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## EASTERN CARIBBEAN CENTRAL BANK WORKING PAPER

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# DETERMINANTS OF CREDITLESS RECOVERIES IN THE EASTERN CARIBBEAN CURRENCY UNION

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**Determinants of Creditless Recoveries in the Eastern Caribbean Currency  
Union**



By

Beverly Lugay and Shernel J Thompson

# Determinants of Creditless Recoveries in the Eastern Caribbean Currency Union

Beverly Lugay and Shernnel J Thompson<sup>1</sup>

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## ABSTRACT

This paper seeks to understand the factors contributing to creditless recoveries in the Eastern Caribbean Currency Union (ECCU). The identification of creditless recovery episodes, defined as a pick-up in economic growth without an increase in credit, was done using the approach of Abiad et al, 2011. Based on this approach six (6) periods of creditless recoveries were identified in the ECCU using annual data for the period 1986-2015. These recoveries occurred largely in the period 2011-2013, after the 2007/2008 global economic and financial crisis. Using a panel rare events logistic model, the results indicate that the magnitude of recessions, a high credit to GDP ratio, the change in foreign direct investment and export growth influence the likelihood of creditless recoveries. An implication of the finding is that following a recession linked to the financial system, output could recover without an increase in credit. Therefore, credit growth may not be a necessary condition for an economic recovery. Further, the recovery in the ECCU was driven mainly by foreign direct investment and services export on account of economic citizenship programs.

**JEL Classification:** C25, E51, O40

**Keywords:** Eastern Caribbean, Creditless Recoveries, Logistic Regression

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## 1.0 Introduction

The 2007/2008 global economic crisis, which had its roots in the financial system, severely affected the ECCU through its impact on tourism, foreign direct investment and remittances. The contraction in economic activity also filtered into the domestic banking system and contributed to a significant spike in non-performing loans and the subsequent intervention by the Eastern Caribbean Central Bank (ECCB) in three indigenous banks. In 2011-2012 many member countries bottomed out of the recession but with little or no growth in domestic credit, yielding what is called a creditless recovery. A creditless recovery simply put is a phenomenon in which output recovers without credit growth, otherwise known as the phoenix miracles. For instance, in Anguilla and Antigua and Barbuda domestic credit contracted for five (5) years amid some years of positive GDP growth. While it could be argued that the evolution of domestic credit in those two countries may be associated with the failure of some indigenous banks<sup>2</sup>, which may have led commercial banks to tightened credit requirements, a similar pattern of credit contraction was observed over shorter time spans in Grenada, St Kitts and Nevis, and Saint Lucia.

According to Bodnar et al, (2014), creditless recoveries are not uncommon in developing and emerging markets. In fact, they are most likely to occur after a crisis. Additionally, the chances of a recovery of this type may be associated with imbalances in the credit or real estate market preceding a recession, a large decline in GDP during the crisis period, and a current account deficit. In those creditless episodes, lending through financial intermediaries is no longer the main pillar for economic growth as growth is being financed through alternative sources; thus, a creditless recovery is often followed and characterised by lower levels of growth.

Bank credit has facilitated the expansion of the private sector, created employment and financed development in the ECCU for decades. Consequently, bank credit has been seen as an important element in the generation of economic growth. The observation that some ECCU countries have recorded an expansion in GDP without credit growth, has motivated this study. The study seeks to uncover the factors that have led to and determined creditless recoveries in the ECCU post the global recession. Using logit and re-logit models based on two definitions of creditless recoveries, the key factors that are likely to affect the probability of creditless recoveries were analysed. To our knowledge, this study is the first attempt to examine this issue in the ECCU and it is the first application of the relogit regression to this subject.

Applying the approach by Abiad (2011) to identify creditless recoveries, our findings firstly indicate that creditless recoveries are rare events in the ECCU and its occurrence is strongly linked to the 2007/2008 global recession. The relogit models suggest that creditless recoveries are mainly preceded

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<sup>2</sup> The ECCB intervened in ABI Bank in 2011 in Antigua and Barbuda and National Bank of Anguilla and Caribbean Commercial Bank in Anguilla in 2013.

by deep economic recessions and high private sector to GDP ratios. Change in foreign direct investment and export growth also impacted the probability of occurrence. The results are consistent with previous studies that examined creditless recoveries. The findings suggest that foreign direct investment and exports of services - on account of the economic citizenship programs - are contributing the most to ECCU economic recovery. Further, policy makers ought to refrain from engaging in a broad-based approach to stimulating economic activity and focus on industries which may be sluggish. This approach should contribute to a more robust economic recovery.

The rest of the paper is as follows, Section 2 will provide some stylized facts on the domestic credit and GDP growth relationship. Section 3 provides an overview of the literature, Section 4 will examine the data and provide a suitable methodology for analysis, Section 5 presents the regression results and analysis, Section 6 examines the policy implications of the study and finally Section 7 concludes the paper.

## **2.0 Stylized Facts**

The bursting of the domestic credit cycle on account of the global financial crisis led to the deepest recession recorded by the ECCU since consolidated figures were estimated in 1985. Consequently, the ECCU contracted by at least 5.0 per cent in 2009 and a little less than 3.5 per cent in 2010 and 0.3 per cent in 2011. Prior to the recession of 2009 – 2011, the Monetary Union recorded periods of robust growth, which ranged from 4.4 per cent in 2003 to 5.4 per cent in 2006. Economic growth has been returning to the region as real GDP expanded at an average rate of 2.0 per cent over the period 2012-2015. The performance of the region for the most part has been reflective of improved global macroeconomic performance as well as domestic policies. However, the rate of growth, in comparison to the years prior to the financial crisis has been low, influenced by a number of issues including a slow pick up in tourism related and private sector construction; fiscal constraints that hinder the ability of governments to fuel growth; inert private sector activity; and still low stay-over tourists' arrivals as visitors from advanced economies have had their wealth curtailed.

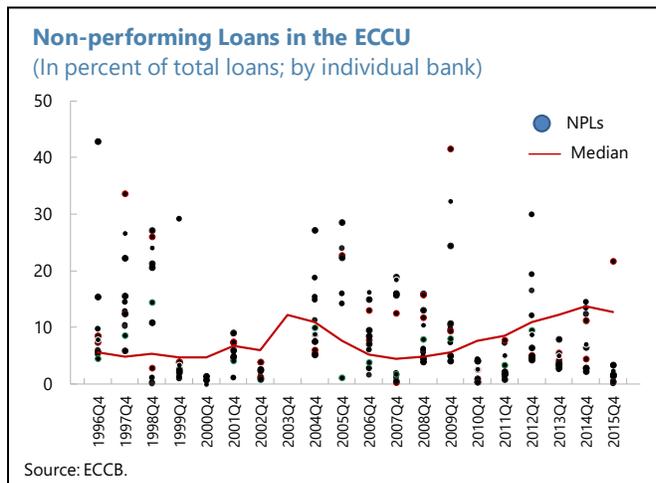
The corresponding energy required by the domestic economy has not been forthcoming and projects have been mainly driven by external financing – mainly as a result of economic citizenship programs of five (5) sovereign countries and the restart of some hotel projects in the member countries. The financing for these projects is generated outside the ECCU, and though flowing through the banking system are channelled directly to those projects. Thus, credit to the local economy is low and directed mainly to households and not businesses. This low credit extension may be attributed to supply, demand and other commercial bank balance sheet related factors. On the one hand, banks, especially foreign branch banks may be engaging in credit rationing<sup>3</sup> – especially towards businesses – and on the other hand, the demand for credit may be low.

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<sup>3</sup> “Equilibrium credit rationing occurs when some borrowers demand for credit is turned down, even if the borrower is willing to pay all the price and non-price elements of the loan contract (Freixas and Rochet 2008).”

The macroeconomy also plays a role in determining whether credit is demanded or supplied. Banks

**Figure 1: Non-Performing Loans in the ECCU**

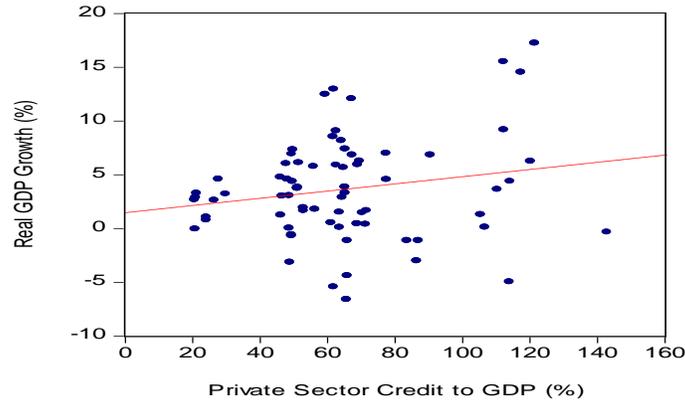


and businesses both assess the economic environment in making future decisions. Banks are better able to make this assessment given that they are able to consolidate multiple sources of information into making their economic decisions (Freixas and Rochet 2008). Another possible reason for low credit extension in the ECCU is the high level of NPLs incurred by commercial banks following the global financial crisis and the ECCU recession (Figure 1). In advanced economies, monetary policy prescriptions have allowed banks to continue extending credit to businesses and households – even at

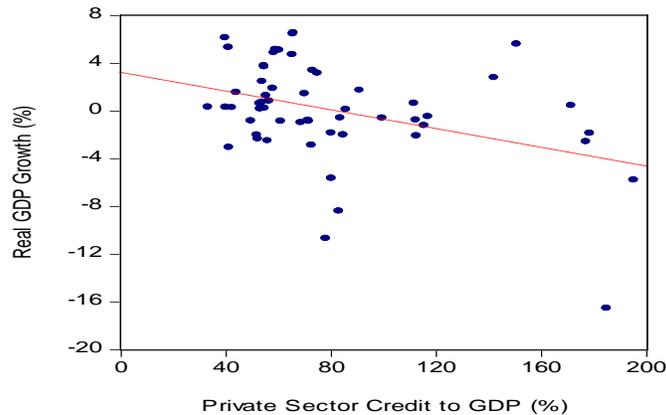
lower levels. Following the financial crisis, theory suggests that the presence of monetary policy – specifically quantitative easing allows for the migration of assets and the stimulation of credit in the general economy. In the absence of monetary policy and in the presence of high NPLs – such as in the ECCU – banks become more risk averse, resulting in low credit extension for prolonged periods, which arguably extends the recession and contributes to the credit rationing behaviour mentioned above.

Examining the relationship between the ratio of private sector credit to GDP and Real GDP growth, provides some insight into the behaviour outlined above and provides further impetus for our discussion. In the first instance there is a positive relationship between the two variables during 2000 – 2008 (Figure 2). This is in keeping with the general understanding associated with the financial crisis. The growth in real economic output was accompanied by an exuberance in the level of credit up to 2008. The converse holds true for the period 2009 to 2015. Following the global financial crisis and subsequent recession in the ECCU, the relationship between the two variables was negative. This suggests that as real economic output fell, the ratio of private sector credit also declined (Figure 3). Thus, the level of domestic credit driving economic output within the ECCU has declined over the period. Moreover, the decline in the level of domestic private sector credit is significantly lower in the 2009 to 2015 period than it was during the 2000 to 2008 period.

**Figure 2: Private Sector Credit to GDP, 2000 - 2008**



**Figure 3: Private Sector Credit to GDP, 2009-2015**

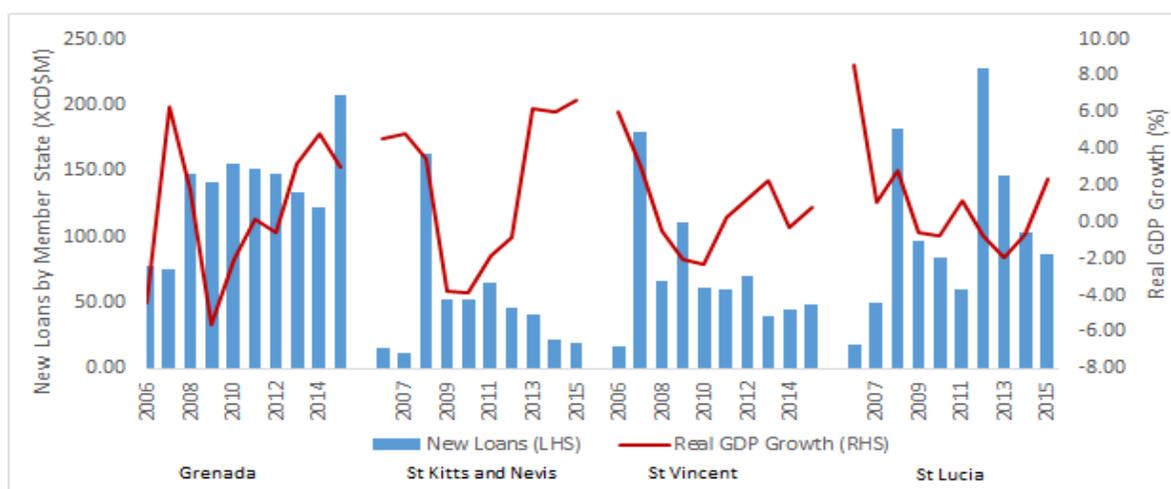
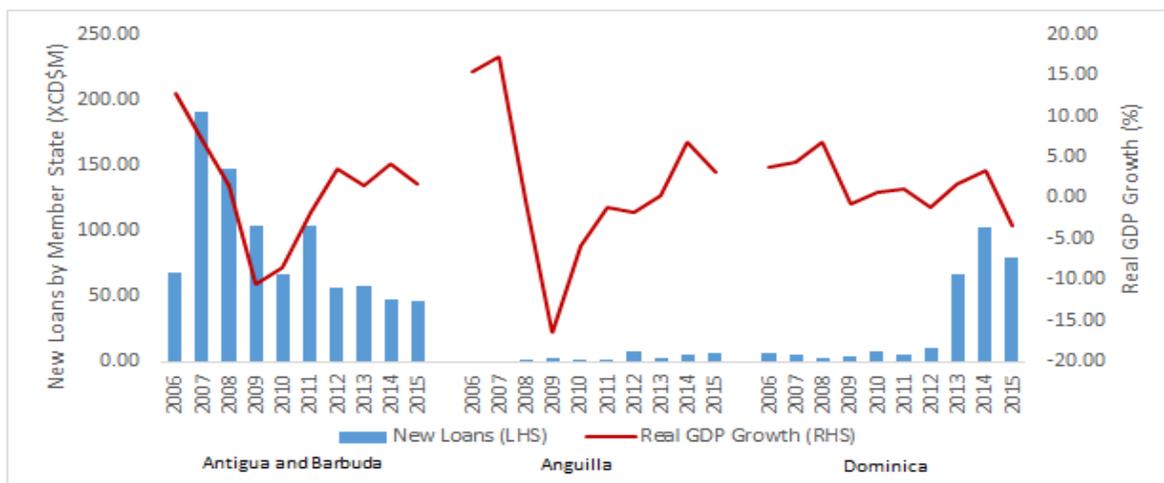


The declines in credit were not just restricted to an overall fall in the stock of credit but a decline in the flows of credit. Recent data from commercial banks within the ECCU suggest that the flow of credit between foreign branch banks and domestic banks have been declining. This data is indicative of either a credit crunch or credit rationing over the period 2008 to 2015. Even as real economic output has been increasing, the overall flow of credit to the economy by domestic and foreign branch banks have fallen (Figure 4). From 2008 to 2011, the flow of credit is estimated to have declined by \$262.4m<sup>4</sup>. Examining the flow of credit prior to the economic crises reveals that from 2006 to 2008, the flow of credit grew by over 250 per cent for domestic banks and over 512 per cent for foreign branch banks. In a similar manner, the fall-off in credit has been greater for foreign branch banks than domestic banks included in the sample.

**Figure 4: Country Breakdown of Credit Flows and Real GDP**

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<sup>4</sup> Based on commercial bank data submitted as of 30 September 2016.



Sources: Commercial Banks in the ECCU, ECCB

Indications of the development of a creditless recovery can be found at the country level, where credit flows declined, and real economic output rose. This occurred in all countries included in Figure 4 except St Vincent and the Grenadines. The flow of new loans in each territory was concentrated mainly in the sectors of distribution, acquisition of personal property, consumer goods, other personal loans, and professional services. The sectoral flows recorded in credit also correspond to the sectoral growth in credit stock following the financial crisis. Domestic credit data reveal that households have taken the bulk of domestic credit while credit to businesses has been reduced. Thus, the domestic demand likely to follow business investment will remain low as businesses use cash available on balance sheets to finance their activities.

Analysis of the external sector accounts reveals that following the financial crisis, there was a fall-off in foreign direct investment. However, FDI is once again climbing with the economic recovery, largely associated with equity investments in real estate and land sales. Moreover, exports of goods and

services are increasing mainly on account of services exports which can be traced to government services attached to the economic citizenship programs in the region. The result has been a reinvigoration of economic activity centred around sectors related to economic citizenship programs, as well as an increase in non-tax revenue in regional fiscal accounts.

### 3.0 Literature Review

The importance of the financial system for economic growth has been debated widely since the 1800s. The principal function of financial systems is to facilitate the allocation of resources across space and time and in an uncertain environment (Marton and Bodie, 1995). This definition can be further decomposed into the functions of the financial system to include the facilitation of trading, hedging, diversifying and pooling of risk; the allocation of resources, savings mobilization and the facilitation of the exchange of goods and services (Levine, 1997). Furthermore, the relationship between credit and economic growth has also been explored in detail by many authors. Beck (2012) identified several channels between credit and economic growth including entrepreneurship, financial intermediation, exports and development. Though financial systems are able to influence growth through these channels, the relationship is not linear and after certain points may incur diminishing returns (Bodnar et al, 2014).

The link between credit and economic growth, was examined from a closed economy approach by Biggs et al (2009). Within a two-sector model of the economy, two types of goods are produced from which income can be derived through their production and sale. Firms in an effort to produce these goods, enlist labour from households in combination with financing from banks. Goods are produced and sold leading to profits, and eventual repayment of loans by firms. The returns to a firms' investment are then shared between consumers through income, which leads to consumption by households. This combination of consumption and investment feeds into overall economic output. Thus, in examining the link between economic growth and credit, we see that the coefficient associated with the change in economic output is significantly larger when compared with the change in the stock of credit. Since GDP growth is a function of the change in the flow and stock of credit, a creditless recovery can occur where the change in credit is negative while the flow of credit is positive, or GDP may be positive while the stock of credit is negative. Biggs et al (2009) therefore defined a creditless recovery as a recovery in output without a pick-up in the growth rate of credit instead of the level of credit as defined by Calvo et al, (2006) and Abiad et al (2011). Consequently, several acceptable definitions of creditless recoveries exist as follows:

1. Three (3) years of consecutive negative annual real credit growth after the trough.
2. Two (2) years of consecutive negative annual real credit growth after the trough.
3. Negative average real credit growth for the 3 years following the trough.
4. Negative average real credit growth for the 2 years following the trough.
5. The level of real credit is higher in the trough year than in the third year after the trough.

6. The level of real credit is higher in the trough year than in the second year after the trough

Creditless recoveries are not rare events. This has been highlighted especially in the works of Calvo et al (2006) and Bijsterbosch and Dahlhaus (2011). Calvo et al, (2006) using data for 31 emerging market economies that were integrated into global capital markets over the period of 1980-2004, examined output contractions and their recovery patterns after systemic sudden stops, identified 22 output collapse episodes. They found that on average although quick V shaped recoveries were typically observed after a crisis, they were associated with weak investment pick-ups and no domestic and external credit recoveries. Using the same data as Calvo et al (2006), Biggs et al (2009) argued that it is the flow, not the stock of credit which impacts the recovery. They modelled the relationship between credit and growth and showed that the flow of credit is correlated with growth in domestic demand. Bijsterbosch and Dahlhaus (2011) focusing on 86 emerging and developing countries using a panel probit model found that the incidence of creditless recoveries doubles after banking or currency crises and that recoveries are more likely to be creditless if they are preceded by large declines in output and financial sector stress as well as high credit to GDP ratio and large capital inflows. Moreover, the frequency of these types of recoveries can double following banking or currency crises. Out of a total of 211 recoveries identified they found that 24 per cent were creditless.

Coricelli and Roland (2011) based on industry level data for 103 countries and 28 manufacturing sectors from the United National Industrial Development Organization (UNIDO) found that alternative sources of financing such as trade credit, and a reallocation to less credit-dependent sectors were some of the factors that allowed for an economy to recover without credit as they assist firms in raising their output despite stringent credit conditions. Moreover, they found that recovery of credit flow rather than the stock had a greater impact on the recovery of output.

Comparing creditless recoveries and normal recoveries in a sample of advanced, emerging and lower income countries, Abiad et al (2011), found that one in five recoveries is creditless. However, in instances of a sudden stop or shock accompanied by a banking crisis, about 80.0 per cent of recoveries were creditless. Furthermore, they found that these recoveries tend to be weak and output growth was on average a third lower than in normal recoveries. They attributed the differences in output growth between normal and creditless recoveries to impaired financial intermediation which affected the supply of credit. They also found that the frequency of credit-lesse recoveries doubled when the downturn was preceded by a credit boom and more than doubled when the downturn was preceded by or coincided with a banking crisis. In addition, currency and sovereign debt crises had a smaller effect and in the presence of a banking crisis they did not significantly increase the likelihood of a creditless recovery.

Similarly, Sagawara and Zalduendo (2013) confirmed in their study using data for European and Central Asian countries that more than 25 per cent of all recoveries were creditless with more than 45 per cent concentrated in the period 2009-2010. They found that countries with large declines in GDP growth rates were more likely to experience recoveries without bank credit and that countries whose currencies depreciated the most and current account balance improved the most have higher

probabilities of experiencing creditless recoveries. On the external side, they found that economies with higher export to GDP ratios during peak periods reduced the likelihood of creditless recoveries.

Creditless recoveries are not limited to country effects. Kannan (2012) examined creditless recoveries using industry level and firm level data. Using data from the UNIDO, he showed that industries which are dependent on external finance recover at a slower pace following a financial crisis while Abiad et al (2011) indicated the relevance of bank credit to stronger output and capital accumulation. Moreover, creditless recoveries are not limited to just overall macroeconomic developments but are necessary for recovery amongst firms. Dagher (2010) using data from three Asian territories finds that in spite of a recovery in sale revenues, firms continued to perform with market values and debt levels similar to their pre-crisis levels. They further noted that the presence of borrowing constraints also affects creditless recoveries.

Although the research on creditless recoveries often focuses on the business and macroeconomic view, the contribution by households is also important. From the point of view of households, credit demand may be influenced by several factors. Theoretically, household borrowing decisions are made based on the idea of permanent income hypothesis - smoothing of consumption over the life cycle, Merikull (2012). Thus, household decisions are influenced by the overall level of residential investments, total income (and expected increases), and the types of loans -mortgage or non-mortgage loans. Merikull (2012) also examined the direct effects of households on overall credit demand. The author found that the debt service ratio and home ownership had an effect on credit demand and mortgage loan demand while savings did not.

In summary, a review of the relevant literature suggests that real GDP growth, the level of private sector credit to GDP, currency depreciation, exports of goods and services, the current account balance and openness to capital/ financial flows were the main factors that influenced the probability of creditless recoveries.

## **4.0 Data and Methodology**

### **4.1 Data**

The study made use of panel data for the eight (8) ECCU territories for the period 1986-2015, yielding a sample size of 240. The data were sourced from the Eastern Caribbean Central Bank (ECCB). To identify creditless recoveries using the approach of Abiad et al (2011), the data used were real GDP and real private credit (credit to the private sector divided by the GDP deflator). The stock of private sector credit was captured from the monetary survey data of the ECCB's balance sheet and included only residential credit for households and businesses. The dependent variable creditless recoveries was constructed as a binary response variable of one or zero, where one reflects the year in which a creditless recovery episode took place and zero otherwise. The binary response one (1) occurred in 6 years across six (6) countries in the data set according to definition 4 and occurred 7 times across 7 countries according to definition 6. This construct suggests that a creditless recovery is a rare event in the ECCU.

To estimate the logistic regression, the following covariates were used:

- *Real GDP growth (rgdpg)*: this variable captures a bounce back effect (Sichel, 1994) and is defined as the annual change in real GDP. The steeper the preceding contraction in output, the larger the probability that it will recover due to unused production capacity. Furthermore, according to financial accelerator mechanisms the more severe the contraction in economic activity, the larger the probability that credit growth could be weak. The expected sign of this variable is negative.
- *Private Sector Credit-to-GDP ratio – natural logs (lpscgt1)*: a high ratio indicates that the private sector is highly leveraged and may have to deleverage during a downturn. Therefore, the higher the ratio, the greater is the likelihood for a creditless recovery. The expected sign of this variable is positive.
- *Change in foreign direct investment (cfdi)*: high levels of financial inflows, sourced from the balance of payment account, increases the probability of a creditless recovery. This variable is defined as the annual change in the ratio of foreign direct investment to GDP and is expected to be positive.
- *Growth in exports of goods and services (exg)*: this data is sourced from the current account of the balance of payments. It may be a key driver of a creditless recovery on the assumption that credit intensive domestic expenditure components are depressed, (Bijsterbosch and Dahlhaus (2011)). The expected impact on creditless recoveries is positive.
- *Banking crisis dummy (cr)*: this crisis dummy captures the ECCB interventions in 2013 in Anguilla, and 2009 and 2011 in Antigua and Barbuda. By limiting the crisis dummy to interventions only, the authors assume implicitly that the effects of the interventions were not transitive and so became constrained to the country of origin. The expected impact on creditless recoveries is positive.

Other explanatory variables that were considered to be important and relevant included the current account balance as a percentage of GDP and the debt to GDP ratio. A high current account deficit indicates the dependence on foreign capital inflows while the debt to GDP ratio could affect credit available to the private sector. However, due to the presence of multicollinearity and insignificance, these variables were dropped from the models. The descriptive statistics of the dataset are presented in table 1, Appendix 1.

## 4.2 Methodology

### 4.2.1 Identification of Recession (Troughs)

A key aspect of the methodology and determining whether creditless recoveries exist is defining a recession (trough). The National Bureau of Economic Research (NBER) defines a recession as: “*a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP...[beginning] just after the economy reaches its peak...and ends as the economy reaches its trough*” (National

Bureau of Economic Research 2008).” The definition in this study goes a bit deeper whereby troughs were identified as periods when cyclical GDP is one standard deviation or more below zero<sup>5</sup> (Braun and Larrain, 2005). Consequently, for each country, data points where the cyclical component of GDP was below a negative one standard deviation were considered as troughs. To avoid a double dip recession, if two or more troughs were identified within two years or less, the one with the lowest cyclical component was chosen. Once the troughs were identified the corresponding peaks were determined. A peak is the highest value between two troughs or in the case of the first trough, the highest cyclical component prior to the first trough. To extract the cyclical component of GDP, the Hodrick-Prescott (HP) filter was used. In using the HP filter, the trend component moves and adjusts continuously thereby leading to a trend which minimizes the sum of squared deviations (Agenor and Montiel 1999). There are, however, several arguments for and against the use of the HP filter. A major criticism has been that it may remove valuable information and introduce spurious patterns into the data thus making it unsuitable for policy analysis<sup>6</sup> (Agenor and Montiel 1999). The authors sought to correct for the nature of the two-sided filter by using a one-sided filter.

#### ***4.2.2 Identification of Creditless Recoveries***

The second stage is the identification of creditless recoveries, according to the methodology of Abiad et al, (2011). The recovery period is defined as the period following the trough (t+1), after which the creditless recovery is identified using the six (6) definitions listed in the literature review. Definition four (4) which defined a creditless recovery as one with negative average real credit growth for the 2 years following the trough and definition six (6) which states that a creditless recovery occurs when the level of real credit is higher in the trough year (t) than in t+2, are the preferred definitions used in this paper. Consequently, according to the definition 4 there were six (6) episodes identified in all countries except Grenada and St Vincent and the Grenadines and according to definition 6 there were seven episodes with the exception of St Vincent and the Grenadines<sup>7</sup>, (Appendix 1, Figure 1). Episodes based on the other definitions 1, 2, 3, and 5 yielded 3, 4, 5 and 5 observations, respectively. Creditless recoveries in the ECCU seem to occur primarily in the post crisis period of 2011-2015 with the only exception of 1998 in Montserrat.

#### ***4.2.3 Model Estimation***

The authors make use of a static panel logistic regression model to estimate the parameters, similar to study done by Bijsterbosch and Dahlhaus (2011). This approach is appropriate as the dependent variable takes a binary form, representing the presence of a creditless recovery (1) and the absence of it (0), and the errors are not normally distributed (equation 1).

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<sup>5</sup> The cyclical GDP is defined as the difference between the logarithm of real GDP and a trend computed by the Hodrick Prescott Filter (HP Filter).

<sup>6</sup> St-Amant and Norden (1997) provide a detailed discussion on the use of the HP filter (one/two-sided approach).

<sup>7</sup> One episode per country.

$$y_i = \begin{cases} 1 & \text{if country } i \text{ has a creditless recovery} \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

.... where  $y_i$  is the realization of a random variable  $Y_i$  that can take the values of one and zero with probabilities of  $\pi_i$  and  $1 - \pi_i$ , respectively. The logit model binds the values of the probability to the 0 to1 range and when compared with the assumption of linearity, it provides much more robust estimates for analysis. Additionally, a static model makes the simplifying assumption that the probability of a creditless recovery in period  $t$  is independent of all previous credit or GDP trough events within a given country. Hence, the authors assume that the absence of a creditless recovery or event in prior periods is unlikely to influence a similar type of recovery in the current period.

The logistic regression model equates the logit transform, i.e., the natural logarithm of the odds that some event will occur, to the linear component  $\pi_i = x_i' \beta_k$  (equation 2).

$$\text{Log} \left( \frac{\pi_i}{1 - \pi_i} \right) = \sum_{k=0}^k x_{ik} \beta_k \quad i = 1, 2 \dots \dots, N \quad (2)$$

.....where  $x_i$  is a vector which includes a constant and  $k - 1$  explanatory variables. The unknown parameter  $\beta_k$  is a  $k \times 1$  vector, where  $\beta_0$  is a scalar constant term and  $\beta_1$  is a vector with elements corresponding to the explanatory variables. Further transformation yields the generic logistic model (equation 3) which follows a cumulative density function (CDF).

$$\Pr(y = 1|x) = \frac{\exp(x' \beta)}{1 + \exp(x' \beta)} \quad (3)$$

.... where the exponential coefficient,  $\exp(\beta_k)$ , represents the odds ratio and the right-hand side is a non-linear function of predictors. Simply put equation (3) indicates that the effect of a predictor variable on the probability of the dependent variable being successful is conditional on the coefficient and the probability value of the other covariates. For logistic regression, the least squares estimates are not capable of producing minimum variance unbiased estimators for the actual parameters, and therefore maximum likelihood estimation (MLE) is used to solve for the parameters that best fit the data (Czepiel, 2002). MLE which is derived from the probability distribution of the dependent variable finds the set of parameters for which the probability of the observed data is greatest.

Two models were estimated using equation 3. The first logistic model was based on a creditless recovery defined according to definition 4 (CRFR) and the second model reflects definition 6 (CRSX).

- Model 1:  $\Pr(\text{creditless recovery, crfr})_{ik} = \beta$  (real GDP growth – rgdpg; the lag of private sector credit to GDP - lpscg1; change in foreign direct investment – cfdi; export growth - exg; crisis –cr)  $_{ik} + \varepsilon_{ik}$
- Model 2:  $\Pr(\text{creditless recovery, crsx})_{ik} = \beta$  (real GDP growth – rgdpg; the lag of private sector credit to GDP - lpscg1; change in foreign direct investment – cfdi; export growth - exg; crisis –cr)  $_{ik} + \varepsilon_{ik}$

Those models were subjected to diagnostic tests including those for specification errors, multicollinearity and goodness of fit. However, while those logistic models passed these diagnostic tests, the rarity of creditless recoveries biased the estimates, making  $\hat{\beta}$  a likely biased estimate of  $\beta$ . This is because the maximum likelihood estimates of the logistic regression suffer from small sample bias and sharply underestimates the probability of infrequent episodes. Furthermore, even if  $\hat{\beta}$  was unbiased, the conditional probabilities are likely to be inferior as most rare events applications produce small estimates of  $\Pr(Y_i = 1|x_i) = \pi_i$  for all observations (King and Zeng, 2001). As a result, the Rare Events Logistic Regression (relogit) was used to estimate the models. This method, which was proposed by King and Zeng (2001) is considered superior to the normal logistic regression as it corrects for biases in small samples or rare observations and empowers the application of logistic regression. They designed a simulation programme that uses the usual logistic regression with a weighting or prior correction method that corrects the biases in rare events data captured in the constant term. Consequently, rare events logistic regression led to less bias coefficients and standard errors compared to logistic regression<sup>8</sup>. Hence, the model estimation process consisted of two steps: the estimation of a normal logistic regression, followed by the estimation of a relogit regression.

Since the coefficients of the relogit model do not allow for inference about the quantitative effects of changes in the explanatory variables, we calculate the marginal effects. The marginal effect measures the change in the probability of the dependent variable as a function of a change in the covariates, such as  $\Pr(\mathbf{Y} = \mathbf{1}|\mathbf{X} = \mathbf{1}) - \Pr(\mathbf{Y} = \mathbf{1}|\mathbf{X} = \mathbf{0})$ . The first difference is used to estimate the marginal effects, calculated at the means of the explanatory variables. The marginal effects of the covariate  $k$  for country  $i$  at time  $t$  is given by equation (4).

$$\frac{\partial F(X'_{it}\hat{\beta})}{\partial X_{itk}} = f(X'_{it}\hat{\beta})\hat{\beta}_k \quad (4)$$

... where  $f$  is the derivative of the cumulative density function of a standard logistic distribution. It is important to note that derivative calculation may not be meaningful in the case of a dummy

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<sup>8</sup> A weakness of the rare events logistic regression is that it overcorrects the bias in MLEs. As such another approach which is highly recommended to deal with small sample bias is the penalised MLE (PMLE) proposed by David Firth, called Firthlogit. PMLE produces unbiased estimates in cases with small sample size and few events. However, due to software constraints this method could not be used.

explanatory variable such as the banking crisis dummy. In this instance the marginal effect of a dummy variable on the predicted probability of  $y$  is calculated as in equation 5:

$$\Pr(y = 1|X_l = 1, \bar{X}, \hat{\beta}) - \Pr(y = 1|X = 0, \bar{X}, \hat{\beta}) \quad (5)$$

## 5.0 Regression Results and Analysis

The summarized regression results are presented in tables 1 in Appendix 2. In model one (1), real GDP growth was found to significantly reduce the odds of a creditless recovery. This is because of the excess capacity caused by the severe extent of economic contraction which could lead to a quicker rebound in economic activity. Meanwhile, the ratio of private sector credit to GDP increases the odds of a creditless recovery by 3.7 times, in sync with a priori expectations as a higher ratio will likely lead firms and households to deleverage during a recession. Change in foreign direct investment and export growth had no relationship with a creditless recovery in this model while the banking crisis was not significant in affecting the odds of a creditless recovery. The banking crisis dummy seemed to have not impacted the evolution of credit at the regional level, hence it's insignificance in affecting the odds of a creditless recovery.

In model 2, real GDP growth maintained the same likely impact on a creditless recovery. However, the external accounts variables such as the change in foreign direct investment and export growth, significantly increased the odds of a creditless recovery, although marginally. Intuitively, this means that growth in GDP was financed by foreign direct investment and export growth with no need for domestic bank borrowing. In particular receipts from the Citizenship by Investment programmes were highly influential in the economy. The level of private sector credit and the banking crisis were not significant in affecting the odds of a creditless recovery in this model.

The estimated marginal effects of changes in the explanatory variables are presented in table 2, in Appendix 2. Model one indicates that a unit increase in real GDP growth will reduce the likelihood of a creditless recovery by 0.2 per cent. Meanwhile, a one per cent increase in real private sector credit to GDP is likely to increase the probability of a creditless recovery by 1.3 per cent. The other variables in the model were not significant in affecting the likelihood of a creditless recovery. In model 2, real GDP growth, the change in foreign direct investment and export growth were all significant in affecting the likelihood of a creditless recovery. The size of the coefficients however indicates weak effects on the probability of a creditless recovery.

The results of this paper are consistent with earlier studies on this topic. Bijsterbosch and Dahlhaus (2011) found that real GDP growth, a high private sector credit to GDP ratio, and export growth among other factors were significant determinants of creditless recoveries. Similar results were obtained by Sugawara and Zalduendo (2013).

The goodness of fit tests presented in Table 3, Appendix 2, indicate that the models were well specified, and the variables were significant in explaining creditless recoveries.

## 6.0 Policy Implications

The results of the rare events model using the first definition of creditless recovery suggests that real economic activity reduces the likelihood of a creditless recovery occurring, while the level of private sector credit to GDP is expected to increase the likelihood of the event occurring. In examining the second model, we see that real economic output has a similar impact on creditless recoveries, while variables related to the external account such as foreign direct investment and export growth increase the likelihood of a creditless recovery.

In the first instance, we see that the growth in real economic output may not necessarily be attributed to an increase in lending activity and can reduce the likelihood of a creditless recovery. Thus, the extension of credit may not be a prerequisite for economic activity in the ECCU. This result is in keeping with the literature, in that while credit may not be a necessary condition for economic recoveries, its absence can act as a constraining factor in the recovery – thus rendering the economic recovery weaker and increase the susceptibility of the ECCU to economic shocks. These results also suggest that a broad-based approach to growth policy in the ECCU especially during these recovery episodes may not be the best approach. Instead, policy makers should seek to target industries/sectors which contribute least to the occurrence of a creditless recovery and stimulate growth in those respective areas. The concentration of growth in areas which are not growing due to low credit is expected to contribute in a more direct way to a robust economic recovery.

The economic recovery in the ECCU is also on account of external factors. The significance of export growth and foreign direct investment support the conclusion that these variables contribute positively to a creditless recovery. The positive influence of these two variables can be traced to the rise of economic citizenship programs and the returns of these programs to the export of services along with the increase in FDI in the region. The returns to economic citizenship programs are attributed to governments rather than professional services. Therefore, government revenue (non-tax revenue) is expected to improve over time in so far as these services continue. Additionally, the inflows of funds associated with the program though passing through the banking system are used for real estate development projects and have positive externalities for other sectors such as transportation, retail and non-tradeable sectors. Further, higher credit extension becomes almost unnecessary as firms are able to keep their balance sheets afloat with inflows from external agents and thus drive domestic economic activity. In a similar manner, the increased external contribution to an economic recovery simply weakens overall activity. Output will remain centred on a few sectors and the diversification necessary to withstand economic shocks is absent. Therefore, it becomes imperative to carefully manage the receipts from the economic citizenship programmes to allow for a maximization of the benefits.

Finally, the significance of external sector variables along with the low credit extension reinforces the hypothesis that credit rationing or lower credit extension is perhaps being used by commercial banks in the ECCU. This restriction of credit is due to the high levels of non-performing loans on the balance sheets of commercial banks. Commercial banks will, in the absence of active monetary policy

seek to reduce the levels of NPLs before extending credit to firms. This contributes to the lower and weaker economic activity seen in the ECCU. Further the level of credit being extended to households for the acquisition of property and durable consumer goods is of concern. This is a potential source of instability as it encourages households to increase their indebtedness, thereby encouraging an environment similar to that prior to the financial crisis. The concentration of bank credit to households is also representative of commercial banks' consideration of future cash flows from businesses. Commercial banks will perceive that the ability of businesses to repay will be low and as such will adjust their credit to households. A policy framework that would incorporate the Eastern Caribbean Asset Management Company and a review of foreclosure laws could assist banks in reducing their NPL levels and curtail the behaviour of credit rationing.

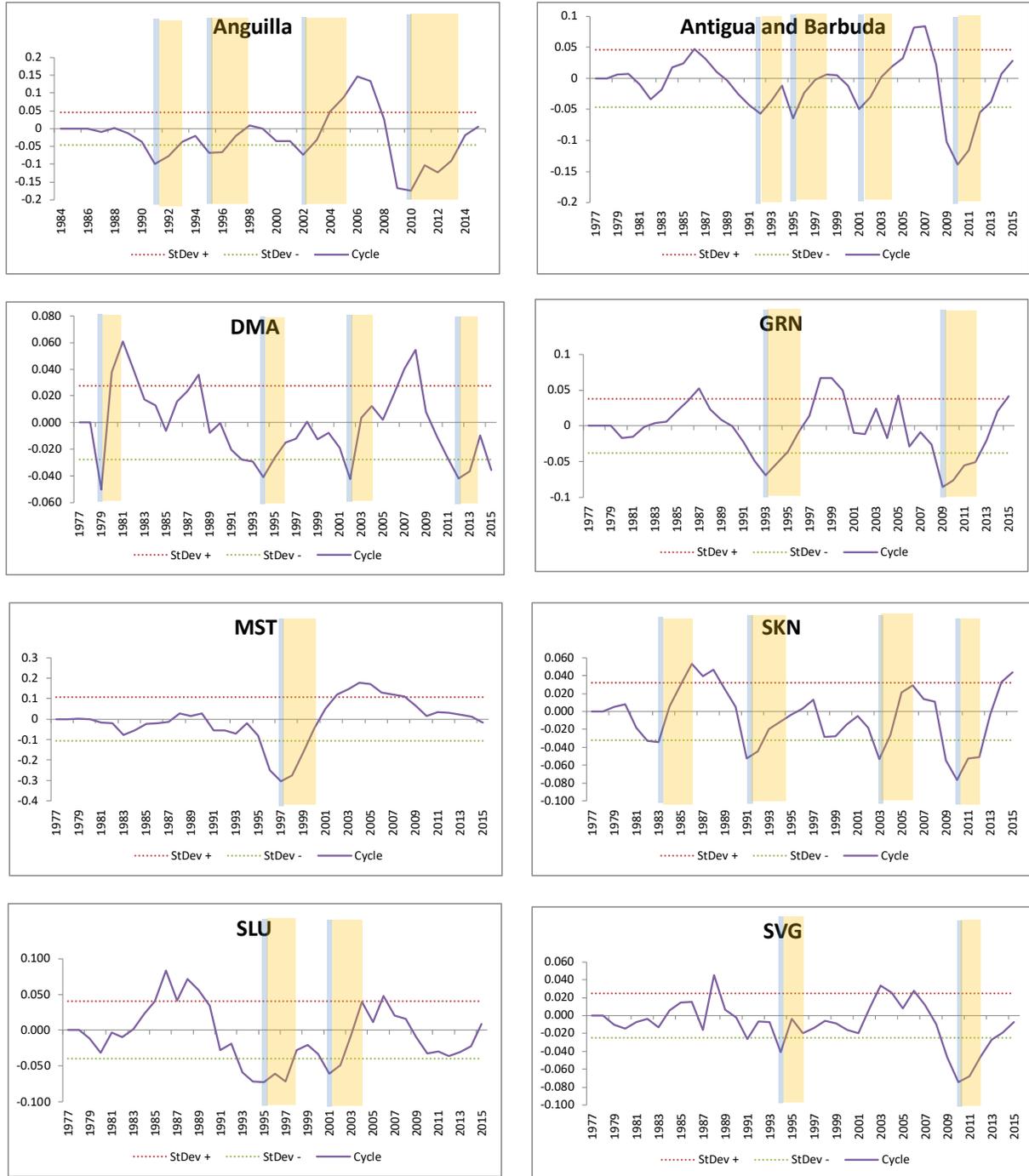
## **7.0 Conclusion**

This research paper provides some insight to the creditless recovery event currently occurring within the ECCU. It reveals even more so that the event is quite rare, occurring as the literature suggests following banking and financial crises. Examination of growth and other indicators suggest that real economic recovery is weak while banks continue to restrict credit to the household sector. Moreover, real economic growth is driven by specific sectors mainly on account of economic citizenship programs in the ECCU. Additionally, the findings point to the lower levels of financial intermediation in the region – mainly on account of higher NPLs in the bank financial system. Consequently, private sector credit to businesses has remained low while credit to households has steadily risen in the ECCU.

The findings also have implications for policy. The economic recovery is expected to continue albeit in an environment where growth is spurred by a few sectors. Thus, policy makers ought to resist a broad-based approach to growth policy and instead create incentives for economic growth from a sectoral view. Thus, the economies will be more diversified and robust in the face of exogenous shocks to the system. The results also point to the influence of economic citizenship programs on fiscal policy and exports of services. One can posit that the absence of the aforementioned programs could have potentially reduced the overall levels of growth driven by exports and foreign direct investment in the ECCU.

# APPENDIX 1

**Figure 1: Economic Downturns amongst ECCU Territories; 1977 - 2015**



**Table 1: Descriptive Statistics of Variables**

Variable	Obs	Mean	Std. Dev.	Min	Max
crfr	240	.025	.1564512	0	1
crsx	240	.0291667	.1686252	0	1
rgdpg	240	2.717471	5.421941	-26.76	17.251
lpscg	238	3.985352	.4456429	2.822149	5.27387
cfdi	228	10.03718	96.62784	-1105.704	259.7459
exg	240	6.126746	14.23294	-61.191	65.899
crisis	240	.0375	.1903806	0	1

APPENDIX 2

Table 1: Relogit Regression

**Relogit Regression**

Variable Name	Model 1	Model 2
rgdpg	0.8451*** (0.607)	0.9390* (0.340)
lpscg1	3.7358* <sup>✓</sup> (0.879)	3.2719 (0.920)
cfdi	1.0050 (0.005)	1.0071** (0.003)
exg	1.0004 (0.0281)	1.0524** (0.022)
cr	3.5307 (1.259)	4.2776 (1.455)
constant	0.0001*** (3.813)	0.0001** (3.764)
Observations	6	7
Log Likelihood	-21.943	-25.73
Pseudo R <sup>2</sup>	0.2091	0.177

Note: Exponential coefficients; standard errors are in parentheses;  
\* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%.

The relogit does not generate summary statistics and the figures reported correspond to an uncorrected logit model in which all coefficients allow for identical substantive interpretation.

**Table 2: Marginal Effects**

**Marginal Effects**

<b>Variable Name</b>	<b>Model 1</b>	<b>Model 2</b>
rgdpg	-0.1681** █ (0.010)	-0.0629** █ (-0.064)
lpsc1	1.3179** █ (0.041)	1.1854 █ (0.198)
cfdi	0.0050 █ (0.344)	0.0071** █ (0.035)
exg	-0.0004 █ (0.989)	0.0511** █ (0.024)
cr	1.2615 █ (0.343)	1.441 █ (0.322)

Note: p values are in parentheses;

\* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%.

**Table 3: Goodness of Fit Tests Results**

**Goodness of Fit Tests**

**Hosmer-Lemeshow (8 groups)**

Null Hypothesis: Model is Correctly Specified

Alternative Hypothesis: Model is Incorrectly Specified

	<b>p-value</b>	<b>Decision</b>
Model 1	0.5474	The null cannot be rejected, hence the model is correctly specified
Model 2	0.7112	The null cannot be rejected, hence the model is correctly specified

**LR Statistics**

Null Hypothesis: All slope coefficients, except the constant equal to zero

Alternative Hypothesis: All slope coefficients, except the constant are different from zero

	<b>p-value</b>	<b>Decision</b>
Model 1	0.0406	lll cannot be rejected, hence the model significantly predicts the probabilities
Model 2	0.0496	lll cannot be rejected, hence the model significantly predicts the probabilities

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