Does Spending Respond to Credit Card Statement Date: Evidence from India[1]

Sumit Agarwal[α], Amit Bubna[β], and Molly Lipscomb[μ]

Abstract

While the permanent income hypothesis suggests that consumers should smooth consumption over time, existing literature provides several examples of consumers failing to smooth consumption evenly across time, even when their income streams are predictable. We use a unique panel dataset of credit card and debit card transactions of consumers at a large bank in India over the period 2006-2008 to study consumers' spending response to the credit card statement date. This dataset provides us with a full picture of all financial accounts the household has at one of the largest banks in India, and therefore serves as a good proxy for the census of the household's non-cash financial transactions. Mental accounting models suggest that the statement date acts as a mechanism to close the mental account for the last month's spending and start fresh for the next month's spending. We find that credit card spending increases by 10% in the week following the receipt of a credit card statement, consistent with mental accounting models. As a falsification test, we estimate the effect of the statement date on debit card spending. We find no effect of credit card statement date on debit card spending. Furthermore, we do not find spending impacts from the credit card payment date.

JEL Classification: G2, D1, D8

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[α] National University of Singapore and Federal Reserve Bank of Chicago
[β] Indian School of Business
[μ] University of Virginia

1. Introduction

There is a growing literature studying the extent to which consumers smooth consumption over time, much of which demonstrates that inconsistent with the permanent income hypothesis, consumer expenditure is not smooth even where income is highly predictable. Stephens (2003) uses daily expenditure data from the CES and finds that social security recipients spend significantly more in the days following the third of the month, when they receive their social security checks. Shapiro (2004) uses daily caloric intake data on food stamp recipients in the US and finds that recipients choose a pattern of declining consumption between monthly food stamp payments. Huffman and Barenstein (2005) use the Family Expenditure Survey of U.K families to track daily expenditure following the most recent paycheck over fourteen days and find a pattern of declining consumption expenditure between paydays.[2] We provide evidence on intra month spending responses to credit card statement date. If consumers smooth consumption, then consumption should not respond to the statement date which has been randomly assigned to each consumer by the financial institution. Our results show that spending increases by 10% in the first week after the statement date.

Credit cards provide a financial mechanism that households use for consumption smoothing purchases, but they also can trap consumers into cycles of debt. Understanding how consumers use their available credit and the mechanisms through which consumption smoothing may fail helps us to understand the welfare implications of the recent record levels of growth in consumer credit. Our results suggest that consumers are engaging in mental accounting--using one financial tool until the balance has reached their mental "limit."

[2] Agarwal and McGranahan (2012) study the spending response to state tax holidays and find that spending rises by as much as 100% on the day of the state tax holidays.

Mental accounting provides a behavioral explanation for the failure of consumers to smooth consumption within a month. Heath and Soll (1996), propose that consumers allocate and track expenses by category (i.e. food, entertainment and clothing), and their purchases are guided by the money available in each category. Hence, future spending is inversely related to past spending within a category.

We use a unique transaction level data set over a 30 month period from one of the largest financial institutions in India to analyze the amount of consumption smoothing practiced by consumers across a month. The mental accounting model suggests that consumers compartmentalize spending by category–credit cards, home improvements, children's education, etc. When the card-holder receives their monthly statement, they reset their mental account for the credit card balance in each compartment to zero, allowing them increased perceived freedom to spend on credit cards. We are also able to distinguish heterogeneous spending behavior across length of credit tenure, demographics, salary, savings and checking account statements, and credit card statement.

Behavioral hypotheses about the use of credit are empirically difficult to test; they require large amounts of data and exogenous changes affecting spending. In addition to unique transaction level data for nearly 3000 consumers who use credit cards, we exploit the exogenously assigned credit card statement date as a source of identifying variation. The statement date for each credit account is assigned by the bank in order to optimize their liquidity and cash flow. Statement dates are well distributed across the month (see figure 5), and statement dates for particular accounts change across months when the assigned statement date falls on a Sunday. We exploit this variation to analyze consumer choice between the use of credit and debit accounts across the month.

To test our basic hypothesis that consumption responds to the statement date, we use distributed lag models with statement payment date as the exogenous event; we study the impulse response of credit card spending. We find that consumers increase the use of their credit card on the first two days until day ten after their credit card statement is issued. Specifically, we find that credit card spending is 10% higher in the first ten days after the credit card statement is issued. This is both economically and statistically significant. We use the consumers' debit card spending to conduct a falsification test. We also show that debit card use is uncorrelated with the credit card statement date. Consumers time the use of the credit card to the issuance of the credit card statement. Finally, liquidity constrained consumers (low credit limit) have stronger spending responses to receipt of the credit statement than high-income consumers.

The remainder of the paper proceeds as follows. Section 2 outlines institutional details and outlines the characteristics of our unique transaction level dataset from India, and provides the summary statistics and the methodology for the event study, section 3 discusses the results, and section 4 concludes.

2. Institutional Details, Data and Methodology

We use a unique proprietary dataset from one of the largest five domestic private commercial banks in India. All customers have a savings account with a debit card which pays a nominal interest rate on the monthly balance. The bank also issues credit cards and offers home loans, auto loans and personal loans which can be tracked through each consumer's savings account. We restrict the analysis to consumers who have both a credit and debit card, as the substitution between the two methods of spending is our primary interest for the purpose of this paper.

2.1 Data

The dataset provides demographic information on each account holder including gender, marital status, age and the city in which they reside. Account information is available from January 2006 until May 2008 or the closing date of the account. Our data includes all information that typically appears on the monthly statement. For credit cards, this includes: minimum payment, balance due, amount paid, statement date, payment due date and date the payment was actually made. For liability accounts, the dataset provides information on the average monthly balance in the account as well as balance at the end of the statement period. Transaction level information, such as transaction date, merchant category code and amount spent on the transaction, is available for both credit cards and debit cards. We exclude bill payments from the debit transactions since most bills cannot be paid with a credit card.

There are 2,880 account holders in our sample with both a credit card and a debit card with transactions occurring over three years. Table 1 provides summary statistics for these account holders. While our sample is not representative of the general population, it is typical of financial services clients in India. Most account holders are married men, the average account holder age is 30, and 75% live in one of the largest 10 cities in India. Table 1 also shows summary statistics for clients with either only a credit card or a debit card. Comparison of demographic characteristics of these classes of consumers shows that they are similar along observable characteristics. While the largest group of consumers have both credit and debit cards, a significant number of consumers have only a credit card. On average credit card only consumers are more often male and relatively older than consumers with both a credit and a debit card while debit card only consumers are more somewhat more frequently female and close in age to those with both debit and credit cards.

It is possible that the three groups identified above also differ on unobservable characteristics which are related to spending. We consider the sample of individuals who have both a debit and a credit card, and analyze the use of credit cards within the month relative to the use of debit cards within a month.

Table 2 reports summary statistics on spending by individuals who had both debit and credit cards. Average daily spending on credit cards is Rs 173 and average debit card daily spending is Rs 35. Credit card transactions are three times as frequent as debit card transactions and occur in one tenth of days, but the distribution is very flat—while many consumers have very few debit and credit transactions, some consumers use both cards frequently. The average consumer has had a credit card for 1.3 years, but some consumers acquire their credit cards over the sample period—there is some evidence of learning among consumers new to using credit cards.

Figure 1 shows the frequency by transaction amount in the use of debit and credit cards over our sample period, January 2006 to May 2008, among those who use both debit and credit cards. Debit cards tend to be used for small transactions while individuals use credit cards for larger transactions.

Figure 2 shows the frequency of credit and debit card transactions over the sample period. Both cards show a rising trend in terms of the number of transaction each month. Credit card transactions do rise with the tenure of credit and debit cards, but this trend also tapered towards the beginning of 2008 in response to the financial crisis. Figure 3 reports the kernel density of credit and debit card payments. These graphs show that there is a long right tail as a few large purchases are made in both cases (the figures are cut off at 5000 rupees). Median debit card spending is 645 rupees, while median credit card spending is 935 rupees.

Figures 4 A and B plot the frequency and size of credit and debit card transactions over the three years of the sample. On average, credit card spending and frequency are higher than debit cards; the transaction frequency is three times higher while the amount spent is five times higher, suggesting that consumers use credit cards for larger purchases. However, the graphs suggest a positive correlation between debit and credit spending. We estimate regression models of credit spending as a function of debit spending both over time and exploiting within-person within-month variation (controlling for month/person fixed effects) and still find very small positive but significant effect of debit spending on credit spending.

There are two key factors which may drive within month spending on credit cards and debit cards: credit card statement date and the receipt of a paycheck. The statement date for credit cards is randomly distributed across the days of the month (Figure 5), but it is common for individuals to receive their paychecks around the first of the month (figure 6). So, if consumers intensively use their credit card (relative to the debit card) after the statement and intensively use their debit card (relative to the credit card) after the pay check day, then we can account for the weak but positive correlation between credit and debit spending within a month. We explore consumer timing of debit and credit transactions in greater detail below.

2.2 Methodology

The summary statistics are suggestive of a preference among consumers for credit over debit use, but a persistence in debit card use despite the relative benefits of credit. To better understand the underlying mechanisms motivating consumers to use their debit cards, we run distributed lag models of debit and credit card usage with account fixed effects. The results are presented in the next section.

We begin with the intra-month account-level data, focusing on overall spending on credit cards and debit cards. Let $S_{i,t}$ represent the amount of spending on debit or credit cards by account *i* at the end of each day *t*, let $I_{i(t)}$ be an indicator for *i* was issued her credit card statement on day t, $I_{i(t-1)}$ be an indicator for *i* was issued her credit card statement 1 day prior to day t, $I_{i(t-2)}$ be an indicator for whether i was issued her credit card statement 2 days prior to day t, etc. $I_{i(t)}$ is the excluded variable, so all coefficients are in comparison to the day the statement is issued.

$$S_{i,t} = \alpha_i + \sum_{d=1}^{31} \beta_{i(t-d)} I_{i(t-d)} + \gamma' X_t + \varepsilon_{it} \qquad (1)$$

The *marginal* coefficients β_1, β_2, …,β_{31} measure the *additional* spending each day after the issuance of the credit card (day 1-day 31) relative to the day the statement was issued. The *cumulative* coefficients $b_s \equiv \sum_{1}^{s} \beta_t$ gives the *total* additional spending after *s* days, *s =1-31*. X_t is a vector of controls which include month, year, and weekend fixed effects.

3. Results

We begin by estimating the average response of credit and debit card spending to the credit card statement date. We then examine the heterogeneity in response across different types of account-holders by age, gender, marital status, location (urban versus rural), credit limits, and account tenure. Some consumers are more responsive to the credit card statement date than others. For example, consumers who have had credit accounts for longer periods of time are more accustomed to using their cards and tend to use them more frequently and charge larger amounts. We also distinguish between groups that are liquidity constrained as measured by credit limits, and examine the responses of different demographic groups: male versus female, urban versus rural, young versus old, etc. In the robustness section, we test the impact of

statement date after controlling for the paycheck date—we find that the statement date effect is robust to the inclusion of day of the month controls. In addition, we conduct a falsification test, randomly assigning the statement date in order to observe whether the effect is an artifact of the specification. The statement date effect is no longer observed when the statement date has been randomly assigned.

For ease of exposition, we present the results from the distributed lag models as graphs plotting the entire path of the cumulative spending on credit cards and debit cards as response to the credit card statement date. The underlying regression coefficients are in the appendix tables for the baseline graphs and the remaining regression results are available upon request.

3.1 Baseline Specification

Figure 7 reports the results of specification (1) with credit card spending and debit card spending as the dependent variables. The figure graphs the entire path of *cumulative* coefficients b_s, s = 1-31[3] where s is the number of days since the statement has been issued. The results can be interpreted as an event study, with day 0 being the time of credit card statement date, $s = 0$ in event time. This is similar in structure to other work that has been done in household finance (see, for example, Agarwal, Liu, and Souleles, 2007).

There is an immediate increase in credit card use of Rs. 32 and Rs. 28 on the first and second day following the issuance of the credit card (see Figure 7A and the Appendix). These are both statistically and economically significant. Average daily credit card spending is Rs. 135, so an average increase on the first day following issuance of the statement of Rs. 32 is a 24% effect--economically this is an important sized effect.

[3]In the appendix we report the *marginal* coefficients $\beta_1, \beta_2, \ldots, \beta_{31}$ for credit and debit card spending and the frequency counts. The regression results for the heterogeneous and robustness analysis is available upon request.

After the statement date, subsequent spending is towards the next month's bill and credit card holders can spend knowing that their purchases will not be billed until the next month. This behavior could also be consistent with models of mental accounting (Prelec and Loewenstein, 1998) and bounded rationality (Laibson, 2002). A card holder does not want to overspend and so reduces transactions after reaching some threshold, but once they have the start of a new month, they can spend more.

The increased spending response lasts beyond the first few days after the statement date. The largest response to the issuance of the credit card statement occurs within the first ten days of the month. The cumulative effect over the first ten days is Rs. 145. This implies that over the first ten days following the issuance of their credit card, on average consumers increase their spending by on average an entire day's worth of purchases. This increase in spending can also be interpreted as 11% of the total spending on the card over the ten days (Rs. 1350). After ten days the spending flattens and subsequently declines.

Additional spending in days 11-20 drops to Rs. 45 and is not statistically significantly different from zero as consumers return to baseline spending levels. Comparing the response of the first 10 days and the next 10 days, we show that they are statistically significantly different from each other. In days 21-30 we see a negative response as people have hit their spending thresholds for the month. The fact that there is no response from day 11 to 20, and then a negative response thereafter is consistent with our hypothesis that cardholders spend an extra 11% on their card because they have liquidity, but subsequently they want to preserve liquidity on their card and may switch to debit cards.

As debit card transactions are a close substitute for credit card transactions, we also compare the response of credit card spending to credit card statement date to the response of

debit card spending to credit card statement date. If the response was an overall spending effect rather than a consumer's optimization of the use of their credit card, we would expect to see the effect in the debit card use as well. However, debit card response to the credit card statement date is small and not significant. In the short term we see a response of Rs. 1 on the first day and Rs. 0.1 on the second day in debit card spending (figure 7B). Over the first 10 days the total response is Rs 25, and then an additional response of Rs. 50 days 11-20. Spending in the first ten days is not statistically significantly different from spending in the second ten days. Over the full month we do see a positive cumulative response of debit card spending to the credit card statement date, this may be indicative of some switching toward debit after consumers reach their spending threshold with their credit card, but this also could be a result of other factors confounding the effect by impacting spending late in the month. For instance, if consumers get paid 10 days after the credit card statement, they may be responding to that by using their debit cards. In the robustness results we control for the payday and find that the long term response of the debit card to credit card statement date is not statistically significant.

Figures 7c and 7d show the impulse response of credit and debit card daily transaction count to the credit card statement date. Consumers are 1.3% more likely to make a credit card transaction in the first day following the issuance of the credit card statement and 0.7% more likely to make a credit card transaction in the second day following the issuance of their credit card statement. Compared to an average probability of making a credit card transaction of 9%, a 1.3% effect is an increase of 15% on the first day following the issuance of the credit card statement. The overall response over the first ten days following the issuance of the credit card statement is an increase in transactions by 10%. In days 11-20 there is an equal decline in transactions. This suggests that consumers do increase both the frequency of credit card

transactions and the spending on their credit cards in response to the credit card statement. In the long term, we do not see any response to the statement date. In contrast, the frequency of debit card transactions does not respond to the issuance of the credit card statement.

3.2 Price Differences in Response to Credit Card Statement Date

While consumers who pay their credit statement balance each month (transactors) are not subject to interest on new purchases, consumers who revolve balances (revolvers) pay interest not only on balances from previous months, but also on new purchases. Therefore, consumers revolving balances should not respond to credit card statement dates as they no longer benefit from the grace period credit cards allow transactors. Therefore we should expect to find a differential response for transactors.

Figure 8A shows the response to the statement date of credit card spending for revolvers. Consistent with the intuition, the response in the first few days of the month is small and not statistically significant. Over the course of the month, the response remains statistically insignificant and the sign becomes negative. These consumers cut their spending after receiving their statement, either because they are liquidity constrained or the statement reminds them of their indebtedness. There is no significant response to the statement date in debit card spending among the revolvers.

Figure 8C shows the credit card spending response for the transactors to the credit card statement date. The immediate response is a statistically significant Rs. 61 and Rs. 49 in the first two days. Comparing these responses to the revolvers of Rs. 10 and Rs. 12 for the first two days, they are statistically different from them as well. In the longer horizon, we see a cumulative response of Rs. 267 over the first 10 days. This is an increase of 13% in total spending by the

transactors over the first 10 days (average daily credit card spending by transactors is Rs. 207). Interestingly, the response for the transactors continues to rise until day 20. Transactors tend to have higher credit limits and so they can use the credit card for a larger percentage of their total monthly spending. Figure 8D shows the debit card spending of the transactors as a function of credit card statement date. We find that their response is statistically and economically insignificant for the first 10 days, but then spending increases as transactors switch away from relying solely on their credit cards.

3.3 Learning and Liquidity Differences in Response to Credit Card Statement Date

Learning is important for credit card consumers as they gain experience in timing purchases to the issuance of their credit card statements. In figure 9A, we see that account holders who have held their credit cards for less than two years (low tenure credit card accounts) have flat spending over the month, and no response to the receipt of their credit card statement. Account holders who have held accounts for more than two years have a strong response to the credit card receipt—in the first days following the receipt of the statement spending increases and is statistically significant. In later days following the issuance of the statement, high tenure consumers actually reduce spending relative to the baseline, having weighted spending toward the days immediately following receipt of the credit card statement.

Liquidity concerns are an additional reason that consumers may react differently to credit card statement dates. If consumers want to preserve liquidity on their credit card in case of unexpected negative shocks, we should see that consumers with higher credit limit have larger credit card spending responses to the statement date than consumers with lower limits. The average credit limit is Rs. 44,000. We segment the card holders into high and low limit at Rs.

40,000 (Figure 10a, b, c, d). We do see that the high limit card holders are more likely to use the card more persistently than the low limit card holders.

3.4 Demographic Differences in Response to Credit Card Statement Date

Demographic differences in terms of financial astuteness are important for policymakers. Single and female consumers in India and other developing countries tend to have less access to financial services and they are more risk averse. Understanding differences between demographic group's ability to take advantage of financial products could help in designing products and regulations adapted to the needs of specific groups.

Figure 11a and 12a show the credit card spending response to the statement date for males and married card holders. We see similar responses as we see for the overall sample, but the credit card spending response is much stronger and persistent for the first fifteen days. The average long term response is Rs. 200 at day 10. Males and married card holders are more likely to optimize by spending more in response to the statement data. The response on the debit cards for males and married card holders (Figure 11b and 12b) are also similar to the overall response. Looking at the responses for females and singles, we do not see any such pattern, presumably either due to lack of experience with these types of financial products or liquidity constraints.

In India, credit and debit cards are more commonly accepted by vendors and shops in urban area than rural areas. We segment the data by accounts located in the 10 largest cities in India; these accounts comprise 75% of the card holders in our sample (Figures 13a, b, c, d). The credit card spending effect is somewhat larger in urban areas as there is a larger increase in the first days following the credit statement, and a larger decrease toward the end of the statement period. Credit card spending is relatively flat for rural card holders, although the smaller sample

size makes it difficult to distinguish whether there is an effect. There no response in rural debit card spending to credit card statement date. Since, on average, the rural card holders are not likely to receive a salary, this is consistent with our hypothesis that once we account for the payday, the debit card responses should disappear, since they are confounded.

In figures 14a and c, we show the response rate by age; older card holders are less likely to be highly educated and less accustomed to new financial products. In younger card holders, we continue to see the cyclical spending effect: spending increases in the first few days following the receipt of the credit card statement, and decreases in the second half of the month. Older consumers do not have the same cyclical spending tendencies. Their spending has no statistically significant changes across the month.

3.3 Robustness

While we have focused on the response of consumers to the credit card statement date in terms of both credit and debit spending, spending may be confounded by correlation across months between statement date, payment of the credit card statement, and pay check receipt. While there is no theoretical reason that credit card payment should affect spending across the rest of the month, if mental accounting rather than rational optimization across the month is driving behavior, credit card payment may trigger increased spending as consumers reset the balance of their accounts to zero. Figure 15 shows the response of credit card spending to the credit card payment date. Consistent with our predictions, we see no significant response of credit card spending to the payment date. However, these results are taken only as suggestive, as statement payment date is endogenous. A consumer can choose to pay off the credit card to time it to their large upcoming spending.

Paycheck receipt is could alter spending as there is increased liquidity in the savings account. We find that paycheck receipt does not have a statistically significant effect on credit use (see figure 16a), but it does strongly affect debit spending (figure 16b). Debit spending is highest immediately after the receipt of the paycheck, and decreases over the remainder of the month.

The paycheck effect on debit spending could have a feedback effect on credit spending if there is some correlation between paycheck date and statement date. Therefore, we consider the response of debit card and credit card use in the days following both the statement date and payday by including indicators for both the number of days from payday and the number of days from statement date in the specification. This is a particularly strict specification—it requires the credit card statement date effect to remain despite each day of the month being separately controlled for through the days from paycheck indicators.

We find that the credit card statement effect in the beginning of the month remains. Spending in the first ten days of the month is positive and statistically significant. It is also significantly different from both days 11-20 and days 21-30. Debit card spending does not have a statistically significant response to statement date, but it does have a significant response to paycheck date. In sum, there is a one-to-one relationship between the event and the specific card whose usage the accountholders choose to alter. Credit card spending responds to credit card statement date and debit card spending responds to the payday.

Our identification relies on the fact that the statement date is randomly assigned and is not set at the request of the cardholder. We conduct a falsification test in order to check that our results are not driven by an artifact of our specification. We randomly assign the number of days each day of the month is located from the statement date to each account in each month and

estimate our distributed lag model. Figure 17 shows the estimated results with the random assignment of the statement date. We do not see any response of credit card spending when the days since the credit card statement have been randomly assigned.

4. Conclusion

According to Soman (2001) payments activate the pain of departing with money resulting in spending aversion, diminishing over time. Soman and Lam (2002) test the above hypothesis on a small sample of long distance telephone users and find that telephone usage is lowest the day after their monthly bill payment and then rises with time, supporting their theoretical argument.

We use distributed lag models to estimate the day-by-day response of debit and credit card spending to credit card statement date and pay check receipt day. We show that consumers who have both credit and debit cards without any binding liquidity constraints use debit cards to time their purchases to their paycheck and use credit cards to time their purchases to their statement date. Over the three year period, we find that consumers learn to use credit cards over debit cards.

Financial literacy and the astuteness of financial decision making among the growing population being targeted by fast expanding financial services markets in developing countries is important in determining the necessity of increasing financial regulations in these new markets. While free access to new financial products cannot reduce the welfare of consumers who understand the financial products and make informed decisions about their use, policy makers may be concerned about less knowledgeable consumers becoming trapped in debt after

incorrectly using consumer credit. This paper provides evidence on the extent to which different types of consumers optimize their use of closely substitutable financial products.

There have been diverging trends in payment behavior around the world. Europe has experienced a significant increase in debit use at the expense of cash and checks but the market share of credit cards has remained flat and low. On the other hand, the US has experienced a significant increase in the use of credit cards at the expense of checks and cash and the market share of debit is flat and low. Rational models suggest that use of credit is optimal but behavioral models suggest that debit use promotes self-control. This paper provides evidence on the relative use of debit and credit by one of the largest new target consumer bases for consumer finance: consumers in developing country markets.

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Table 1: Demographic Summary Statistics

Debit and Credit Account Holders	Observations	Mean	Std. Dev.	Min	Max
Age	2882	30	6.499067	20	73
Married	2882	0.899	0.300883	0	1
Male	2882	0.851	0.356349	0	1
Credit Card Accounts only					
Age	1874	33.456	8.82	19	72
Married	1874	0.8714	0.334757	0	1
Male	1874	0.8821	0.32249	0	1
Debit Card Accounts only					
Age	862	30.162	6.676	21	63
Married	862	0.9095	0.286897	0	1
Male	862	0.7865	0.409778	0	1

Table 2: Summary Statistics of Financial Transactions

Daily Transactions	Obs	Mean	Std. Dev.	Min	Max
Daily Debit Transactions	1018359	0.030	0.209844	0	11
Daily Debit Spending	1018359	35.388	476.6957	0	50000
Daily Credit Transactions	1018359	0.094	0.378383	0	9
Daily Credit Spending	1018359	173.504	1545.284	-4	257557
Credit Limit	1018359	55981	47893.2	0	548300
Number of years credit account open	1018359	1.257	1.168775	0	8
Account Holders	Observations	Mean	Std. Dev.	Min	Max
Daily Debit Transactions	2882	21.21	31.03921	1	517
Daily Debit Spending	2882	24898.92	45928.61	1	991717
Daily Credit Transactions	2882	38.93	47.99839	0	890
Daily Credit Spending	2882	73750.84	116037.2	0	3473840
Credit Limit	2882	53968	45410.96	0	548300

Figure 1: Frequency Counts of Transaction Amounts

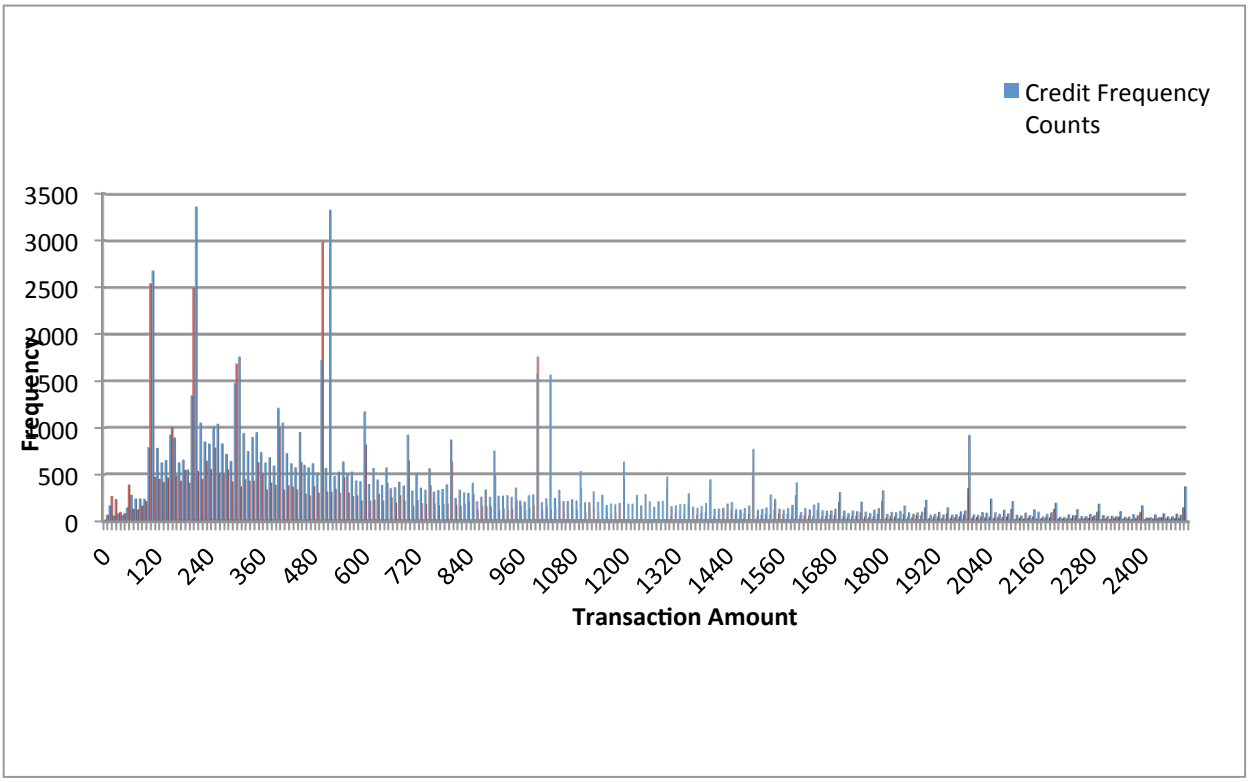


Figure 2: Number of Transactions by Date

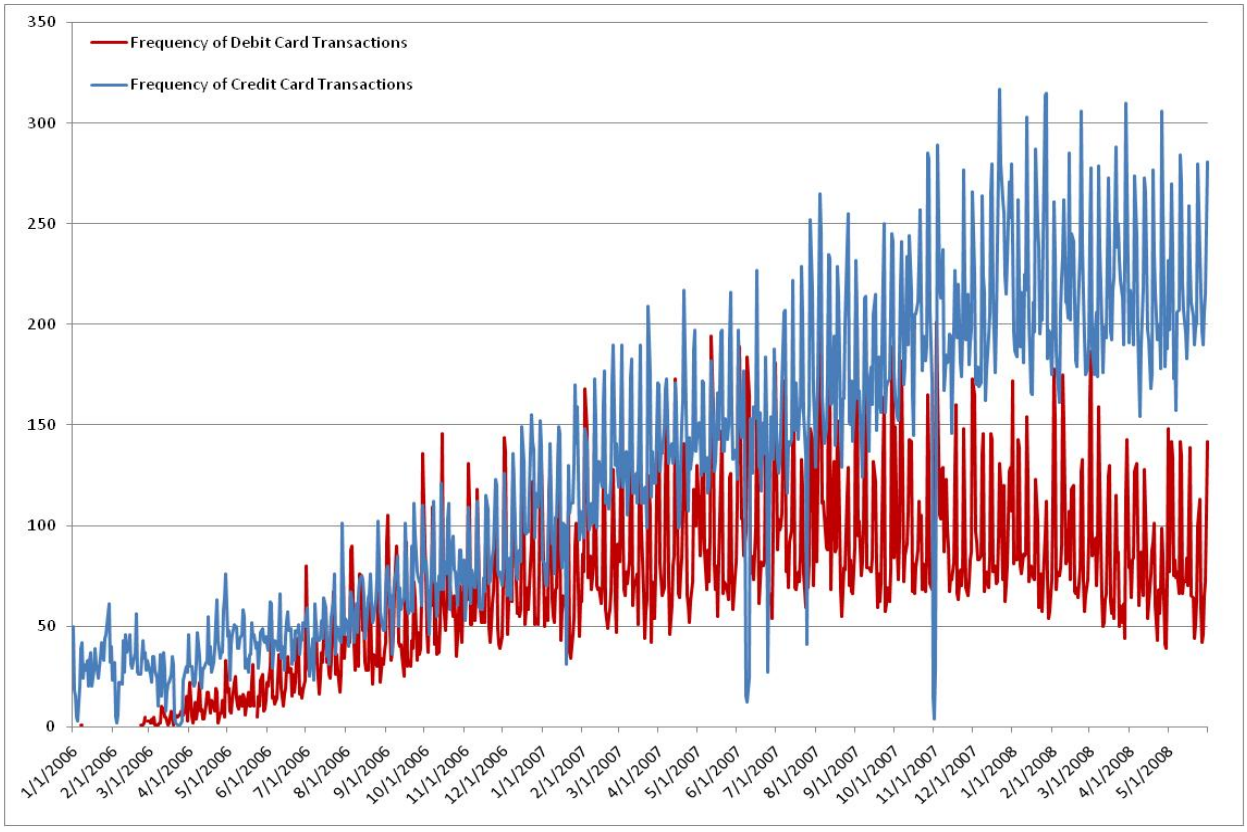
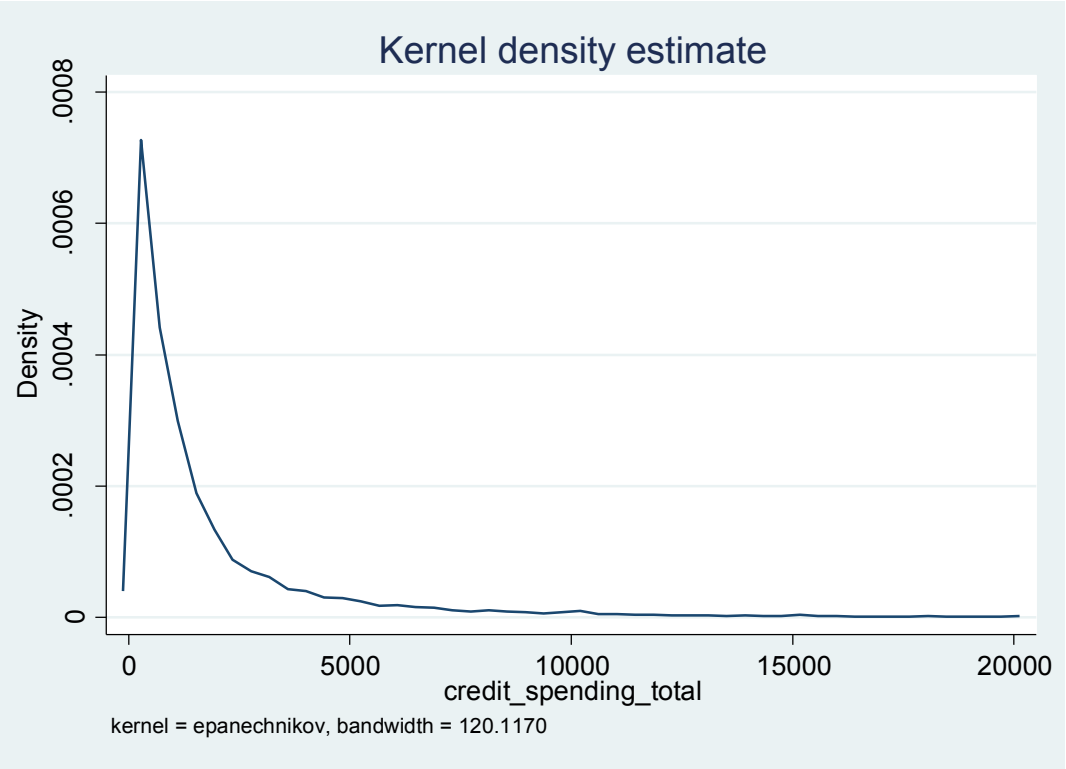


Figure 3: Density of Credit and Debit Card Spending (Rs.)



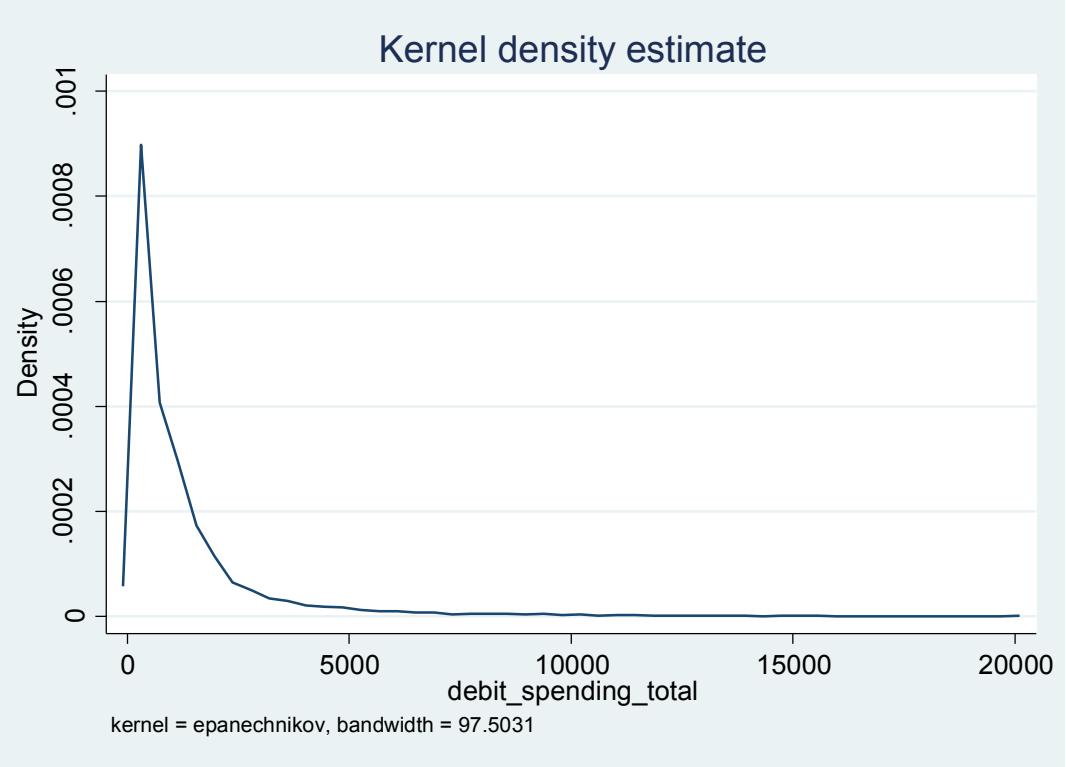
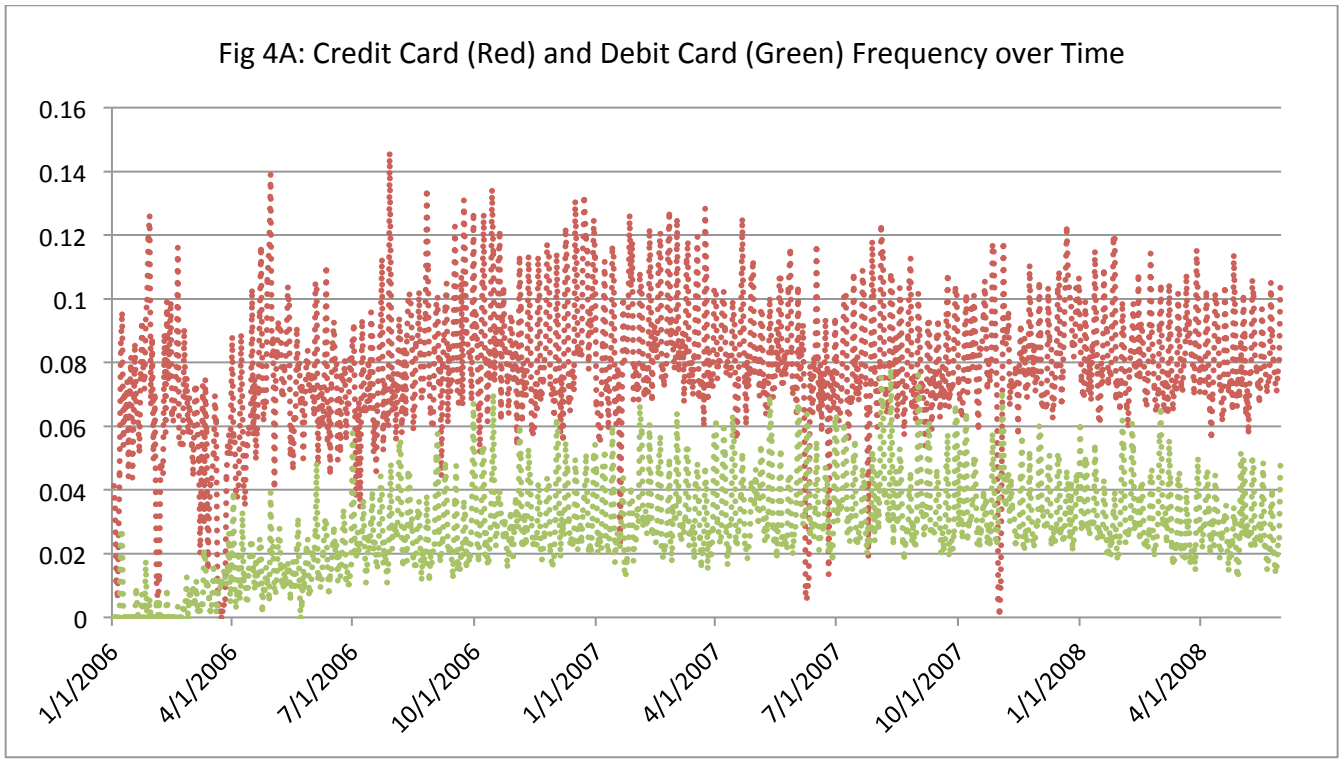


Figure 4: Transaction Amounts and Frequency for Credit and Debit Spending over time



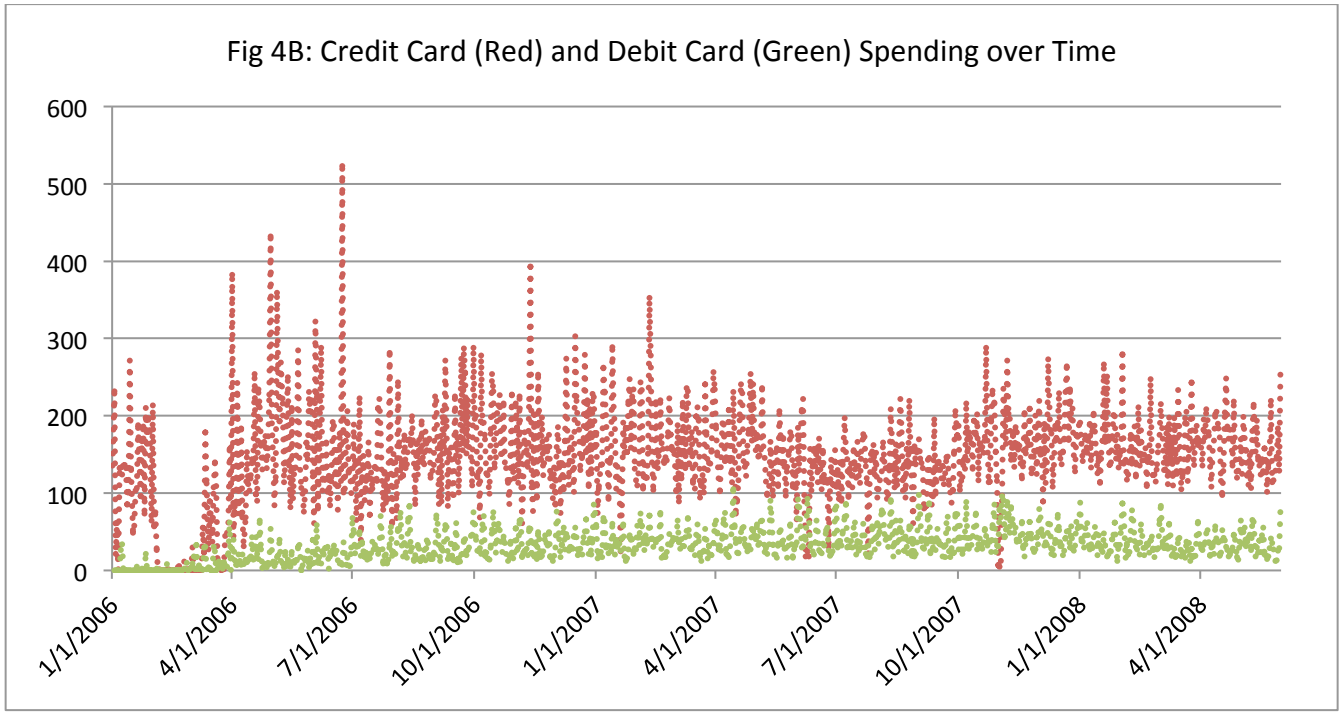


Figure 5: Credit Card Statement Payment Day Frequency

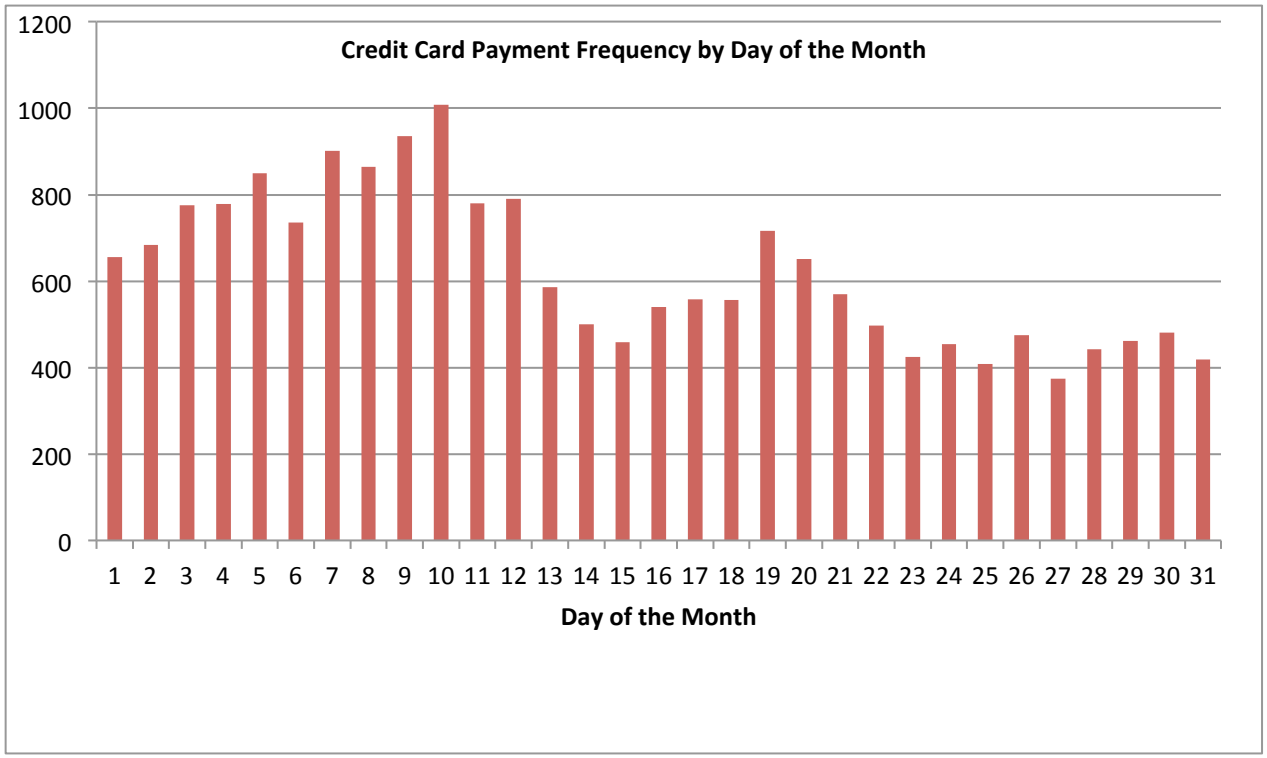


Figure 6: Salary Payment Day Frequency

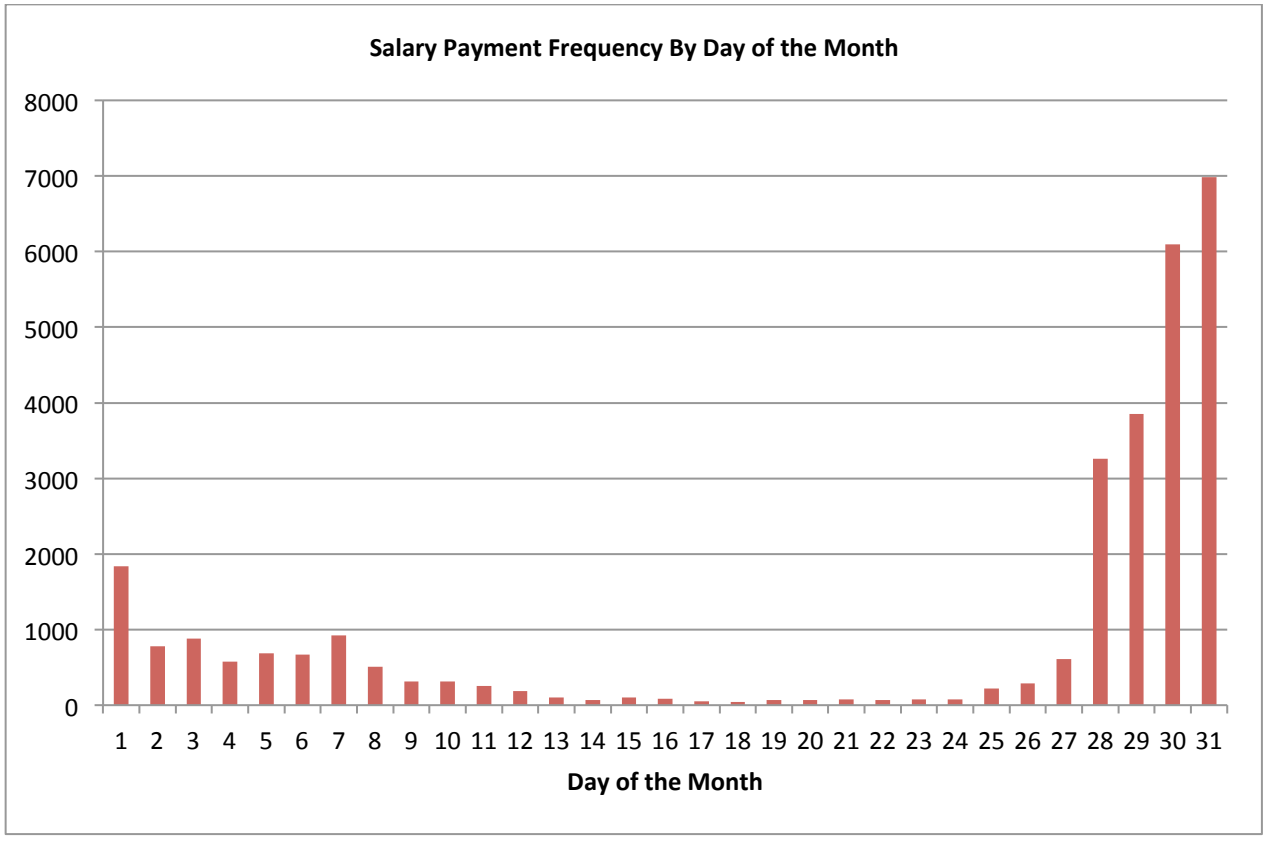
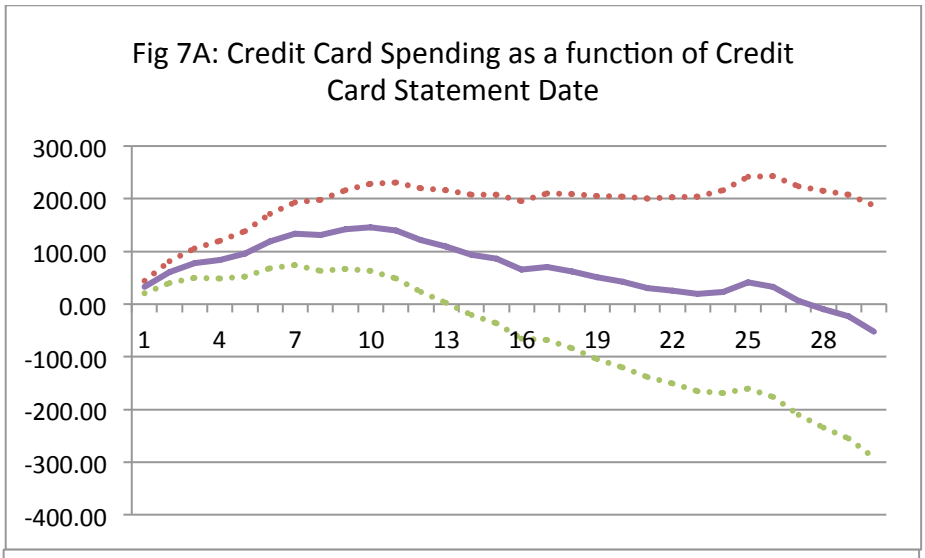


Figure 7: Coefficients for credit card and debit card spending as a response to Credit Card Statement



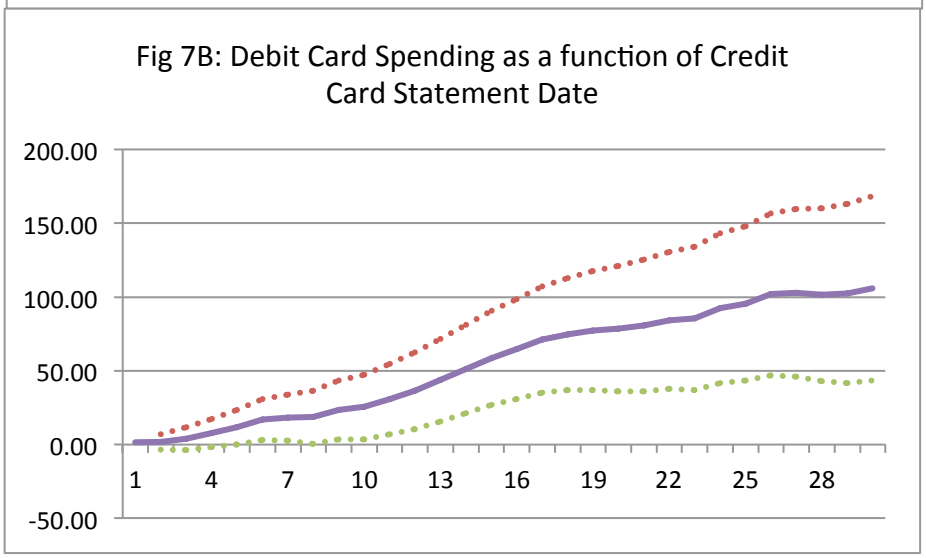


Fig 7C: Credit Card Spending Frequency as a function of Credit Card Statement Date

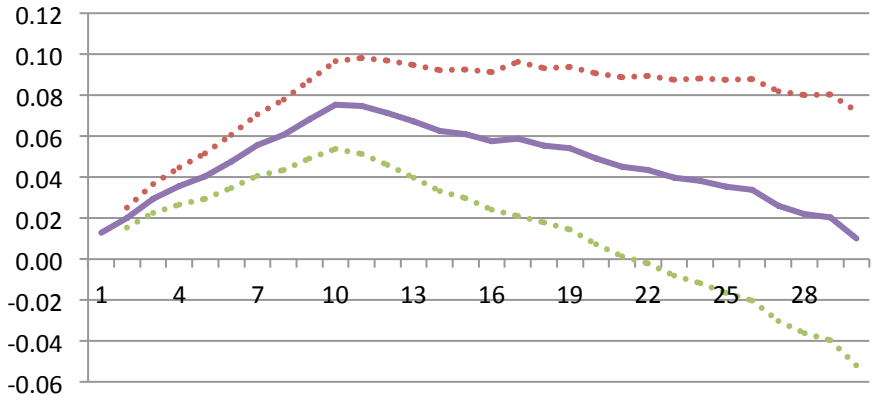


Fig 7D: Debit Card Spending Frequency as a function of Credit Card Statement Date

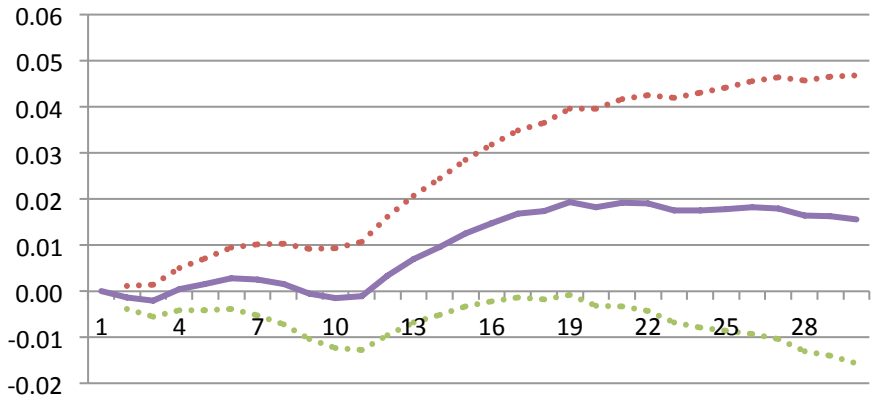
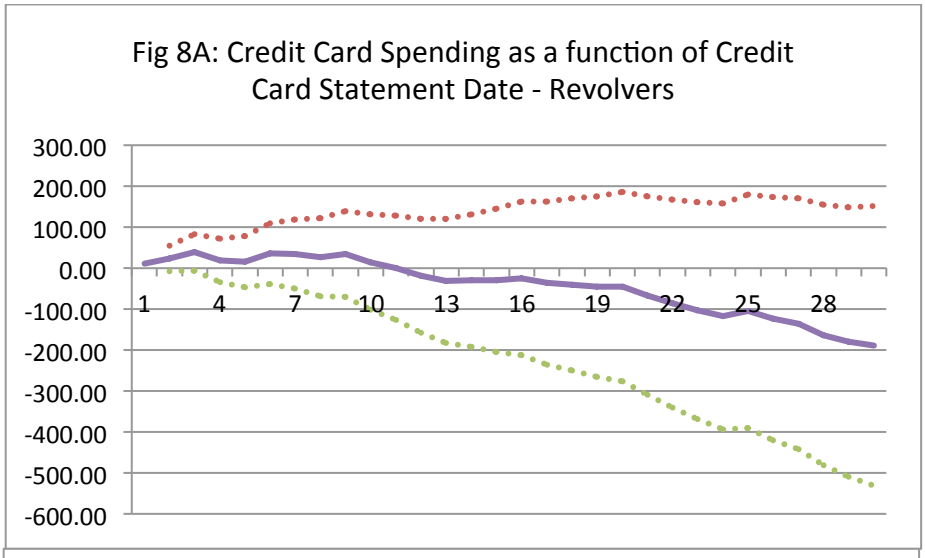
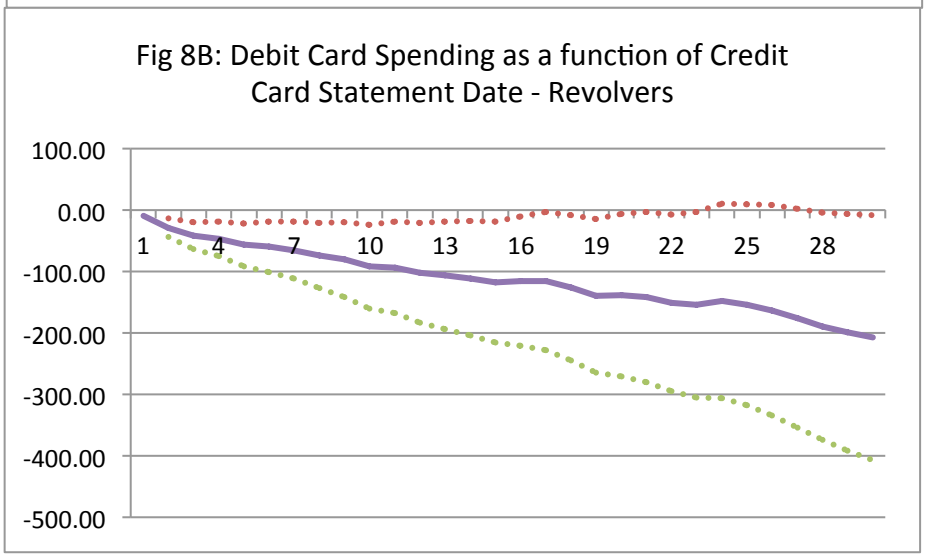


Figure 8: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Revolvers and Transactors





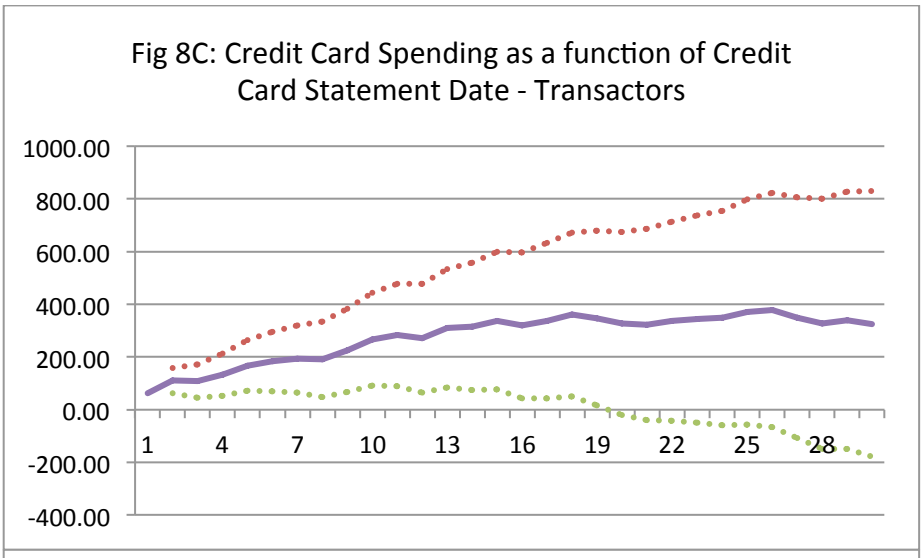


Fig 8C: Credit Card Spending as a function of Credit Card Statement Date - Transactors
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
1
4
7
10
13
16
19
22
25
28

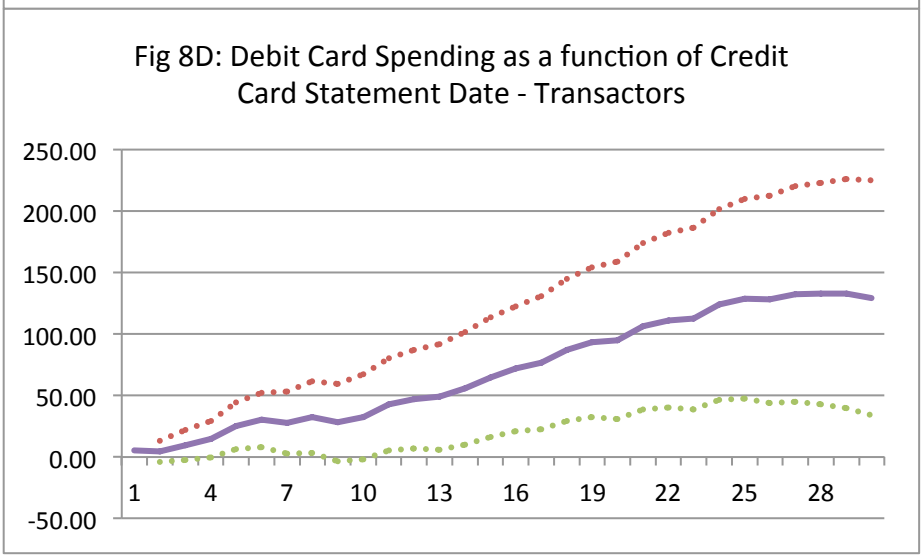
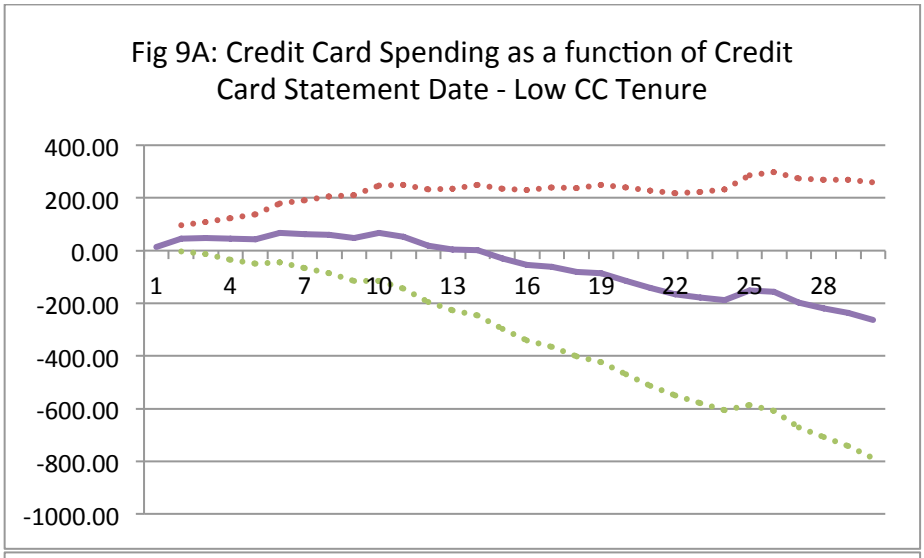
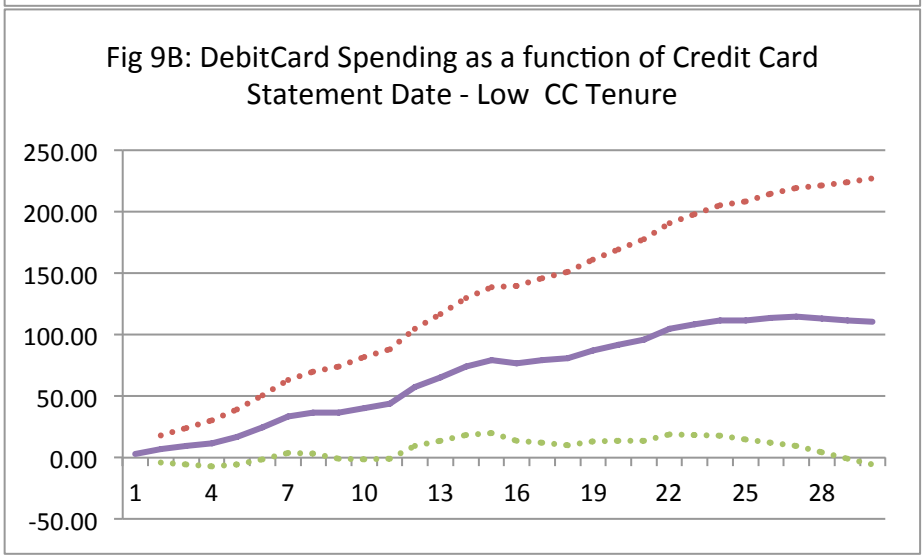


Fig 8D: Debit Card Spending as a function of Credit Card Statement Date - Transactors
250.00
200.00
150.00
100.00
50.00
0.00
-50.00
1
4
7
10
13
16
19
22
25
28

Figure 9: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Low and High CC Tenure





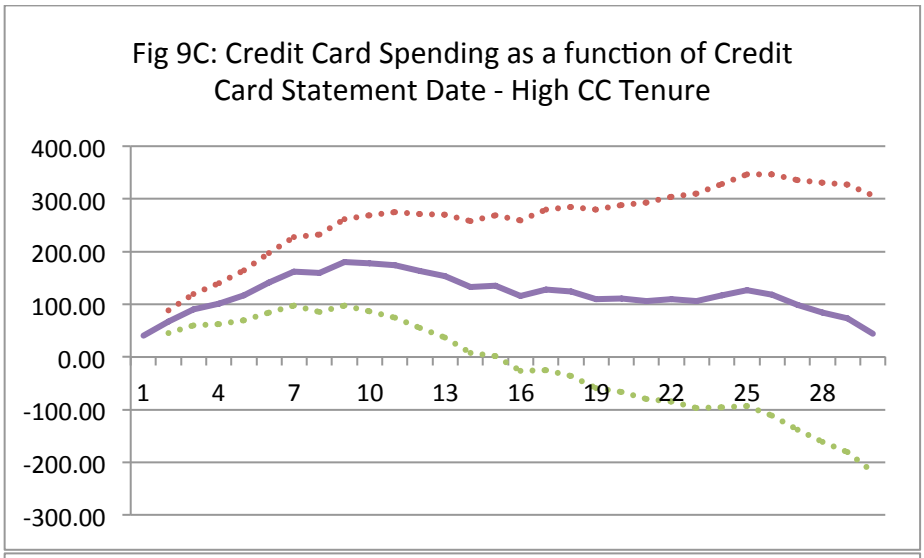


Fig 9C: Credit Card Spending as a function of Credit Card Statement Date - High CC Tenure
400.00
300.00
200.00
100.00
0.00
-100.00
-200.00
-300.00
1
4
7
10
13
16
19
22
25
28

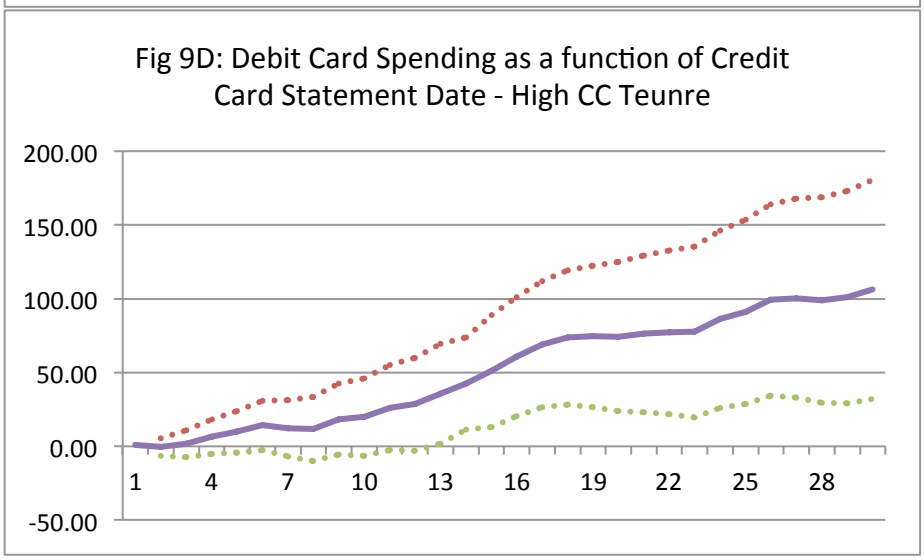
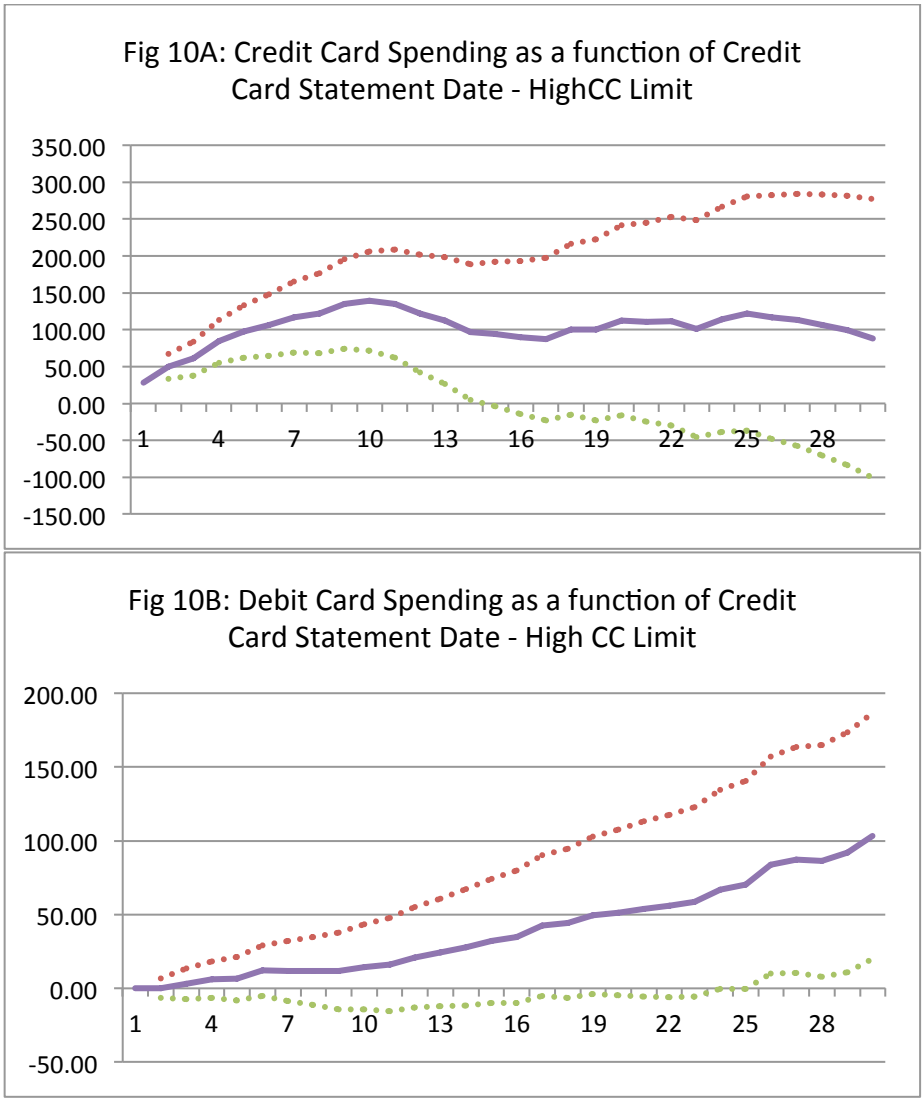


Fig 9D: Debit Card Spending as a function of Credit Card Statement Date - High CC Teunre
200.00
150.00
100.00
50.00
0.00
-50.00
1
4
7
10
13
16
19
22
25
28

Figure 10: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Low and High CC Limit



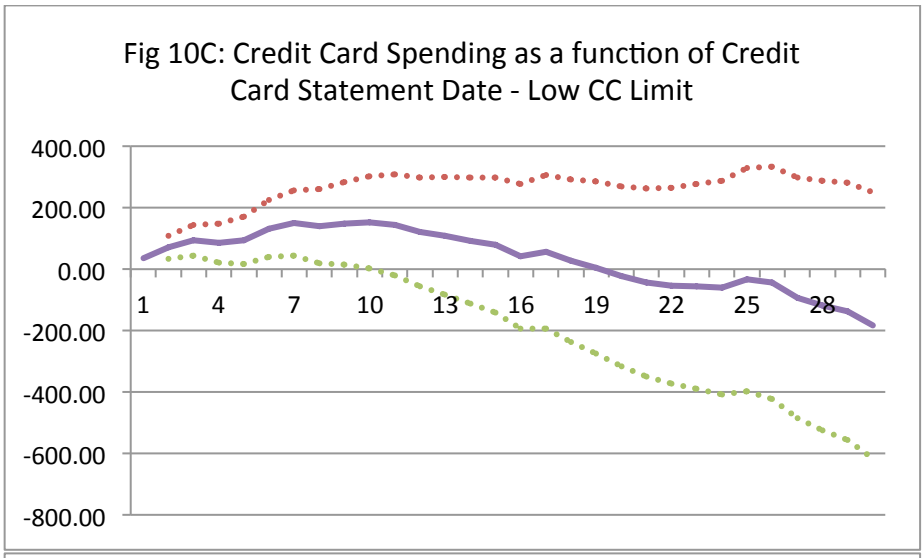


Fig 10C: Credit Card Spending as a function of Credit Card Statement Date - Low CC Limit
400.00
200.00
0.00
-200.00
-400.00
-600.00
-800.00
1
4
7
10
13
16
19
22
25
28

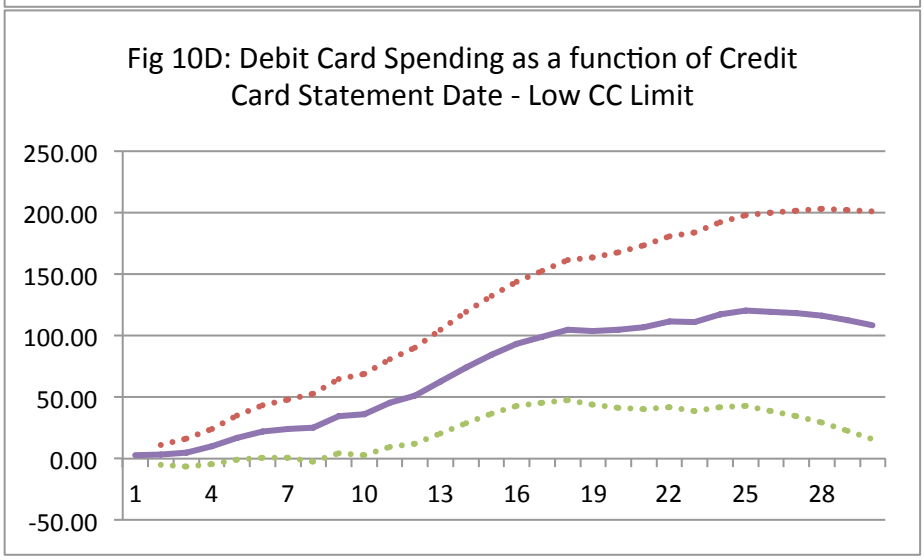
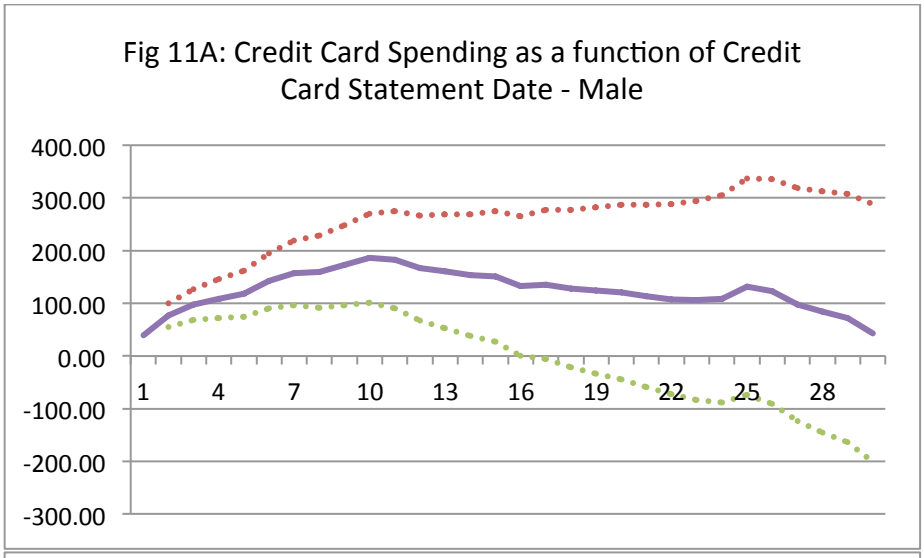


Fig 10D: Debit Card Spending as a function of Credit Card Statement Date - Low CC Limit
250.00
200.00
150.00
100.00
50.00
0.00
-50.00
1
4
7
10
13
16
19
22
25
28

Figure 11: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Male and Female



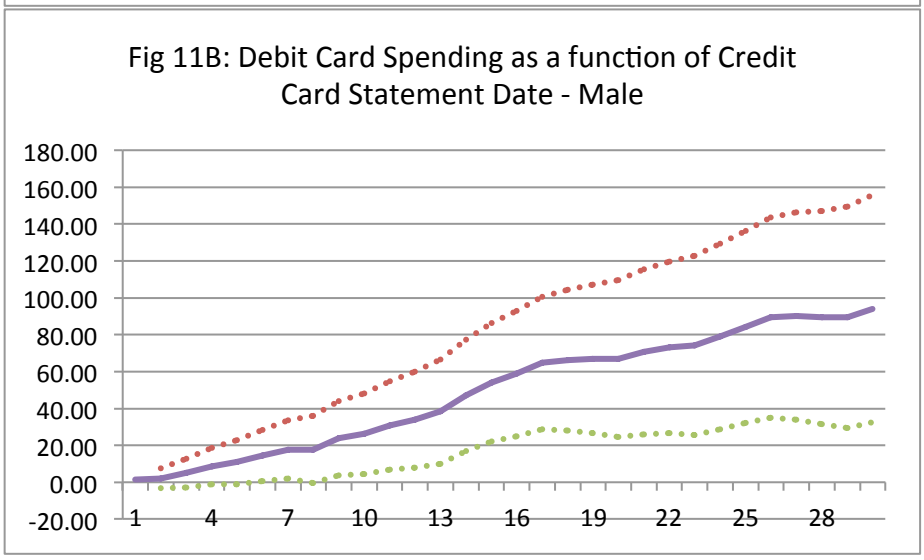


Fig 11 C: Credit Card Spending as a function of Credit Card Statement Date - Female

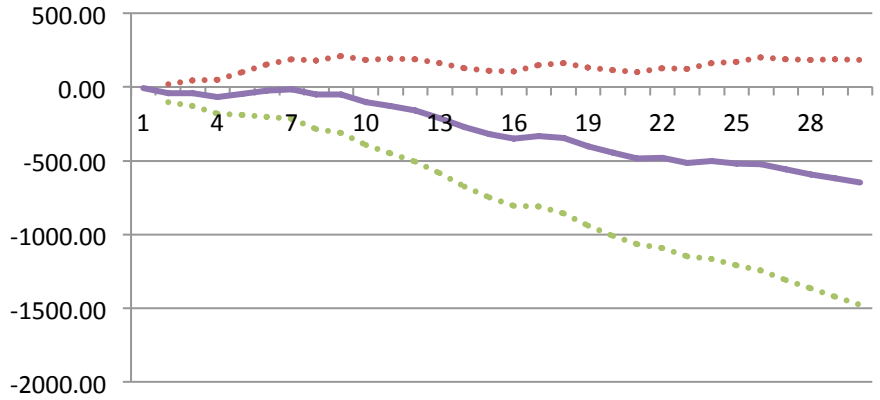


Fig 11 D: Debit Card Spending as a function of Credit Card Statement Date - Female

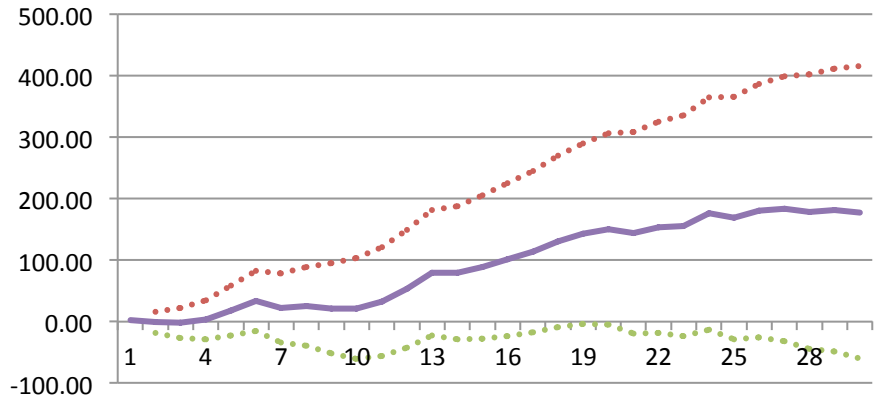
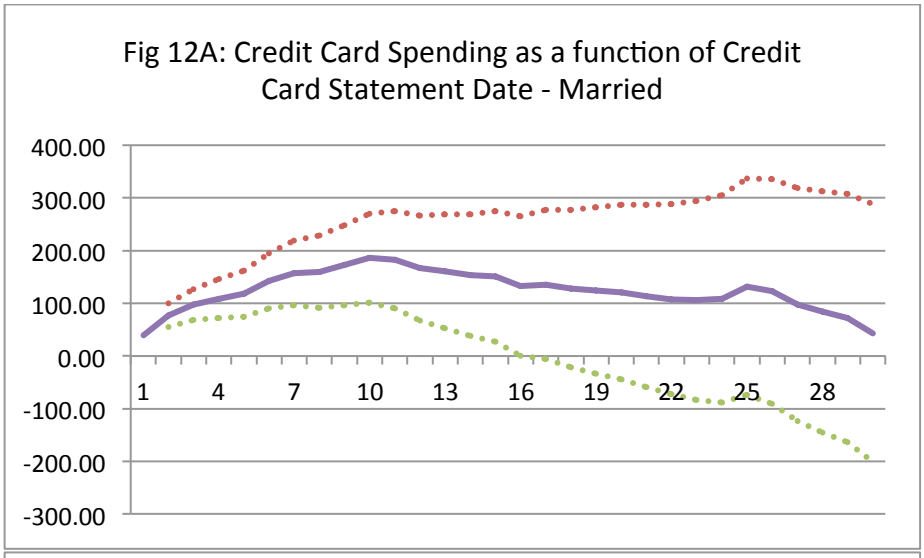
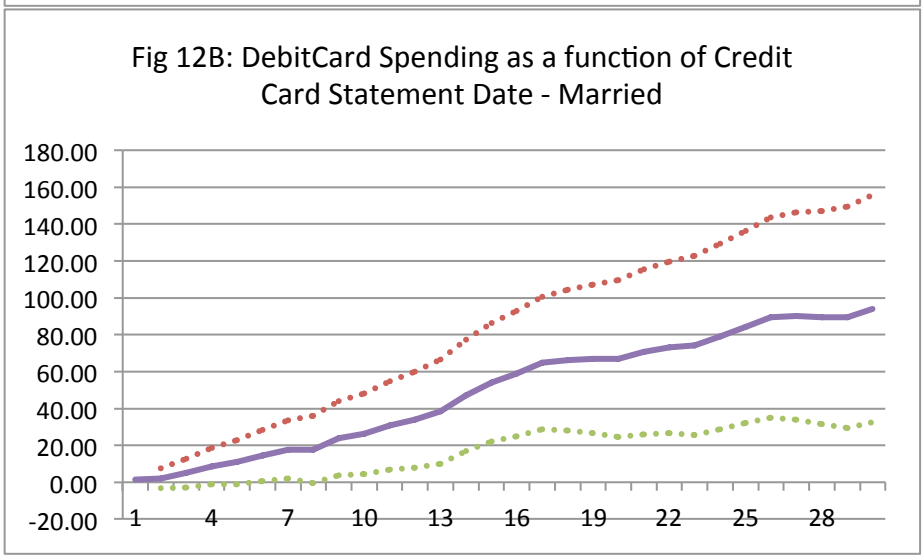


Figure 12: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Married and Single





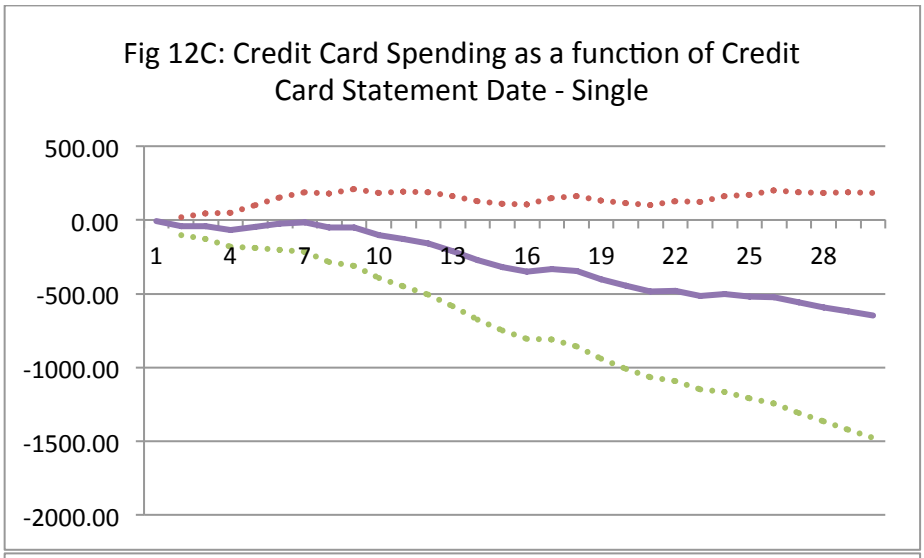


Fig 12C: Credit Card Spending as a function of Credit Card Statement Date - Single
500.00
0.00
-500.00
-1000.00
-1500.00
-2000.00
1
4
7
10
13
16
19
22
25
28

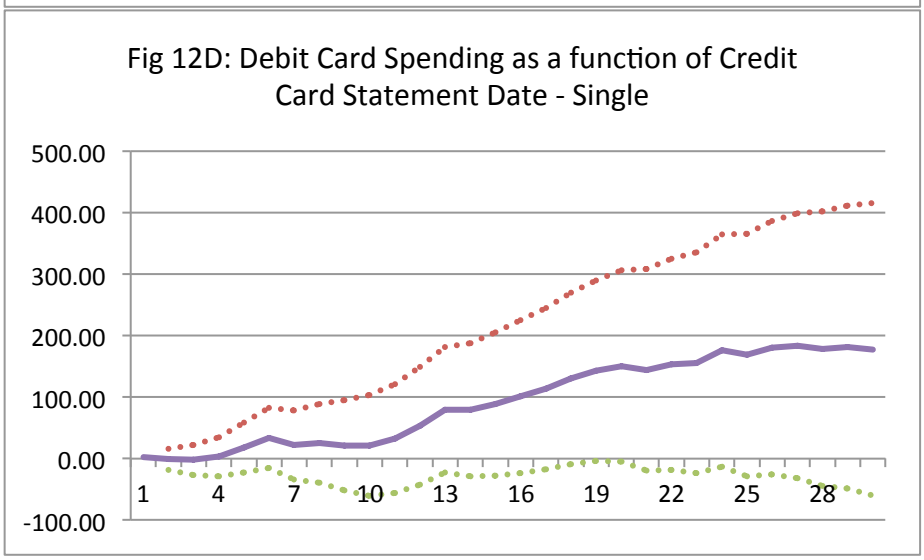
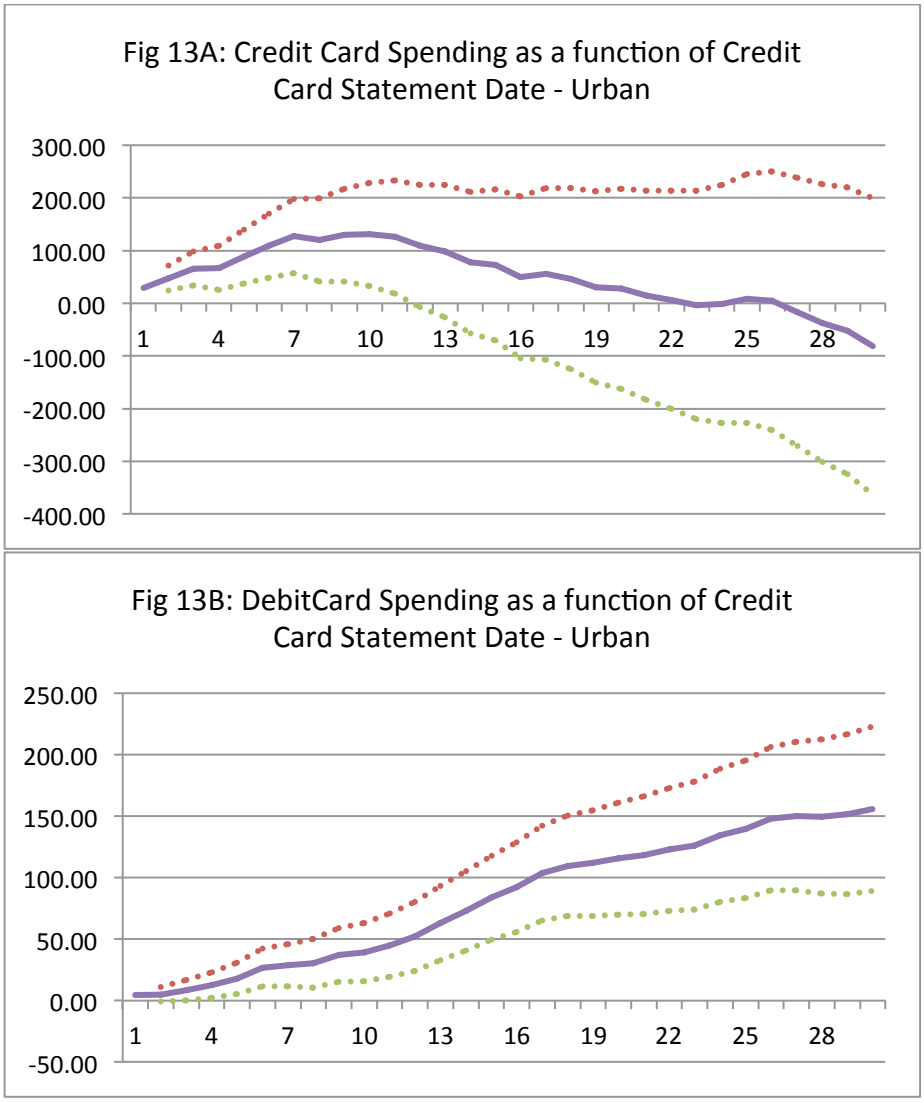


Fig 12D: Debit Card Spending as a function of Credit Card Statement Date - Single
500.00
400.00
300.00
200.00
100.00
0.00
-100.00
1
4
7
10
13
16
19
22
25
28

Figure 13: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Urban and Rural



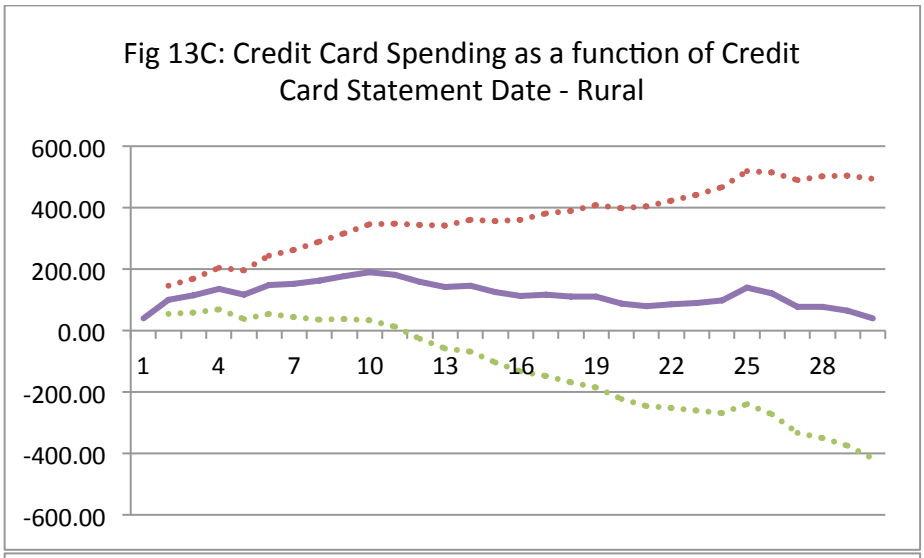


Fig 13C: Credit Card Spending as a function of Credit Card Statement Date - Rural
600.00
400.00
200.00
0.00
-200.00
-400.00
-600.00
1
4
7
10
13
16
19
22
25
28

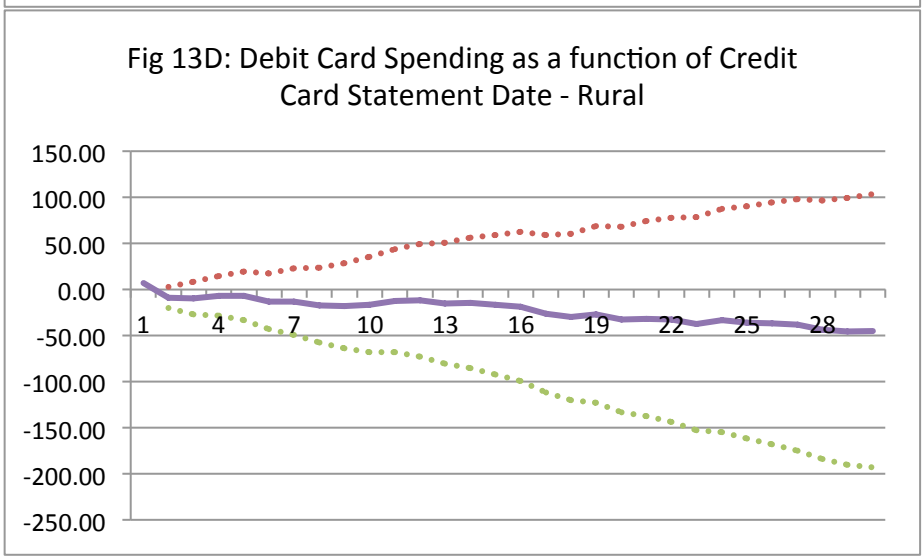
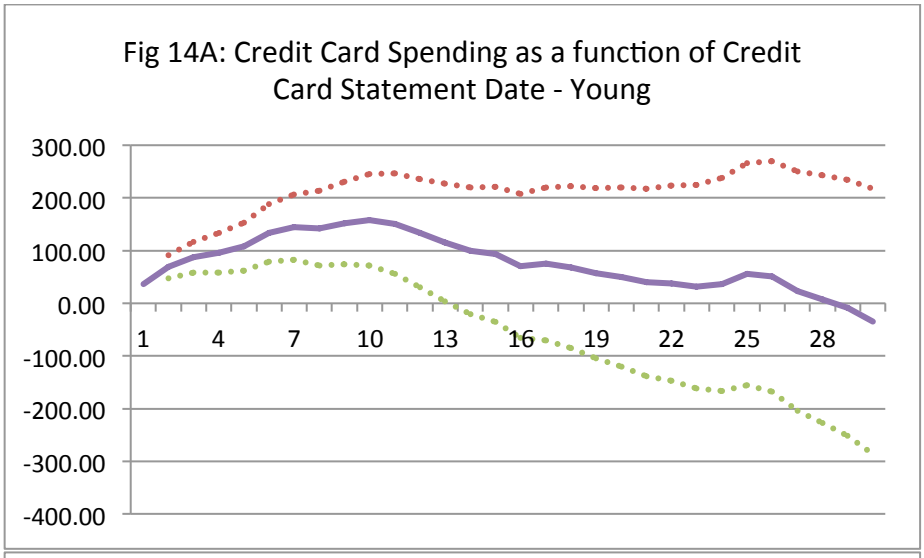
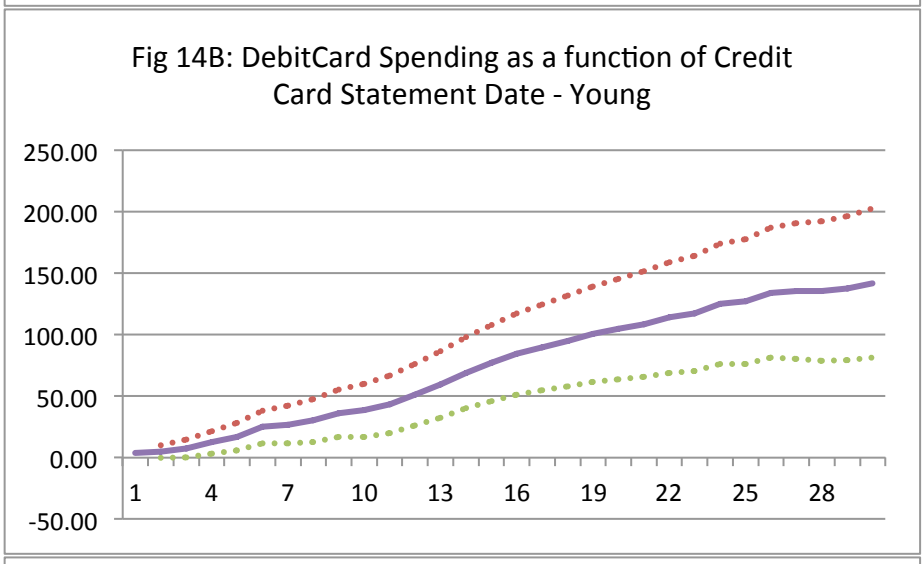
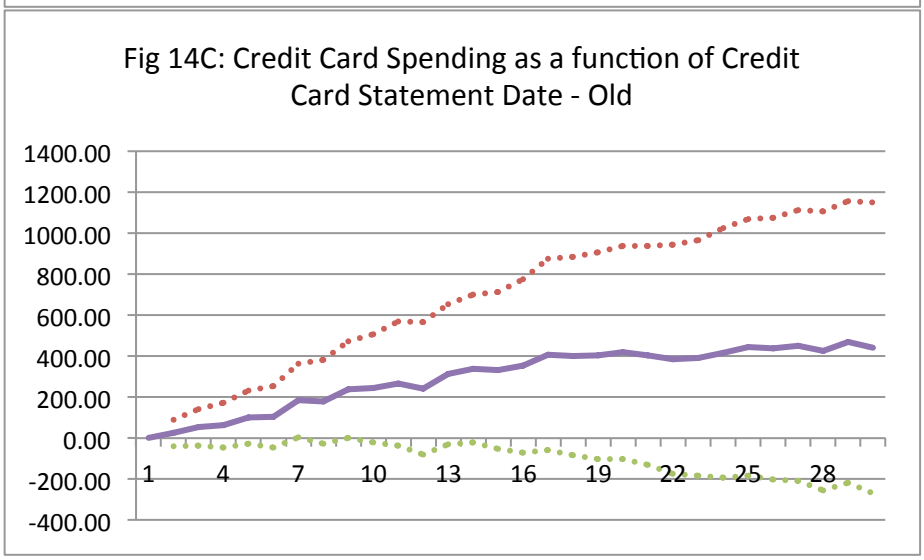


Fig 13D: Debit Card Spending as a function of Credit Card Statement Date - Rural
150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
-200.00
-250.00
1
4
7
10
13
16
19
22
25
28

Figure 14: Coefficients for credit card and debit card spending as a response to Credit Card Statement – Young and Old







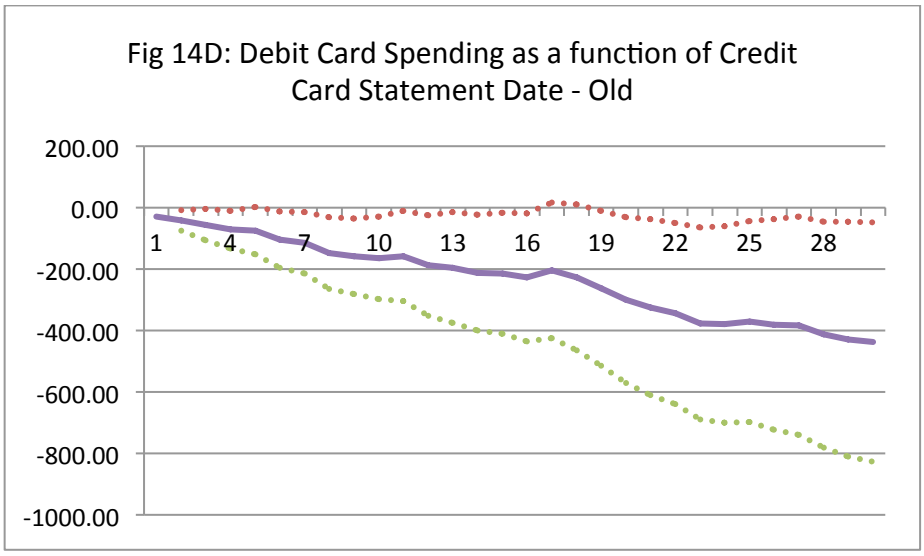


Fig 14D: Debit Card Spending as a function of Credit Card Statement Date - Old
200.00
0.00
-200.00
-400.00
-600.00
-800.00
-1000.00
1
4
7
10
13
16
19
22
25
28

Figure 15: Credit Card Spending as a function of Credit Card Payment Date

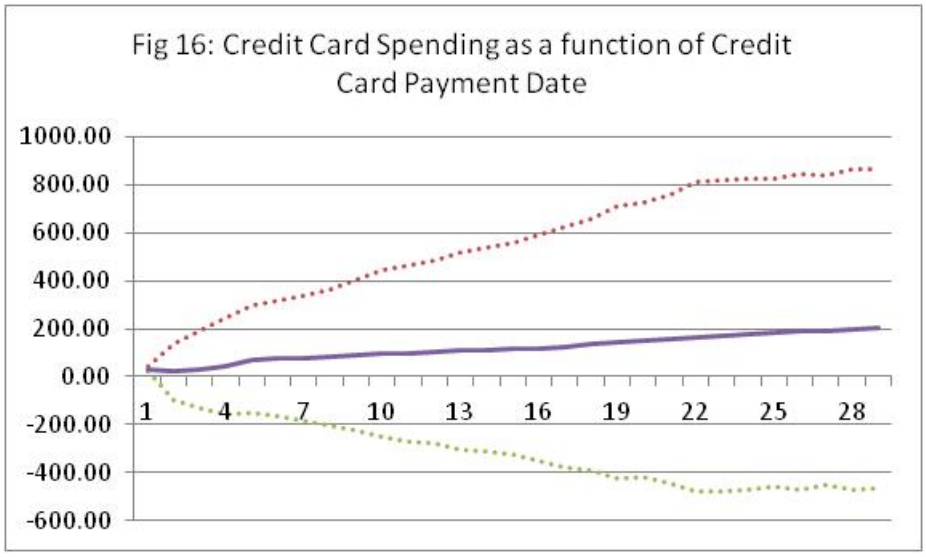
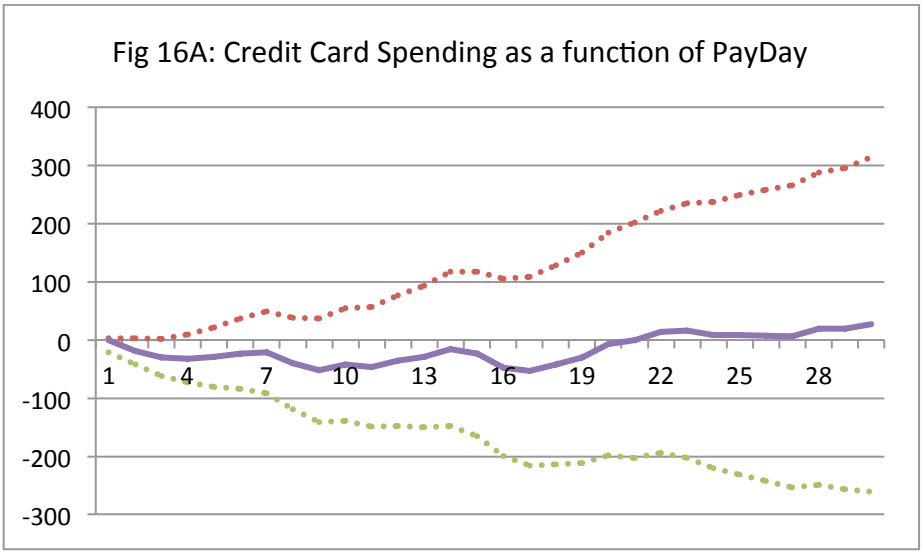


Figure 16: Credit Card and Debit Card Spending as a function of Payday



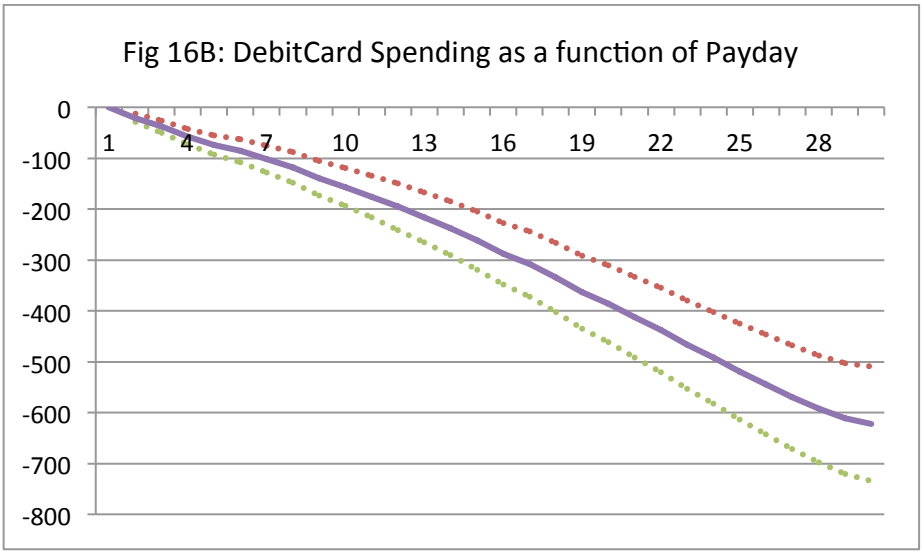
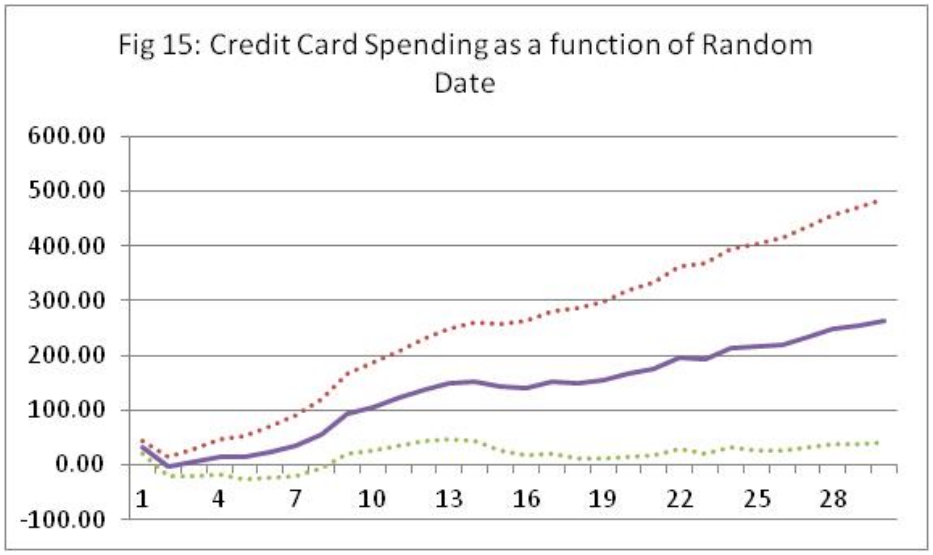


Figure 17: Falsification Test – Credit Card Spending as a function of Random Statement Date



Appendix:

Spending Response to CC Statement Date

VARIABLES	CC Spending	DC Spending	CC Freq	DC Freq
statementdayct1	32.611***	1.575	0.013***	-0.000
	(11.686)	(3.353)	(0.003)	(0.001)
statementdayct2	28.188**	0.079	0.007**	-0.001
	(14.184)	(2.830)	(0.003)	(0.001)
statementdayct3	17.113	2.292	0.009***	-0.001
	(10.924)	(3.331)	(0.003)	(0.001)
statementdayct4	6.479	3.920	0.006**	0.003
	(11.427)	(2.931)	(0.003)	(0.002)
statementdayct5	11.115	4.001	0.005*	0.001
	(11.386)	(3.156)	(0.003)	(0.002)
statementdayct6	23.835*	5.179	0.007**	0.001
	(12.363)	(3.250)	(0.003)	(0.002)
statementdayct7	14.228	1.156	0.008***	-0.000
	(11.467)	(2.955)	(0.003)	(0.001)
statementdayct8	-2.855	0.481	0.005*	-0.001
	(11.333)	(3.179)	(0.003)	(0.001)
statementdayct9	11.009	4.710	0.007**	-0.002
	(11.959)	(3.872)	(0.003)	(0.001)
statementdayct10	3.969	2.053	0.007**	-0.001
	(11.204)	(3.237)	(0.003)	(0.001)
statementdayct11	-6.360	5.428*	-0.001	0.000
	(10.985)	(3.165)	(0.003)	(0.001)
statementdayct12	-18.010*	5.536*	-0.003	0.004***
	(10.600)	(3.273)	(0.003)	(0.002)
statementdayct13	-11.828	7.336**	-0.004	0.004**
	(11.741)	(3.513)	(0.003)	(0.002)
statementdayct14	-15.415	7.549**	-0.005*	0.003*
	(11.614)	(3.441)	(0.003)	(0.002)
statementdayct15	-8.253	7.422**	-0.002	0.003*
	(11.222)	(3.137)	(0.003)	(0.002)
statementdayct16	-20.685*	6.017*	-0.004	0.002
	(11.393)	(3.334)	(0.003)	(0.002)
statementdayct17	5.566	6.618*	0.001	0.002
	(11.808)	(3.543)	(0.003)	(0.002)
statementdayct18	-8.421	3.498	-0.003	0.001
	(10.970)	(3.421)	(0.003)	(0.002)
statementdayct19	-11.706	2.392	-0.002	0.002

	(10.837)	(3.148)	(0.003)	(0.002)
statementdayct20	-8.334	1.179	-0.005*	-0.001
	(10.774)	(3.444)	(0.003)	(0.002)
statementdayct21	-11.458	2.457	-0.004	0.001
	(10.205)	(3.181)	(0.003)	(0.002)
statementdayct22	-4.871	3.291	-0.001	-0.000
	(11.729)	(3.094)	(0.003)	(0.002)
statementdayct23	-6.124	1.226	-0.004	-0.002
	(11.950)	(3.475)	(0.003)	(0.001)
statementdayct24	3.821	7.020*	-0.001	0.000
	(11.523)	(3.743)	(0.003)	(0.002)
statementdayct25	17.512	3.275	-0.003	0.000
	(13.563)	(3.187)	(0.003)	(0.001)
statementdayct26	-7.688	6.131	-0.002	0.000
	(11.031)	(3.849)	(0.003)	(0.002)
statementdayct27	-26.991**	1.095	-0.008***	-0.000
	(10.860)	(2.977)	(0.003)	(0.001)
statementdayct28	-16.413	-1.431	-0.004	-0.002
	(10.846)	(2.953)	(0.003)	(0.001)
statementdayct29	-13.578	0.953	-0.002	-0.000
	(11.260)	(3.427)	(0.003)	(0.002)
statementdayct30	-28.655**	3.406	-0.010***	-0.001
	(12.135)	(4.059)	(0.003)	(0.002)
statementdayct31	23.246	2.760	-0.010**	0.001
	(32.996)	(6.849)	(0.005)	(0.003)
Person and Time FE	Yes	Yes	Yes	Yes
Observations	1,018,359	1,018,359	1,018,359	1,018,359
R-squared	0.021	0.027	0.062	0.068