

FOREIGN BANK ENTRY AND BANK EFFICIENCY IN BOSNIA AND HERZEGOVINA: A RESERVE MANAGEMENT APPROACH

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October 2006

Abstract

There is growing literature that finds that foreign banks in emerging markets are more efficient than the domestic ones, especially in the transition economies. This paper evaluates this proposition using data from transition economy of Bosnia and Herzegovina. Efficiency is measured in terms of banks' excess reserve holdings with the central bank. Two different types of efficiency in reserve management are evaluated: static and dynamic. The efficiency gains to foreign ownership are economically substantial. Had the domestic banks adopted the reserve management procedures of the foreign banks, they could have increased their Net Income on average by 63 percent in each year of the sample period. Additionally, foreign banks are faster to respond to changes in prudential and reserve requirement regulations as well as more aggressive in exploiting potential loopholes.

Keywords: Reserve Management, Bank Efficiency, and Foreign Ownership.

JEL Classification: P30, P34.

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* I thank Carol Osler for very helpful guidance and comments. I am also grateful for comments of Mojmir Mrak and participants at the EPRU Research Competition Work-in-Progress Seminar (June, 2006). All remaining errors are mine. Financial assistance from the European Union support to the EPPU is gratefully acknowledged.

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In emerging markets, foreign direct investment (FDI) is seen as a key ingredient for a country seeking to transform or build from scratch entire industries. Often, FDI provides an important source of non-debt financing needed to fill the financing gap that cannot be filled domestically. Moreover, FDI is seen as the key source of technology transfer. Beyond the transfer of “hardware” – latest technology in the production process – FDI brings with it the transfer of “software” – management know-how and best practice – which is seen as essential for lasting development. Furthermore, FDI inflows are perceived as stabilizing factor in an economy. FDI is often long term and introduces much less volatility into the financial system, unlike commercial bank loans and portfolio investments (i.e. “hot money”).

Spurred by the liberalization of banking and financial sectors in the late 1980s and 1990s globally, FDI in the banking sector expanded together with FDI overall. A key driver of FDI in the banking sector is the decision of governments in emerging markets to privatize their banking sectors. The most common reason cited for privatization is the presumed greater efficiency of private sector in running the firms. La Porta, Lopez-De-Salianes, and Schleifer (2002) find that indeed privately held banks perform better than the government-owned banks. As with every privatization, one of the key concerns is whether to sell enterprises to foreign entrants.

One important and lasting benefit of FDI in the banking sector comes from local banks’ exposure to global competition. Countries that receive FDI in banking benefit from the transfers of technology, innovations in products and other processes commonly associated with foreign entry. Additionally, Alfaro et al. (2003) argue that lack of development of local financial markets can adversely limit the economy’s ability to take advantage of potential knowledge spillovers¹ from FDI, magnifying the output effects of FDI. In many emerging markets, banking sector is the corner stone of every financial system. From Schumpeter

¹ Knowledge spillovers are defined as *de novo* entrepreneurial activity spurred by agents that have acquired skills/knowledge in an FDI firm.

(1911) to, more recently, King and Levine (1993) many have shown that financial systems are important for both productivity growth and development. Therefore, FDI in banking has an additional benefit of strengthening the very foundation of every well-functioning financial sector and thereby increasing country's "absorptive capacity" of FDI in other sectors of the economy.

Further, the success of foreign banks can exert pressure on local institutions to reassess local regulations and local lending practices. Foreign banks may also bring new credibility to the banking sector and thereby marshal savings that were outside the system, especially in countries that experienced significant financial traumas in the past. The result can be better risk management, more competitive pricing, and in general a more efficient allocation of credit economy-wide (BIS 2004). Claessens, Demirguc-Kunt, and Huizinga (2001), looking at eighty countries from 1985-1995, show that the foreign banks perform better than the domestic banks in developing countries, while opposite is true for developed countries. For example, several studies that focus on multi country bank samples in transition economies find similar results. Bonin, Hasan, and Wachtel (2004, 2005), Hasan and Marton (2003), Fries and Taci (2005), Weill (2003) and Kraft, Hofler, and Payne (2002) find that domestic private banks are more efficient than state-owned banks and that foreign-owned banks are the most efficient of all.

These efficiency gains might be partially or fully diminished if there is trade-off between banking efficiency and banking stability. Namely, Stiglitz (2002) has emphasized a view that foreign-dominated banking sectors might be susceptible to a more volatile credit supply. However, de Haas and Lelyveld (2006) and Haselmann (2006) analyze the credit supply of foreign banks during various crises in Central and Eastern Europe (CEE). Not only that they find that foreign banks reduced their outstanding credit less drastically than domestic banks during crisis, but also that the foreign banks, in most cases, have even

increased their credit base. This is a clear evidence of for a stabilizing role of foreign banks in CEE.

Why would, then, foreign ownership of banks induce them to behave so differently in emerging markets? Haselmann (2006) and de Haas and Lelyveld (2006) argue that differences come from the fact that foreign banks operate a multinational banks and that their subsidiaries are not completely autonomous organizations. This is to say that, subsidiaries' decision-making process is in effect driven not only by the conditions in the host countries ("pull factors"), but also by the conditions in the parent banks' home country ("push factors") whereas domestic banks are just affected with their home country market conditions. In essence, the foreign banks operate as multinational banks and have different opportunities and constraints from banks that are only operating within one country or within a region of a country.

The above mentioned studies on bank efficiency utilize balance sheet and income statement data to focus on traditional measures of bank efficiency, such as interest rate spreads, profitability, and expense ratios. This paper addresses a natural follow-up question: Exactly what do foreign banks do differently than local banks in transition economies? To answer this question, I focus closely at the details of how banks run their businesses in order to identify a particular source of the greater efficiency, putting the banks' reserve management practices under a microscope for banks in Bosnia and Herzegovina.

Holding minimal excess reserves signals bank's ability to conduct treasury operations efficiently and hence use assets most productively. Banks that hold more reserves than required are in effect keeping the savings that are in the banking system idle.

This paper evaluates two different types of efficiency in reserve management: static and dynamic. Static efficiency is the relative holdings of excess reserves over a period of time. Dynamic efficiency is more nuanced. It seeks to evaluate banks' responses to changes

in the policy environment. Specifically, I evaluate a number of responses of changes in prudential regulation and to three different monetary policy “instruments”: i) the required reserves ratio, ii) the rate of remuneration on required reserves, and iii) the rate of remuneration on excess reserves.

I find that foreign banks are more efficient in reserve management practices in both static and dynamic measures. On the static measure of efficiency, foreign banks hold 8.8 percent of their deposit base as excess reserves, while the corresponding figure for domestic banks is 13.7 percentage points. Had domestic banks adopted the reserves management practices of foreign banks, they could have increased their Net Income on average by 63 percent in each year over the sample period. Depositors in the domestic banks could have earned, on average, extra 0.7 on their deposits per year. Alternatively, shareholders of domestic banks could have earned, on average, an extra 2.2 percent return per year. In terms of dynamic efficiency I find that foreign banks are faster to respond to changes in prudential and reserve requirement regulations as well as more aggressive in exploiting potential regulatory loopholes.

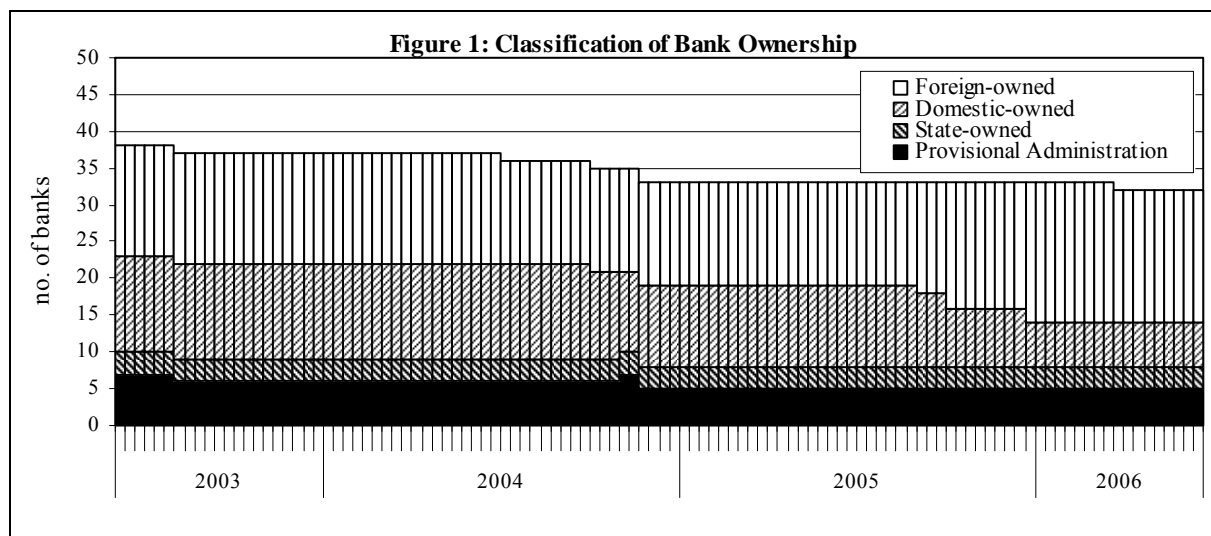
The remainder of this paper is organized as follows. In the next section, I describe the data and the bank ownership classification. Section 3 compares the static efficiency of domestic and foreign banks, and calculates the economic value of foreign bank ownership. Section 4 presents a brief overview of the history of the bank regulatory policy in Bosnia and Herzegovina, characterizes the methodology for evaluating dynamic efficiency, and finally compares the dynamic efficiency of domestic and foreign banks. Section 5 concludes.

II THE DATA AND OWNERSHIP TYPOLOGY

This study relies most heavily on Central Bank of Bosnia and Herzegovina (CBBH) data gathered for monitoring reserve requirements. The data, which are divided into 111 ten-calendar-day maintenance periods, begin in June 1, 2003 and end in June 30, 2006. For each

bank of the 31 banks the following information is available: deposits in domestic currency (Convertible mark or KM), deposits in foreign currency (FC), total deposits (KM and FC), required reserves (RR), actual reserve balances, excess/shortfall reserves, remuneration on required reserves, remuneration on excess reserves, total remuneration, and penalty payments.

Until 1998, the banking sector in Bosnia and Herzegovina was almost entirely state-owned. By the beginning of my sample period, however, most banks were privately held. Figure 1 gives the breakdown of banks according to ownership status: state-, domestic-, foreign-owned, and banks under provisional (temporary) administration by the banking supervisory agencies. For the purposes of this paper, a bank was classified as foreign-owned if more than 50 percent of its equity capital was owned by non-residents.



For the remainder of this paper, banks that are under provisional administration are excluded from the data set, while domestic private and domestic state-owned banks are grouped together and labeled as “domestic”. State-owned banks are very small in assets, deposits, and capital and are thus unlikely to have a meaningful impact on the results.

The following table gives descriptive statistics of banks’ assets for the years in the sample period.

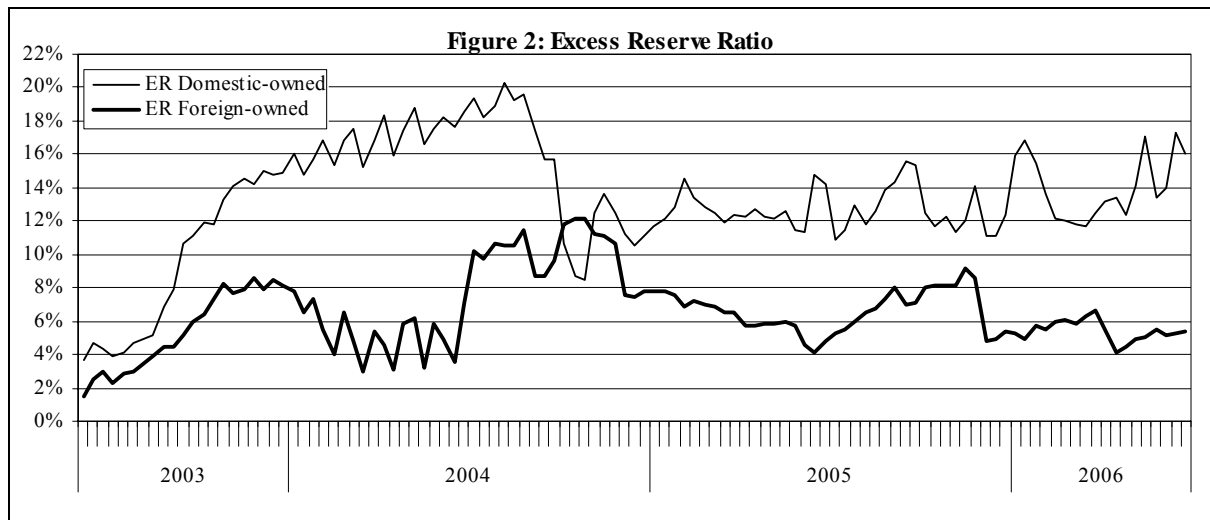
Table 1: Banks' Summary Statistics

- in thousands of KM -

	2003	2004	2005	H1.2006
Number of banks	31	28	28	27
Average bank assets	220,709	324,846	414,320	469,140
Min bank assets	25,051	28,589	36,318	36,359
Max bank assets	1,349,318	2,043,448	2,494,767	2,754,710
Average deposits with banks	166,807	241,108	307,250	341,385
Min deposits	8,190	2,153	8,375	6,022
Max deposits	1,043,861	1,462,463	1,659,404	1,790,340
Average bank capital	28,420	38,861	46,626	48,982
Min bank capital	5,564	14,470	16,192	9,443
Max bank capital	91,656	133,753	169,444	188,064
Average bank net income	2,475	2,066	3,383	2,243
Min bank net income	-6,616	-4,015	-7,744	-1,108
Max bank net income	20,271	21,146	24,229	13,100

III STATIC EFFICIENCY – REALIZED AND POTENTIAL ECONOMIC GAINS

To compare the efficiency of domestic- and foreign-owned banks I focus on their reserve management practices, with efficiency measured in terms of excess reserves ratio. A quick perusal of these reserve ratios shows clearly that foreign-owned banks generally have lower excess reserves ratios. The average excess reserves ratio, during the sample period, for foreign banks was 8.8 percent (standard deviation = 10.8) while the comparable figure for domestic banks was 13.7 percent (standard deviation = 14.1). Even though both groups have very high standard deviations, this difference is quite statistically significant (t-stat = 11.2). The same general tendency can be observed in all but three of the 111 maintenance periods, as shown in Figure 2.



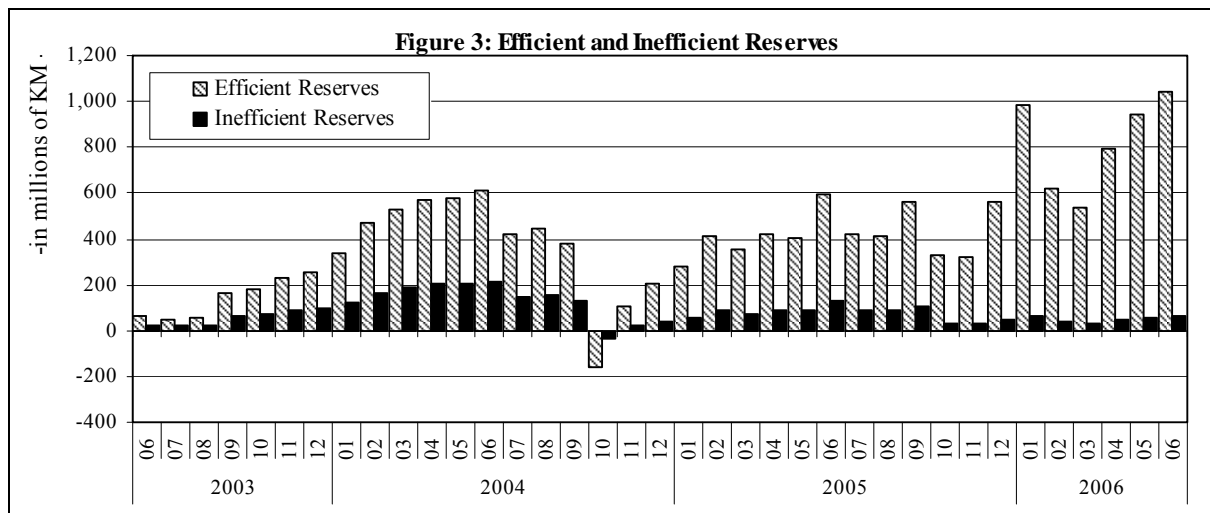
One very evident feature of the Bosnian banking sector is a very high level of liquidity, as reserve holdings are persistently higher than required. Even the foreign-owned banks, hold about 8.8 percent of their deposit base above the requirement! Certain structural features of the system promote this high overall level of liquidity. First, the CBBH cannot serve as a Lender of Last Resort as it operates as a currency board and as such is prohibited to extend credit to anyone. Second, banks need to hold liquid domestic assets in order to satisfy regulatory requirements of the bank supervision agencies. This can, perhaps, be best illustrated by the behavior of banks from mid-2003 through end-2004, when significant changes in the regulatory environment occurred. Evaluating bank behavior in response to these changes, as well as changes in the reserve requirement, can be used to evaluate their relative efficiency.

How substantial are the economic gains from adopting more efficient reserve management practices? To address this question, I first calculate realized gains from foreign ownership. Second, I calculate potential additional gains if all banks adopted foreign reserve management practices.

To measure economic gains from the efficient foreign ownership, I average excess reserve (ER) ratios for all domestic-owned banks and calculate a difference between each foreign bank's ER ratio and the domestic bank *average* ER ratio for each maintenance period.

Difference between foreign and the average of domestic bank reserve holdings is the “efficient” reserve ratio. Each foreign bank’s efficient reserve ratio is then multiplied by its own level of deposits to get the KM value of efficient reserves. These are then aggregated on monthly basis (3 maintenance periods per month).

Similarly, I calculate the economic gains of inefficient behavior by doing the reverse. Namely, I average ER ratios for all foreign-owned banks per maintenance period and find the difference between each domestic bank’s ER ratio and the foreign bank *average* ER ratio for each maintenance period. Difference between domestic and the average of foreign bank reserve holdings is the “inefficient” reserves ratio. As was the case with “efficient” reserves, these are converted into actual KM values and aggregated on monthly basis. Figure 3 shows the level of both “efficient” and “inefficient” reserves.



To finish, I multiply efficient reserves by average lending rates for each month in order to calculate a measure of *Realized* Economic Gain (see Appendix 1 for details). Parallel calculation is done for inefficient reserves in order to arrive at a measure of *Potential* Economic Gain. Table 2 below gives us the economic significance by comparing *Realized* and *Potential* Economic Gains to the banks’ Net Income, Deposits, Assets and Equity.

The effects of foreign bank ownership are substantial according to all yardsticks. Gains due to efficient reserve management accounted, on average, of nearly 48 percent of foreign bank net income in each year over the sample period.

Had domestic banks adopted the reserves management practices of foreign banks, they could have increased their Net Income on average by 63 percent in each year over the sample period. These gains could have accrued to the banks' depositors, lenders, or shareholders. If all gains accrued to the depositors in the domestic banks, they could have earned, on average, extra 0.7 on their deposits per year. Alternatively, if these gains accrued to the shareholders of the domestic banks, they could have earned, on average, an extra 2.2 percent return per year.

Table 2: Realized and Potential Economic Gains - in thousands of KM -

	2003*	2004	2005	2006*	Average
<i>Realized</i> Economic Gain	13,123	33,712	34,412	66,170	
<i>Potential</i> Economic Gain	5,220	11,816	6,299	4,114	
Total Economic Gain	18,343	45,528	40,711	70,284	
Total Assets of Foreign Banks	4,810,661	7,274,779	10,352,352	13,091,409	
Total Assets of Domestic Banks	2,031,304	1,820,904	1,248,615	841,730	
<i>Realized</i> Economic Gain as a share of Foreign Banks' Assets	0.3%	0.5%	0.3%	0.5%	0.4%
<i>Potential</i> Economic Gain as a share of Domestic Banks' Assets	0.3%	0.6%	0.5%	0.5%	0.5%
Total Economic Gain as a share of Total Banks' Assets	0.3%	0.5%	0.4%	0.5%	0.4%
Total Deposits of Foreign Banks	3,662,571	5,537,020	7,815,126	9,456,471	
Total Deposits of Domestic Banks	1,508,443	1,214,005	787,862	488,980	
<i>Realized</i> Economic Gain as a share of Foreign Banks' Deposits	0.4%	0.6%	0.4%	0.7%	0.5%
<i>Potential</i> Economic Gain as a share of Domestic Banks' Deposits	0.3%	1.0%	0.8%	0.8%	0.7%
Total Economic Gain as a share of Total Banks' Deposits	0.4%	0.7%	0.5%	0.7%	0.6%
Total Equity of Foreign Banks	566,807	728,018	1,011,037	1,071,896	
Total Equity of Domestic Banks	314,224	360,081	294,503	269,048	
<i>Realized</i> Economic Gain as a share of Foreign Banks' Equity	2.3%	4.6%	3.4%	6.2%	4.1%
<i>Potential</i> Economic Gain as a share of Domestic Banks' Equity	1.7%	3.3%	2.1%	1.5%	2.2%
Total Economic Gain as a share of Total Banks' Equity	2.1%	4.2%	3.1%	5.2%	3.7%
Net Income of Foreign Banks	59,716	45,495	93,138	113,972	
Net Income of Domestic Banks	17,006	12,361	9,342	7,168	
<i>Realized</i> Economic Gain as a share of Foreign Banks' Net Income	22.0%	74.1%	36.9%	58.1%	47.8%
<i>Potential</i> Economic Gain as a share of Domestic Banks' Net Income	30.7%	95.6%	67.4%	57.4%	62.8%
Total Economic Gain as a share of Net Income	23.9%	78.7%	39.7%	58.0%	50.1%

*Note: Economic Gains for 2003 and 2006 are annualized. Bank data on Assets, Deposits, Equity and Net Income for 2006 are annualized based on growth rates in the first half of 2006. Net Income of Domestic Banks for 2005 excludes one bank whose results nearly wipe out all other domestic banks' Net Income. This is due to a one-time restructuring charge. Average is a simple linear average for all years.

IV DYNAMIC EFFICIENCY - RESPONSIVENESS TO POLICY CHANGES

We have seen that foreign banks hold lower excess reserves on average, and thus demonstrated greater static efficiency. Efficiency can also be manifest dynamically. For

example, a more efficient bank will respond more quickly when the remuneration on excess reserves declines. In this section, I use panel regressions to examine banks' responses to changes in the policy environment. Specifically, I evaluate a number of responses of changes in prudential regulation and to three different monetary policy "instruments": i) the required reserves ratio, ii) the rate of remuneration on required reserves, and iii) the rate of remuneration on excess reserves.

To understand these changes, however, it is helpful to have some familiarity with the institutional structure of banking in Bosnia and Herzegovina. The following section summarizes the most important developments during the period between 1997 and 2006. It is noteworthy that of all the areas where economic reforms have been introduced in Bosnia and Herzegovina, the most significant progress has been made in the banking sector, and it is this sector in which there has been the greatest proportion of foreign investment.

A. REGULATORY POLICY HISTORY

In 1997, Bosnia and Herzegovina had around 75 commercial banks, of which most were very small and none operated nationally. Most bank assets were state-owned with over 90 percent of loans classified as nonperforming. Citizens had experienced many financial traumas in the recent past, which generated intense distrust in the banks. During the 1980s, there were prolonged periods of high inflation, culminating in hyperinflation during which inflation peaked at 2,700 percent². As a consequence, citizens used foreign currencies, namely German marks, for their savings. Commercial banks even offered foreign currency denominated deposits to capture some of these savings, and maintained reserves denominated in foreign currencies at the National Bank of Yugoslavia. When the National Bank seized these foreign-currency-denominated reserves in 1992, prior to the outbreak of war, the banks were forced to freeze the foreign currency deposits of their clients. The war also disrupted

² Hanke et al. (1993), pp. 40.

links to international financial markets, and extensively damaged the physical infrastructure of the country. The signing of the Dayton Peace Agreement in 1995, made possible for the reconstruction of government in Bosnia and Herzegovina.

Banking sector reform essentially started in 1997 with the creation of the Central Bank of Bosnia and Herzegovina (CBBH), which under the provisions specified in the Dayton Peace Agreement, was given the sole authority for monetary policy. The CBBH operates as a currency board and thus is prohibited from lending money to the government and is not a Lender of the Last Resort (LOLR) to the banking system. The new Bosnian currency – the Convertible mark or KM³ – was issued in 1998 and was pegged to the German mark at the rate of 1:1. Subsequently, when the euro started to be used in 1999 for accounting purposes the CBBH specified the peg as 1KM = 1DM = 0.51129 euros, matching exactly the parities between the euro and its legacy currencies.

Inflation was kept low, averaging three percent per year, during the 1998-2002, generating more trust in the local currency. As a measure of this trust, during the first quarter of 2002, when euro notes went into circulation, large amounts of German mark notes were changed into Convertible marks or placed on deposit in Bosnian banks in KM-denominated accounts, although euro-denominated accounts were also available. During the conversion period (1 September 2001 to 30 March 2002), around DM 4.3 billion of DM banknotes⁴ had been repatriated to Germany (approx. euro 2.2 billion), causing a sharp one time increase in KM and euro deposits by Bosnian citizens with commercial banks. For illustration, the amount of KM in circulation rose from KM 812 million to KM 1,977 million, a rise of 143 percent. The amount of bank deposits in commercial banks rose from KM 2,372 million to KM 3,730 million, a rise of 57 percent. Deposits continued to grow during 2002 (25 percent) on top of already impressive growth in 2001 (51 percent).

³ For much of the discussion on the name of the currency see Coats (2004).

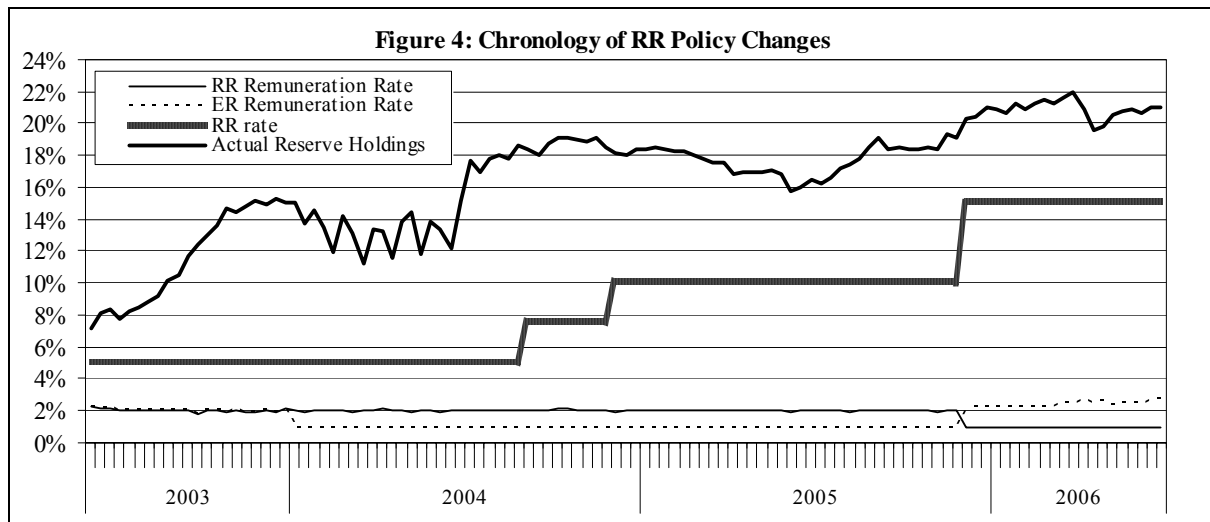
⁴ Nicholl (2004), pp. 29.

From 1998, new modern banking laws were passed and Banking Agencies of the Federation of BiH and the Republika Srpska were established as independent institutions mid-1998, to supervise commercial banks in their respective Entities⁵. By 2002, the banking sector has been almost completely privatized, and the majority of assets are now under foreign ownership. In the process considerable consolidation has occurred—the number of banks has declined from 75 in 1997 to 31 at mid-2006 of which five are still under provisional administration.

Reserve Requirement Policy

From the introduction of the currency board in 1997 until the mid of 2003, there were no changes in the regulation of required reserves in Bosnia and Herzegovina. A reserve requirement of 10 percent was only imposed on domestic currency deposits, which were minimal until the end of 2001. After the changes on June 1, 2003, the reserve requirement applied now to both domestic and foreign currency deposits. This was hugely important as it gave the CBBH its only discretionary tool of monetary management. It also mattered, of course, to the banks themselves. Initially, the required reserves rate was set at 5 percent of the deposits. It was subsequently raised three times, as the CBBH attempts to cope with rapid credit expansion (Figure 4). During 2002, in the wake of euro conversion and newly found domestic deposits, total bank lending grew by 53 percent. From 2003 through 2005, banks have continued to expand credit at the average rate of 30 percent per year.

⁵ According to the Dayton Peace Agreement, Bosnia and Herzegovina (BiH) consists of a central authority, and two autonomous entities, namely the Federation of Bosnia and Herzegovina (FBiH) and the Republika Srpska (RS). The state of Bosnia and Herzegovina is the central authority, but has limited and specific powers like monetary policy (common currency and common central bank), external trade and customs, foreign relations, etc. The entities — which each have their own executive, legislative and judicial bodies — exert all functions not expressly assigned to the central state by the constitution of BiH. This arrangement is akin, perhaps, to the early history of banking in the United States where each state regulated banks while the central government issued single currency.



Prior to 2003, required reserves were remunerated at market rates, while excess reserves received no remuneration. However, starting in June 2003 all bank reserves with the CBBH, not just required reserves, were remunerated at market rates with market rates defined as the rate earned by the CBBH on its overnight deposits of foreign exchange reserves. This continued until the end of December 2003. From January 2004, required reserves continued to be remunerated at market rates, while remuneration of excess reserves was cut from the market rate (two percent at the time) to one percent (which was the European Central Bank’s deposit facility rate at the time). Remuneration policy was changed once more in December 2005, when the remuneration rates for required and excess reserves were swapped. Since December 2005, CBBH has paid fixed one percent on required reserves and variable market rates on excess reserves.

Prudential Regulatory Policy

From their establishment in 1998, the banking supervision agencies received a great deal of technical assistance in order to effectively implement the Basel principles. In response to the rapid credit expansion, and in parallel with changes in the reserve requirements, from June 2003, the banking agencies required banks to phase in two new prudential requirements: i) tighter limits on their net open foreign exchange position of banks (“forex regulations”) and ii) tighter prudential regulations of liquidity (“liquidity regulations”).

Despite the large increase in KM deposits in 2002, banks continued to create loans either denominated in or indexed to a foreign currency, primarily the euro. The new forex regulations imposed progressively tighter limits on banks' net open foreign exchange exposure positions, from about 120 percent of capital in mid-2003 to 30 percent of capital by mid-2004. The new forex exposure regulations also broadened the range of assets and liabilities considered "foreign" to include KM assets and liabilities indexed to foreign currencies.

As the new deposits were typically very short-term in nature, the banks were also required to comply with the new prudential regulations on liquidity by June 2004. The new liquidity regulations required that liabilities of maturity up to 90 days be matched 100 percent by assets of similar maturity. Lack of strict enforcement in the application of similar rules in the past had led to substantial nonobservance. Most banks were required to comply with these regulations by June 2004 with some banks being given extensions until September 2004.

In response to these two reforms, banks increased their deposits with the central bank, since short-term assets denominated in domestic currency would help them meet both of the new regulations. Banks increasingly converted their deposits in foreign banks⁶ into short-term KM deposits held with the CBBH. The currency conversion in this operation helped them to meet the steadily tightening forex exposure rules. In addition, the short term deposits with the CBBH helped them to meet the liquidity rules. As a result, banks' reserves at the central bank increased steadily, as the forex and liquidity regulations were steadily phased in during the late 2003. Indeed by the end-2003, banks were holding 15.2 percent of their deposit base with the central bank, up from 7.4 percent in mid-2003. Subsequently, the growth of banks' reserves with CBBH substantially moderated. The required reserve ratio was only 5 percent. Without taking into account the changes in the regulatory environment, one could be

⁶ At the end of 2003, Bosnian banks held KM1.2 billion as short-term deposits with banks abroad. For comparison purposes, total deposits with the CBBH at the end of 2003 were KM800 million

mistakenly led to believe that banks, as a whole, became twice as inefficient during this period. This is why it's important to compare the behavior of domestic and foreign banks.

From the beginning of 2004 the commercial banks began to exploit the fact that the forex and liquidity regulations being phased in applied only on end-of-the-month basis and not daily. Consequently, banks only observed them at the end-of-the-month. Banks converted their foreign currency deposits held abroad at end of a month, placed these on deposit with the CBBH, and reversed these transactions a few days later. This caused substantial intra-month swings in bank reserves from January 2004 (Figure 2). As CBBH operates as a currency board, this automatically translated in swings of its foreign reserves as well. This behavior suggests that in the absence of the new regulations banks would have preferred a significantly lower level of reserves with the CBBH. These swings increased in size, month by month, as banks converted more of their deposits from abroad in order to meet the progressively tighter limits. Indeed, the intra-month swings reached as much as KM 400 million from peak to trough by mid-2004, which represented 12.5 percent of CBBH's foreign reserves at the time! However, the amplitude declined significantly from July 2004, after banks were informed that the banking agencies would be requiring daily reporting of forex exposure positions. These swings have been virtually eliminated since daily forex exposure reporting was implemented in October 2004. Despite the cut in remuneration, excess reserves continued to grow through most of 2004, but with a pronounced end-of-month effect. The intra-month swings in reserves began precisely at the beginning of 2004 with the change in remuneration of excess reserves.

B. EVALUATING DYNAMIC EFFICIENCY

To compare the dynamic efficiency of the domestic- and foreign-bank reserve management in Bosnia and Herzegovina, I employ a panel regression. Each of the 111

maintenance periods is included for 31 banks resulting in an unbalanced panel with 3,237 observations.

To capture the time trend of the structural shift in required reserves in mid 2003, described above, a trend is included in the form of the $\log(\text{time})$. Ownership dummy (*foreign*) is included to capture the simple effect of a bank being owned by a non-resident. This variable is set to unity in case the bank is foreign-owned, and can change should the ownership status of a bank change. A proxy for size (*size*) is included to control for disparate bank size. I use the amount of deposit base used for calculation of required reserves as a proxy for size. It correlates well to the bank size measured by Assets or Equity, and it also has a distinct advantage that it has same 10-day frequency as other variables in this data set. To capture the effect of the new prudential regulations, I include a regulatory regime dummy (*reg_regime*). This is set to unity during the time span of the progressive implementation of the new regulations from June 2003 until end of September 2004, and zero otherwise. To capture the swings in reserve holdings at the end of each month, described above, I include an end-of-month dummy (*endmo*) that is set to unity for every maintenance period at a month's end. I also include the dummy for the announcement of the daily observance of new prudential regulations (*announce*) that captures this effect. Additionally, I include the remuneration rate on excess reserves (*erem_rate*) that CBBH pays on those reserves. Since changes in this rate might affect the holdings of excess reserves with a delay, I include four lags of this variable as well as its current value.

To compare the dynamic efficiency of domestic and foreign banks, I interact dummies for domestic and foreign ownership with most of the variables. Only the required reserve rate (*rr_rate*) and GDP (*gdp*) are not split between domestic and foreign banks as there is not reason to expect that these would affect banks differently. Additionally, the proxy for bank

size (*size*) is not split on foreign and domestic as I am trying to control for bank size independent of ownership structure.

The baseline model takes the following functional form:

$$\begin{aligned}
 er_rate = & \alpha + \beta_1 \log(time)_{nt} + \beta_2 foreign_{nt} + \beta_3 size + \beta_4 dom_x_reg_{nt} + \beta_5 for_x_reg_{nt} + \\
 & \beta_6 dom_x_ann_{nt} + \beta_7 for_x_ann_{nt} + \beta_8 dom_x_erem_{nt} + \beta_9 (L)dom_x_erem_{nt} + \\
 & \beta_{10} for_x_erem_{nt} + \beta_{11} (L)for_x_erem_{nt} + \beta_{12} dom_x_endmo_{nt} + \beta_{13} for_x_endmo_{nt} \\
 & + \beta_{14} rr_rate + \beta_{15} gdp_{nt} + \varepsilon_{nt}
 \end{aligned}
 \tag{eq. 1}$$

Definitions of the variables are as follows:

<i>log (time):</i>	natural log of time
<i>foreign:</i>	dummy variable where 1-foreign owned bank, 0-otherwise
<i>domestic:</i>	dummy variable where 0-foreign owned bank, 1-otherwise
<i>size</i>	proxy for bank size – deposit base for calculation of required reserves in KM millions.
<i>reg_regime:</i>	new regulatory regime dummy where 1-from 01June2003 until 01Oct2004, 0-afterwards. This corresponds to the implementation period of new prudential regulations.
<i>dom_x_reg:</i>	interaction of <i>domestic</i> dummy and <i>reg_regime</i>
<i>for_x_reg:</i>	interaction of <i>foreign</i> dummy and <i>reg_regime</i>
<i>announce:</i>	announcement period dummy where 1-from 01July2004 until 01Oct2004, 0-otherwise. This corresponds to the announcement period for daily observance of new prudential regulations.
<i>for_x_ann:</i>	interaction of <i>foreign</i> dummy and <i>announce</i>
<i>dom_x_ann:</i>	interaction of <i>domestic</i> dummy and <i>announce</i>
<i>erem_rate:</i>	remuneration rate on excess reserves
<i>for_x_erem:</i>	interaction of <i>foreign</i> dummy and <i>erem_rate</i>
<i>dom_x_erem:</i>	interaction of <i>domestic</i> dummy and <i>erem_rate</i>
<i>endmo:</i>	1-if the m-period is at the end of the month, 0-otherwise (from 01Jan04 until 01Oct04)
<i>for_x_endmo:</i>	interaction of <i>foreign</i> dummy and <i>endmo</i>
<i>dom_x_endmo:</i>	interaction of <i>domestic</i> dummy and <i>endmo</i>
<i>rr_rate:</i>	required reserves rate
<i>gdp:</i>	rate of growth of GDP

C. RESULTS

As the data consists of high-frequency observations (10-day intervals) and as banks in this sample vary significantly in size (from nearly KM 3billion in total assets to banks that have less than KM 50 million) it is highly likely that standard OLS estimates will not produce unbiased estimates due to heteroskedasticity and possibly autocorrelation. Consequently, I use feasible generalized least squares (FGLS), which corrects both for heteroskedasticity and

panel-specific autocorrelation. Table 4 contains the results of the panel data regression used to estimate the rate of excess reserves.

Column 1 reports estimated coefficients, standard errors and levels of significance for our baseline regression, while column 2 reports the same results for a “cleaned up” equation that drops any insignificant variables using the general-to-specific approach. My analysis focuses on results from column 2.

Table 03: Results of Panel Data Estimation

Dependent variable:	(1)		(2)	
<i>er_rate</i>	Baseline		Clean Regression	
<i>ln_time</i>	3.1706	[0.5703]***	1.7702	[0.4255]***
<i>foreign</i>	-1.9753	[1.2752]	-2.2523	[1.0097]**
<i>size</i>	-0.0040	[0.0010]***	-0.0041	[0.0009]***
<i>dom_x_reg</i>	-1.2513	[0.9358]		
<i>for_x_reg</i>	-1.6507	[0.6203]***	-1.9349	[0.6041]***
<i>dom_x_ann</i>	0.9670	[0.6660]		
<i>for_x_ann</i>	0.7627	[0.4356]*	0.9081	[0.4308]**
<i>dom_x_ere</i>	-0.0401	[0.5584]		
<i>dom_x_ereL1</i>	0.3756	[0.3758]		
<i>dom_x_ereL2</i>	0.5163	[0.3780]		
<i>dom_x_ereL3</i>	0.3630	[0.3781]		
<i>dom_x_ereL4</i>	0.3188	[0.3727]		
<i>for_x_ere</i>	-0.1158	[0.4056]	-0.2087	[0.3333]
<i>for_x_ereL1</i>	0.1210	[0.2372]	0.0310	[0.2236]
<i>for_x_ereL2</i>	0.8148	[0.2394]***	0.7812	[0.2260]***
<i>for_x_ereL3</i>	0.0361	[0.2463]		
<i>for_x_ereL4</i>	0.0557	[0.2360]		
<i>dom_x_endmo</i>	-0.0556	[0.1695]		
<i>for_x_endmo</i>	0.4616	[0.1092]***	0.4802	[0.1066]***
<i>rr_rate</i>	-0.6075	[0.0824]***	-0.5350	[0.0694]***
<i>gdp</i>	0.0258	[0.1887]	0.0893	[0.1358]
constant	4.3927	[2.6178]*	9.7898	[1.6707]***
Observations	3113		3175	
Number of panels	31		31	
Standard errors in brackets				
* significant at 10%; ** significant at 5%; *** significant at 1%				

Overall, these results sustain the earlier conclusion from the evaluation of the static efficiency, which is that foreign banks, on average, hold fewer reserves than domestic banks. The coefficient on the foreign bank dummy indicates that excess reserve ratio is 2.25 percentage points less for a foreign bank than for a comparable domestic bank, other things being equal. This result becomes statistically significant in the cleaned up regression when other insignificant variables are omitted. The coefficient on the size variable tells us that for

every additional million in deposits, big banks hold KM 4,100 less in excess reserves, implying that some efficiency is derived from increasing scale of bank operations, even though this does not appear very economically significant. Nonetheless, foreign ownership is significant even when controlling for gains from increasing bank size.

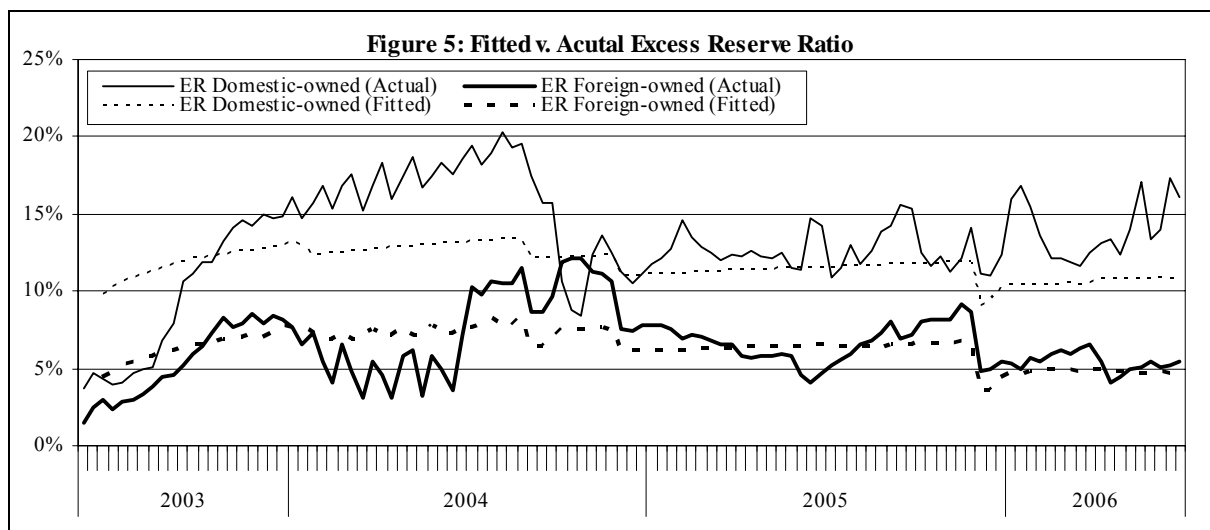
In addition, fine differences in dynamic efficiency are manifested in three ways. First, foreign banks held additional 1.5 percentage points fewer reserves than the domestic banks during the implementation of the new prudential regulations. This suggests that foreign banks were more strongly motivated by the forgone income of holding higher excess reserves than the domestic banks.

Second, foreign banks were more aggressive at exploiting in exploiting the end-of-the-month loophole in the first half of 2004. The coefficient for domestic banks' end-of-month variable is not statistically significant at any level while it is very significant for the foreign banks. This indicates that it was foreign banks that were exploiting the fact that new prudential regulations could be observed at the end of each month, thus fulfilling the letter if not the spirit of the new regulations. Once the regulators announced that banks should report daily observance of new regulations in July of 2004, it is again only foreign banks that have statistically significant coefficient for the announcement dummy. Daily observance of new prudential regulations caused foreign banks to hold additional 0.9 percentage point of deposit base in reserves, other things being equal.

Third, the two groups of banks differ also in their response to changes in the remuneration rate on excess reserves. Other things equal, a one percentage point increase in the remuneration rate prompts foreign banks to increase excess reserves by 0.78 percentage points in the second maintenance period after the change in remuneration on excess reserves. Domestic banks, by contrast, appear indifferent to changes in the remuneration rate on excess reserves as the coefficient on contemporaneous as well as on all lags is just never even weakly

significant. The more limited response of domestic banks could be interpreted as additional evidence that domestic banks do not have many opportunities for short-term liquidity management and/or that they lack financial sophistication. It appears that they pile up cash at the Central Bank as it earns them something kind of a return as opposed to just keeping it in their vaults.

Figure 5 gives the graphical representation of fitted versus actual excess reserves from the model.



Evaluating dynamic bank efficiency confirms what we have learned evaluating static bank efficiency. Foreign banks are faster to respond to changes in prudential and reserve requirement regulations as well as more aggressive in exploiting potential loopholes.

V CONCLUSION

In the ten years since the end of the war, Bosnia and Herzegovina has made many advances in normalizing the daily lives of its people. Even though a lot of work remains to be done, one thing can be said with a certainty – the banking sector reforms have been very successful. These reforms have managed to transform a virtually non-functioning banking sector – one that took in very little savings and channeled them to productive uses – to a banking sector whose leading banks make the lists of top 50 banks in Central and Eastern Europe. In this transformation no public money has been spent, and, as a consequence,

foreign capital has played a major role in revitalizing the banking sector: 70 percent of banks' equity at end-2005.

Banks from Austria dominate the banking sector in Bosnia and Herzegovina, controlling 45 percent of equity, followed by banks from Italy (12 percent), Slovenia (9 percent) and Germany (7 percent).⁷ The breakdown of banking assets by country is very similar. Therefore, the parent banks are motivated by the economic opportunities in their mature home markets (ie "push factors" with ROE between 0-10 percent) and by the opportunities in the emerging markets of CEE (ie "pull factors" with indicative ROE targets of 20-25 percent).⁸ This is very much consistent with my results, as under such constraints, subsidiaries of foreign banks in Bosnia and Herzegovina will minimize their excess reserve holdings in order to maximize their ROE targets. Domestic banks not only don't have access to foreign sources of funding, but they don't have a hard external profit maximization constraint either.

Indeed, by focusing on the banks' reserve management practices, I find that foreign banks are more efficient than the domestic ones. On the static measure of efficiency, foreign banks hold 8.8 percent of their deposit base while domestic banks hold 13.7 percentage points. Had domestic banks adopted the reserves management practices of foreign banks, they could have increased their Net Income on average by 63 percent in each of the last three years. Depositors in the domestic banks could have earned, on average, extra 0.7 on their deposits per year. Alternatively, shareholders of domestic banks could have earned, on average, an extra 2.2 percent return. Foreign banks also demonstrate greater dynamic efficiency as they are faster to respond to changes in prudential and reserve requirement regulations as well as more aggressive in exploiting potential loopholes.

⁷ IMF & World Bank (2006), pp. 11.

⁸ Ibid, pp. 18.

This paper does not intend to suggest that foreign banks are panacea in each and every situation, but rather that in the case of Bosnia and Herzegovina, allowing entry of foreign banks not only restructured the banking sector but dramatically improved its efficiency as well, giving it an important building block in the construction of a self-sustainable market economy.

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APPENDIX 1

Table 4: Calculation of Realized and Potential Economic Gain

- in KM\$ -

Year	Month	Efficient Reserves	Inefficient Reserves	Avg. Lending Rate	Realized Econ. Gain	Potential Econ. Gain
2003	06	60,466,314	25,600,238	9.18%	462,567	195,842
	07	50,549,923	20,765,932	9.17%	386,286	158,686
	08	59,829,255	24,241,579	9.33%	465,172	188,478
	09	165,946,953	66,483,377	9.27%	1,281,940	513,584
	10	182,234,481	71,580,224	9.01%	1,368,277	537,448
	11	233,247,953	92,280,905	8.82%	1,714,372	678,265
	12	258,369,923	100,999,578	9.18%	1,976,530	772,647
				Total 2003	7,655,145	3,044,950
2004	01	340,533,528	124,894,852	8.77%	2,488,733	912,773
	02	467,683,592	165,762,403	9.66%	3,764,853	1,334,387
	03	531,208,056	187,395,615	9.64%	4,267,371	1,505,411
	04	570,030,459	206,828,263	9.08%	4,313,230	1,565,001
	05	578,309,358	206,612,060	8.91%	4,293,947	1,534,095
	06	614,920,838	215,259,813	8.57%	4,391,560	1,537,314
	07	422,465,929	148,241,006	8.90%	3,133,289	1,099,454
	08	446,865,034	157,441,675	9.33%	3,474,376	1,224,109
	09	377,651,691	133,204,168	8.08%	2,542,855	896,908
	10	-160,549,002	-34,474,252	9.00%	-1,204,118	-258,557
	11	108,448,611	22,449,142	9.15%	826,921	171,175
	12	206,855,960	42,915,734	8.23%	1,418,687	294,330
				Total 2004	33,711,704	11,816,400
2005	01	283,648,565	57,719,736	8.75%	2,068,271	420,873
	02	413,426,937	88,270,787	8.63%	2,973,229	634,814
	03	352,436,861	74,931,281	8.11%	2,381,886	506,411
	04	422,235,032	88,866,225	8.50%	2,990,831	629,469
	05	401,413,212	85,983,550	8.02%	2,682,778	574,657
	06	593,773,444	130,392,841	8.18%	4,047,556	888,845
	07	423,415,519	91,975,769	7.98%	2,815,713	611,639
	08	409,997,144	88,036,096	8.34%	2,849,480	611,851
	09	564,967,493	106,879,305	8.09%	3,808,823	720,545
	10	329,991,109	29,803,730	7.59%	2,087,194	188,509
	11	321,256,941	28,808,755	7.90%	2,114,942	189,658
	12	560,430,078	50,205,666	7.69%	3,591,423	321,735
				Total 2005	34,412,125	6,299,003
2006	01	986,429,460	61,917,562	8.35%	6,863,905	430,843
	02	623,823,607	38,850,278	8.05%	4,184,817	260,621
	03	535,549,143	32,185,626	7.63%	3,405,200	204,647
	04	793,683,047	47,353,542	8.07%	5,337,518	318,453
	05	942,237,350	58,411,942	8.29%	6,509,290	403,529
	06	1,038,411,851	67,145,632	7.84%	6,784,291	438,685
				Total 2006	33,085,021	2,056,777