The Various Facets of Credit Card Debt

Dr. William Chow 13 May, 2014

Executive Summary

- This paper looks at consumer borrowings using data of credit card debt and evaluates the various economic implications observed.

- Credit card debt (CCR, credit card receivables of financial institutions) is pro-cyclical but delinquency is counter-cyclical. The growth in CCR is closely and positively related to growth in private consumption.

- While the growth in CCR resembles the growth in nominal wage from 2008 onwards, in level terms, the two appear to diverge.

- CCR exhibits a rather different growth cycle as compared to mortgage loan with the latter tracking closely the property market cycles. Mortgage loan is comparatively more interest rate sensitive.

- Job prospect seems to be a crucial determinant of credit card delinquency.

- Using a 4-variable time series model, we consider two economic questions: (i) whether consumer debt buildup is a precondition of economic recovery, and (ii) whether consumer debt and labor income are complements or substitutes. CCR is our proxy of consumer debt in the exercise.

- Evidence points to (i) a positive role of CCR in stimulating economic growth in general, although systemic risk would increase if CCR growth outpaces real GDP growth for a prolonged period of time; and (ii) the average consumers consider CCR and labor income substitutes rather than complements.

1. Introduction

1.1. This short paper explores the economic implications of consumer debt in Hong Kong using available credit card data. Interest in consumer leverage comes in different areas. The enthusiasm owes much to the pivotal role of private consumption in determining national output, and the need to articulate a forward looking stance of economic decision makers. In the consumption smoothing literature, for instance, Friedman's (1956) permanent income hypothesis argues that people tend to smooth their consumption path across time which, given income fluctuations, would be achievable only with lending/borrowing activities.

1.2. Another example is the research in the growth and financial development nexus (see e.g. Levine, 1997). Tremendous amount of effort has been put in to ascertain causality between economic growth and financial development. The empirical evidence up till now is mixed regarding the causality pattern – with findings in support of a growth causes development proposition, and one with causality in the reverse direction, both in abundance – but the majority of the works done confirm a significant role of financial development, typically proxied by consumer credit, in instigating economic growth.

1.3. We focus on neither of these issues. Instead, we look specifically at the role of consumer debt[1] in economic cycles. The questions we attempt to answer are (i) whether consumer borrowing would have a role to play in phases of economic recovery and (ii) whether consumers see borrowing and labor income as complements or substitutes. The paper is organized as follows: Section 2 reviews the data available for our analysis and summarizes the factual observations; Section 3 discusses the econometric approach of our study; and Section 4 concludes.

[1] Hong Kong has no detailed data on private/consumer debt but just aggregate data of bank loans. As we cannot separate out the corporate debts, we do not use them. An important category is mortgage lending where it is somewhat easier to identify the borrower type. However, this kind of loan is property-related which reflects more the long term needs of the borrowers and the fluctuations in the property market rather than the cyclicality of the economy. Credit card debt is a more appropriate proxy for studying consumer leverage.

2. Observations from the Data

2.1. The credit card loans and the mortgage loans data are extracted from Hong Kong Monetary Authority's (HKMA) quarterly Credit Card Lending Survey and monthly Residential Mortgage Survey, respectively. Other economic data are available from the Census and Statistics Department (C&SD) website. They include nominal and real national income data, aggregate private consumption, retail sales (growth rates), nominal and real wage indices, unemployment rate, inflation rate, number of bankruptcy cases, HIBOR rates, and property and stock price indices. The data sample is an unbalanced panel with different starting dates, but the principal consumer debt data are available from 2001:Q4. All data series other than retail sales growth and interest rates are seasonally adjusted.

Figure 1. Credit Card Loan Growth compared to Output and Consumption Growth

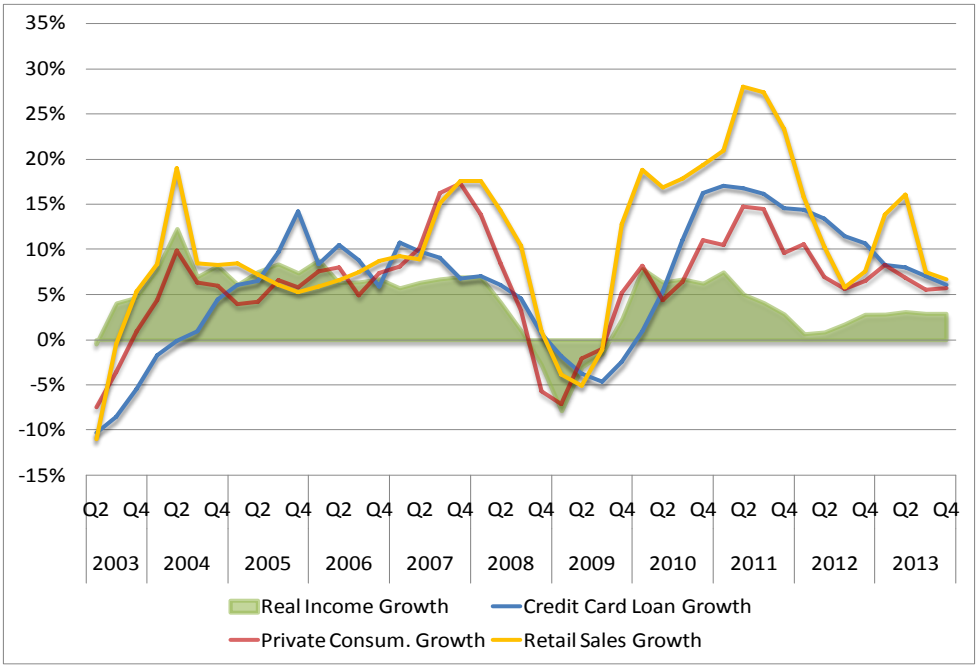


Figure 2. Credit Card Loan Growth compared with Labor Income Growth

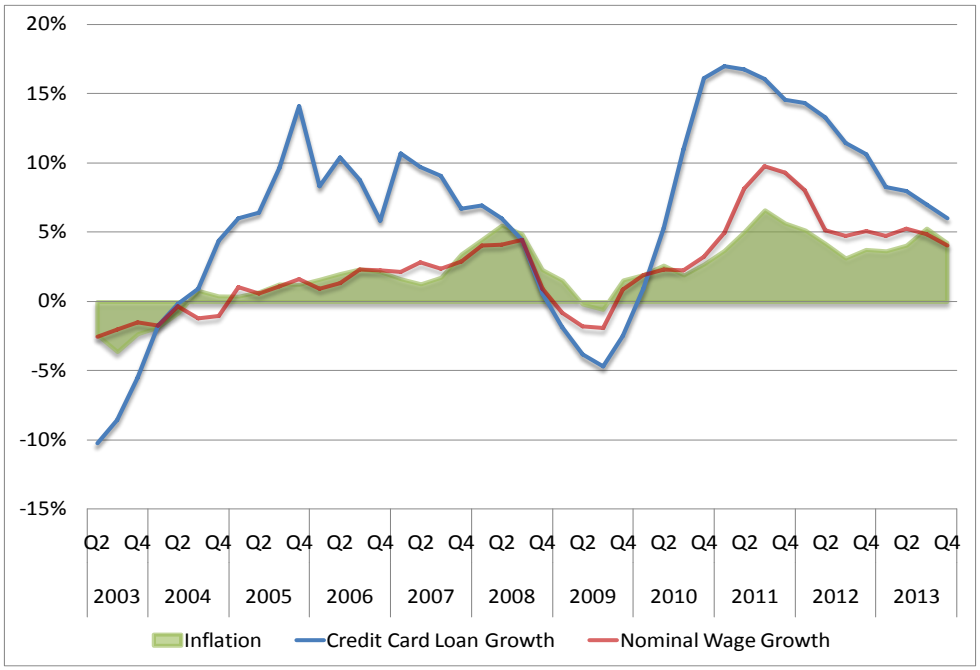
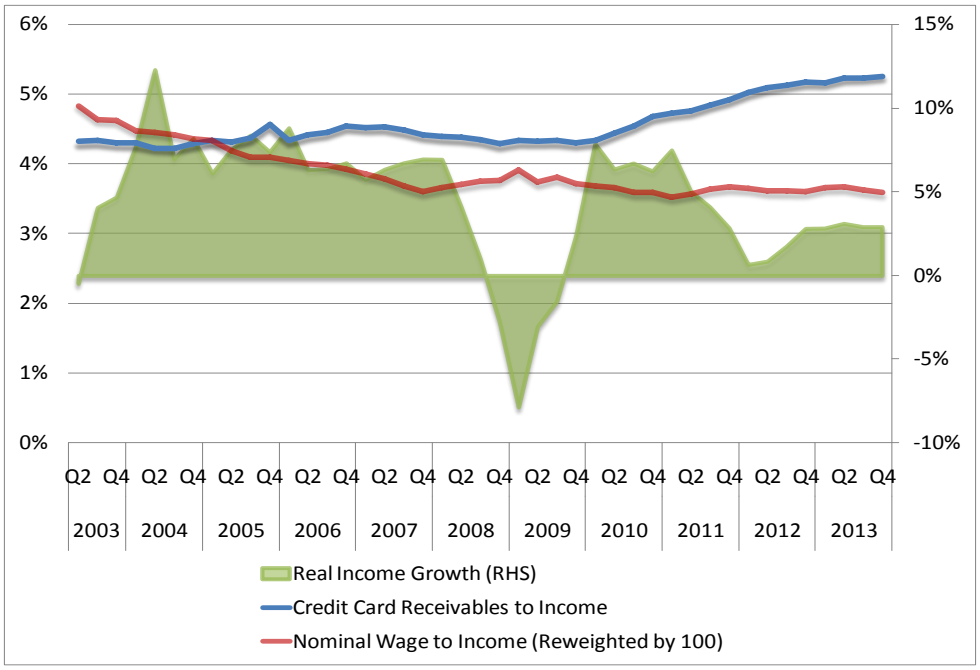


Figure 3. Credit Card Loan Levels as Percentage of GDP



2.2. Figure 1 to 3 provide us with the basic observations on the relationship between credit card loans (receivables to financial institutions, and

thus the abbreviation CCR used in this paper) and other economic variables. They can be summarized by the following:

- **Growth in credit card debt is pro-cyclical in general**.
- **Growth in credit card debt tracks the year on year change in private consumption closely**.
- Since 2008, retail sales growth has been higher than the growth in private consumption most of the time.
- Growth in credit card debt and nominal wage growth appear to move in the same direction since 2008, with the former exhibiting larger swings than the latter.
- **Credit card loans diverge with nominal wage in level terms** (expressed as a percentage of nominal GDP).

2.3. We have seen that domestic private consumption is a good predictor, if not a determinant, of consumer debt. The role of labor income looks uncertain as the trend levels and growth cycles convey somewhat contradicting message. This is a topic to be further pursued in the next section.

2.4. The next five diagrams Figure 4 to 8 offer other perspectives of consumer leverage derived from the credit card data:

- Fig. 4 compares credit card growth with mortgage loan growth and interest rate. The growth cycles of the two kinds of loans differ.
- As far as credit card debt is concerned, **the presumably negative relationship with interest rate is not obvious** before the 2007-8 financial crisis. Comparatively, mortgage loan looks more interest rate sensitive.
- Fig. 5 shows that mortgage loan growth tracks the property market cycles in general. Credit card loan growth, however, has no obvious relationship with changes in stock prices and property prices.

Figure 4. Interest Rate and Loan Growth

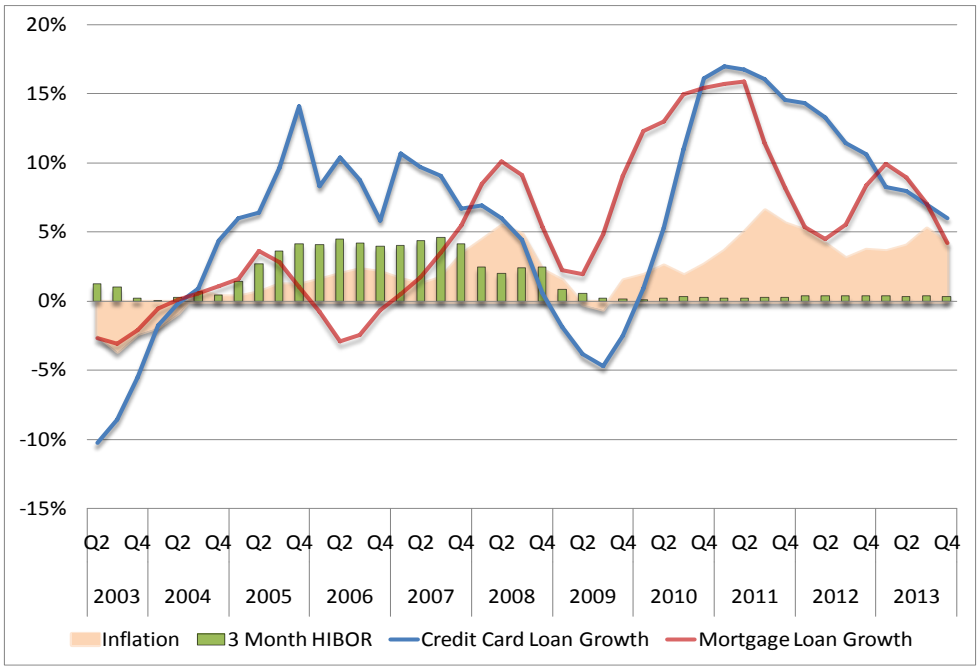


Figure 5. Asset Cycles and Loan Growth

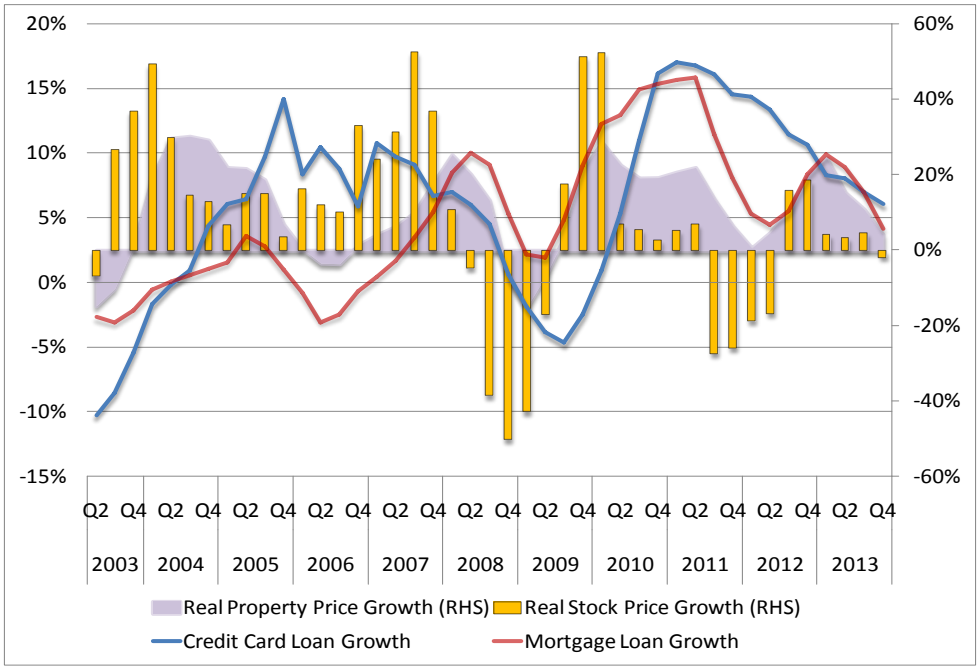


Figure 6. Credit Card Delinquency and Unemployment

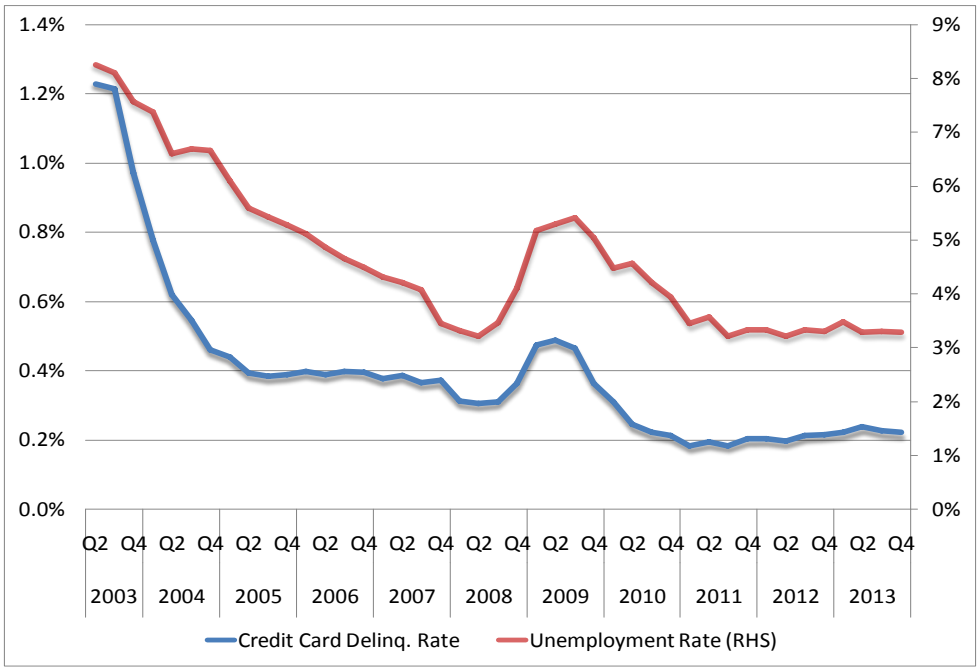


Figure 7. Credit Card Delinquency and Bankruptcy

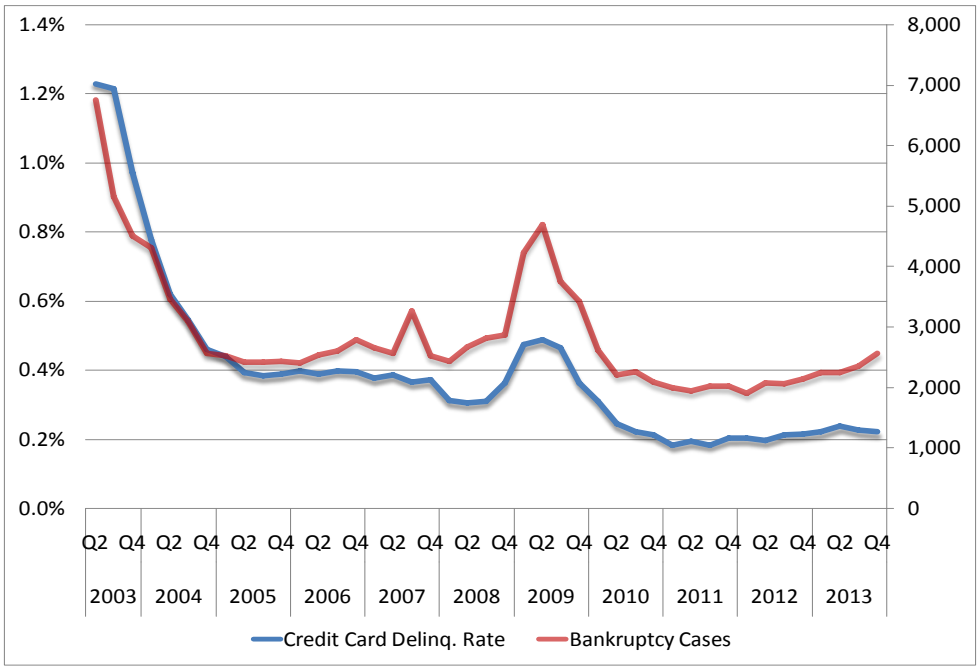
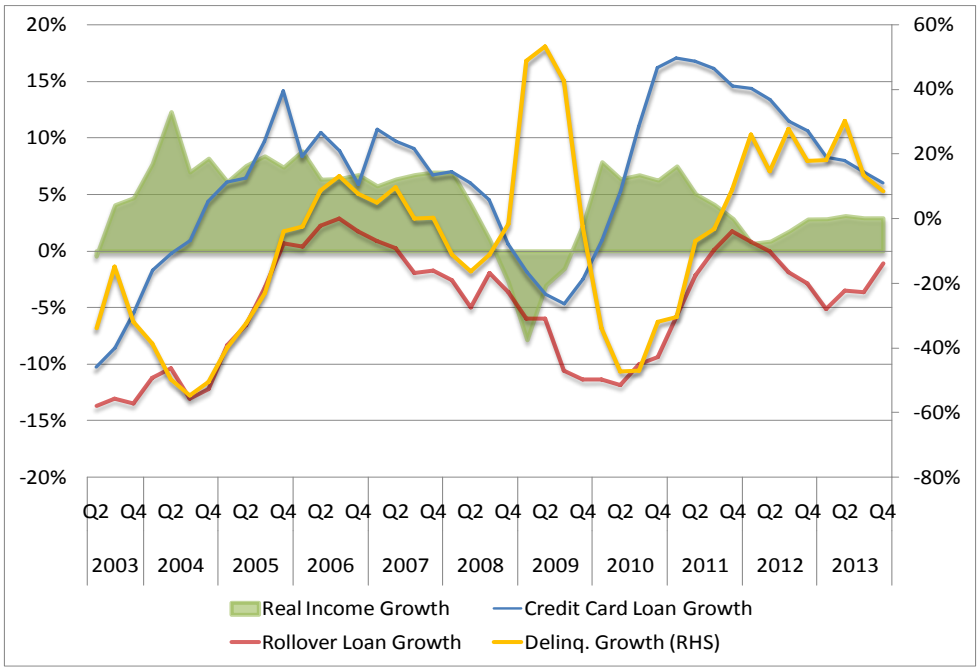


Figure 8. Credit Card Debt Rollover and Delinquency



2.5. Fig. 6 and 7 compare the delinquency rate (those overdue for more than 90 days as a proportion of total receivables) of credit card debt with the unemployment rate and the number of bankruptcy cases, respectively. Fig. 8 plots credit card loan growth together with year on year changes in delinquent debt and rollover debt. The observations are:

- It seems that **the probability of credit card default decreases with job prospects and results in a smaller amount of bankruptcy cases**.
- **The change in delinquent debt is generally counter-cyclical**. During bad times, delinquency increases.
- Changes in overall credit card debt and those rolled over have similar pattern of acceleration and deceleration. However, **growth in overall debt is positive most of the time while growth in rollover debt is predominantly negative**.

2.6. In sum, credit card debt is strongly related to consumption. The causality between credit card debt and overall economic growth has

yet to be explored, but their growth cycles appear to be positively related. Another thing is that consumers seem rather risk averse towards credit card borrowing. There is preliminary evidence of divergence between credit card borrowing and wage level. Besides, while the overall level of credit card loan grows for the most part of the sample period, the portion that is rolled over shrinks consistently over time. Consumers' tendency to default also reduces as their employment prospect increases.

3. Econometric Analysis

3.1. Among the many research topics surrounding consumer/household debt, there are two that justify our pursuance given the available data. First, there is the question of whether consumer debt buildup will induce subsequent recession; or whether consumer leveraging will precede a major economic recovery. Second, there is the debate on the substitutability and complementarity between consumer debt and labor income.

3.2. We analyze both the debt-growth relationship and the debt-earnings substitutability using multivariate time series methods. We collect the data series credit card receivables (CCR), nominal private consumption (PCON), real output (RGDP) and nominal wage index (NWAGE); seasonally adjust them using the X-12 method; and log-transform the resulting smoothed series. The sample contains 49 quarterly observations running from 2001:Q4 to 2013:Q4. They are then fitted to a 4-variable vector error correction model[2] (VECM) that takes the form:

$$\Delta Y_t = C + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t, \qquad (1)$$

[2] Since the system includes both output and consumption which are potentially cotrending (hence, the possible existence of cointegration relationship) because of the national income identity, a VECM is adopted instead of a VAR (vector autoregression model).

where Y_t is the time t vector of the four log-transformed variables; Δ is the difference operator with $\Delta Y_t = Y_t - Y_{t-1}$ interpreted as the percentage changes in the variables; C contains the exogenous variables which include a constant, a trend term, and the seasonal dummies; and ε_t is the vector of random error. Π and Γ_i, $i = 1, \cdots, p-1$ are parameters to be estimated.

3.3. Put simply, model (1) is a re-formulation of a vector autoregression model with an error correction term ΠY_{t-1} present to guarantee short run deviations from an equilibrium relationship (the linear relationship between private consumption and aggregate output defined by national income accounting) would not get too far off and a reversion to such steady state can be maintained. The VECM is the appropriate specification when the individual series are non-stationary but combination(s) of them are stationary, i.e. the presence of cointegration.

3.4. To verify if (1) is the appropriate setting, we run the augmented Dickey-Fuller test and confirm that all the series in Y_t are individually non-stationary. The Johansen Trace test used to check for cointegration turns out to be sensitive to choice of model lag ($p-1$). We choose a lag of $p = 5$ and execute the Johansen test based on this selection[3]. The result indicates one cointegration relationship (i.e. one single linear combination of the variables under the long run relationship).

3.5. To make inference from the results, we need to estimate the structural form of model (1) via a process called identification, see for instance Lütkepohl (2005). We will not cover the details here, but the idea is to present the model in an economically sensible way. There are numerous ways to "identify" a VECM. We choose to impose restrictions

[3] It is common to turn to information criteria (e.g. Akaike Information Criterion or the Bayesian Information Criterion) for the determination of model dimension. We did check the indicators which pointed to longer lags than what we have chosen in the paper. However, certain impulse responses exploded and some error bands were not computable with such long lags. We therefore choose a lag that renders the model parsimonious and yet provides coverage for the span of a year or so.

on how the structural shocks of the model are related to one another contemporarily[4]. The restriction scheme is summarized in Table 1.

Table 1. The Short Run Identification Scheme of the VECM

Equation (down)	CCR	PCON	RGDP	NWAGE
CCR	*	*	0	0
PCON	*	*	0	*
RGDP	0	*	*	0
NWAGE	0	0	0	*

3.6. The table lists whether the shocks to variables (columns) would contemporaneously affect the prime variable in an equation (row). An asterisk indicates a contemporaneous relationship and a zero indicates none. Note that the keyword is "contemporaneous" and a zero does not imply no linkages at all.

3.7. The crucial point that affects the behavior of the impulse responses in our case is how the contemporary relationship between RGDP and PCON should be modeled. As highlighted in Table 1, we assume a shock to consumption can impact on RGDP within *the same quarter*, while the reverse is not true. We think this is reasonable because shocks to investment and exports, for instance, will by definition affect RGDP. While this may have an impact on consumption subsequently, it may not be necessarily contemporaneous.

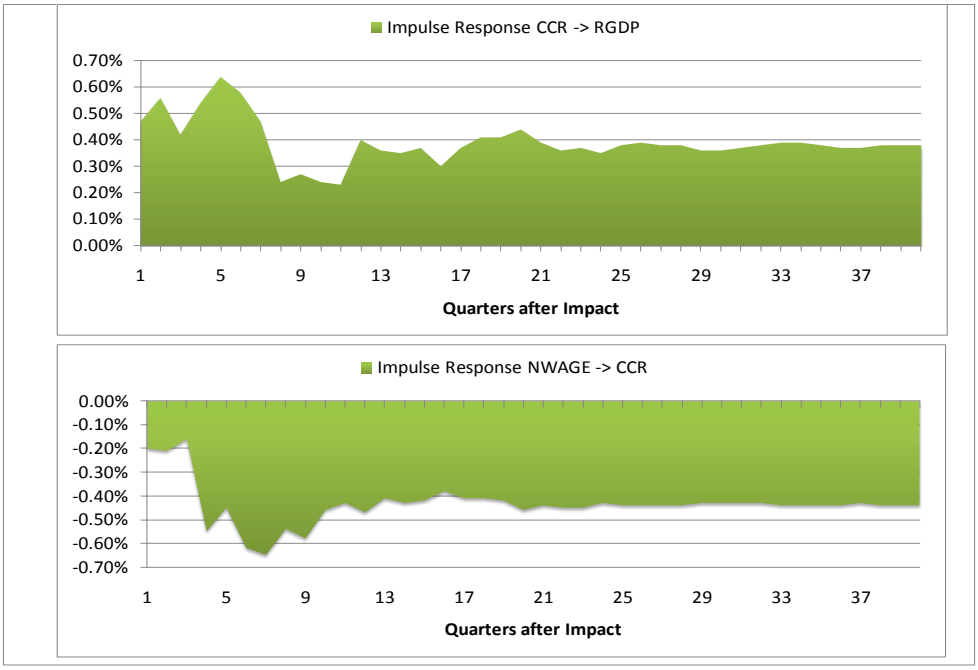
3.8. Figure 9 shows the impulse responses of interest to us. In the upper panel, there is the impulse response of RGDP to a 1 standard deviation shock in CCR. **National output reacts positively and persistently in real terms to a shock increase in credit card debt**. The instantaneous response of RGDP is about a 0.47% increase, and this gradually climbs to a peak of about 0.64% in five quarters' time. The shock looks permanent as the response never retraces back to zero or to the negative territory. Thus, stimulating consumer leverage by institutional or policy measures seems to be a way to lift the economy out of a recession. The persistence observed from the impulse response

[4] Using the so-called sign restriction approach to a VAR representation of our model gives impulse responses that have similar patterns with those reported in this paper.

also implies that historically consumer debt buildup by way of credit card does not threaten economic prosperity.

3.9. The lower panel of Fig. 9 shows the impulse response of CCR to a shock in NWAGE. A positive response suggests that credit card debt and labor income are complements while a negative response implies that the two are substitutes. The response is plotted against a 1 standard deviation shock in nominal wage index. The initial impact is a 0.2% decrease in CCR and in about two years the retreat will bottom out at around (-)0.65%. Again, the shock appears to be permanent. **The negative response indicates that for the average consumers, credit card debt and labor income are substitutes**. Improvements in earnings would induce the cardholders to decrease their leverage. This is consistent with what we saw in Fig 3.

Figure 9. Impulse Response Functions of the VECM



4. Conclusion

4.1. The subprime and Euro crises have raised concerns about consumer debt pileup. This paper considers the issue of consumer leverage using

aggregate data from the credit card industry. It is found that credit card debt is positively related to both consumption and national output/income. Consumers are on average conservative towards credit card borrowing. There seems to be a tradeoff between labor income and credit card debt. Also, the delinquency ratio declines with unemployment. These may partly explain why we observe a positive and persistent response by national output to a credit card loan shock. Consumer debt buildup does not trigger subsequent recessions because consumers are averse to excessive leverage.

4.2. The analysis is based on a relatively small sample of aggregate data and is applied to a particular kind of consumer debt. Larger and more comprehensive dataset, if available, may give somewhat different conclusions. Still, the findings here look reasonable and are consistent with conventional economic theories – that financial development and economic growth are closely related, and consumers tend to smooth the path of consumption over their lifetime.

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