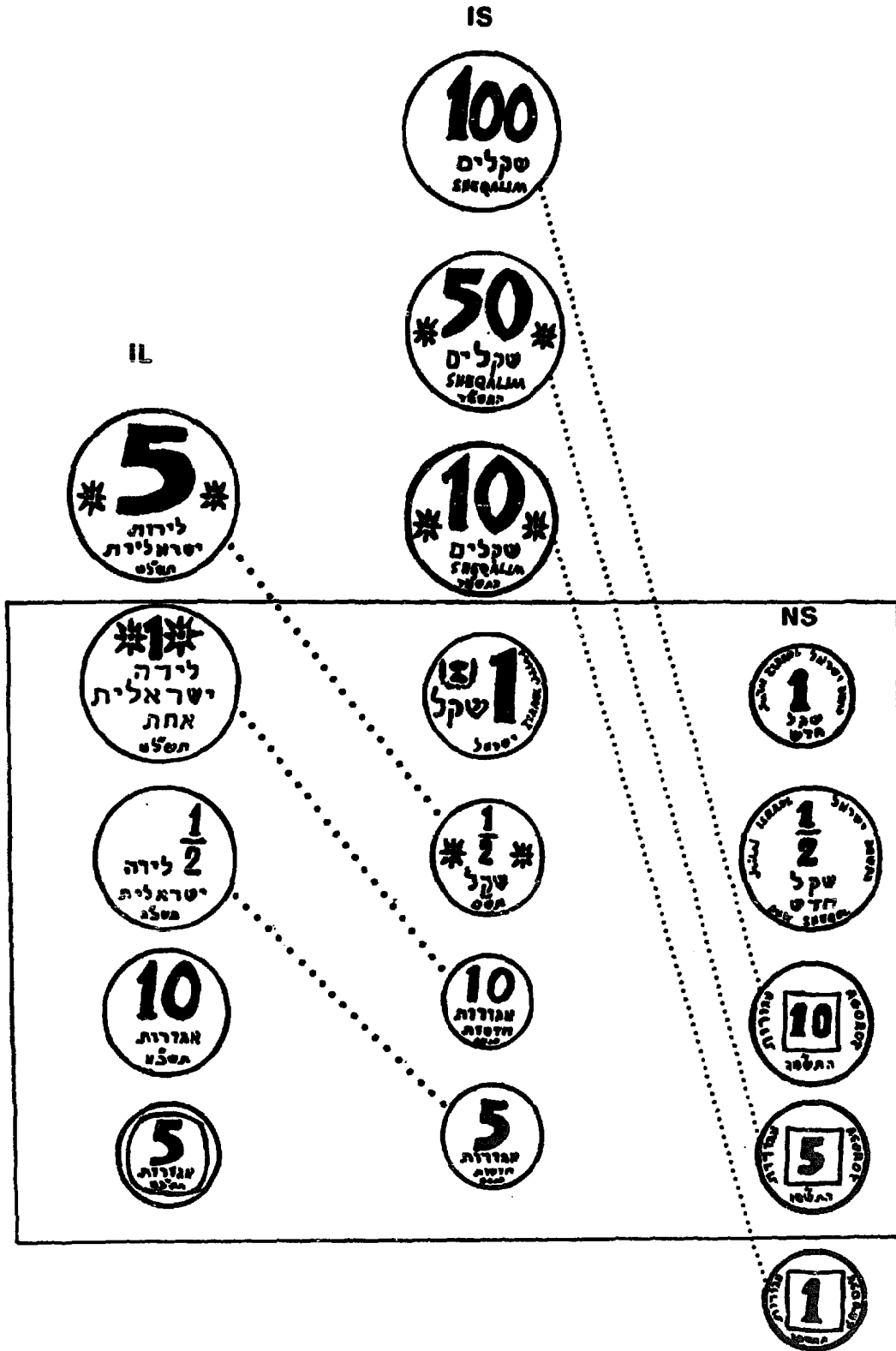


Fig. 1. The 17 coins used in the experiments. — table 1; table 2; table 3. (Reduction factor of 65%.)

Table 1
Actual coin sizes and extent of error: Currency × Designation (size = actual coin size in mm.; delta = estimated size – actual size; s.d. = standard deviation).

Designation	Currency						Means		
	IL			IS			NS		
	Size	Delta	s.d.	Size	Delta	s.d.	Size	Delta	s.d.
1.0	17	-0.51	3.0	23	-1.23	2.7	18	-3.62	2.1
0.5	21	-1.76	2.3	20	1.90	4.0	26	-2.71	2.8
0.1	24	-1.32	2.3	16	2.05	4.8	22	-3.41	3.8
0.05	27	-1.01	2.5	18	-1.17	3.0	19	-2.01	3.3
Mean	22.25	-1.15 -5%		19.25	0.38 2%		21.25	-2.93 -14%	

Table 2

Comparison of the extent of error for IL vs. IS with coins of same value.

Value (in IL)	Currency			
	IL		IS	
	Size	Delta	Size	Delta
0.5	24	-4.22	18	0.6
1	27	-1.5	16	3.58
5	30	-3.05	20	2.30
Means	27	-2.25	18	2.16

as was the interaction ($F(3,288) = 5.48$ and $F(6,576) = 29.4$ resp.), but the pattern of results supports no simple interpretation. In particular, the work of Tajfel (1957), supported by that of Smith et al. (1975), would have led us to expect an exaggeration of the differences between the coins, in those cases where the size relations mirror the relative values. This effect is not found in any of the columns.

Since it might be feared that the size of the IL coins were no longer reliably remembered, or that the NS coins were not yet sufficiently known, we computed the standard deviation of all the estimates. These appear also in table 1. As can be seen, comparison of the standard deviations indicates no systematic effect in either case.

Constant purchase value: IL vs. IS, and IS vs. NS

Table 2 summarizes the paired comparisons of IL and IS. There is a marked underestimation of the size of the IL coins, and a comparable

Table 3

Comparison of the extent of error for IS vs. NS with coins of same value.

Value (in IL)	Currency			
	IS		NS	
	Size	Delta	Size	Delta
100	26	-1.05	17	-1.45
500	28	-1.58	19	-0.91
1000	28	0	22	-2.40
Means	27.33	-0.87	19.33	-1.58

overestimation of the IS coins which were introduced to replace them. That difference is highly significant ($F(1,96) = 105$, $p < 0.0001$). The other main effect and the interaction are also significant ($F(2,192) = 33$ and 30 , resp.), but again, no clear pattern of results emerges.

The comparison of IS and NS is summarized in table 3. Here, the IS coins are slightly underestimated, while there is a marked underestimation of NS coins that recently replaced them ($F(1,96) = 5.6$, $p = 0.02$). The effect of value is non-significant, while the interaction is highly significant ($F(2,192) = 24$; $p < 0.0001$).

Discussion

Let us first return to the five working hypotheses listed earlier:

(1) *Inflation* leads to underestimation of the size of currency. As we saw, the actual situation is more complex, different IS displaying different patterns.

(2) *Currency change per se* (NS) will lead to underestimation of currency. Our data are consistent with this hypothesis. However, it should be remembered that, in the experiment that lead to this prediction (Smith et al. 1975), only one of the coins tested exhibited this effect.

(3) The *size* of coins will affect the direction of misjudgment in such a way as to exaggerate the differences between them, and (3bis) the preceding relation will only hold when *size and purchase value* are positively correlated. Neither version of this hypothesis was confirmed.

(4) More *valuable* coins will be judged larger in comparison to less valuable ones. This hypothesis was not supported.

(5) Coins with higher *nominal value* will be judged larger than those of lesser face value. This hypothesis was not confirmed either.

In summary, our results do not lend support to the hypotheses that can be gleaned from the literature. When studying the pattern of our data, another explanatory principle seems to be called for, one that takes into account the developments in the Israeli economy over the past several years. We submit that the main factor operative in the money size illusion is the *attitude of the public* towards a given coin, and that this attitude remains unchanged when the coin or note is no longer in circulation.

First, let us consider the IL. At the time it was replaced, the IL had lost most of its value. Indeed this was the reason for its replacement. It can therefore be assumed that the attitude towards the IL was dismissive, and this is reflected in the underestimation of the size of that currency. The IS, which replaced it, was at first greeted with some hope, as a concrete token of a new era of economic stability. The IS coins of lower denominations (appearing in table 2) were quickly removed from circulation, having served to facilitate the transition, and we suggest that the positive aura that surrounded them was therefore not tarnished by subsequent events. The situation is here similar to that of the old British pound, which was untouched by the inflation that, as it were, befell the new pound note only. By contrast, the higher denomination IS coins, (which appear in table 3), were introduced at a time of very high inflation, and saw their purchase value eroded within a very short time. This would explain why they were underestimated. Finally, the introduction of the newest currency, the NS, has been greeted with much skepticism. Moreover, it may well be that replacement of a currency by another for reasons of inflation (not of decimalization) itself depresses the value of the former.

It should be noted that this formulation generalized the thesis of Lead (1981) and Furnham (1983). It is not inflation itself that causes underestimation, for there would then be no reason for the NS to be underestimated. Rather, inflation causes a loss of confidence in the currency, and this climate is reflected in the size estimations.

The estimation of the telephone token is something of a puzzle. Its size is 19 mm, and it was underestimated by 2.46 mm on average. We suggest that the explanation is simply a matter of comparison set. Since the token was presented together with known coins, and its size relative to them known, its underestimation is understandable.

It is also of interest to discuss the effect of size and value on estimation. McCurdy (1956) put forward the idea that the differences between coins are exaggerated. Tajfel (1957), confirmed by Smith et al. (1975), found that this only occurs when size and value are correlated, and that the effect could even be reversed when that condition is violated. In the present study, we found no evidence for such an effect in any of the systematic ways we used to test it: size alone, size with value controlled, value only with size controlled. A simple explanation suggests itself. In view of the successive changes of currency and the periods of overlap between them, subjects abandoned the attempt to

relate size and value. For instance, the most valuable coin tested (1 NS = 10,000 IL) is also one of the smallest. Under these circumstances of utter confusion, the systematic effects found by previous investigators, which were based on a rational strategy, are not to be expected.

Fluctuation in the money size illusion may be a barometer of public confidence in the currency. The various factors which affect that confidence are reflected in the extent and direction of the illusion.

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