A Seigniorage Perspective on the Introduction of a Palestinian Currency

Arie Arnon and Avia Spivak

Discussion Paper No. 95.04

May 1995

Research Department, Bank of Israel, POB 780, Jerusalem 91007, Israel

I Introduction

In the economic agreements between the Palestinians and both Israel and Jordan, it was decided to postpone the issue of an independent Palestinian currency to later negotiations.[1] While the introduction of an independent currency has political aspects, it certainly has economic implications for the development of the Palestinian economy.

Prior to the interim arrangements of 1994, the two areas had no money of their own, no monetary authorities and very limited financial intermediation. The civil administration running the areas did not issue debts, neither internal nor external. Thus, monetary and fiscal policies, in the traditional meaning of these terms, did not exist, with all the implications for the economies of the West Bank and Gaza. The money used in the West Bank and Gaza since 1967 was Israeli money (New Israeli Shekels - NIS since 1985 and old Shekels and the Israeli Lira - IL, prior to this date) and Jordanian money (Jordanian Dinar - JD) which was legal tender only in the West Bank.

The financial system was relatively undeveloped. The Jordanian Cairo-Amman Bank had received permission to open branches in the West Bank in 1986, but in 1993 only nine branches of the bank were functioning in the West Bank. The much smaller Bank of Palestine functioned in Gaza since 1981.[2] In addition, there were a few Israeli banks which were not very active, one major insurance company and many moneychangers. The most

---

1 The only change in the status quo is that now the JD is legal tender in Gaza too. See: Protocol on economic relations between Israel and the PLO, 1994, Jordanian-Palestinian Agreement, 1994.

2 In April 1994 the first branch of the Bank of Jordan was reopened in Ramalla. Since then, The Arab Bank, The Jordan Gulf Bank, The Commercial Bank of Palestine and the Arab Land Bank started operations in the territories. As of the end of 1994, close to twenty bank branches of all the above-mentioned banks combined are active in the West Bank; half of them belong to the Cairo-Amman Bank.

important lacuna was in financial intermediation. There was almost no mechanism through which savers and others who could contribute resources to the economy could channel funds to productive activities. The levels of productive investment (i.e. total investment excluding housing) in the West Bank & Gaza have been relatively low in spite of high saving rates. There are several reasons for this, and the lack of substantive financial intermediation is certainly one of them. Thus, the traditional intermediation function of the financial system was not fulfilled by any institution in a satisfactory manner, and a situation that is harmful for the development of the economy prevailed.

According to the economic agreement between Israel and the PLO, a Palestinian Monetary Authority (PMA) will be created and will assume the responsibilities and powers of a central bank, albeit without the power of issuing currency.[3] Thus, a modern banking system is now underway.

The lack of a Palestinian currency and separate monetary authority and the imposed structure where Israel and the West Bank and Gaza on the one hand, and Jordan and the West Bank on the other, function as currency areas, raises the question of whether these areas are optimal currency areas. We address this issue in another paper (Arnon-Spivak, 1994) and arrive at the conclusion that the best arrangement for the initial phase is a currency board. Thus, the Palestinian economy will do better with an independent currency that will be backed by a stable foreign currency to which it can be converted at a fixed rate.

One of the considerations concerning an independent currency is its contribution to the financing of the public sector. In the paper, we will try to estimate the gains as well as to emphasize the dangers for the stability of the economy. In particular, we will present

---

[3] At the time of writing, the PMA has not yet been established.

estimates of the seigniorage, i.e. the revenue from money creation. Since no data exists on the prevailing quantities of NIS and JD in the West Bank and Gaza, we will use an 'indirect' approach to measure the demand for money. We will then estimate the seigniorage from a new currency.

The rest of the paper is organized as follows: In Section II we present the notion of seigniorage and the risks involved in it. In Section III the demand for money is obtained, in Section IV the introduction of the new money is discussed and in Section V the resulting seigniorage is calculated. Section VI summarizes our findings and concludes the paper.

II. Seigniorage: Opportunities and Risks

The revenue from creating money is called "seigniorage". The seigneur was the feudal lord; one of his prerogatives was the minting of money. If the creation of new money is solely to meet increased demand for money, because the economy is growing or for another reason, i.e. there is need for more money, the new money is not considered inflationary. Yet the seigneur can control more resources through minting the new money. Thus, the introduction of new money has advantages for every sovereign issuer, in the form of revenues from the creation of the money.

In the case of a new Palestinian money there is a very large initial seigniorage to be gained by the issuer, since it will replace the current money - i. e. the JD and the Shekel. This might be particularly important during the initial period when the system for tax collection is not yet developed. However, there is a risk that the easy access to the money printing press will result in inflation which may be detrimental to the economy and might have serious effects on the attempts to institute an efficient intermediation system. It is important to note that during this replacement process, when the Palestinian Lira (LIP) will

replace the JDs and Shekels, the new Palestinian entity will obtain outside resources through the exchange of these foreign currencies for goods and services.

When the State of Israel was founded, the printing press was indeed abused: in the first two years of its existence, revenue from taxes amounted to only a third of the total expenditures (this ratio improved to 61% two years later). The money supply increased by 40% in each of those years, resulting later in inflation, exchange rate problems and unemployment. (See: Kleiman (1977), in Gross et. al. Tables C-4, C-6, pp. 247, 250.)[4]

Even well established states such as Greece, Italy, Portugal and Spain rely on seigniorage as a source of revenue which amounts to 6-12 percent of government revenues due to a poorly developed tax base (Drazen, 1988). Our aim here is to examine the amount of seigniorage under various alternative scenarios, assuming the introduction of new currency by the Palestinian entity.

III. The Demand for Money

As mentioned earlier, there is no data on the money supply in the West Bank and Gaza. However, an indirect approach may be used. The demand for money in the surrounding Arab countries show very similar patterns to that in the West Bank and Gaza: low velocity, and demand for money which is not very sensitive to inflation. The estimates for the money velocity reported in Table 1 for the years 1968-69 in the West Bank and Gaza is low, and is much closer to that of Jordan than it is to that of Israel. Our strategy is to assume that the demand for money in the new Palestinian entity will be similar to that of its neighboring Arab countries; in the light of the estimated lower velocities for 1968-69 in the

---

[4] It is interesting to note that a few months earlier, the Jewish Agency's officials were not interested in the monetary question, probably not realizing its revenue potential (Kleiman, p. 221).

West Bank and Gaza compared with the Arab countries we do not over-estimate the demand for money and hence the seigniorage.

Inspection of Tables 2-4 shows that the (nominal) interest rate cannot be used as a measure of the alternative cost for holding money: there is no data for Jordan; a constant 5% interest rate is reported for Syria, due to strong government intervention in the credit markets. Thus, the inflation rate will serve as the proxy for the cost of holding money. In all three countries, inflation was lower in the 1960s, and became double digit after 1973. It is interesting to note that in all three countries, the velocity of money did not increase over time. In fact, there is a trend for the velocity of money to decline, in spite of the increase in inflation. The regression results reported below indicate that velocity did increase as a reaction to inflation and the increased cost of holding money. Apparently, the short term effects of inflation are difficult to detect in the tables because of the lag involved, but they are captured by the regression. An increase in the money supply temporarily reduces V because P does not react immediately to M (partially because of subsidies and price controls) so that M/P increases; the ensuing inflation then increases P and V. These dynamics can be seen in the Egyptian case between 1973 and 1978.

For the statistical estimation of the money demand function we used the veteran semi-logarithmic function suggested by Cagan (1956), with a lag:

$$(1) \qquad \ln\frac{M}{P} = \alpha_0 + \alpha_1 \ln\frac{Y}{P} - \alpha_2\pi + \alpha_3 \ln\left(\frac{M}{P}\right)_{-1}$$

where M is the money supply, P is the price level and Y is the nominal GDP. The lag incorporates the price change dynamics. The long-run values for the coefficients are $\frac{\alpha_1}{1-\alpha_3}$ for the GDP and $\frac{\alpha_2}{1-\alpha_3}$ for the inflation. We could not reject statistically the

hypothesis that the same demand function applies to both Egypt and Syria:[5]

$$\ln M/P = \underset{(-2.64)}{-0.41} + \underset{(2.62)}{0.20}\ln(Y/P) - \underset{(-4.31)}{0.64\pi} + \underset{(13.4)}{0.87}\ln(M/P)_{-1} \quad D.W. = 1.34 \quad R^2 = 0.99$$

The sum of the coefficients of the GDP and the lagged money supply is 1.07. Such a condition which is greater than 1 leads to a decrease in the velocity of money and thus is consistent with the secular decline in the velocity of money. However, we cannot reject the hypothesis that $\alpha_1 + \alpha_3 = 1$, leading to a long-run coefficient for the GDP which is equal to one. The unitary income elasticity of the demand for money is the standard outcome. Furthermore, economies of scale in the use of money would predict an elasticity which is less than 1[6]. We thus normalize the sum of the coefficients to be 1 and obtain the equation:

$$(2) \qquad \ln\frac{M}{P} = -0.41 + 0.19\ln\frac{Y}{P} - 0.64\pi + 0.81\ln\left(\frac{M}{P}\right)_{-1}$$

This is the equation used in the sequel for estimating the seigniorage.

IV. The Introduction of Palestinian Money

An important consideration in the estimation of seigniorage is the rate at which the new currency will be accepted by the citizens of the new entity. This, in turn, depends on how the new money is introduced into the Palestinian economy and how the old money - JD, shekels - leaves it. The introduction of the new money can be the result of economic activity: either expenditures of the government financed in the new currency which increases the money supply of LIPs, or a balance of payment deficit paid by shekels and JD which will decrease their share in the money supply. Alternatively, new money can be introduced by the government buying assets from the public with new money.

---

5 t statistics are given in parentheses.

6 In the seminal model due to Baumol (1952), the elasticity is ½.

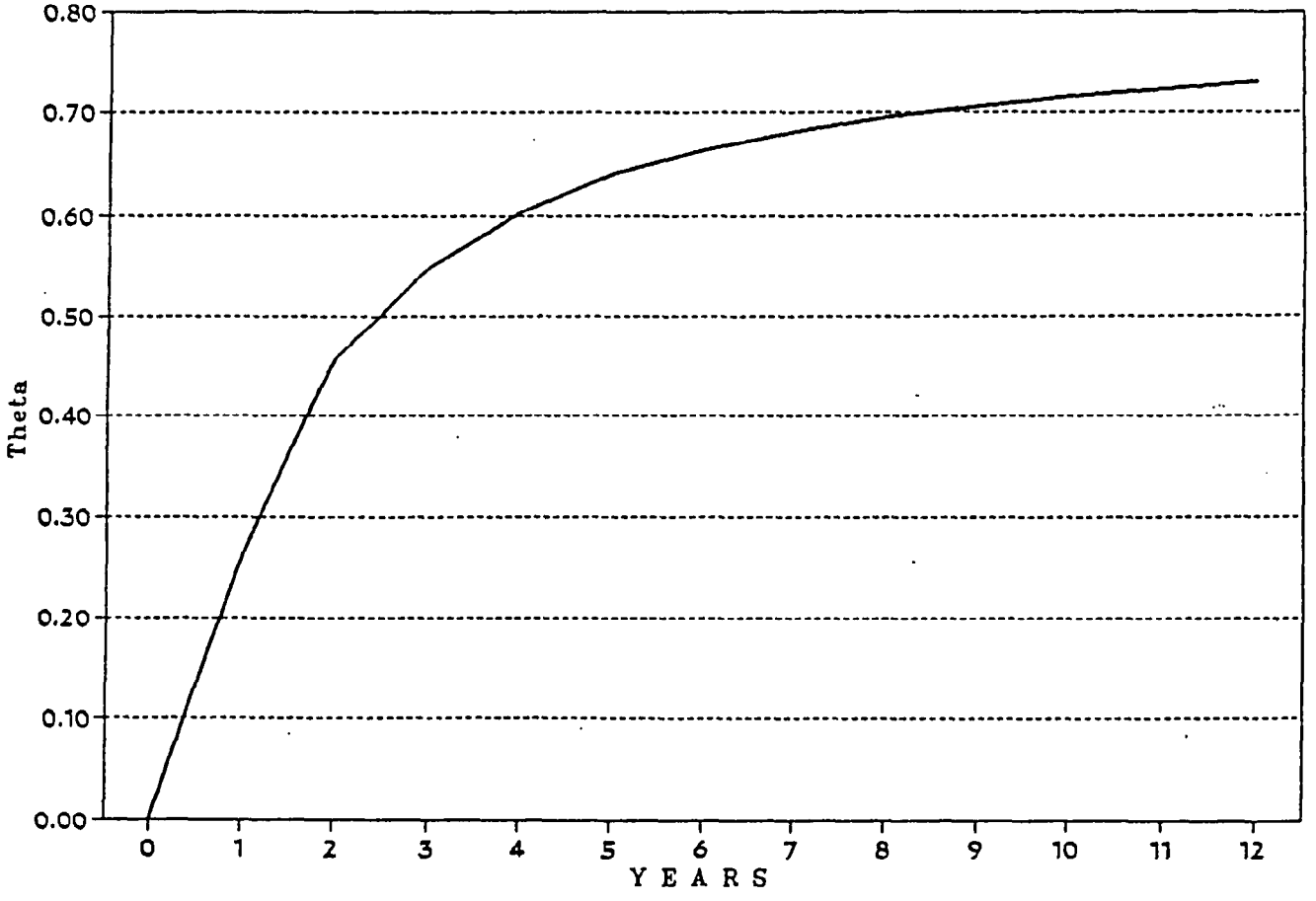
A possible method, frequently used by new issuing authorities, is purchasing the existing money, i.e. JDs and shekels, from the public, thus exchanging them for the LIPs at a fixed rate. To promote the confidence in the LIP, a currency board (CUB) may be established. A pure CUB operates in the following way: the LIP is linked through a fixed exchange rate to a strong and stable currency, such as the Deutsche Mark or the U.S. dollar, "the reserve currency". To issue one more LIP, the stock of the reserve currency held by the currency board must increase by the amount determined by the rate of exchange. For example: if the rate of exchange is 2 LIPs for 1 U.S. dollar, then to issue a million LIPs the reserves of the currency board must increase by half a million dollars. The exchange rates of the JD and the shekel will be derived from their position vis a vis the reserve currency. A currency board is the closest that an economy can get to the Gold Standard. Monetary policy is limited, but not impossible. We discuss the desirability of a CUB in the broader context of optimal currency areas in another paper (Arnon-Spivak, 1994).

While we assume in the sequel the institution of the CUB, the Palestinian entity may decide, of course, to have a more flexible rate of exchange leading, possibly, to higher inflation rates, since the citizens will have the choice of maintaining the use of Jordanian Dinars or Israeli Shekels as their store of value and means of exchange. While their adherence to the new money will depend on ideological and legal factors and circumstances, it will also depend on the trust that they will place in the new government, its commitment to economic stability and to stable prices. Formally we introduce a variable, Θ, $0 \leq \Theta \leq 1$, that will measure the share of the new money, the LIP, in the total money supply. Denoting by L the amount of LIPs, $L = \Theta \cdot M$, where M is obtained from equation 1. The fraction Θ depends on a learning process about the new money. We assume that the learning process follows the logistic curve, $\theta = \theta^* e^{-\frac{k}{t}}$, where t is the time since the introduction

of the new money and k is a positive constant. (The curve is an S-shaped curve with the inflection point at t = k/2.) The parameter k was chosen so that after five years Θ will reach 80% of the long run ($t=\infty$) value of Θ is Θ^*.

Insert Figure 1

Figure 1: Share of LIPs in the Money Supply



The long run value of Θ, Θ^*, depends on the confidence which economic units will have in the LIPs; hence we assume that it is inversely related to expected inflation, which we will assume to be equal to actual inflation. We also assume that the learning process brings Θ to 80% of Θ^* in five years, i.e., $\Theta_5 = 0.8\Theta^*$. Given the specification of the learning function: $\theta_5 = e^{-\frac{k}{5}} \cdot \theta^*$, and k can be computed thereof. The relationship assumed between Θ^* and π and the resulting parameter k are presented below:

Shares of LIP in Money Supply (Θ) and Inflation

π	Θ^*	k
5%	0.8	1.12
10%	0.6	1.12
20%	0.4	1.12
40%	0.2	1.12

Doubling the inflation rate reduces its share linearly hence we assume a logarithmic relation. We must emphasize that the choice of learning parameters is somewhat arbitrary, because there is no historical precedent from which we can learn. In many of the new states that were founded in the 1940s, 50s and 60s there was a local currency that was linked to the currency of a world power - Sterling, French Franc, etc. The conversion from that currency to a new currency was natural and presented no problems. Furthermore, the population did not have an alternative because the money of the previous ruling power ceased to exist[7].

[7] This is what happened in the establishment of Israel. See: Kleiman (1977), p. 241.

In the West Bank and Gaza, the population can still use the Jordanian Dinar and the Shekel and hence must be persuaded to use the LIP. The use of the logistic function for the representation of a learning process is rather common in economics, for technological, sales saturation as well as expectation formation[8].

Our analysis assumes that the demand for Palestinian money is $L = \theta_t(\pi)\cdot(M/P)^d(\pi)$. Thus, inflation affects L through Θ and through the money demand function $(M/P)^d$. The influence of π on Θ reflects the alternative that the economic unit faces, namely holding Shekel and Dinar instead of LIPs. In fact, it is a dual (or even triple) currency economy, as in many Latin American economies, where inflation drove the economic units to use U.S. dollars as an inflation-proof currency. A fuller analysis would explain the demand for the LIP in a portfolio framework, with three 'monies' to choose from. However, the lack of data prevents such empirical analysis.

V. The Seigniorage of the Issuing Authority: Alternative Scenarios

We now combine the share of the LIP (Θ) and the total demand for money (M/P) to obtain the seigniorage. Our definition of the real value of the seigniorage, denoted as S/P is $\frac{S}{P} = \frac{L-L_{-1}}{P}\cdot\frac{1}{mm}$, where mm is the money multiplier, i.e. the ratio of M_1 to the monetary base. We assume that, initially, the demand for money is in a long-run equilibrium with a 10% inflation and real GDP of 3000 million US dollars. In Table 5 we present the computations of the real seigniorage S/P and its share in the GDP, (S/Y), for the base case of no growth and 5% inflation. The LIP is introduced in period 1, and its share Θ is assumed to be determined exogenously so that Θ is a logistic function. $\Theta^*(5\%) = 0.8$ and

---

[8] See: Levy and Spivak (1986).

the rate of learning is such that makes $\Theta_5 = 0.64$ (80% of Θ^*). M is computed recursively using $(M/P)_{-1}$, the domestic product Y and the inflation rate π. All the demand for LIPs in the first year, $385 million, divided by the monetary multiplier, is seigniorage because no Palestinian money existed before, hence all of it is issued at the first year. In the first five years the seigniorage amounts to 22.9% of the GDP (assuming mm=1.5)[9] but it goes down fast to a long-run value of 1.2% of the GDP per year. The convergence to the long-run equilibrium is marked by a slight decline in the velocity of money, from 2.14 to 2.11, due to the decrease in the yearly inflation rate from 5% to 10%.

In Table 6 we keep the inflation of the base case (5%) but change the growth rates. The seigniorage in the short-run, the first five years, stays around 22% of the GDP, again assuming mm=1.5, but the long-run share increases from 1.2% to 2.0%.

The short-run seigniorage is mainly due to the replacement of old currency by LIP. The replacement rate depends on Θ_t which in turn depends on the inflation, that does not change. In the long-run, the growth of the economy creates more demand for money that yields more seigniorage with faster growth. In Table 6 we also notice that the velocity of money increases with growth, leading to small changes in the short-run seigniorage. This increase is due to the lag structure in the demand for money: the money demand depends on past values of the GDP, hence when the GDP grows faster the ratio of money to GDP decreases, causing the increase in V.

We now study the impact of inflation on the seigniorage, keeping the growth rate constant, at 3% per year, but increasing the inflation from 5% to 40%. Unlike the former case, the results, reported in Table 7, present dramatic impact: both the short-run and the

---

[9] Such value for mm is typical for economies whose financial system is relatively less developed.

long-run seigniorage decline, the former from 22.7% to 4.7%, the latter from 1.6% to 0.5% for the inflation rate of 40%, again, under the assumption of mm=1.5. The high inflation in the LIP will drive the economic units away from LIPs, since they will minimize the use of the new currency and adhere to the JD or the Shekel as their preferable currency. One should note that switching between currencies, already in use, is practically without cost.

The seigniorage in the short-run and in the long-run (reported in Tables 6 and 7) can be explained by using some well-known functional relationships from monetary theory. The short-run seigniorage is mostly the result of the one-time introduction of the LIPs. Thus the total quantity of LIPs held after five years is $0.8\Theta^*$ of M_5, which is equal to 20.1% of GDP for $\pi = 5\%$ and g=0, out of the total of 22.9%. The long-run seigniorage in this case is the pure inflation tax which is equal to $\frac{\theta}{mm}\frac{\pi}{1+\pi}\frac{M}{Y} = \frac{1}{mm}\frac{\theta\pi}{1+\pi}\frac{1}{V}$,[10] indeed the result obtained in Table 6 is -1.2%. Some inflation tax is collected in the first five years, although on a lower average LIP base, amounting to 2.8% in this case.

The lowering of Θ^* that follows the increase in the inflation rate reduces the short-run

---

[10] The long-run formula for both growth g and inflation π is: $\frac{S}{Y} = \frac{\theta^*}{V}\frac{g+\pi+g\pi}{(1+g)(1+\pi)}\cdot\frac{1}{mm}$. It is obtained by observing that $S = \frac{1}{mm}\left(\theta^*M-\theta^*M_{-1}\right)$, that $\frac{M}{Y} = \frac{M_{-1}}{Y_{-1}} = V$ and that $Y = Y_{-1}(1+g)(1+\pi)$.

For the year t=40, the actual Θ and not Θ^* should be used in the calculation.

seigniorage, with a little help from the increase in g, as reported in Table 7. The long-run demand for all money is inelastic for all levels of inflation considered here but 40%; so the total inflation tax increases, but the share of the LIPs decreases, leading to the results reported in Table 7.[11] In Table 8 we report the average seigniorage in the short-run and the long-run for alternative values of inflation and growth. One should note that the seigniorage is not sensitive to g due to the interaction of two forces: on the one hand g increases the seigniorage but on the other hand V increases with g.

The results of our simulations are that of all the scenarios considered, 5% inflation maximizes the seigniorage. This is close to the long-run rate of inflation prevailing in Western countries. Thus if a currency board is adopted, it is reasonable to assume that the rate of inflation will be low and will lead to high seigniorage.

Hamed and Shaban (1993) calculated the seigniorage gained by Israel from the use of the Israeli shekel as legal tender in the West Bank and Gaza. They solved the problem of lack of data on the money held in the territories by assuming that the holding of Shekels per unit of GDP was the same as in Israel. In contrast, we assumed that the economy of the West Bank and Gaza is more similar to the Arab neighbors than to Israel. Since the velocity of money is much higher in Israel, in our view Hamed and Shaban may have underestimated the total money held in the territories and thus the seigniorage. However, since part of the money supply was in JD, Jordan also enjoyed seigniorage; we have no way of estimating the division of the seigniorage between Israel and Jordan because it depends on the relative

---

[11] For our semi-logarithmic demand function $\frac{M}{P} = e^{\alpha_0}\left(\frac{Y}{P}\right)^{\alpha_1} e^{-\alpha_2 \pi}$, the maximum inflation tax $\Pi \cdot \frac{M}{P}$ is obtained at $\pi_0 = \frac{1}{\alpha_2}$. In the long-run, $\alpha_2 = 3.37$ so $\pi_0 = 29.7\%$.

quantities of the JD and Shekel in the money supply in the West Bank and Gaza. The World Bank report on Peace and the Jordanian Economy (1994) estimated the allocation of the existing money supply in the West Bank and Gaza between JDs and shekels, using a formula based on the relative sizes of the economies. They find that the existing stock of money is about $1.8 billion, 45% JDs and 55% NIS. Interestingly, the estimates are in line with our results about the existing stock of money. However, since this publication was written from a Jordanian perspective, no estimate of the seigniorage for the Palestinian economy was provided.

VI. Summary and Conclusion

In this paper we found that there are substantial revenues to be gained from the introduction of a Palestinian currency. According to our calculations, it will yield a short-term revenue amounting to more than 22% of the GDP (in the first five years) and around 1.2% annually in the long-run, assuming that the money-multiplier will be equal to 1.5. The revenues will decrease in direct proportion to an increase in the actual money-multiplier. These numbers are based on the assumption that a European inflation rate of 5% per year will prevail. They change considerably with the inflation rate.

In a system without a CUB, the temptation of easy revenue may lead to high inflation and instability in the exchange rate, which will create a bad climate for growth. This is what happened to many new nations, including Israel. The adoption of a CUB will allow the Palestinian entity to collect the seigniorage, while maintaining stability. By our assumptions, since stability is essential to the acceptance of the Palestinian money, the seigniorage will be maximized under this arrangement.

Table 1

Money Aggregates in the West Bank and Gaza, 1967-1969*

(in millions of U.S. Dollars)

Year	Cash			1+2+3	Deposits				Total Money Supply	GNP	Velocity of Money
	(1) JD	(2) EL	(3) IL	(4) Total	(5) JD	(6) IL	(7) Total	(8) C/D	(9)		
1967	46	5	23	74	17	-	17	4.4	91		
1968	75	-	30	105	9	2	11	9.5	116	139	1.20
1969	103	-	14	117	6	5	11	10.6	128	183	1.42

Source: Bank of Israel, Research Department, 1970.

* Note there are no estimates for later years due to reasons explained in the text.

JD=Jordanian Dinar EL=Egyptian Lira IL=Israeli Lira

Table 2

Monetary Aggregates for Egypt, 1963-1989

	Gross Domestic* Product (GDP)	Money Supply (M1)	Inflation	Interest	Velocity (V)
1963	1685	516	1.32%	5%	3.27
1964	1888	621	3.25%	5%	3.04
1965	2214	655	15.09%	5%	3.38
1966	2403	684	8.74%	5%	3.51
1967	2418	707	1.01%	5%	3.42
1968	2533	722	-1.99%	5%	3.51
1969	2696	746	3.55%	5%	3.61
1970	2971	783	3.92%	5%	3.79
1971	3146	846	3.30%	5%	3.72
1972	3337	989	1.83%	5%	3.37
1973	3757	1205	5.38%	5%	3.12
1974	4190	1503	9.79%	5%	2.79
1975	4886	1863	9.69%	5%	2.62
1976	6542	2239	10.25%	5%	2.92
1977	9076	2943	12.82%	6%	3.08
1978	11748	3553	11.08%	7%	3.31
1979	12610	4354	9.97%	8%	2.90
1980	15470	6775	20.47%	9%	2.28
1981	17149	7646	10.42%	11%	2.24
1982	20881	9552	14.86%	12%	2.19
1983	24834	10933	15.98%	13%	2.27
1984	28600	12443	15.98%	13%	2.30
1985	34221	14696	12.11%	13%	2.33
1986	38221	15973	23.90%	13%	2.39
1987	45249	18241	19.69%	13%	2.48
1988	54553	20579	17.60%	13%	2.65
1989	64688	22471	21.27%	13%	2.88

Source: International Financial Statistics

* Millions of current EL.

Table 3

Monetary Aggregates for Syria, 1963-1987

	Gross Domestic* Product (GDP)	Money Supply (M1)	Inflation	Interest	Velocity (V)
1963	3980	1029	1.81%	5%	3.87
1964	4596	1095	5.33%	5%	4.20
1965	4614	1240	-3.93%	5%	3.72
1966	4698	1350	4.09%	5%	3.48
1967	5437	1619	6.18%	5%	3.36
1968	5947	1867	2.65%	5%	3.19
1969	6844	2088	-1.55%	5%	3.28
1970	6848	2341	4.19%	5%	2.93
1971	8044	2502	6.03%	5%	3.22
1972	9286	3151	1.90%	5%	2.95
1973	9945	3797	20.47%	5%	2.62
1974	15951	5540	15.44%	5%	2.88
1975	20597	6966	11.37%	5%	2.96
1976	24725	8561	11.41%	5%	2.89
1977	27013	10924	12.13%	5%	2.47
1978	32389	13866	4.81%	5%	2.34
1979	38974	16119	4.59%	5%	2.42
1980	51270	21854	19.30%	5%	2.35
1981	65777	24832	18.38%	5%	2.65
1982	68788	29518	14.29%	5%	2.33
1983	73291	36978	6.11%	5%	1.98
1984	75342	45607	9.22%	5%	1.65
1985	83225	54976	17.23%	5%	1.51
1986	100300	61214	36.10%	5%	1.64
1987	126325	67821	59.44%	5%	1.86

* Millions of current LS.

Table 4

Monetary Aggregates for Jordan, 1969-1991

	Gross Domestic* Product (GDP)	Money Supply (M1)	Inflation	Velocity (V)
1969	222.8	96.22		2.32
1970	211.8	105.46	6%	2.01
1971	226.2	108	5%	2.09
1972	251.7	115.02	8%	2.19
1973	265.2	139.25	11%	1.90
1974	300	172.01	19%	1.74
1975	379.1	224.68	10%	1.69
1976	512.1	276.73	14%	1.85
1977	624.6	329.01	15%	1.90
1978	767.9	370.52	7%	2.07
1979	914.6	465.58	14%	1.96
1980	1195.6	580.7	11%	2.06
1981	1414.1	701.66	8%	2.02
1982	1604.8	787.5	7%	2.04
1983	1728.1	869.42	5%	1.99
1984	1818.7	878.39	4%	2.07
1985	1880	848.22	3%	2.22
1986	2024.6	897.1	0%	2.26
1987	2073.2	979.8	-0%	2.12
1988	2189.5	1166.76	3%	1.88
1989	2556.6	1302.3	26%	1.96
1990	2618.4	1425.3	20%	1.84
1991	2805.5	1646.6	8%	1.70

* Millions of current dinars.

Table 5: Inflation, Growth and Seigniorage: The Base Case (rate of inflation is 5%, rate of growth is 0% and theta star is 0.8 . mm=1.5).

year	Y/P *	g	π	M/P *	M	θ	L	S/P *	S/Y	V
0	3000	0%	5%	1400	1400	0	0	0	0	2.143
1	3000	0%	5%	1403.93	1474.13	0.2810	384.78	244.31	0.08144	2.137
2	3000	0%	5%	1407.13	1551.36	0.4570	708.92	198.00	0.06533	2.132
3	3000	0%	5%	1409.72	1631.93	0.5507	898.78	109.34	0.03645	2.128
4	3000	0%	5%	1411.83	1716.09	0.6046	1037.59	76.13	0.02538	2.125
5	3000	0%	5%	1413.53	1804.07	0.6395	1153.62	60.60	0.02020	2.122
6	3000	0%	5%	1414.92	1896.13	0.6638	1258.60	52.23	0.01741	2.120
7	3000	0%	5%	1416.04	1992.51	0.6817	1358.32	47.25	0.01575	2.119
8	3000	0%	5%	1416.95	2093.48	0.6955	1455.99	44.07	0.01469	2.117
9	3000	0%	5%	1417.69	2199.30	0.7064	1553.56	41.93	0.01398	2.116
10	3000	0%	5%	1418.28	2310.24	0.7152	1652.36	40.44	0.01348	2.115
11	3000	0%	5%	1418.77	2426.58	0.7226	1753.33	39.36	0.01312	2.115
12	3000	0%	5%	1419.16	2548.61	0.7287	1857.20	38.56	0.01285	2.114
13	3000	0%	5%	1419.48	2676.64	0.7340	1964.55	37.95	0.01265	2.113
14	3000	0%	5%	1419.74	2810.98	0.7385	2075.89	37.49	0.01250	2.113
15	3000	0%	5%	1419.94	2951.96	0.7424	2191.66	37.13	0.01238	2.113
16	3000	0%	5%	1420.11	3099.93	0.7459	2312.28	36.84	0.01228	2.113
17	3000	0%	5%	1420.25	3255.24	0.7490	2438.15	36.61	0.01220	2.112
18	3000	0%	5%	1420.36	3418.27	0.7517	2569.65	36.43	0.01214	2.112
19	3000	0%	5%	1420.45	3589.41	0.7542	2707.15	36.28	0.01209	2.112
20	3000	0%	5%	1420.52	3769.07	0.7564	2851.04	36.15	0.01205	2.112
21	3000	0%	5%	1420.58	3957.69	0.7585	3001.71	36.05	0.01202	2.112
22	3000	0%	5%	1420.63	4155.71	0.7603	3159.56	35.97	0.01199	2.112
23	3000	0%	5%	1420.67	4363.62	0.7620	3324.98	35.90	0.01197	2.112
24	3000	0%	5%	1420.70	4581.90	0.7635	3498.39	35.85	0.01195	2.112
25	3000	0%	5%	1420.73	4811.08	0.7650	3680.24	35.80	0.01193	2.112
26	3000	0%	5%	1420.75	5051.71	0.7663	3870.97	35.76	0.01192	2.112
27	3000	0%	5%	1420.76	5304.36	0.7675	4071.06	35.73	0.01191	2.112
28	3000	0%	5%	1420.78	5569.63	0.7686	4280.99	35.70	0.01190	2.112
29	3000	0%	5%	1420.79	5848.15	0.7697	4501.28	35.68	0.01189	2.112
30	3000	0%	5%	1420.80	6140.60	0.7707	4732.46	35.66	0.01189	2.111
31	3000	0%	5%	1420.80	6447.66	0.7716	4975.10	35.64	0.01188	2.111
32	3000	0%	5%	1420.81	6770.07	0.7725	5229.77	35.63	0.01188	2.111
33	3000	0%	5%	1420.81	7108.60	0.7733	5497.11	35.62	0.01187	2.111
34	3000	0%	5%	1420.82	7464.05	0.7741	5777.74	35.61	0.01187	2.111
35	3000	0%	5%	1420.82	7837.27	0.7748	6072.36	35.61	0.01187	2.111
36	3000	0%	5%	1420.82	8229.15	0.7755	6381.66	35.60	0.01187	2.111
37	3000	0%	5%	1420.83	8640.62	0.7761	6706.38	35.60	0.01187	2.111
38	3000	0%	5%	1420.83	9072.66	0.7768	7047.32	35.60	0.01187	2.111
39	3000	0%	5%	1420.83	9526.30	0.7774	7405.29	35.59	0.01186	2.111
40	3000	0%	5%	1420.83	10002.62	0.7779	7781.15	35.59	0.01186	2.111

* Millions of U.S. Dollars

Table 6

Share of Seigniorage as a Percentage of GDP and V for π=5% and Alternative Growth Rates

Growth rate	0		3		5		7	
Year	S/Y	V	S/Y	V	S/Y	V	S/Y	V
1	8.1	2.14	8.0	2.19	7.8	2.22	7.7	2.26
2	6.5	2.13	6.3	2.23	6.2	2.29	6.1	2.35
3	3.6	2.13	3.6	2.26	3.6	2.35	3.6	2.44
4	2.5	2.12	2.6	2.28	2.7	2.39	2.7	2.50
5	2.0	2.12	2.2	2.30	2.3	2.43	2.3	2.56
Total	22.9		22.7		22.5		22.3	
Average	4.6		4.5		4.5		4.5	
40	1.2	2.11	1.6	2.39	1.9	2.60	2.0	2.82

Table 7

Share of Seigniorage as a Percentage of GDP and V for g=3% and Alternative Inflation Rates

Inflation rate	5		10		20		40	
Year	S/Y	V	S/Y	V	S/Y	V	S/Y	V
1	8.0	2.19	5.8	2.26	3.6	2.41	1.6	2.74
2	6.3	2.23	4.6	2.36	2.8	2.65	1.2	3.34
3	3.6	2.26	2.7	2.44	1.8	2.86	0.8	3.92
4	2.6	2.28	2.1	2.51	1.4	3.04	0.6	4.47
5	2.2	2.30	1.8	2.57	1.3	3.20	0.6	4.97
Total	22.7		17.0		10.9		4.7	
Average	4.5		3.4		2.2		0.9	
50	1.6	2.39	1.6	2.84	1.3	3.97	0.5	7.78
θ^*	80%		60%		40%		20%	

Table 8

Average Seigniorage in First Five Years and in the Long-Run for Alternative Values of Inflation and Growth

(as percent of GDP; MM=1.5)

g/π	5	10	20	40	
0	4.6	3.4	2.2	1.0	Year 1-5 (Average)
	1.2	1.4	1.2	0.5	Year 40
3	4.5	3.4	2.2	0.9	"
	1.6	1.6	1.3	0.5	
5	4.5	3.4	2.2	0.9	"
	1.9	1.7	1.2	0.5	
7	4.5	3.3	2.1	0.9	"
	2.0	1.8	1.2	0.5	

References

Arnon, A. and Gottlieb, D. (1992), "Alternative Monetary Arrangements in the Territories and their Implications," (mimeo in Hebrew), Research Department, Bank of Israel.

Arnon, A. and Spivak, A. (1994), "Monetary Arrangements Between the Israeli, Jordanian and Palestinian Economies", paper presented in the conference "Sustaining Peace in the Middle East Through Economic Cooperation", Amsterdam, October 1994.

Bank of Israel, Research Department, (1970) "The Administered Territories Economy 1969" (Hebrew).

Baumol, W.J. (1952), "The Transaction Demand for Cash," *Quarterly Journal of Economics* 67, no. 4, pp. 545-566.

Bean, C.R. (1992), "Economic and Monetary Union in Europe," *Journal of Economic Perspectives* 6, pp. 31-52.

Bennet, A.G.G. (1993), "The Operation of the Estonian Currency Board," *IMF Staff Papers* vol. 40, pp. 451-470.

Bregman, A. (1974), "Economic Growth in the Administered Territories 1968 to 1973," Research Department, Bank of Israel.

Cagan, P. (1956), "The Monetary Dynamics of Hyperinflation," in Friedman, M. (ed.) *Studies in the Quantity Theory of Money*, Chicago: The University Press.

Drazen, A. (1988), "Monetary Policy, Capital Controls and Seigniorage in an Open Economy," pp. 13-32.

Fischer, S., Rodrik, D. and Tuma, E. (1993), *The Economics of Middle East Peace*, Cambridge: MIT Press.

Fischer, S. (1982), "Seigniorage and the Case for a National Money," *Journal of Political Economy* 90, pp. 295-313.

Gross, N., Halevi, N., Kleiman, E. and M. Sarnat (1977), *A Banker for the Reviving Nation: The History of Bank Leumi LeYisrael*, Ramat Gan: Masada (Hebrew).

Hamed, O.A. and R.A. Shaban (1993), "One-Sided Customs and Monetary Union: The Case of the West Bank and Gaza Strip under Israeli Occupation" in Fischer, S., Rodrik, D. and Tuma, E. (1993), *The Economics of Middle East Peace*, Cambridge: MIT Press.

Harris, L. (1988), "Money and Finance with Undeveloped Banking in the Occupied Territories," in A. George (ed.) *The Palestinian Economy*, Routledge.

Jordan-PLO Economic Agreement, 7 January 1994, *Journal of Palestinian Studies*, vol. 23, pp. 135-137.

Levy, A. and Spivak, A. (1988), "How Does the Public Perceive an Unprecedented Rising Inflation: The Case of Inflationary Expectation in Israel," *Journal of Macroeconomics* 10, no. 2, pp. 273-282.

Mansour, A.S. (1982), "Monetary Dualism: The Case of the West Bank under Occupation," *Journal of Palestinian Studies*, pp. 103-116.

McKinnon, R.I. (1973), *Money and Capital in Economic Development*, Brookings Institute.

Protocol on Economic Relations Between the Government of the State of Israel and the P.L.O., representing the Palestinian People (1994).

Schwartz, A. J. (1992), "Do Currency Boards Have a Future?", IEA, Occasional Paper 88.

UNCTAD (1989), *The Palestinian Financial Sector under Israeli Occupation.*

World Bank (1993), *Developing The Occupied Territories*, (six volumes), Washington: The World Bank..

World Bank (1994), *Peace and the Jordanian Economy*, Washington: The World Bank.

רשימת המאמרים בסדרה

91.01 R. Melnick and Y. Golan - Measurement of Business Fluctuations in Israel.

91.02 י. ארטשטיין, צ. זוסמן - דינאמיקה של עליות שכר בישראל: כוחות שוק והשוואות בינענפיות.

91.03 M. Sokoler - Seigniorage and Real Rates of Return in a Banking Economy.

91.04 E.K. Offenbacher - Tax Smoothing and Tests of Ricardian Equivalence: Israel 1961-1988.

91.05 ג. עופר, ק. פלוג, נ. (קלינר) קסיר, - קליטה בתעסוקה של עולי בריה"מ בשנת 1990 והלאה: היבטים של שמירה והחלפת משלחי יד.

91.06 צ. זוסמן, ד. זכאי, - פערים בין בכירים וזוטרים ומשברים במערכת ציבורית: שכר הרופאים בשנים 1974 עד 1990.

91.07 M. Beenstock, Y. Lavi and S. Ribon - The Supply and Demand for Exports in Israel.

91.08 R. Ablin - The Current Recession and Steps Required for Sustained Sustained Recovery and Growth.

91.09 צ. הרקוביץ, ל. (רובין) מרידור - ההשלכות המקרו-כלכליות של עלייה המונית לישראל.

91.10 M. Beenstock - Business Sector Production in the Short and Long Run in Israel: A Cointegrated Analysis.

91.11 א. ארנון, ר. עמיחי, - ההפרטה וגבולותיה.

91.12 ק. פלוג, נ. קסיר (קלינר) - עלות העבודה בתעשייה הישראלית.

91.13 A. Marom - The Black-Market Dollar Premium: The Case of Israel.

91.14 A. Bar-Ilan and A. Levy - Endogenous and Exoqenous Restrictions on Search for Employment.

91.15 M. Beentstock and S. Ribon - The Market for Labor in Israel.

91.16 ד. אלקיים, - השפעת המדיניות המוניטרית על פער הריביות במגזר השקלי הלא צמוד 1986 עד 1990.

92.01 מ. דהן, - בחינת מדד הדחף הפיסקאלי של ה-IMF עבור המשק הישראלי לשנים 1964 עד 1990.

92.02 O. Bar Efrat - Interest Rate Determination and Liberalization of International Capital Movement: Israel 1973 - 1990.

92.03 Z. Sussman and D. Zakai - Wage Gaps between Senior and Junior Physicians and Crises in Public Health in Israel, 1974-1990.

92.04 צ. ויס, ע. לויתן - התפתחות תשלומי העברה בישראל, 1965 עד 1989.

92.05 O. Liviatan - The Impact of Real Shocks on Fiscal Redistribution and Their Long-Term Aftermath.

92.06 A. Bregman, M. Fuss and H. Regev - The Production and Cost Structure of the Israeli Industry: Evidence from Individual FiRm Data.

92.07 M. Beenstock, Y. Lavi and A. Offenbacher - A Macroeconometric Model for Israel 1962-1990: A Market Equilibrium Approach to Aggregate Demand and Supply.

92.08 ס. ריבון, - מודל חודשי לשוק הכסף.

92.09 R. Melnick - Financial Services, Cointegration and the Demand for Money in Israel.

92.10 מ. ברון, - העליות לארץ והשפעתן על הפסיפס הדמוגרפי של האוכלוסייה והן ההון האנושי.

92.11 ד. זינגר, - גורמים הקובעים את ההסתברות של פירמות להיסגר.

92.12 R. Melnick - Forecasting Short-Run Business Fluctuations in Israel.

92.13 K. Flug, N. Kasir and G. Ofer - The Absorption of Soviet Immigrants into the Labor Market from 1990 Onwards: Aspects of Occupational Substitution and Retention.

92.14 א. ארנון, ח. פרשטמן, - הפרטת מונופולים טבעיים: הריצה אחר הבלתי מוכח.

93.01 B. Eden - How to Subsidize Education and Achieve Voluntary Integration: An Analysis of Voucher Systems.

93.02 א. ברגמן, א. מרום, - גורמי צמיחה בסקטור העסקי בישראל (1958 עד 1988).

93.03 מ. דהן, - צמיחה כלכלית תחת איום ביטחוני.

93.04 ק. פלוג, נ. (קלינר)קסיר - קליטה בתעסוקה של עולי חבר המדינות - הטווח הקצר.

93.05 מ. דהן, - האם קיימת יריבות בין שיוויון בחלוקת ההכנסות להתפתחות כלכלית? המקרה של ישראל.

93.06 צ. הרקוביץ, ל. מרידור - ההשלכות המקרו-כלכליות של עלייה המונית לישראל: עדכון ובחינה מחודשת.

93.07 A. Arnon, D. Gottlieb - An Economic Analysis of the Palestinian Economy: The West Bank and Gaza, 1968-1991.

93.08 צ. הרקוביץ, ל. מרידור, נ. קנטור - הגירה וצמיחה בתנאים של ניידות הון בלתי משוכללת: גל העלייה לישראל בראשית שנות התשעים.

93.09 K. Flug, N. Kasir - The Absorption in the Labor Market of Immigrants from the CIS - the Short Run.

94.01 R. Ablin – Exchange Rate Systems, Incomes Policy and Stabilization Some Short and Long-Run Considerations.

94.02 B .Eden - The Adjustment of Prices to Monetary Shocks When Trade is Uncertain and Sequential.

94.03 מ. ברון, - התחזית הדמוגרפית ולקחיה.

94.04 K. Flug, Z. Hercowitz and A. Levi - A Small-Open-Economy Analysis of Migration.

94.05 R. Melnick and E. Yashiv - The Macroeconomic Effects of Financial Innovation: The Case of Israel.

94.06 צ. הרקוביץ, מ. סטרבצ'ינסקי, - מדיניות חוב ציבורי בישראל.

94.07 א. כלס, - חוזים כחסמי כניסה בשיווק דלק לתחנות תילדוק: בחינת החלטת הממונה על הגבלים עיסקיים לפיה מערכת ההסדרים הקיימת היא בגדר הסדר כובל.

94.08 מ. דהן, - צמיחה כלכלית, פעילות בלתי חוקית והתחלקות הכנסות.

94.09 A. Blass - Are Israeli Stock Prices Too High?

94.10 א. ארנון, ג'. וינבלט, - פוטנציאל הסחר בין ישראל, הפלסטינים וירדן.

A. Arnon and J. Weinblatt - The Potential for Trade Between Israe the Palestinians, and Jordan.

94.11 מ. דהן, מ. סטרבצ'ינסקי, - תקציב הסקטור הציבורי וצמיחה כלכלית בישראל.

94.12 ק. פלוג, נ. (קלינר) קסיר - הציות לחוק שכר המינימום בסקטור העסקי.

94.13 B. Eden - Inflation and Price Dispersion: An Analysis of Micro Data

94.14 א. ספיבק, - משבר קרנות הפנסיה בישראל: מסגרת מושגית ובחינת ההמלצות לפתרון.

94.15 ל. מרידור, ש. פסח - שער החליפין הריאלי בישראל: פרספקטיבה של שלושה עשורים.

94.16 B. Eden - Time Rigidities in The Adjustment of Prices to Monetary Shocks: An Analysis of Micro Data.

94.17 O. Yosha - Privatizing Multi-Product Banks.

95.01 B. Eden - Optimal Fiscal and Monetary Policy in a Baumol-Tobin Model

95.02 B. Bar-Nathan, M. Beenstock and Y. Haitovsky - An Econometric Model of The Israeli Housing Market.

95.03 מ. דהן - אוכלוסיה אנדוגנית והתחלקות הכנסות.

95.04 A. Arnon and A. Spivak - A Seigniorage Perspective on the Introduction of a Palestinian Currency.