The Impact of Non-performing Loans and Capital Adequacy on loan growth

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Presentation Format

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Introduction

Financial Crisis

- Subprime meltdown in The United States triggered a global financial crisis in the 2007.
- The financial crisis has caused a slowdown in monetary expansion.
- One factor that causes a slow down in monetary expansion is a reduction in loan.
- *Loan creation is impacted by both demand side and supply side factors:*
  - *On the demand side, global loan demand declined due to a decline in those eligible to access loans as well as reluctance to increase personal debt.*
  - *On the supply side loans have declined as banks become more risk averse and unwilling to increase loan supply (This is called a "Credit Crunch") and regulators improve risk requirements*.

Introduction cont'd

Impact of Financial Crisis on Caribbean

- Caribbean Financial Sector was resilient given the magnitude and nature of the recent financial crisis.

- There were no major runs on commercial banks.

- The failures that have occurred have been more or less contained:

  - 1) Collapse of the Standford International Bank in Antigua;

  - 2) CLICO in Trinidad and Tobago.

Introduction cont'd

Impact of Financial Crisis on Caribbean cont'd

- Increase In Non-Performing Loans (NPLs) (2009 vs 2008):
  - In Jamaica by 65.6 percent and 26.2 percent respectively.
  - In Trinidad and Tobago 400.3 percent and 57.6 percent respectively.

- Reduction in Loans Year on year (2009 and 2008 relative to 2007 and 2006):
  - In Jamaica loans increased by 3.5 percent and 27.1 percent, respectively.
  - Trinidad and Tobago loans increased by 1.4 percent and 20.3 percent, respectively.

Motivation

- The study was motivated by three factors:
  - The deterioration of the balance sheet of entities within the Caribbean financial sector.
  - Increase in NPLs and a decline in loans (Credit Crunch).
  - The need for a regulatory tool which can signal beforehand issues regarding NPLs and CAR performance.

Previous Studies

Type of NPLs Study	Authors	Paper
1. Role of macroeconomic performance, management quality and policies on NPL outturn	• Tracey (2008)	•A Var analysis of macroeconomic shocks on banking system Sector Loan Quality in Jamaica
	• Maggi and Guida (2009)	•Modeling non performing loans probability in the commercial banking system: efficieincy and effectiveness related to credit risk in Italy
2. Link with macrofinancial Conditions and probability of a crisis	• Kaminsky and Reinhart (1999)	•The Twin Crises:the causes of Banking and Balance of payments Problems
	• Berger and Humphrey (1992)	•Problem Loans and Cost of efficiency in Commercial Banks
	• Hou and Dickinson (2007)	•The Non-Performing Loans: Some Bank-level Evidences
3. Predicting NPLs from aggregate NPL ratios	• Marco (2008)	•Is Bank Portfolio Riskiness Procyclical

Empirical Specification

The Basic Model

- Linear model specified Ordinary least Squares (OLS) model is used.
- The model will capture supply side factors (Balance Sheet variables) which help in the determination loans.
- The regression equation:

$$LGR_t = \beta_o + \beta_1 DGR_t + \beta_2 CGR_t + \beta_3 OIEAGR_t + \beta_4 NPL/LGR_{t-1} + \beta_5 NPL/LGR_{t-1}^2 + \varepsilon_t$$

Conditioning terms

Non-Linear Function

where

- t is the index for time period in this instance quarterly;
- DGR_t is the Deposit growth rate;
- CGR_t is Capital growth rate;
- $OIEAGR_t$ is the deposit growth rate;
- Cap_{t-1} is the capital growth rate;
- $(NPL/L)^2_{t-1t}$ is a nonlinear variable but linear in its parameter.

Empirical Specification cont'd

Confidence Interval

A 100(1-α) percent confidence interval on $\hat{\beta}_5$ is obtained as follows:

$$\hat{\beta}_5 \pm t_{\frac{\alpha}{2},n-2} \bullet se(\hat{\beta}_5)$$

where $\hat{\beta}_5$ is the coefficient of the squared variable of interest in this case ,

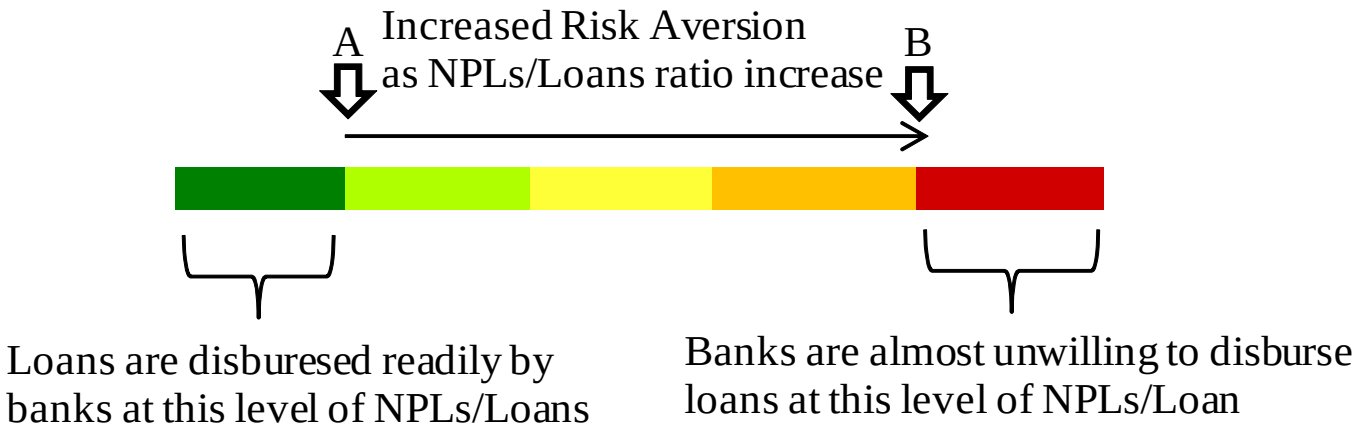
$t_{\frac{\alpha}{2},n-2}$ is the confidence interval and

$se(\hat{\beta}_5)$ is the standard error of $\hat{\beta}_5$.

Empirical Specification cont'd

Confidence Interval

Risk Aversion Spectrum of Banks – A represents lower bond of threshold and B represents the upper bound.

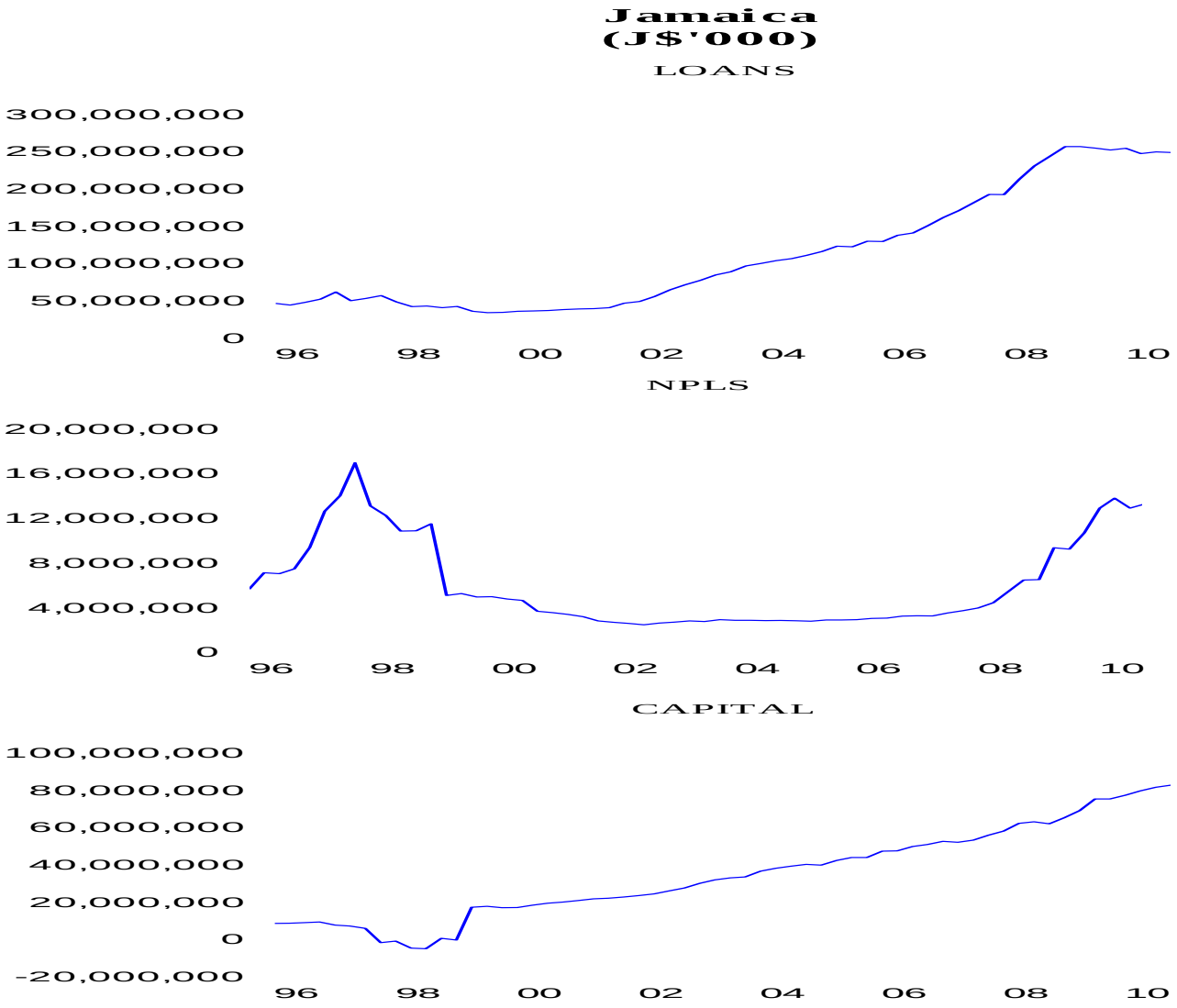


- Quarterly from 1996Q1 to 2011Q2:

	CAPITAL1	DEPOSITS	INVESTMENT	LOANS	NPLS
Mean	37226404	2.18E+08	1.13E+08	1.19E+08	6648519.
Median	34242128	1.97E+08	1.13E+08	95202423	4718343.
Maximum	87764439	3.84E+08	1.86E+08	2.59E+08	20118760
Minimum	-4011994.	87557891	19607657	36321196	2640276.
Std. Dev.	25739480	95760717	47902830	80130240	4513502.
Skewness	0.301974	0.345189	-0.508491	0.659886	1.126972
Kurtosis	2.085367	1.766740	2.239454	1.930394	3.192630
Jarque-Bera	3.103374	5.160341	4.166097	7.455123	13.21987
Probability	0.211890	0.075761	0.124550	0.024051	0.001347
Sum	2.31E+09	1.35E+10	7.02E+09	7.36E+09	4.12E+08
Sum Sq. Dev.	4.04E+16	5.59E+17	1.40E+17	3.92E+17	1.24E+15
Observations	62	62	62	62	62

DATA cont'd

Jamaica



DATA cont'd

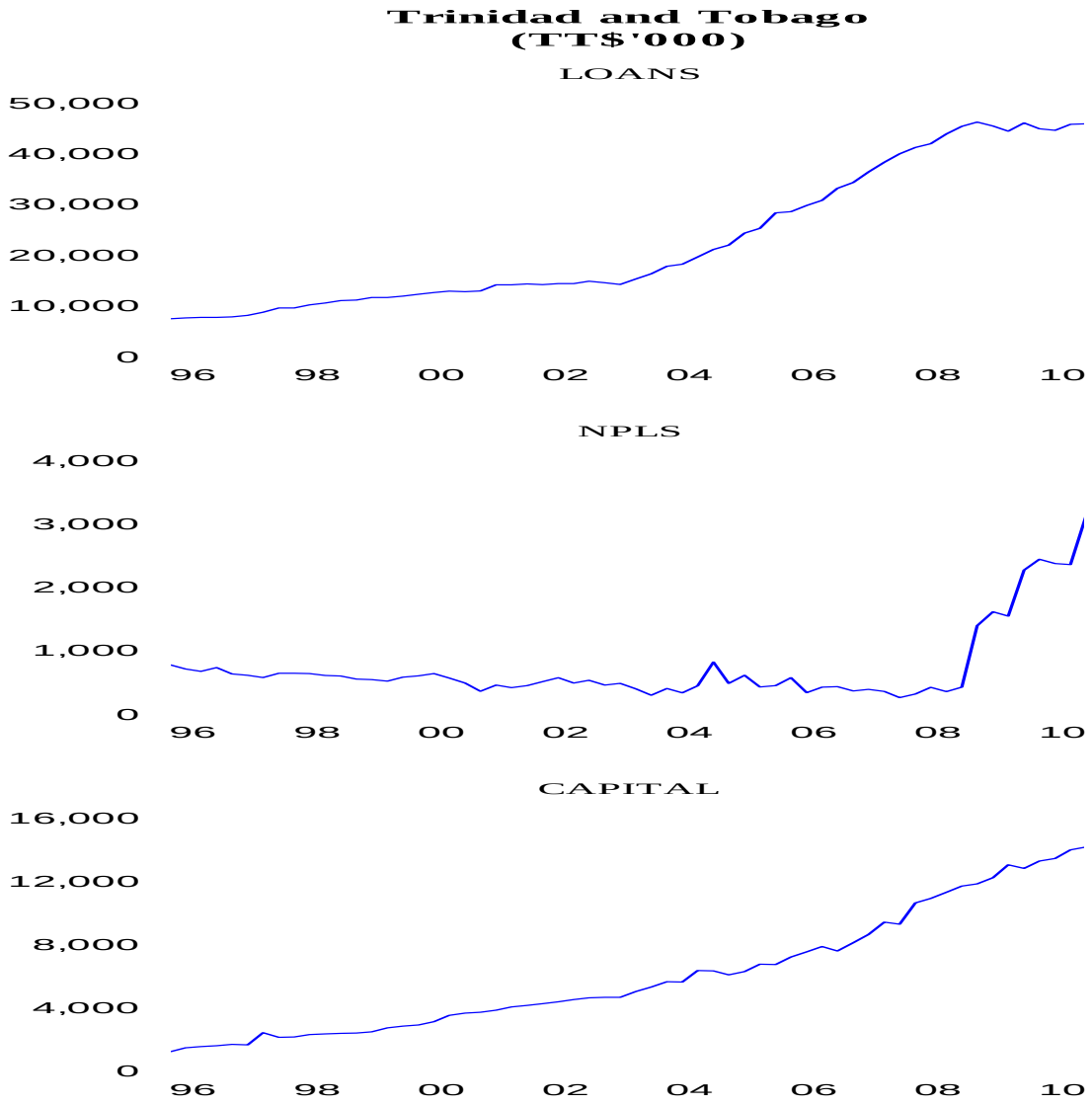
Trinidad and Tobago

- Quarterly from 1995Q3 to 2010Q4:

	CAPITAL	INVEST	LOANS	NPLS	DEPOSITS
Mean	5915.787	8831.441	22142.38	755.3672	30413.38
Median	4790.255	8079.750	14910.25	591.9000	22030.20
Maximum	14301.57	18897.90	46679.90	3168.200	74399.30
Minimum	1279.990	2451.190	7627.740	290.3000	11737.10
Std. Dev.	3895.940	3888.188	13784.82	587.8754	19022.64
Skewness	0.727547	0.848471	0.707583	2.541975	1.045375
Kurtosis	2.343449	3.431763	1.934125	8.731560	2.838552
Jarque-Bera	6.795623	8.176091	8.370084	156.5262	11.72613
Probability	0.033446	0.016772	0.015222	0.000000	0.002843
Sum	378610.4	565212.2	1417112.	48343.50	1946457.
Sum Sq. Dev.	9.56E+08	9.52E+08	1.20E+10	21772644	2.28E+10
Observations	64	64	64	64	64

DATA cont'd

Trinidad and Tobago



Empirical Results and Discussion

A Priori Expectations

- Loans should be pro-cyclical;

- Negative relationship between loans and the variables Nonperforming loans and income earning assets;

- Positive relationship between loans and the two variables deposits and capital.

Empirical Results and Discussion cont'd

Regression Outturn

Jamaica

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.030441	0.017064	1.783988	0.0805
D(NPLS_LOANS(-1))	-2.709298	0.946232	-2.863250	0.0061
D(NPLS_LOANS2(-1))	10.56569	2.547274	4.147842	0.0001
@PCH(CAPITAL(-1))	0.060794	0.017113	3.552587	0.0008
DLOG(INVESTMENT(-1))	-0.179364	0.066046	-2.715742	0.0091
DLOG(DEPOSITS(-1))	0.198683	0.088295	2.250213	0.0289
AR(2)	0.347331	0.132304	2.625256	0.0115
MA(5)	0.987483	0.026446	37.33899	0.0000

R-squared	0.606948	Mean dependent var	0.026474
Adjusted R-squared	0.551921	S.D. dependent var	0.067302
S.E. of regression	0.045051	Akaike info criterion	-3.234611
Sum squared resid	0.101479	Schwarz criterion	-2.950412
Log likelihood	101.8037	Hannan-Quinn criter.	-3.123910
F-statistic	11.02996	Durbin-Watson stat	1.948052
Prob(F-statistic)	0.000000		

Inverted AR Roots	.59	-.59		
Inverted MA Roots	.81-.59i	.81+.59i	-.31+.95i	-.31-.95i
	-1.00			

Empirical Results and Discussion cont'd

Regression Outturn

Trinidad and Tobago

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.021769	0.005847	3.722869	0.0005
D(NPLS_LOANS(-1))	-3.184559	0.740662	-4.299610	0.0001
D(NPLS_LOANS2(-1))	16.42155	7.008000	2.343257	0.0228
@PCH(CAPITAL(-1))	0.068842	0.037896	1.816599	0.0747
DLOG(DEPOSITS(-1))	0.106186	0.066318	1.601164	0.1151
D(INVEST(-1))	-2.71E-07	4.02E-06	-0.067459	0.9465
MA(4)	0.518511	0.126412	4.101763	0.0001

R-squared	0.383365	Mean dependent var	0.028657
Adjusted R-squared	0.316096	S.D. dependent var	0.032389
S.E. of regression	0.026786	Akaike info criterion	-4.295903
Sum squared resid	0.039461	Schwarz criterion	-4.055743
Log likelihood	140.1730	Hannan-Quinn criter.	-4.201610
F-statistic	5.698968	Durbin-Watson stat	1.665856
Prob(F-statistic)	0.000116		

Inverted MA Roots	.60+.60i	.60+.60i	-.60-.60i	-.60-.60i

Empirical Results and Discussion cont'd

Confidence Interval Outturn

Jamaica

- The Threshold range was found to be:

$$5.6 \leq \hat{\beta}_2 \geq 15.6$$

Empirical Results and Discussion cont'd

Confidence Interval Outturn

Trinidad

- The Threshold range was found to be:

$$2.7 \leq \hat{\beta}_2 \geq 30.2$$

Conclusion

- Model has detected evidence that at higher level of NPLs/Loan ratio banks become more risk averse in loan disbursal
- NPLs have a negative impact on loan creation as evidenced from the study is different in its degree of influence across Jurisdictions.
- Jamaica's threshold range indicates that banks operate within a tight band of risk aversion relative to Trinidad and Tobago.

Future Work

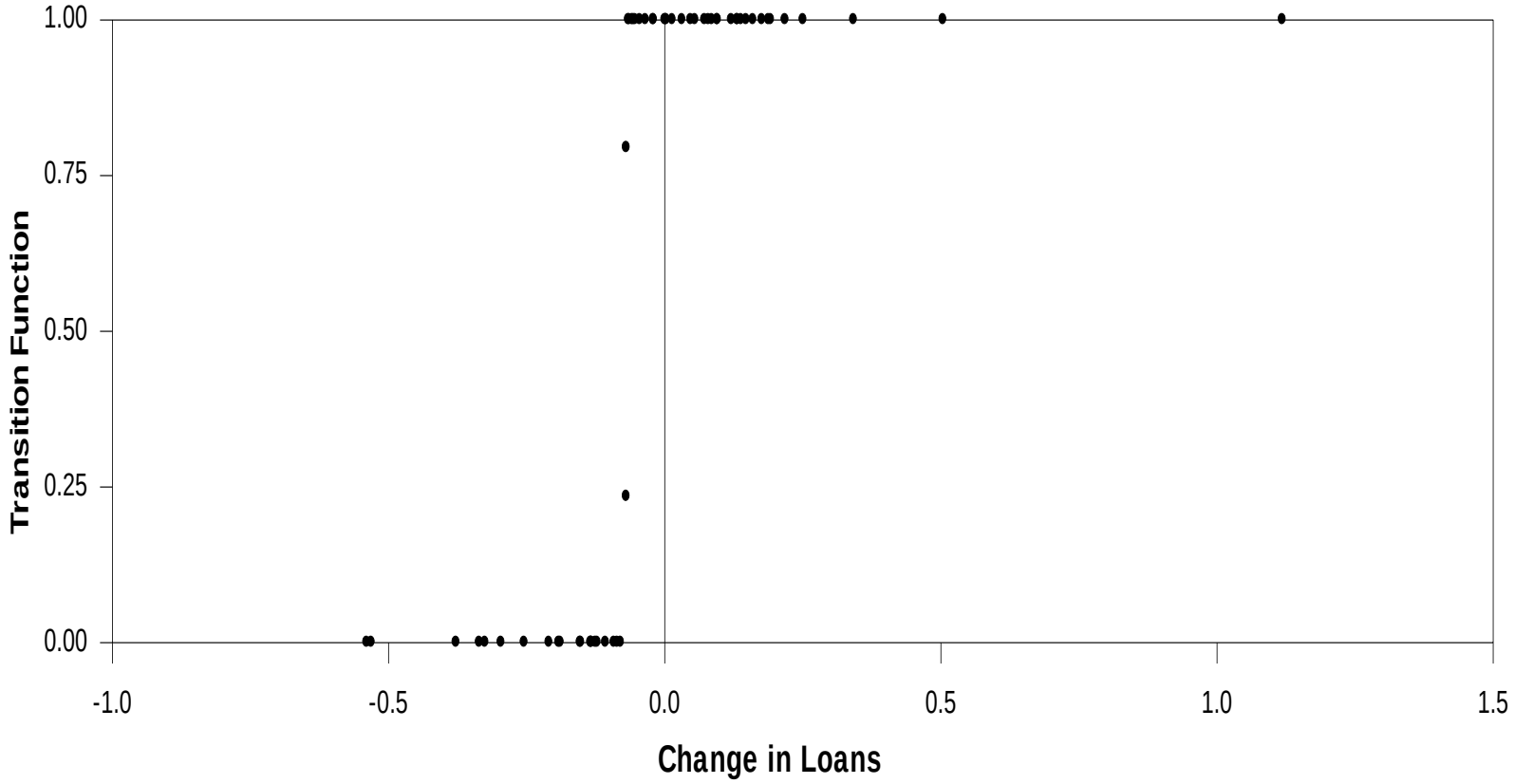
- Results are encouraging, however a threshold level rather than a range would improve upon the usefulness of the model as an early warning tool.
- There will be two added features to the body of work;
  - Incorporation of the impact of Capital adequacy (CAR) on loan growth;
  - Estimate a threshold level rather than a threshold range for both NPLs and CARs.
- Estimate the threshold level using a Smooth Transition Autoregressive (STAR) model. This will allow for the estimation of the Loan-NPL-CAR relationship.

Smooth Transition Regressions

$$y_t = \beta' \tilde{x}_t + \theta' \tilde{x}_t F\left(z_{t-d}, \gamma, c\right) + \mu_t$$

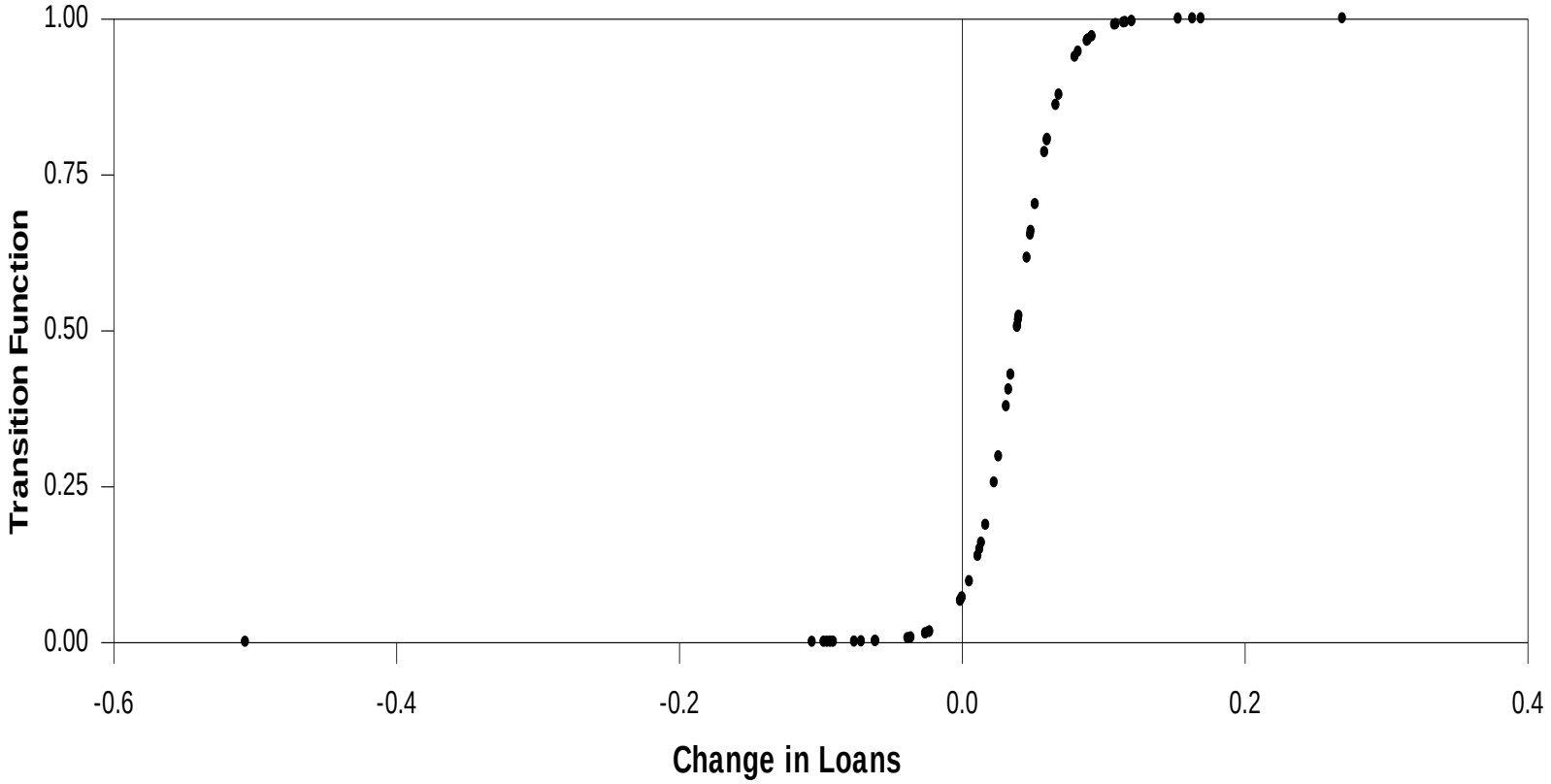
$$F\left(z_{t-d}, \gamma, c\right) = \left[\left(1+\exp\left\{-\gamma\left(z_{t-d} - c\right)\right\}\right)^{-1} - \frac{1}{2}\right]$$

Transition Function – NonPerforming loans



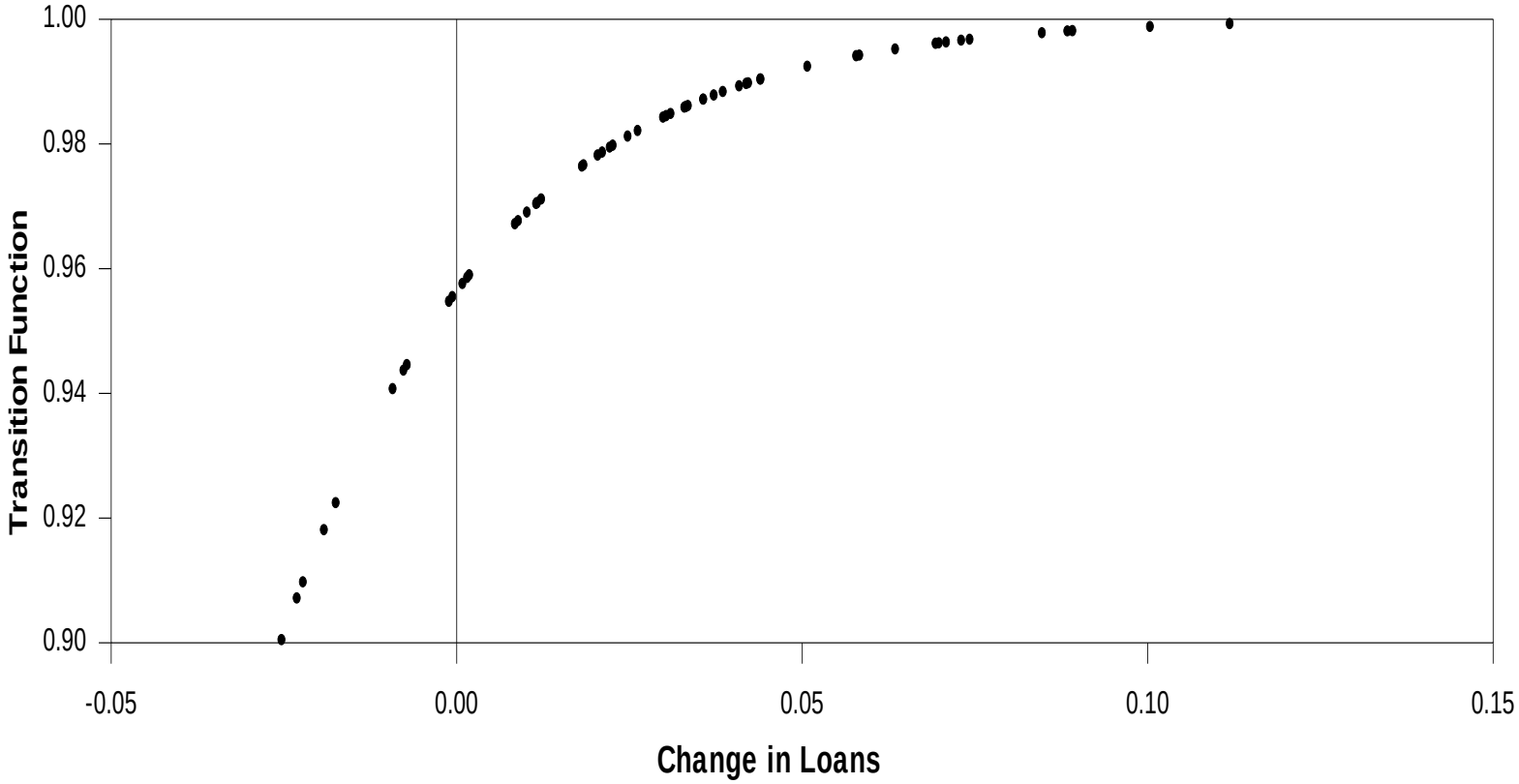
Transition Function in LSTAR for Loans Growth

Transition Function - Investment



Transition Function in LSTAR for Loans Growth

Transition function – STAR (own delay)



Transition Function in LSTAR for Loans Growth

The End