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Georgia: Two Turning Points in the Integration of Financial Markets

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Abstract

Georgia has gone through three distinct phases in its transition to a market-oriented financial sector. The two turning points that delineate these phases are 17 September 1994 and 25 September 1995. In this paper I examine the evolution of Georgian financial markets in these three phases, with special attention to the ability of commercial banks to intermediate between savers and borrowers, and between government and the private sector in foreign exchange markets.

The initial sections provide a short economic history of Georgia since independence and a descriptive examination of the evolution of financial markets and institutions during this period. The importance of the two turning points to behavior in those markets is highlighted. The final section uses daily foreign exchange rate data for the period 13 March 1993 to 13 February 1998 to examine the evidence for financial market evolution from phase to phase.

Three conclusions are drawn:

- The two turning points delineate three distinct phases of economic behavior in foreign exchange markets. Aggregating these for statistical work will be inappropriate.
- While market response to relative price incentives is evident in all three phases, only the third sub-period exhibits the characteristics that theory would predict for an integrated financial sector. The markets for Rbl and for USD are characterized by quite different evolution during this period.
- The transitions in government behavior represented by the two turning points were necessary, but not sufficient, to achieve financial-market stability. Use of the formal financial institutions, including the national currency, remains at low levels. The stability of the exchange rate with the US dollar during the period 1995-1998 was purchased through extensive central bank intervention with borrowed funds.

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Georgia has a population of 5.5 million located in a geographical area bounded by the Black Sea, Russia, Azerbaijan, Armenia and Turkey. It is a small economy with comparative advantage in a small number of agricultural goods and in tourism. It thus exemplifies the interdependent economy, and has much to gain from market integration in commodities and financial assets.¹

Georgia's financial sector development since independence has been tumultuous. During an initial period, the government exploited financial-market participants in an effort to sustain the economic pre-independence status quo, but brought about hyperinflation and massive disintermediation. Once policies were adjusted to reflect the post-independence reality, these financial imbalances were gradually righted; since the introduction of a new currency (the lari) in September 1995, the financial sector has developed rapidly and in positive directions.

This paper sets three goals. First, I summarize briefly the economic history of Georgia since independence. There are two turning points of importance in understanding Georgian financial sector development, and each is examined in detail. Second, the evidence of financial-market deepening and integration during the period since independence is summarized and evaluated. Third, the specific case of integration of private and official foreign-exchange markets in Georgia is examined through econometric analysis. The two turning points divide the post-independence financial history into three regimes, and I demonstrate that each regime was characterized by its own distinctive evolution and transmission of exchange-rate shocks. The markets for US dollars (USD) are further shown to differ significantly from the markets for

¹ As Alexander Rondeli of Tbilisi State University put it in a seminar discussion in Tbilisi: "Georgia is condemned to be an open economy".

Russian rubles (Rbl). There are also interesting differences between the two currencies in terms of shock transmission between private and official markets. The final section states conclusions and possible extensions.

The historical record.

Agriculture accounted for about 30 percent of net material product (NMP) in Georgia in the pre-independence years. Industry represented another 33 percent, transport and communications 21 percent, construction 8 percent, and other branches the balance. In agriculture Georgia became quite specialized: it produced nearly all the tea and citrus for the Soviet markets, and provided substantial shares of wine, fruits and vegetables, and other products. Industry also had a substantial agro-industrial base, but included as well production of aircraft, steel, wood products, locomotives, lorries and color TVs.

The economic integration that would naturally occur between Georgia and its neighbors was magnified greatly by the economic structures of the former Soviet Union. Productive activity in Georgia, whether agricultural or industrial, was managed by Union-level ministries and integrated with upstream suppliers (for inputs of metals, oil, basic chemicals, cotton, wool and others) and downstream consumers (for locomotives, oil drilling tubes, tea, citrus) scattered throughout the Soviet Union. In many ways, it was among the most integrated into that system. Georgia was entirely dependent on Russia (and to a lesser extent Azerbaijan and Turkmenistan) for its supply of oil products, natural gas and electricity. These were provided at highly subsidized prices. There was thus a continuing subsidy to Georgian consumption by participation in the Union trading system.

Economic integration was not limited to production of goods and services. In the pre-independence period, Georgia was dependent upon the Soviet government for provision of financial credit and foreign exchange. Although there were republican offices of Gosbank and Eximbank in Tbilisi, allocation decisions in credit and foreign exchange were taken in Moscow.

Things fall apart.

Georgia's economic performance was among the best in the FSU during the 1980s, especially in the first half of the decade when net material product (NMP) grew by 8 percent per year. But as elsewhere in the Soviet Union, economic performance weakened considerably in 1989-90 when NMP declined by a cumulative 17 percent. When Georgia declared independence in April 1991 it was hoped that independence would allow Georgia to escape from the economic collapse staring at the rest of the Soviet Union. Instead, economic performance deteriorated, and roughly mirrored that of the other former Soviet republics.

NMP fell by almost 21 percent in real terms in 1991 and the decline was steeper in 1992 when NMP is estimated to have fallen another 46 percent. This contraction occurred across-the-board in production of goods: industrial production fell by about 34 percent in 1992 and agricultural production by almost 50 percent. Retail sales measured in real terms fell 44.7 percent in the first five months of 1993 over the already depressed record of the same period in 1992.

Inflation accelerated in this period. The retail price index rose by about 3 percent in 1990 and 79 percent in 1991. Inflation continued to accelerate in 1992, especially in the second half. The annual inflation rate for the period December 1991 - December 1992 was about 1500 percent. For the period May 1992 - May 1993, already excluding the impact of the ruble

overhang, the increase in consumer prices was 831 percent.

The poor economic performance in 1991-92 was attributable in part to a number of Union-wide factors. With the dissolution of the Soviet Union the Union-wide ministries for coordination of production and distribution of resources became more and more ineffective, and both producers and consumers struggled to establish alternative marketing and supply channels. Demand for Georgian products was also constrained by the contraction in economic activity in partner countries, notably Russia. Further, inputs to Georgian industry and agriculture that had formerly been subsidized by the Soviet Union -- fertilizers, energy and ores -- were being sold at prices closer to the world market price.² Finally, according to Georgian authorities, other Soviet republics discriminated against Georgia through limitations on trade in critical inputs in retaliation for Georgia's active pursuit of independence. Trade between Georgia and other FSU republics and with the rest of the world fell sharply. Taking 1989 as a base, exports to FSU republics fell as a percent of GDP from 40 percent to 23 percent in 1991 and 11 percent in 1992; imports fell from 34 percent to 19 percent and 14 percent, respectively. Exports to the rest of the world fell also, from a smaller base: from 2.5 percent of GDP in 1989 they fell to 0.2 percent in 1991 and 1.2 percent in 1992. Imports from the rest of the world declined similarly.

The unfavorable economic developments were also caused by factors that were internal to Georgia. Among the exogenous factors, an earthquake that struck the north-west region of Georgia on 29 April 1991 caused extensive damage to agricultural output as well as transport, communications and other infrastructure. Later in 1991-92, the volatile political and social

² The import price of crude oil had increased from Rbl 82 per ton in 1990 to Rbl 4000 by mid-1992. That for natural gas had increased from Rbl 42 per thousand cubic meters to Rbl 1710 in the same period. Retail sales prices had increased 14 times over the same period.

conditions created severe disruptions in production, transportation and trade. For example, in early 1992 oil and gas imports from Russia were almost completely disrupted due to a conflict in South Ossetia. The production and processing of tea, Georgia's main export product, was particularly hard hit by the continuing armed dispute in Abkhazia where it is grown: the production of tea in 1992 was only about a third of the 1991 level.

Apart from the exogenous elements, economic policies also contributed to the adverse economic developments. Some of these policies were inevitable following the reforms in Russia. Thus, when Russia liberalized prices and increased the prices of energy, Georgia had to follow. The increase in consumer prices during 1992 was directly the result of the liberalization of prices in March of that year and the significant increase in most of the prices that remained administered throughout 1992. For example, gasoline prices were increased 11 fold between March 1992 and June 1992, milk prices rose 6 fold and the price of bread was increased 13 fold. The maintenance of quotas and licenses for exports, which was meant to maintain lower prices in Georgia following liberalization in Russia, contributed to the decline in trade, and to further contraction in output.

The continuing increase in prices also reflected an imbalance in government budgets. The budget deficit increased from 3.5 percent of GDP in 1991 to 35 percent in 1992 and to over 40 percent of GDP in the first two quarters of 1994. Government revenues fell sharply over that period: from 30 percent of GDP in 1991 to 14 percent in 1992 to 3 percent of GDP in 1994.³ Government expenditures began in 1991 at 32 percent of GDP, but rose in percentage terms from that point through the beginning of 1994.

³ The revenue shortfall was caused by several factors, including the disruption in trade, the collapse of output in the state sector, and the difficulties in tax collection in areas affected by the civil strife.

The budget deficits were financed through domestic credit creation and foreign borrowing. The growth of domestic credit was particularly strong. Between July - December 1992, credit to the government increased from Rbl 16.6 billion to Rbl 62 billion (273 percent). Credit to the non-financial public enterprises also increased sharply (190 percent) in the same period.⁴ In 1993 the National Bank of Georgia (NBG) had targeted credit emission at Rbl 140 billion for the year, but had already issued Rbl 450 billion in credits in the first half.⁵ This excess emission led to an excess demand for currency; the government ratified this demand by introducing a locally issued coupon (GEC) to trade at par with the ruble in April 1993.

The foreign debts of Georgia reportedly summed to USD 800 million in late 1994. Georgia was heavily indebted to Russia (USD 135 million for imported goods) and to Turkmenistan (USD 500 million for natural gas). Inability to service these debts led to stoppages in shipments of wheat (for bread) and gas (for cooking and heating).

These economic setbacks led to declining standards of living. In July 1994, in a sample of 500 households, 81 percent of respondents indicated that more than half of available income was spent upon food alone; 33 percent indicated that over 80 percent of income goes for this use. In October 1994, in a similarly sized sample, 92 percent indicated that more than half of available income was spent upon food, and 64 percent indicated that over 80 percent of available income went to food purchase. Durable purchases were only reported in 7 instances in July and 10

⁴ In contrast, in the period January-June 1992, domestic credit to the government rose marginally, from Rbl 13.9 billion to Rbl 16.2 billion. Credit to the non-financial public enterprises increased by 97 percent.

⁵ The President of the NBG until October 1993 was Demur Dvalishvili; he was replaced at that time by Nodar Javakhishvili. On 9 September 1994 Dvalishvili was accused by First Deputy Prime Minister Gotsiridze of undermining the economy of Georgia through issuing GEC credits equal in value to 8 million USD.

instances in October. In the lowest income group, for two-person households, the average was above 90 percent of income. Formal-sector salaries were absurdly low when converted to foreign exchange: with a monthly salary of 5.5 million GEC, President Shevardnadze was receiving the equivalent of USD 2.85 per month.⁶

There was substantial disintermediation of the financial system during this period. Results of a survey of Georgian residents indicated that 45 percent of the population held accounts at commercial banks prior to the introduction of the coupon, but that by May 1995 only 3 percent still maintained an account at a commercial bank.

Reported unemployment in the economy rose 44 percent from January through August 1994.⁷ Production of consumption goods fell 40 percent over the previous 12 months. Industrial output in 1994 was down across the board when compared with the already-disastrous 1993 production, with light industry production down 50 percent.

Coupons had little use at this time other than for government payments (wages, pensions), purchases of rationed bread, purchases of government services, and use in privatization purchases. Coupon payments by the government (wages, pensions) were thus targeted to two types of transactions: bread purchases and government service payments. The prices of these were set at an affordable rate in coupons, and thus represented an extreme subsidy when converted into foreign currency.⁸ All other commodity and financial transactions occurred in foreign currencies

⁶ Georgia initially remained in the ruble zone upon attaining independence. However, it introduced its own coupon in 1993.

⁷ Source: Labor Exchange.

⁸ In fact, the coupon had value in a third type of transaction: the purchase of privatization vouchers. This, too, had a safety-net nature to it, since the cost in GEC for vouchers was set absurdly low.

(USD or Rbl), but these were prohibitively expensive for individuals with income denominated in coupons.⁹

First Turning Point: September 1994.

Georgia began a long-delayed economic stabilization program in September 1994. President Shevardnadze introduced two reforms at that time. First, the republican budget went from a substantial deficit in the first quarter of 1994 to a projected balance in the fourth quarter.¹⁰ Expenditures were slashed across the board, including a 30 percent cut in employment by each ministry. The prices of subsidized goods (e.g., bread, utilities and transport) have also been raised. On 17 September 1994 the prices of gas, electricity, bread and metro transportation rose.¹¹ Government services (metro, TV, electricity) were sharply cut back in availability. The government budget was brought more closely into balance, although with tremendous citizen hardship, especially during the winters of 1994 and 1995.

Second, and as a consequence, emission of GEC credits by the NBG declined drastically. Up to this point the exchange rate of the coupon had been depreciating steadily (and, at the end, exponentially) against USD on the private currency exchange markets. The results from the Tbilisi Interbank Currency Exchange Market (TICEX) illustrated in Figure 1 provide a useful barometer of these depreciating pressures. Beginning in January 1994, the 59 auctions chronicle a

⁹ On 23 August 1994, the newspaper Resonance reported that President Shevardnadze was considering a draft project of measures to reintroduce the coupon as a medium of exchange. The mayor of Kutaisi volunteered his city as the test case for these measures, as the coupon was already more popular there than elsewhere. In Autonomous Republic of Adjara, by contrast, the coupon was not even used for government transactions.

¹⁰ This balance is defined idiosyncratically in Georgia with revenues inclusive of foreign assistance.

¹¹ For example, bread rose in price by 285 times (from 700 to 200000 coupons) and metro rides by 50 times (from 1000 to 50000 coupons).

rise until auction 34 (20 September) and a fall thereafter.¹²

The market for bread illustrates the nature of this first turning point in the Georgian economy. The price of bread (per kilogram) when evaluated at the currency-exchange rate for USD is illustrated in Figure 2.¹³ The rationed bread, selling for 700 GEC per kilogram on 15 September 1994 (observation 541), had an equivalent price in USD of .00036 per loaf. The first successful push at reducing the government subsidy occurred in mid-September 1994. As is evident from Figure 2, this push only reduced the subsidy element. Over the following months and years, the government gradually reduced the subsidy element of the price of bread, with complete liberalization only occurring in June 1996.¹⁴

The government's austerity program increased the value of the coupon, as evident in Figure 1, but it had little effect on the use of the coupon for daily transactions. Despite the improving stability of the coupon, consumers continued to use it only for bread and public services purchases. Most non-durable purchases were still made in Russian rubles, while durables purchases and financial transactions were denominated in Rbl or USD.

Second turning point: 25 September 1995.

On 25 September 1995 the lari (GEL) was introduced as a new currency. The NBG exchanged 1 lari for 1 million GEC. In the course of following months, 51.9 trillion GEC were

¹² In mid-September, TICEX also switched the denomination of its transactions from cash/cash to non-cash/non-cash: i.e., while the auctions originally traded cash GEC for cash USD, after that time the auctions traded bank credits of USD for bank GEC credits.

¹³ The horizontal axis is measured in daily observations from 13 March 1993 to 15 November 1998.

¹⁴ On 25 May 1998 (observation 1901) the price of bread expressed in USD fell once again; this could be reintroduction of subsidy, or simply the indication in terms of price of a more efficient production and distribution network.

taken out of circulation.¹⁵ The “exchange banks” designated by the government also traded lari for Rbl at an initial rate of at the rate 4000 Rbl/lari and for USD at the initial rate of 0.8 USD/lari. This represented a slight depreciation relative to the currency exchanges for USD and near parity for Rbl.

The introduction of the lari had three salutary effects on the economy.

- Its introduction provided for an almost immediate switch in currency denomination of commodity transactions away from Rbl and USD to lari.

- The government’s willingness and ability to defend the value of the lari also led to a rapid reduction in inflation.¹⁶ While the annual increase in CPI in 1995 (December over December) had been 57 percent, the subsequent year witnessed annual inflation of 14 percent.¹⁷ By June 1997, the annual inflation over the preceding 12 months was only 5 percent.

- It encouraged use of the local currency as a store of value. By the end of 1997 there were 254 million lari in circulation, which was a nearly 100 percent increase over the quantity issued in the last quarter of 1995. Given that price levels as measured by the CPI had increased by less than 25 percent, there was a substantial increase in real holdings of currency.

Things come back together -- albeit at a lower level.

The year 1995 was the first in which there was evidence of positive growth in industrial output over the previous year. By 1996, the economy was recovering rapidly, with 10.5 percent

¹⁵ An additional 0.75 trillion remained unexchanged, most probably having been destroyed as worthless.

¹⁶ The IMF made a credit of 25 million USD available for support of the lari at this time.

¹⁷ The 57 percent increase was due in large part to the depreciation of the Russian ruble (45 percent over the year to the introduction of the lari) and in part as well to the increased cost of subsidized goods to consumers (see the figure on the rising cost of bread).

GDP growth over 1995. Industrial production grew by 11 percent in 1996, but per capita output in 1996 was only 16 percent of the comparable figure for 1990. Over a third of economic activity is estimated to be in the shadow economy.

Inflation in the CPI declined with the first turning point, and continued its decline through 1997: annual rates were 75 percent in 1995, 13 percent in 1996, 7 percent in 1997.

Government revenues remain a weak point for the economy. While collections have risen from the low point of 3 percent of GDP in 1994, the share in 1997 was only 9 percent of GDP. Foreign credits, including those of the World Bank and IMF, remain crucial in allowing the non-inflationary financing of government activity.

Implications of the turning points for the financial markets.

The exchange rates of Georgian currency for USD and Rbl are illustrated in Figures 3a and 3b.¹⁸ The two turning points are evident in the pattern of rates. In both markets the GEC exchange rate depreciated at an exponential rate until September 1994; there was then a rapid appreciation followed by relative stability until the introduction of the lari in September 1995 (indicated by the vertical line). The record from introduction of the lari to late 1998 was one of remarkable stability – a stability ensured when necessary by NBG intervention in TICEX foreign exchange auctions. During the second half of 1998 the NBG sold large quantities of foreign currency on this market. It supervised a gradual depreciation of the lari relative to the US dollar during the period September-December 1998, but on 5 December 1998 switched policy. From

¹⁸ These are “buy foreign currency” exchange rates observed daily at currency exchanges in Tbilisi over this period. Gaps in the data indicate an unwillingness of traders to trade at any price on those days. Details of the data collection procedure are provided in the appendix.

that point on, the quantity of foreign currency sold at TICEX was strictly defined and the exchange rate was allowed to adjust to clear the market. As Figure 3a illustrates, this led to greater volatility in this last period.

This stability can be viewed from another perspective in examining the daily rate of depreciation of the local currency/USD exchange rate in Figure 4a. The previous figures illustrate that the initial period is one of massive net depreciation; Figure 4a indicates that this net depreciation masked a great deal of volatility in private exchange markets. This volatility, further, did not end with the first turning point; while the percent changes are less striking in the period between the two turning points, there is substantial exchange-rate movement. Introduction of the lari largely eliminated that until end-1998.

The stability of the lari has led to a large reduction in risk premia in private foreign-exchange markets. The currency exchanges in Tbilisi have set their “buy USD” and “sell USD” rates to incorporate a risk premium, and these premia were substantially larger before the first turning point. Figure 5 illustrates the sell/buy ratio of USD exchange rates in private currency markets. The period pre-September 1994 was characterized by large and variable ratios.¹⁹ The period just after the first turning point (observations just after 543) were also characterized by large ratios, as traders were uncertain about the permanence of the government’s intentions for this policy switch. The ratio fell as the traders grew more comfortable with the policy regime, but then shot up again on the rumors of the introduction of the lari. After a short transition period subsequent to the second turning point, the risk premia nearly disappeared.

¹⁹ Those observed in fact understate the magnitude of this risk premium, for missing observations may be interpreted as infinite values of this ratio: the firms were unwilling to transact at any price in at least one direction on those days.

The exchange-rate record for the period after the second turning point indicates that the NBG mastered the technique of exchange-market intervention, but its record in earlier periods was less brilliant. Figure 6 illustrates the ratio of the private exchange rate to the NBG exchange rate of local currency per USD. Effective exchange-market intervention will lead to a ratio of 100, and this is in fact observed for the lari period past the second turning point. Prior to that time, and especially for initial observations, there is such dispersion in the ratio that the NBG and private traders appeared to be trading different assets.²⁰

The “dollarization” of the Georgian economy in the period before the first turning point led to a bifurcation of credit markets. The coupon credit market was one dominated by the state banking system, with most credits directed by the NBG to borrowers designated by the government. The private banking system lent (and accepted deposits) almost exclusively in USD or Rbl. The real interest rates on these two credit channels diverged sharply, with strongly negative real interest rates on coupon credits and strongly positive real interest rates on USD or Rbl credits. The first turning point represented the first effective push to unify these channels, with low-interest rate lending in coupon sharply curtailed for budgetary reasons. In its aftermath, as Table 1 demonstrates, interest rates on both channels of lending rose. With the second turning point, and the establishment of the lari as a viable currency alternative to foreign currencies, the real interest rates in the two channels were gradually unified. The interest rates on lending remain

²⁰ For much of the period before the first turning point, this was strictly true. The NBG exchange rate was quoted for exchange of non-cash coupon for non-cash USD, while the currency exchanges traded cash for cash. The monetary policies in Georgia, as in other former Soviet economies, led to a large divergence in value for these two forms of money. Conway (1995) examines this in the context of the ruble zone, while Conway (1997) illustrates its implication for inflation and saving. The period just before the first turning point (observations 450-540) was atypical, in that the NBG switched to a cash/cash basis for its auctions during that period. The decline in the premium offered at the currency exchanges after the second turning point is in part a reflection of the declining discrepancy in value between cash and non-cash assets.

positive and quite high in real terms, reflecting a continuing demand for credit resources that outstrips domestic supply.

Stability – but at a low level. While the demand for national currency has rebounded with the introduction of the lari, it has stabilized at a low relative level. In Figure 7 the ratio of currency to nominal GDP is approximated on a monthly basis for Georgia. The stock of currency in circulation in the pre-independence period has been estimated to be in excess of the Union-wide average of 15 percent of recorded GDP (see Table II.6) due to the relatively large shadow economy. By the beginning of 1993 the stock of currency had increased exponentially, but the inflation rate had risen even faster. Thus, despite the fall in real GDP, the currency/nominal GDP ratio was near zero. This ratio began to rise in September 1994 with the first turning point, and jumped sharply in September 1995 with the introduction of the lari. However, after that point the currency/GDP ratio stabilized at about 3 percent – well below its pre-independence value.

The banking sector has also begun to rebound with the introduction of the new currency. There was a slight increase during the years 1996 and 1997 in the ratio of bank deposits to GDP. This increase in deposits was due, as Figure 8 shows, to the growth of deposits denominated in foreign currency. The value of GEL deposits in fact declined as a share of GDP. This pattern was evident both in the holdings of households and in the holdings of enterprises: each increased its foreign-currency deposits by about 21 million lari (in 1995 prices), while holdings of lari deposits increased by 14 million real lari in total. This latter increase was almost entirely due to increases in enterprise-sector demand deposits. The total rate of intermediation through the formal banking system remains quite low, however, representing a total of 1 percent of GDP in 1997.

While there has been positive banking-sector growth, there has also been a shift in the make-up of the banking industry. As noted earlier, the opportunities for the banking sector have been in recent years divided in two: rent-seeking opportunities from the government in national-currency denominated banking, and profit-seeking opportunities with private individuals in foreign-currency denominated banking. The banks formerly owned by the state have had the inside track on the national-currency opportunities, and have remained at the forefront of that market. Private banks have recognized their niche in foreign-currency denominated operations, and have specialized in that activity. At the beginning of 1996, the three largest banks, all formerly state-owned, had over 70 percent of the lari-denominated deposits of enterprises and over 95 percent of such deposits by households. By contrast, the three largest banks had 35 percent of foreign-currency denominated deposits by enterprises, and 55 percent of such deposits by households. Figure 9 illustrates the evolution of the market for deposits from the point of view of the smaller banks (i.e., all but the big three). These smaller banks maintained their share of enterprise deposits in foreign currency, and increased by large percentages their shares of the other markets. For example, by the end of 1997 the smaller banks' share of household deposits had increased to 30 percent of lari-denominated deposits and 65 percent of foreign-currency denominated deposits. Their share of lari-denominated deposits by enterprises rose to 45 percent of the total. In fact, by end-1997 the "smaller banks" together outweigh the larger in their attraction of both kinds of deposits.

Evolution of interest rates. In the period since mid-1995, the Georgian economy has shifted from an inflationary environment (57 percent over 1995) to one of quite stable prices (6 percent in 1997). While the inflation rate was embodied in the interest rates on national currency

denominated loans and deposits in 1995, the interest rates did not fall as quickly as the inflation rate. The result was strikingly high real interest rates in both lari-denominated and foreign-currency denominated loans at the end of 1997. Figure 10 illustrates the downward tendency in nominal interest rates on lari-denominated instruments since the currency's introduction in 1995. Note, however, that the real interest rates implied by this evolution have in fact increased. The corresponding movement in interest rates on foreign-exchange denominated instruments is indicated in Figure 11. By August 1998, with stable exchange rate and very low inflation, the interest rates had equalized at about a 34 percent annual rate in loans and about 11 percent in deposits.²¹

The ruble scare of August 1998: a third turning point.

The stability of the foreign exchange markets in Georgia was tested in August 1998. On 17 August, the Russian government devalued the exchange rate it was pledged to support for the ruble vis a vis the US dollar. It also declared a moratorium on interest payments by Russian commercial banks. In the following days it became clear that the Russian government had effectively suspended its interventions to support the ruble. This led to a strong depreciation of the ruble against other currencies.

As Figure 3b illustrates, this depreciation also occurred relative to the Georgian lari. Beginning on 20 August (observation 1984 on the figure), the lari appreciated relative to the ruble. The volatility of the Russian foreign exchange market was also imported into the GEL/Rbl

²¹ Deposits differed somewhat in weighted interest rate as the figures show. This was due to the greater weight in lari-denominated deposits on demand deposits with low interest rate.

exchange rate. Figure 4b indicates that beginning at that time the volatility of the GEL/Rbl exchange rate grew to rival that observed in the 1994 crisis. By contrast, the volatility of the lari relative to the US dollar was minor (see Figure 4a). While the lari appreciated against the ruble and depreciated against the US dollar, the volatility in exchange rate was concentrated in the GEL/Rbl market. The gradual depreciation of the lari against the US dollar (Figure 3a) was made possible by NBG intervention on the inter-bank exchange. In the first sixteen days of September 1998, for example, 11.9 million US dollars were traded on the TICEX. The National Bank supplied USD 11 million of these.²² Fortuitously, the IMF had released an additional USD 37 million tranche from its Structural Transformation Facility to Georgia on 27 July 1998.

This continued drain of borrowed foreign-exchange reserves became worrisome, and Irakli Managadze, President of the NBG, announced a change in policy on intervention on 5 December 1998.²³ Defined amounts of foreign exchange will serve as strict limits to the amounts of foreign exchange sold by the NBG at any auction. The exchange rate determined at each auction will then reflect the excess demands of non-NBG traders. In fact, as Figure 4 illustrates, the volatility of the GEL/USD exchange rate increased after that time.

The Russian crisis may appear to be separate from the December decision to “float” the lari, but the evidence from the credit markets suggests that the two are closely connected.

Beginning in early September 1998 the interest rate on lari-denominated credit on the Interbank

²² Georgia’s mini-crisis in the GEL/USD market occurred on Sunday, 6 September 1998. News sources (RFE-RL) reported that currency exchanges were buying dollars at 1.7 lari per dollar, well in excess of the 1.35 exchange rate observed at the preceding TICEX auction. On Monday, 7 September 1998, the NBG defused the crisis by selling USD 3 million on the exchange to meet all commercial-bank demand at the 1.35 exchange rate. After that time, however, the NBG allowed a gradual depreciation against the USD throughout September, October and November 1998.

²³ Source: the newspaper Resonance.

Credit Auction rose dramatically. As Figure 12 illustrates, it grew to exceed the weighted interest rate charged by commercial banks on their lending. Russian corporations and individuals borrowing in lari drove up the interest rate paid to lari depositors (see Figure 8) and caused an excess demand for foreign currencies that over time depleted the NBG borrowed reserves.

Sources of saving: a review.

While there are no unified accounts of public, private and foreign saving available for Georgia during this period, it is possible to obtain a rough estimate of the magnitudes by examination of the information available from various sources. These data can be summarized:

	1996	1997
Private saving in formal banking system:	0.71	0.88
Households	0.23	0.38
Enterprises	0.48	0.50
Implied private saving, other channels:	-1.29	-5.98
General government saving	-4.50	-5.00
State government	-5.60	-5.30
Local governments	1.10	0.30
Foreign Saving	6.5	10.1

General government saving figures are taken from IMF statistics. The foreign saving figures are taken from the State Department of Statistics, as reported by TACIS. Private saving in the formal banking system is calculated as the net real change in deposits. The implied non-formal saving is calculated as a residual. This residual is a large dissaving greater in magnitude in 1997 than the general government deficit. It suggests one of two possibilities, each causing concerns about the evolution of financial markets in Georgia. First, it may be that the Georgian economy remains one

in which the country is borrowing abroad against future income. Private consumption or purchase of foreign financial assets through informal channels, unmeasured in the statistics cited above, is offset by official borrowing from the IMF and other sources. In this case, the obligation to repay in the future falls upon the national bank and the government. Examination of the net foreign asset position of the NBG illustrates this, as in Figure 13. Second, it may be that the Georgian savers have chosen to save informally in foreign markets. In this case the observed foreign saving is an overstatement of the net flow coming into Georgia; the private, unmeasured, flows out of the country offset the imbalance in saving and investment. The outlook for 1998 is even less favorable to saving, as private holdings of deposits, both lari-denominated and foreign-currency-denominated, declined in nominal (and real) terms. Saving may have taken place, but in Russian and other foreign financial instruments. The NBG intervention policy to stabilize the lari in the first half of 1998 could have inadvertently encouraged this by making export of saving through foreign exchange quite simple. However, the moratorium announced by Russia in August 1998 will greatly reduce the anticipated return on that type of saving.

A dynamic model of potentially integrated foreign-exchange markets.

The descriptive history of Georgian financial markets since independence defined two turning points. While there are certainly breaks in the data on these two dates, it is important to ask whether they represented simply a change in government policy, or a change in financial market activity as well. One goal of Georgia's financial policy has been to improve the performance of local financial markets, and it is useful to investigate whether this improvement has occurred.

As a benchmark of improvement in market performance I take the interaction of the two most important auction markets for financial instruments since independence. Currency exchanges grew up rapidly and ubiquitously in Georgia after independence. These were initially little-regulated, and they have consistently provided a venue for private citizens to convert local currency into Russian rubles (Rbl) and US dollars (USD). The National Bank of Georgia (NBG), by contrast, has since independence provided limited opportunities to convert local currency into foreign currency from its official reserves.

The foreign-exchange markets of the NBG and of the currency exchanges are not directly linked. The NBG in its initial period was not directly subject to market forces in its determination of exchange rates. When NBG-sponsored auctions were introduced, only large commercial banks were eligible to participate. The currency exchanges traded with citizens in a less-regulated environment. If the exchange rates for the two markets were to be unified, it would rely upon the arbitrage of traders with access both to the currency exchanges and to the commercial-bank participants in the NBG auction. This arbitrage may not be forthcoming, if the form of currency or means of payment available at one exchange is not directly substitutable for the form of

currency or means of exchange available at the other (as, for example, with cash and non-cash forms of foreign exchange). It may also not be forthcoming if the commercial banks, the common participants in the two markets, do not find it profitable to exploit differentials in exchange rates.

The following section develops a simple arbitrage-based model of exchange-rate evolution in two potentially integrated markets. This market serves as the basis for investigation, with deviations from the model representing dimensions in which market interdependence has not been achieved. The hypothesis of this paper is that the behavior in these markets will be significantly different in the three sub-periods defined by the two turning points. Estimation of the model using data from Georgia's financial markets will allow both a test of the existence of these differences and an investigation of the different behavior associated with each sub-period.

The arbitrage-based model of exchange-rate evolution.

Consider a CES demand system for private (P) and official (G) foreign-exchange assets. Each asset is available in its own market. If the exchange rates for the two assets in period t are denoted e_{it} , with demand scale variables of traders in each market denoted Y_{it} , then the ratio of demands is

$$D_{Pt}/D_{Gt} = \gamma(e_{Pt}/e_{Gt})^{-\sigma}(Y_{Pt}/Y_{Gt}) \quad \text{for all } t \quad (1)$$

with σ the elasticity of substitution between the two assets and γ a taste parameter.²⁴

The number of traders visiting market i and the value of desired trades per trader are key

²⁴ If the markets are non-integrated on the demand side, then the ratio relation will no longer be relevant. There will only be one demand curve $D_{it} = f(e_{it}, Y_{it})$ in each market.

determinants of the volume of demand Y_{it} . This number is fixed at each moment, but will adjust over time. Consider a potential population of traders for the two markets with demand scalar $Y_t \geq Y_{Pt}, Y_{Gt}$ sharing the CES demand system summarized in (1). Given costs to traders and less-than-instantaneous dissemination of information on price differentials, the changes in the volume of demand can be represented by an autoregressive system in the logarithmic differences:

$$dy_{Pt} - dy_{Gt} = a_0 - \sum_{j=1}^{\infty} a_j (de_{Pt-j} - de_{Gt-j}) + v_t \quad (2)$$

with v_t as random shock to market size.²⁵ Exchange-rate differentials provide incentives to switch demand from one market to another. With completely integrated markets the a_j will be undefined, since the difference in exchange rates will be a constant reflecting any less-than-perfect substitutability of the assets. With complete non-integration the a_j will equal zero, since there will be no spillover in demand in response to exchange-rate differentials. The coefficient a_0 represents a trend increase in the volume demanded at the first market relative to the second.

Total supply of foreign exchange to the two markets is assumed to grow at an annual rate of r with the potential for random supply shocks u_t . Commercial banks provide the link between the two markets of foreign-exchange trade. They will have the incentive to reallocate supply across markets in response to exchange-rate differentials.

$$S_t = S_{Pt} + S_{Gt} = S_0 e^{rt} e^u \quad (3)$$

$$(S_{Pt}/S_{Pt-1}) = (S_{Gt}/S_{Gt-1})(e_{Pt-1}/e_{Gt-1})^\phi \quad (4)$$

²⁵ Lower-case letters represents logarithms.

In the absence of differentials, supplies to the two markets would grow at the rate r adjusted for stochastic shocks. However, when an exchange-rate differential opens between the two markets the banks respond by shifting supply to the higher-return location. The parameter ϕ is increasing in the supply-responsiveness of commercial banks in transferring foreign exchange from one market to another.²⁶

In a controlled market, supply need not equal demand; there is the possibility of shortages and rationing with fixed price. For market-oriented outcomes, by contrast, supply equals demand in each location. This can be stated as:

$$S_{Pt} = D_{Pt} \quad (5a)$$

$$S_{Gt} = D_{Gt} \quad (5b)$$

Balance with flexible exchange rates can be rewritten by dividing (5a) by (5b), substituting in the demand functions in (1), and taking logarithms of the resulting equation.

$$s_{Pt} - s_{Gt} = \ln(\gamma) - \sigma(e_{Pt} - e_{Gt}) + (y_{Pt} - y_{Gt}) \quad \text{for all } t, \text{ or alternatively}$$

$$(e_{Pt} - e_{Gt}) = (1/\sigma)[\ln(\gamma S_{Gt}/S_{Pt}) + (y_{Pt} - y_{Gt}) - (u_{Pt} - u_{Gt})] \quad (6)$$

Total differentiation of equation (6) and substitution for $(dy_{Pt} - dy_{Gt})$ from equation (2)

²⁶ This dynamic trade-off can be thought of as an example of Marshallian adjustment to illustrate the role of ϕ . Suppose that the Marshallian adjustment process for location i takes the form $(S_{it}/S_{it-1}) = (e_{it-1}/1)^\phi$ with e_{it-1} the demand price and 1 the supply price. ϕ parameterizes the response to exchange-rate incentives, with ϕ close to zero indicating sluggish response and ϕ large a more rapid, fluid response. The ratio of the adjustment processes for the two locations yields equation (4).

yields:

$$(de_{Pt} - de_{Gt}) = (1/\sigma)[a_0 - \sum_{j=1}^{\infty} a_j (de_{Pt-j} - de_{Gt-j}) - \phi(e_{Pt-1} - e_{Gt-1}) - \{(du_{Pt} - du_{Gt}) - v_t\}] \quad (7)$$

The differential of exchange-rate movements in the two markets thus potentially has four sources. One source is the contemporaneous random shocks to supply and demand sides of the markets $\{(du_{Pt} - du_{Gt}) + v_t\}$. A second source is the demand response to exchange-rate movements in previous periods; the coefficient a_j indicates the elasticity of the demand ratio to past exchange-rate differentials, and as defined in the equation is expected to be positive. The third source is the allocation of foreign exchange between markets in response to exchange-rate differentials by the commercial banks; its importance is measured by the coefficient ϕ , which is also defined to be non-negative. The final source is the trend growth in demand in one market relative to another captured by a_0 .

Estimating the model: exchange markets in Tbilisi.

I have daily observations on exchange rates for the period 13 March 1993 - 13 February 1998 for private transactions and for the NBG in Tbilisi, Georgia.²⁷ During this period private transactions began with simple trades in the downtown bazaar. Currency exchanges grew up next, providing a fixed location for foreign-exchange transactions. These, in contrast to present Western experience, were for the most part not affiliated with commercial banks. In the beginning, these were relatively unregulated. The currency-exchange observations were

²⁷ This estimation exercise was also undertaken for weekly observations (taken on Wednesdays) of the two exchange-rate series. The results were much as reported here, although the significance of the coefficient estimates is reduced by the exclusion of the information from the other daily observations.

predominantly sampled at the railway station, where there is a great deal of traffic (and potential trades). The NBG rate was drawn either from TICEX result or government pronouncement.

As noted above, the US dollar and Russian ruble are two foreign currencies of primary importance in Georgia during this time. I conduct the hypothesis testing implied by (7) above for each of these with respect to the local currency. I exclude the period 25 September - 1 October 1995 from the sample to purge the valuation effects of the switch to a new currency. Hypothesis testing within the context of this model led to rejection as insignificant explanatory variables from longer horizon than seven days.

The preceding discussion highlights the importance of testing for changed market behavior at the turning points.²⁸ Further, the coefficients as estimated in (7) have clear interpretations in the Georgian case. The coefficient a_0 should be zero in an integrated market of perfectly substitutable assets; if not, then a positive value will indicate relatively larger growth in the private (currency-exchange) trading volume. The coefficients a_j will be positive if the speed of transmission of information (and traders) from one market to another is at least one day, but will be zero if the transmission is complete before that time. The demand and supply elasticities (σ and ϕ , respectively) have distinctive interpretations. The demand elasticity σ is an indication of the relative substitutability of the two assets in transactions: the smaller the value, the less substitutable.²⁹ The supply elasticity ϕ provides a measure of the relative importance of commercial banks (as the only actors welcome in both markets) in transferring foreign exchange

²⁸ The most recent episode of flexible USD exchange rate is not included in the sample. If it were, this would define a third turning point for the foreign exchange markets.

²⁹ The cash/non-cash distinction is obviously of importance in determining this, as some transactions could only be completed in cash. NBG regulations on uses of foreign exchange obtained from its window also reduced the substitutability.

from one market to another in response to exchange-rate differentials. It will not be surprising to find that low σ and high ϕ are paired (and vice versa) in estimation – when the two assets are less substitutable, the commercial banks play a larger role in converting one asset to the other.³⁰

USD Estimation. The results from estimation of (7) for data on USD exchange in Tbilisi are reported in Table 2. The hypothesis that market behavior changes significantly at the turning points cannot be rejected in these data: an F test for structural breaks yields a value of 5.69, in excess of the 1.67 critical value.³¹ The estimated coefficients for the full sample are given in the first column of figures, but these have little meaning given the structural breaks. The estimates for the sub-periods indicate clearly the sources of the structural breaks:

- In all sub-periods the coefficient a_0 is non-negative, indicating relatively larger growth in those with access to currency-exchange markets and less than perfect substitutability of the two markets’ “products”. This distinction was a significant one in the first two sub-periods, but is very small and insignificantly different from zero in the third. By this measure, the integration of the two markets has been progressively better over time.

³⁰ The evolution of the number of commercial banks (not the less-regulated currency exchanges) in Georgia is also indicative of this role.

Date	Commercial banks
27/10/93	169
25/02/94	200
01/01/95	232
17/06/96	77
22/11/96	64
26/5/97	55
05/12/98	43

From the peak, 147 were closed for violating NBG restrictions, 23 were self-liquidating, and 19 merged with other banks.

³¹ In this, and in what follows, statistical significance is defined at the 95 percent level of confidence. Standard errors are reported in parentheses under the estimated coefficients.

● The coefficients a_j in theory reflect any delayed transmission of demand from one market to another. These should be positive if the information of an increased exchange rate in one market led to a switch in demand (and raised price) in the other market. This is not observed in the first sub-period, with negative and often significant coefficients a_j . It is observed, albeit weakly, in the second sub-period. Only in the third sub-period, after the introduction of the lari and more frequent TICEX auctions, do the a_j take on the correct sign and become significantly different from zero. By this measure, also, the two markets have become more integrated over time.

● The coefficient ϕ is significant in all sub-periods. It takes on the expected larger values in the earlier sub-periods, as commercial banks played a relatively larger role in “converting” one asset to the other.³² This greater degree of error-correction in the earlier sub-periods is also due to the relatively infrequent NBG auctions at that time. When auctions occurred twice a week, the reported exchange rate remained fixed at that level until the next auction. This alone leads to a larger role for commercial banks in “carrying over” the foreign exchange desired by private citizens.

● The demand elasticity coefficient σ is equivalent to the inverse of the root mean-square error of the estimation. Without loss of generality these are normalized with the σ for the full sample. It is evident that the substitutability of the assets available in these two markets increased markedly over time. The first sub-period has $\sigma = .52$ while the third sub-period has $\sigma=13$. The greater frequency of TICEX auctions contributed to this, as did the greater integration of the two

³² In econometric terms, the significance of this coefficient is also evidence of the cointegration of the two exchange rate series. It is simple to show (evidence available on demand) that each exchange rate series (in logarithmic form) is $I(1)$ in nature, but that the difference in series is $I(0)$.

markets by commercial banks.

Rbl Estimation. The results from estimation of (7) for data on Rbl exchange in Tbilisi are reported in Table 3. The hypothesis that market behavior changes significantly at the turning points cannot be rejected in these data: an F test for structural breaks yields a value of 7.36, in excess of the 1.67 critical value. The estimated coefficients for the full sample are given in the first column of figures, followed by estimates for the sub-periods.

● Just as was observed for the US dollar, the coefficient a_0 is positive in all subperiods. However, it was largest, and only significantly different from zero, in the second sub-period. The first and (especially) third sub-periods indicate a high degree of market integration.

● The demand-response coefficients a_j follow most closely to theory in sub-periods one and three, and provides only very weak support for theory in the second sub-period. The demand-side transmission of shocks appears most evident in either the initial period, when the ruble remained the most familiar foreign currency to citizens, or in the third sub-period after the lari was introduced.

● The error-correction coefficient ϕ takes the correct sign in all periods, and is significantly different from zero in the second and third sub-period. The stabilization period between first and second turning points provides evidence of substantial commercial-bank activity in unifying the markets in the absence of demand-side transmission. After the introduction of the lari the adjustment falls more strongly on the demand-side transmission and less on the commercial-bank supply adjustment.

● The demand elasticity of substitution coefficient σ is nearly identical in the first two periods, but rises sharply in the third period.

An extension: who drives whom? Causality in foreign exchange markets.

The theory of (7) is agnostic as to the market in which adjustment occurs. If the private market is small relative to the official market, then integration may take a one-sided form – the private exchange rate adjusts to the official rate, and not vice versa. Alternatively, the private market may operate independently of the official market, with NBG reserves policy designed to keep the two markets in line. The results of Tables 2 and 3 suggest that there will be measurable differences between periods of demand-based response, and that the significant supply-side response captured by the estimates of ϕ should be decomposable into private-sector and government stimuli.

The evolution of the two exchange rates separately can be examined to decompose this question of causality. I use the formulation of (8a) and (8b) to mirror insofar as possible the specification (7) derived from theory, and impose the same number of lags used in Tables 2 and 3.

$$de_{Pt} = (1/\sigma_P)[c_0 - \sum_{j=1}^{\infty} (c_j de_{Pt-j} - d_j de_{Gt-j}) - \phi_P(e_{Pt-1} - e_{Gt-1}) + \epsilon_{pt}] \quad (8a)$$

$$de_{Gt} = (1/\sigma_G)[f_0 - \sum_{j=1}^{\infty} (f_j de_{Gt-j} - g_j de_{Pt-j}) - \phi_G(e_{Gt-1} - e_{Pt-1}) + \epsilon_{Gt}] \quad (8b)$$

If the two markets are independent, then the coefficients d_j and g_j will jointly be insignificantly different from zero. The error-correction coefficients ϕ_P and ϕ_G indicate the degree to which that specific exchange rate series converges to a long-run parity between the two exchange rates.

Insignificant values of these will indicate that any convergence is observed by “catching up” of the other exchange rate. The estimates of ϕ_P and ϕ_G should sum to equal approximately the estimates of ϕ from Tables 2 and 3.

Table 4 summarizes the results from this exercise for both USD and Rbl exchange rates.³³

The coefficients on d_j and g_j are not reported, but the sign and significance is indicated by the entry in the appropriate column.

- The demand-side effects d_j are expected to be positive, as shocks in the government exchange rate are passed through to the currency-exchange. This is true for the full sample for the Rbl markets, but not for the USD markets. However, these estimates mask considerable differences across sub-periods. In the USD markets, the progression runs from significantly opposite to theory in the first sub-period around to significantly in support of theory in the third sub-period. In the Rbl markets, the signs are as expected and significant in the first and third sub-periods, but significantly opposite in the second sub-period.

- The coefficients g_j indicate the response in the government exchange rate to shocks in the private market. Two possibilities could be observed: a positive transmission indicating the commercial-bank role in the TICEX auction, or a negative transmission due to NBG foreign-exchange intervention to “lean against the wind”. In the USD markets, the NBG intervention role dominates in all sub-periods (and significantly so in the first and third). In the Rbl markets the government “leaning against the wind” dominates in the first and second sub-periods, but in the third sub-period the NBG decision to intervene only in the USD market allowed the commercial-bank positive response to emerge significantly.

The estimates of coefficients ϕ_P and ϕ_G are significant in the full sample, and suggest USD and Rbl foreign-exchange markets in which the official exchange rate is more responsive to observed inequalities between private and official rates.

³³ The complete results from error-correction estimation are available on demand from the author.

- In the USD markets, the pattern of greater official-rate responsiveness is observed in both the first and third sub-periods, and in roughly the same proportions. For example, in the third sub-period the ratio of government to private adjustment is nearly three to one (.08/.03). However, the responsiveness in the second sub-period was reversed from this pattern. Not surprisingly, the second sub-period was one in which the availability of foreign-exchange reserves at the NBG was most limited.

As these results are compared, it becomes clear in Table 4 that the period since the introduction of the lari is most closely in line with the theoretical model of integrated financial markets. In both USD and Rbl markets, these estimation results suggest the greatest degree of theoretically predicted interdependence of markets. Despite the falling number of commercial banks, the effectiveness of the remaining banks at pulling the two markets together has increased. The difference in demand-transmission effects between USD and Rbl can be attributed to the NBG foreign-exchange intervention strategy.

Conclusions.

Georgia has gone through three distinct phases in its transition to a market-oriented financial sector. The two turning points that delineate these phases are identified as 17 September 1994 and 25 September 1995. The evolution of financial markets in the three sub-periods created by those two turning points are examined descriptively and econometrically for the period 13 March 1993 to 13 February 1998.

I draw three conclusions from this analysis.

- The two turning points delineate three distinct phases of economic behavior in foreign exchange markets. Aggregating these for statistical work will be inappropriate, especially since the first sub-period is characterized by command, rather than market, determination of prices.
- While market response to relative price incentives is evident in all three phases, only the third sub-period exhibits the characteristics that theory would predict for an integrated financial sector.
- The markets for Rbl and for USD are characterized by quite different evolution during this period. That of USD is consistent with progressive market deepening and integration, while that of Rbl indicates an initially deep market thrown into disarray (in the second sub-period) and emerging in the third sub-period as exhibiting classical features of market integration in the absence of central bank intervention.

While the two turning points identified in this paper were important in the evolution of the Georgian financial system, the change in NBG policy toward exchange-market intervention is a turning point of equal importance. The data are not yet available for sufficient time after that change to conduct a similar analysis. However, I anticipate that the model of interdependent financial markets will provide an alternative view in the most recent period -- one of currency-exchange adjustment and largely passive official market.

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Table 1
Bank Interest Rates on Deposits and Loans

	July 1993	Jan/Sept 1994	Dec 1994	April 1995	Jan/Jul 1996	June 1997
Lending						
Short term, USD	435 %	180 %	435 %	n.a.	84 %	51 %
Short term, local curr.	---	420 %	---	n.a.	84 %	58 %
Deposits						
Short term, USD	80 %	36 %	42 %	80 %	18 %	14 %
Short term, local curr.	---	300 %	---	---	10 %	9 %
Memorandum						
CPI inflation in that year	3125 %	15606 %	120 %	57 %	13 %	7 %

Interest rates converted to annual equivalents.

Source: Ivertbank for first, second and fifth observations; New Georgian bank for third observation; TBC Bank for fourth observation; Georgian average for June 1997 (NBG).

“—“ indicates “not offered”.

Table 2

Error-Correction Estimation: Dynamic Evolution of USD Exchange RatesDependent variable: $de_{Pt} - de_{Gt}$

	Full	Sub-period I	Sub-period II	Sub-period III
a_0	0.005 (0.002)	0.040 (0.009)	0.007 (0.002)	0.000 (0.000)
a_1	-0.005 (0.028)	-0.163 (0.071)	0.069 (0.048)	0.034 (0.030)
a_2	-0.038 (0.027)	-0.198 (0.069)	0.110 (0.046)	0.168 (0.030)
a_3	0.032 (0.028)	-0.085 (0.069)	0.013 (0.048)	0.068 (0.030)
a_4	-0.034 (0.028)	-0.149 (0.068)	-0.001 (0.048)	0.021 (0.030)
a_5	0.034 (0.028)	-0.024 (0.069)	-0.057 (0.036)	0.038 (0.029)
a_6	0.046 (0.028)	-0.010 (0.069)	-0.008 (0.036)	-0.020 (0.030)
a_7	0.056 (0.027)	0.048 (0.068)	-0.051 (0.033)	0.007 (0.030)
ϕ	0.099 (0.014)	0.303 (0.062)	0.106 (0.017)	0.075 (0.014)
σ	1.000	0.515	1.268	13.000
N	1379	302	344	731
SSE	3.81	3.00	0.56	0.010
SST	4.05	3.40	0.63	0.011
R^2	0.06	0.12	0.12	0.11

F test of significance of turning points:

F(16,1355) = 5.69

Critical value $F_c = 1.67$

Table 3
Error-Correction Estimation: Dynamic Evolution of Rbl Exchange Rates

Dependent variable: $de_{Pt} - de_{Gt}$

	Full	Sub-period I	Sub-period II	Sub-period III
a_0	0.004 (0.002)	0.007 (0.009)	0.027 (0.006)	0.000 (0.000)
a_1	0.118 (0.030)	0.049 (0.082)	0.051 (0.062)	0.184 (0.040)
a_2	0.066 (0.030)	0.045 (0.084)	-0.001 (0.061)	0.073 (0.040)
a_3	0.073 (0.029)	0.017 (0.077)	0.020 (0.061)	0.056 (0.040)
a_4	0.067 (0.029)	0.183 (0.074)	-0.071 (0.060)	0.035 (0.040)
a_5	0.062 (0.028)	0.030 (0.070)	0.008 (0.059)	-0.064 (0.040)
a_6	0.076 (0.028)	0.056 (0.069)	0.063 (0.058)	0.093 (0.040)
a_7	0.027 (0.031)	-0.031 (0.099)	0.038 (0.055)	-0.012 (0.039)
ϕ	0.085 (0.018)	0.020 (0.056)	0.331 (0.051)	0.028 (0.011)
σ	1.000	0.687	0.664	3.86
N	11136	143	312	679
SSE	2.61	0.66	1.60	0.10
SST	2.85	0.72	2.01	0.11
R^2	0.08	0.08	0.12	0.11

F test of significance of turning points:

$F(16,11112) = 7.36$

Critical value $F_c = 1.67$

Table 4
Results of Causality Tests, USD and Rbl

	USD				Rbl			
	d_j	g_j	ϕ_P	ϕ_G	d_j	g_j	ϕ_P	ϕ_G
Full	N*	Y*	0.03 (0.01)	0.08 (0.01)	Y*	Y*	0.00 (0.02)	0.08 (0.01)
Sub-period I	N*	N*	0.10 (0.06)	0.25 (0.06)	Y*	N	-0.15 (0.06)	0.14 (0.05)
Sub-period II	Y	N	0.07 (0.02)	0.04 (0.01)	N*	N*	0.17 (0.04)	0.15 (0.04)
Sub-period III	Y*	N*	0.03 (0.01)	0.08 (0.01)	Y*	Y*	0.01 (0.01)	0.02 (0.01)

Note on symbols:

Y indicates that the coefficients sum to a positive number – i.e., the impact of a positive shock in one market is a positive shock to the other market. N indicates the converse.

* indicates that the coefficient d_j or g_j is significant in the regression run.

Standard errors in parentheses.