ISCTE Business School
Instituto Universitário de Lisboa

The Interaction between Business and Financial Cycles, in USA, Japan and UK

Cristiano Duarte Oliveira

Dissertation submitted as partial requirement for the conferral of

Master in Finance

Supervisor:

Prof. Doutor Luís Filipe Martins, Assistant Professor ISCTE-IUL – Department of Quantitative Methods

Co-supervisor:

Mestre Rui Silva, Research Assistant, UECE – Research Unit on Complexity and Economics, ISEG - UL

October 2014

ISCTE Business School
Instituto Universitário de Lisboa

The Interaction between Business and Financial Cycles, in USA, Japan and UK

Cristiano Duarte Oliveira

Dissertation submitted as partial requirement for the conferral of

Master in Finance

Supervisor:

Prof. Doutor Luís Filipe Martins, Assistant Professor ISCTE-IUL – Department of Quantitative Methods

Co-supervisor:

Mestre Rui Silva, Research Assistant, UECE – Research Unit on Complexity and Economics, ISEG - UL

October 2014

Resumo

A presente dissertação apresenta uma análise sobre as interações existentes entre os ciclos económico e financeiro de três países (Japão, Reino Unido e Estados Unidos América), caracterizando as suas tendências individuais e coletivas.

Primeiramente é efetuada uma revisão à literatura económica e financeira existente nomeadamente quanto à formação, comportamento, duração e interação dos ciclos económicos e financeiros.

Posteriormente é abordada, por via de metodologia econométrica, a interação entre os ciclos económico e financeiro, no período compreendido entre 1989 e 2013 (com periodicidade trimestral), correspondendo o ciclo económico de cada pais ao agregado dos seus principais indicadores económicos domésticos, sendo o ciclo financeiro construido com base na agregação ponderada do índice bolsista doméstico, do índice de preços das casas e pelas taxas de juro de longo prazo.

Recorrendo à estimação de modelos DL e ADL, tem-se por objetivo testar a existência de interações entre estes ciclos, bem como quais os impactos e a duração dos mesmos.

Conclui-se que nas 3 economias que constituem a amostra, o ciclo financeiro é explicado apenas pelo ciclo económico e respectiva desfazagem, não possuindo o passado da própria variável relevância para explicar variações actuais. No que diz respeito ao ciclo económico, tanto as suas desfazagens como o ciclo financeiro possuem significância estatistica para explicar parte das suas variações no presente. Relativamente à duração dos impactos, em ambos os casos a amplitude é de curto-prazo (com excepção do Japão).

Palavras-chave: Ciclo Economico; Ciclo Financeiro; Crises Financeiras; Bolhas Especulativas

JEL Classification System: C19; E32

Abstract

This thesis aims to develop an analysis on the interaction between the business and financial cycles of three main countries (Japan, United Kingdom and U.S.A), highlighting its individual and collective trends.

First, a review is made to the existing economic and financial literature, emphasizing the creation, behavior, duration and interaction between the cycles referred above.

Later, by means of an econometric methodology, it is studied the interaction between economic and financial cycles, on the time period comprehended between 1989 and 2013 (quarterly data), being the economic cycle of each country related to the aggregation of its main domestic economic indicators, and the financial cycle based on the weighted aggregation of the data related with the domestic stock market, house price index and the long term interest rates.

Using a DL and ADL model, the main goal is to test for the existence of interactions between these two cycles, and what are the impacts and the duration.

It is concluded that in the three economies, the financial cycle is only explained by the business cycle and its first lag, meaning that the past of the financial cycle do not have statistical significance to explain the variations in the present. In what concerns the business cycle, both the respective lags and the financial cycle have statistical significance to explain part of the present variations of the business cycle. Regarding the impact duration, in both cases, with the exception of the estimation for the Japanese financial cycle, they have short-term amplitude.

Keywords: Economic Cycle; Financial Cycle; Financial crises; Speculative bubbles

JEL Classification System: C19; E32

Acknowledgements

After the challenge that this study has represented, it is appropriated to give some acknowledgements to several people who have contributed to this project.

First I would like to thank Professor Luís Martins for accepting to be my supervisor, and for all the availability and comprehension demonstrated through all this time, as well for the guidance during the development of this study.

To my dear friend Rui Silva, who I consider an example, I give the most sincere acknowledgements for being patient, and for his friendship, supporting me since the first day of this friendship.

To my mother I would like to say that I recognize all her efforts to supporting me, and give me the possibility to achieve this goal.

To Diogo Rino, and all of my other friends, that in several ways contribute to this project and motivate me to finish it, I dedicate this project.

Table of Contents

Resumo ..... **II**
Abstract ..... **III**
Acknowledgements ..... **IV**
Table of Contents ..... **V**
Annexes ..... **VIII**
List of Abbreviations ..... **X**
Sumário Executivo ..... **XI**
Chapter 1 - Introduction **1**
Chapter 2 - Theories about several features of business and financial cycles **3**
2.1 Business Cycle **3**
2.1.1 The definition of business cycle **3**
2.1.1.1 Kitchin Inventory cycle **4**
2.1.1.2 Juglar fixed investment cycle **5**
2.1.1.3 Kuznets Infrastructural investment cycle **7**
2.1.1.4 Kondratieff wave or Technological cycle **8**
2.2 Financial Cycle **10**
2.2.1 Features about Financial cycles **10**
2.2.2 Equity Market Cycle **11**
2.2.2.1 Market phases **12**
2.2.3 Real Estate Cycle **14**
2.2.3.1 What drives the Real Estate market? **15**
2.2.3.2 Market phases **16**
2.2.4 Credit Cycle **17**
2.2.4.1 Credit Bubble **17**
2.2.4.2 Credit Busts **18**
Chapter 3 - Business and Financial Cycles Interactions **20**
3.1 Cycles Interactions **20**
3.2 History of Bubbles and Crashes **21**
Chapter 4 – Data **23**
Chapter 5 - Methodology **26**
Chapter 6 – Business and Financial Cycles Interactions **31**
6.1 Empirical Results **31**
6.1.1 Japan **32**
6.1.2 United Kingdom **41**

6.1.3 United States of America 48
6.1.4 Aggregate view 56
Chapter 7 – Conclusion Notes 57
References 59
Other References 62
Annex 1- Correlations 63
Annex 2 - Autocorrelations 64
Annex 3 – Normality Tests 70
Annex 4 – Unit Root Tests 71
Annex 5 – Chow Breakpoint Tests 77
Annex 6 – Granger Causality Test 79
Annex 7 – Tested Models 80
Annex 8 – Lag Order Selection 82
Annex 9 – Models with Dummies 85

Index of Figures

Figure 1 – Business Cycle for Japan between the periods of 1989Q3-2013Q1 ..... **32**
Figure 2 – Business Cycle HP Filter for Japan, between the periods of 1989Q1-2013Q1 ..... **33**
Figure 3 – Financial Cycle for Japan, between the periods of 1989Q3-2013Q1 ..... **34**
Figure 4 - Financial Cycle HP Filter for Japan, between the periods of 1989Q1-2013Q1 ..... **36**
Figure 5 – The Business and Financial Index behavior of Japan, between the periods of 1989Q3-2013Q1 ..... **39**
Figure 6 – Business Index residuals of Japan.. ..... **39**
Figure 7 - Dynamic Multipliers for ADL (2,5) of Japan **40**
Figure 8 – Business Cycle for U.K. between the periods of 1989Q3-2013Q1 ..... **41**
Figure 9 – Business Cycle HP Filter, for U.K.., between the periods of 1989Q1-2013Q1 ..... **42**
Figure 10 - Financial Cycle, for U.K., between the periods of 1989Q3-2013Q1 ..... **43**
Figure 11 - Financial Cycle HP Filter of U.K., between the periods of 1989Q1-2013Q1 ..... **44**
Figure 12 – The Business and Financial Index behavior of U.K., between the periods of 1989Q3-2013Q1 ..... **46**
Figure 13 – Business Index residuals of U.K. **46**
Figure 14 – Dynamic Multipliers for ADL (2,1) of U.K. **47**
Figure 15 – Business Cycle of U.S.A. between the periods of 1989Q3-2013Q1 ..... **48**
Figure 16 - Business Cycle HP Filter, of U.S.A., between the periods of 1989Q1-2013Q1 ..... **49**
Figure 17 - Financial Cycle of U.S.A., between the periods of 1989Q3-2013Q1..... **50**
Figure 18 –Financial Cycle HP Filter of U.S.A., between the periods of 1989Q1-2013Q1 ..... **51**
Figure 19 – The Business and Financial Index behavior of U.S.A., between the periods of 1989Q3-2013Q1 ..... **54**
Figure 20 – Business Index residuals of U.S.A. **54**
Figure 21 – Dynamic Multipliers for ADL (2,5) of U.S.A. **55**

Index of Tables

Table 1 – DL (1) estimation for Japan **37**
Table 2 – ADL (2,5) estimation for Japan **38**
Table 3 – ADL (2,1) estimation for U.K **45**
Table 4 – DL (2) estimation for U.S.A **52**
Table 5 – ADL (2,5) for U.S.A. **53**

Annexes

Annex 1.1 – Correlation between Business and Financial Indexes, Japan **63**
Annex 1.2 - Correlation between Business and Financial Indexes, U.K. **63**
Annex 1.3 - Correlation between Business and Financial Indexes, U.S.A. **63**
Annex 2.1 – Autocorrelation Business Index, Japan **64**
Annex 2.2 – Autocorrelation Financial Index, Japan **65**
Annex 2.3 – Autocorrelation Business Index, U.K. **66**
Annex 2.4 – Autocorrelation Financial Index, U.K. **67**
Annex 2.5 – Autocorrelation Business Index, U.S.A. **68**
Annex 2.6 – Autocorrelation Financial Index, U.S.A. **69**
Annex 3.1 – ADL Residual Normality Test between Business and Financial Index, Japan **70**
Annex 3.2 – ADL Residual Normality Test between Business and Financial Index, U.K. **70**
Annex 3.3 – ADL Residual Normality Test between Business and Financial Index, U.S.A. **70**
Annex 4.1 - Unit Root test to Business_Index using ADF, to Japan **71**
Annex 4.2 - Unit Root test to Financial_Index using ADF, to Japan **71**
Annex 4.3 - Unit Root test to Business_Index using PP, to Japan **71**
Annex 4.4 - Unit Root test to Financial_Index using PP, to Japan **72**
Annex 4.5 - Unit Root test to Business_Index using KPSS, to Japan **72**
Annex 4.6 - Unit Root test to Financial_Index using KPSS, to Japan **72**
Annex 4.7 - Unit Root test to Business_Index using ADF, to U.K. **73**
Annex 4.8 - Unit Root test to Financial_Index using ADF, to U.K. **73**
Annex 4.9 - Unit Root test to Business_Index using PP, to U.K. **73**
Annex 4.10 - Unit Root test to Financial_Index using PP, to U.K. **74**
Annex 4.11 - Unit Root test to Business_Index using KPSS, to U.K. **74**
Annex 4.12 - Unit Root test to Financial_Index using KPSS, to U.K. **74**
Annex 4.13 - Unit Root test to Business_Index using ADF, to U.S.A. **75**
Annex 4.14 - Unit Root test to Financial_Index using ADF, to U.S.A. **75**
Annex 4.15 - Unit Root test to Business_Index using PP, to U.S.A. **75**
Annex 4.16- Unit Root test to Financial_Index using PP, to U.S.A. **76**
Annex 4.17 - Unit Root test to Business_Index using KPSS, to U.S.A. **76**
Annex 4.18 - Unit Root test to Financial_Index using KPSS, to U.S.A. **76**
Annex 5.1 – Chow Breakpoint Test, Japan (2008Q2) **77**
Annex 5.2 –Chow Breakpoint Test, U.K. (2008Q4) **77**
Annex 5.3 –Chow Breakpoint Test, U.S.A. (2002Q2) **77**

Annex 5.4 –Chow Breakpoint Test, U.S.A. (2008Q2) **77**
Annex 5.5 –Chow Breakpoint Test, U.S.A. (2009Q3) **78**
Annex 6.1 - Granger Causality test for Japan. **79**
Annex 6.2 - Granger Causality test for U.K. **79**
Annex 6.3 - Granger Causality test for U.S.A. **79**
Annex 7.1 – Bivariate VAR model tested for Japan **80**
Annex 7.2 – Bivariate VAR model tested for U.K **80**
Annex 7.3 – Bivariate VAR model tested for U.S.A. **81**
Annex 8.1 – ADL Lag Order Selection Criteria of Japan **82**
Annex 8.2 – ADL Log Order Selection Criteria of U.K. **83**
Annex 8.3 – ADL Log Order Selection Criteria of U.S.A. **84**
Annex 9.1 - ADL (2,5) with dummy 2008Q2 estimation of Japan **85**
Annex 9.2 - ADL (2,1) with dummy 2008Q2 estimation of U.K. **86**
Annex 9.3 - ADL (2,5) with dummy 2002Q2 estimation of U.S.A. **87**
Annex 9.4 - ADL (2,5) with dummy 2008Q2 estimation of U.S.A. **88**
Annex 9.5 - ADL (2,5) with dummy 2009Q3 estimation of U.S.A. **89**

List of Abbreviations

ADF: Augmented Dickey-Fuller

ADL: Autoregressive Distributed Lag Model

AIC: Akaike Information Criterion

AR (p): Autoregressive process

CLI: Composite Leading Indicator

EMH: Efficient Market Hypothesis

E.U.A.: Estados Unidos da América

ITA: International Trade Agency

FIR: Function Impulse Response

FRED: Federal Reserve of Economic Data

GDP: Gross Domestic Product

HP: Hodrick–Prescot

HQ: Hannan-Quinn information criterion

IMF: International Monetary Fund

IV: Instrumental Variables

JB: Jarque-Bera

KPSS: Kwiatkowski-Phillips-Schmidt-Shin

LTV: Loan to Value

NBER: National Bureau of Economic Research

NOI: Net Operating Income

OECD: Organization for Economic Co-operation and Development

OPEC: Organization of the Petroleum Exporting Countries

OLS: Ordinary Least Squares

PP: Phillips-Perron

SC: Schwarz information Criterion

SPV: Special Purpose Vehicle

SSR: Sum of squared residuals

U.K: United Kingdom

U.S.A.: United States of America

VAR:Vector Autoregression

Sumário Executivo

O objetivo da presente dissertação assenta na elaboração de um estudo sobre o comportamento e as dinâmicas de interação entre os *business cycles* e *financial cycles* de três das maiores e mais desenvolvidas economias mundiais, sendo elas os Estados Unidos da América, Japão e Reino Unido.

Como forma de atingir tal objetivo, é elaborada uma revisão literária às dinâmicas inerentes aos processos de formação dos ciclos e as suas respetivas caracteristicas (origem, duração e implicações), com especial ênfase para as abordagens de Kitchin (*inventory cycle*), Juglar (*fixed investment cycle*), Kuznets (*infrastrucutural cycle*), e para os super-ciclos de Kondratieff (*long technological cycle*) no que refere ao *business cycle,* destacando-se os contributos de Kindleberger Herring and Watcher, Kyiotaki e Moore assim como de Shiller, referentes ao *financial cycle.*

Após a revisão de literatura é formulada e abordada a problemática que serve de base ao presente estudo, ou seja, a interação entre os *business cycles* e *financial cycles* dos Estados Unidos da América, Japão e Reino Unido, sendo complementada através da apresentação de uma breve sequência cronológica quanto às mais relevantes crises economicas e financeiras.

Por último é apresentada uma abordagem econométrica, por via da estimação de modelos DL e ADL, visando a obtenção de resultados relevantes para a pergunta de partida deste estudo. Esta possui por base dados trimestrais, compreendidos entre 1989 e 2013, sendo aproximado o ciclo economico através das tendências dos principais indicadores macroeconomicos de cada pais, e o ciclo financeiro através de um agregado ponderado, o qual engloba a cotaçao do indice bolsista doméstico, o indice do preço das casas e as taxas de juro de longo prazo.

É assim desta forma analisada a eventual existência de impactos na formação de um *business* cycle por via do desempenho passado do próprio indicador, bem como do desempenho atual ou passado do *financial cycle,* sendo verificada a relação inversa. O desfasamento dos periodos de influência, bem como a possibilidade de existência de quebras de estrutura são aspectos de igual modo abrangidos pelo estudo realizado.

Conclui-se que o ciclo financeiro possui significância estatística na explicação do ciclo económico, juntamente com a desfazagem da própria variável dependente. Ainda assim, esta relação não se verifica quando analisado o ciclo financeiro, atendendo que o passado da própria variável não se apresenta estatisticamente significante para a

explicação de variações no presente. Em termos de duração dos impactos, em ambos os casos e com excepção da estimação efectuada para o ciclo financeiro do Japão, a amplitude encontra-se compreendida num horizonte de curto-prazo.

Os resultados apontam igualmente para um forte grau de sincronização entre os business cycles dos E.U.A. e do Japão, sendo o do Reino Unido o que demonstra menor grau de sincronização. Por sua vez, em termos domésticos, o *business cycle* do Japão é aquele que maior impacto possui na explicação das variações do *financial cycle,* contrariamente ao verificado nas outras duas economias estudadas.

Embora os três países apresentem evidências quanto à presença de quebras de estrutura nos seus *business cycles*, a sua inclusão nos modelos de estimação não apresenta significância estatística.

Chapter 1 - Introduction

Some events are recurrent throughout time. Economic depressions or expansions, crashes and speculative bubbles are historically relevant variables both in the world economy and the financial markets, with shifts responsible for important and relevant events. From these, it stands out, namely, the Tulip Crisis (1637), the Great Depression (1929), the Japanese Crisis (1992), and more recently the Dot-Com Bubble (2001), and the Subprime Crisis that begun in the U.S.A. in 2008, and that still affects the world economy.

Specifically, the subprime crisis, which started in the USA, quickly spread through other nations, generating in a global economic crisis, which affected both less resilient and strong economies. As a result, countries nowadays still struggle with high unemployment rates, difficulties in resuming economic growth stagnation scenarios in the real estate markets and several restrictions in the credit policy of banks.

The relevance of the interactions between business and financial cycles in the economy is undeniable. However, despite the existence of innumerous studies related with this research area, a lack of information on how business and financial cycles interact still prevails. This problem is even bigger when financial cycles are considered as the result of the aggregation of the three major financial markets (equity, credit and real estate). The literature about the behavior, duration, periodicity and origins of business cycles restricts its range only to the business area, despite being well documented in the studies conducted by Juglar (1862), Kitchin (1923), Kondratieff (1926), Kuznets (1930), and also Schumpeter (1954). Studies about the financial cycle thematic are, nevertheless, more completed. Those conducted by Herring and Watcher (1999), Kiyotaki and Moore (1995), Kindleberger and Aliber (2005) or Hott (2009) represent examples of studies that do not treat the financial cycle components individually and isolated (credit, equity, and real estate), extending the range of analysis to the dynamics between them and with the business cycles. One attempt to correct this flaw is found in the IMF study developed by Claessens *et al* (2011a), where an extended analysis to the interactions between the business and financial cycles is exposed. However, the financial segments that were chosen (credit, equity and real estate) are compared, each one, isolated with the business cycle and not as one financial index, like is done in the present work, which can result in the underestimation of the real impact of the financial cycle on the business cycle.

The present work aim to disclose how the business and the financial cycles are related, and their possible degree of synchronization, recurring to economic and financial data of three of the most solid economies in the world (Japan, U.K. and U.S.A.).It is organized in the following way.

Following to this introduction, on Chapter 2 a review over the main features related with the interactions between the business and financial cycles is made.

On Chapter 3 it is exposed a brief description, of one of the multiple types of interactions between business and financial cycles, and also a chronological review over several business and financial bubbles, busts and crises.

Chapter 4 is devoted to the description of the data, which supports the estimated models.

On chapter 5, the methodology is presented, which includes the tests and the estimation methods.

In chapter 6 the main hypothesis of this dissertation is tested with the resort to a DL and ADL model, which is proceeded by the analysis of the results, and the explanation in terms of the economic relevance of them.

Finally in the Chapter 7 a brief discussion over the results is made, and proposed further research possibilities.

Chapter 2 - Theories about several features of business and financial cycles

There does not exist an undeniable truth or an immutable theory. From the beginning of times, and in the subsequent evolution of society, that economic theories and models had change and evolve in order to respond more accurately to the continuous changes in markets and in the society, in general. Currently, the accepted models and theories remain, in most cases, based on the previous discoveries, being usually adapted or reformulated until a new improved theory appears.

This is also true for the business cycle research field, where some of the older approaches remain currently the most complete references, like Juglar (1862), Kitchin (1923), Kondratieff (1926), Kuznets (1930), and Schumpeter (1954).

2.1 Business Cycle

2.1.1 The definition of business cycle

The 1819 year can be seen as a turning point on the comprehension of business cycles. Sismondi in this year contradicts, in his book "*Nouveaux Principes d'économie politique*" the well-established theory that pointed to the existence of one unique economic equilibrium, only interrupted by the effect of external factors (e.g., wars). According to Sismondi (1819), a non *equilibria* situation could be motivated, besides the impact of external factors, by cycles of industrial overproduction and underconsumption in the market.

However the formal definition of business cycle was only presented in 1946 by Burns and Mitchell, which is used as standard definition even today. Burns and Mitchell (1946:3) say that "*Business Cycles are a type of fluctuation found in aggregate economic activity of nations that organize their work mainly in business enterprises: cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of next cycle; this sequence of changes is recurrent but not periodic"*.

This formal definition of business cycle creates a common basis to all new studies, allowing new works to have a common reference point. This leaded to the

reorganization and reclassification of the previous studies that were developed. Following this, Schumpeter (1954) took the existent approaches and methodologies to suggest a new type of cycle classification. These cycles can be triggered by internal factors (e.g., business sector crisis, credit crisis or boom, and economic recessions), or exogenous factors (e.g., wars, fluctuations of commodities prices), without taking in consideration the cycles duration, amplitude and periodicity. Considering this basis, Schumpeter proposed a classification scheme of the economic cycles, ordered by their periodicity and wave duration, distinguished in the following way:

- Kitchin inventory cycle – 3 to 5 years;
- Juglar fixed investment cycle – 7 to 11 years;
- Kuznets infrastructural investment cycle – 15 to 25 years;
- Kondratieff wave or long technological cycle – 45 to 60 years.

2.1.1.1 Kitchin Inventory cycle

Kitchin (1923) had a determinant role in the definition of short term cycles. In his work, based in a set of observations from USA and Great Britain data comprehended between 1890 and 1922, it was considered statistics of several economic indicators[1] from both countries. The inventory cycles, like are known, are the result of an information flow time lag, which degenerates in market asymmetries. This occurs as a consequence of the enterprises behavior, as they tend to follow the positive progress of a given market scenario (e.g., demand´s growth). Facing this favorable context, they make efforts in order to increase their output throughout the employment of fixed capital assets. When the full employment of these assets occurs, the supply levels are higher than the demand, making an overproduction scenario inevitable and resulting in one market flooded in excess with goods and/or commodities.

The correction of this situation begins with a readjustment process, based on the reduction of the demand, which leads to the accumulation of inventories, and ends up with the necessity of a price adjustment (i.e., reduction trend). This creates a window of opportunity for the outflow of older stocks, allowing the generation of revenues, creating cash-flow and reducing the working capital needs. This operative environment

[1]The variables commodity prices, interest rates and clearing transactions were considered in monthly basis.

implies the mutation of the strategies applied by firms, resulting, namely, on the resizing of the output volumes. In order to proper understand this cycle, a classification in two categories his made:

Minor Cycles – cycles with an average duration of forty months. These cycles occurs for a short period of time, which isn´t rigid. It means that minor cycles can suffer oscillations in their length, so that a cycle with a shorter length (under average cycle) can be compensated by a following lengthened subsequent cycle (over average cycle).

Major Cycles – Often called o trade cycles, are in general an aggregated form of two or even three Minor Cycles, where the delimitation of each Minor Cycle in this main cycle can be associated with significant changes in bank rates or market panic situation. Usually their average length is of eight years, and they tend to happen with intervals between seven up to ten years.

It is also important to notice that the duration of the cycle and the trend that it follows during this process are a direct result of the outstanding amount of money, since the demand is influenced by the money supply available in the market. Another relevant fact is related with the existence of a time lag between the USA and the Great Britain cycles. As described by Kitchin (1923), the USA cycles occur usually earlier than in Great Britain, existing however an inconsistency in the lag time duration.

2.1.1.2 Juglar fixed investment cycle

Clément Juglar had an important role in the way that cycles are understand actually. His work allowed the identification of the cyclical component of economic fluctuations, and also pointed to the linkage between different crises, putting an end in the prevalent theory of that time, where crises were looked as isolated events.

Juglar (1862) argues that crises can't be avoided, since they are intrinsically related to the natural behavior of economy. But with them comes some positive features. It creates conditions for an adjustment on optimistic market expectations, formed during a prosperity phase, which was triggered by speculative movements in the markets and by low standards in the credit lending policy. Also, crises have a selective function in the economy, eliminating inefficient companies, and forcing the efficient ones to create and apply new productive methodologies and technologies, which in the long term

degenerates in higher growth rates in their net income. And since they can't be avoided, they could be seen as learning processes of what was incorrect to do.

According to Juglar, the cycles are not the result of specific shocks or isolated factors, but a consequence of some aggregated factors, like, for instance, the expansion in credit lending volumes conjugated with speculative behaviors.

Thus, Juglar (1862) pointed the existence of a seven to eleven year's cycle, known as business cycle in his research. They are constituted of 3 phases:

-1st phase "Prosperity": during this period trades more intense and entrepreneurs obtain high rates of return. This contributes to a constant inflow of new investors and, as time passes, creates a "collective enthusiasm", since investors do not to predict the overflow on that specific market. The growing number of new investors triggers a credit demand increase, justified by the need to support the speculative movements. Once optimism is traduced in investment, the credit volume increases. The credit injection if the economy supports the investments, becoming difficult to distinguish a well developed economy of another supported on the credit expansion (economies with higher growth rates sustained in the increase of credit, tends to face higher levels of instability). Thus, during this phase the prices rise, the discount rates decrease, being these movements followed by the reduction of metallic reserves in the possession of banks, leading to a capital absorption phase (inefficient companies take cash that eventually could be used by profitable ones), and into a financial bubble.

The investors will remain in the market as long their expectations are corresponded by the natural favorable evolution. But when this trend ends, the natural attitude taken by investors is to sold out their investment positions, and a crisis takes place.

-**2nd phase "Crisis":** This begins with prices at their maximum level, but with low levels of metallic reserves in the possession of the financial institutions, due to the previous credit expansion. This scenario results in the lending rates raise, reaching a point where credit becomes more restricted. Since some companies are credit dependents (i.e., the inefficient ones), and there are less buyers in the market due to an overproduction state, investors enter in the "liquidation phase".

-**3rd phase "Liquidation":** Assets are sold under their real value, which occurs as an attempt to recover some of the investment made. Prices fall provoking chain

bankruptcies (which is identified as a selection process), leading to the decrease of the confidence levels. Prices will continue to diminish until they become low enough to stimulate a potential demand increase, and to create conditions for prices to rise again, since for "*the combination of low prices and reduced interest rates, become the starting point for a recovery"* (Ducos, 1997: 346).

According to Juglar (1862), these oscillations between phases can be seen as an oscillation between confidence, credulity and distrust.

2.1.1.3 Kuznets Infrastructural investment cycle

According to Kuznets (1930), for one economy/country/market/industry to rise, another one must fall. This scheme occurs because the level of capital available for a given industry decreases with its evolution. The logic behind this idea is related with the fact that funds applied in the expansion of the industry were provided by the previous returns of past investments or from the reallocation of capital from another different sector. Naturally, the returns in that industry will be higher in the beginning than in the maturity.

In Kuznets perspective, there does not exist a mechanism that avoids this kind of events. A given industry in some country can have its performance affected by an analogous industry in another one, which can occurs since the start-up period. This interaction is not limited to the domestic market, since wars, technological innovations, and fiscal policies could motivate the need for capital reallocation in other industry or in another country but in the same industry.

Kuznets (1930) and later Diebolt and Doliger (2008), in their studies found similar evidences pointing to the existence of a fifteen to twenty five years cycle. For Kuznets (1930), this cycle begins with the launch of a new product. At this earlier phase, high profits and a large demand, higher than the supply, are natural. Specifically, the difference between the supply and the demand levels imply the raise of the product price. When the industry or the economy reaches the limit in the production capacity, the necessity for a readjustment is the main concern. Those modifications are only made with new machinery, technological advances, and/or even new facilities. However, in the majority of the cases, the implementation of these modifications occurs with a time lag, that generally has a six years duration, when the still increase. Companies tend to

accumulate stocks in order to delay the expected decrease of prices, and since the production level is in is limit, this also gives them time to increase their production level and to fulfill completely the demand. With price escalations with an average duration of five years, its common the existence of a time lag in the adjustment of the production levels.

During this phase, an adjustment in the wages levels is probable to occur in line with the price increase. However, despite of the raise in average wages, it will be proportionally lower when compared to the escalation in the cost of living. The salary effect increases the production costs, which already suffer from the raise in commodity costs, motivated by the growth of demand. This trend is also followed by bigger costs with rents, amortizations, and higher interest rates for long term investments. Eventually these factors lead to the continuous raise of the product price until a point where the producers of these consumption goods are not satisfied with the distribution of the income provided.

Since the profits are the main stimulus for an independent economy (made of entrepreneurs), the reallocation of previous earnings in other business sectors becomes a normal movement, creating a pre-recession scenario. The fall of prices occurs, such as reductions in the production levels, and in the employment rate, ending in the fall of production costs. Nevertheless, the costs related with the long term investments are maintained stable, since they are less flexible.

Schumpeter (1954) also defends that the economic activity based on progress and growth is what is behind cyclical fluctuations, being the amplitude of the cycle dependable of how strong the growth rate of aggregated activity will be.

2.1.1.4 Kondratieff wave or Technological cycle

The role of Kondratieff in the economic cycle research is unquestionable. Is main result identifies the existence of a super cycle in the world economy, with a length duration between 45- 60 years.

Kondratieff (1926) argues about the existence of a first super cycle comprehended between 1789 up to 1849, where the upswing move occur between 1783 to 1814, and the declining phase from that previous period until 1849. The second super cycle is initiated in 1849, with the upside movement ended in 1866, prorogating the descendent

trend until 1890. The upside movement of the third super cycle began in 1896, ending up in 1920, with a downside movement phase in 1920. According with the data used by Kondratieff (1926), the interest rates show an inverse trend when compared with the trend of the business cycle, occurring a similar dynamic when commodities are compared with the interest rates. The average wages, levels of consumption and production are also good indicators for the forecast of variations in the cycle, as they follow the trend of the business cycle.

Kondratieff characterizes the cycle of recession as the phase when a flow of innovations and technological progresses occur. These innovations and progress represents key factors for the acceleration path towards a turning point in business cycle. Schumpeter research (1934) also supports the idea that innovation is one of the solutions to end up earlier or to attenuate the effects of the recession phase, being the entrepreneurs responsible for the introduction of these innovations in the economy. However, the tool to introduce these innovations is capital allocation, which is already fully allocated in the economy in recession phases (Schumpeter 1954; Papageorgiou and Tsoulfidis 2006). One way of overcoming this situation is credit. Nevertheless, a continuous flow of credit into the economy leads to a moment when new credit is no more supported on savings and deposits, which increases, as a consequence, inflation.

For Kondratieff (1926), an upswing movement in a long wave movement is only possible after a solid increase in the purchasing power. This is possible through high investment levels, which consumes the capital available and leads for the demand for credit, implying the increase of the interest rates. The raise of the risk aversion by credit lenders avoids the continuation of the investment process, which is reflected in the prices, making again the constitution of savings a preferable action (Schumpeter 1954).
In Kondratieff´s perspective, a successful equation for a prosperous trend includes the accumulation of capital at low interest rates and the increase in the inflow of gold.
Schumpeter (1939) argues that the “Kondratieff Long Waves” are the combination of other minor cycles, with durations strictly related to the different types of investments that trigger them. He also divides the cycles in four different phases. The first one is the expansion phase, where the expansion in production is associated with low interest rates, and a generalized increase trend in prices. After the expansion occurred, as a second phase, a crises phase takes place, characterized by a crash in the stock exchanges

and/or several bankruptcies. This scenario creates the foundations for the third phase, when the economic recession starts. The market becomes more instable, mainly due to the fall of the prices of the products, commodities and assets, seeking companies on the sale of assets a way to avoid bankruptcies, since this environment results in credit restrictions and high interest rates. The adjustment in the prices of goods, assets and commodities, makes them cheap enough for a rise in the consumer confidence. This last dynamic increases demand, triggering an economic recovery (Schumpeter 1939).

2.2 Financial Cycle

2.2.1 Features about Financial cycles

In the article *"Financial Cycles: What? How? When?"* by Claessens *et al* (2011b), they classified the financial cycle as the aggregation of three cycles belonging to specific financial segments. It is considered that the variations and movements that occur in the real estate, credit and equity sectors can disclosure a general behavior, aggregating what may be considered a financial cycle. Taking this idea, it can be assumed that financial cycles are composed by three types of cycles: Equity market Cycle; Real Estate Cycle; and Credit Cycle.

Different from the dynamics that govern the real economy, where changes occur smoothly, financial wealth can be created or destroyed quickly (Pagan and Sossounov, 2003). This picture characterizes the complexity associated to the financial field and particularity, the difficulty of making forecasts and disclosing patterns in the financial cycles. Nevertheless, it can be said that two general phases are associated to it. The first one, called expansion, occurs with a generalized increase of prices, corresponding to an upward market trend. The second one, called contraction, is characterized by a symmetric opposing movement (Biscarri *et al*, 2003; Chauvet and Potter, 2000). These two phases, and their respective amplitude and duration, can also be influenced and affected by extreme market movements, such as "booms or bubbles" and "busts or crashes". Silva (2012) describes a market crash situation as the situation where "*the preview upward trend in stock prices never more was seen, being replaced by an unstable and undetermined fluctuation, with special emphasis on losses" p*resenting a

bubble market as a preceding phase for a crash situation, which is characterized by the rapidly increase of market prices.

According to Claessens *et al* (2011b), a financial cycle can be measured and characterized by three main features:

-duration: length period between the cycle peak and the following trough (downturn movement), or between the trough and next peak in the cycle (upturn movement);

-amplitude: total return obtained during the upturn movement, or the total loss provided by the downturn movement;

-slope: is divided in two types: (i) the downturn slope, which is related with the ratio obtained between amplitude and the downturn duration; (ii) upturn slope, which is the ratio between amplitude and upturn duration.

2.2.2 Equity Market Cycle

Stock markets can be seen as an approximation to the economic structure in a given economy. Indexes like Nikkei-225 in Japan, FTSE – 100 in U.K. or Nasdaq Composite, Dow Jones Industrial Average or S&P-500 in U.SA., include companies that belong to several sectors, or companies that represent a specific sector (like construction, mining, retail, banks, or technology), creating a good benchmark of the strength or value of the domestic entrepreneurial tissue.

Largely studied, stock markets and their behavior constitute a concern in the financial world, namely after a crisis or an economic depression, being responsible for an important share of academic research. Some relevant examples are, for instance, the studies conducted by Galbraith (1954) and White (1990), focused on the 1929 stock crash, or Kindleberger and Aliber (2005) about different moments of disruption on the financial markets.

The unpredictability of the movements in the stock markets necessarily makes forecasting models to minimize the risk, despite several studies[2] pointing to the impossibility of an accurate forecast of its returns. One of them is the Efficient Market Hypothesis (EMH) theory. The EMH is based on the principle that all agents present in the market are rational, and by consequence also the markets are efficient. This result from the fact that all assets traded at a given time have their price fixed in relation to all of the available information. Thus, the release of new information rapidly adjusts the price, conducting to a random walk process of prices, (Bodie *et al*, 2009).

2.2.2.1 Market phases

The creation and destruction of the financial wealth is a dynamic process that changes with a quick pace, mainly due to the volatility of markets (Pagan and Sossounov, 2003). Because of "random walk" processes, in what prices formation concerns, the attempts to predict the future value of stocks aren´t, generally, successful (Fama, 1965).
However, according to Pagan and Sossounov (2003), it is possible to disclose cycles in equity prices based in their general trend. Thus, stock markets can be characterized by the existence of two distinct phases. The "Bear" and "Bull" market phases, which together form a cycle:

- "**Bear market" -** contraction phase in equity markets, characterized by the generalized decrease trend of the equity prices.

- "**Bull market" –** expansionary period in which equity prices increase, being this tendency persistent among the majority of the equities outstanding in the market.

The equity price cycle can be seen as a period comprehended between the beginnings of the bull phase until the end of the bear phase. Despite its complexity, it is still possible to describe the equity price cycle dynamics in general terms, as showed by Kindleberger

[2] Fama (1965), White (1990).

and Aliber (2005), based in previous Minsky[3] work, where the following stages are recognized:

- "Exogenous shock" - in order to a new cycle to start, an exogenous shock must occur. This type of shock must have a considerable impact and persistency in order to improve the economic perspectives and to create investment opportunities in at least one major sector (e.g. automobile industry in U.S.A. in 1920, or the financial liberalization in Japan during the 80's);

- "Boom phase" - once these investment opportunities, expectations and predictions about future larger profits increase, entrepreneurs and investors recur more frequently to banks in order to finance their new investments, with the expectation that this new debt will be paid with future profits. The credit expansion increases the competitiveness among banks in order to expand their market share, relaxing the conditions for credit access. This scenario associated with higher demand than offer rapidly increases the average prices. Consequently, the natural expansion of profits makes the market more appealing for new investors. This process, along with the positive performance of the economy, implies the increase of the GDP growth rate;

- "Euphoria" - it may not always occur, and is seen as a specific feature of the boom phase. The acquisition by investors of assets and securities in the expectation of repayment with future profits and the operative environment, which decreases the risk aversion and originate speculative investments, in the majority of the cases conduct to an overestimation of the real returns. As a consequence the real free-cash-flows become inappropriate to the leverage levels;

- "Economic cool off"- After a sharply and continuously increase of the asset prices, investors become more conscious about the real trend associated to future returns. One justification derives from the fact that some of the previous expectations, concerning the evolution of prices, were not fulfilled. This implies

[3]Minsky 1992, "*The financial instability hypothesis*".

less desire for new investments, justifying the slowdown or even the drop of prices.

- "Distress"-With the cool off in asset prices, future cash-flows from investments previously made become lower, deteriorating the debt service and increasing the probability of failing some payments and entering in default.

- "Liquidation"- The urgency to generate liquidity, mainly to fulfill debt payments, makes investors sell their assets, which will overflow, with the generalization of this behavior, the market. This will depreciate even more the asset prices. Investors who do not sold at the proper time their assets will enter in default, mainly due to restrictions in banks credit policy;

- "Panics and crashes"- The arising of panic and subsequently the crash of the market.

2.2.3 Real Estate Cycle

Real estate activities have a relevant direct (generation of revenues, despite the small value added to GDP), or indirect (influencing the development of other business sectors like construction, engineering, concrete, iron/steel and wood) roll in the performance of an economy.

Despite the complex relation between real estate and other economic activities, real estate cycles have some particularities that make their formation and structure different from equity or credit cycles. According to Herring and Watcher (1999), there isn't any robust economic model that can predict real estate asset prices fluctuation with a high degree of confidence, since real estate price bubbles have a low frequency.

Associated to their low frequency, Case *et al* (2000) point another differentiating feature from other business sectors. This is based on the fact that real estate assets don´t have the same level of mobility as other assets. For instance, stocks can be bought and sold almost everywhere, and credit can be conceded in every country (as long as their covenants are fulfilled), but moving physically a shopping center or an office building to another country or even to another city, is not an easy task.

These restrains in the real estate assets mobility implies the inexistence of a non-arbitrage force that act as a regulator, preventing the sharp uprise of prices in a given city or country, since it is not possible to move the excessive supply on one market to another that has an excess of demand.

2.2.3.1 What drives the Real Estate market?

There are innumerous factors on a sole or combined way that can contribute to a distortion of real estate asset prices, as stated by Case *et al* (2003), Shiller (2007) and Herring and Watcher (1999):

- "Demography"- The evolution of this feature influences the demand for real estate assets. Regions with positive demographic trends, justified by the increase of the birth rate or an immigration flow, can exercise pressure for an uprise on the demand for real estate assets.

- "Demand and Supply" – The gap between demand and supply exercises a positive or negative influence on the real estate assets prices. For instance, an excessive supply level will end up leading to a reduction in prices. This reduction can be justified by the difficulty of investors on the sale of their assets.

- "Shortage of Land" – The size of the available and buildable area is reflected directly in prices. As time passes and the available land reduces, the cost to acquire the reminiscent ground increases, since land is not a factor that can be expanded.

- "Economy openness"- The openness of a given economy is a relevant variable to measure the ability to capture foreign investments. Economies with higher levels of liberalization are able to capture more foreign investors, leading to a demand increase for real estate assets in order to establish stores or offices.

- "Credit supply and interest rates"- The "amount of credit available" in the economy and the price imputed imposes restrains to the realization of new

investments. Periods with lower interest rates make less expensive the cost of capital of firms and individual investors, and since real estate firms, and investments in a generally way, are highly leveraged, it becomes cheaper to realize new investments.

- "Financial regulation" – The lack regulation or supervision in a financial system, is responsible, for instance, for changes in the credit policy, making credit covenants easier to fulfill or less strict. One of these possible changes is related with the maximum value for LTV (loan-to-value) ratio, which can be settled higher.

2.2.3.2 Market phases

There are some common and recurrent features that can indicate the presence of a real estate asset boom. In generic terms, Kaiser (1997) defines a set of stages describing a real estate asset cycle.

The cycle begins with the increase of the inflation rate, which will be followed by the increase of the prices of consumer goods and services. These sustained increases will also be reflected in house rents, conducting to an increase in the NOI (net operating income) of real estate firms.

The profitability of the real estate sector will attract new investors, and this the number of investments increase.

Capital needs, and the planning and construction phases creates a time lag between the moment when the profit opportunity is discovered and the moment when the asset enters in the market. This same time lag will avoid a fast adjustment in prices when demand and supply are equally met since, some projects are at the middle point of their development while others just started, which together with the desire of investors to recoup their investments, will be responsible for the slow adjustment between supply and demand.

However, when the market is overflowed, vacancy rates increase and prices drop. This continues to provide firms with cash-flow, but with smaller margins that were initially expected, reducing the number of new investors and making the existing ones to step back, resulting in a market depression.

2.2.4 Credit Cycle

Nowadays, credit is massively established worldwide, since not only investors and firms require it in order to improve their productions, or to conduct new investments, but also individuals sustain the demand for credit in order to pay their houses, cars, education, or even vacancies. This demand structure forms a basis to the credit co-movement with house prices, consumption, and investment and expectations trend.

The most recent crisis are characterized by booms and busts in supply of credit and thus, liquidity as a result of the excessive leveraged levels sustained by investors, firms and individuals (Lambertini *et al,* 2011).This represents a potential problem, since lenders can´t compel borrowers to pay all their debts, unless they are securitized. In order to attenuate the risk of credit default, banks restrain borrowers credit limits to the value of their collaterals, but even them are influenced by the credit limits, creating an amplification effect in booms and busts Kiyotaki and Moore, (1995).

Collaterals in this case have a double roll. They securitize loans used to buy them or to make investments. Also, they will have influence in the operational performance of companies. In the real estate segment, specifically, credit is securitized by lands or buildings that are the object of investment to posterior commercialization or renting. Variations in collateral values will end up influencing, positively or negatively, the net worth of banks, mainly due to provisions or impairments.

2.2.4.1 Credit Bubble

Banks, like other companies, look for the best way to increase future returns and profits. And as a normal company, expectations on future investments have a major role in their internal policy (Kindleberger and Aliber, 2005).

In order to increase their profits, banks seek for segments with considerable growth rates in revenues and profits and good prospects.

On those cases, they are willing to provide credit to those sectors, which expands their credit portfolio and lever their balance sheets (Herring and Watcher, 1999).

If the economy continues to give positive signs and expectations are maintained favorable, financial institutions will continue to seek for opportunities to concede credit, which will create the pressure for the decrease of the lending interest rates and the covenants required.

The scenario conducts banks to have myopic perspectives, justified by the underestimation of the risks inerrant to the increase of the credit supply (Herring and Watcher, 1999). These levels will continue to be sustained until the first wave of defaults occurs.

2.2.4.2 Credit Busts

Credit isn't an isolated instrument of the financial system, because it is a mean to obtain profitability and to generate revenues. To accomplish that, it is necessary the growth of different economic segments and subsequently the repayment of the credit conceded. According to Kiyotaki and Moore (1995), this feature justifies the transmission effect associated to credit cycles during its boom or bust phase. This will be responsible for the following effects in the economy:

(i) In the first stage, a temporary negative shock in the economy occurs, leading to the reduction of the productivity and profitability levels, which imposes limitations in the generation of positive returns. This will restrict the net worth value of firms, which are, generally, highly dependent of credit.

(ii) In order to fulfill their credit obligations, and since refinancing firms by contracting new credit operations is not a possibility, they will most likely sell their assets in order to generate liquidity, overflowing the market with those products and not fulfilling the existent demand.

(iii) The transmission effect now occurs, at the same time that complementary sectors suffer from the demand drop (circularity effect between companies in vertical organizations).

(iv) As firms struggle to fulfill credit obligations, the previously sold assets now constrain their production ability, reducing the cash-flow generated.

(v) The increasing volume of assets and services in the market, jointly with the urgency to sell them, ends up dropping their value. The decrease in collateral values will influence negatively the bank's capital structure.

.

Chapter 3 - Business and Financial Cycles Interactions

3.1 Cycles Interactions

The interactions between business and financial cycles cannot be confined to a single process. The relationships between them are the result of dynamic interactions, derived from the influence that different segments in the financial cycle (e.g. Equity indexes, Real Estate, among others) have on the dynamics of the business cycle.

On several studies, like the ones conducted by Kiyotaki and Moore (1995), Kindleberger and Aliber (2005), Hott (2009) and Claessens *et al* (2011a), different types of interactions among the segments of the financial cycle, and the respective relation and impact on the business cycle, are presented.

According to them, the variations in the financial cycle could be motivated by different features belonging to different financial segments. The negative shift in one business sector can be propagated, and contagion the remaining segments, in a dynamic movement similar to a domino effect, that will impact in the business cycle.

One way to show how the dynamic process of creation and development of a financial cycle and the respective interaction with the business cycle occurs, is to present interaction schemes between one financial segment (in this case, the real estate) and the business area:

- The successive positive increase, in real estate investment returns results in the growth of interest among investors on related opportunities;
- The increasing demand for this type of investments conducts the real estate assets prices to an even higher increase;
- Since this sector is characterized by highly levels of financial leverage, the dependence from credit conceded by the financial system is large. Supported in this relationship and seeking to increase their market share, banks gradually begins to support the real estate segment, increasing their loans values and decreasing the associated interest rates;
- As the real estate prices increases, loan collaterals value also increase, allowing to banks lending higher amounts of credit. Which improves banking balance sheets and allows them to lend higher amounts of credit;

- During this process, complementary sectors and services to the real estate sector (e.g. construction, wood, concrete, among others), suffers an operational growth in their financial statements.
- As the positive trend, that had started in the real estate sector, spreads and contagious the remaining sectors, companies increase both their profits and market value. This last effect is also extendable to the equity index listed companies, since their market performance in theory increases, with this contagion effect;
- The aggregation of individual market shares value increases in the majority of the listed companies leads the general index to an higher market capitalization;
- As the economy faces an increase in the levels of consumption and investment, the raise of the economy activity and generating wealth is seen, finally with the domestic GDP reflecting this trend.

These positive impacts remain present in the economy as long as the investor´s expectations are fulfilled, or a financial disruption occurs, which will reverse the trend sustained until that moment (Silva, 2012).

3.2 History of Bubbles and Crashes

During centuries, worldwide, economic expansions and recessions, market bubbles and busts were seen. Some of them are circumscribed to just one country and others with influence in more than one.
The next chronology scheme reports some of them:

- 1633 – 1637 “Tulip Mania” (Netherlands): during the period comprehended between 1633 and 1637, a simple bulb of tulip raised its value up to a full year salary, which resulted in speculative spectrum. After a severe and suddenly decrease in its price, several bankruptcies occurred and Netherlands economy was hugely affected
- 1720 “Mississippi Bubble” (France): Mississippi bubble was driven by the excessive speculation over the future profits in the Mississippi Company, and

the restructuration of French national debt process, under Mississippi Company supervision.

- 1720 “South Sea Bubble”. (U.K): South Sea Company was founded, in order to consolidate a large amount of England´s national debt, receiving in compensation the monopoly of their international commerce with South America. There was a lot of expectation and speculation in their future profits. Share prices increases sharply, even though at that time Spain controls South America. As Spain control the South America commerce, the monopoly of South Sea was worthless, so company ends up to enter in default.
- 1812-1821 “Post Napoleonic Depression” (Europe): Europe was merged into an economic depression, resulting from the battles against Napoleon.
- 1837 “U.S.A Banks failure” (U.S.A.): In 1937 U.S.A. suspended the conversion of commercial papers for specie payments at their full value. A huge wave of banks collapses occur, deflation increase, and several firms went into bankruptcy. American economy suffers a recession.
- 1873-1879 “Long Depression”: (U.S.A. and Europe): It was one of the first’s International financial crisis. It started with a boom in Central Europe stock exchanges, ending up with several banks bankruptcies in U.S.A, contagiously Europe as well.
- 1927 “Japan financial Panic” (Japan): In 1923 Japanese economy was suffering a depression, the government in order to support the financial system issue discounted bonds to banks, when in 1927 the rumor that government was redeeming those bonds, and banks who holds that bonds will went into bankruptcy spread. This rumor starts a massive withdrawal of deposits leading to several banks bankruptcies.
- 1929-1933 “Great Depression” (Worldwide): The burst of speculative bubbles in stock exchanges all over the world (especially in U.S.A.), and the collapse of the major banks, leads to one of the biggest international depressions.
- 1973 “Oil Crisis” (Europe, Japan, and U.S.A): In 1973 OPEC establish an embargo for oil to all the countries that support Israel. The increase in oil prices result in high levels of inflation and unemployment rate.

The following crisis and bubbles are some of the most recent ones, and are reflected in the data used in this dissertation:

- 1986-1991 “Japanese Asset Price Bubble” (Japan):The easily monetary policy, associated with the excessive overconfidence and speculation, over shares prices, and real estate asset, ends up leading to one asset price bubble, that when busts results in one of the biggest periods of deflation registered. The burst of the bubble and the following periods are known as the “Lost Decade”.
- 2000 “Dot.com Bubble” (U.S.A.): Venture capitalists and excessive optimism of investors, result in a quickly increase in technology companies shares. After the collapse of the Dot.com bubble, several technology firms close, and the remains suffer huge losses in their value.
- 2008 - Today “Subprime and Sovereign Debt Crisis” (Europe, U.S.A.): The Subprime crisis in U.S.A., results in the collapse of some of the biggest banks and insurance companies and also lunch the economy into a recession. Europe ends up suffering from the contagion effect, resulting in government intervention in their financial system, which culminates in economic recession and sovereign debt crisis.

Chapter 4 - Data

This dissertation aims to disclose the possible relations and interactions between the business and financial cycles of three of the main economies in the world: Japan, U.K., and U.S.A. The selection of only three countries can be justified by the difficulty on accessing data from every economy and from the fact that these countries can represent a good benchmark for the global economic cycle

Due to the lack of available and free access information, the time-series data used (obtained mainly from institutional sources) is in a quarterly basis, comprehended from 1989Q3 up to 2013Q1 (95 observations), which makes it possible to capture the effects of the end of the real estate asset price bubble in Japan, and the majority of the subprime crisis in the U.S.A. and the sovereign debt crisis in Europe.

The variables chosen to fulfill the main objective of the work were the Trend CLI (composite leading indicators) index (retrieved from the OECD website) for the business segment and three benchmark indicators for the equity, real estate and credit segments, aggregated in one financial main segment (the construction of the aggregated financial index is explained further in Chapter 4.

- **Equity Market**; It was selected the close price in the end of the quarter for the Stock Markets Index Prices of each country, namely, the S&P 500 Composite Index (USA), FOTSIE - 100 Index (UK) and NIKKEI – 225Index (Japan), obtained from Bloomberg;

- **Real Estate Market**:, The domestic housing price index of each country, retrieved from the Thomson Reuters Datastream;

- **Credit Market**: It was decided to use a benchmark indicator for this segment, considering the wide range of indicators belonging to this area. The choice fell on the domestic long term lending interest rates of each country, obtained from the OECD website, since it can be considered a good indicator on the expectations surrounding the future evolution of the economy.

These indicators were put together into a single moving average index, assuming each one a contribution equivalent to the weighted measured importance of them in the

economy, according to the study performed by Claessens *et al* (2011a) on 44 countries (21 advanced OECD countries and 23 emerging ones), for a time series comprehended between 1960Q1–2007Q4 for the advanced economies", and between 1978Q1-2007Q4 for the "emerging economies". This same article had the objective of analyzing the degree of synchronization between business and financial cycles. Also, it is important to indicate that the option taken– using these weights (27,4% for Equity Index, 39,4% for Real Estate Market and 33,2% for Credit Market) achieved for a sample with a larger number of countries – is justified by the difficulty in getting information about the real weight of each financial segment in the GDP of each country analyzed in this thesis.

The Trend CLI indicator, used to approximate the domestic business cycle, was converted from fixed to moving terms. The same was done in the real estate price index. Concerning equity and credit, each of the indicators was transformed to a moving average base from the original series.

Chapter 5 - Methodology

In order to test and to analyze the main question of this dissertation, the adopted methodology belongs to econometrics. Namely, it was chosen to analyze the relations between the business and financial cycle throughout the application of a DL (Distributed Lag) and an ADL model (Autoregressive Distributed Lag). The choice fell on these approaches since, like it is exposed on Chapter 6, the VAR model (Vector Auto-Regressive) does not has statistical significance in all the variables included, even with a reduced number of lags. Nevertheless, in what concerns to the software used (EVIEWS 7), the predefined VAR model was used, but with explanatory exogenous variables.

The choice of the DL and ADL methodology is corroborated both by the reasons aforementioned and by the results of the Box-Pierce Test, which indicated the existence of AR(p) processes on the variables.

Other possible approaches were considered, related with the possible application of estimations based on the Ordinary Least Squares (OLS) or Instrumental Variables (IV). Nevertheless, considering the objectives of the study, they were not the adequate approach. Specifically, estimators like OLS and IV gain efficiency as more explanatory variables are introduced in the model. Using only the two variables of the database (business and financial cycle) showed low explanatory results, and several structural problems. Likewise, an analysis using the PROBIT or LOGIT models were also impropriated when considering the objectives aimed.

A Distributed Lag (DL) model is a similar approach to an infinite moving average ARMA process (Baltagi, 2011). The DL (q) is a dynamic model that estimates the relation over the time between a dependent variable Y and X explanatory variables, where p$\in \mathbb{N}$ is the order lag of X, $\delta$is the parameter and μ is a stationary error term.

$$Y_t = \alpha + \sum_{i=0}^{p} \delta_i X_{t-i} + \mu_t \qquad (1)$$

The Autoregressive Distributed Lag (ADL) model aims to estimate relevant economic relationships between variables in a single equation model, where the lags increase

drastically the explanatory capability (Baltagi, 2011). The ADL (p,q) improves the DL (q) by including lags of the dependent variable Y, maintaining the X explanatory variables, where p is the order lag of Y and q is the order lag of X is given by

$$Y_t = \alpha + \sum_{j=1}^{p} \beta j Y_{t-j} + \sum_{i=0}^{q} \delta i X_{t-i} + \varepsilon_t \quad (2)$$

For a white noise ε_t process, α is the independent term, β and δ as regressors are parameters, and $\forall t, p, q \in \mathbb{N}$.

A priori to the estimation of the DL and ADL models in the data of each of the countries under analysis, a set of tests were applied. The main objectives were to see the statistical distribution of the residuals, the degree of correlation between the variables, the existence of a unit root, and also the optimal number of lags to estimate the model. These procedures are necessary conditions to ensure the consistency of the estimation of both the DL and ADL models.

To what concerns the degree of correlation between the variables, a conventional correlation test was made, followed by the application of a Box-Pierce test for no serial correlation to understand their degree of autocorrelation.

$$Q_{BP} = n \sum_{k=1}^{h} \hat{\rho}_k^2, \quad (3)$$

Where n is the sample size, $\hat{\rho}_k$ is the sample autocorrelation at lag k and h the number of lags tested.

The relevance of the past information of one variable in the explanation of the present variations of another (e.g., financial and business cycle) was tested in each of the countries through the application of the Granger Causality Test. By this, X Granger causes Y if and only if $\sigma_1^2(y_t: y_{t-j}, x_{t-i}) < \sigma_2^2(y_t: y_{t-j})$, $j, i = 1,2,3, \dots, n$ and σ^2 representing the variance of the forecast error.

The statistical distribution of the residuals was tested by the Jarque-Bera (JB) test. The main objective is to ensure that the residuals have skewness and kurtosis matching with a Gaussian distribution in order to avoid an erroneous result in what concerns directly to the statistical significance of the coefficients (Jarque and Bera, 1980).

$$JB = n\left[\frac{S^2}{6} + \frac{(k-3)^2}{24}\right] \rightarrow \chi^2_{(2)} \tag{4}$$

Where n is the number of degrees of freedom, S is the sample skewness, and K the sample kurtosis.

The analysis of the presence of a unit root was conducted with resort to three different tests: Phillips-Perron (PP) test, Augmented Dickey-Fuller (ADF) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (Dickey and Fuller, 1979; Phillips and Perron, 1988; Kwiatkowski *et al*, 1992):

$$PP: \Delta y_t = \beta_0 D_t + \pi y_{t-1} + u_t \tag{5}$$

With D_t as the vector of deterministic terms and u_t being I(0).

$$ADF: y_t = \beta_0 D_t + \varphi y_{t-1} + \sum_{j=1}^{p} \psi_j \Delta y_{t-j} + \varepsilon_t \tag{6}$$

Where D_t is a vector of deterministic terms, p the lagged difference terms, Δy_{t-j}used to approach an ARMA structure.

$$KPSS: LM = \frac{\left(T^{-2}\sum_{t=1}^{T}\widehat{S_t}^2\right)}{\hat{\lambda}^2} \tag{7}$$

Where $\widehat{S_t} = \sum_{j=1}^{t}\widehat{u_j}$and $\widehat{u_t}$ is the residual of the regression of Y on D_t, $\hat{\lambda}$ is a consistent estimation of the long-run variance of u_t.

The best fit of the model was obtained applying to a function lag length criteria based on the Akaike Information Criterion (AIC). The result of these likelihood criteria was chosen based on Liew (2004) arguments, who describe the AIC as the one with the best probability of non under-estimating the optimal number of lags.

$$AIC_p = 2k - 2Ln(L) \tag{8}$$

Where k is the number of parameters in the model, and L the maximized value of the likelihood function for the model.

The structural stability of the parameters was evaluated by the use of the Chow Break-Point test. If in any of the series there exist a structural break, in this case, we opt to include that moment in the model. For that, a dummy variable is included assuming the value 0 until the structural break and 1 from that moment until the end of the sample series. The Chow break Point test is calculated as:

$$Chow = \frac{(SSR - SSR_1 - SSR_2)/k}{(SSR_1 + SSR_2)/(n_1 + n_2 - 2k)} \tag{9}$$

With SSR as the sum of squared residuals of the combined data, SSR_1, SSR_2 as the sum of squared residuals of each group, k as the total number of parameters and n_1, n_2 indicating the number of observations of each group.

It is important to see that, according to Hansen (2001), the Chow test has some limitations, mainly due to the necessity of realizing the test knowing a priori a break date. Thus, there are two ways of choosing the data: arbitrarily; or based in some known feature. If the date is chosen arbitrarily, the true break date could be missed, but if the chosen date is based in some feature known, it is possible that the conclusion of the test is one falsely positive break, since the break date is endogenous, and so correlated with the data.

The trends of the variables under analysis are captured by applying the Hodrick-Prescott filter, in order to highlight the cyclical component of the time series, and to separate them from non-relevant information.

$$HP: \min_{\{\tau_t\}} \left(\sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t+t-1})]^2 \right) \quad (10)$$

Where Y is the variable, τ the trend component, and λ a multiplier.

Finally, in order to construct a forecast basis and to see in more detailed the impact of variations on the exogenous variable on the dependent variable, it was calculated the dynamic impact multipliers of the ADL model as

$$\frac{\partial y_{t+k}}{\partial x_t}, k = 0, 1, 2, \ldots, i \quad (11)$$

Chapter 6 – Business and Financial Cycles Interactions

6.1 Empirical Results

This study aims to be a valid contribution to the study of the interactions between business and financial cycles. Nevertheless, it includes some limitations, mainly due to the series included in the Financial Cycle and their length (1989Q3-2013Q1), which may be responsible for some lack of accuracy. For instance, the equity cycle is benchmarked only by a stock index and the credit cycle is approximated by the long-term lending interest rates.

However, the inclusion of no more variables on the financial index, like the price of commodities or the annual variation on loans, was a predefined choice. The inclusion of these series could lead to three different scenarios: (i) the increase of the volatility, with consequences in the correlation degrees between the business and financial cycle; (ii) corroboration of the relations and conclusions obtained in the present study; (iii) the smoothness of the financial index, creating conditions to the estimation of a bivariate VAR. Nevertheless, despite the reserves imputed to the results, it is possible that they could be validated in a more complete analysis.

The valence of this study lies in the corroboration of the existence of chains of influences between business and the financial cycles. The presence of correlation among the variables (see annex 1), suggest the existence of a relationship between the two series, at least contemporaneously.

From the analysis to the autocorrelation of each variable (see annex 2), it is possible to discover the presence of an AR(p) process in the business cycle, and its relation with the financial cycle, justifying the utilization of a DL and ADL models in this study.

Given the size of the sample (95 observations for each country) and the importance of normality in the distribution of the residuals, the JB test was conducted, concluding the Gaussian distribution of the residuals, with the exception of the U.K. Nevertheless, considering the size of the sample, it was assumed, for means of simplification, that the Gaussian distribution was present in the residuals of the estimation of this country. (see annex 3).

The stationarity of the series is ensured by the results of the ADF, PP and KPSS tests (see annex *4*).The Chow breakpoint test indicates the presence of a structural breakpoint

in the models (see annex 5), the inclusion of a Dummy variable in the model could be necessary (if the structural breakpoint reveals statistical significance when introduced in the model).

6.1.1 Japan

Between 1991 and 2001, as the result of the "Japanese Asset Price Bubble" (1986-1991), the Japanese GDP growth rate suffered a sharp decrease, accompanied of an average salary contraction and a long period of deflation. This period, denominated as "Lost Decade". Nevertheless, the evolution of the Japanese economic performance between 2001- 2010, mainly due to low levels of economic growth, remains far from what is needed to compensate the poor performance during the "Lost Decade", what may be seen "The Lost two Decades".

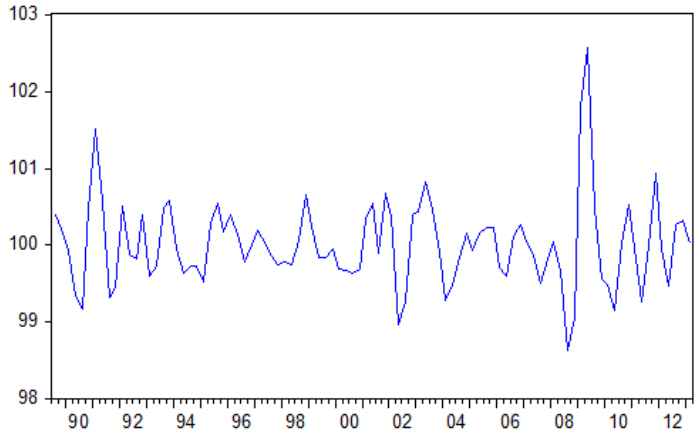


Figure 1 – Business Cycle for Japan between the periods of 1989Q3-2013Q1, quarterly data (source: OECDhttp://stats.oecd.org/Index.aspx?DataSetCode=MEI_CLI)

According to the Federal Reserve of Economic Data (FRED), and supported on the Business cycle of Japan (see Figure 1), it is possible to identify the periods of recession and expansion of the Japanese economy.

The periods constrain to 1987Q1-1990Q2 represent an expansionary period of the Business Cycle, which is coincident with the "Japanese Asset Price Bubble". After the bubble burst, a period of recession is seen from 1990Q3 to 1993Q3. The incentives implemented by the government, and the adjustments in the monetary policy (for instance, interest rates decreased in order to maintain the economy in the same levels) and in domestic economic policy (e.g., several banks were nationalized, in order to

prevent the failing of the financial system) (Economic Planning Agency of Japan, 1994).

However, the Business cycle shows some positive features, namely the expansionary period between 1993Q4-1996Q4. Although, despite the measures adopted to re-launch the Japanese economy, it remains struggling to recoup the previous levels of economic growth (e.g. the basic loan rate in Japan still continues below 1% since 1995).

From 1997Q1 to 2001Q4, Japan experienced a recessionary period of economic activity, interrupted between 1999Q3-2000Q4, where a recovery occurred. The period comprehended between 2002Q1 to 2007Q4 was characterized by an expansionary phase of the Japan´s Business cycle, only interrupted shortly in the period of 2004Q2 to 2004Q4. Nevertheless, despite this expansionary phase that the economy is facing, the long period of deflation occurred (from 1999 to 2005) avoided bright short-term positive economic prospects.

From 2008Q1 to 2012Q3, excluding the period between 2009Q2 to 2010Q2, it corresponds to an expansionary phase.

In 2012 and after several changes in the monetary and economic policies, but still suffering the impacts of the "Japanese Asset Price Bubble", Japan introduces in the economy a another reform program in order to re-lunch. The program focus three major lines, the chronically low inflation rate, the aging of population, and the decrease verified in productivity (OECD, 2013a). Since 2012Q4, and after the start of the reform program, Japanese Business cycle is experiencing an expansionary phase.

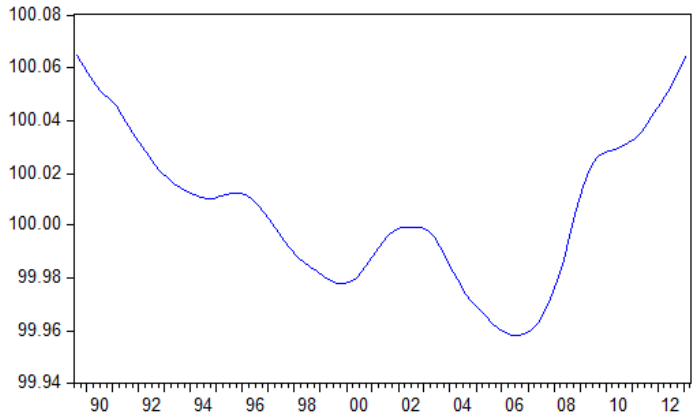


Figure 2 – Business Cycle HP Filter for Japan, between the periods of 1989Q1-2013Q1, quarterly

The HP filter of the Japanese business cycle over the last 23 years shows evidences of an underperformance activity (see Figure 2). Due to the high commercial dependence

that Japan has with U.S.A., the business cycle of Japan follows in general terms the U.S.A business cycle path.

Between 1995 and 2001, and struggling with a disinflation phase, the economy of Japan seems registered a Kitchin cycle. The Japanese economy benefited from the "Dot.com" bubble, which at the time was occurring in the U.S.A..

The behavior verified between the years of 2001 to 2009 is very similar to the pattern of a Juglar cycle, being relatively closed to the one experienced by the U.S.A. economy. In this country, after the burst of the "Dot.com" bubble, investors redirected their investment to the real estate and construction segments. The shift of the investors target, created in the market the need for new products, or the increase trade volume of those generally transacted, beneficiating, thus, the main trading partners (Flath, 2000).

Considering the period of time during which the Kitchin and Juglar cycles occurred, is possible to identify what seemingly corresponds to a Kuznets cycle. The movements registered from 1995 up to 2009 correspond to the downswing movement, and to the start of an upswing movement of the Kuznets cycle.

The business cycle HP filter of Japan shows some similarities to a dowsing movement, and the begin of an upswing movement in a Kondratieff´s wave, namely, in terms of duration and behavior. The downswing movement lasts nearly 18 years (1989-2007), and the upswing movement is observed with amplitude of 5 years (2007-2012). This means that only with a bigger time frame it is possible to define the end of the upswing movement. So the trend demonstrated by the economy of Japan in the last 23 years can be compared, due to its performance and duration, to the recession, depression, and improvement phases of the Kondratieff´s wave.

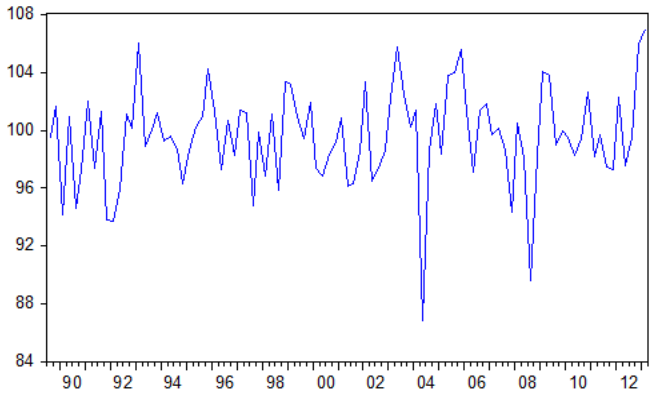


Figure 3 – Financial Cycle for Japan, between the periods of 1989Q3-2013Q1, quarterly (moving average index made by author based on data retrieved from: Bloomberg and Reuters Datastream)

The Japanese financial cycle (see Figure 3) exposes three troughs during the period under analysis (1992, 2004-2005, 2008).

The most accentuated of them occurs between 2004 and 2005. This time frame was characterized by the intervention by the Japanese monetary authorities in the foreign exchange market, when several amounts of Yens were sold, depreciating by this way their national currency. During the year 2004, the regulators of the financial system imposed new rules in the provisioning of problematic loans, which ended up resulting in heavy losses for the financial system (Syed *et al*, 2009).

The "Sub-prime" crises, which started in 2008 in U.S.A., namely with the collapse of Bank Lehman Brothers, impacted in the japanese financial cycle. As a consequence of the financial instability, the investor's confidence suffered a sharp decrease, leading to an increased risk aversion. The interest rates suffered an upward pressure, in consonance with the increased levels of volatility in foreign exchange markets, mainly due to their lack of liquidity.

The overvalued Stock Market of Japan collapsed during the year of 1990. However, land prices only begin decreasing in 1992. The combination of these two factors, associated with the imposed limitations in the bank lending to real estate sector and the increase of discount rates, are the origins of the 1992 trough (Syed *et al*, 2009).

With regard to the peaks, these occurred in 1993 and 2003.

In 1993, the Japanese government ordered the public financial institutions to buy stocks with the purpose of inverting the price decrease trend. The government also discouraged Japanese companies from reducing their labor force in order to sustain the consumption levels in the economy (Syed *et al*, 2009).

In 2003, in cooperation with foreign banks, Japanese Financial Institutions created several special purpose vehicles (SPV´s) with the purpose of transferring their nonperforming loans to them. This process of restructuration of the banking system was followed by the increase of the supervisory requirements, regarding the standards of loan quality. This encouraged companies to reduce their financial debt, allowing them to cut back financial costs, increasing the net income (Syed *et al*, 2009).

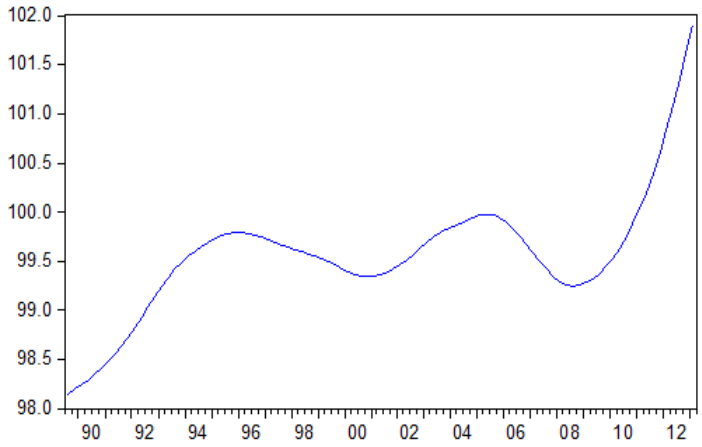


Figure 4 - Financial Cycle HP Filter for Japan, between the periods of 1989Q1-2013Q1, quarterly data

Consonant with the business cycle HP filter, the Japanese equally demonstrates (see Figure 4) signals of underperforming activity between 1990 and 2012. It is also possible to notice that the peaks observed in the financial cycle (see Figure 3), are coincident with an initial upswing movement of the financial cycle HP filter.

The DL and ADL models estimated for Japan considers two variables, the business cycle (business_index), and the financial cycle (financial_index). The DL model has the financial cycle has dependent variable and have as explanatory variables the business cycle and their lags, what was corroborated by the results of the Granger Causality Test (see annex 6.1). The ADL estimation was made for the business cycle, with the financial cycle has an exogenous variable. Prior to both estimations, a bivariate VAR was performed. (see annex 7.*1*).

In the DL model (see Table 1) the optimal number of lags was achieved manually. In the ADL estimations, to (see Table 2) find the optimal number of lags, it was performed a function lag length criteria. The output of the AIC criteria (see annex 8.1) suggests eleven lags as the optimal fit for the explanation of the business cycle. However, with eleven lags included in the model, not all of them were statistically significant.
The best fit is only achieved by manually testing different lag options and seeing the respective impact in the adjusted R^2 and in the individual t-test.

By conducting this process, it was obtained an DL (1) and an ADL (2,5) model. The adjusted R^2 achieved was 19,53% and of 51,75% respectively, creating the idea that the inclusion of more variables may improve the explanatory capability of the model.

Sample (adjusted): 1989Q4 2013Q1
Included observations: 94 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	FINANCIAL_INDEX
C	-221.4177 (65.7583) [-3.36714]
BUSINESS_INDEX	2.025952 (0.58308) [3.47456]
BUSINESS_INDEX(-1)	1.183807 (0.58174) [2.03494]
R-squared	0.212626
Adj. R-squared	0.195321
Sum sq. resids	811.4013
S.E. equation	2.986051
F-statistic	12.28701
Log likelihood	-234.6872
Akaike AIC	5.057175
Schwarz SC	5.138344
Mean dependent	99.56839
S.D. dependent	3.328785

Table 1– DL (1) estimation for Japan

The lack of statistical significance of the financial index, to explain itself, is driven by the lack of autocorrelation (see annex 2.2).

Nevertheless the low adjusted R^2 achieved (19,53%), demonstrates the inability of the business cycle, to explain isolated the variations in the financial cycle.

Sample (adjusted): 1990Q4 2013Q1
Included observations: 90 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.492173 (0.08403) [5.85707]
BUSINESS_INDEX(-2)	-0.620938 (0.08178) [-7.59247]
C	112.3535 (9.33551) [12.0351]
FINANCIAL_INDEX	0.036568 (0.01382) [2.64562]
FINANCIAL_INDEX(-5)	-0.031279 (0.01363) [-2.29497]
R-squared	0.539179
Adj. R-squared	0.517493
Sum sq. resids	13.35421
S.E. equation	0.396369
F-statistic	24.86336
Log likelihood	-41.84546
Akaike AIC	1.041010
Schwarz SC	1.179889
Mean dependent	100.0173
S.D. dependent	0.570621

Table 2 – ADL (2,5) estimation for Japan

According to the Chow breakpoint test (see annex 5.1), the business cycle of Japan denotes a structural break point in the second quarter of 2008, which is consistent with the subprime crises started in U.S.A. in 2008. However, it was not statistically significant by the arguments previous demonstrated (Hansen 2001). The presence of a structural break could disturb the results estimated, so in order to minimize it, a dummy variable was tested in the model. However, the dummy does not have statistical significance (see annex 9.1), which, according to Hansen (2001), is possibly due to the fact that the Chow test can sometimes indicate the presence of a falsely break.

There are some several relevant results from the analysis of the ADL (2,5) estimated for Japan (see table 2). The variations of the business cycle have the biggest impacts from its own lags, despite the fact that both jointly, ceteris paribus, result in -0,13 points in the index value. In what concerns to the relation with the financial cycle, it is possible to see that the moment zero have a positive impact in the business cycle, being abrogated by the fifth lag. This relationship, demonstrates that the impacts of the financial cycle in the moment 0, tends to dissipate its impact across the time (see Figure 5).

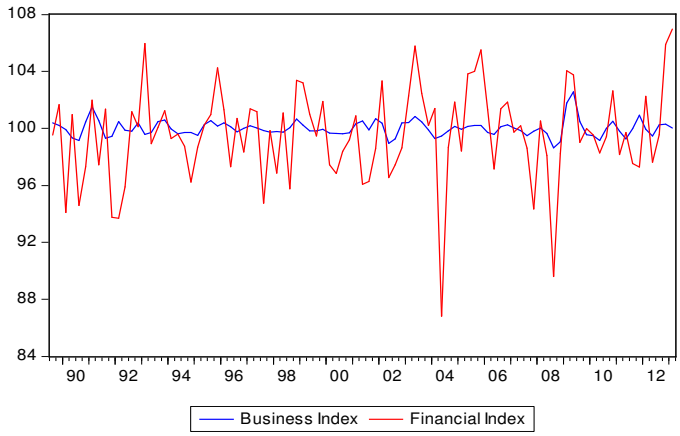


Figure 5 – The Business and Financial Index behavior of Japan, between the periods of 1989Q3-2013Q1, quarterly data

The residuals of the ADL (2,5) show that the financial cycle is not sufficient to explain the variations of the business cycle, which was already seen by the value of the R^2. This is possible to verify by some historical examples. For instance, in 1992 the Japanese government declared officially the bubble collapse, and begins the implementation of a fiscal stimulus package, in order to stimulate a faster economic recovery, being this event not captured by the financial index directly. In 2009, Japanese economy was dealing with a scenario characterized by the reduction trend in the exportations levels, the decreasing of consumer's confidence, and the raise of the unemployment rate, which ultimately leaded to the sharp decrease in the GDP. The variation of these variables, again, isn't captured directly by the financial index, and the lags applied to the business cycle may be short to include totally these events.

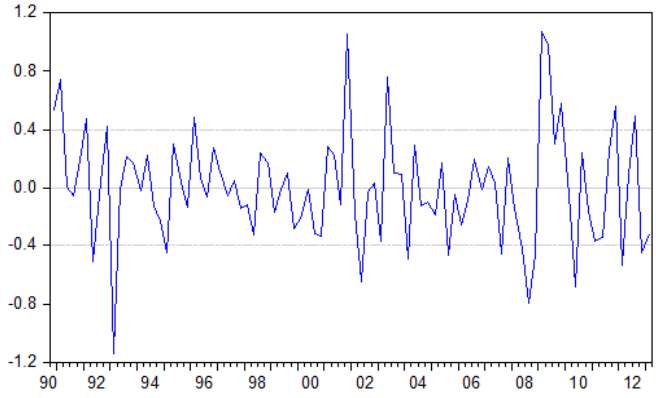


Figure 6 – Business Index residuals of Japan, between the periods of 1989Q1-2013Q1, quarterly data

By the analysis of the Dynamic Multipliers for the ADL (2,5) of Japan (see figure 7), it is possible to conclude that, an impulse of one unit in the financial cycle will induce in the moment 0, and in the first period a positive impact in the business cycle. However, it

will induce negative responses from the second period until the sixth period, where a readjustment process begins, compensating the previous impacts. The deep negative impact in the fifth period is justified, by the effect of the inclusion the financial cycle fifth lag. Nevertheless, the fact that the business cycle reacts negatively in the tenth period corroborates the presence of a cyclical behavior.

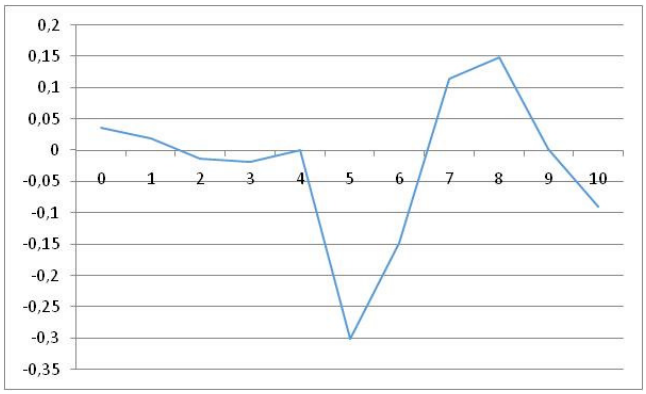


Figure 7 - Dynamic Multipliers for ADL (2,5) of Japan

6.1.2 United Kingdom

From the privatization of several state-owned companies, deregulation of financial markets, the easing of the labor market and the attempts to reduce the levels of inflation and unemployment rate during de decades of 80 and mid 90's, to the nationalization process of some of the major national banks during the "Sub-prime crisis" in 2008, the U.K. economy has experienced innumerous changes throughout the last years.

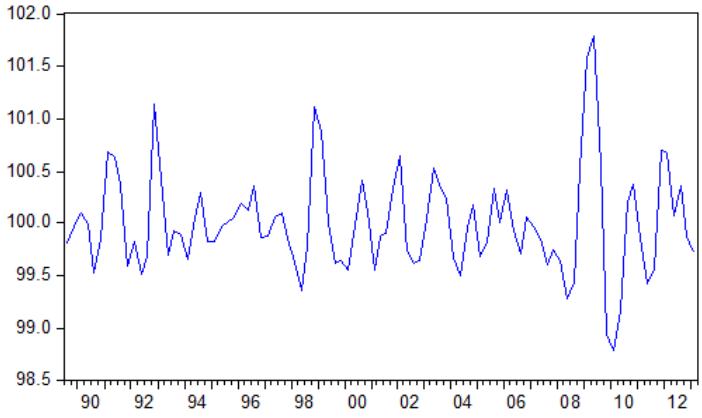


Figure 8 – Business Cycle of U.K between the periods of 1989Q3-2013Q1, quarterly data (source: OECDhttp://stats.oecd.org/Index.aspx?DataSetCode=MEI_CLI)

Analyzing the Business Cycle of U.K (see Figure 8), and recurring to FRED in order to date periods of expansion and recession, is possible to identify the following periods.

The 1988Q4-1992Q1 period represent a recessionary phase for the U.K´s Business cycle. During this time frame, U.K, suffered from high levels of inflation, and the economic policies used to control the inflation rate ended up with the increase of the unemployment rate (Jenkins, 2010).

After several changes in the policies applied, the economy reacted, and in the period of 1992Q2-1994Q3 a recovery phase was verified. Although, the changes in the economic panorama results in positive outcomes in the short term, however this performance was not sustained for long.

During the period of 1994Q4-2002Q1, a recessionary phase in the Business cycle is found (interrupted briefly during the periods of 1996Q4-1997Q4 and 1999Q2-2001Q1).

The expansionary phase experienced between 2002Q2-2007Q3 (excluding 2004Q1 to 2004Q4), is abruptly interrupted by the "Sub-prime crisis". This last event motivates a recession phase from 2007Q4 up to 2009Q2.

After the nationalization of several banks, the stabilization of the interest rates, and the implementation of incentives (e.g., financial and fiscal) in the economy, the Business cycle regains a positive trend (expansionary phase between 2009Q3 and 2011Q4) (OECD, 2011a).

Nevertheless, in 2012 the U.K economy entered in a double dip recession, making by this way the Business cycle return to the recessionary phase.

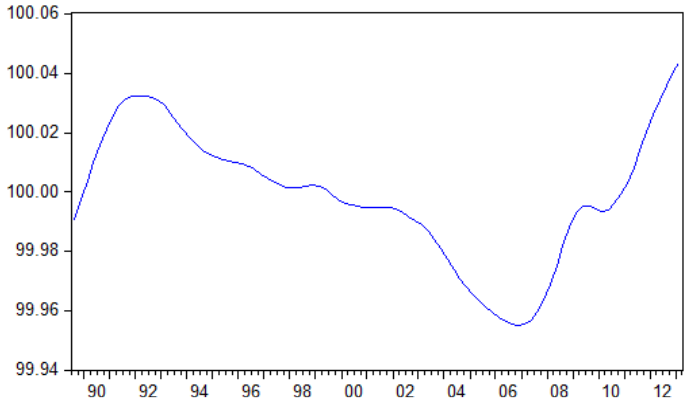


Figure 9– Business Cycle HP Filter, for U.K., between the periods of 1989Q1-2013Q1, quarterly data

After the analysis to the U.K's Business cycle HP filter (see Figure 9), it is possible to identify three different types of cycles.

The first one is a Kitchin Inventory Cycle occurred between 2009 and 2011. It was the result of the readjustment of the prospects from producers and consumers concerning the evolution of the economy after the "Sub-prime crisis".

The period comprehended between 2003 and 2013 could represent part of the downswing movement and the start of the upswing movement of a Kuznets Infrastructural Investment cycle. This period is coincident with the collapse of the real estate sector and the implementation of policies by U.K.'s government in order to stimulate the economy (e.g. the maintenance of low interest rates or nationalization of several banks) (OECD, 2004; OECD, 2011b; OECD, 2013b).

The downswing movement registered between 1992 and 2007 and the upswing movement started in 2007, when considered the duration of the wave, could be associated to the features associated to the Kondratieff cycle. Nevertheless, it will only be possible to date the end of the Kondratieff's cycle with additional future data, since the upswing movement observed only start in 2007.

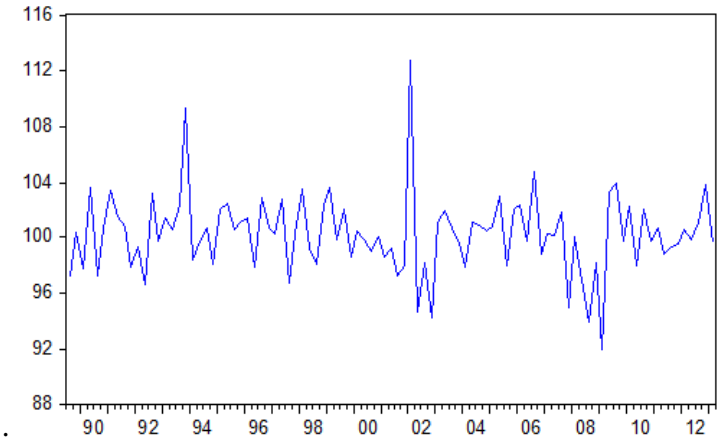


Figure 10-Financial Cycle, for U.K., between the periods of 1989Q3-2013Q1, quarterly data (moving average index made by author based on data retrieved from: Bloomberg and Reuters Datastream)

According to the graphic representation of the U.K financial cycle (see Figure 10), it is possible to identify two lowest point in 2003 and 2009. The trough of 2009, which is the most evident, reflects the sharp decrease of the asset prices, which was amplified by the reduction of the levels of financial market liquidity, and the restrictions in the supply of credit (these restrictions inclusively leaded to decrease in house prices). During this period several companies tried to close several asset positions in order to rebuild their capital structures. In order to stimulate the financial market, which was facing investors and companies repatriating their savings, U.K government started a program to recapitalize their domestic banks, depreciating the sterling to improve their exports and the U.K´s net external asset position (OECD, 2009).

In the year of 2003, U.K´s government decided to participate in the Iraq´s war, regarding all the direct costs associated to the national economy and the indirect impacts on national companies. The escalation of oil prices made companies dispend more money with energy costs and commodities, which at the same time was accompanied by the of the investor´s risk aversion (Leigh *et al*, 2003). Previously to 2003, the government had compromised to maintain the inflation levels around 2.5%, but that was achieved at the cost of the fall of the interest rates.

In what concerns the peaks of the financial cycle occurred at the end 1993 and at the beginning of 2002.

Regarding the underperformance of the stock market in the year of 2002, the financial cycle registered the biggest peak in that same year. The population growth increased the housing demand in U.K, and leaded to an increase of the prices in the real estate sector.

This fueled the decrease of the interest rates. These factors were sufficiency strong to suppress the poor performance of the stock market and to positively influence the financial cycle.

In the year of 1993 the U.K´s government declared the end of the economic recession, at the same time that the French franc was suffering a speculative attack, similar to what has happened to the sterling in 1992. Due to the relief of speculative pressures over the sterling, and since U.K left the Exchange Rate Mechanism (ERM) at the end of 1992, with the definition of new inflationary target, the interest rates in U.K. suffered a decrease (Buiter *et al*, 1998).

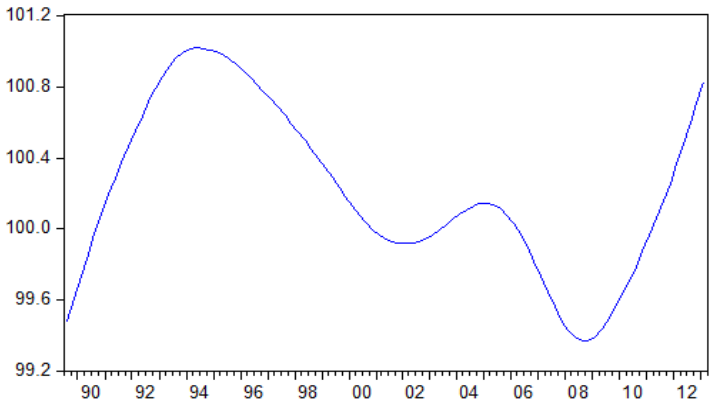


Figure 11 - Financial Cycle HP Filter of U.K., between the periods of 1989Q1-2013Q1, quarterly data

When comparing the financial cycle HP filter of U.K. (see Figure 11) with the behavior of the financial cycle, it is possible to discover some common patterns, in what concerns the analysis of peaks and troughs.

When compared the financial cycle HP filter with the business cycle HP filter (see Figure 9), both demonstrate signals of an underperforming activity after 2000.

Contrarily to the estimations for Japan, it was chosen not to perform an estimation for the financial cycle in U.K., since this variable do not show an AR(p) process (see annex 2.4), and the Granger causality test indicates that the past of the business cycle does not explain the present variations of the financial cycle (see annex 6.2). However, the estimation of the business cycle includes both variables (ADL model) (see tee table 3).

According to the AIC lag length criteria (see annex 8.2), the optimal number of lags to apply at the ADL estimation of the business cycle is eleven. Nevertheless, if it is considered eleven lags, the model will not have statistical relevance. After adopting the same manually process made in the estimation of Japan, the optimal number of lags to

use in the ADL estimation for U.K. is two. The final ADL model for the U.K. is composed by two lags of the business cycle and one lag for the financial cycle. The inclusion of these length of lags implies an adjusted R^2 of 50,63%.

Sample (adjusted): 1990Q1 2013Q1
Included observations: 93 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.763133 (0.08340) [9.15025]
BUSINESS_INDEX(-2)	-0.559421 (0.08338) [-6.70899]
C	83.08112 (8.59631) [9.66474]
FINANCIAL_INDEX(-1)	-0.034436 (0.01290) [-2.66879]
R-squared	0.522411
Adj. R-squared	0.506312
Sum sq. resids	10.70365
S.E. equation	0.346793
F-statistic	32.45084
Log likelihood	-31.42759
Akaike AIC	0.761884
Schwarz SC	0.870813
Mean dependent	100.0014
S.D. dependent	0.493565

Table 3 – ADL (2,1) estimation for U.K.

For the ADL (2,1) model of the U.K (see Table 3), the Chow breakpoint test (see annex 5.2), for the business cycle of U.K. reveals a structural break point in the fourth quarter of 2008 (if considered a significance level of 10%). The structural break verified in the U.K business cycle is concordance with the impacts originated by the subprime crises in U.S.A.. However it does not have statistical significance (see annex 9.2).

From the analysis of the ADL (2,1) estimation for U.K (see table 3) it is possible to observe that the first lag of the financial cycle have a negative impact, *ceteris paribus*, in the business cycle (see Figure 12). This could be seen as an anticipating movement. Nevertheless, it is relevant to refer that the joint impact of the two lags of the business cycle have a positive impact in the variations of the business cycle as dependent variable, contrarily to the estimation for the Japanese case.

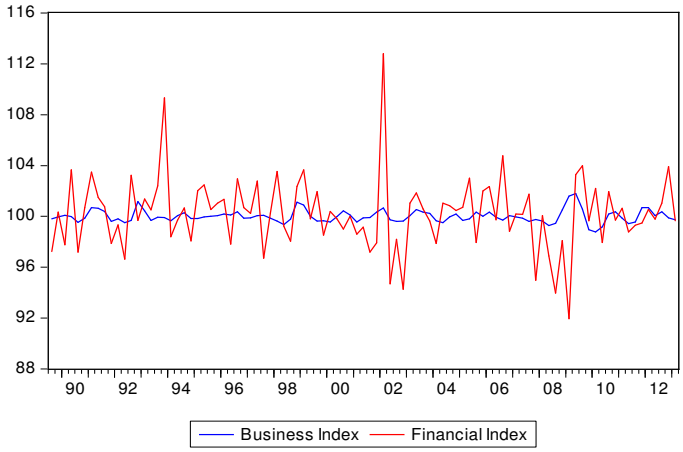


Figure 12 – The Business and Financial Index behavior of U.K., between the periods of 1989Q3-2013Q1, quarterly data

Like in the Japanese estimation, a relevant part of the variations occurred in the U.K. business cycle is not captured by the financial cycle and his lags, like is seen by the analysis of the business cycle residuals (see Figure 13).

For example, between 1992 and 1993, the U.K.'s economy had a sharp increase on the unemployment rate, struggling at the same time to accomplish the ERM guidelines, which let the sterling under speculative attacks.

In the year 2008, not only the financial market was in crisis, but also the main commercial partners of the U.K.. In order to attenuate the impacts of this scenario on the U.K economy, the government applied several measures to stimulate the economic activity such as the decrease of the interest rates, the nationalization of several domestic banks, the increase of the labor market flexibility, the consolidation of the public finances and the reform of the fiscal system.

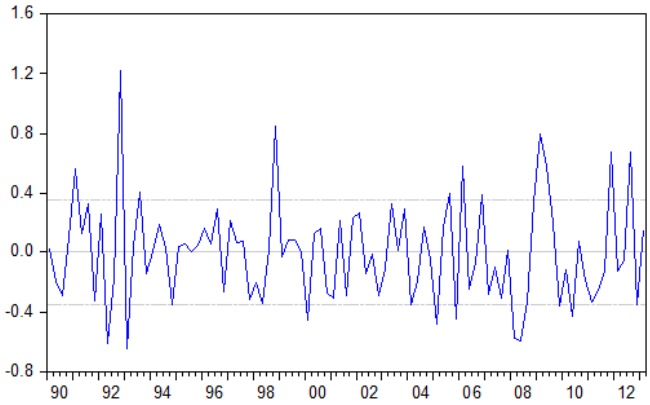


Figure 13 – Business Index residuals, of U.K between the periods of 1989Q1-2013Q1, quarterly data

By the analysis of the Dynamic Multipliers (see figure 14) for the ADL (2,1) estimation for the U.K., it is possible to conclude that an impulse of one unit in the financial cycle, *ceteris paribus*, will induce a cyclical behavior in the business cycle, represented by three periods of negative impact, and four periods of positive impact. As the time passes, this influence will vanish.

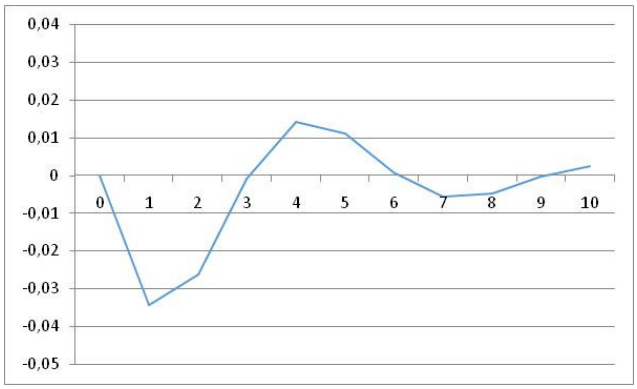


Figure 14 – Dynamic Multipliers for ADL (2,1) of U.K.

6.1.3 United States of America

In the last 24 years, the U.S.A. economy has experienced some difficult periods.

The high levels of inflation registered in the yearly's 90´s were aggravated by the sharply increase in oil prices.

In the 2001 year, the collapse of the "Dot.com" bubble dragged the national economy into a recession.

More recently, in 2007, the "Sub-prime crisis" and the collapse of the banking system, end up not affecting only the U.S.A., but the world economy.

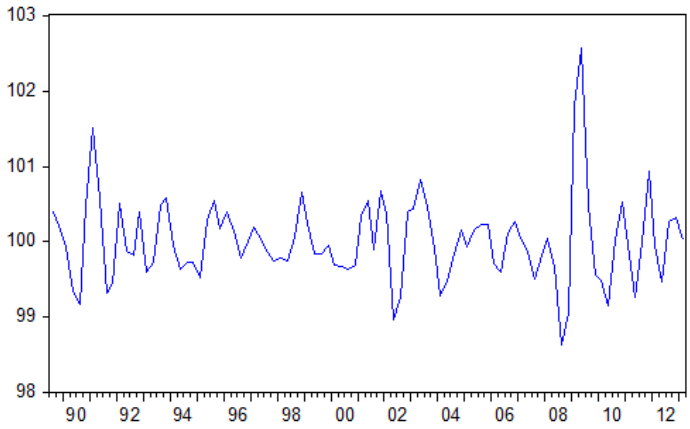


Figure 15 – Business Cycle of U.S.A. between the periods of 1989Q3-2013Q1, quarterly data (source: OECDhttp://stats.oecd.org/Index.aspx?DataSetCode=MEI_CLI)

Based in data of the National Bureau of Economic Research (NBER), and considering the behavior of the Business Cycle of U.S.A (see Figure 15), the period comprehended between 1990Q3 and 1991Q1 registered a contraction, coincident with the shock in the oil prices.

Coincident with the expansion of equity market, and fueled in the late 90´s by the technological sector and several others, the Business cycle of U.S.A. experienced an expansionary phase, comprehended between 1991Q2 and 2000Q4. Nevertheless, the sharply increase in the share price of this technological companies, and the scenario of euphoria, ended up in the collapse of the financial market, and subsequently in the recession of the economy (Silva, 2012). This recession was also aggravated by the terrorist attack of the 9/11, occurring between the periods of 2001Q1 up to 2001Q4.

The Business cycle shows an expansionary phase between 2002Q1 and 2007Q3.

More recently, the U.S.A. economy is facing several and different crises simultaneously on important business sectors (banking, automobile, real estate and construction),

attributing to the period comprehended between 2007Q4 to 2009Q2 the label of a contraction phase.

The expansion phase started in 2009Q3 and the sluggish growth in the U.S.A economy, lead to some comparisons with the period denominate of the "Lost Decade", experiences by the Japanese economy in the 90´s.

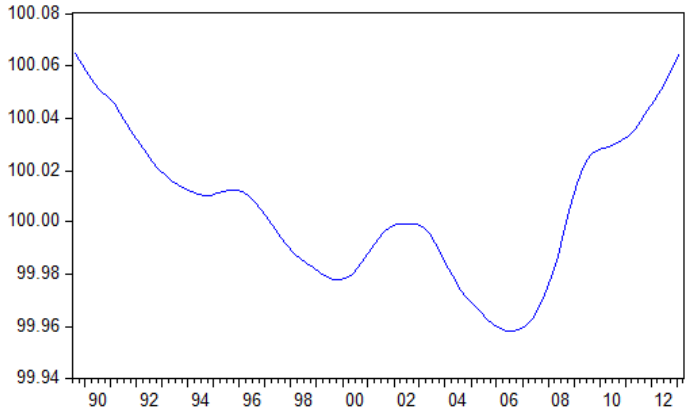


Figure 16 - Business Cycle HP Filter, of U.S.A., between the periods of 1989Q1-2013Q1, quarterly data

When analyzed the business cycle HP filter of U.S.A. (see Figure 16) it is possible to identify four types of cycles.

The first one, and the shorter, is a Kitchin cycle. Observed between 1995 and 2001, it could represent the euphoria moments experienced during the period of the "Dot.com" bubble, which was sustained, principally, by the asymmetry of information in the market (i.e., the investors were not able to understand correctly the true value and the economic and financial prospects of the companies in which were investing) (Silva 2012).

The second cycle starts with the dowsing movement of the previous cycle. In this case, a Juglar fixed investment cycle is possible to disclose, happening between 2001 and 2008. This can be justified by the redirection of the liquidity, after the burst of the "Dot.com" bubble, to new investments in the real estate segment.

The conjugation of the Kitchin´s cycle and the Juglar´s cycle previously described resulted in the observation of a part of the downswing movement and the start of the upswing movement (1995-2008) of the Kuznets infrastructural cycle. The evidences of this cycle are related with the shift in the investors investments focus. The redirection of these investments to one particular sector over another can be seen as the cause of the Kuznets´s cycle.

All of these three previous cycles represent natural movements in a Kondratieff´s major cycle. The period comprehended between 1990 and 2013 could represent the entire downswing phase and the begun of the upswing phase of a Kondratieff's cycle.

Due to the dimension of the U.S.A. economy in the international markets, it is plausible to say that changes in this reality could affect all the remaining world economies, mainly in the main trade partners. This impact is well noticed in the Japanese business cycle (since Japan is one of the major trade partners of U.S.A.) (OECD, 2012).

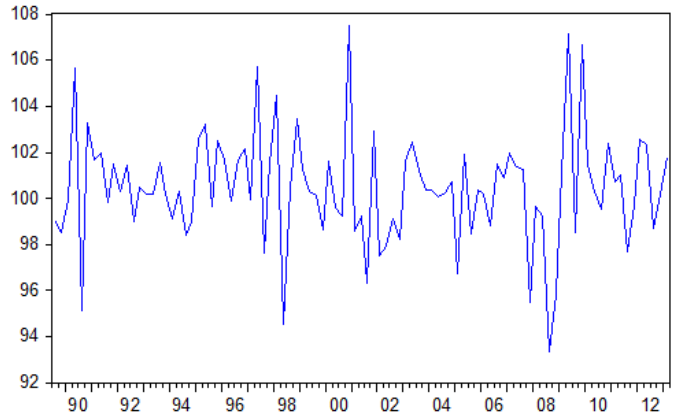


Figure 17 - Financial Cycle of U.S.A., between the periods of 1989Q3-2013Q1, quarterly data (moving average index made by author based on data retrieved from: Bloomberg and Reuters Datastream)

From the financial cycle of U.S.A. (see Figure 17), it is possible to identify three major peaks (one in 2000 and two in 2009).

The causes to the peak of 2000 are well-known. During that year, U.S.A. markets were still benefiting from the "dot.com" bubble, and from the decrease in interest rates. The decrease of interest rates, in the middle of 2000 coincides with the expansion of the volume of credit in the U.S.A., mainly as mortgage credit, which will later result in the "Sub-prime" crisis (Shiller, 2005).

After the nationalization of several domestic financial institutions, the reduction of the interest rates, the purchase of non-performing assets held by financial institutions, and the stimulus implemented in order to trigger the economy growth, the year of 2009 marks the end of the recession caused by the "Sub-prime" crisis (OECD, 2010).

The light recovery of the economy, and the positive prospects, resulted in the reduction of the investors risk aversion, increasing the liquidity in the stock market and stimulating companies to increase their production and investment levels, which resulted in a credit expansion (OECD, 2010).

The lowest levels registered in the financial cycle are registered in 1998 and 2008.

The lowest point registered in 1998 is the direct consequence of the Asian financial crisis. However, it does not have the same consequences for the economy like the ones resulted from the collapse of the "dot.com" bubble. Also, despite being one of the lowest points in the financial cycle, its impact in the business cycle was reduced (see figure 19).

Nevertheless, the impact of the lowest point registered in the financial cycle in 2008, is not restricted only for the domestic dimension. The lower standards in the credit concession, and the continuously increase of housing prices resulted in 2008 on the burst of the "housing bubble", and in the beginning of the "Sub-prime". This scenario penalized the international economy, conducting inclusively the Europe into the "Sovereign debt crisis" (OECD, 2010).

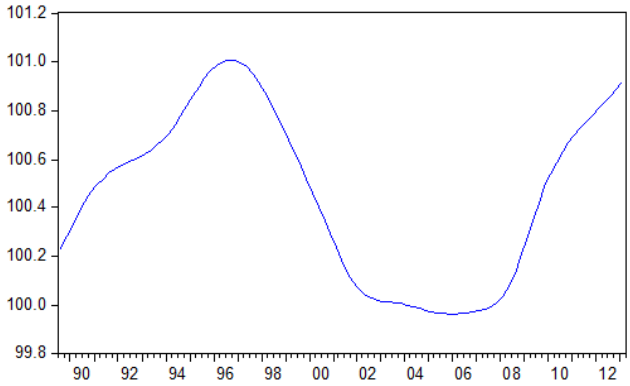


Figure 18 –Financial Cycle HP Filter of U.S.A., between the periods of 1989Q1-2013Q1, quarterly data

The HP filter of the U.S.A´s Financial cycle (see Figure 18) exposes evidences of an underperforming activity between 2000 and 2009, which is denominated in the recent years of "The America´s Lost Decade". The period comprehended between 2000 and 2009 is the reflection of the several crisis suffered by the U.S.A.. The impact of the each crisis in the business cycle (see Figure 15) differs and not all of them have the same impact.

In the case of the U.S.A., and as stated previous for the Japan estimation, the financial cycle is only explained by the business cycle DL model (see table 4), ensured by the results of the Granger Causality Test (see annex 6.3), again with the best fit obtained manually, while the variations of the business cycle are estimated trough an ADL model (see table 5). When applied the AIC criteria (see annex 8.3), it is stated that the model should have eleven lags as the optimal fit. However, again a manually insertion of

variables, like was done for Japan and the U.K, was made. As occurred for Japan and the U.K., the Chow breakpoint test for U.S.A.´s business cycle, suggests the presence of a structural breakpoint, if considered a significance level of 10%, in 2002Q2, 2008Q2 and 2009Q3 (see annex 5.3; 5.4; 5.*5)*. However, they don't have statistical significance when included in the ADL estimation of the business cycle (see annex 9.3; 9,4; 9.5).

Sample (adjusted): 1990Q1 2013Q1 Included observations: 93 after adjustments Standard errors in ( ) & t-statistics in [ ]	
	FINANCIAL_INDEX
C	-181.2964 (77.0777) [-2.35212]
BUSINESS_INDEX	1.794669 (0.45954) [3.90533]
BUSINESS_INDEX(-2)	1.023173 (0.45890) [2.22961]
R-squared	0.148810
Adj. R-squared	0.129894
Sum sq. resids	477.5320
S.E. equation	2.303456
F-statistic	7.867145
Log likelihood	-208.0368
Akaike AIC	4.538425
Schwarz SC	4.620122
Mean dependent	100.4896
S.D. dependent	2.469414

Table 4 – DL (2) estimation for U.S.A

The lack of statistical significance of the financial index, to explain itself, is driven by the lack of autocorrelation (see annex 2.6).

The impact driven by the business cycle in the financial cycle, only occur in a two quarters basis. Nevertheless the low adjusted R^2 achieved (12,99%), demonstrates the inability of the business cycle, to explain isolated the variations in the financial cycle.

Sample (adjusted): 1990Q4 2013Q1
Included observations: 90 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.547261 (0.07681) [7.12486]
BUSINESS_INDEX(-2)	-0.648858 (0.07538) [-8.60757]
C	109.9309 (8.72122) [12.6050]
FINANCIAL_INDEX	0.053630 (0.01755) [3.05505]
FINANCIAL_INDEX(-5)	-0.051286 (0.01666) [-3.07800]
R-squared	0.577549
Adj. R-squared	0.557669
Sum sq. resids	12.24227
S.E. equation	0.379509
F-statistic	29.05173
Log likelihood	-37.93330
Akaike AIC	0.954073
Schwarz SC	1.092952
Mean dependent	100.0173
S.D. dependent	0.570621

Table 5 – ADL (2,5) estimation for U.S.A.

The estimated model has an adjusted R^2 of 55,77%, which is the best result for the three analyzed countries. Considering the coefficients of the ADL (2,5) with. (see table 5), it is possible to state again that the two lags of the business cycle have impact on the explanation of the variations of it, but with a joint negative impact, ceteris paribus, of 0,10 points.

In what refers to the impacts caused by financial cycle, the positive impacts occur only at the first lag, being the remaining one responsible for negative impact, when considered a *ceteris paribus* scenario (see figure 19).

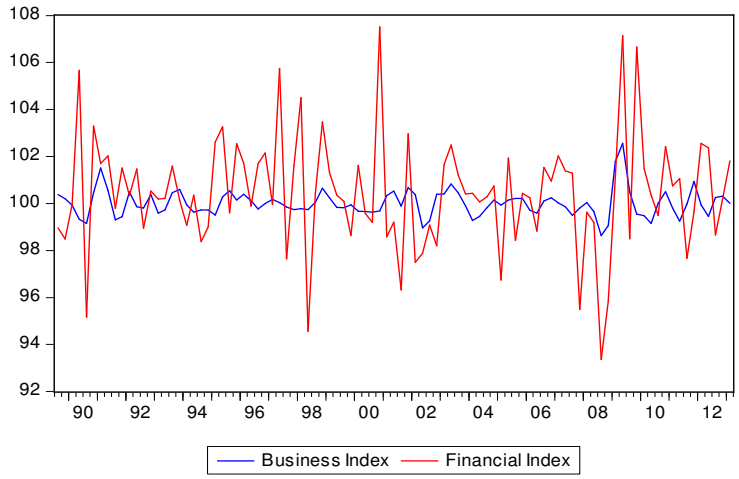


Figure 19 – The Business and Financial Index behavior of U.S.A., between the periods of 1989Q3-2013Q1, quarterly data

From the analysis of the business cycle residuals (see Figure 20), it is possible to disclose the volatility and the impact of other variables that weren't considered in this estimation. For instance, between the end of 2000 and the beginning of 2001, the U.S.A. was not only suffering from the collapse of the "dot.com" bubble, as it was facing an economic recession. The decrease of the GDP, due mainly to the increase of the unemployment rate (the number of layoffs increased sharply, and companies start to outsourcing their services), the fall in consumption levels and the raise of the inflation, contributed to the increase of importance of exogenous factors in the business cycle, which were not captured by the model.

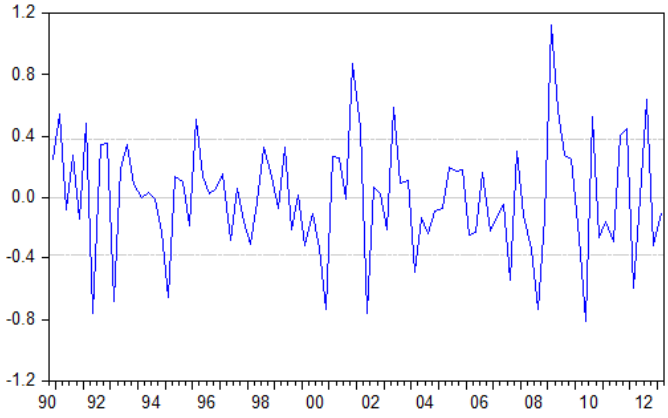


Figure 20 - Business Index residuals of U.S.A., between the periods of 1989Q1-2013Q1, quarterly data

From the analysis of the Dynamic Multipliers (see figure 21), it is possible conclude that an impulse of one unit in the financial cycle cause a positive response in the

business cycle during the moment 0, and the first period. However, it will induce negative responses from the second period until the sixth period, where a readjustment process begins, compensating the previous impacts. The negative impact in the fifth period, after a brief "recovery" occurred in the fourth, is justified by the effect of the inclusion the financial cycle fifth lag. Nevertheless, the fact that the business cycle reacts negatively in the tenth period corroborates the presence of a cyclical behavior.

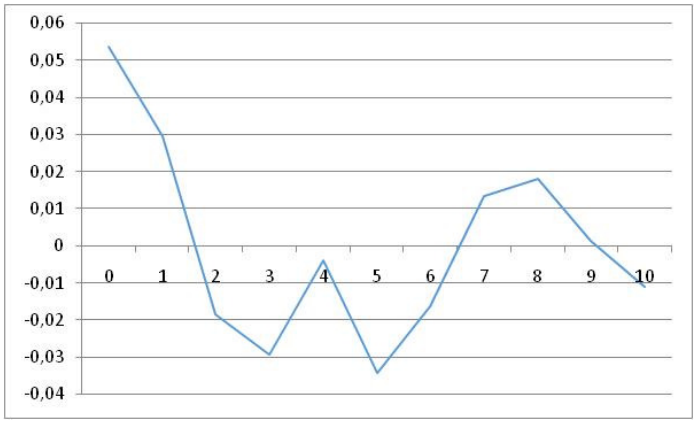


Figure 21 – Dynamic Multipliers for ADL (2,5) of U.S.A

6.1.4 Aggregate view

From the individual analysis of each one of the three countries (Japan, U.K. and U.S.A), and considering their importance in the global economy, there are some common patterns from their business and financial cycles. The business cycle of Japan show evidences of synchronization with the U.S.A´s business cycle, which is corroborated by the similarity of their trends. However, the financial cycle of Japan does not have the same behavior. It continues to show signals of underperformance, reflecting the impacts felt in the financial system due to the "Japanese Asset Price Bubble".

Regarding the fact that the three business cycles are all at the same stage (recovering from a recession), the trend of the U.K´s business cycle is the one with fewer similarities with the other countries. However, the business cycle trend in U.K is similar to its own financial cycle. Nevertheless, it is important to verify that until the middle of the 2001 year, the financial cycle trend of the U.K shows some common patterns with the financial cycle of the U.S.A.. This can be justified by the economic zone where U.K. is settled, and with its main trade partners.

The DL estimation for each country shows different results. In the case of Japan, the impact of the business cycle in the financial cycle occurs contemporarily and with the lag of one period. Nevertheless, for the U.S.A example the impact also occurs contemporarily, but the lag with statistical significance is of two periods. The U.K. is a particular case, where the past of the business cycle does not have statistical significance to explain the present variations of the financial cycle.

According with the ADL model estimated for each country, in what concerns the impact of the financial cycle in the business cycle, both Japan and U.S.A. show some common features. In the U.K the negative impact of the financial cycle occurs at the first period, when in the other two countries are at the fifth moment).

All the three countries under analysis expose the presence of structural break points in the year of 2008, as consequence of the "Sub-prime" crisis in U.S.A., and the "Sovereign Debt "crisis in Europe. However, when considered as a variable in the ADL estimation, none of them have statistical significance.

Chapter 7 – Conclusion Notes

This dissertation aimed to evaluate the existence of relationships between business and financial cycles in three of the most developed economies in the world.

Contrarily to what was expected, the business cycle, based in the data used in this study, does not show statistical significance to explain the financial cycle.

As the result of the globalization process, when a severe financial disruption occurs, it will spread its negative impacts in several economies worldwide, but with different magnitude levels. The 2008 subprime crisis is a good example of this, starting in the U.S.A, but ending up resulting in a sovereign debt crisis in Europe.

Regarding the existence of common patterns between the cycles of these countries, the majority of the policies adopted to mitigate a crisis or to start recovery process of the economy have some similarities. Each bubble burst, in a direct or indirect way, ends up bringing negative impacts on the domestic economy. Governments spent millions of dollars/yens/sterling pounds in order to stimulate the economy activity, injecting liquidity in their financial systems, reforming their fiscal system, which in the majority of the cases is insufficient to avoid the decrease of consumption levels and of the GDP.

However, it is important to notice that usually governments act too late, mainly after the occurrence of a burst or recession, not demonstrating their policies to be pro-active when the first signals of a bubble or a slow-down of the economy appear.

Despite the limitations imposed by the data collected and the indicators chosen, it was possible to show that the financial cycles have influence in the movements of the business cycle, and vice-versa, and an important role in the formation of peaks and troughs.

Due to the natural cyclical behavior of the economy and the financial markets, taking in account the result of a financial disruption have in the economy, and the long periods for which their negative impacts remain valid in the economy, a more complete set of surveillance measures should be implemented by the governments (e.g., like a set of financial and macroeconomic indicators with control values determined by historical reference standards observed in past bubbles and crisis)

For further investigation, it will be interesting to test the interactions between the business and financial cycles with a larger data range, and with the inclusion of more variables in the estimation model. This more complete picture can be able to seek in a

more complete way an important question “Does the business cycle really influence the financial cycle?”.

The study of these same relationships between economies with different stages of development will be relevant to define a common standard trend in the business and financial cycles all over the economic world.

Despite the efforts of supervisors to create and to impose rules in the financial system, the increasing complexity of the financial instruments continuous to maintain a gap, those investors will try to explore, which will spread its effects on the business cycle. By this way, maybe it is more important to first understand the dynamics and chain of events betweens those cycles, and then adapt the regulation in order to increase its efficiency.

For further investigation, will be interesting testing the interactions between the business and financial cycles with a larger set of data, and with the inclusion of more indicators in the estimation model. This more complete approach, will seek essentially respond to the question “Does the business cycle really influence the financial cycle?”.

Also, studying these same relationships between economies with different stages of development, will be relevant, in order to define a common standard trend in the business and financial cycles all over the world.

Due to the continuously deregulation of the financial system, it will be important understand, how this fact is affecting the behavior of the financial cycle, allowing to understand if the deregulation of the markets, are increasing the impacts of the financial cycle in the economies.

References

Baltagi, B. 2011. ***Econometrics*** (5th ed.). Berlin: Springer.

Bodie, Z., Kane, A., & Marcus, A. J. 2009. ***Investments*** (8th ed.). New York: McGraw-Hill Irwin.

Box, G. E. P., & Pierce, D. A. 1970. Distribution of Residual Correlations in Autoregressive-integrated Moving Average Time Series Models. ***Journal of the American Statistical Association***, 65: 1509–1526.

Buiter, W. H,, Corsetti, G. M., & Pesenti, P. A. 1998. Interpreting the ERM Crisis: Coutry-specific and Systemic issues. ***Princeton Studies in International Finance***, 88. New Jersey: Princeton University

Burns, A., & Mitchell, W. 1946. ***Measuring business cycles.*** New York: National Bureau of Economic Research, Inc

Case, B., Goetzmann, W., N., & Rouwenhorst, K., G. 2000. Global Real Estate Markets - Cycles and Fundamentals. ***National Bureau of Economic Research***, Working Paper 7566.

Case, K., Quigley, J., Shiller, R. 2003. ***Home-buyers, Housing and the Macroeconomy***. Paper presented at the Reserve Bank of Australia Conference on Asset Prices and Monetary Policy (August).

Chauvet, M., & Potter, S. 2000. Coincident and leading indicators of the stock market. ***Journal of Empirical Finance***, 7(1): 87-111.

Claessens, S., Kose, M. A., & Terrones, M. E., 2011a. How Do Business and Financial Cycles Interact?. ***International Monetary Fund,*** Working Papers 11/88.

Claessens, S., Kose, M. A., & Terrones, M. E., 2011b. Financial Cycles: What? How? When?. ***International Monetary Fund,*** Working Papers 11/76.

Diebolt, C., & Doliger, C. 2008**.** New International Evidence on the Cyclical Behaviour of Output: Kuznets Swings Reconsidered. ***Quality & Quantity: International Journal of Methodology,*** 42(6): 719–737.

Dickey, D.,& Fuller, W. 1979.Distribution of the estimators for Autoregressive Time Series with a Unit Root. ***Journal of the American Statistical Association***, 74: 427-431.

Ducos, G. 1997. Clément Juglar. In Glasner, D.(ed), ***Business Cycles and Depressions. An Encyclopedia***: 345-347. New York and London: Garland Publishing Inc..

Economic Planning Agency of Japan. 1994***. Economic Survey of Japan (1993-1994): A Challenge to New Frontiers Beyond the Severe Adjustment Process***. Tokyo: EPA.

Edwards, S., & Biscarri, J. G., & Perez de Gracia, F. 2003. Stock market cycles, financial liberalization and volatility. ***Journal of International Money and Finance***, 22(7): 925-955.

Fama, E., F. 1965. The Behavior of Stock-Market Prices. ***The Journal of Business***, 38(1): 34-105.

Flath, D. 2000. ***The Japanese Economy*** (1st ed.). Oxford: Oxford University Press

Galbraith, J. K. 1954. ***The Great Crash*** *1929.*Boston: Houghton, Mifflin Company.

Hamilton, J. 1994. ***Time Series Analysis***. New Jersey: Princeton University Press.

Herring, R., & Wachter, S. 1999. Real Estate Booms and Banking Busts-An International Perspective. ***Group of Thirty,*** occasional paper 58.

Hott, C., 2009. Banks and Real Estate Prices. ***The Swiss National Bank***, Working Paper 2009-8.

Jarque, C. and Bera, 1980.Efficient Test for Normality, Homoscedasticity and serial independence of regressions residuals. ***Economics Letters***, 6 (3): 225-259.

Jenkins, J. 2010. The Labour Market in the 1980s, 1990s and 2008/09 Recessions. ***Economic & Labour Market Review***, 4 (8): 29-36.

Juglar, C. 1862.***Des Crises commerciales et de leur retour periodique en France, en Angleterre, et aux Etats-Unis***. Paris: Libraire Gillaumin. et Cie.

Kaiser, R., W., 1997. The Long Cycle of Real Estate. ***Journal of Real Estate Research***, 14(3): 233-258.

Kindleberger, C. P., & Aliber, R. Z. 2005. ***Manias, Panics and Crashes: A History of Financial Crises*** (5th ed.) *.London:* Palgrave Macmillan.

Kitchin, J. 1923. Cycles and Trends in Economic Factor. ***Review of Economic and Statistics***, 5 (1): 10-16.

Kiyotaki, N., & Moore, J. 1995. Credit Cycles. ***National Bureau of Economic Research***, Working Paper 5083.

Kondratieff, N.D. 1926 [1979]. The Long Waves in Economic Life. ***Review,*** 2(4):519-562.

Kuznets, S. 1930. ***Secular Movements in Production and Prices. Their Nature and their Bearing upon Cyclical Fluctuations***. Boston: Houghton Mifflin.

Kwiatkowski D., P. Phillips, Schmidt, P.,& Shin, Y. 1992.Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. ***Journal of Econometrics***, 54: 159-178.

Lambertini, L. Mendicino, C., & Punzi, M., T. 2011. Leaning Against Boom-Bust Cycles in Credit and Housing Prices. ***Banco de Portugal***, Working Paper 8/11.

Leigh, A., Wolfers, J., & Zitzewitz, E. 2003. What do Financial Markets think of War in Iraq?. ***National Bureau of Economic Research***, Working Paper 9587.

Liew, V. 2004. Which Lag Length Selection Criteria Should We Employ? ***Economics Bulletin***, 33(33): 1-9.

Minsky, H. P.1992. The Financial Instability Hypothesis. ***Economics Working Paper Archive***. 74.

OECD. 2004. OECD Economic Surveys of United Kingdom 2004. Paris

OECD. 2009.OECD Economic Surveys of United Kingdom 2009. Paris

OECD. 2010. OECD Economic Surveys of United States 2010. Paris

OECD. 2011a. OECD Economic Surveys of Japan 2011. Paris

OECD. 2011b. OECD Economic Surveys of United Kingdom 2011. Paris

OECD. 2012. OECD Economic Surveys of United States 2012. Paris

OECD. 2013a. OECD Economic Surveys of Japan 2013. Paris

OECD. 2013b. OECD Economic Surveys of United Kingdom 2013. Paris.

Pagan, A. R. & Sossounov, K. A., 2003. A simple framework for analyzing bull and bear markets. ***Journal of Applied Econometrics***, 18(1): 23-46.

Papageorgiou, A., & Tsoulfidis, L. 2006. Kondratiev, Marx and the Long cycle. Indian Development Review. In Mariolis, T.,& Tsoulfidis, L. (Eds.), ***Distribution, development and prices, critical perspectives***. New Delhi: Serials

Phillips, P., & Perron, P. 1988. Testing for a Unit Root in Time Series Regression. ***Biometrika*****,**75: 335-346.

Poterba, J. M. 1991. House Price Dynamics: The Role of Tax Policy and Demography. ***Brookings Papers on Economic Activity***, 2: 143-183.

Schumpeter, J.A. 1934. ***The Theory of Economic Development***. Cambridge, Massachusetts: Harvard University Press.

Schumpeter, J.A. 1939. Business ***Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process***. New York and London: McGraw-Hill.

Schumpeter, J. 1954. ***History of economic analysis***. London: Allen and Unwin.

Shiller, R., 2005.***Irrational Exuberance*** (2nd ed.). New Jersey: Princeton University Press.

Shiller, R. 2007. "Understanding Recent Trends in House Prices and Home Ownership". ***National Bureau of Economic Research***, Working Paper 13553.

Silva, R. 2012.The Investor Behavior on Extreme Situations of Speculation and Crash: An approach based on Iterated Prisoner´s Dilemma. ***International Journal of the latest trends in Finance and Economic Science****,* 2 (3): 169-189.

Sismondi, J. C. L. 1819 [1991]. ***New Principles of Political Economy of Wealth in its Relation to Population.*** New Brunswick: Transaction Publishers.

Syed, M., Kang, K., & Tokuoka, K. 2009. "Lost Decade" in Translation: What Japan´s Crisis could Portbend about Recovery from the Great Recession. ***International Monetary Fund***, Working Paper WP/09/282.

White, E. N. 1990. The Stock Market Boom and Crash of 1929 Revisited. ***The Journal of Economic Perspectives,*** 4 (2): 67-83.

Other References

Bloomberg Hardware

FRED
http://research.stlouisfed.org/fred2/series/GBRRECDM
http://research.stlouisfed.org/fred2/series/JPNRECP

ITA
http://tse.export.gov/TSE/MapDisplay.aspx

NBER
http://www.nber.org/cycles.html

OECD
http://stats.oecd.org/Index.aspx?DataSetCode=MEI_CLI
http://stats.oecd.org/viewhtml.aspx?datasetcode=MEI_PRICES&lang=en#

Thomson Reuters Datastream
http://online.thomsonreuters.com/datastream/

Annex 1- Correlations

	BUSINESS_INDEX	FINANCIAL_INDEX
BUSINESS_INDEX	1.000000	0.419417
FINANCIAL_INDEX	0.419417	1.000000

Annex 1.1 – Correlation between Business and Financial Indexes, Japan

	BUSINESS_INDEX	FINANCIAL_INDEX
BUSINESS_INDEX	1.000000	0.189131
FINANCIAL_INDEX	0.189131	1.000000

Annex 1.2 - Correlation between Business and Financial Indexes, U.K.

	BUSINESS_INDEX	FINANCIAL_INDEX
BUSINESS_INDEX	1.000000	0.309083
FINANCIAL_INDEX	0.309083	1.000000

Annex 1.3 - Correlation between Business and Financial Indexes, U.S.A.

Annex 2 - Autocorrelations

Sample: 1989Q3 2013Q1
Included observations: 95

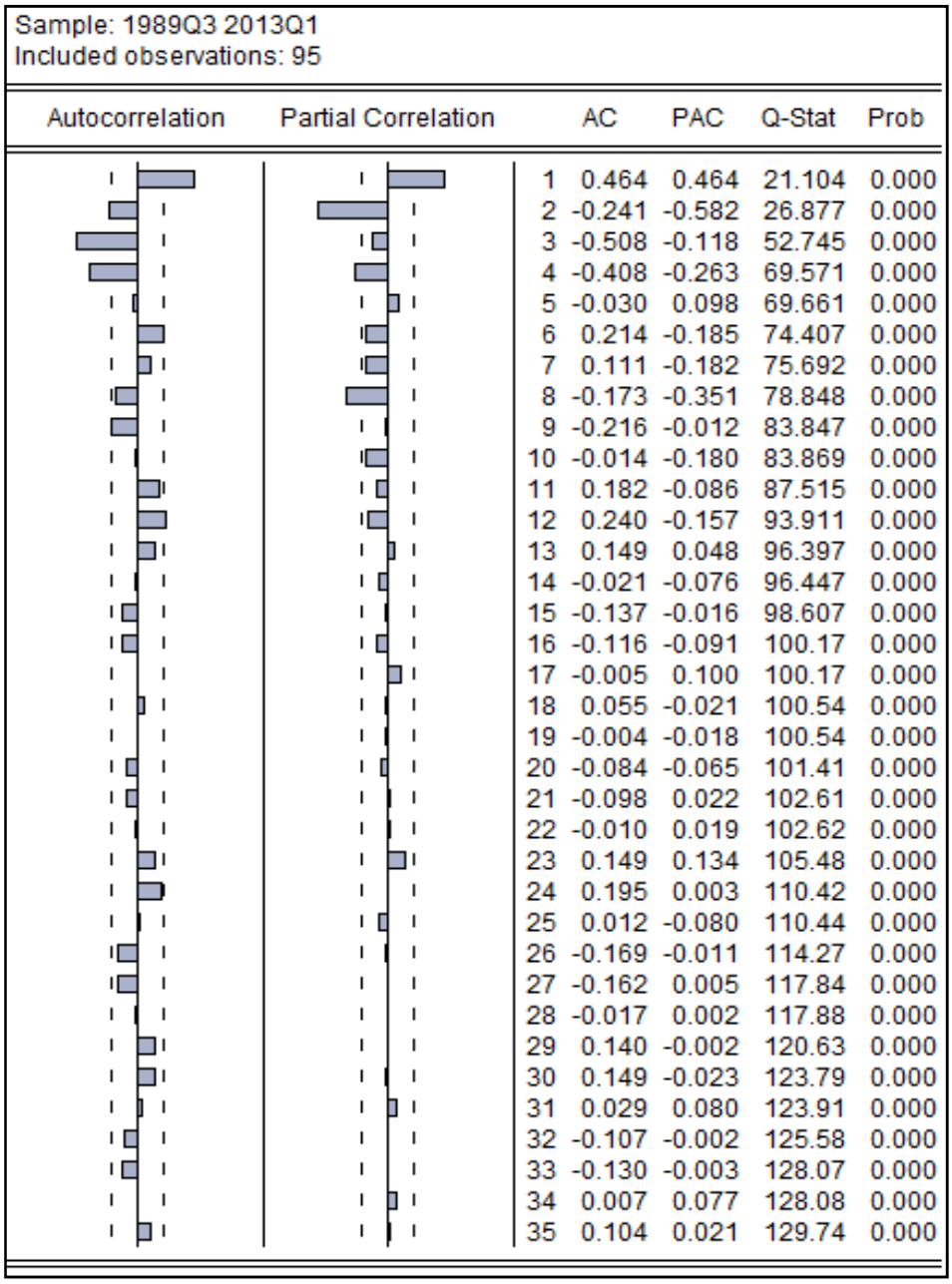
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.362	0.362	12.834	0.000
		2	-0.407	-0.619	29.218	0.000
		3	-0.390	0.133	44.490	0.000
		4	-0.157	-0.433	47.002	0.000
		5	-0.038	0.036	47.147	0.000
		6	0.078	-0.173	47.779	0.000
		7	0.052	-0.195	48.065	0.000
		8	-0.083	-0.162	48.791	0.000
		9	-0.021	-0.031	48.837	0.000
		10	0.205	0.098	53.383	0.000
		11	0.092	-0.316	54.318	0.000
		12	-0.174	0.071	57.687	0.000
		13	-0.114	-0.127	59.142	0.000
		14	0.056	-0.001	59.504	0.000
		15	0.060	-0.036	59.915	0.000
		16	0.019	-0.097	59.956	0.000
		17	0.021	0.096	60.007	0.000
		18	0.046	0.060	60.257	0.000
		19	-0.000	-0.049	60.257	0.000
		20	-0.083	-0.073	61.104	0.000
		21	-0.148	-0.166	63.841	0.000
		22	-0.111	0.022	65.387	0.000
		23	0.088	-0.041	66.384	0.000
		24	0.239	0.039	73.804	0.000
		25	0.168	0.081	77.506	0.000
		26	-0.047	-0.115	77.800	0.000
		27	-0.245	-0.090	85.939	0.000
		28	-0.172	-0.028	90.030	0.000
		29	0.044	-0.133	90.297	0.000
		30	0.113	0.038	92.093	0.000
		31	0.142	0.171	94.995	0.000
		32	0.144	0.049	98.039	0.000
		33	0.001	0.064	98.040	0.000
		34	-0.136	-0.020	100.82	0.000
		35	-0.129	0.020	103.39	0.000

Annex 2.1 – Autocorrelation Business Index, Japan

Sample: 1989Q3 2013Q1
Included observations: 95

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.149	0.149	2.1620	0.141
		2	-0.036	-0.059	2.2891	0.318
		3	-0.057	-0.043	2.6121	0.455
		4	-0.182	-0.174	5.9776	0.201
		5	-0.103	-0.058	7.0653	0.216
		6	-0.072	-0.072	7.6011	0.269
		7	-0.047	-0.054	7.8367	0.347
		8	0.060	0.031	8.2202	0.412
		9	-0.035	-0.091	8.3497	0.499
		10	-0.074	-0.093	8.9440	0.537
		11	0.066	0.059	9.4235	0.583
		12	-0.064	-0.102	9.8739	0.627
		13	0.025	0.028	9.9465	0.698
		14	0.083	0.039	10.727	0.707
		15	0.080	0.069	11.458	0.720
		16	0.110	0.072	12.866	0.683
		17	0.046	0.044	13.114	0.729
		18	-0.198	-0.183	17.824	0.467
		19	-0.076	0.002	18.521	0.488
		20	-0.153	-0.120	21.411	0.373
		21	-0.187	-0.151	25.781	0.215
		22	-0.111	-0.174	27.325	0.199
		23	0.039	0.022	27.518	0.235
		24	0.121	0.003	29.431	0.204
		25	0.197	0.115	34.526	0.097
		26	-0.093	-0.210	35.674	0.098
		27	0.094	0.134	36.869	0.098
		28	0.004	-0.091	36.871	0.122
		29	0.078	0.229	37.730	0.128
		30	0.136	-0.001	40.346	0.098
		31	-0.045	-0.013	40.642	0.115
		32	0.087	0.122	41.756	0.116
		33	-0.028	0.035	41.874	0.138
		34	-0.185	-0.119	47.071	0.067
		35	-0.164	-0.068	51.196	0.038

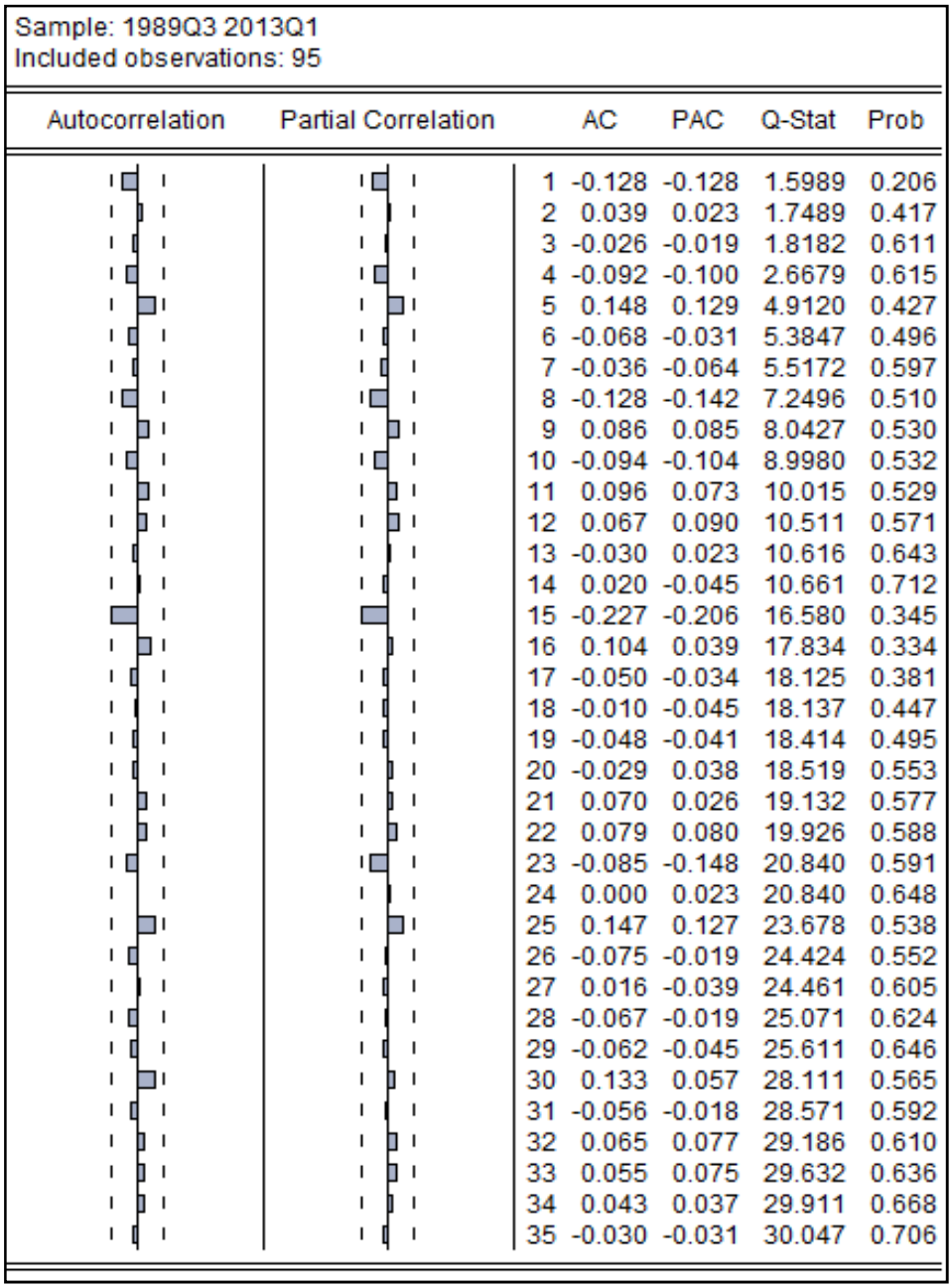
Annex 2.2 – Autocorrelation Financial Index, Japan



Sample: 1989Q3 2013Q1
Included observations: 95

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.464	0.464	21.104	0.000
		2	-0.241	-0.582	26.877	0.000
		3	-0.508	-0.118	52.745	0.000
		4	-0.408	-0.263	69.571	0.000
		5	-0.030	0.098	69.661	0.000
		6	0.214	-0.185	74.407	0.000
		7	0.111	-0.182	75.692	0.000
		8	-0.173	-0.351	78.848	0.000
		9	-0.216	-0.012	83.847	0.000
		10	-0.014	-0.180	83.869	0.000
		11	0.182	-0.086	87.515	0.000
		12	0.240	-0.157	93.911	0.000
		13	0.149	0.048	96.397	0.000
		14	-0.021	-0.076	96.447	0.000
		15	-0.137	-0.016	98.607	0.000
		16	-0.116	-0.091	100.17	0.000
		17	-0.005	0.100	100.17	0.000
		18	0.055	-0.021	100.54	0.000
		19	-0.004	-0.018	100.54	0.000
		20	-0.084	-0.065	101.41	0.000
		21	-0.098	0.022	102.61	0.000
		22	-0.010	0.019	102.62	0.000
		23	0.149	0.134	105.48	0.000
		24	0.195	0.003	110.42	0.000
		25	0.012	-0.080	110.44	0.000
		26	-0.169	-0.011	114.27	0.000
		27	-0.162	0.005	117.84	0.000
		28	-0.017	0.002	117.88	0.000
		29	0.140	-0.002	120.63	0.000
		30	0.149	-0.023	123.79	0.000
		31	0.029	0.080	123.91	0.000
		32	-0.107	-0.002	125.58	0.000
		33	-0.130	-0.003	128.07	0.000
		34	0.007	0.077	128.08	0.000
		35	0.104	0.021	129.74	0.000

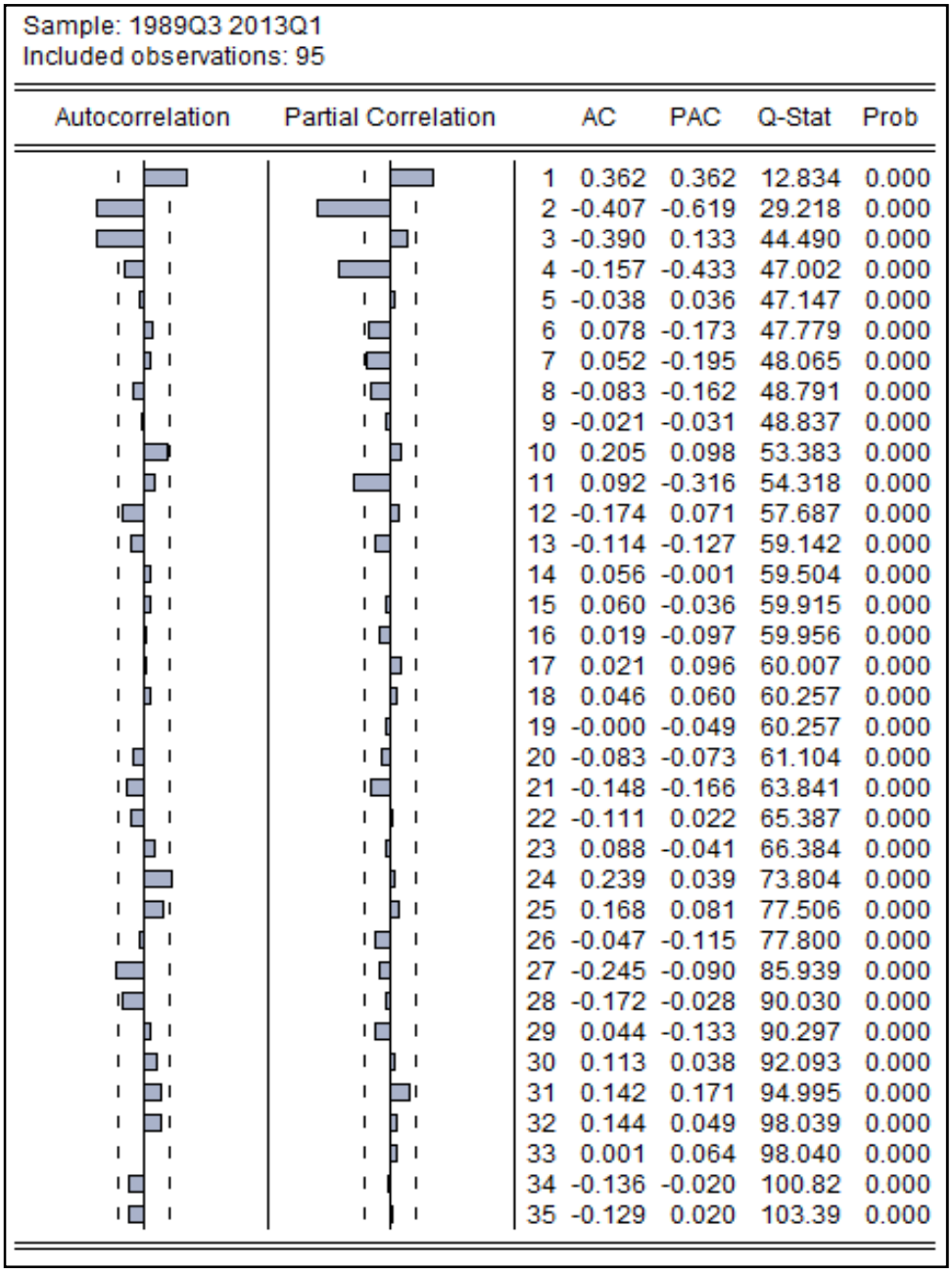
Annex 2.3 – Autocorrelation Business Index, U.K.



Sample: 1989Q3 2013Q1
Included observations: 95

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.128	-0.128	1.5989	0.206
		2	0.039	0.023	1.7489	0.417
		3	-0.026	-0.019	1.8182	0.611
		4	-0.092	-0.100	2.6679	0.615
		5	0.148	0.129	4.9120	0.427
		6	-0.068	-0.031	5.3847	0.496
		7	-0.036	-0.064	5.5172	0.597
		8	-0.128	-0.142	7.2496	0.510
		9	0.086	0.085	8.0427	0.530
		10	-0.094	-0.104	8.9980	0.532
		11	0.096	0.073	10.015	0.529
		12	0.067	0.090	10.511	0.571
		13	-0.030	0.023	10.616	0.643
		14	0.020	-0.045	10.661	0.712
		15	-0.227	-0.206	16.580	0.345
		16	0.104	0.039	17.834	0.334
		17	-0.050	-0.034	18.125	0.381
		18	-0.010	-0.045	18.137	0.447
		19	-0.048	-0.041	18.414	0.495
		20	-0.029	0.038	18.519	0.553
		21	0.070	0.026	19.132	0.577
		22	0.079	0.080	19.926	0.588
		23	-0.085	-0.148	20.840	0.591
		24	0.000	0.023	20.840	0.648
		25	0.147	0.127	23.678	0.538
		26	-0.075	-0.019	24.424	0.552
		27	0.016	-0.039	24.461	0.605
		28	-0.067	-0.019	25.071	0.624
		29	-0.062	-0.045	25.611	0.646
		30	0.133	0.057	28.111	0.565
		31	-0.056	-0.018	28.571	0.592
		32	0.065	0.077	29.186	0.610
		33	0.055	0.075	29.632	0.636
		34	0.043	0.037	29.911	0.668
		35	-0.030	-0.031	30.047	0.706

Annex 2.4 – Autocorrelation Financial Index, U.K.



Sample: 1989Q3 2013Q1
Included observations: 95

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.362	0.362	12.834	0.000
		2	-0.407	-0.619	29.218	0.000
		3	-0.390	0.133	44.490	0.000
		4	-0.157	-0.433	47.002	0.000
		5	-0.038	0.036	47.147	0.000
		6	0.078	-0.173	47.779	0.000
		7	0.052	-0.195	48.065	0.000
		8	-0.083	-0.162	48.791	0.000
		9	-0.021	-0.031	48.837	0.000
		10	0.205	0.098	53.383	0.000
		11	0.092	-0.316	54.318	0.000
		12	-0.174	0.071	57.687	0.000
		13	-0.114	-0.127	59.142	0.000
		14	0.056	-0.001	59.504	0.000
		15	0.060	-0.036	59.915	0.000
		16	0.019	-0.097	59.956	0.000
		17	0.021	0.096	60.007	0.000
		18	0.046	0.060	60.257	0.000
		19	-0.000	-0.049	60.257	0.000
		20	-0.083	-0.073	61.104	0.000
		21	-0.148	-0.166	63.841	0.000
		22	-0.111	0.022	65.387	0.000
		23	0.088	-0.041	66.384	0.000
		24	0.239	0.039	73.804	0.000
		25	0.168	0.081	77.506	0.000
		26	-0.047	-0.115	77.800	0.000
		27	-0.245	-0.090	85.939	0.000
		28	-0.172	-0.028	90.030	0.000
		29	0.044	-0.133	90.297	0.000
		30	0.113	0.038	92.093	0.000
		31	0.142	0.171	94.995	0.000
		32	0.144	0.049	98.039	0.000
		33	0.001	0.064	98.040	0.000
		34	-0.136	-0.020	100.82	0.000
		35	-0.129	0.020	103.39	0.000

Annex 2.5 – Autocorrelation Business Index, U.S.A.

Sample: 1989Q3 2013Q1
Included observations: 95

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.131	-0.131	1.6908	0.194
		2	-0.008	-0.026	1.6974	0.428
		3	0.060	0.057	2.0615	0.560
		4	-0.008	0.008	2.0675	0.723
		5	-0.165	-0.167	4.8456	0.435
		6	-0.061	-0.113	5.2256	0.515
		7	-0.098	-0.132	6.2396	0.512
		8	0.004	-0.013	6.2411	0.620
		9	0.049	0.056	6.4946	0.690
		10	-0.145	-0.159	8.7700	0.554
		11	0.185	0.118	12.543	0.324
		12	0.097	0.093	13.585	0.328
		13	-0.080	-0.059	14.307	0.353
		14	0.039	0.010	14.482	0.414
		15	0.045	-0.000	14.716	0.472
		16	0.112	0.190	16.177	0.441
		17	-0.165	-0.113	19.410	0.306
		18	0.018	0.001	19.447	0.365
		19	-0.133	-0.136	21.605	0.304
		20	0.044	-0.003	21.837	0.349
		21	-0.061	0.043	22.304	0.382
		22	-0.050	-0.079	22.619	0.424
		23	0.106	0.065	24.065	0.400
		24	0.024	-0.018	24.138	0.454
		25	0.007	0.018	24.145	0.511
		26	0.127	0.147	26.284	0.448
		27	0.001	-0.100	26.284	0.503
		28	-0.079	-0.021	27.136	0.511
		29	-0.010	-0.047	27.151	0.564
		30	-0.013	0.046	27.177	0.614
		31	-0.104	-0.048	28.722	0.584
		32	0.011	-0.082	28.739	0.632
		33	-0.101	-0.011	30.270	0.604
		34	0.085	0.023	31.367	0.597
		35	-0.046	-0.031	31.691	0.629

Annex 2.6 – Autocorrelation Financial Index, U.S.A.

Annex 3 – Normality Tests

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 90

Component	Skewness	Chi-sq	df	Prob.
1	0.285713	1.224482	1	0.2685
Joint		1.224482	1	0.2685

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 90

Component	Kurtosis	Chi-sq	df	Prob.
1	3.866587	2.816151	1	0.0933
Joint		2.816151	1	0.0933

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 90

Component	Jarque-Bera	df	Prob.
1	4.040632	2	0.1326
Joint	4.040632	2	0.1326

Annex 3.1 – ADL Residual Normality Test between Business and Financial Index, Japan

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 93

Component	Skewness	Chi-sq	df	Prob.
1	0.749468	8.706380	1	0.0032
Joint		8.706380	1	0.0032

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 93

Component	Kurtosis	Chi-sq	df	Prob.
1	4.033835	4.141656	1	0.0418
Joint		4.141656	1	0.0418

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 93

Component	Jarque-Bera	df	Prob.
1	12.84804	2	0.0016
Joint	12.84804	2	0.0016

Annex 3.2 – ADL Residual Normality Test between Business and Financial Index, U.K.

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 90

Component	Skewness	Chi-sq	df	Prob.
1	0.056091	0.047194	1	0.8280
Joint		0.047194	1	0.8280

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 90

Component	Kurtosis	Chi-sq	df	Prob.
1	3.319415	0.382597	1	0.5362
Joint		0.382597	1	0.5362

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1989Q3 2013Q1
Included observations: 90

Component	Jarque-Bera	df	Prob.
1	0.429791	2	0.8066
Joint	0.429791	2	0.8066

Annex 3.3 – ADL Residual Normality Test between Business and Financial Index, U.S.A.

Annex 4 – Unit Root Tests

Null Hypothesis: BUSINESS_INDEX has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.252709	0.0000
Test critical values:	1% level	-3.503879	
	5% level	-2.893589	
	10% level	-2.583931	

*MacKinnon (1996) one-sided p-values.

Annex 4.1 - Unit Root test to Business_Index using ADF, to Japan

Null Hypothesis: FINANCIAL_INDEX has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.959259	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Annex 4.2 - Unit Root test to Financial_Index using ADF, to Japan

Null Hypothesis: BUSINESS_INDEX has a unit root
Exogenous: Constant
Bandwidth: 47 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.37690	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.279002
HAC corrected variance (Bartlett kernel)	0.013671

Annex 4.3 - Unit Root test to Business_Index using PP, to Japan

Null Hypothesis: FINANCIAL_INDEX has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.941633	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	10.70741
HAC corrected variance (Bartlett kernel)	10.50564

Annex 4.4 - Unit Root test to Financial_Index using PP, to Japan

Null Hypothesis: BUSINESS_INDEX is stationary
Exogenous: Constant
Bandwidth: 44 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.201504
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.319343
HAC corrected variance (Bartlett kernel)	0.032288

Annex 4.5 - Unit Root test to Business_Index using KPSS, to Japan

Null Hypothesis: FINANCIAL_INDEX is stationary
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.139897
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	10.84755
HAC corrected variance (Bartlett kernel)	12.45848

Annex 4.6 - Unit Root test to Financial_Index using KPSS, to Japan

Null Hypothesis: BUSINESS_INDEX has a unit root
Exogenous: Constant
Lag Length: 7 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.865074	0.0000
Test critical values:	1% level	-3.507394	
	5% level	-2.895109	
	10% level	-2.584738	

*MacKinnon (1996) one-sided p-values.

Annex 4.7 - Unit Root test to Business_Index using ADF, to U.K.

Null Hypothesis: FINANCIAL_INDEX has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.96960	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Annex 4.8 - Unit Root test to Financial_Index using ADF, to U.K.

Null Hypothesis: BUSINESS_INDEX has a unit root
Exogenous: Constant
Bandwidth: 93 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-8.395625	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.186848
HAC corrected variance (Bartlett kernel)	0.007275

Annex 4.9 - Unit Root test to Business_Index using PP, to U.K.

Null Hypothesis: FINANCIAL_INDEX has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.96826	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	7.935064
HAC corrected variance (Bartlett kernel)	7.950134

Annex 4.10 - Unit Root test to Financial_Index using PP, to U.K.

Null Hypothesis: BUSINESS_INDEX is stationary
Exogenous: Constant
Bandwidth: 19 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.114895
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.236307
HAC corrected variance (Bartlett kernel)	0.050385

Annex 4.11 - Unit Root test to Business_Index using KPSS, to U.K.

Null Hypothesis: FINANCIAL_INDEX is stationary
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.145130
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	8.077511
HAC corrected variance (Bartlett kernel)	6.911578

Annex 4.12 - Unit Root test to Financial_Index using KPSS, to U.K.

Null Hypothesis: BUSINESS_INDEX has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.252709	0.0000
Test critical values:	1% level	-3.503879	
	5% level	-2.893589	
	10% level	-2.583931	

*MacKinnon (1996) one-sided p-values.

Annex 4.13 - Unit Root test to Business_Index using ADF, to U.S.A.

Null Hypothesis: FINANCIAL_INDEX has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.95417	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Annex 4.14 - Unit Root test to Financial_Index using ADF, to U.S.A.

Null Hypothesis: BUSINESS_INDEX has a unit root
Exogenous: Constant
Bandwidth: 47 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.37690	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.279002
HAC corrected variance (Bartlett kernel)	0.013671

Annex 4.15 - Unit Root test to Business_Index using PP, to U.S.A.

Null Hypothesis: FINANCIAL_INDEX has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.97265	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5.906318
HAC corrected variance (Bartlett kernel)	5.754383

Annex 4.16- Unit Root test to Financial_Index using PP, to U.S.A.

Null Hypothesis: BUSINESS_INDEX is stationary
Exogenous: Constant
Bandwidth: 44 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.201504
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	0.319343
HAC corrected variance (Bartlett kernel)	0.032288

Annex 4.17 - Unit Root test to Business_Index using KPSS, to U.S.A.

Null Hypothesis: FINANCIAL_INDEX is stationary
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.068640
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Residual variance (no correction)	5.970940
HAC corrected variance (Bartlett kernel)	5.970940

Annex 4.18 - Unit Root test to Financial_Index using KPSS, to U.S.A.

Annex 5 – Chow Breakpoint Tests

Chow Breakpoint Test: 2008Q2
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1989Q3 2013Q1

F-statistic	3.169414	Prob. F(2,91)	0.0467
Log likelihood ratio	6.397154	Prob. Chi-Square(2)	0.0408
Wald Statistic	6.338828	Prob. Chi-Square(2)	0.0420

Annex 5.1 – Chow Breakpoint Test, Japan (2008Q2)

Chow Breakpoint Test: 2008Q4
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1989Q3 2013Q1

F-statistic	2.605366	Prob. F(2,91)	0.0794
Log likelihood ratio	5.289734	Prob. Chi-Square(2)	0.0710
Wald Statistic	5.210732	Prob. Chi-Square(2)	0.0739

Annex 5.2 –Chow Breakpoint Test, U.K. (2008Q4)

Chow Breakpoint Test: 2002Q2
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1989Q3 2013Q1

F-statistic	2.911180	Prob. F(2,91)	0.0595
Log likelihood ratio	5.891752	Prob. Chi-Square(2)	0.0526
Wald Statistic	5.822359	Prob. Chi-Square(2)	0.0544

Annex 5.3 –Chow Breakpoint Test, U.S.A. (2002Q2)

Chow Breakpoint Test: 2008Q2
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1989Q3 2013Q1

F-statistic	2.492795	Prob. F(2,91)	0.0883
Log likelihood ratio	5.067165	Prob. Chi-Square(2)	0.0794
Wald Statistic	4.985591	Prob. Chi-Square(2)	0.0827

Annex 5.4 –Chow Breakpoint Test, U.S.A. (2008Q2)

Chow Breakpoint Test: 2009Q3
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1989Q3 2013Q1

F-statistic	3.652344	Prob. F(2,91)	0.0298
Log likelihood ratio	7.335160	Prob. Chi-Square(2)	0.0255
Wald Statistic	7.304688	Prob. Chi-Square(2)	0.0259

Annex 5.5 –Chow Breakpoint Test, U.S.A. (2009Q3)

Annex 6 – Granger Causality Test

Pairwise Granger Causality Tests
Sample: 1989Q3 2013Q1
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
FINANCIAL_INDEX does not Granger Cause BUSINESS_INDEX	91	0.30382	0.8746
BUSINESS_INDEX does not Granger Cause FINANCIAL_INDEX		3.07665	0.0206

Annex 6.1 - Granger Causality test for Japan.

Pairwise Granger Causality Tests
Sample: 1989Q3 2013Q1
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
FINANCIAL_INDEX does not Granger Cause BUSINESS_INDEX	91	2.67421	0.0376
BUSINESS_INDEX does not Granger Cause FINANCIAL_INDEX		1.51552	0.2053

Annex 6.2 - Granger Causality test for U.K.

Pairwise Granger Causality Tests
Sample: 1989Q3 2013Q1
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
FINANCIAL_INDEX does not Granger Cause BUSINESS_INDEX	91	0.43570	0.7825
BUSINESS_INDEX does not Granger Cause FINANCIAL_INDEX		2.75659	0.0332

Annex 6.3 - Granger Causality test for U.S.A.

Annex 7 – Tested Models

Sample (adjusted): 1989Q4 2013Q1
Included observations: 94 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX	FINANCIAL_INDEX
BUSINESS_INDEX(-1)	0.382661	1.882721
	(0.10787)	(0.63919)
	[3.54754]	[2.94547]
FINANCIAL_INDEX(-1)	-0.008535	0.013986
	(0.01903)	(0.11274)
	[-0.44861]	[0.12405]
C	62.58273	-90.10561
	(10.1178)	(59.9559)
	[6.18539]	[-1.50287]
R-squared	0.133441	0.108319
Adj. R-squared	0.114396	0.088722
Sum sq. resids	26.16828	918.8907
S.E. equation	0.536249	3.177688
F-statistic	7.006536	5.527244
Log likelihood	-73.27912	-240.5342
Akaike AIC	1.622960	5.181579
Schwarz SC	1.704129	5.262748
Mean dependent	100.0018	99.56839
S.D. dependent	0.569832	3.328785
Determinant resid covariance (dof adj.)		2.561598
Determinant resid covariance		2.400701
Log likelihood		-307.9212
Akaike information criterion		6.679174
Schwarz criterion		6.841512

Annex 7.1 – Bivariate VAR model tested for Japan

Sample (adjusted): 1989Q4 2013Q1
Included observations: 94 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX	FINANCIAL_INDEX
BUSINESS_INDEX(-1)	0.514270	1.273462
	(0.09061)	(0.60171)
	[5.67550]	[2.11640]
FINANCIAL_INDEX(-1)	-0.044150	-0.168734
	(0.01547)	(0.10276)
	[-2.85313]	[-1.64206]
C	52.99755	-10.19813
	(8.90081)	(59.1059)
	[5.95424]	[-0.17254]
R-squared	0.280706	0.062653
Adj. R-squared	0.264897	0.042052
Sum sq. resids	16.12158	710.9044
S.E. equation	0.420904	2.795020
F-statistic	17.75645	3.041238
Log likelihood	-50.51283	-228.4726
Akaike AIC	1.138571	4.924950
Schwarz SC	1.219740	5.006119
Mean dependent	100.0010	100.2408
S.D. dependent	0.490918	2.855708
Determinant resid covariance (dof adj.)		1.377355
Determinant resid covariance		1.290842
Log likelihood		-278.7593
Akaike information criterion		6.058708
Schwarz criterion		6.221046

Annex 7.2 – Bivariate VAR model tested for U.K

Sample (adjusted): 1989Q4 2013Q1
Included observations: 94 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX	FINANCIAL_INDEX
BUSINESS_INDEX(-1)	0.390020	1.175091
	(0.10205)	(0.45522)
	[3.82179]	[2.58136]
FINANCIAL_INDEX(-1)	-0.021104	-0.215952
	(0.02364)	(0.10545)
	[-0.89274]	[-2.04792]
C	63.11725	4.642312
	(9.73659)	(43.4320)
	[6.48248]	[0.10689]
R-squared	0.139065	0.084406
Adj. R-squared	0.120143	0.064283
Sum sq. resids	25.99845	517.3139
S.E. equation	0.534507	2.384275
F-statistic	7.349512	4.194526
Log likelihood	-72.97311	-213.5319
Akaike AIC	1.616449	4.607062
Schwarz SC	1.697618	4.688231
Mean dependent	100.0018	100.4682
S.D. dependent	0.569832	2.464814
Determinant resid covariance (dof adj.)		1.522267
Determinant resid covariance		1.426652
Log likelihood		-283.4610
Akaike information criterion		6.158744
Schwarz criterion		6.321082

Annex 7.3 – Bivariate VAR model tested for U.S.A.

Annex 8 – Lag Order Selection

Endogenous variables: BUSINESS_INDEX
Exogenous variables: C FINANCIAL_INDEX
Sample: 1989Q3 2013Q1
Included observations: 70

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-50.83336	NA	0.264917	1.509524	1.573767	1.535042
1	-48.00438	5.415467	0.251439	1.457268	1.553632	1.495545
2	-33.74745	26.88449	0.172173	1.078499	1.206984	1.129535
3	-33.25201	0.920109	0.174694	1.092915	1.253521	1.156710
4	-26.27220	12.76308	0.147284	0.922063	1.114791*	0.998617
5	-26.23013	0.075717	0.151408	0.949432	1.174282	1.038745
6	-25.45892	1.366159	0.152452	0.955969	1.212940	1.058041
7	-22.61531	4.955992	0.144692	0.903295	1.192387	1.018126
8	-21.58744	1.762068	0.144654	0.902498	1.223712	1.030088
9	-21.58156	0.009917	0.148919	0.930902	1.284237	1.071251
10	-20.57739	1.664055	0.149020	0.930782	1.316239	1.083890
11	-13.64106	11.29630	0.125890*	0.761173	1.178751	0.927040*
12	-13.05009	0.945562	0.127511	0.772860	1.222559	0.951486
13	-12.71420	0.527821	0.130120	0.791834	1.273655	0.983219
14	-12.50043	0.329826	0.133273	0.814298	1.328240	1.018442
15	-12.27666	0.338848	0.136491	0.836476	1.382539	1.053379
16	-10.31554	2.913661	0.133047	0.809015	1.387200	1.038677
17	-9.962800	0.513992	0.135821	0.827509	1.437814	1.069929
18	-9.756166	0.295192	0.139270	0.850176	1.492603	1.105356
19	-8.903678	1.193482	0.140233	0.854391	1.528939	1.122330
20	-7.971318	1.278666	0.140924	0.856323	1.562993	1.137021
21	-3.416483	6.116492*	0.127733	0.754757*	1.493548	1.048214
22	-3.304907	0.146643	0.131494	0.780140	1.551053	1.086356
23	-3.287595	0.022259	0.135778	0.808217	1.611251	1.127192
24	-3.176755	0.139342	0.139882	0.833622	1.668777	1.165355
25	-0.988748	2.688122	0.135862	0.799679	1.666955	1.144171

* indicates lag order selected by the criterion

Annex 8.1 – ADL Lag Order Selection Criteria of Japan

Endogenous variables: BUSINESS_INDEX
Exogenous variables: C FINANCIAL_INDEX
Sample: 1989Q3 2013Q1
Included observations: 70

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-51.99027	NA	0.273821	1.542579	1.606822	1.568097
1	-42.37656	18.40339	0.214092	1.296473	1.392837	1.334750
2	-23.39528	35.79327	0.128089	0.782722	0.911208*	0.833758
3	-22.90719	0.906441	0.129992	0.797348	0.957955	0.861143
4	-21.99876	1.661136	0.130355	0.799965	0.992693	0.876519
5	-21.96269	0.064921	0.134029	0.827506	1.052355	0.916818
6	-18.28088	6.522075	0.124184	0.750882	1.007853	0.852954
7	-16.71241	2.733615	0.122236	0.734640	1.023732	0.849471
8	-13.29689	5.855182	0.114145	0.665625	0.986839	0.793215*
9	-13.09608	0.338500	0.116858	0.688459	1.041794	0.828808
10	-10.59410	4.146143*	0.112039	0.645546	1.031002	0.798654
11	-9.366522	1.999196	0.111417*	0.639043*	1.056621	0.804910
12	-8.803096	0.901481	0.112940	0.651517	1.101216	0.830143
13	-8.648053	0.243639	0.115849	0.675659	1.157479	0.867044
14	-8.403274	0.377660	0.118550	0.697236	1.211178	0.901380
15	-8.133877	0.407943	0.121254	0.718111	1.264174	0.935014
16	-8.031637	0.151899	0.124642	0.743761	1.321946	0.973423
17	-7.729570	0.440156	0.127426	0.763702	1.374008	1.006123
18	-7.624545	0.150035	0.131041	0.789273	1.431700	1.044453
19	-7.624394	0.000211	0.135200	0.817840	1.492388	1.085779
20	-7.360796	0.361506	0.138487	0.838880	1.545550	1.119578
21	-7.330240	0.041032	0.142846	0.866578	1.605370	1.160035
22	-7.199295	0.172099	0.146970	0.891408	1.662321	1.197624
23	-5.129108	2.661670	0.143114	0.860832	1.663866	1.179807
24	-5.088401	0.051174	0.147735	0.888240	1.723395	1.219974
25	-4.901818	0.229230	0.151933	0.911481	1.778757	1.255973

* indicates lag order selected by the criterion

Annex 8.2 – ADL Log Order Selection Criteria of U.K.

Exogenous variables: C FINANCIAL_INDEX
Sample: 1989Q3 2013Q1
Included observations: 70

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-56.38831	NA	0.310484	1.668238	1.732480	1.693756
1	-52.29162	7.842239	0.284204	1.579761	1.676125	1.618038
2	-34.00004	34.49269	0.173420	1.085716	1.214201	1.136752
3	-33.38983	1.133256	0.175383	1.096852	1.257459	1.160647
4	-25.15461	15.05869	0.142655	0.890132	1.082860*	0.966686
5	-25.14430	0.018546	0.146783	0.918409	1.143258	1.007722
6	-23.18142	3.477101	0.142848	0.890898	1.147869	0.992970
7	-19.68232	6.098429	0.133061	0.819495	1.108587	0.934326
8	-18.97412	1.214065	0.134247	0.827832	1.149046	0.955422
9	-18.93854	0.059983	0.138088	0.855387	1.208722	0.995736
10	-18.92024	0.030316	0.142129	0.883435	1.268892	1.036543
11	-13.23856	9.253030	0.124451*	0.749673	1.167251	0.915540*
12	-13.23103	0.012049	0.128172	0.778029	1.227728	0.956655
13	-13.05509	0.276464	0.131394	0.801574	1.283395	0.992959
14	-12.96019	0.146417	0.135035	0.827434	1.341376	1.031578
15	-12.82408	0.206120	0.138642	0.852117	1.398180	1.069019
16	-12.07180	1.117674	0.139893	0.859194	1.437379	1.088856
17	-11.84293	0.333495	0.143317	0.881227	1.491532	1.123647
18	-11.84205	0.001260	0.147822	0.909773	1.552200	1.164953
19	-11.48591	0.498590	0.150971	0.928169	1.602717	1.196108
20	-11.12718	0.491973	0.154221	0.946491	1.653161	1.227189
21	-3.002996	10.90962*	0.126233	0.742943*	1.481734	1.036400
22	-2.954306	0.063993	0.130183	0.770123	1.541036	1.076339
23	-2.756133	0.254794	0.133732	0.793032	1.596066	1.112007
24	-2.632765	0.155092	0.137725	0.818079	1.653234	1.149813
25	-1.517086	1.370691	0.137928	0.814774	1.682051	1.159267

* indicates lag order selected by the criterion

Annex 8.3 – ADL Log Order Selection Criteria of U.S.A.

Annex 9 – Models with Dummies

Sample (adjusted): 1990Q4 2013Q1
Included observations: 90 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.491935 (0.08450) [5.82192]
BUSINESS_INDEX(-2)	-0.621114 (0.08224) [-7.55287]
C	112.3763 (9.38720) [11.9712]
FINANCIAL_INDEX	0.036428 (0.01391) [2.61927]
FINANCIAL_INDEX(-5)	-0.031011 (0.01374) [-2.25695]
DUMMY_2008Q2	0.027981 (0.10341) [0.27058]
R-squared	0.539580
Adj. R-squared	0.512174
Sum sq. resids	13.34258
S.E. equation	0.398548
F-statistic	19.68845
Log likelihood	-41.80626
Akaike AIC	1.062361
Schwarz SC	1.229015
Mean dependent	100.0173
S.D. dependent	0.570621

Annex 9.1 - ADL (2,5) with dummy 2008Q2 estimation of Japan

Sample (adjusted): 1990Q1 2013Q1
Included observations: 93 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.757901
	(0.08410)
	[9.01235]
BUSINESS_INDEX(-2)	-0.562562
	(0.08382)
	[-6.71184]
C	83.86548
	(8.71503)
	[9.62309]
FINANCIAL_INDEX(-1)	-0.034016
	(0.01296)
	[-2.62384]
DUMMY_2008Q2	0.059492
	(0.09446)
	[0.62983]
R-squared	0.524554
Adj. R-squared	0.502943
Sum sq. resids	10.65561
S.E. equation	0.347975
F-statistic	24.27232
Log likelihood	-31.21845
Akaike AIC	0.778891
Schwarz SC	0.915053
Mean dependent	100.0014
S.D. dependent	0.493565

Annex 9.2 - ADL (2,1) with dummy 2008Q2 estimation of U.K.

Sample (adjusted): 1990Q4 2013Q1
Included observations: 90 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.547121 (0.07720) [7.08683]
BUSINESS_INDEX(-2)	-0.649867 (0.07581) [-8.57179]
C	110.2231 (8.80042) [12.5248]
FINANCIAL_INDEX	0.053013 (0.01772) [2.99147]
FINANCIAL_INDEX(-5)	-0.052289 (0.01696) [-3.08301]
DUMMY_2002Q2	-0.030579 (0.08176) [-0.37399]
R-squared	0.578252
Adj. R-squared	0.553148
Sum sq. resids	12.22192
S.E. equation	0.381443
F-statistic	23.03418
Log likelihood	-37.85844
Akaike AIC	0.974632
Schwarz SC	1.141286
Mean dependent	100.0173
S.D. dependent	0.570621

Annex 9.3 - ADL (2,5) with dummy 2002Q2 estimation of U.S.A

Sample (adjusted): 1990Q4 2013Q1
Included observations: 90 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.546409
	(0.07723)
	[7.07505]
BUSINESS_INDEX(-2)	-0.649156
	(0.07577)
	[-8.56773]
C	110.0032
	(8.76736)
	[12.5469]
FINANCIAL_INDEX	0.053616
	(0.01764)
	[3.03886]
FINANCIAL_INDEX(-5)	-0.050927
	(0.01677)
	[-3.03627]
DUMMY_2008Q2	0.037826
	(0.09876)
	[0.38301]
R-squared	0.578286
Adj. R-squared	0.553184
Sum sq. resids	12.22093
S.E. equation	0.381428
F-statistic	23.03741
Log likelihood	-37.85479
Akaike AIC	0.974551
Schwarz SC	1.141205
Mean dependent	100.0173
S.D. dependent	0.570621

Annex 9.4 - ADL (2,5) with dummy 2008Q2 estimation of U.S.A

Sample (adjusted): 1990Q4 2013Q1
Included observations: 90 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	BUSINESS_INDEX
BUSINESS_INDEX(-1)	0.543719 (0.07767) [7.00062]
BUSINESS_INDEX(-2)	-0.645396 (0.07622) [-8.46755]
C	109.8261 (8.76787) [12.5260]
FINANCIAL_INDEX	0.054552 (0.01778) [3.06767]
FINANCIAL_INDEX(-5)	-0.051014 (0.01676) [-3.04424]
DUMMY_2009Q3	-0.046294 (0.11257) [-0.41126]
R-squared	0.578398
Adj. R-squared	0.553303
Sum sq. resids	12.21767
S.E. equation	0.381377
F-statistic	23.04803
Log likelihood	-37.84279
Akaike AIC	0.974284
Schwarz SC	1.140938
Mean dependent	100.0173
S.D. dependent	0.570621

Annex 9.5 - ADL (2,5) with dummy 2009Q3 estimation of U.S.A