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Money Demand in Mongolia: A Panel Data Analysis

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This paper investigates if there is a significant money demand relationship in Mongolia. The data used is a panel data set covering 22 Mongolian regions over the period 1993–99. The static fixed effect, dynamic fixed effect, and the pooled mean group estimators all confirm the key role of monetary policy in stabilization and reveal that even in a transition economy as rudimentary as Mongolia, a stable money demand exists. In addition, the analysis points to an elasticity of money demand with respect to activity around 0.5, reflecting the larger role for transactions demand for money. [JEL E31, E41, O53, P24]

Until 1990 the Mongolian economy was based on a centrally planned model that had been adopted more than six decades earlier. Almost all production activities were carried out by the state and organized in large monopolistic enterprises. Monetary policy was conducted by the single state bank and focused on accommodating public sector credit, and interest rates were not a factor in the mobilization and allocation of resources or in managing aggregate demand.

Since 1991 the strategy of the monetary authorities has been to stabilize inflation through stable growth in the money supply. Below, it is analyzed if such a significant relationship between money and activity exists in Mongolia. A money demand relation is estimated running panel regressions on regional data on money, activity, interest rates, and the exchange rate. The main conclusion is that even in

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Table 1. Development of Real GDP in Transition Countries, 1989 = 100

	1989	2001
Eastern Europe	100	101.8
CIS	100	63.5
Baltic States	100	72.9
Total above	100	73.8
Mongolia	100	98.6

Source: UN, *Economic Survey of Europe,* 2000, No. 1, Appendix Table B.1. Data for Mongolia are IMF staff estimates.

a transition economy as rudimentary as Mongolia, such a precondition does exist and hence market-based monetary policy is effective. In addition, the elasticity of money demand with respect to activity appears to be significantly lower than in advanced economies, reflecting the larger role for transactions demand for money.

Money demand is a key issue for economies in transition (Polak, 1997) and there are several studies of individual transition countries such as Albania (Kalra, 1998), Hungary (Nemenyi, 1997), Poland (Kokoczynski, 1997), Czech Republic (Hrncir, 1997), Slovakia (Makuch and Nemec, 1997), and Slovenia (Ross, 1998). Mongolia's transition to a market economy has received only limited attention in the literature on transition countries and Mongolia has generally not been identified in cross-country studies. Broader presentations of Mongolia's transition to a market economy can be found in Browne (1996), Goyal (1999), Kalra and Sløk (1999), and Sløk (2000).[1]

One simple measure of how transition is progressing in Mongolia relative to other transition economies is the level of real GDP in 2001 relative to what it was in 1989. Table 1 shows that using this measure Mongolia has been doing quite well.

Out of 27 transition countries, only Poland, Slovenia, and Slovakia have been doing significantly better than Mongolia, and the Czech Republic and Hungary have performed just as well as Mongolia. This simple measure has limitations, however, and does not say much about the level of institution building and the role of policies in the individual transition countries. To analyze the role of policies and in particular the role of monetary policy in transition one has to take a closer look at the relationship between monetary variables and activity, and that is what is done in the following.

I. Monetary Policy in Transition

A market-based monetary policy depends on the existence of a market for money and foreign exchange. Specifically, reserve requirements, refinance windows, government and central bank bills and bonds, and credit allocation through banks or credit auctions are needed. If the institutional framework for monetary policy and these specific monetary instruments are lacking or malfunctioning, the conduct

[1]The analysis below is an extension of the work carried out in Sløk (2000).

and effectiveness of monetary policy will be impeded. Most transition economies have gradually established an institutional framework and introduced instruments and financial markets that function like those in developed countries, although they are smaller and less liquid.

Mongolia enhanced the role of monetary policy in the early stages of its transition. In May 1991, a two-tier banking system was introduced to replace the previous, central bank-based system. Directed credits, which until 1991 had been determined by the credit plan, were limited to priority sectors and oil importers and were phased out in mid-1994. Bank-by-bank ceilings and interest rates that had been imposed in the initial transition phase were also eliminated. In addition, the central bank introduced reserve requirements on business and household demand deposits in 1991, central bank bills in 1993, and regular financing auction at market-determined rates in 1995. The degree of independence given to the central bank, the Bank of Mongolia, is surprisingly similar to that observed in many developed countries. The Banking Law of Mongolia, adopted in 1996, states that the two primary objectives of the Bank of Mongolia are to ensure a stable value for the Mongolian tugrik and to act as supervisor of the financial system. In summary, the institutions and financial markets required for an effective monetary policy in Mongolia have, to a large extent, been created.

Over the transition period, Mongolia's banking sector has faced major challenges including a high volume of nonperforming loans. To strengthen the banking system, measures have been taken, under IMF-supported programs, to reduce operating costs, resolve the financial situations of insolvent banks, and increase loan recoveries. The ratio of foreign exchange deposits to broad money has for most years been less than 20 percent, the average of all transition countries since 1991. But the interest spread, defined as the difference at the end of the year between the rates on short-term bank loans in domestic currency and rates on deposits was, over the same period, one of the highest in the transition countries. The high interest rates have been maintained throughout the transition period to preserve and restore confidence in the banking system. While progress has been made in strengthening the system, problems remain, particularly in the balance-sheet positions of several private banks.

A key challenge for monetary policy in transition is that inflation is not just a monetary phenomenon. Apart from the usual demand-pull and cost-push pressures, at least five additional influences pose challenges for the conduct of monetary policy. First, price liberalization at the beginning of transition results in an initial price level adjustment and substantial changes in relative prices. Second, this adjustment in relative prices brings about a significant reallocation of resources, and subsequent monetary financing of rising fiscal deficits resulting from a combination of declining revenue and rigid expenditure patterns also generates inflationary pressures. Third, downward rigidities in goods and labor markets, together with the indexation of prices, generate more permanent moderate inflation (15–40 percent a year) in many transition countries. Fourth, as income grows, so does the price level of the economy (in line with the so-called Balassa-Samuelson effect), and authorities have to determine to what extent inflation comes from this source. Finally, privatization, institution building, and the creation of competitive markets

take considerable time, and the speed with which competition and efficiency are introduced in the private sector significantly affects inflation rates during the transition. Given all these transition-specific influences on inflation, the existence of predictable relationships between key economic variables, necessary for monetary policy to be conducted effectively, cannot be taken for granted.

II. Money Demand in Mongolia

An essential element in conducting quantity-based monetary policy is to have a stable money demand function. A significant relationship between money, activity, and interest rates enables policy-driven changes in monetary aggregates to have predictable influences on output, interest rate, and prices.[2]

At a theoretical level a strict interpretation of the classical Baumol-Tobin model of the transaction demand for money predicts an income elasticity of one half.[3] However, time series studies often arrive at an elasticity of one and cross-sectional studies at an income elasticity *higher* than one. There are a number of papers analyzing money demand within countries using panel data (Mulligan and Sala-i-Martin, 1992; Metzler, 1963; Feige and Swamy, 1974; Gandolfi and Lothian, 1976; and Fujiki and Mulligan, 1996). These studies all find that the income elasticity is significantly greater than one. Fujiki and Mulligan (1996) study money demand across regions in Japan and find income elasticities between 1.2 and 1.4. Mulligan and Sala-i-Martin (1992) estimate cross-sectional money demand for the United States (excluding Alaska and Hawaii) and they arrive at income elasticities between 1.3 and 1.5. Mulligan and Sala-i-Martin argue that the income elasticity is over one since the process of economic development is associated with a larger number of vertically integrated firms (using more complicated technologies with more varieties of inputs and interacting with a larger number of suppliers). When firms need money to transact with other firms, but not for internal transactions, a higher level of income will be associated with a more than proportionally higher level of money demand. To the extent that this is correct, a lower income elasticity must be expected in transition economies since the level and complexity of transactions in banks and firms are much less sophisticated than in highly developed economies.

For Mongolia there is currently no indicator for real activity at any higher frequency than annually. Hence, it is not possible to carry out traditional time series money demand estimations. However, data exist on deposits and activity on a regional basis, and using this panel data set for the period 1993 to 1999, it is possible to exploit the panel dimension and estimate money demand across the regions.

The data set covers Mongolia's 22 regions and contains data on total individual bank deposits for each region and sales of industrial production for each region. Since no regional GDP numbers are available, industrial production is used as a proxy for GDP.[4] Furthermore, national data exist on currency in circulation,

[2]A recent survey of the money demand literature can be found in Sriram (1999a).

[3]See Baumol (1952) and Tobin (1956).

[4]This approximation is also used in several other money demand studies such as Choudhry (1995), McNown and Wallace (1994), and Sriram (1999b). If, however, the variation in industrial production across regions and over time is different from the "true" variation in GDP, this approximation is inappropriate.

M1, the average loan rate at commercial banks, and the consumer price index for the Ulanbaataar area.[5] The data are from the *Mongolian Statistical Yearbooks 1997*, *1998*, and *1999*.

Subtracting national M1 from national currency in circulation gives overall deposits in the economy, which can be used to calculate a proxy for the money stock in each region. Specifically, the ratio of national money over deposits over the period 1993 to 1999 is multiplied on the regional deposit series to get a proxy for the regional money stock. With these variables at hand it is possible to carry out a panel estimation of money demand across regions in Mongolia by estimating an equation where log of real money (m) is explained by log of real industrial production (y), the real interest rate (R), and log of the real exchange rate (e) vis-à-vis the U.S. dollar (i.e., an increase denotes a depreciation).

The estimated equation has the following form:

$$m_{it} = \alpha_{i1} + \alpha_2 y_{it} + \alpha_3 R_t + \alpha_4 e_t$$

where i = 1, 2, 3, ..., 22 are the 22 regions in the panel. Table 2 shows that the money demand elasticity in Mongolia is around 0.5, as suggested by the classical Baumol-Tobin model of the transaction demand for money.

The first of the four columns displays the results of the static fixed effect estimation. The income elasticity is 0.43 and it is highly significant. The coefficients in front of the interest rate and the exchange rate are both insignificant, indicating that they have had limited effect on money demand throughout the transition period. This is not surprising given that both money markets and foreign exchange markets have developed over the estimated period. In addition, interest rates have been kept high in order to attract deposits and restore confidence in the banking system, and hence it is not clear that the sign of the coefficient to the interest rate in a transition economy should be negative as we would normally expect. Furthermore, an appreciation in the real exchange rate can be argued to have both a negative and a positive effect on money demand. If the real exchange rate appreciates it automatically implies an increase in the demand for tugriks, which again implies an increase in the money supply. However, a real exchange rate appreciation is also associated with a negative shock to activity and hence potentially also lower demand for money.

In Mulligan and Sala-i-Martin (1992) the panel money demand estimations only contain the income variable, and there are several arguments for also dropping the interest rate and the exchange rate from the estimations here. First, they are statistically insignificant. Second, as discussed above, the expected sign of the coefficients is not straightforward. Third, since the exchange rate and the interest rate do not vary across regions there is only variation in the time series dimension. If data for interest rates had been available on a regional basis they could perhaps have added some insight. Dropping them from the regression, however, does not imply that they are not important. In particular it must be expected that

[5]Unfortunately, no other CPI data are available, and in the following it is assumed that the Ulanbaataar price level is the same as in every region or at least that it is uncorrelated with the level of income.

Table 2. Mongolia: Money Demand Estimation, 1993–99

	Model			
Dependent Variable: *m*	Static Fixed Effect	Static Fixed Effect	Dynamic Fixed Effect	PMGE
y	0.43 (4.79)	0.51 (6.40)	0.58 (4.24)	0.78 (19.0)
R	0.24 (0.77)			
e	0.35 (1.65)			
Error corr. coefficient			–0.69 (8.45)	–0.74 (6.43)
R^2	0.75	0.75	0.78	
Sigma	0.38	0.39	0.36	
Log likelihood	–46.18	–48.87	–39.66	
Serial correlation[1]	15.20	9.32	1.35	
Functional form[2]	1.12	2.93	12.21	
Normality[3]	0.59	0.15	0.17	
Heteroskedasticity[4]	0.61	0.66	0.06	
Hausman[5]				0.04 (0.83)

Note: Values in parentheses are *t*-statistics (except for the Hausman test where it is the *p*-value).

[1]Lagrange multiplier test for serial correlation. Chi-square distributed with 1 degree of freedom.

[2]Ramsey's RESET test using the square of the fitted residuals. Chi-square distributed with 1 degree of freedom.

[3]Based on a test of skewness and kurtosis of residuals. Chi-square distributed with 2 degrees of freedom.

[4]Based on the regression of squared residuals on squared fitted values. Chi-square distributed with 1 degree of freedom.

[5]Hausman test of identical Pooled Mean Group Estimator and Mean Group Estimator.

as transition progresses, interest rates will begin to play the usual role they do in developed economies.

The second column in Table 2 shows the static fixed effect estimation where only the activity variable is included, and again the coefficient is close to 0.5. The third column shows the dynamic fixed effects model where the long- and short-run coefficients are the same for all groups and using this method the estimated elasticity stays around 0.5.

In the presence of dynamics and slope heterogeneity, the use of standard panel techniques, such as the fixed effect estimator, leads to inconsistent estimates and potentially misleading inferences even for large N and T panels (Pesaran, Smith and Im (1996)). The solution to this potential problem is the pooled mean group estimator (PMGE) suggested by Pesaran, Shin, and Smith (1999) and shown in the fourth column of Table 2. The PMGE assumes that the long-run coefficient is identical across all groups but it allows the short-run coefficients to differ between the 22 groups. In other words, this estimator allows for maximum heterogeneity for the panel. The PMGE indicates that the income elasticity is 0.78 which still is significantly smaller than unity. The Hausman test of identical long-run coefficients between the PMGE and the mean group estimator is clearly accepted.

III. Conclusion

This paper investigates if there is a significant money demand relationship in Mongolia. The data used is a panel data set covering 22 Mongolian regions over the period 1993–99. The static fixed effect, dynamic fixed effect, and the pooled mean group estimators all confirm the key role of monetary policy in stabilization and reveal that even in a transition economy as rudimentary as Mongolia, a stable money demand exists.

The coefficient on income in the money demand estimations is around one half. This relatively low value stands in contrast to the estimates between 1.2 and 1.5 found in the cross-sectional studies for U.S. and Japan. A lower coefficient than that which is found for developed countries could indicate that the level of economic development is important for this elasticity. In addition, the income variable for Mongolia is probably a better indicator of transactions in the economy as imagined in Baumol-Tobin's original model than the income variable in developed countries. In other words, a transition economy is characterized by a larger transaction demand and hence less flow of funds between accounts, which explains the smaller elasticity.

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