

## Trends and Prospects for the Debit Card Industry in Barbados

---

Winston Moore

### 1. Introduction

Since the beginning of the 1990s technology has revolutionised the way consumers interact with their banker and how payments are affected. There were three major innovations that took place in the Barbadian financial industry during this period: (1) the introduction of automatic teller machines (ATMs); (2) the growth of the credit card industry and (3) the development of the Caribbean Integrated Financial Services network (CarIFS).

Although credit card debt remains a small proportion of overall personal debt, outstanding credit card debt has been rising significantly over the last ten years. In terms of overall market penetration (credit cards issued per thousand persons), Barbados is on par with the European countries of Germany, Ireland, Netherlands and Austria, but still lags behind countries such as the United Kingdom, Canada, Japan and the United States of America (for a more detailed analysis of the Barbadian Credit Card market see Moore, 2006)<sup>1</sup>.

The diffusion and utilisation of ATM technologies has also been growing quite rapidly in recent years. A large proportion of this growth has been generated through the expansion of off-premises ATMs and point-of-sale (POS) terminals. ATMs are located around the island in various types of retail establishments: supermarkets, gas stations, and so on, allowing individuals to not only withdraw cash but also make account inquiries and pay utility and credit card bills. The growth in the number of POS terminals at various retail and other service outlets has also allowed consumers to reduce their dependence on cheque facilities.

Despite the growing importance of the debit card industry in Barbados, there exists no previous research on the topic. At present, debit card transactions are even more important than credit cards as a means of payment and could soon overtake some other popular means of conducting transactions. Monitoring trends in debit card transactions is also imperative given the importance of

---

<sup>1</sup> The accumulation of short-term consumer debt through credit cards is not what is advocated here. It is acknowledged that high levels of consumer debt reduce domestic savings, which is essential for economic growth and development.

an efficient payment system in overall macroeconomic development. An inefficient system can frustrate economic agents as they attempt to conduct their transactions and therefore lower overall economic activity.

The intent of this research effort is to extend the current knowledge of the payments system in Barbados by providing a detailed investigation of the debit card industry. It also gives projections as well as possible opportunities and threats to the future development of the industry. The study is particularly important for three reasons: (1) there is no previous research on this area in Barbados; (2) an efficient payments system is a key component of any successful economy, and (3) the debit card industry has the potential to become the most important means of payment in Barbados.

The remainder of the paper is as follows: because of the complexity and the specialised technology used by the debit card industry, section 2 provides background information on the ATM industry. Section 3 gives a detailed investigation of key debit card trends, while section 4 derives projections for the industry for the period 2007 to 2010. Section 5 discusses in greater detail key policy recommendations as well as suggestions for future research.

## **2. Background**

A debit card is a credit card-sized plastic card containing a magnetic strip for static data storage. The magnetic strip contains account information of the individual cardholder. The main characteristic that distinguishes a debit from a credit card is that each debit card transaction is linked directly to the consumer's bank account. There are two main types of debit card transactions: (1) automatic teller machine (ATM) transactions and (2) point-of-sale (POS) transactions.

With an ATM transaction, the consumer either withdraws cash or queries information about his/her account. In Barbados, the consumer can conduct ATM transactions through the CarIFs network at any ATM terminal. The consumer simply enters a personal identification number (PIN) to verify identity, the account is checked for adequate funds, and if everything is satisfactory, cash is issued. All of this is routed across one or more ATM networks. A visual illustration of this process is provided in Figure 7.1.

Figure 7.1:

## Cash Withdrawal from an ATM across a Shared Network

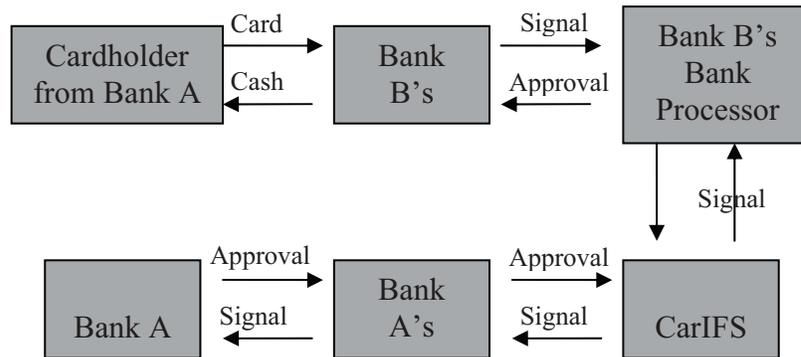


Figure 7.1 shows the complex process that is required to complete each interbank transaction. After the cardholder inserts his/her card into the ATM, the first step is to determine the issuing bank. If the cardholder is from Bank B, the transaction does not utilise the CarIFS network. However, if the cardholder is from another bank, say Bank A, then Bank B's processor routes the transaction through the CarIFS network that contacts Bank A's processor and checks the PIN, limits on withdrawals and the availability of funds. If the transaction is authorised, the processor signals the ATM to complete the transaction. This entire process takes at most 10 seconds. The bank whose terminal is used to complete the transaction (Bank B) is referred to as the Acquirer while the bank that issued the card is known as the Issuer (Bank A).

CarIFS operates on a UNIX platform with frame relay network hook-up between its members and the central hub for primary communications and a wireless network of equivalent throughput as backup: the protocol used is TCP/IP. Each member is connected to the hub via access routers; 3DES compliant Excrypt devices for encryption are utilised for security and fraud prevention.

The CarIFS network also facilitates consumer purchases of goods and services. With these types of transactions, the cardholder presents the debit card to a retailer initiating the transaction. The transaction travels over the debit network to the issuing bank, which checks the availability of funds in the user's deposit account. If the consumer has enough funds the bank authorises the transaction and his/her account is immediately debited for the amount of the transaction and the retailer's account is credited.

There are two possible types of point-of-sale debit transactions: those that are authorised by a personal identification number (PIN) and those authorised by a signature. With a PIN-based system, the customer or shop

assistant therefore swipes the card in the terminal and enters the PIN and the transaction amount. The transaction goes over the network and the customer's and retailer's accounts are immediately debited and credited, respectively. With a signature-based debit transaction, the transaction is only authorised after the customer signs a receipt. There are two obvious problems with these systems. The PIN system requires that the retailer carry a network debit terminal for each bank that issues a card, while the signature based approach is prone to abuse (for example, identity theft, account take-over, and so on).

One solution is for the commercial banks to use some common network for debit card transactions. The CarIFS network therefore offers commercial banks and retailers in Barbados the convenience of having one common debit card network. The shared debit card network earns revenue from each inter-bank transaction. Table 7.1 shows the schedule of fees for each of these transactions. The schedule shows that for ATM transactions, the consumer pays an interchange fee for using the CarIFS network of \$0.50 and \$0.35 to the acquiring bank for both withdrawals and balance inquiries. If the transaction is refused, the fee charged to the consumer is reduced. For POS transactions, CarIFS charges \$0.46 per transaction that is equally shared between the issuing and acquiring bank if the transaction is approved. If the POS transaction is refused, however, the issuing bank is charged the full switch charge.

**Table 7.1:****Debit Card Fees**

Transaction Type	Issuer	Acquirer	Switch (CarIFS)
ATM Withdrawals (approved)	-\$0.85	+\$0.35	+\$0.50
ATM Withdrawals (declined)	-\$0.60	+\$0.10	+\$0.50
ATM Balance Inquiry (approved)	-\$0.85	+\$0.35	+\$0.50
ATM Balance Inquiry (declined)	-\$0.60	+\$0.10	+\$0.50
POS Purchase (approved)	-\$0.23	-\$0.23	+\$0.46
POS Purchase (declined)	-\$0.46	-\$0.00	+\$0.46

Source: CarIFS

The use of debit cards depends primarily on consumers' attitudes towards convenience, as the card reduces the amount of time consumers have to spend on bank premises to conduct transactions. As individuals use the service more often, they value the service even more and are typically willing to pay for this convenience. Previous research (given below) has found that the value persons place on this convenience is related to the individual's level of income, financial assets and education.

One of the earliest studies to empirically investigate this issue was Kennickell and Kwast (1997). The authors use the results from the 1995 US Survey of Consumer Finances to obtain a detailed look at the extent of use, and the characteristics of households that exploit electronic and other technologies in their personal and business transactions. The authors report that, in general, financial assets, age and education tend to be more important explanatory factors than income of the factors that influences a household's decision to utilise electronic media. Kennickell and Kwast also find that households with annual incomes below US\$25,000 per year were unlikely to use electronic media, while those with incomes above US\$50,000 were relatively more likely to utilise electronic media. Additionally, age was an important factor, with those household heads under the age of 35 years being more likely to employ ATMs and/or debit cards. The adoption of electronic technologies was also positively related to the years of education.

Kennickell and Kwast's (1997) study was done when debit card technologies were now being diffused throughout the United States (US). However, more recent studies have tended to find similar results. Hayashi and Klee (2003), for example, utilise data from a 2001 survey of consumers who are primarily users of the Internet. The authors find that consumers who employ new technology or computers are more likely to use electronic forms of payment, like debit cards. Payment choice also depends on the characteristics of the transaction, such as the transaction value, and the physical characteristics of the POS.

In addition, Mantel (2000) notes the importance of household wealth, but like Hayashi and Klee (2003), suggest that personal preferences (for instance, convenience, budgeting, control, incentives, involvement, security) and transaction-specific factors (for example, dollar size, variability of dollar amount, offline versus online location, and so on) are important. In terms of personal preferences, convenience, security and budgeting are self-explanatory, but control refers to the consumer's ability to review, initiate, stop and record payments. Incentives, on the other hand, deal with such benefits as reward programmes (for example, the possibility of winning a free trip or cruise), while involvement relates to the consumers' recourse to customer service to resolve any problems that may arise. For the transaction-specific factors, the availability of an appropriate payments infrastructure has a significant influence on the choice of payment instrument. Mantel argues that consumers make rational choices regarding the use of alternative payment instruments. Therefore, as debit card transactions become closer substitutes for cash and cheques, due to the availability of these payment options at the point of sale, their use should rise.

More recently, Zinman (2005) and Borzekowski *et al.* (2006) focus specifically on the issue of the adoption of debit cards. Zinman employs

the neoclassical model of consumer choice to investigate consumers' use of debit versus credit cards to conduct transactions. The author utilises data on a nationally representative cross-section of 4,442 US households from the 2001 Survey of Consumer Finances. The author reports that individuals who did not clear their balance on their credit card (revolvers), credit card holders and those individuals that are facing credit limit constraints were more likely to use debit cards. Zinman also finds that these relationships are primarily driven by the minimisation of pecuniary, time, and other transactions costs rather than personal or behavioural factors – debit card users rarely report utilising the card to control spending. Borzekowski, *et al.*, in contrast, employ data collected during March, April, and May 2004 as a special module of the Michigan Surveys of Consumers. The authors find that debit cards serve primarily as a substitute for cash and cheques, with younger, educated females being the most likely users of debit cards. Consumers also seemed to be fairly sensitive to the fees charged on debit card transactions: the authors estimate that a fee that comprises less than 2 percent of the average purchase amount is associated with a 12 percent reduction in the likelihood of employing the card. In agreement with Zinman, however, they find that less than 6 percent of the card holders used the debit card as a method of behavioural restraint. Consumers, in general, had a preference for spending from liquidity, resorting to credit cards only during periods of financial stress.

Owing to the rapid growth of electronic payment transactions, some recent studies have attempted to measure the macroeconomic benefits that stem from this means of payment. Most of these initial studies focus on the cost savings arising from utilising electronic payment systems relative to cheques. These cost savings relate to overhead costs such as maintaining a large branch network, clerks, and so on. Humphrey *et al.* (2006) use an output characteristics cost function to examine the payment sources of technical efficiency change in European banking. The authors estimate that as a result of the rise in the share of electronic payments in the European countries studied, operating efficiency increased, leading to a reduction in operating costs at banks of about \$32 billion or 0.4 percent of the gross domestic product (GDP). In Barbados, Craigwell *et al.* (2005) employ data envelope and stochastic frontier analyses to estimate the impact on efficiency resulting from the adoption of ATMs among local commercial banks. The results are very similar to those obtained by Humphrey *et al.* with the introduction of ATMs leading to a 3.5 percentage point expansion in economic efficiency.

De Grauwe *et al.* (2000) explicitly estimate the cost of card-based versus cash-based transactions. The authors report that the cost for each cash transaction (US\$2.57) in Iceland is about four-times greater than that for the payment card system (US\$0.61), while due to the relatively low use of the

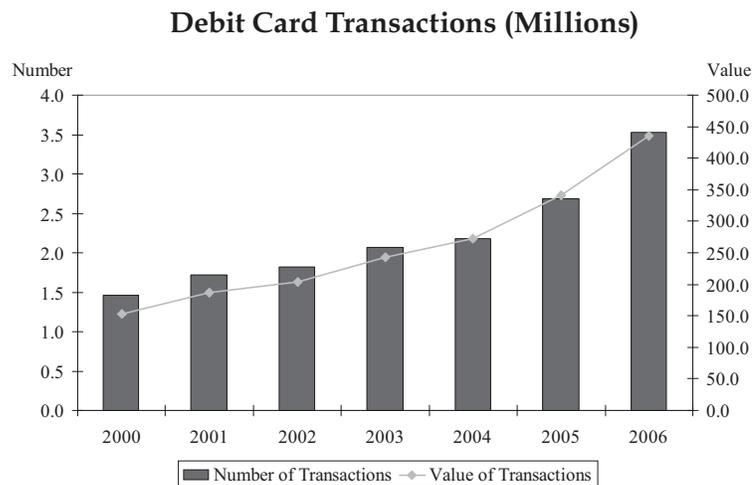
payment cards in Belgium, this system is relatively more expensive. One of the drawbacks of the approach utilised by De Grauwe *et al.* is that it does not explicitly take into account the subsequent macroeconomic benefits from switching to card based systems and may thus underestimate these cost savings. As a result, Adams *et al.* (2004) employ the GTAP computable general equilibrium model to assess the cost savings arising from card-based payment systems. The authors report that the switch to card payments increased GDP in the countries studied by between 0.1 and 0.7 percent.

Global Insight (2003) estimated a pooled econometric model that links constant dollar consumer expenditures to the share of payments done using debit cards for the period 1993 to 2002 for 50 countries. The authors report that on average a 10 percent increase in the share of electronic payments leads to a 0.5 percent expansion in real consumer expenditure. Moreover, the impact of electronic payments on consumer expenditure tends to rise as the electronic payments become more widespread. Given the direct link between overall GDP and consumer spending, any expansion in real consumer spending should have a multiplier effect on the rest of the economy.

### 3. Trends in Debit Card Use in Barbados

Debit card transactions consist of ATM transactions and POS transactions. ATM transactions are basically a method of withdrawing cash or obtaining account information, while POS transactions represent a means of payment. Figure 7.2 shows the trend in both the value and number of the total debit card transactions between 2000 and 2006. At the end of 2006, the total number of transactions reached 3.5 million, valued at \$435 million.

Figure 7.2:



There has been an upward trend throughout the period. Between 2000 and 2006, the number of transactions more than doubled, while the value of these transactions tripled. One of the most noteworthy trends shown in the figure is that transactions tend to climb even during economic downturns. At the end 2001 and 2002, as economic activity in Barbados slumped due to a slowdown in the international economy, the number of debit card transactions had grown by 260,000 and 103,000, respectively. One of the key drivers behind this robust expansion has been the proliferation of POS and off-premise ATM terminals throughout the country. Most retail establishments, from gas stations to supermarkets, now have terminals where customers can either withdraw cash or make payments using their debit card. As customers have become more familiar with ATM and POS services, and because of convenience, electronic transactions have become dominant. In addition, as a result of the inherent safety involved in the transaction for both parties, some retail establishments have been encouraging debit card payment in preference to cheques by charging high fees for returned cheques.

As a measure of the size of the debit card industry at present, one can express the value of these debit card transactions as a percentage of nominal GDP. This ratio has grown quite rapidly over the review period. Beginning in 2000, the value of debit card transactions was less than 3 percent of GDP; by 2005 the figure had doubled and at the end of 2006 it was 7 percent of GDP.

ATM transactions over the period accounted for the bulk of overall debit card activity. By the end of 2006, the number of ATM transactions had reached 2.5 million while total POS transactions were just 1 million. However, the proportion of total debit card transactions arising from POS activities has been expanding over the review period. At the end of 2006, almost 30 percent of all debit card transactions were due to POS activity, up from just 17 percent in 2000.

Although the rate of increase in POS transactions has been rising quite rapidly in recent years, there is still significant room for growth in this area. Current figures suggest that there are approximately 158,000 debit cards in circulation. However, only 15 percent of each bank's cards are active each month at POS terminals, compared to 32 percent at ATMs. The average cardholder in Barbados only uses his/her debit card four times a year for POS payments, while the average cardholder in the US utilises their card 52 times each year.<sup>2</sup> This indicates that there is still significant room for growth in the area of POS activity in Barbados. Unfortunately, the biggest hurdles to the future growth of debit card payments is the time it takes to make these payments at most retail establishments and the availability of these services. While the CarIFS network provides a fairly rapid response to debit card payment requests,

---

<sup>2</sup> Fees for POS transactions are roughly on par with those in the US: average POS fees are in the range from US\$0.25 to US\$2 per transaction.

the problem occurs on the merchant end. Most retailers are still using fairly outdated payment terminals that significantly increase the time needed to complete a POS transaction. The value of debit card transactions per card, however, is significantly higher than that for credit cards. While the average customer only takes about \$384 in new credit on each credit card, debit card customers conduct transactions valued at \$2,757 each year.

#### 4. Forecasts

This section of the report describes a framework and a methodology for forecasting the likely use of debit cards in Barbados. The framework builds on findings from prior research (discussed in Section 2). The report employs four forecasting approaches to evaluate the best technique to project debit card use on a monthly basis: (1) naïve forecasting models, (2) trend, (3) time series and (4) a behavioural model. The first three techniques only require monthly observations on the number of debit card transactions, however, the behavioural model attempts to predict future changes in debit card use by obtaining empirical estimates of the correlation between debit card transactions and other demographic and economic variables.

Before one can implement any of the naïve forecasting techniques, the series on the number of debit card transactions first has to be deseasonalised and detrended. Seasonality is basically the pattern in an economic series that repeats itself every year. For example, retail sales usually rise in December. If this is the case, debit card transactions should also be highly seasonal. One can deseasonalise a series by subtracting the seasonal factor from the actual data. A trend, on the other hand, is the relationship between debit card transactions and time. Over time, due to the diffusion of debit card terminals, one should expect that the number of debit card transactions should rise: there is a positive relationship (correlation) between time and the number of debit card transactions. Detrending a series basically implies that one is removing the trend component from the series.

The report uses the Census X12-ARIMA method to deseasonalise and detrend the debit card transactions series. The Census X12-ARIMA method is one of the most popular seasonal adjustment procedures and recently Fok *et al.* (2006), using simulation techniques, show that the technique is also one of the most robust approaches for removing seasonality from economic time series. Intuitively, the approach computes the deseasonalised series in two steps. First, the algorithm sequentially applies a set of linear moving average filters. Secondly, the outlying observations are removed.

After a deseasonalised-detrended series is obtained, one can then apply traditional naïve forecasting techniques. Two naïve forecasting techniques are

employed: random walk with a drift and exponential smoothing. The random walk model with a drift assumes that the deseasonalised and detrended debit card transactions series grows at some constant rate every year, for example, 5 percent per year. Therefore, forecasts are simply the previous month's transaction value plus the estimated monthly increase. The random walk model, however, has the undesirable property of ignoring previous observations when making forecasts. As a result, one can instead utilise the exponential smoothing model that discounts past observations in a gradual fashion – therefore, the most recent past observation obtains a little more weight than the second most recent, which in turn obtains a little more weight than the third most recent, and so on. Forecasts from the exponential smoothing model are the previous periods smoothed series plus the weighted forecast error from the last period.

In addition to naïve forecasting models, the report also employs a simple linear trend model to project future debit card trends. To predict a time series using the trend model, one first has to compute empirical estimates of the relationship between the series of interest and time. This is done using ordinary least squares – an estimation technique that minimises the errors between the actual series and estimated series obtained from the trend model. After the estimated relationship between the debit card transactions series and time is obtained, one can then utilise this relationship to project debit card use into the future. Note that for the trend model, one only removes the seasonal components from the original series.

All the approaches highlighted so far have only attempted to model either the trend or seasonal fluctuations in debit card transactions. However, there is an additional component of economic time series – cycles. Cycles are usually thought of as the general up-and-down pattern in most economic series, however, this report uses a more general definition: dynamics not captured by trends or seasonals. Time series or Auto-Regressive Moving-Average (ARMA) models attempt to model these unexplained fluctuations utilising previous values of the debit card transactions series as well as previous errors.

The final forecasting approach estimates a behavioural model of debit card transactions. Behavioural models differ from the approaches outlined so far in that it attempts to estimate the empirical relationship between debit card transactions and the likely key drivers of this activity. The literature review section (Section 2) identified a number of possible explanatory variables. The explanatory variables employed in this study are income, the dependency ratio, the proportion of the population with at least tertiary level education and deposits at commercial banks. In general, one would expect that as incomes rise, the amount of debit card transactions should also increase – there should be a positive relationship between income and debit card transactions. The dependency ratio – the proportion of the population below 15 and above 64

as a ratio of the population between 15 and 64 – accounts for the impact that age has on debit card use. The dependency ratio is anticipated to be inversely related to debit card use as younger individuals and those who are working are more likely to employ debit cards – older individuals might not want to invest the time in learning the new technology, while children (less than 15) are assumed not to be working and therefore have no interest in utilising a debit card. The literature also identified education as an important factor in the adoption of debit card technology. It is expected that there should be a positive relationship between the proportion of the population with at least tertiary education debit card transactions, since these individuals should be more willing to invest time in becoming at ease with the new technology. Finally, the larger an individual's financial assets, the greater the ability to pay for the added convenience of a debit card. One of the drawbacks of the behavioural approach is that to forecast future values for debit card transactions one also needs to have future values of the explanatory variables.

Before the projections are presented it is important to evaluate the forecasting accuracy of each approach. Table 7.2 provides estimates of the out-of-sample forecasting accuracy (evaluation period is 2005M1 to 2006M12) of the four approaches using the root mean squared error and the mean absolute percent error. For both forecast evaluation statistics, the lower the value the better the performance of the model.

Table 7.2:

## Forecast Evaluation Statistics

	<i>Exponential Smoothing</i>	<i>Random Walk</i>	<i>Trend</i>	<i>ARMA</i>	<i>Regression</i>
<i>One Month Ahead</i>					
Root Mean Squared Error	1700.3	46660.0	33875.5	11688.9	78309.0
Mean Absolute Percent Error	0.9	24.5	17.8	6.1	41.12
<i>Six Months Ahead</i>					
Root Mean Squared Error	907.4	38033.3	18595.9	18681.9	65811.6
Mean Absolute Percent Error	0.4	17.6	8.6	8.6	30.4
<i>Twelve Months Ahead</i>					
Root Mean Squared Error	11154.9	23495.4	50916.3	70276.9	2394.6
Mean Absolute Percent Error	3.7	7.9	17.0	23.5	0.8
<i>Twenty-Four Months Ahead</i>					
Root Mean Squared Error	24916.6	74681.9	118069.6	147960.1	13446.7
Mean Absolute Percent Error	6.4	19.1	30.1	37.8	3.4

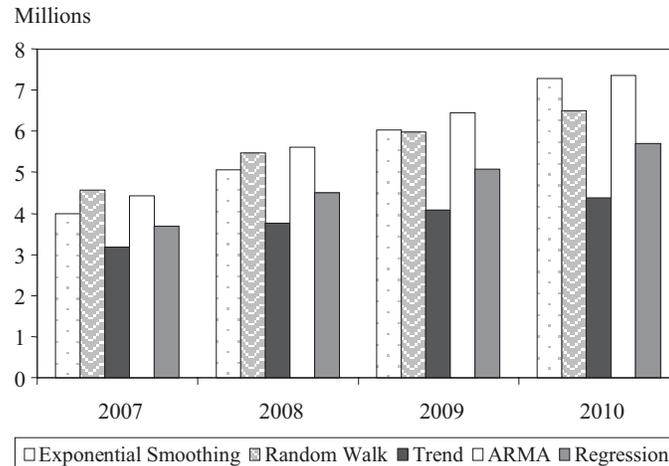
The table evaluates the forecasting performance of the models at four horizons: one month, six months, twelve months and twenty-four months. It shows that the simple exponential smoothing approach outperforms most of the other models at very short horizons – one to six months. For example, if one uses the exponential smoothing technique to project total debit card transactions for the next six months, on average, the forecast would only be half of a percentage point away from the actual value. Over longer horizons, however, the behavioural model outperforms all of the other techniques, with a forecast error of only 3 percent predicting debit card trends 24 months into the future.

Armed with this information, projections for debit card trends up until 2010 can be made. The results are provided in Figure 7.3. They show that the trend

approach produces the most conservative forecast of debit card transactions over the four-year period 2007-2010 with a rise of up to \$4 million per year.

**Figure 7.3:**

**Projected Number of Debit Card Transactions**



The ARMA model, on the other hand, provides the most optimistic predictions – 7 million transactions per year by 2010. However, the forecast evaluation statistics given earlier, revealed that the projection errors for these models are fairly large over long horizons. A more accurate estimate is more likely to be produced by either the exponential smoothing or regression approaches. Using these two techniques, one should expect annual debit card transactions in the range of \$5.5 million to \$7 million per year by 2010. These figures suggest that revenues from debit card transactions should rise by between \$1 million – \$1.6 million over the next four years.

## 5. Conclusions

The paper finds that over the review period, 2000-2006, the number and value of debit card transactions grew quite rapidly: the number of transactions more than doubled during the period while the value of these transactions almost tripled. Given this rapid rate of expansion, the industry has developed in importance to the domestic economy. At the end of 2006, the value of debit card transactions had reached 7 percent of GDP. Most of these transactions are, however, due to ATM activities, with POS transactions rising quite quickly, but still fairly small in levels. Indeed, per capita POS transactions in Barbados are just 4 compared to 53 for the US.

Given this rapid rate of expansion, the paper, therefore, attempted to project future trends in the industry over the medium term. The results indicate that the industry could experience continued robust growth. The forecasting models employed imply that the number of debit card transactions could rise from just 3.5 million at the end of 2006, to almost 7 million by the end of 2010.

The projections provided in the paper implicitly assume that there are no significant changes to the domestic economic and/or financial landscape in the medium-term. Consequently, it is possible that the actual outturn for CarIFS in Barbados could either be below or above the projected outcomes. It is therefore also important to identify the key opportunities and threats that debit cards face in the medium- to long-term. One of most exciting opportunities is the formation of regional debit card network that allows customers that hold a debit card from participating banks to make ATM withdrawals and POS transactions anywhere in the region. In most countries, there have been consolidations through mergers and acquisitions of debit card networks. While a number of factors account for this trend, the most important one is the network effects or economies of scale of operating larger networks. Debit card technology requires a significant initial capital investment. However, as more transactions are sent through the network, the per transaction costs fall. For example, rather than using the local debit card network only for domestically issued cards, one could allow cards issued from regional participating banks to access the network. As more transactions are routed through the network switch, the cost per transaction drops significantly. Thus, networks throughout the region should have a significant cost incentive to consolidate.

Carlton and Frankel (1995) examine the results of a network merger between two regional shared ATM networks in Chicago. They found that average network operation costs fell 66 percent just one year after the merger, while the number of transactions rose by 108 percent. This huge growth in participation occurred despite the imposition of foreign fees on customers who used ATM terminals owned by other banks. There is already evidence of demand for this service as a number of attempts to conduct transactions in other Caribbean countries have been reported by the CarIFS network.

Another important opportunity for debit cards is the ability to conduct online bill payments. At present most Internet-based bill payments are done either using the online banking services at a particular bank or credit cards. However, it is possible to link with merchants or utility websites to facilitate online payment using debit cards. The payment system is very similar to a credit card. The consumer visits the utility company's site and is prompted to enter their card information. The utility company then sends the transaction details over the CarIFS network to either approve or decline the transaction.

The CarIFS network also faces potential threats to its future performance. Internationally, the emergence of offline debit cards has significantly reduced the share of transactions done using online debit cards. Online debit cards, such as the CarIFS network, provide immediate payment of transactions at merchant terminals. With offline debit cards, the physical components of the network consist of POS terminals, a telecommunication connection, apparatus that route transaction information to appropriate parties, and computers that store deposit and transact information. The procedure for authorising debit transactions is then similar to that of credit cards. Indeed, the two biggest players in the offline debit card industry are run by Visa and Mastercard and essentially piggy-back off the credit card networks. Visa's offline debit card is known as the Visa Check Card, while MasterCard refers to its product as MasterMoney.

Commercial banks have a strong incentive to promote offline debit cards because of the higher interchange fees obtained compared with online debit cards. Merchants on the other hand would prefer online debit cards due to lower interchange fees. The consumer for the most part might be indifferent: online debit cards offer more security, but offline cards offer the consumer the convenience of using his card wherever credit cards are accepted. One way online debit cards have sought to shift the consumer to their side in overseas markets is by offering the customer the option to get cash back at any POS terminal. This system could be considered for Barbados.

### References

- Adams, P. D., Dixon P. B., and Rimmer, M. T., 2004, "The Macroeconomic Effects of Reductions in the Costs of Facilitating Payments," *Centre of Policy Studies*, Monash University, Australia.
- Borzekowski, R., Kiser E. K., and Ahmed, S., 2006, "Consumer's Use of Debit Cards: Patterns, Preferences, and Price Response," *Finance and Economics Discussion Paper Nos. 2006-16*, Federal Reserve Board, Washington, DC.
- Carlton, D. W., and Frankel, A. S., 1995, "Antitrust Payment Technologies," *Federal Reserve Bank of St. Louis' Review*, Vol... pp. 41-54.
- Craigwell, R., Coppin K., and Moore, W., 2005, "Financial Innovation and Efficiency in the Barbadian Banking Industry," *Money Affairs*, Vol. 18, pp. 83-100.
- De Grauwe, P., Buyst E., and Rinaldi, L., 2000, "The Costs of Cash and Cards Compared: The Cases of Iceland and Belgium," *University of Leuven*, Leuven, Belgium.
- Fok, D., Franses P.H., and Paap, R., 2006, "Performance of Seasonal Adjustment Procedures: Simulation and Empirical Analysis," In Mills, T.C. and K. Patterson (eds), *Palgrave Handbook of Econometrics*, Vol. 1, pp. 1035-1055.
- Global Insight, 2003, "The Virtuous Circle: Electronic Payments and Economic Growth," *White Paper* prepared by Visa International Global Insight, Inc.
- Hayashi, F. and Klee, E., 2003, "Technology Adoption and Consumer Payments: Evidence from Survey Data," *Review of Network Economics*, Vol. 2, pp. 175-190.
- Humphrey, D., Willeson, M., Bergendahl G., and Lindblom, T., 2006, "Benefits from a Changing Payment Technology in European Banking," *Journal of Banking and Finance*, Vol. 30, pp. 1631-1652.
- Kennickell, A. B., and Kwast, M. L., 1997, "Who Uses Electronic Banking? Results from the 1995 Survey of Consumer Finances," paper presented at the *Annual Meetings of the Western Economic Association*, Seattle, Washington.

- Mantel, B., 2000, "Why Don't Consumers Use Electronic Banking Products? Towards a Theory of Obstacles, Incentives, and Opportunities," *Emerging Payments Occasional Paper Series* Nos. EPS-2000-1, Federal Reserve Bank of Chicago, Chicago, Illinois.
- Moore, W. R., 2006, "Trends in the Barbadian Credit Card Market," *Central Bank of Barbados' Economic Review*, Vol. 33, pp 25-32.
- Zinman, J., 2005, "Debit or Credit?" *unpublished paper*, Dartmouth College, New Hampshire, US.