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In Number 6th presented in Section of Economy an article *Stochastic frontier of inefficiency in public expenditure of Mexico 1998-2010* by Sandoval-Luis, with adscription in the Instituto Politécnico Nacional, in Section of Computing an an article *The education system and support technology in Mexico and the BRIC* by Garibaldi Maria & Hernadez Ivan with adscription in the Instituto Tecnológico de los Mochis Sinaloa,Universidad Nacional Autónoma de México respectively in Section of Optimization an article *Fractal concatenation applied to the interpolation of the price in the London Stock Exchange* by Miranda-Fernando & Ramos-Maria, with adscription in the Universidad de Santiago de Compostela, Instituto Politécnico Nacional, respectively, in Section of Risks an article *Dynamic risk in the IS-LM model with delayed* by Ávila- Eric, García- Gerardo & Chan- Noé, with adscription in the Universidad Autónoma de Yucatán , in Section of Finance an article *The twin deficits of the United States, a comparison of two periods (1981-1988, 2001-2008)* by Guadalupe-Carmen & Padilla-Felipe, with adscription in the Universidad de Metropolitana, in Section of Administration an article *Statistical and econometric techniques for employment in the informal sector in Mexico* by Fernández-Oscar with adscription in the Universidad Instituto Politécnico Nacional, in Section Net Business an article *Financial innovations: Role of CDOs, CDS and securitization during the US financial crisis 2007-2009* by Aziz-with adscription in the Instituto Politécnico Nacional.

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Stochastic frontier of inefficiency in public expenditure of Mexico 1998-2010

CONTRERAS - Luis†*

Instituto Politécnico Nacional., Unidad Profesional Adolfo López Mateos, Av Juan de Dios Bátiz S/N, Gustavo A. Madero, Residencial La Escalera, 07738 Ciudad de México, Distrito Federal, México

In the first part of this research demonstrate the existence of technical inefficiency in public spending for the 32 states of the Mexican Republic, First will have to point out the methodology of this research, a form commonly used to measure the technical efficiency of a unit is the stochastic frontier methodology. This technique assumes that for a combination of inputs, the maximum profit attainable by an entity is defined by a parametric function of known inputs that involve unknown parameters and a measure of error, the smaller the distance to the current profit or stochastic frontier best practice, the higher the technical efficiency of the entity, a stochastic frontier profit function can be expressed assuming a Cobb-Douglas. Public spending, with its various funds are focused economic development and reducing inequality in the states but its distribution is not efficient for what their status is reviewed later with the analysis of the results of the regression will a comparison between regions, showing that this inequality leads to malpractice, folow in undevelopment.

Public cost, Economic Development, Technical Efficiency

*Correspondence to Author (*luissandoval58@hotmail.com)
† Researcher contributing first author.

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Introduction

After reorganizing the world after the Second World War, other theorists in different parts of the world are still wondering why nations with similar characteristics were not developed to the same degree. While the convergence theory explains how the developed countries someday will be matched in technology by countries without development because of the disparity in growth rates, Raúl Prebisch and the dependency theory speak the purest sense of the Hegelian dialectic that among nations and individuals, there is a dependent relationship between rich and poor, that without one, the other can not survive.

Simon Kuznets hypothesis related to economic growth and income distribution. According to this, the growth is sufficient to reduce inequality, although is also associated with the early growth, when there is a need for large investments in infrastructure and capital goods. Then job creation and increased productivity would lead to higher wages and better income distribution. Because this way we find that Mexico is one of the countries where gap between the richest 10% of the population and the rest are older. This largely explains why the high degree of inequality in our country. Miguel Székely in one of his studies, states that among the reasons for the marked degree of inequality in Mexico has the largest variance in education, this statistical indicator measuring the degree of dispersion that exists with respect to an average. Subject that it was a detail below.

The efficiency of public expenditure is an essential aspect of fiscal policy, and a prerequisite for achieving the objectives of economic, social and institutional development in the country. It is referred to the effects it has on the economic and social conditions in the countries, and the daily lives of people in relation to the resources used in this sense, efficiency is distinguished from effectiveness, regardless of the level of expenditure targets are met. Consequently, a policy can be effective and not efficient, but not vice versa. The effects of public expenditure can be assessed indirectly based on products (outputs) generated by the government, which includes aspects of both coverage and quality of goods and services provided by the public sector.

In recent years there has been more emphasis on results (outcomes) in measuring the efficiency of public spending. This is a direct way to measure the effects of public spending on the living conditions of the population. The relationship between public spending and products is much more direct and easier to measure than between spending and results because it is difficult to distinguish between the impact of economic policies and other factors that affect the economic and social conditions.

So on the management of public expenditure differs between allocative efficiency and operational efficiency. The first are public resources allocated according to priority objectives to be achieved as a country.

The second are the resources assigned once, so they are used to achieve the best results and / or to reduce the costs of producing public goods and services (Campos and Pradhan, 1996; Schick, 1998; PEFA, 2005; Machado, 2006).

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Regardless of the approach taken, the analysis of the efficiency of public spending required to link the level of expenditure (the total amount of resources) with the proceeds from it. This would determine whether the government should more given its level of spending, or whether it should spend less given the (outputs / outcomes) they get. So you need to build indicators for outputs and outcomes of the public sector, and relate the categories of relevant public spending.

For the technical efficiency of public spending, there are few studies that address this issue from an international and regional perspective, most research on the subject are rather national, as Public Expenditure Review (PER) developed in recent years by the World Bank in a wide number of countries. In the context of the region in question, the IDB has recently conducted studies on public expenditure in each of the countries. It has long been recognized that the efficient functioning of the public sector is a prerequisite for the economic success of a country. However, the measurement of the efficiency of government and the resulting comparison of the different sectors of public countries have a number of difficulties related to the lack of data available to the public, the poor quality of information, and complicated problems that may arise in the estimation procedure.

Only recently, a small number of studies highlights the need for the calculation of indicators of public sector efficiency. As far as the economies of the OECD, Afonso and Tanzi (2005) use a nonparametric method to estimate the results of the relative efficiency of various parts of the public sector in 23 OECD countries during the 80 `s and 90` s Afonso and St. Aubyn (2005).

They used similar techniques to estimate the efficiency of public spending on education and health. The main problem of nonparametric methods to measure efficiency, has been its inability to distinguish inefficiency attributable to malpractice governmental management inefficiency arising from differences in socio-economic backgrounds or attributable to other factors favoring the factors governing performance. Recent studies analyzing two-and three-stage purge the effect of factors called environmental and noise (Fried, 2002 were made,. Glass et al, 2006;. Simar and Wilson, 2007;. Balaguer-Coll , 2007). Then in the next section the theoretical elements of technical efficiency to be able to do so later estimation is analyzed.

Theoretical elements

In this research the performance of each entity is evaluated through the concept of efficiency. Overall, technical efficiency refers to the ability of the government to produce the maximum benefit for a given (Farrell, 1957) budget. One way commonly used to measure the technical efficiency of a unit is the stochastic frontier methodology. This technique assumes that, for a combination of inputs, the maximum attainable benefit an entity is defined by a parametric function of inputs that involve known and unknown parameters a measure of error.

Smaller the distance between the actual benefit to the stochastic frontier or best practice, greater technical efficiency of the entity.

A stochastic frontier profit function can be expressed as: Assuming a Cobb-Douglas function expressed in logarithms, equation (1) can be expressed as: yit = βxit + (υit - uit).

$$y_{it} = f\left(x_{it}, t; \beta\right)e^{\upsilon_{it} - u_{it}}$$

(1)

Where y_{it} is the welfare of the *ith counterparty* i=1,2,…,N in the period t=1,2,…,T; $f(x_{it},t;\beta)$ represents the variations in the budget; x_{it} is a vector (1xK) inputs and other factors that influence the well-being associated with the ith counterparty at time t; β is a vector (K × 1) to estimate the unknown parameters that indicate the relative importance of each of the inputs of production; t is a time trend indicator that serves as a proxy for budgetary change. The basic idea of the stochastic frontier is to introduce a non-negative component in the error term of the production function to consider technical inefficiency. The error term in the model is divided into two parts; the traditional random component (υ_{it}) and a new component of inefficiency (u_{it}). The first part, υ_{it}, is a vector of random errors that assumed iid, $N(0,\sigma^2{}_\upsilon)$, and independently distributed of u_{it}. The $\upsilon_{it}'s$ captures the random variation in output due to factors beyond the control of the entities (such as variations in the budget, bad governance, corruption, marginalization).

The second part, u_{it}, is a vector of independently distributed random variables and nonnegative ($u_{it} \geq 0$), represents technical inefficiency in public spending and is assumed to be specific to the entity. In particular, u_{it} is the combined welfare of factors unrelated to the budget and other factors that limit the institution to achieve the maximum benefit for a given income and budget. Thus, when an entity reaches a full technical efficiency ($ET=1$), u_{it} takes the value of 0 and when the entity facing problems in this regard ($0<ET<1$), u_{it} takes a value greater than zero.

The magnitude of $u_{it}'s$ determines the efficiency gap, ie, which is so far the benefit of an entity of its potential.

It is assumed that both υ_{it} and u_{it} are independent of the regressors. Thus, the ith entity faces a stochastic frontier equation (1); with a common deterministic part to all entities $f(x_{it},t;\beta)$ and a specific part of the entity, $e^{\upsilon_{it}-u_{it}}$. The technical efficiency of the i-th entity in the t-th time can be expressed as the ratio of actual benefit to the maximum potential benefit:

$$ET_{it} = \frac{f(x_{it},t;\beta)e^{\upsilon_{it}-u_{it}}}{f(x_{it},t;\beta)e^{\upsilon_{it}}} = \frac{y_{it}}{f(x_{it},t;\beta)e^{\upsilon_{it}}} = e^{-u_{it}}$$
(2)

Note that the specification of the stochastic frontier (1) allows technical inefficiency of an entity changes over time. Include time as an explanatory variable to measure trends in productivity change. A further aspect is the identification of the sources of technical inefficiency level entities.

In the literature there are generally two models to analyze the differences in efficiency between entities. These models differ according to the specification that give the term that captures the effects of technical inefficiency u_{it}. This document suggested by Battese and Coelli (1995) to determine the variables that generate inefficiency model is followed. This approach allows the estimation of the parameters that influence the level of technical efficiency simultaneously with temporal changes in technical efficiency and budget change. In the exogenous model to explain changes in the performance of the entity influences are incorporated.

Consequently, the effects of technical efficiency are defined in terms of the average model u_{it} as a function of specific characteristics to the entity. In this regard, it is assumed that technical efficiency affects $u_{it}{'s}$, which have average δz_{it} and variance $\sigma^2{}_u$. This development allows to keep the case that the factors affecting the technical efficiency are distributed independently. Thus, the model of inefficiency can be specified as $u_{it} = g(z_{it}, \delta)$, where $g(\bullet)$ is a functional form, it is generally assumed linear, so that it can be expressed as:

$$u_{it} = \delta z_{it} + \eta_{it} \tag{3}$$

Where z_{it} is a vector (L×1) of explanatory variables related to the specific technical inefficiency to the ith entity that can change over time; δ is a vector (1×L) unknown parameters to be estimated and η_{it} is an error term that is normally distributed $N(0, \sigma^2{}_\omega)$ truncated in $-\delta z_{it}$

In other words, are unobservable random, identically distributed, obtained by the truncation of the normal distribution with zero mean and unknown variance variables, σ^2, eith averages, δz_{it}, $i = 1,2,...,N$; y $t = 1,2,...,T$.

Thus, average will be different for each entity and time periods but thus equations (1), of the stochastic frontier and (3), of technical efficiency, are estimated simultaneously using the maximum likelihood method, obtaining the level technical efficiency (ET_{it}) of the form:

$$ET_{it} = e^{-u_{it}} = e^{(-\delta z_{it} - \eta_{it})} \tag{4}$$

The Models of stochastic frontier production tend to be estimated with panel data methodology and consider technical efficiency varies with time (Friedet al., 1993). This way, you can raise the following panel model:

$$Ln(y_{it}) = f(x_{it}\beta) + \upsilon_{it} - u_{it} = \beta_{0t} + \sum_n \beta_n Lnx_{nit} + \upsilon_{it} - u_{it}$$

$$\tag{5}$$

$$= \beta_{it} + \sum_n \beta_n Lnx_{nit} + \upsilon_{it}; i = 1,2,...,N; t = 1,2,...,T$$

Where, y_{it} represents the profit of the ith entity in the period t; x_{it} denotes a vector with the values for inputs and other relevant variables, and is a vector of parameters to be estimated. β_{0t} is interpreted as the intercept of the production frontier common to all entities in the period t; $\beta_{it} = \beta_{0t} - u_{it}$ is the intercept for bank i in period t.

The term υ_{it} corresponding to the noise component u_{it} It is not negative technical component inefficiency time-variant.

υ_{it} means with the same properties identified for (1). In estimating equation (5) the parameters are obtained β of the production function and at the same time, the values of technical efficiency of bank i in period t.

In the next section "empirical application" with an approach of the variables are used for determining the technical efficiency in public spending for each of the entities is studied.

Empirical application

Now the above approach leads us to determine the technical efficiency among the states of Mexico and the possible causes of inefficiency, and classify them according to their levels of technical efficiency.

According to Delgado and Álvarez (2001) on the approach to stochastic frontier analysis of the efficiency of the estimate of the production frontier as a function of various inputs, together with the estimation of technical inefficiency associated. In this regard, the literature uses three functional forms of the production function: Cobb-Douglas, translog and CES. The most commonly used flexible functional form is the translog. While this specification requires more estimated parameters, the Cobb-Douglas function imposes no restrictions and, therefore, is generally preferred unless a hypothesis test to determine the best functional form is Cobb-Douglas, or prevent the availability of data type use a translog function (Coelli et al., 2003).

In this sense, the translog function is a generalization of the Cobb-Douglas, considering cross and square terms as elements. The fact that the partial derivatives are not constant makes the preferable and more flexible translog function as Cobb-Douglas (Shao and Lin, 2001). Additionally, an advantage of the translog function is that it considers the interactions between inputs and at the same time, the elasticities are expressed in terms of the variables themselves, so they vary depending on the level of use of productive factors. In contrast to the Cobb-Douglas function allows the translog relations of complementarity and substitutability between factors in the model. Given the Cobb-Douglas specification is a special case of the translog model, analysis of the translog specification.

Therefore, according to Fan (1991), Karagiannis and Tzouvelekas (2001), the expression (1) or (5) is specified as a translog function, which is represented as:

$$Lny_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k Lnx_{kit} + \sum_{j=1}^{J}\sum_{k=1}^{K} \beta_{jk} Lnx_{kit} Lnx_{jit} + \beta_0 t + \sum_{k=1}^{K} \beta_{Tk} Lnx_{kit} t + e_{it} \tag{6}$$

Where $k, j = 1,...K; 1,...,J$ indicate elements that influence the public expenditure budget (G33); If the stochastic frontier is estimated by a Cobb-Douglas would have: $y_t = Ax_1^{\beta_1} x_2^{\beta_2} e^u$, where y is the product, A a positive constant, x_1 and x_2 inputs, β_1 and β_2 parameters to be estimated and u the error term. When linearized holds: $\ln(y_t) = \alpha + \Sigma\beta_1 \ln x_{it} + \xi_t$. $e_{it} = (\upsilon_{it} - u_{it})$, υ_{it} is the random error and u_{it} the inefficiency term.

In this document, y_{it} represents the benefit that approximates the value of the entity with greater efficiency i; $i = 1, 2,...,31$ and the time t; $t = 1, 2,...,22$, in millions of pesos 2000. x_{it} is a vector (1×21) containing a constant term, income GDP (K), economically active population PEA (L), population density DP (H) and an element (A); a variable representing the implied variations in changes in budget spending pres. Other variables such as the construction of primary schools and normalesc and construction of medical facilities as a proxy for GDP (K), in millions of pesos of 2000 that is constructed with conventional perpetual inventory method are used.

The capital stock at t is given by skt = (1-δ)•skt-1 + It-1, where δ is the depreciation rate and I is the investment in the previous period. The capital stock in t-1 is calculated as sktt-1 = It / (k + d), where k is the average rate of growth of output (GDP) long term and d the depreciation rate.

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It is estimated by regressing It = α + βt, with α = Io, and the initial stock of capital as sko = Io / (k + d). PEA (*L)* represents the economically active population in millions; (H) DP is the population density, which is a relationship between the territory and the number of inhabitants in millions of people, and (A) is the change in budget spending, it is assumed that even if this comes from the revenue law of the federation change over time.The variables in the model of stochastic frontier production are expressed in deviations from their respective sample means.

This is only a change in the units of measurement and does not modify the data itself.

However, it has the advantage that the parameters estimated in the first-order translog function can be interpreted directly as estimates of the elasticities of production inputs, evaluated at the sample means (Coelliet al., 2003).

Thus, the model has J = 7, N = 32 and T = 12 and the particular form of the function output translogarithmic each of the 32 states is expressed:

$$y_{it} = \beta_0 + \beta_K K_{it} + \beta_L L_{it} + \beta_H H_{it} + \beta_A A_{it} + \frac{1}{2}\beta_{KK}K_{it}^2 + \frac{1}{2}\beta_{LL}L_{it}^2 + \frac{1}{2}\beta_{HH}H_{it}^2 +$$

$$\frac{1}{2}\beta_{AA}A_{it}^2 + \beta_{KL}K_{it}L_{it} + \beta_{KH}K_{it}H_{it} + \beta_{KA}K_{it}A_{it} + \beta_{LH}L_{it}H_{it} + \beta_{LA}L_{it}A_{it} +$$

$$\beta_{HL}H_{it}A_{it} + \beta_T T + \frac{1}{2}\beta_{TT}T^2 + \beta_{KT}K_{it}T + \beta_{LT}L_{it}T + \beta_{HT}H_{it}T + \beta_{AT}A_{it}T - \upsilon_{it} - u_{it}$$

(7)

Furthermore, the technical efficiency is specified as a linear function:

$$u_{it} = \sum_{m=1}^{M} \delta z_{mit} + \eta_{it}$$

(8)

Where the influence of two factors assumed in the level of inefficiency (u_{it}), one being an independent term (η_{it}). The components included in the vector z_{it} are associated with: GDP (K), PEA (H) PRES (A) and time (T). The series were obtained from different sources including various databases are the (INEGI) National Institute of Statistics and Geography (CONAPO) national population council (BANXICO) bank of Mexico.

(UN) organization of the United Nations (SIMBAD) and Municipal State System Database INEGI (INAFED) National Institute for Federalism and Municipal Development.

The set of data to estimate a model of unbalanced panel data for the period 1998-2010 using annual data.

The maximum likelihood estimates of the model are obtained by Frontier 4.1 program, which allows an estimation of the stochastic frontier model in a single step while the estimated parameters of the variables included in the explanation of inefficiency.

After the estimation, the results below, which tell us that factors involved in both efficiency and inefficiency as well as entities that are more efficient are interpreted.

Regression analysis

Model results of stochastic frontier, equation (7) and the model are shown in Table 1.

A positive sign in the parameters of the first equation implies that inputs tend to increase the level of production; while a negative sign in the second model indicates that an increase in the value of variables results in a reduction of inefficiency.

Estimation of technical efficiency for all 32 states by fp
stochastic frontier, "from 2008 to 2010.

	coeficiente	error standard	t-ratio	
C	0.1452	1.7879	0.0812	
Pres	0.0966	0.1534	0.6296	*
Dp	-0.2519	0.3200	-0.7873	*
Pib	0.1360	0.2801	0.4855	**
Im	-0.0665	0.1353	-0.4916	**
Esc	1.0901	1.0506	1.0376	*
Um	-0.6184	0.8430	-0.7336	*
Pea	-0.3898	0.5746	-0.6783	*
T	0.0376	0.0867	0.4334	**
(presXpres)/2	-0.1715	0.2227	-0.7699	*
(dpXdp)/2	0.0108	0.0228	0.4748	**
(imXim)/2	0.0132	0.0165	0.8021	*
(escXesc)/2	0.0170	0.0357	0.4781	**
(peaXpea)/2	0.1292	0.1325	0.9750	*
(tXt)/2	-0.3204	0.3458	-0.9265	*
presXdp	-0.0402	0.0561	-0.7152	*
presXim	-0.0718	0.0785	-0.9152	*
presXesc	0.3540	0.2831	1.2508	*
presXum	-0.1729	0.2678	-0.6454	*
presXt	0.1677	0.2485	0.6748	*
dpXim	-0.0062	0.0108	-0.5730	*
dpXpea	0.0313	0.0526	0.5940	*
dpXt	0.0465	0.0492	0.9451	*
pibXim	0.0065	0.0138	0.4746	**
pibXesc	0.0313	0.0633	0.4938	**
pibXum	0.0448	0.0829	0.5406	*
pibXt	0.0666	0.1086	0.6130	*
segundo modelo "ineficiencia"				
C	0.1075	0.1489	0.7222	*
Ic	-0.0015	0.0026	-0.5844	*
Tcp	0.0120	0.0190	0.6306	*
Ppp	-0.0338	0.0457	-0.7411	*
T	-0.0330	0.0491	-0.6716	*
SIGMA-2	10.3466	2.5795	4.0111	*
GAMMA	0.8298	0.1557	5.3306	*
log likelihoodfunction = 0.14208897E+03				
LR test of the one-sided error = 0.11073241E+02				
*significativo al 1%				
**significativo al 5%				

Table 1

Whereas the first-order parameters, βk, tells us that the budget (pres), the (GDP) and the construction of basic schools and normal (esc) positively influence the G33. The budget Variable their small but significant value (0.0966) tells us little influence on the variations of the G33, and this result is justified because the G33 was designed to compensate the poor distribution of budgetary expenditure across states that the most disadvantaged entities will benefit from this sector to its activities regardless of federal participation.

Gross domestic product (GDP) as expected value (0.1360) positively influences the evolution of the G33, every year the budget spending has a small increase because it is considered as a percentage of (GDP), therefore it is natural to find a direct relationship between these.

Like the variable (esc) with a significant value (1.0901) as the FAEB not only includes the construction of schools but also the maintenance of these so that an entity with a greater number of schools, be a creditor of a higher budget.

Distribution of technical efficiency measures for entities of Mexico: 2000-2005 and 2010

Technical efficiency of public spending per entity 2000

Table 2

Technical efficiency of public spending per entity 2005
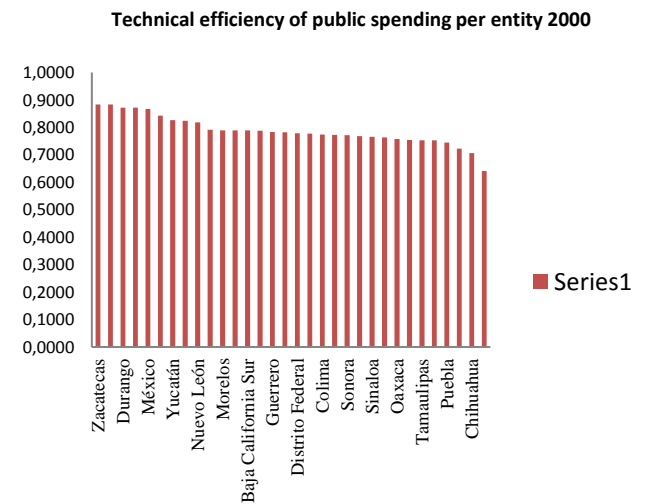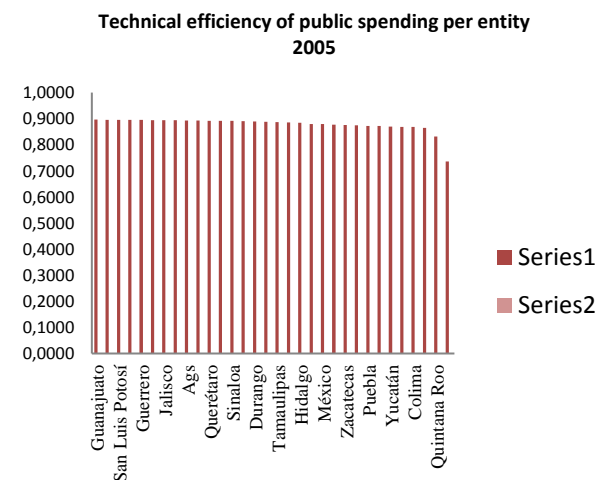
Government expenditure by institution 2010

One of the advantages of an analysis of efficiency segmented by groups of authority lies in the ability to control the presence of outliers, anomalous endpoints, which, depending on the variable in question must correspond to groups of company characteristics individuals.

Classification of technical efficiency by the entity and the year.

Technical efficiency of public spending per entity 2000

Table 3

After making the maximum likelihood estimates using the Frontier 4.1 program, were made for the years 2000, 2005 and 2010, which allows an estimation of the stochastic frontier model in a single step while the estimated parameters of the variables included in explaining inefficiency.

While the methodological framework presented to estimate directly the state efficiency from estimating production frontiers, since it provides a framework of relative efficiency, it is essential to be implemented from groups entity with common characteristics.

In order to obtain results unbiased, consistent and interpretable efficiency. This is relevant in a context of state heterogeneity showing varying levels of politeness, population size, unmet basic needs, etc. And that makes it methodologically incorrect to compare the performances of authority with diverse characteristics.

Technical efficiency of public spending per entity 2005

Technical efficiency of public spending per entity 2010
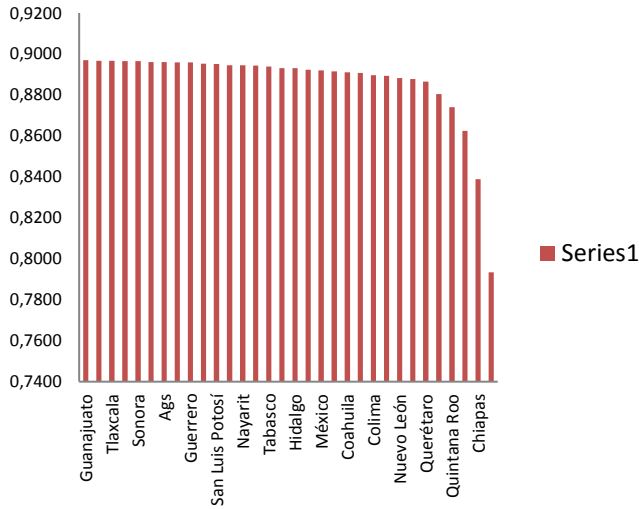
Technical efficiency ranking by institution 2005-2010.

	Grajphic Mexico 2010	
1	Guanajuato	0.8969
2	Morelos	0.8967
3	Tlaxcala	0.8966
4	Jalisco	0.8965
5	Sonora	0.8965
6	Oaxaca	0.8961
7	Ags	0.8960
8	Sinaloa	0.8959
9	Guerrero	0.8959
10	Baja California	0.8952
11	San Luis Potosí	0.8950
12	Veracruz	0.8944
13	Nayarit	0.8944
14	Durango	0.8943
15	Tabasco	0.8939
16	Tamaulipas	0.8931

Table 4

	Mexico 2005	
1	Zacatecas	0.8835
2	Quintana Roo	0.8830
3	Durango	0.8723
4	Hidalgo	0.8716
5	México	0.8673
6	Ags	0.8429
7	Yucatán	0.8261
8	Guanajuato	0.8237
9	Nuevo León	0.8181
10	San Luis Potosí	0.7912
11	Morelos	0.7891
12	Tlaxcala	0.7887
13	Baja California Sur	0.7886
14	Tabasco	0.7873
15	Guerrero	0.7833
16	Michoacán	0.7819

17	Distrito Federal	0.7784
18	Campeche	0.7776
19	Colima	0.7741
20	Jalisco	0.7723
21	Sonora	0.7720
22	Veracruz	0.7686
23	Sinaloa	0.7653
24	Coahuila	0.7632
25	Oaxaca	0.7576
26	Nayarit	0.7546
27	Tamaulipas	0.7528
28	Chiapas	0.7526
29	Puebla	0.7448
30	Querétaro	0.7229
31	Chihuahua	0.7069
32	Baja California	0.6405

Economic inequality between regions in Mexico

Different theorists around the world are still wondering why nations with similar characteristics were not developed to the same degree. While the convergence theory explains how the developed countries someday will be matched in technology by countries without development because of the disparity in growth rates, Raúl Prebisch and the dependency theory we speak the purest sense of the Hegelian dialectic that among nations and individuals, there is a dependent relationship between rich and poor, that without one, the other can not survive.

Simon Kuznets hypothesis related to economic growth and income distribution. According to this, the growth is sufficient to reduce inequality, although it is also associated with the early growth, when there is a need for large investments in infrastructure and capital goods.

Then job creation and increased productivity would lead to higher wages and better income distribution.

We found that Mexico is one of the countries where the gap between the richest 10% of the population and the rest are older. This largely explains why the high degree of inequality in our country.

Miguel Székely in one of his studies states that among the reasons for the marked degree of inequality in Mexico has the largest variance in education, this statistical indicator measuring the degree of dispersion that exists with respect to an average.

From a comparative exercise among 18-year-old Mexico offers a variance of 14, while the United States for 1996, offers a variance of only 2 years between its young population.

Mexicans aged between 15 to 19 years, set in a mass population of 10.1 million, recorded the largest deviation of years of 14 years schooling, reflecting extreme youth population who do not study or are poorly trained to enter the labor market situation chaining process inequality, low wages and low incomes.

In another significant finding of Székely, and it says closes the explanation of the transmission circle of inequality refers to the number of children and average education of women in the family, where the higher education of women are better, Family pay opportunities, increased labor force participation and minor informality, limited by better-educated children, and fewer children; increased household income and therefore a better distribution of income. Although global data for Mexico have improved by lowering the fertility rate to 2.5 children per woman, due to the higher level of female education and economic incorporation, there are states where poverty is concentrated: Chiapas, Guerrero, Hidalgo, Oaxaca, Puebla and Yucatan Peninsula, and therefore the fertility indicator continues as fifty years ago, 3.5 children per woman.

This regional difference is also a factor that strengthens an even intergenerational transmission of inequality. Between selected 10 countries in Latin America, Mexico ranks fifth in inequality and ranks among the twelve most unequal societies in the world. According to the study by Miguel Székely, Mexico would be among the most unequal countries in Latin America not only because of the disproportionate concentration in 10% of the richest population but also by education inequities, differences in participation women, the number of children per family and the different opportunities offered by different regions of the country.

Also, in an interesting international comparison made by the same investigator, where the Gini index recalculated to Mexico (1994) amputating the tenth decile of extreme concentration, it appears that Mexico occupies the twelfth place (16) in inequality in the region (only have three equal), and has less than United States inequality.

This comparison introduces a relevant fact and underserved: Mexico's problem has to do only with extreme poverty but mainly with excessive wealth. In other words, the fight against poverty necessarily involves a redistribution of income; deduction is relatively easy: Mexico requires a tax reform that meets criteria of quality and equity.

If the goals of reducing extreme inequalities and achieve greater equity are not registered clearly in the functioning of institutions, existing distortions in the structure of the distribution of wealth, income, power, prestige, the opportunities and decisions, they will only widen the gap between rich and poor, between trained and lacking in skills between men and women, between indigenous and non indigenous. In this research to demonstrate that an increase in public spending an entity not necessarily be reflected in an increase in economic growth$(\uparrow GP \neq \uparrow PIB)$, this causes unequal relationship between the growth regions of Mexico uneven. To avoid this situation it is necessary to find the technical efficiency of public expenditure so that in the first part begins by defining "technical efficiency" (ET), according to Koopmans, 1951 ET represents the ability and willingness of an economic unit to produce the maximum output possible given level of inputs and technology.

When estimating the efficiency of the resources we are able to quantify the efficiency of the state as provider, and formulator of public policy, and thus will have among other things a control mechanism with which to monitor the performance of decision units identify the sources of inefficiency and, from this, to outline policies or action plans (C. Knox Lovell 1993).

It is said that the efficiency of decision units must be analyzed taking into consideration: the inputs used and results based on products obtained in the production process.

Results are expected on the optimal production or potential; given the amount of inputs used. Or conversely, are expected to use the minimum amount, optimal or potential inputs to produce certain objective result.

Charnes and Cooper (1985) mention "a decision unit is efficient if it meets the following: A) None of the results can be increased without increasing at least one of its inputs or reduce at least one of their other products. And B) None of the inputs can be reduced without reducing the quality of at least one result or raise at least one of the other inputs. "It is appropriate for the objectives of this research using the branch 33 of public expenditure for study . This will be an analysis of technical efficiency in public spending in each of the programs this field with what is expected to find that institutions are more efficient to do this type of investment and which are not.

On the other hand economic inequality is a topic of current interest, the standard of all governments in Latin America's struggle against poverty, there is a more global concept that speaks not only of economic growth but also development and is expressed as the "quality of life "that the inhabitants of a country or region and is known as the Human Development Index (HDI). Using the concept of human development report published in 2009 by the United Nations Programme for Development (UNDP), which ranks countries in three groups:

- Country with high human development (HDI $\geq$ 0.8).

- Country with medium human development (0.5 ≤ HDI <0.8).

- Country with low human development (HDI <0.5).

When the weights expressed by (UNDP) apply to the states of the country we find that organizations like the Federal District, Nuevo León and Baja California, have rates above 0.8 HDI and are classified as high, while the state from Mexico, Guanajuato and San Luis Potosí show medium HDI levels, Oaxaca and Chiapas entities with low HDI.

It is said that the resources available to the state are limited so it is vital to know if it is usied correctly. It is considered that investments made by the state through the various economic programs and budgets are insufficient, each once more and unsatisfied demand exists. Beyond budgeting and resource allocation to the various activities of the state, it is believed that it can improve the efficiency in the use of state resources.

The following will perform research and analysis to estimate the states of the Mexican Republic of the technical efficiency of public spending programmable, more specifically the branch 33 which is within the classification of administrative type of public spending. It is supposed that an efficient use of resources brings us closer to meeting the goals and objectives of growth and economic development in order to achieve the inequality and poverty in Mexico is decreased.

Public spending in the branch 33 is inefficient due to the misuse of state resources, and technical efficiency, is located far from the frontier of production possibilities in each of the programs that compose it.

If the states of the northern region are more technically efficient in the use of public spending Bouquet 33, particularly on those programs, unlike the states included in the other regions of the country; then, economic inequality, as measured by the HDI, would be higher among those regions.

One of the main features is the structure of the state is to provide public services, state intervention covers a wide and diverse aspects such as social security, education, culture, health, infrastructure, internal order, among others.

It is said that beyond that the State does not have the sufficient amount of resources incurs an inefficient provision of public goods (BP). As part of the state, there is only a limited spending on these goods, but also a bad management of state resources, we find here the interests of this research by analyzing the characteristics and forms as the State provides public services.

There are numerous disturbances that can affect the state to fulfill its functions: corruption, insecurity, administrative machinery, economic, political and social order, similar and complementary. It is assumed that increasing the efficiency of public spending can help correct these distortions affecting the fulfillment of the great national objectives, such as, education, health, infrastructure, security, etc. And that within the theory of endogenous growth are key factors for growth and development.

The Human Development Index (HDI) is composed of three dimensions: health, education and income, each dimension is measured from variables set by the UN.

ECONOMY

The assessment at the regional level can be considered complete for this research, the information below must be modified so that it is regionally as it seems more convenient to be broader. For funds Bouquet 33 FAEB, Fassa, etc. No need to change any criteria only entities according to a plan proposed by the federal government as opposed to regionalization HDI for example the size of the education attendance rate replaces the enrollment rate by organized school.

The attendance corresponds to the obtained from the population between 6 and 24 years attending school among the population in the same age range. The literacy rate is obtained from the number of people aged 15 and over, who can read and write the number of people aged 15 and older.

In the dimension of per capita GDP is replaced by the per capita annual income average, this income is obtained through a process of recognition of income from the National Household Income and Expenditure Survey (ENlGH) General Census of Population and Housing following the methodology developed by Elbers and Lanjouw.

This methodology Elbers and Lanjouw is based on census data to achieve more disaggregated than those obtained by representative surveys estimates. The work uses household consumption to determine their level of income. Based on per capita household consumption, the average household consumption, the percentage of poor in each region and the Gini inequality index are calculated. The average annual per capita income obtained by this methodology is tight to the country's GDP by applying a homogeneous factor nationwide and subsequently adjusted by conversion factor terms Parity Purchasing Power in U.S. dollars (PPP in USD).

Then the HDI to Mexico is shown in 2009 as the country is divided for purposes of this investigation, which according to the regions of different levels of HDI.

Country with high HDI (HDI ≥ 0.8).

Medium HDI country (0.5 ≤ HDI <0.8).

Country with low HDI (HDI <0.5).

The above table shows a bias to a higher rate in the northern states except Nayarit, Quintana Roo and Mexico City, the country's regions center shown in the figure below for an intermediate color display an average index still considered high to be greater than 0.8 while the lighter color represents the regions with less than 0.8 index.

As shown on the map, although the economic backwardness revealed most backward entities as Chiapas, Guerrero and Oaxaca, the evaluation of the United Nations in Mexico this year, 2009 is benevolent with an average HR, higher than in other Latin American countries, as their deficiencies in these three areas of education, health and income are alarming for these entities.

Human Development Index by State 2009

Graphic 1

Source: http://www.skyscraperlife.com/mexican-lounge/35549-idh-de-mexico-y-sus-estados-muy-completo.html

- Funds Contributions to the states and municipalities (item 33).

Until 1997, the financing of decentralization was performed by conditional grants from the federation and the states transfers, but the proliferation of these agreements and arrangements and their complexity, it was decided to give this set of transfers a legal basis that would ensure their continuity and permanence.

To the above in LCF reform effective from 1998, Chapter V, where various funds and establishing the figure of the contributions is created as a mechanism for financing decentralized functions and materials is added. Item 33 is included in the Expenditure Budget of the Federation (PEF), where financial decentralization provisions are contained in the same year. For 1998, the following funds are established:

- Contributions Fund for Basic and Normal Education (FAEB)

- Contributions Fund Health Services (Fassa)

- Fund Contributions for Social Infrastructure, with two parts, one state (FISE) and other municipal (FISM)

- Contribution Fund for Strengthening Regional Municipalities and Districts of the Federal District (FORTAMUNDF)

- Multiple Contributions Fund (FAM)

- Contributions Fund for Technological and Adult Education (FAETA)

- Contribution Fund for Public Security of States and the Federal District (FASP)

Originally on the initiative of the Federal Executive considered only the creation of three funds contributions: FAEB the Fassa and municipal FAIS, then in the House of Representatives and the FORTAMUNDF joined FAM.

After some amendments to the Law of Fiscal Coordination two new funds: The FAIS contains some of the above resources to states and municipalities as part of Branch 26 to finance works, basic social actions and investments that directly benefit sectors were allocated of the population living in extreme poverty and social backwardness as water, sewerage, drainage, latrines, rural electrification, basic infrastructure, health and education, improved housing and rural productive infrastructure, among others.

Percentage distribution by branch 33 1998-2010
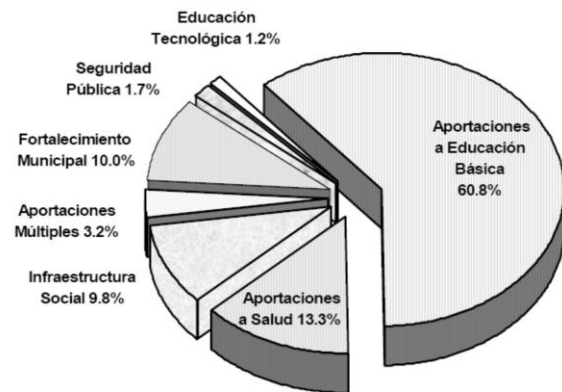
Graphic 1

Source: Own calculations based on data published by the Ministry of Finance on the Budget Federal Expenditures for different years.

As the distribution criteria already discussed in chapter one. FAEB is the fund which has more resources composes more than 60% of the branch 33, Fassa has a 13% then FAIS FORTAMUNDF are 10% of them.

Resources across seven funds, except FORTAMUNDF already transferred to states and municipalities through various branches, so that the amendments to the Law of Fiscal Coordination and creation of Item 33 is basically a reorganization of these resources, although strengthen their legal and budgetary certainty.

The criteria for allocation of funds for each vary, but overall, the historical FAEB, Fassa, gaps or FAIS poverty, population and needs FORTAMUNDF or FASP compliance programs.

It is very important to mention that the DF was only included in Fassa, FORTAMUNDF and FAM as resources for the education budget gets directly through the bouquet 25. In regarding the amounts, FAEB integrates almost two thirds of the contributions, although their relative share has decreased from 1998 to 2004.

The funds that have grown are the Fassa, the FIES and FORTAMUNDF while the FASP has lowered its allocation both in absolute and relative terms as infrastructure and health education, housing, paving rural roads, drainage, drinking water and electrification.

Distribution bouquet 33 billion and per capita.

México	40,064
Veracruz	28,968
Chiapas	21,997
Jalisco	20,429
Oaxaca	20,122
Puebla	19,126
Guerrero	18,762
Michoacán	17,020
Guanajuato	16,211
Nuevo León	12,296
Tamaulipas	12,213
Hidalgo	11,688
Chihuahua	11,357
San Luis Potosí	10,957
Baja California	10,225
Sinaloa	9,718
Coahuila	9,459
Sonora	9,247
Tabasco	9,023
Distrito Federal	8,063
Durango	7,851
Yucatán	7,516
Zacatecas	7,325
Morelos	6,510
Querétaro	6,212
Nayarit	5,134
Quintana Roo	4,895
Tlaxcala	4,694
Campeche	4,563
Aguascalientes	4,456
Colima	3,129
Baja California Sur	3,055

Table 3

CAMPECHE	6250.15
BAJA CALIFORNIA Sur	6235.61
GUANAJUATO	6233.15
OAXACA	5935.62
CHIHUAHUA	5688.48
NAYARIT	5641.79
ZACATECAS	5549.51
DURANGO	5377.54
COAHUILA	5300.50
GUERRERO	5148.79
SAN LUIS POTOSÍ	4702.38
TABASCO	4699.43
TLAXCALA	4557.04
QUINTANA ROO	4490.50
MICHOACÁN	4432.18
AGUASCALIENTES	4326.57
YUCATÁN	4270.17
VERACRUZ	4210.43
TAMAULIPAS	4182.66
MORELOS	4173.28
QUERÉTARO	4033.72
SONORA	4002.95
CHIAPAS	3924.80
SINALOA	3856.45
BAJA CALIFORNIA	3718.05
PUEBLA	3671.05
COLIMA	3628.44
ESTADO DE MÉXICO	3427.33
HIDALGO	3128.47
NUEVO LEÓN	3028.51
JALISCO	2954.57
DISTRITO FEDERAL	955.34

Table 4 Distribution bouquet 33 per capita

Source: Own calculations based on data published by the Ministry of Finance in the Expenditure Budget of the Federation for different years.

These funds are distributed by the federation to the states, they are required to distribute to municipalities no later than five days after receipt as mentioned by law.

The distribution of item 33 for the year 2009 is presented by ordered high to low which helps us to make a comparison to the states with their level of HDI federal entity.

Distribution bouquet 33 million
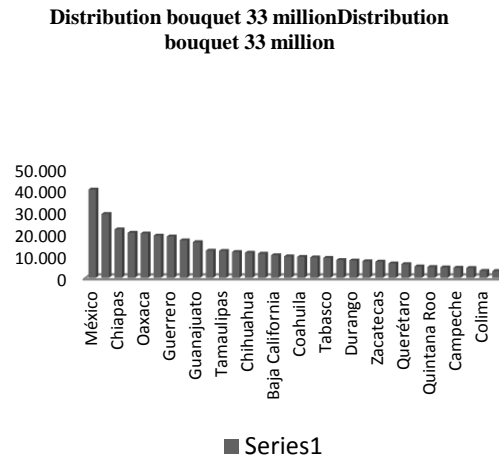
Distribution bouquet 33 millionDistribution bouquet 33 million

Graphic 2

Source: Own calculations based on data published by the Ministry of Finance in the Expenditure Budget of the Federation for different years.

When the branch 33 is the main idea was created to benefit the less developed entities and not only reimburse entities that contributed most. It was meant to support the institutions with the highest number of people presenting to an HDI below the national average, the chart above shows that the three entities with less developed that have the lowest HDI Chiapas, Guerrero and Oaxaca resources are received in the most money, while Quintana Roo and Campeche are the least receive; the State of Mexico we see on top of the previous graph but consider that it is the most populous entity in the graph below we see what happens when we see the same allocation of resources now in per capita terms.

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Distribution bouquet 33 million

Distribution bouquet 33 million
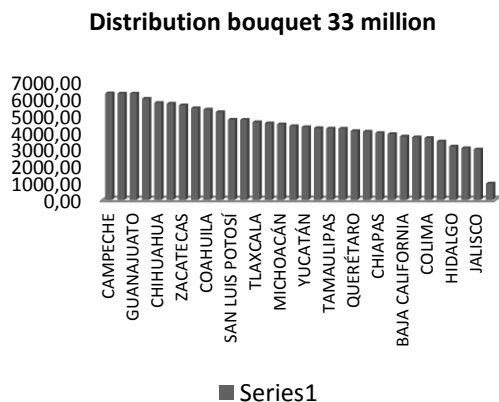

■ Series1

Graphic 3

Source: Own calculations based on data published by the Ministry of Finance in the Expenditure Budget of the Federation for different years.

This graph 3 when the analysis is now in per capita terms the situation is very different, Campeche and Baja California Sur are the first two places and the existence of inefficiency in the performance of public expenditure is shown as compared with the level of HDI Baja California has a very high level of development compared to Campeche both receiving more resources in these funds as other entities, Oaxaca now ranks as the fifth entity that receives more resources per capita and say that is the idea assumes that less developed institutions receive more resources through these funds but again conclude that there is technical inefficiency in public spending despite the use of funds is regulated.

Conclusions

Once it has been empirically shown that the existence of technical inefficiency to make public spending on the states of the country, it is concluded that inefficiency is a factor that promotes economic inequality between regions of Mexico. The fact mentioned here apply the methodology to public spending becomes efficient can be stated as one of many solutions to prevent inequality between regions, these positions range from advocating the existence of a minimal state entrusted to perform basic functions such such as public safety and the administration of justice, to positions that support an active state involvement in the economy, including the provision of private goods and services through public enterprises.

Beyond conceptual discussions about the role of the state in the development process, traditionally three areas of competence of the public sector accepted distributional equity, macroeconomic stability and efficiency in the allocation of productive resources, public sector performance in promote equity and stability be measured directly using variables such as the Gini coefficient of income concentration and the rate of inflation, respectively. Another important variable that macroeconomic stability is the coefficient of variation of the rate of output growth. As for the efficient allocation of resources, government action would measure indirectly through indicators related to economic performance.

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The education system and support technology in Mexico and the BRIC

GARIBALDI- Maria- *†´& HERNÁNDEZ- Marcos´´

´Instituto Tecnológico de los Mochis Sinaloa y la Universidad Nacional Autónoma de México
´´Universidad Nacional Autónoma de México, Jaime Torres Bodet 176, Santa Maria la Rivera, 06400 Ciudad de México, Distrito Federal, México

An analysis of the educational model of each of the countries forming the BRIC as well as major technological tools used in this area versus Mexico's educational model can help to better understand where we are positioned, what we need and what mistakes we are making. The estimate is that the BRIC countries are world leaders in 2050 with 44% of GDP.

BRIC, Education, Educational Model, Technology and Education.

*Correspondence to Author (email: mtavera@ipn.mx)
† Researcher contributing first author.

Introduction

The countries of the BRIC, now BRICS with the inclusion of South Africa, not only are countries that collect similar characteristics in a large population, vast territory and important natural resources, they also have the fortune to share an enviable stability in macroeconomic variables and especially in regard to investment opportunities and growth prospects in the coming years. The clearest examples are China and India with an average annualized growth rate of 9% and 8% in the last decade. Brazil and Russia with moderate rates but with similar growth prospects for the coming years and decades.

The interesting thing about the countries of the BRICS is to analyze the impact it has had on the population such as poverty reduction, health, housing etc., However, we believe that even more important is to determine the source or motor trigger that made these so attractive countries for investment, we must not forget that a few decades China, for example, was a closed country to economic and cultural world and India was mired in extreme poverty or coming from a Russia economic disaster following the fall of the socialist regime, nations are now estimated to be the dominant countries for the year 2050, generating 44% of the World GDP. Although Mexico shares many of the characteristics that have the BRIC countries, the issue is why Mexico is not considered within the same block? Regardless of whether it belongs or not because the OECD or a simple acronym theme's background is that due to poor growth in recent years, but is stable enough to compare it with the dynamism of the BRIC countries. Then the question is what these countries have to make that machinery work?

Regardless of the multiple responses that can be obtained is a common factor theme of Education and Technology.

Could not understand the progress of a country without the support of its people and technological tools. We know that education is very important, its level and quality often depends on the future of any country, then it is interesting to analyze the educational model of each of the countries in the BRIC versus of Mexico and know where we are unemployed, BRIC countries are doing and what technological tools have been used to strengthen their educational level. The following sections discuss each of them.

Structure of the education system

With regard to the educational structure in Mexico is not much difference with the countries of the BRIC, which covers basic and higher grades of education, however we found a difference in higher education in regard to Russia and Brazil, as these countries offer associate degrees or between secondary and college preparatory education, which are prepared workers of different professions, in the case of Russia is called Professional Education and in the case of Brazil Sequential Courses and is aimed at those who did not have access or opportunity to enter universities.

The government gives them this option, in the case of Russia has a duration of 3 years and in the case of Brazil is 2 years. The Brazilian government says the professionals who are already in the labor market and need a higher level diploma are most benefited by this type of training. The following tables show the structure of the educational system of each of the countries of the BRIC and Mexico shows.

Structure of the Education System of Mexico

Mexico				
General Program	Specific Program	Grades/ years	theoretic al age	Comm ents
Basic Educatio n	preschoo l	3		No mandat ory. It serves childre n ages 4 and 5 years old
	Primary	6	6-11	Compu lsory Educati on
	Seconda ry	3	12-14	
Higher education	preparat ory	3	15-17	
	Universi ty	4	Older than 18 years	
	Especiali zation	1		
	Mastery	2		
	Doctorat e	1		

Table 1

Structure of the education system in Russia

University education in Russia is the cheapest worldwide.

The vast majority of Russian citizens can enter free, but if you do not have that facility at hand, the price of a semester costs between 300 and 1000 dollars (depending on the university and the faculty)

Food, urban transportation and personal expenses (laundry, cleaning supplies, notebooks, etc..) Comprise an average budget of $ 150 a month, it may vary according to the habits, customs, and tastes of the student organization.

Lives in university hostels located, mostly, on the same campus. There, consisting of cooking, reading, sports rooms, gas, cold and hot water all year round, heating, electricity, bedroom furniture and bedding. Live with Russian and foreign students more than 100 countries. (Ministry of Education and Science of the Russian Federation, 2011)

Table 2

Structure of the Education System of Russia

Russia				
General Program	Specific Program	Grades/years	theoretical age	Comments
	Casa Cuna		18 m – 3	
Basic Education	preschool	3-7	3-6	No mandatory
	Primary	3 or 4	7-10	Compulsory education. required to pass professional education
	Basic Secondary Education	5	10-15	
	Higher Secondary	2	16-17	to go to college or University
Higher Education	Professional Education	3	18-20	Prepare to workers of different professions.
	School	2	Older tan 18 years	Prepare technical specialists, to finish you can enter university in the same specialty.
	University	2		Higher professional incomplete (diploma is granted)
		4		Professional higher
		6		Higher Vocational Instructor (master's degree)

Structure of the Russian Education System (SEP). (Ministry of Education)

Table 3

Correspondence Chart Russia - Mexico. (Ministry of Education)

Table 4

Structure of the education system in China

China currently has more than 200 million primary school students, along with preschoolers added a population equivalent to sixth of the national total.

Therefore, the Central Government has placed basic education in a position of priority development, taking it as an important area in terms of infrastructure development and education. (Embassy of the PRC in Venezuela).

Structure of the Educational System of China

China				
General Program	Specific Program	Grades/years	Theorical age	Comments
Basic Education	Primary	6	6-11	Compulsory Education. It can be done in 3 ways (6 + 3, 5 + 4, or nine in nine degrees)
	Elemental Secondary Education	3	12-14	
	Middle School	3	15-17	
Educación Superior	Higher Education	4 to 6	18-21	bachelor's degree
	Mastery	2 o 3	Older tan 21	
	Doctorate	1		

Table 5

Structure of the Education System in China (SEP). (Ministry of Education)

Table 6

Tabla de Correspondencia (SEP)

Table 7

Garibaldi M. Hernández M. The education system and support technology in Mexico and the BRIC. ECORFAN Journal-Mexico 2012, 3-6: 453-463

Education in China has a high level of demand. Education provides the usual school hours plus additional hours of extracurricular classes such as English, math, etc.. The opportunities to enter universities are only for the best students in addition to the companies highly value educational titles.

Structure of the education system in India

As a result of efforts in literacy campaigns, the literacy rate in the country has increased from 18.33 percent in 1951 to 65.38 percent in 2001. Thus in five decades, the literacy rate has increased a 47.05 percent, or an average of 9.41 percent per decade.

According to the 2001 census the male literacy was 75.85 per cent and female literacy 54.16 percent. (India.gov.in). More emphasis on science and mathematics, it raises a very good basis for the development of technical skills in the field of engineering such as programming and information processing. The second reason is the dominance of the English language, both spoken and written, and emerging technical professionals with a competitive edge.

Structure of the Educational System of India. (Ministry of Education)

India				
General Program	Specific Program	Grades /years	Theori cal age	Comments
Basic Eduction	Daycare	4	0-6	No mandatory. Most are private schools.
		2		
	Primary	5	6-11	Mandatory Education
		4		
	Secondary	3	11-15	
	Preparatory	3	16-17	

Higher Educatio n	University first grade	3-5	17-20	
	University second grade	1-3	21-24	Máster degree
	Doctorate	More tan 2 years		

Table 8

Structure of the Education System in Brazil

Higher education in Brazil is offered by universities, colleges, faculties, institutes and centers for technology education.

Citizens can choose three types of graduation: bachelor, bachelor and technological training. Post graduation courses are divided into sensu lato (majors and MBAs) and strictu sensu (master's and doctoral). In addition to the face shape, in which the student must have frequency at least 75% of the cases and assessments, is still possible to form for distance learning (ODL). In this mode, the student receives books etc., and with the help of Internet. The student's presence is not required in the classroom. There are also mixed courses, classroom lectures and distance. (brasil.gov.br)

Structure of the Education System in Brazil

Brazil				
General Program	Specific Program	Grades/years	Theorical Age	Comments
Higher Education	Sequential courses (specific training, Complementation studies)	1600 hours	Older tan 18	Do not have access to postgraduate (Masters and PhD)
	Graduation (Bachelor)	2400 hours		
	Graduation (BA)	2800 hours		

	Graduation (Technology Training)	1600 hours		
	Maestry	2		
	PhD	2		
	Professional Grade	3		
	Specialization courses	360 hours		

Technology in Education

These countries supplement their education with information technology, then we state some programs that are implemented.

Brazil

Regarding technology Brazil has within its educational system

- Telecentres

    Are Community spaces in which citizens have free access to computers connected to broadband Internet. These facilities are essential in needy regions, in which the individual does not have access to the virtual world differently. In these spaces people can do basic computer courses and special workshops. There are over 5400 community telecentres spread around Brazil.

- Each unit has 11 computers, a printer, multimedia projector, a camera for online safety monitoring and furniture required for operation. They are managed by community members.

- Digital inclusion programs

    These are actions that help to democratize access to new technologies, bringing computers, Internet connection and training to needy populations. For example, there is the Computer for all program offers machines with a given configuration by the government at discounted prices, as have tax incentive. It is also possible to use special lines of credit to purchase another of these programs are called telecenters. Another program called Broadband in schools, with the help of telephony operators; Internet carries with fast connections to Primary students in the public network. The program is scheduled to run until 2025.

- Public Domain

    The Public Domain Portal was launched in November 2004 and made available to users a virtual library, where you can consult literary, artistic and scientific works in various formats (text, sound, image and video) and public domain or have been duly authorized disclosure.

- Mercosur Education

    Aims to disseminate knowledge and integrate the work within the block. A service offering is bank practices and public policies in the member countries of the group. Therefore the solutions found in one country can be taken by others. The tools that teachers and students encounter is the terminology database of Education.

Russia

- Students Forum All Russia

  A forum held in Russia every 3 years with the main objectives: Select basic tools and mechanisms for the participation of students and student government in the process of modernization and development vocational training, develop strategies for student government in Russia, development of an organizational model for the interaction of state bodies, local authorities, entrepreneurs, heads of educational institutions and other institutions of research and education community with the community student, identifying the areas and forms of interaction, improve the legal framework of the activity of the student government.

- Define the role of the student community to improve the quality of education, scientific development, innovation and modern technologies in education, attract government attention and knowledge of students. From October 31 to November 3 will be held in the Student Forum Barnaul, Russia.

  The October 1, 2011, the Russian Ministry of Education announces a public competition to support the strategic development of programs of public educational institutions of higher education. The selection of programs for the strategic development of the universities is based on the evaluation of educational, scientific and innovative capacity and financial stability, strategic development and evaluation of the projects proposed by the concession.

India

- Text Books online

  Online This service provides easy access to textbooks, the service covers textbooks of all subjects taught by the NCERT for classes from I to XII, in English or Urdu.

- Red Results

  The results of various academic and entrance exams for selection in the hands of various Boards, Commissions and Institutions are being published online by the National Informatics Centre (NIC) since 1997, IAS is a repository of ICT Organisation of the Government of India operates depending on the IT Department, Ministry of Communications and IT.

- It is a specialized portal www.results.gov.in developed for this purpose and has been very popular among students and parents who can review your test results in the comfort of your home. Important announcements for students are posted on the web portal.

- Touch Screen Tablet for Students

  Touch tablet at a subsidized $ 35 called "Aakash" (sky) for display, aims to students, the government distributed about 10 million in the coming years, was launched in poorest and most remote regions. The tablet features web browser, works for video calls, the battery lasts about 4 hours and has 2 USB ports.

China

- Teaching via the Internet

The emergence of some large investors has made this modality a new hot spot in the field of education. The main beneficiaries are the students in remote areas, border and less developed in the educational aspect. Those who have failed to pass the entrance examination to college, and employed persons also have the opportunity to study (ongoing study) and get a specific training in higher educational establishments across the network.

- The Ministry of Education has recognized 68 institutions of higher education and the University of Central Radio and Television as experimental centers for modern distance education.

In late 2003, these centers were established throughout the country 2,027 delegates-school study centers, in which 140 specialties covering 10 major departments, with 1,373,000 students's enrolled work.

The gradual dissemination of broadband technology has driven the development of online education.

The Network for Scientific Studies of Education of China (CERNET) whose construction began in 1994, has a network of high-speed transmission 20,000 miles, with 28 information channels international and regional covering major cities across the country, what makes it the second Chinese Internet.

This network uses high speed with the China Education Network Satellite Broadcasting Broadband Multimedia (CEBSat), and constitutes a transmission platform for modern distance education, which "integrates into one heaven and earth "and provides the conditions for a more comprehensive support network.

Mexico

- Digital Skills for all

It is a strategy that promotes the development and use of information technology and communication (ICT) in primary schools to support student learning, expand their life skills and facilitate their integration into the knowledge society. This strategy aims to reduce the educational gap and the digital divide in which students and teachers are the people who have not had access to technologies. (Digital Skills for All, 2011)

- Telematics Classrooms

Model primary equipment. Computer equipment without connectivity and Internet access for every 30 students for 5th and 6th grade.

- Model Secondary equipment

Classrooms equipped with one server and 20 light laptops with internet connectivity and access to high school students.

- Enciclomedia

An educational strategy based on an articulator system resources, by digitizing textbooks, has been linked to their various lessons multimedia training materials aimed at promoting greater quality. Enciclomedia process consists of two main parts: the Student Site and the Site Master.

- Site Student

It has been called so as it integrates the Free Textbooks that each year students receive at the beginning of each school year, only in a digital and loaded onto the hard drive of the computer version. They are organized by grade level and subject, so that with one click, the teacher or student can easily select any of these books materials. The "enciclomediados" retain their original structure, but thanks to its digital edition has successfully linked by hypertext links and icons, lessons from books with thousands of multimedia educational resources such as images, maps, virtual tours, videos, movies, audio, interactive exercises, among many others.

- Enciclomedia

It is a database that organizes a body of information about Textbook, with the aim of providing a range of options for teachers and students to complement the topics covered in the curriculum from very different viewpoints.

- Site Master

In addition to Free Textbooks SEP digitally, Enciclomedia account with the Site Master, which was designed with major needs and tasks of teachers. In this space, teachers are familiar with various resources for this educational program and optimize their use in the classroom, as well as having other materials that support their daily work.

- Telesecundaria

Provide the most vulnerable groups in the country's secondary education with a solid foundation in each discipline with ethical principles and social solidarity, enabling them to develop their skills and abilities so that their graduates are able to perform successfully in secondary education and as responsibly leverage local resources to improve their quality of life through educational spaces, materials, computer equipment, use of new technologies of information and communication technologies (ICT), and according to their specific needs teaching methods. At the same time to provide training and resources to teachers to ensure optimum performance.

Statistics

Country	Literacy (%)	Unemployment (%)	PIB/Education (%)
Rusesia	99.4	7.6	4.3
Brazil	88.6	7	4.3
China	92.2	4.3	3.6
India	61	10.8	3.8
México	86.1	5.6	5.7

Conclusions

In general the educational models are similar, including Mexico, there are certain variations that have certainly made a differentiator over the years in each of the countries.

In Russia, the education of the cheapest in the world because the government guarantees that the basic level is free for all its citizens and even the upper level through competition or with very low fees should not approve it, it which makes a lot of sense to leave open education for every citizen. In Mexico it could be similar to the technology of each entity, UNAM and IPN shares about the problem are in the supply of higher education places.

Education in China is particularly competitive and demanding, perhaps because excess conditions the life of a person in adulthood, only if they have good grades is possible to reach the University, all courses have school hours; however, in our country the opposite happens at least primary education are studied only 4 hrs per day and is no longer possible to fail a student even if their ratings warrant.

In India they put much emphasis on mathematics, science and English students causing very competitive professional profiles. In our country English in higher education is not compulsory and the highest percentages of students are on financial administrative areas.

Similarly, in an effort to reduce the digital divide and increase the literacy rate is currently 60% are starting a project to provide low-cost tablets to students. The Brazilian model is similar, but has strengthened its system of distance education and is taken more seriously in education policies. In 2010 1.3% of GDP invested in research and development lie in Mexico was 0.4%.

It is vital to a society with more and better education if we want to be a more competitive country, although the educational model is obsolete in Mexico it is important to carry out reforms and specific measures to help improve the education, such as having more level hours in elementary (primary), strengthen scientific mathematical branches, be more demanding on the quality of students, open more schools of higher level or at least strengthen remote systems leveraging new technology tools.

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Fractal concatenation applied to the interpolation of the price in the London Stock Exchange

MIRANDA- Fernando[*] & RAMOS- Maria[**]

Universidad de Santiago de Compostela, Praza do Obradoiro, s/n, 15782 Santiago de Compostela, A Coruña, España
'Instituto Politécnico Nacional, Unidad Profesional Adolfo López Mateos, Av Juan de Dios Bátiz S/N, Gustavo A. Madero, Residencial La Escalera, 07738 Ciudad de México, Distrito Federal, México

In this article   we presented an analysis of the concatenation fractal with GIS, in schemes of first fractals with local geography applied to the limit of quotation of   the actions of the stock market of London and applied to the determinants of cost and rank according to the attraction level that exists in the localities of chaotic noise determined by fractal concatenation in the short term.

First fractal, attractors of level, bifurcation fractal.

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[*]Correspondence to Author (email:fernando.miranda@usc.es)
[**]Correspondence to Author (email:maria.ramos@usc.es)

Introduction

The complex dynamics of the London Capital Markets group is characterized by anomalous fluctuations, known as universal empirical evidence, their distribution is fat-tailed and volatility of profitability fits all long-term autocorrelations. This is a great start to get detect and catastrophic possibilities, such as bubbles and crashes on the trading activity of shares, rare events that can not be recognized with a normal distribution, so it is important to model fractal concatenation with each price the specific stock market indices. Given the Capital Markets have fractal behavior, it is possible to know their variations with information share trading day periods and identify outliers in both survey periods down as the high precision with better decision-making with respect to other indexes in Europe and the world.

An analytical tool in financial economics is the Fractal Approach because it highlights the inherent properties of self-similarity and self-affinity representing the processes of return and volatility (in terms of cost and margin) in the Capital Markets in London.

Thus, improving the results obtained with the assumption of such distributions abnormality.

Modeling prices

Considering the price parameters Xn +1 (Ex Ante) and another parameter Yn +1 (Ex Post), do the concatenation fractal process in a context of GIS'F delimitándonos to such expressions:

$$X_{n+1} = (1-\Omega)\ f\lambda(X_n) + \frac{\Omega}{4}[f\lambda(X_n) + f\lambda(Y_n)]$$

$$Y_{n+1} = (1-\Omega)\ f\lambda(Y_n) + \frac{\Omega}{4}[f\lambda(Y_n) + f\lambda(Z_n)]\varsigma$$

$$Z_{n+1} = (1-\Omega)\ f\lambda(Z_n) + \frac{\Omega}{4}[f\lambda(Z_n) + f\lambda(X_n)] \tag{1}$$

Regarding the price invariant under a possible transformation Xn, Yn and Zn, we have that a diagonal on the market is a trend that will be symmetrical in its singularity at cost and margin [RE Maria: 2011], so it will be necessary to have another diagonal passing through the transformation of operators in the market prices and be close to the plane resulting in X, Y, Z and ϑ.

$$MP\frac{-1}{1}: (x,y) \rightarrow (f(x,y), g(x,y))$$

$$MP\frac{-1}{2}: (x,y) \rightarrow (f(x,y), -g(x,y))$$

$$MP\frac{-1}{3}: (x,y) \rightarrow (-f(x,y), -g(x,y))$$
$$MP\frac{-1}{4}: (x,y) \rightarrow (-f(x,y), g(x,y)$$

$$\tag{2}$$

Points delimiting the London market broker (see Appendix 1: Quotes London stock market), we obtain the following values of the cost and margin, with the following notation X and YR points. [Abraham, L. Gardini, and C. Mira: 1997], with GIS'F 4λ 4 stations (North, South, East and West) and NO negativity $1 - \Omega$, to the $\frac{\Omega}{4-\Omega}$, respect to the present and expected price.

For the Ex Ante price, we get:

f(x,y)=

$$\sqrt{\frac{\Omega}{4\lambda}\left\{4 - \left(1 + \frac{1}{1-\Omega}\right)X - \left(1 - \frac{1}{1-\Omega}\right)y\right\}}$$

For the Ex Ante Price, we get:
$g(x,y)=$

$$\sqrt{\frac{\Omega}{4\lambda}\left\{4-\left(1-\frac{1}{1-\Omega}\right)X-\left(1+\frac{1}{1-\Omega}\right)y\right\}}$$

The interpolation of these prices will be given in the limit of linearity NO $4-\Omega$, for all X and Y .

$£=\{(x,y)|y=1+\frac{\Omega}{4-\Omega}(x-1)(x\leq 1, y\leq 1)(3)$

Markets respond to a pattern of hidden, irrational, compulsive, seemingly random and unpredictable behavior and therefore disconcerting but, despite all these repellent characteristics, respond to a geometric structure and therefore are sufficiently organized, it is vital for all interested in the capital markets [M. F. Barnsley: 2006]. Our focus will then be to describe and apply various models, while comparisons to establish the relevant securities markets that are similar in terms of the number of stations Market activity, as in the case of our index of London (TSE) - Time Stock Exchange.

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Cost Range and Capital Markets in London.

Volumen de venta	6.8980733
Postura de venta	3.619002
Volumen de compra	7.6596823
Postura de compra	3.9969111
Volumen operado	6.7809385
Máximo Ex Post	3.0897609
Mínimo Ex Post	4.0528564
Máximo Ex Ante	0.2368859
Mínimo Ex Post	2.0937977
Acciones en circulación	8.2341117

Table 1

Own calculations based on data from http://www.londonstockexchangegroup.com.

In Table 1 we obtained all the logarithmic values of the study variables for modeling, we collect data from 247 stations in the London market and typify according to their marketability index in (TSE), so we define the coordinates of the maps that we will thicken fractal shape according to [J. Kigami: 2001].

Set to the margin:

$$X£=\left(-1+\sqrt{\frac{(1-4\Omega+8\lambda(1-\Omega\ )^2}{4\lambda(1-\Omega)}}\right) \qquad (4)$$

Set to the Cost:

$$Y£=\left(-1-\sqrt{\frac{(1-4\Omega+8\lambda(1-\Omega\ )^2}{4\lambda(1-\Omega)}}\right) \qquad (5)$$

Each of the curves or diagonal lines to be formed on the fractal mapping satellite have thickened regions X0 and Y0, and will grasp more accurately price any run through the inflection points with determinants of Jacobians that auxiliaran join us each forks price [R. L. Ruiz and DF Prunaret, Int J] curves in dependence on Julia'S SET as 360 ° in geographic axes.

$z0 = 0$ $z4=26$

$z1 = 1 = 2 + 1$

$z2 = 3$

$z3 = 5$

Forming the matrix of rational iterations NO whole of MP (market price), [K. Falconer 1997] we obtain the following in conjunction with the golden mean:

$$MP = \begin{vmatrix} Z0 & 0 & -1 & 2 \\ Z1 & -1 & 1 & 4 \\ Z2 & 0 & -1 & 8 \\ Z3 & -1 & 3 & 16 \\ Z4 & & & \end{vmatrix} > 0.618 \quad (6)$$

And arrogates the sub-areas of cost: $z0 = 0$, $z1 = i$, $z2 = -1 + i, -i = z3$, $z4 = -1 + I, -I = z5$, $z6 = -1 + i$ margin ..... and we obtain $z0 = 0$, $z1 = 2i$, $2i + z2 = -4$, $z3 = 12 - 14i$, $z4 = 52 - 334i$, [H. Furstenberg and H. Kesten: 1960] as the distribution of fat tails leptukorticas (relatively long tails) for price changes (and not fractional Gaussian distribution).

$$MP\frac{-1}{4} = p\frac{-1}{4}(MP)U(p\frac{-1}{4}(MP))$$

$$\frac{-4}{41} = p\frac{-1}{1}(MP\frac{-1}{4})$$

$$MP\frac{-1}{4}MP\frac{-4}{44} = p\frac{-1}{4}(MP\frac{-1}{4}) \quad (7)$$

Starting thickening, locked in the price in $X, Y_{(n+1)}$:

$$X_{n+1} = (1-\Omega)\, f\lambda_1(X_n) + \frac{\Omega}{4}[f\lambda_1(X_n) + f\lambda_2(Y_n)]$$

$$Y_{n+1} = (1-\Omega)\, f\lambda_2(Y_n) + \frac{\Omega}{4}[f\lambda_1(X_n) + f\lambda_2(Y_n)]$$

Given the Price function, $f(p) = \sum_{i=1}^{n\infty}\frac{MP1i}{p1i-z} + \sum_{n=1}^{n\infty}\frac{MP'1}{p'n-z}$, we get μ in the range of Ex Ante and Ex Post:

$$\mu = \sum_{n=1}^{n\infty}\frac{MP'n}{p'\frac{k}{n}+1} \quad (8)$$

Resorting to the market with respect to k (range) $|MP|^{\frac{1}{k}}$, in the price of each share will get $MP = p_{K(1+\frac{\mu k}{pk})}$, logarithms and using the force

of attraction G fractal $|MP|^{\frac{1}{k}} = |p_K|^{\frac{1}{k}}G^{\frac{\Omega}{4}}\frac{1}{k}\log|1+\frac{\mu k}{pk}|$, then if $MP \geq p$, NO marketability is $\frac{1}{p} \leq \frac{1}{p1}$.

Representation of the space G 360°

.

.
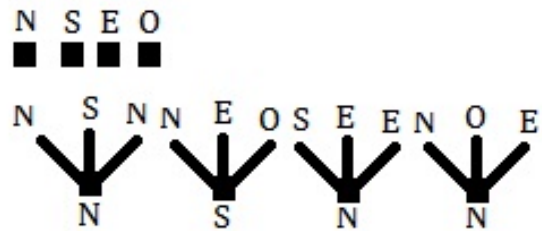
Graphic 1

Matrix form we get:

$$MP = \begin{vmatrix} N & 2 & -1 & 1 \\ S & 2 & 3 & 3 \\ E & 2 & 4 & 4 \\ O & 3 & 4 & 4 \end{vmatrix} \quad MP = \begin{vmatrix} 1 \\ 4 \end{vmatrix} \quad (9)$$

Let's choose some geometric body to swell our prices in Table 1, within the London stock market, to measure the distance between the price range, we use the idea of ε-thickening of a market trend, so ε is the collection of all prices within a trend of ε capital Markets.

Miranda F, Ramos M. Fractal concatenation applied to the interpolation of the price in the London Stock Exchange. ECORFAN Journal-Mexico 2012, 3-6: 464-473

Thickening of prices contained in a pyramid for a simplex-d4 square.
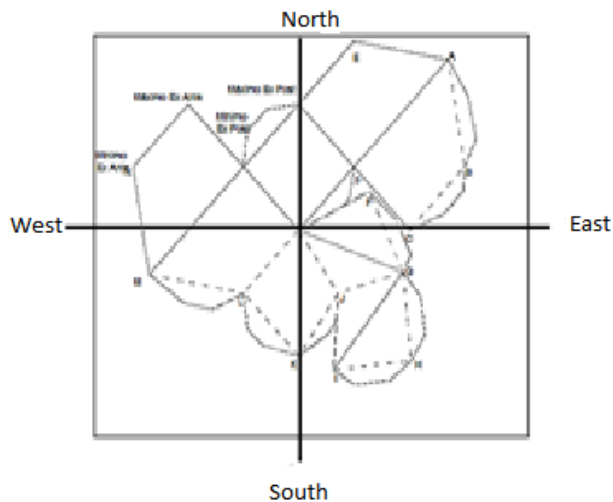
Graphic 2

Variations of each segment will have dimensions for each specific geometric SET $f\lambda_1(X_n)+f\lambda_2(Y_n)+f\lambda_3(X_n)+f\lambda_4(Y_n)$, the following geometric thickening as [K. Falconer 1997]:

Chain price thickening

N	(Q & A & Ñ & P)1/2 (B & F & D & E & O & N)3/4
S	(H & I & K)1/2 (C & G & J & L & M)3/4
E	(A & B & C & G & H)1/2 (Q & D & F & I & J)3/4
O	(M & N & Ñ)1/2 (E & K & L & O & P)3/4

Table 2

Considering the topology of fractal body get the

run$\{(1/2)^{(1/2)}(1/2)_{(1/2)}(1/2)_{(1/2)}(1/2)_{(1/2)}(1/2)^{(1/2)}(1/2)^{(1/2)}(1/2)_{(1/2)}(1/2)^{(1/2)}(3/4)_{(3/4)}(3/4)_{(3/4)}(3/4)^{(3/4)}(3/4)^{(3/4)}(3/4)_{(3/4)}(3/4)_{(3/4)}(3/4)^{(3/4)}(3/4)^{(3/4)}(3/4)_{(3/4)}(3/4)_{(3/4)}(3/4)^{(3/4)}(3/4)_{(3/4)}\}$ $\therefore \epsilon= 18$ $\alpha= 0.000000072583281$, which tells us that the London market is empirical evidence to be fractal.

In the study period 2010-2011, assuming that α and ϑ are compact subsets of the general trend of the 247 stations. Now if α is the square of the price range, and d is the length of projection of the market: and

$$Pf=\frac{\log \alpha 1}{\bar{d}\,3} (90,180,360) , \frac{\ln \alpha 1}{\bar{d}\,1}$$

$$Pf=\frac{\log \alpha 2}{\bar{d}\,1} (180,270) , \frac{\ln \alpha 2}{\bar{d}\,3}$$

$$Pf=\frac{\log \alpha 3}{\bar{d}\,2} (360, 270, 90) , \frac{\ln \alpha 3}{\bar{d}\,2}$$

$$Pf=\frac{\log \alpha 4}{\bar{d}\,2} (270,360,180) , \frac{\ln \alpha 4}{\bar{d}\,2}$$

$$(10)$$

Prices dependencies that are broken can be obtained from $MP=\alpha_0\alpha_1\ldots\alpha k\ldots\epsilon\ p\ \frac{\infty}{\Omega}$ with the following dimensions:

D-Vertical: North-South

$$(\Omega\frac{\alpha}{1}, \ldots, \Omega\frac{\alpha}{p}=\lim_{k\to\infty}\ \mu^{\alpha 0},\ldots, \mu^{\alpha k-1}(\Omega\frac{0}{1},\ldots,\ \frac{0}{p})$$

D-Horizontal: East-West

$$(k\frac{\alpha}{1}, \ldots, k\frac{\alpha}{p}=\lim_{k\to\infty}\ £^{\alpha 0},\ldots, £^{\alpha k-1}(K\frac{0}{1},\ldots,K\frac{0}{p})$$

Now the construction of the fractal matrix [K. Kaneko: 1986], with geographic pricing iteration becomes:

$$p=\begin{vmatrix}N & 1 & 2 & 1\\ S & 1 & 3 & 4\\ E & 2 & 3 & 3\\ O & 2 & 2 & 3\end{vmatrix} MP\longleftrightarrow(p)=\begin{vmatrix}N & (\frac{1}{3})\Omega & 0 & 0\\ S & \Omega(\frac{1}{2}) & \frac{1}{3} & \frac{1}{2}\\ E & 0 & (\frac{1}{3}) & 0\\ O & 0 & \frac{1}{2} & \frac{1}{3}\end{vmatrix}$$

(11)

Price interpolation

When this concept is transferred to fractals prices and a geographic basis, their error terms may also be interrelated $(p1 \ldots pk-1)(MP)$, then find ourselves with the concept of spatial autocorrelation or spatial correlation [R. S. Strichartz, 2006], to discuss this correlation in space instead of time $f\,\frac{\Omega}{k1}(\emptyset)\circ f\,\frac{\Omega}{k2}(p1)$, so it is important to distinguish correlation and autocorrelation and serial correlation lags ask a series fractal, herself, behind a number of time units (u1, u2, ..., u10 and u2, u3, ..., u11) in the London market will be 1 year (2010-2011), and raises the fractal correlation lag correlation between two different series (one Ex Ante and Ex Post another) - (u1, u2, ..., u10 & v1, v2, ..., v10) in reverse:

$MP\subset \mathbb{R}^n, \Omega\epsilon\,k.$

$MP(\emptyset)=MP^0,\qquad MP\ \ k_1\ldots k_m= \ f\ \frac{\Omega}{k1}(\emptyset)\circ f\,\frac{\Omega}{k2}(p1)\ \circ\ldots\circ f\,\frac{\Omega}{km}(p1\ldots pk-1)(MP)$

$MP^k=\cup\,p1\ldots pk$ (12)

After demonstrating the iterations of fractal concatenations must consider all prices from $\pounds^{\alpha0}$ to $\pounds^{\alpha k-1}$, in all the cases λ will be the axis of curvature of all critical points that are outside the market trend and interpolated prices $f\lambda_1(X_n)$ to $f\lambda_n(Y_n)$:

$$\vartheta\supset\vartheta k1\supset\cdots\supset\vartheta k1\ldots km\supset\cdots,\vartheta\supset\vartheta k1$$
$$\supset\cdots\supset\vartheta k1\ldots km\supset\cdots$$

$\vartheta k\cap\vartheta p=\emptyset$

$|k|=|p|, k\neq p$

$$\vartheta\supset\vartheta1\supset\cdots\supset\vartheta k\supset\cdots,\vartheta\supset\vartheta-1\supset\cdots$$
$$\supset\vartheta-k\supset$$

All logs must be narrow and strictly convex are increasingly turning point in the bulge $|k|=|p|$, showing correlation of prices in the fractal empty [E. Ott, 2002], which represent geometrically with:

$$MP^k=\prod_{k\geq1}\vartheta-_k(\Omega)$$

(13)

Fractal indexing of the pivoting series at prices is:

$$A=\begin{bmatrix}K\alpha(1) & \cdots & \vartheta\alpha(1,1)\vartheta\alpha(1,\vartheta)\\ \vdots & \ddots & \vdots\\ K\alpha(4) & \cdots & \vartheta\alpha(\vartheta,1)\vartheta\alpha(\vartheta,k)\end{bmatrix}$$

(14)

For all price pairs (x, y), (x ', y'). In general, the contractions can reduce the distance between prices for different amounts (Ln modeling and / or Log), depending on the position of the ranges [M. F. Barnsley, Hutchinson and J. E. Ö. Stenflo: 2005]. A similarity reduces all distances by the same number, r <1.

$$R_{\min}(\alpha)=\inf(\lambda)\sum_{m=1}^{K\lambda}\ \ (r\frac{\Omega}{k})^\alpha\,, R_{\max}$$

$$(\alpha)\sup(\lambda)\sum_{m=1}^{K\lambda}\ \ (r\frac{\Omega}{k})^\alpha$$

In $\mathbb{R}^2$, [R. Abraham, L. Gardini, and C. Mira: 1997], to the space $[f\lambda(Y_n)+f\lambda(Z_n)$:

$$X^\alpha=(K\frac{\Omega}{1},\ldots K\frac{\alpha}{\Omega})=(K1,\ldots,K_\alpha)$$

In R^3 concatenated space R Price:

$$Y^\alpha = (p\frac{\Omega}{1},\ldots p\frac{\alpha}{\Omega}) = (p1,\ldots,p_\alpha)$$

Whereas according bifurcations [Hutchinson 1981] narrowing of prices for the reasons

nes $K^{\alpha 0(\alpha)}\cdot\ldots\cdot K^{\alpha p}$ the space will be:

$$\lim_{k\to\infty} \mu\frac{1}{k}\log\| K^{\alpha 0(\alpha)}\cdot\ldots\cdot K^{\alpha p-1}(\alpha)\| = \mu(\alpha) \qquad (15)$$

Overall fractal Concatenation

$$f^\alpha(k1,\ldots,K_m) = \bigcup_{m=1}^{Mk\alpha(1)} f\frac{1\alpha}{m}(M_{k\alpha(1,m)}),\ldots$$

, $\bigcup_{m=1}^{Mk\alpha(p)} f\frac{1\alpha}{m}(M_{k\alpha(p,m)})$ y para el Ex Ante (k $\frac{\Omega}{1}, \ldots k\frac{\Omega}{1}) = \lim_{k\to\infty} \mu^{\alpha 0},\ldots, \mu^{\alpha k-1}(\Omega\frac{0}{1},\ldots, \Omega\frac{0}{p})$, mientras que para el Ex Post (p $\frac{\Omega}{1}, \ldots k\frac{\Omega}{1}) = \lim_{m\to\infty} \mu^{\alpha 0},\ldots, \mu^{\alpha k-1}(\Omega\frac{0}{1},\ldots, \Omega\frac{0}{p})$.

Conclusions

The London market for all price pairs (x, y), (x ', y') using the transformation T (x, y) = (x r · r · y) as its contraction factor r. An affinity reduced distances by different amounts in different directions ie (N, S, E and O). If all transformations of an IFS are twitching, and then iterating the IFS is guaranteed to converge [H. Kitajima, T. Yoshinaga, K. Aihara, and H. Kawakami 2003] in a unique way for the best price in the Short-Term Market via GIS'F.

Having the median price to the border between Max & Min; gives rise to other limits symmetrically above and below the average, generally expressed as a common multiple in its Border Geospatial fractal concatenation. Position in the market with index 0.37 was determined, the maximum market closed 2.85 respect to 1.95, thus the difference in 0.9 and 2.85-1.95 are accepted with fractal statistics for golden mean is greater than 0.618 (expected) and less of a Gauss 1.Finalmente only 3 companies (AUTONOMY CORP, BABCOCK & BROWN BEAR STEARNS LTD PRTNSHPS PUBLIC PRIVATE EQUITY) are outside the parameters enrollment marketability retardoαn-1. Having 0 as the boundary between Rates Max & Min, symmetrically above and below 0 was the basis for concatenation MP

$$(\alpha) = \sum\{p[\vartheta]): m\leq p\epsilon\Omega_k, |p|=p(\alpha)\}.$$

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Annex A

London Capital Markets

OPTIMIZATION

Company									
CADOGAN PETROLEUM									
CAPITA GROUP									
CARE UK									
CASTLE ALTERNATIVE INVEST AG									
CATTLES									
CAZENOVE ABSOLUTE EQUITY LTD									
CENTRAL RAND GOLD LTD									
CENTRICA									
CERES AGRICULTURAL FUND LTD									
CHARLES STANLEY GROUP									
CHARTER INTERNATIONAL PLC									
CHEMRING GROUP									
CHRYSALIS GROUP PLC									
CINEWORLD GROUP									
CITY MERCHANTS HIGH YIELD TRUST									
CLOSE ENTERPRISE VCT PLC									
COMMERCIAL BANK OF QATAR (THE)									
CORE VCT IV PLC									
CORE VCT V PLC									
COSTAIN GROUP									
CRITICAL INFORMATION GROUP PLC									
DAISHIN SECURITIES CO									
DB X-TRACKERS									
DEPA LTD									
DEXION ABSOLUTE LTD									
DEXION TRADING LTD									
DIAMOND CIRCLE CAPITAL PLC									
DIMENSION DATA HLDGS PLC									
DOMINO'S PIZZA UK & IRL									
DOWNING PROTECTED VCT IX PLC									
DOWNING PROTECTED VCT VI PLC									
DOWNING PROTECTED VCT VII PLC									
DOWNING PROTECTED VCT VIII PLC									
EASTPHARMA LTD									
EDGE PERFORMANCE VCT									
ENDEAVOUR INTL CORP									
EURASIA DRILLING CO LTD									

Company									
EURASIAN NATURAL RESOURCES CORP									
EUROPEAN CAPITAL LTD									
F&C MANAGED PORTFOLIO TRUST PLC									
FENNER PLC									
FINANCIAL TECHNOLOGIES (INDIA)									
FIRST QUANTUM MINERALS									
FRESNILLO PLC									
FRIENDS PROVIDENT GROUP PLC									
FRM DIVERSIFIED ALPHA LTD									
GALLIFORD TRY									
GARTMORE GROWTH OPPORTUNITIES									
GENUS									
GITANJALI GEMS LIMITED									
GLOBAL INVESTMENT HOUSE									
GLOBAL MENA FINANCIAL ASSETS LTD									
GLOBALTRANS INVESTMENT PLC									
GLOBSOP FINANCIAL SERVICES SA									
GOLDEN PROSPECT PRECIOUS METALS LTD									
GOTTEX MARKET NEUTRAL TRUST LTD									
GREAT PORTLAND ESTATES PLC									
GREENE KING									
GRESHAM COMPUTING									
GROUPE EUROTUNNEL SA									
GRUPO CLARIN SA									
GUARANTY TRUST BANK									
GULF FINANCE HOUSE									
HANSEN TRANSMISSIONS INTL NV									
HANSON WESTHOUSE HLDGS PLC									
HARDY OIL & GAS									
HARGREAVES LANSDOWN PLC									
HSBS									
HENDERSON DIVERSIFIED INCOME LTD									
HENDERSON GROUP PLC									
HENDERSON HIGH INCOME TRUST									
HERITAGE OIL CORP									
HERITAGE OIL LTD									

Company									
HILTON FOOD GROUP PLC									
HRVATSKE TELEKOMUNIKACIJE D D									
IMPAX ENVIRONMENTAL MARKETS PLC									
IMPERIAL ENERGY CORP									
IMPERIAL TOBACCO GROUP									
INDOCHINA CAPITAL VIETNAM HLDGS LTD									
INFRASTRUCTURE INDIA PLC									
INGENIOUS ENTERTAINMENT VCT 1 PLC									
INGENIOUS ENTERTAINMENT VCT 2 PLC									
INGENIOUS LIVE VCT 1 PLC									
INGENIOUS LIVE VCT 2 PLC									
INNOLUX DISPLAY CORPORATION									
INTERMEDIATE CAPITAL GROUP									
INTERNATIONAL FERRO METALS									
INTERNATIONAL PERSONAL FINANCE PLC									
INVESCO LEVERAGED HIGH YIELD									
INVESTORS CAPITAL TRUST PLC									
JARVIS									
JOHNSTON PRESS									
JPMORGAN INCOME & CAPITAL TRUST PLC									
JUPITER GREEN INVESTMENT TRUST									
JZ CAPITAL PARTNERS LTD									
KAZAKHSTAN KAGAZY PLC									
KEYDATA AIM VCT 2 PLC									
KILN LTD									
LAMPRELL PLC									
LMS CAPITAL PLC									
LOCAL SHOPPING RET PLC(THE)									
LSR GROUP OJSC									
LUCKY CEMENT LTD									
LUMINAR GROUP HLDGS PLC									
MAGNIT OJSC									
MAGNITOGORSK IRON & STEEL WORKS									
MARSHALLS									
MEARS GROUP									
MECOM GROUP PLC									

Company									
MELROSE RESOURCES									
MHP SA									
MIDAS INCOME & GROWTH TRUST									
MIDDLEFIELD CANADIAN INC TST INV CO									
MONDI SA									
MONEYSUPERMARKET.COM GROUP PLC									
MAV TOPS LTD									
MWB GROUP HLDGS PLC									
NAMAKWA DIAMONDS LTD									
NABFERS									
NCC GROUP									
NEW BRITAIN PALM OIL LTD									
NEW CENTURY AIM VCT 2 PLC									
NEW CITY HIGH YIELD FUND LTD									
NEW STAR RBC HDG 250 IDX EXCH TRADE									
NEW WORLD RESOURCES NV									
NORCROS PLC									
NOVOROSSIYSK COMMERCIAL SEA PORT									
OCTOPUS PROTECTED VCT 2 PLC									
OCTOPUS PROTECTED VCT PLC									
OCTOPUS TITAN VCT 1 PLC									
OCTOPUS TITAN VCT 2 PLC									
OCTOPUS TITAN VCT 3 PLC									
OGK 2									
PACE MICRO TECHNOLOGY									
PALM HILLS DEVELOPMENTS SAE									
PARAGON GROUP OF COMPANIES									
PARTNERS GROUP GLOBAL OPPORTUNITIES									
PHARMSTANDARD OJSC									
PHAUNOS TIMBER FUND LTD									
PLASMON									
POWERSHARES GLOBAL FUNDS IRELAND									
PREMIER RENEWABLE ENERGY FD LTD									
PRIMARY HEALTH PROPERTIES									
PRINCESS PRIVATE EQUITY HLDGS									
PRINCIPLE CAPITAL INVESTMENT TRUST									

PRODESSE INVESTMENT									
PROGRESSIVE DIGITAL MEDIA GROUP PLC									
PSOURCE STRUCTURED DEBT LTD									
PUMA VCT V PLC									
QUEENCO LEISURE INTERNATIONAL LTD									
QUORUM OIL & GAS TECHNOLOGY FUND LD									
R.E.A.HLDGS PLC									
RANDGOLD RESOURCES									
RECKITT BENCKISER GROUP PLC									
RECORD PLC									
REGUS PLC									
RENOVO GROUP									
REO SECURITIES LTD									
RIO TINTO									
ROYAL & SUN ALLIANCE INSURANCE GR									
ROYAL BANK OF SCOTLAND GROUP PLC									
RUGBY ESTATES INVESTMENT TRUST PLC									
SAFESTORE HLDGS PLC									
SALAMANDER ENERGY PLC									
SCARBOROUGH BUILDING SOCIETY									
SCI ENTERTAINMENT GROUP									
SDL									
SEPURA PLC									
SHAFTESBURY PLC									
SHANKS GROUP									
SHIRE LTD									
SIG									
SINCLAIR PHARMA									
SKYEPHARMA									
SMURFIT KAPPA PLC									
SPA ETF PLC									
SPEEDY HIRE									
SPICE PLC									
SPORTECH									
SPORTS DIRECT INTL PLC									
STANDARD CHARTERED									
STEPSTONE ASA									
STOBART GROUP LTD									
SUPERGLASS HLDGS PLC									

SYMPHONY INTERNATIONAL HLDGS LTD									
SYNERGY HEALTH PLC									
TAPESTRY INVESTMENT CO PCC									
TARSUS GROUP PLC									
TELECITY GROUP									
THAMES RIVER MULTI-HEDGE PCC									
THIRD POINT OFFSHORE INVESTORS LTD									
THOMSON REUTERS PLC									
TPS VCT PLC									
TP70 VCT PLC									
TUI TRAVEL PLC									
UK COMMERCIAL PROPERTY TRUST LTD									
UNITED BUSINESS MEDIA LTD									
UNITED UTILITIES GROUP PLC									
URALKALI JSC									
UTV MEDIA PLC									
VECTURA GROUP									
VIMETCO NV									
VTB BANK(JSC)									
WAGON									
WELLSTREAM HLDGS PLC									
WESTBURY PROPERTY FUND(THE)									
WICHFORD PLC									
WPP PLC									
XCHANGING PLC									
XP POWER LTD									
ZHAIKMUNAI L.P.									

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Dynamic risk in the IS-LM model with delayed

ÁVILA- Eric, GARCÍA- Gerardo, CHAN- Noé*

Universidad Autónoma de Yucatán, Calle 60 491, Centro Histórico, 97000 Mérida, Yucatán, México

In this paper we present a stability analysis for a IS-LM model (Investment Saving-Liquidity preference Money supply) and according to Kalecki we considered the idea of a time delay in the model. We establish conditions to prove that the delay gain or lose stability and a Hopf bifurcation occurs. For the stability analysis we consider the particular case where the investment (I) and the demand for money (L) are nonlinear.

Delay, IS-LM model, Hopf Bifurcation.

*Correspondence to Author (email:noe.chan.86@hotmail.com)
† Researcher contributing first author.

Introduction

Investment is a topic of great importance in the economy. The business cycle models of Kaldor and Kalecki use an investment function which is based more on the principle of profit and principle of acceleration. In the model of Kaldor, gross investment depends on the level of performance and capital stock. For a given amount of real capital, investment depends on the level of profit, which depends on the activity level. Kaldor's assumptions present a nonlinear investment and saving functions and their change over time leading to a cycle. On this model we have studied the possibility of possessing a unique limit cycle, a major breakthrough came when necessary and sufficient conditions for the existence of a limit cycle in the model is established, has also studied the coexistence of a limit cycle and balance.

The macroeconomic business cycle Kaldor [1] of the form

$$\frac{dY}{dt} = \alpha[I(Y,K) - S(Y,K)]$$
$$\frac{dK}{dt} = I(Y,K) - \delta K, \tag{1}$$

Where I is the investment, S saving function, and the gross domestic product, K the capital stock, α the coefficient of market adjustment and δ is the depreciation rate of capital stock. Kaldor assumes that the investment function I is not linear in Y and has an "s". As an example of this type of function we can mention the proposed Bischi et al [2] for your model, this function is:

$$I(t) = \sigma\mu + \gamma\left(\frac{\sigma\mu}{\delta} - K(t)\right) + \arctan(Y(t) - \mu), \tag{2}$$

Where $\sigma\mu/\delta$ is the normal level of capital stock. And consider two short investment components, the first is proportional to the difference between the stock of capital and the current average stock, according to a coefficient $\gamma > 0$, usually explained by the presence of adjustment costs; the second is an increasing function of the difference between "normal" income and level, indicated by μ. This function has an "s" seen as a function that depends on income Y.

The model Kalecki business cycle [3] was proposed a few years earlier than that of Kaldor. Kalecki assumed that the portion of the gain is invested savings and capital grows because of past investment decisions. There is a gestation period or time delay, after which the assets are available for production.

In Kalecki's theory of the fundamental role is played by the time delay T related to investment decisions. He distinguishes three stages of investment: investment orders I, production of capital goods A, and capital goods ended D. The change in capital stock is due to investment orders in the past,

$$\frac{dK(t)}{dt} = D(t) - U = I(t - T) - U, \tag{3}$$

Where U denotes the capital depreciation. Krawiec and Szydlowski [4] formulated the business cycle model Kaldor-Kalecki based on dynamic multiplier which is the basis of both approaches, following the approach of Kalecki investment and the time delay between investment decisions and implementation , obtain the system of differential equations with delay:

$$\frac{dY}{dt} = \alpha[I(Y(t), K(t)) - S(Y(t), K(t))]$$
$$\frac{dK}{dt} = I(Y(t-T), K(t)) - \delta K(t), \qquad (4)$$

Where T = constant is the time delay. Investment depends on the gain at the time investment decisions are made and the stock of capital investment when the time ends. The latter is due to the fact that at time tT, there are some investments that will end between tT and t. It is assumed that the capital stock produced in this period is taken into account when new investments are planned.

The authors conclude that the reconstructed model of the business cycle based on the Kaldor model parameter and time delay associated with Kalecki investment decisions generates limit cycles in phase space. The crucial role in the creation of the limit cycle is the time delay, rather than the assumption of the role of investment in the form of "s".

Torre [5] reviewed and updated the model by replacing the stock of capital with the interest rate R (t) to formulate the next business cycle model standard IS-LM:

$$\frac{dY}{dt} = \alpha[I(Y(t), R(t)) - S(Y(t), R(t))]$$
$$\frac{dR}{dt} = \beta[L(Y(t), R(t)) - M], \qquad (5)$$

Where M is the constant flow of money, β is the coefficient of adjustment in the money market and L is the demand for money. Apparently Torre who was originally introduced to the economy Hopf bifurcation theorem [6] as a tool to establish the existence of closed orbits in dynamical systems. As Kaldor model combination and Torre Gabisch and Lorenz [7] considered an IS-LM model amended as follows:

$$\frac{dY}{dt} = \alpha[I(Y(t), K(t), R(t))$$
$$\qquad - S(Y(t), R(t))]$$
$$\frac{dK}{dt} = I(Y(t), K(t), R(t)) - \delta K(t) \qquad (6)$$
$$\frac{dR}{dt} = \beta[L(Y(t), R(t)) - M],$$

Where δ is the depreciation rate of capital stock. Based on the idea of Kalecki delay in time, Cai [8] presented the following IS-LM model with delay:

$$\frac{dY}{dt} = \alpha[I(Y(t), K(t), R(t))$$
$$\qquad - S(Y(t), R(t))]$$
$$\frac{dK}{dt} = I(Y(t-\tau), K(t), R(t)) - \delta K(t) \qquad (7)$$
$$\frac{dR}{dt} = \beta[L(Y(t), R(t)) - M].$$

In this model τ is the time delay required for the new capital is installed, Cai gave results on local stability and Hopf bifurcation.

Kaddar and Talibi [9] considered a model where the τ delay is introduced in the gross domestic product, capital stock and interest rate, arguing that the change in the capital stock is due to past investment decisions, obtaining the following model:

$$\frac{dY}{dt} = \alpha[I(Y(t), K(t), R(t))$$
$$\qquad - S(Y(t), R(t))]$$
$$\frac{dK}{dt} = I(Y(t-\tau), K(t-\tau), R(t-\tau))$$
$$\qquad - \delta K(t) \qquad (8)$$
$$\frac{dR}{dt} = \beta[L(Y(t), R(t)) - M].$$

Talibi and Kaddar study the dynamics of the model locally and describe the Hopf bifurcation. This assuming the functions of investment I, the saving function S, and the demand for money L as:

$$I(Y, K, R) = \eta Y - \delta_1 K - \beta_1 R$$
$$S(Y, R) = l_1 Y + \beta_2 R$$
$$L(Y, R) = l_2 Y - \beta_3 R,$$

Where $\delta_1, l_1, l_2, \beta_1, \beta_2, \beta_3$ are positive constants

According to Rocsoreanu [10], economic conditions lead to the following limitations on economic variables:

$$\frac{\partial I}{\partial Y} > 0, \quad \frac{\partial I}{\partial R} < 0, \quad \frac{\partial I}{\partial K} < 0,$$
$$\frac{\partial S}{\partial Y} > 0, \quad \frac{\partial S}{\partial R} > 0, \quad (9)$$
$$\frac{\partial L}{\partial Y} > 0, \quad \frac{\partial L}{\partial R} < 0.$$

Based on the above functions take investment, savings and money demand as follows, these functions being considered according to the idea of Rocsoreanu [10] and De Cesare [11]:

$$I(Y, K, R) = A \frac{Y^a}{R^b} - cK$$
$$S(Y) = sY \quad (10)$$
$$L(Y, R) = \gamma Y + \frac{h}{R - \hat{R}},$$

Which satisfy the following constants $a, b, A, \gamma, h > 0$, $0 < s < 1$ y $\hat{R} > 0$ es una tasa very small fixed interest generating a liquidity trap when R (t) tends to R, ie, $\frac{h}{R - \hat{R}} \to +\infty$ when $R(t) \to \hat{R}$.

Note that these functions satisfy the constraints given in (9) and also the value that is assigned to the exponent allows us to control the shape of the graph of I as a function of Y (Concave for a <1, convex for a> 1 and linear for a = 1).; the exponent b allow us to control the convexity of the graph of R as a function of R; L allows the existence of a liquidity trap and finally S is proposed as a linear function of Y as is often done in the literature.

Considering the system (8) and functions as described in (10) to analyze the system is:

$$\frac{dY}{dt} = \alpha \left(A \frac{Y^a(t)}{R^b(t)} - cK(t) - sY(t) \right)$$
$$\frac{dK}{dt} = A \frac{Y^a(t - \tau)}{R^b(t - \tau)} - cK(t - \tau) - \delta K(t) \quad (11)$$
$$\frac{dR}{dt} = \beta \left(\gamma Y(t) + \frac{h}{R(t) - \hat{R}} - M \right).$$

Stability analysis

In this section we perform a stability analysis of the system (11) by calculating its characteristic equation at an equilibrium point.

The equilibrium point (Y ^ *, K ^ *, R *) for the above system is given by the constant solutions of the system, note that if the solutions are constant the right side of each equation of the system (11) is equals zero and $Y(t) = Y(t - \tau) = Y^*$ for all t, the same is satisfied for K ^ *, R *, then the equilibrium point is obtained by solving the following system:

$$0 = A \frac{(Y^*)^a}{(R^*)^b} - cK^* - sY^*$$
$$0 = A \frac{(Y^*)^a}{(R^*)^b} - cK^* - \delta K^* \quad (12)$$

$$M = \gamma Y^* - \frac{h}{R^* - \hat{R}}.$$

For linearization consider the system as:

$$\frac{dY}{dt} = f_1(Y, K, R, Y_\tau, K_\tau, R_\tau)$$
$$\frac{dK}{dt} = f_2(Y, K, R, Y_\tau, K_\tau, R_\tau) \qquad (13)$$
$$\frac{dR}{dt} = f_3(Y, K, R, Y_\tau, K_\tau, R_\tau).$$

The functions f_i, $i = 1,2,3$ that depends on Y, K, R, $Y_\tau = Y(t - \tau)$, $K_\tau = K(t - \tau)$ and $R_\tau = R(t - \tau)$, are the right side of the system (11) associated with $\partial Y/\partial t$, $\partial K/\partial t$ y $\partial R/\partial t$ respectively. The linearization is given by:

$$\dot{x}(t) = Jx(t) + J_D x(t - \tau), \qquad (14)$$

Con $x(t) = (x_1(t), x_2(t), x_3(t))$ donde J y J_D son jacobianos de (13) evaluados en el equilibrio (Y^*, K^*, R^*), que están dados por:

$$J = \begin{pmatrix} \frac{\partial f_1}{\partial Y} & \frac{\partial f_1}{\partial K} & \frac{\partial f_1}{\partial R} \\ \frac{\partial f_2}{\partial Y} & \frac{\partial f_2}{\partial K} & \frac{\partial f_2}{\partial R} \\ \frac{\partial f_3}{\partial Y} & \frac{\partial f_3}{\partial K} & \frac{\partial f_3}{\partial R} \end{pmatrix}$$
$$= \begin{pmatrix} \alpha\left(\frac{Aa(Y^*)^{a-1}}{(R^*)^b} - s\right) & -\alpha c & -\alpha Ab\frac{(Y^*)^a}{(R^*)^{b+1}} \\ 0 & -\delta & 0 \\ \beta\gamma & 0 & -\frac{\beta h}{(R^* - \hat{R})^2} \end{pmatrix}$$

$$J_D = \begin{pmatrix} \frac{\partial f_1}{\partial Y_\tau} & \frac{\partial f_1}{\partial K_\tau} & \frac{\partial f_1}{\partial R_\tau} \\ \frac{\partial f_2}{\partial Y_\tau} & \frac{\partial f_2}{\partial K_\tau} & \frac{\partial f_2}{\partial R_\tau} \\ \frac{\partial f_3}{\partial Y_\tau} & \frac{\partial f_3}{\partial K_\tau} & \frac{\partial f_3}{\partial R_\tau} \end{pmatrix}$$
$$= \begin{pmatrix} 0 & 0 & 0 \\ Aa\frac{(Y^*)^{a-1}}{(R^*)^b} & -c & -Ab\frac{(Y^*)^a}{(R^*)^{b+1}} \\ 0 & 0 & 0 \end{pmatrix}$$

To find the characteristic equation of the system, we seek solutions of the form $\left(c_1 e^{\lambda t}, c_2 e^{\lambda t}, c_3 e^{\lambda t}\right)$ for the linear system (14) are non-trivial. The condition for the above to happen is that the determinant of the system matrix equaled zero $\Delta(\lambda, \tau) = \lambda I - J - e^{-\lambda\tau}J_D$ (Here I is the identity matrix 3x3), Solutions obtained by considering the previously mentioned manner, is equal to zero. In our case

$$\Delta(\lambda, \tau) := \lambda^3 + a_2\lambda^2 + a_1\lambda + a_0 + (b_2\lambda^2 + b_1\lambda + b_0)e^{-\lambda\tau} = 0, \qquad (15)$$

Where:

$$a_2 = as + \delta + a\alpha A\frac{(Y^*)^{a-1}}{(R^*)^b}$$
$$a_1 = \alpha s\delta + a\alpha A\delta\frac{(Y^*)^{a-1}}{(R^*)^b} + Ab\alpha\beta\gamma\frac{(Y^*)^a}{(R^*)^{b+1}}$$
$$+ \frac{\beta h}{(R^* - \hat{R})^2}\left(\alpha s + \delta\right.$$
$$\left. - a\alpha A\frac{(Y^*)^{a-1}}{(R^*)^b}\right)$$
$$a_0 = Ab\alpha\beta\gamma\delta\frac{(Y^*)^a}{(R^*)^{b+1}}$$
$$+ \frac{\alpha\beta\delta h}{(R^* - \hat{R})^2}\left(s - aA\frac{(Y^*)^{a-1}}{(R^*)^b}\right)$$
$$b_2 = c$$

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$$b_1 = \alpha sc + \frac{c\beta h}{\left(R^* - \hat{R}\right)^2}$$

$$b_0 = \frac{\alpha sc\beta h}{\left(R^* - \hat{R}\right)^2}$$

Based on the characteristic equation we can establish the stability of equilibrium whereas an equilibrium solution is stable if all λ roots of the characteristic equation (15) are in the left half of the complex plane, this is the real part of λ, R (λ) is negative for all λ roots.

When $\tau = 0$, the characteristic equation reduces

$$\Delta(\lambda, 0) := \lambda^3 + (a_2 + b_2)\lambda^2 + (a_1 + b_1)\lambda + a_0 + b_0 \qquad (16)$$

To determine the stability in this case we use the Routh-Hurwitz criterion.

This approach in its general form states that if a system is of order n, the polynomial can be taken in the form:

$$P(\lambda) = \lambda^n + a_1\lambda^{n-1} + \cdots + a_n = 0,$$

Where the coefficients a_i, $i = 0,1, \ldots, n$ are all real.

Assuming aj = 0 for j> n, we require conditions on the coefficients such that the zeros of P (λ) have R (λ) <0. The necessary and sufficient conditions for this to be true are:

$$D_1 := a_1 > 0,$$

$$D_2 := \begin{vmatrix} a_1 & a_3 \\ 1 & a_2 \end{vmatrix} > 0,$$

$$D_3 := \begin{vmatrix} a_1 & a_3 & a_5 \\ 1 & a_2 & a_4 \\ 0 & a_1 & a_3 \end{vmatrix} > 0,$$

$$D_k := \begin{vmatrix} a_1 & a_3 & \cdot & \cdot & \cdot & \cdot \\ 1 & a_2 & a_4 & \cdot & \cdot & \cdot \\ 0 & a_1 & a_3 & \cdot & \cdot & \cdot \\ 0 & 1 & a_2 & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ 0 & 0 & \cdot & \cdot & \cdot & a_k \end{vmatrix} > 0, \quad k = 1,2,\ldots,n$$

For the case of a cubic equation

$$\lambda + c_1\lambda^2 + c_2\lambda + c_3 = 0 \qquad (17)$$

With real coefficients c_1, c_2, c_3 the conditions to $\Re(\lambda) < 0$ are:
$c_1 > 0$, $c_3 > 0$, $c_1 c_2 - c_3 > 0$.

Thus in our case the balance (Y^*, K^*, R^*) is locally asymptotically stable if and only if

$$a_1 + b_1 > 0, a_0 + b_0 > 0 \quad \text{y} \quad (a_2 + b_2)(a_1 + b_1) - (a_0 + b_0) > 0 \qquad (18)$$

For $\tau > 0$ case we will determine conditions so that $\lambda = i\omega$ is a root of the characteristic equation, ie, that present the possibility of a Hopf bifurcation [6]. It replaces the previous value of λ is the characteristic equation (15) we have:

$$\begin{aligned} \Delta(i\omega, \tau) &= -\omega^3 i - a_2\omega^2 + a_1\omega i + a_0 \\ &\quad + (-b_2\omega^2 + b_1\omega i + b_0)e^{-i\omega\tau} \\ &= -\omega^3 i - a_2\omega^2 + a_1\omega i + a_0 \\ &\quad + (-b_2\omega^2 + b_1\omega i \\ &\quad + b_0)(\cos(\omega\tau) - isen(\omega\tau)) \end{aligned}$$

And separating the above equation we obtain real and imaginary part, respectively, the following equations:

$$-\omega^2 a_2 + a_0 = (\omega^2 b_2 - b_0)\cos(\omega\tau) - b_1\omega sen(\omega\tau) \qquad (19)$$

$$-\omega^3 + a_1\omega = -b_1\omega\cos(\omega\tau) + (-\omega^2 b_2 + b_0)sen(\omega\tau) \quad (20)$$

To remove the trigonometric functions we raise both sides of (19) and (20) the square and add, after algebraic simplifications we obtain the following equation for ω:

$$\omega^6 + A_1\omega^4 + B_1\omega^2 + C_1 = 0, \quad (21)$$

Where

$$A_1 = a_2^2 - 2a_1 - b_2^2,$$
$$B_1 = a_1^2 - 2a_0 a_2 + 2b_0 b_2 - b_1^2,$$
$$C_1 = a_0^2 - b_0^2$$

Taking $z = \omega^2$ we can write the above equation as an equation of third degree, $z^3 + A_1 z^2 + B_1 z + C_1 = 0$.

Thus to find a root $\lambda = i\omega$ seek the positive characteristic equation from the above equation solutions so that $\omega = \sqrt{z}$. Note too $\lambda = -i\omega$, the conjugate of the anterior root is a root of the characteristic equation.

 Lemma 1.

Considering $D = A_1^2 B_1^2 - 4B_1^3 - 4A_1^3 C_1 - 27C_1^2 + 18A_1 B_1 C_1$, the discriminant of the above equation, the roots of equation (21) satisfy:

Number of positive solutions
Conditions

(i)	0	$A_1 > 0, B_1 > 0, C_1 > 0, A_1 B_1 - C_1 > 0$
(ii)	1	$C_1 < 0$, y $(B_1 \leq 0$ o $A_1 \geq 0)$ o $C_1 < 0, B_1 > 0, A_1 < 0, D_1 > 0$ o $C_1 = 0, B_1 < 0$ o

(iii)	2	$C_1 = 0, B_1 = 0, A_1 < 0$ $C_1 > 0, B_1 < 0$ o $A_1 < 0, D_1 \leq 0$ o $C_1 = 0, B_1 > 0, A_1 < 0$
(iv)	3	$C_1 < 0, B_1 > 0, A_1 < 0, D_1 \leq 0$

In case (i) when there are no positive solutions of the cubic equation, then the equation (21) can not have a real root $z = \sqrt{\omega}$, so by Rouche's theorem [6] the number of roots with positive real part is unchanged. Thus in this case the solution is stable equilibrium when (18) is satisfied.

In cases (ii) - (iv) can be found $\omega = \sqrt{z}$ real, in a way that $\lambda = \pm i\omega$ root of the characteristic equation (15), then you retaking the system (19) - (20) we can multiply equation (19) by $b_0 - \omega^2 b_2$, (20) by $b_1\omega^2$ adding the equations and eliminate the trigonometric function sin (ωτ) and solve cos (ωτ) obtaining:

$$\cos(\omega\tau)$$
$$= \frac{\omega^4(b_1 - a_2 b_2) + \omega^2(a_2 b_0 + a_0 b_2 - a_1 b_1) - a_0 b_0}{(b_1\omega)^2 + (b_0 - b_2\omega^2)^2}, \quad (22)$$

Whereas ω ^ * as given by Lemma 1 root clearance τ we obtain the value of parameter τ where a pair of conjugate pure imaginary roots occur:

$$(23)$$
$$\tau^*$$
$$= \frac{1}{\omega^*}\arccos\left(\frac{(\omega^*)^4(b_1 - a_2 b_2) + (\omega^*)^2(a_2 b_0 + a_0 b_2 - a_1 b_1) - a_0 b_0}{(b_1\omega)^2 + (b_0 - b_2(\omega^*)^2)^2}\right).$$

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There is more than one value of $\tau ^ *$ due to the periodicity of the cosine function and the possible existence of 2 or 3 values $\omega ^ *$ (cases (iii) and (iv) of Lemma 1). Of these values $\tau ^ *$ take the smallest positive value. For other values of $\tau ^ *$ there may be other exchange of stability depending on the direction in which it again crosses the imaginary axis in each of these values of $\tau ^ *$. Note that in the above expression is first necessary to set the parameters of the system (11), except for τ, to have $\omega ^ * ^ *$ and τ associated to the pair of imaginary roots. Henceforth $\tau ^ *$ be the smallest positive value given by (23) and $\omega ^ *$ root (21) from which it comes.

Now, to establish the Hopf bifurcation at $\tau = \tau ^ *$, we need to show that the imaginary axis from left to right cross. To do this it is determined whether $d\Re(\lambda(\tau))/d\tau|_{\tau=\tau^*} > 0$, that is, the derivative of the real part of the root $\lambda(\tau)$ of the characteristic equation in $\tau ^ *$ evaluated is positive. Then (15) Differentiating with respect to τ we have:

$$(3\lambda^2 + 2a_2\lambda + a_1)\frac{d\lambda}{d\tau}$$
$$+ \left(-\tau e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)\right)\frac{d\lambda}{d\tau}$$
$$- \lambda e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)$$
$$+ e^{-\lambda\tau}(2b_2\lambda + b_1)\frac{d\lambda}{d\tau} = 0$$

Clearing $d\lambda/d\tau$ we have $\frac{d\lambda}{d\tau} = \frac{\lambda e^{-\lambda\tau}(b_2\lambda^2+b_1\lambda+b_0)}{3\lambda^2+2a_2\lambda+a_1-\tau e^{-\lambda\tau}(b_2\lambda^2+b_1\lambda+b_0)+e^{-\lambda\tau}(2b_2\lambda+b_1)}$

esto da:

$$\left(\frac{d\lambda}{d\tau}\right)^{-1}$$
$$= \frac{3\lambda^2 + 2a_2\lambda + a_1 - \tau e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0) + e^{-\lambda\tau}(2b_2\lambda + b_1)}{\lambda e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)}$$

$$= \frac{3\lambda^2 + 2a_2\lambda + a_1 + e^{-\lambda\tau}(2b_2\lambda + b_1)}{\lambda e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)} - \frac{\tau}{\lambda}$$

$$= \frac{3\lambda^3 + 2a_2\lambda^2 + a_1\lambda + e^{-\lambda\tau}(2b_2\lambda^2 + b_1\lambda)}{\lambda^2 e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)} - \frac{\tau}{\lambda}$$

$$= \frac{2\lambda^3 + a_2\lambda^2 - e^{-\lambda\tau}b_2\lambda^2 + \lambda^3 + a_2\lambda^2 + a_1\lambda - e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda)}{\lambda^2 e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)} - \frac{\tau}{\lambda}$$

$$= \frac{2\lambda^3 + a_2\lambda^2 - e^{-\lambda\tau}b_2\lambda^2 - a_0 - e^{-\lambda\tau}b_0}{\lambda^2 e^{-\lambda\tau}(b_2\lambda^2 + b_1\lambda + b_0)} - \frac{\tau}{\lambda}$$

$$= \frac{2\lambda^3 + a_2\lambda^2 - a_0}{-\lambda^2(\lambda^3 + a_2\lambda^2 + a_1\lambda + a_0)} + \frac{b_2\lambda^2 - b_0}{\lambda^2(b_2\lambda^2 + b_1\lambda + b_0)} - \frac{\tau}{\lambda}$$

Note that we use the equation (15) in various equalities. Now we find the sign or direction of the real part, equation (15) back to help simplify some expressions:

$$signo\left\{\frac{d\Re(\lambda(\tau))}{d\tau}\right\}\bigg|_{\lambda=i\omega^*} = signo\left\{\Re\left(\frac{d\lambda}{d\tau}\right)^{-1}\right\}\bigg|_{\lambda=i\omega^*}$$

$$= signo\left\{ \Re\left[\frac{2\lambda^3 + a_2\lambda^2 - a_0}{-\lambda^2(\lambda^3 + a_2\lambda^2 + a_1\lambda + a_0)}\right]_{\lambda=i\omega^*} + \Re\left[\frac{b_2\lambda^2 - b_0}{\lambda^2(b_2\lambda^2 + b_1\lambda + b_0)}\right]_{\lambda=i\omega^*} - \Re\left[\frac{\tau}{\lambda}\right]_{\lambda=i\omega^*} \right\}$$

$$= signo\left\{ \Re\left[\frac{-2i(\omega^*)^3 - a_2(\omega^*)^2 - a_0}{(\omega^*)^2(-\omega^3 i - a_2(\omega^*)^2 + a_1\omega^* i + a_0)}\right] + \Re\left[\frac{-b_2(\omega^*)^2 - b_0}{-(\omega^*)^2(-b_2(\omega^*)^2 + b_1\omega^* i + b_0)}\right] \right\}$$

In the next step we consider the real part of the above equality, note that τ / λ is purely imaginary, obtaining:

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$$= signo \left\{ \frac{2(\omega^*)^6 + (a_2^2 - 2a_1)(\omega^*)^4 - a_0^2}{(\omega^*)^2[(a_2(\omega^*)^2 - a_0)^2 + ((\omega^*)^3 - a_1\omega^*)^2]} + \frac{b_0^2 - b_2^2(\omega^*)^4}{(\omega^*)^2[(b_0 - b_2(\omega^*)^2)^2 + (b_1\omega^*)^2]} \right\}$$

The denominators of the above fractions are equal, this can be seen in the system (19) - (20) which can raise both sides to the square and we add equality mentioned:

$$= signo \left\{ \frac{2(\omega^*)^6 + (a_2^2 - 2a_1 - b_2^2)(\omega^*)^4 + b_0^2 - a_0^2}{(\omega^*)^2[(a_2(\omega^*)^2 - a_0)^2 + ((\omega^*)^3 - a_1\omega^*)^2]} \right\}$$

Substituting

$b_0^2 - a_0^2$ the equation (21) and simplifying we have:

$$= signo \left\{ \frac{3(\omega^*)^4 + 2(a_2^2 - 2a_1 - b_2^2)(\omega^*)^2 + (a_1^2 - 2a_2a_0 + 2b_2b_0 - b_1^2)}{[(a_2(\omega^*)^2 - a_0)^2 + ((\omega^*)^3 - a_1\omega^*)^2]} \right\}$$

$(a_2(\omega^*)^2 - a_0)^2 + ((\omega^*)^3 - a_1\omega^*)^2$ is positive, a Hopf bifurcation if present:

Based on the above we can establish the following:

$$3(\omega^*)^4 + 2(a_2^2 - 2a_1 - b_2^2)(\omega^*)^2 + a_1^2 \quad (24)$$
$$- 2a_2a_0 + 2b_0b_2 - b_1^2 > 0.$$

Theorem 1

If condition (18), the equilibrium point (Y ^ *, K ^ *, R *) is satisfied is locally asymptotically stable when $\tau = 0$. So is whether further fulfills the first condition of Lemma 1 when $\tau > 0$.

Theorem 2

Suppose that satisfies (18) and one of the last three conditions of Lemma 1, as ω ^ * ^ * roots and τ the delay value associated with this result given in (23). Intone a Hopf bifurcation occurs if (24) is satisface.

Observation: Also you can have a Hopf bifurcation at $\tau = \tau^*$ when the characteristic equation $\tau = 0$ has exactly 2 roots with positive real part (equilibrium point (Y ^ *, K ^ *, R *) unstable) and $d\Re(\lambda(\tau))/d\tau|_{\tau=\tau^*} < 0$, es decir, (24) and satisfy with "<" instead of ">".
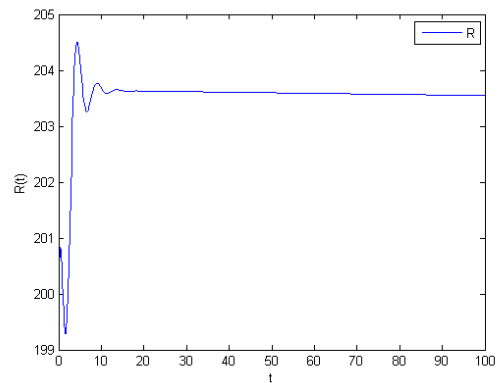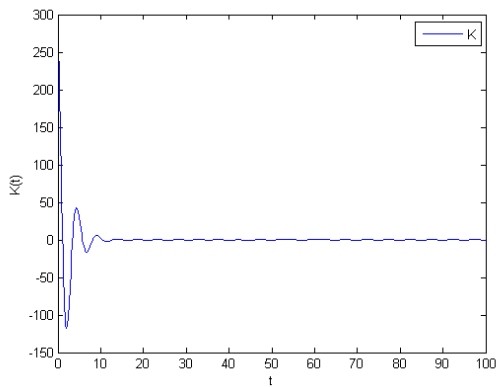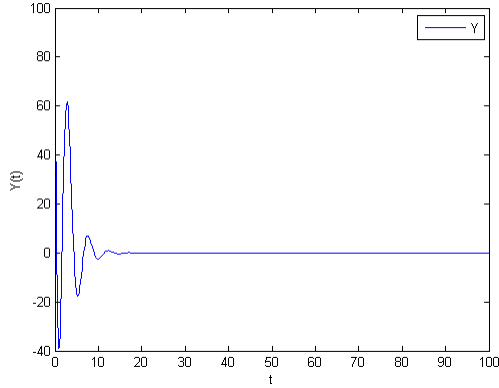
Numerical simulations

In this section we present some numerical simulations for certain fixed parameter values to illustrate the change in stability of the system (11) depending on the value of retardoτ. For our simulations we consider the following values for the parameters:
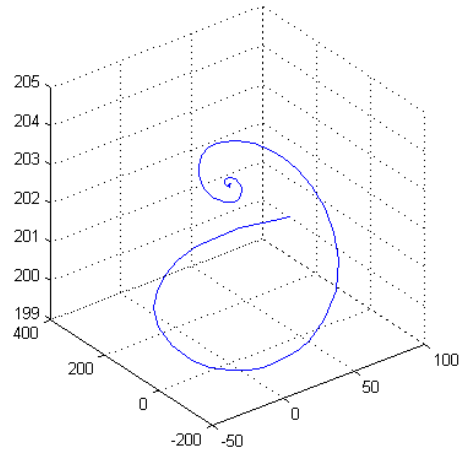
Parameter	Value
α	1
A	0.01
a	1
b	0.5
c	0.9
s	1
δ	0.1
β	1
γ	0.5
h	0.2
R̃	0.0001
M	200

To consider the delay values $\tau = 1.3$ to illustrate the stability and instability first value with the second.

The above graphs illustrate the stability of the system (11), taking as delay value $\tau = 1$.

The first three illustrate the dynamics of Y (t), K (t) and R (t), and the latter reflects the type attractor behavior of the equilibrium point.

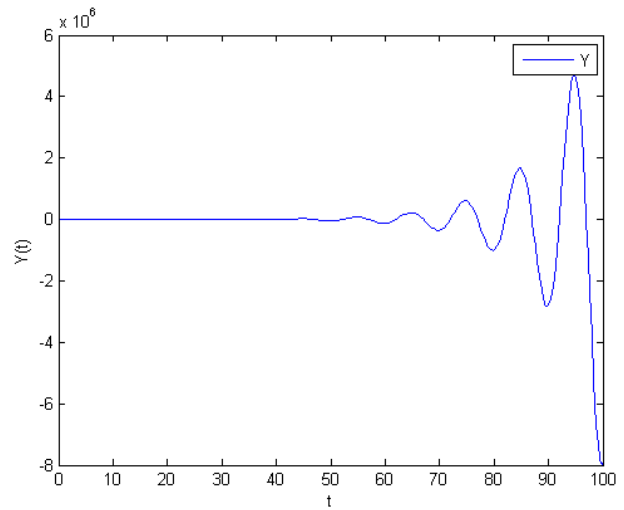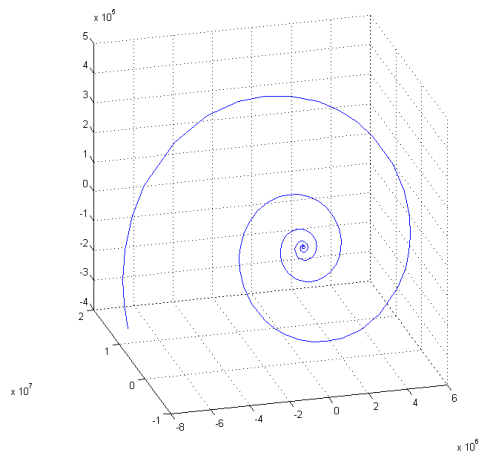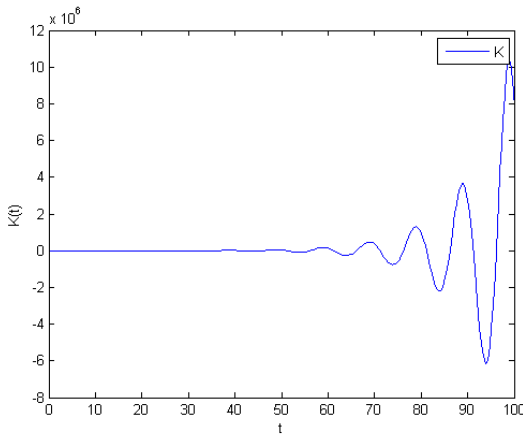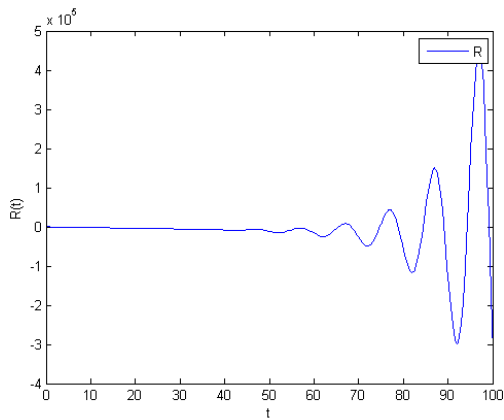The above graphs illustrate the loss of stability of the system (11), taking as delay value $\tau = 3$.

Graphic 2

Graphic 1

The first three illustrate the dynamics of Y (t), K (t) and R (t), and the latter reflects the behavior type repeller breakeven.

Conclusions

In this paper we focus on the analysis of mathematical way, we established conditions to ensure stability of the equilibrium change according to the delay and the occurrence of a Hopf bifurcation. In the numerical simulations we can see the loss of stability of the equilibrium to increase the value of retard possible future work can study the model

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The twin deficits of the United States, a comparison of two periods (1981-1988, 2001-2008)

GUADALUPE– Carmen†* &PADILLA- Felipe

Universidad de Metropolitana, Calz del Hueso 1100, Villa Quietud, Coyoacán, 04960 Ciudad de México, Distrito Federal, México

The aim of this paper is to analyze the twin deficits in the United States and compared in two periods 1981-1988 and 2001-2008, in order to demonstrate that the twin deficits there is a correlation between the budget deficit and the deficit in the balance current account. The result is that in these periods, we verify this correlation. The budget deficit stems from an increase in defense spending while the deficit of current account stems from an increase in investment and household consumption. The deficit of current account is financed through global savings derived from the surpluses of this scale in countries such as Germany, China and Japan.

Twin deficits, budget deficit, deficit of current account.

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*Correspondence to Author (email:g_hernandez_@hotmail.com)
† Researcher contributing first author

Introduction

Given the transcendence, which carries the budget deficit and the deficit of current account balance for the U.S. economy, both are analyzed in order to study what is known as twin deficits. Where the budget deficit is analyzed when it starts the beginning of the fiscal cycle from September to August each year, in August is when it becomes relevant for its political and economic aspects. The deficit in the current account balance becomes important for competitiveness posed to the U.S. economy relative to other economies.

Both deficits in the periods 1981-1988 and 2001-2008 have been linked simultaneously gaining importance and relevance for their economic implications, being part of the political discourse and initiatives to find a solution to them. Therefore, the hypothesis of this paper is that the twin deficits there are a correlation in the budget deficit and the current account deficit.

The structure of the paper is as follows. Prime ro the theoretical framework is established and the first twin deficits period, 1981-1988 is analyzed. After opening and budget surplus, 1993-2000 is studied. The second period of twins, 2001-2008 deficit is then reviewed, and finally the conclusions.

Theoretical framework and the twin deficits first period, 1981-1988

In recent years discussions on macroeconomic policy has focused on current account deficits experienced by many countries, including the United States with a deficit of 5% of GDP and China with a surplus of almost 3% of GDP.

Policy makers, analysts and academics have focused on the international adjustment process, and discussed the process by which the correction of these imbalances affect the exchange rate, job creation and economic growth (Edwards, 2004) . Hence the importance of analyzing the current deficit account.

In the case of the U.S. economy, it is currently undergoing a deficit in the current account balance plus a budget deficit, which is called twin deficits. But this is not a recent events, dating back to the eighties, when the emerging so-called twin deficits, under President Ronald Reagan.

To establish the theoretical framework of an open economy in which the accounting identity on savings and investment is:

$$Y = C + I * G * XN \qquad (1)$$

Where Y=National Income

C= Consume

I= Investment

G=Government spending

XN= Net exports

If consumption and government spending on the right side of equation (1) is passed, it is the following equation:

$$Y - C - G = I + XN \qquad (2)$$

Where $Y - C - G = S$ \qquad (3)

Substituting S (national savings) in equation 2 we have:

$$S = I + XN \qquad (4)$$

Equation 4 indicates that in equilibrium national saving equals investment plus net exports. Rewriting equation (4) gives:

$$S - I = XN \qquad (5)$$

This equation indicates that a deficit in the current account balance must be matched by an excess of investment over domestic savings, or insufficient saving relative to investment.

Rewriting the above identity is that:

$$S_{private} + S_{public} - I = XN \qquad (6)$$

Donde $S_{private}$ = Private save

S_{public} = Public Save

This identity clearly indicates how a budget deficit may lead to a deficit in the current account balance. If government saving decreases as a result of a budget deficit, the remaining variables of identity, can behave as follows: private savings should increase to offset public savings, or investment must fall, or the external deficit increases.

However, the world's imbalances, particularly for the U.S. economy is never satisfied. In the specific case of the U.S. economy investment exceeds savings (see Graphic 1).

Economic theory states that the decline in saving is due to a decline in public savings as a result of an increase in the budget deficit.

They coupled with high budget deficits high interest rates were recorded, which led rigged large volumes of money that caused the appreciation of the dollar (Aguado, 2008: 7).

When saving decreases recorded a higher budget deficit and the result is a decline in investment, or net exports, or both. In the case of the U.S. economy has increased investment and household consumption which has pushed foreign savings decreased and increased external deficit (Dehesa: 2003). Foreign savings has declined. In 1999-2004, was recorded a figure of 16.6% relative to GDP, while in 2010 it was 11.6%. Note that this increased investment is used for productive purposes, which become profitable projects and benefited the economy.

Savings and investments to GDP, the United States, 1997-2010 (percentages)
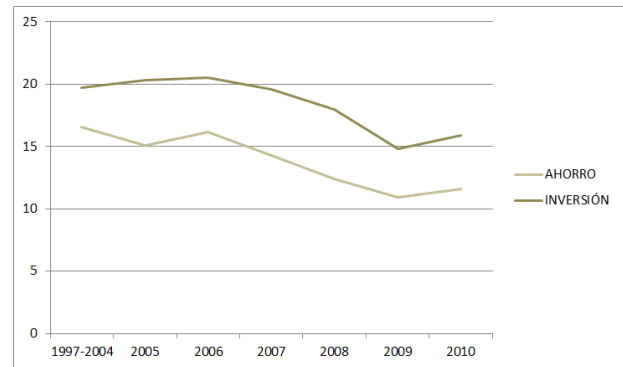
Graphic 1

Source: Own calculations based on statistics from the IMF, World Economic Outlook, April 2011.

At the time of Ronald Reagan (1981-1988), taxes were lowered, causing tax revenues to GDP spend of 19.6% in 1981 to 18.1% in 1988, while increased spending on defense military at 1.5 million, leading to a budget deficit of just over 3% in that period.

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Specifically, defense spending increased by 1.9-fold from 1981 to 1989 of 157.513 to 303,555,000 dollars, respectively. In addition to the increase in defense spending, payment of the services of the public debt increased, moving from 32% in 1980 to 40% by 1984 and 50% in 1988 as a proportion of GDP. This shows that a factor of the increase in debt was military invasions and wars that began in the Reagan era, why defense spending increased. Ie, lower taxes and increased spending produced the largest budget deficits in the post war period (Frankel, 2004).

Note that in such a government, in this type of economy, was called a "voodoo economics" (DeLong, 2004, Krugman, 2003) in which the reduction of tax is based on two propositions that little or nulamente have been verified by empirical evidence. These propositions are: a) The Laffer curve in which a reduction in tax rates would end up producing an increase in tax revenues and thus a removal of the fiscal deficit, and b) The Ricardian Equivalence Theory which proposes that the emergence of a deficit would not necessarily imply a decline in national saving in a country, it could be that the private sector will compensate by saving more, so the "crowdingout" effect on investment disappear (Aguado, 2007). As we have seen in the period of the Reagan tax cuts did not lead to an increase in tax revenue, involves the Laffer curve, but they decreased, demonstrating that in this case, do not check the proposition that curve.

Returning to the analysis of the increase in defense spending, it appears that the United States went from being the largest creditor of the world, in 1980 recorded a creditor position of 14% relative to GDP, the largest debtor in 1990 showed a debit position -7% of GDP.

Defense spending in the period 1981-1990, growing at an average annual rate of 38.85%, increasing defense spending from year to year (see Graphic 2).

Defense spending of the United States, 1981-1990 (millions of dollars)
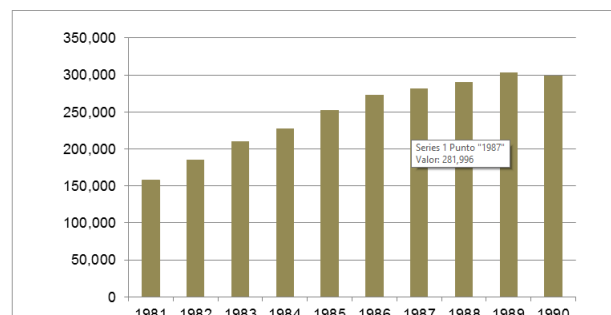
Graphic 2

Source: Own calculations based on statistics from the Bureau of Economic

On trade, protectionism intensified because Japanese products were more efficient than the Americans and increased tariffs twice. (Chomsky, 2010: 261-262). Also a restrictive monetary policy imposed at that time by the chairman of the Federal Reserve Paul Volcker was implanted.

The budget deficit and the deficit in the current account balance for the period 1981-1990 show figures ranging from 70.000 to 220.000 million in connection with the budget deficit and 5.000 to 100.000 million dollars from the deficit of current account, which shows that they are correlated. That is, the budget deficit causes a decrease in public saving, to keep the identity (6), private savings should increase or decrease investment.

However, what happened is that the private savings declined, it increased from 10.3% in the period 1981-1984 to 8.6% in the period 1985-1988; and investment increase, moving from 8.2% to 8.6% from one period to another, which led to a deficit in the current account balance (see Graphic 3). Recall that a deficit in the current account balance is counterbalanced by an excess of investment over domestic savings, or insufficient saving relative to investment.

Twin deficits of the United States, 1981-1990 (millions of dollars)

Graphic 3

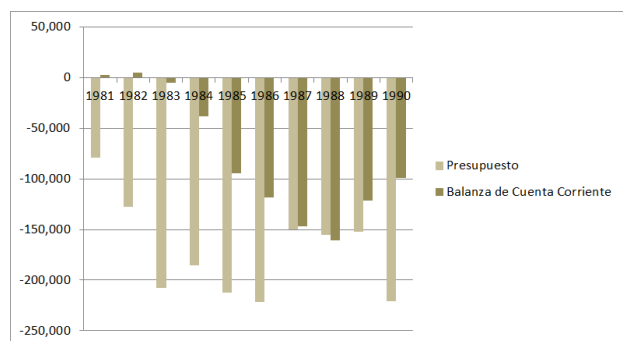Source: Own calculations based on statistics from the IMF, World Economic Outlook, April 2011.

Opening and budget surplus, 1993-2000

Due to the budget deficit in 1990 recorded a figure of 3% to GDP budget laws were developed in 1990 and 1993 in the administrations of George HW Bush and Bill Clinton, which consisted of limiting spending and raise taxes on incomes over high (Samuelson, 1999: 636-637). In the presidency of George HW Bush increased taxes on some luxury items (Aguado, 2008: 4). While under President Bill Clinton (1993-2001) increased taxes to higher-income families and defense spending declined.

As a result of this policy, Clinton had taken the economy with a budget deficit of 3.3%, obtained a budget surplus of 1.2% during the last four years of his government, which was transferred to the retirement of pensioners, the generation of so-called 'baby boomers'.

However, in the period 1993-2001, was recorded a deficit on current account, the increase in trade openness, which is derived from the implementation under President Clinton from a firm belief in the benefits of trade liberalization. Hence the Clinton presidency, begin with the signing of the Free Trade Agreement (NAFTA) and China's accession to the World Trade Organization (WTO), events that affected an increase in its rate trade liberalization in 4% and contributed to its economic growth.

It is noteworthy that the external deficit is not due to a budget deficit because in the last four years of the Clinton administration a budget surplus was recorded, while in his entire government deficit of the current account balance is observed. For example in 2000 the budget surplus was 230, 000 million dollars and the external deficit of 405,000 million. (Dehesa: 2003), which shows no correlation between the budget deficit and the deficit in the current account balance for the period 1998-2001 (see chart 4).

It is very important to note that the budget surplus is the result of a decrease in defense spending, because the U.S. did not make, in this period, new military interventions nations of the world.

In addition to the fall of the Berlin Wall and the consequent end of the Cold War helped to reduce defense spending. During the Clinton defense spending increased only 1.04 times, remaining stable from 1995 to 1999 (see Figure 5).

Twin deficits of the United States, 1993-2001 (millions of dollars)
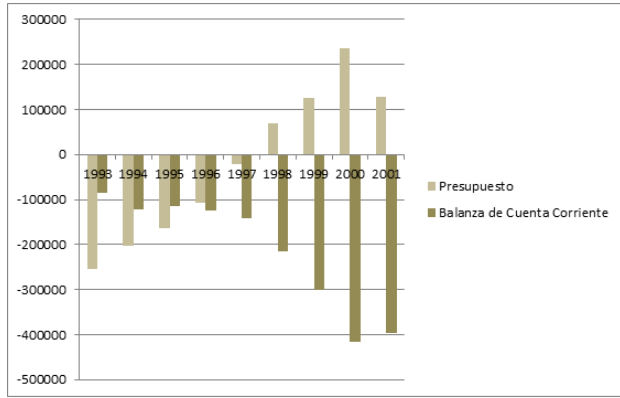
Graphic 4

Source: Own calculations based on statistics from the Bureau of Economic Analysis.

Raising taxes along with reducing defense spending and strong economic growth and the boom in the stock market led to the end of the period of fiscal deficits and the beginning of a brief period of fiscal surpluses, the last four years of the Clinton presidency. Other successes of the Clinton economic management are: a) An increase in employment rose from 109.5 to 131.9 million jobs from 1993 to 2000, as a result of economic growth averaged 4% in that period, b) budget balance transited from -255 to 236 million dollars from 1993 to 2000, c) The rate of investment to GDP rose 4% from 17.5% to 21.5% during this period.

Successes explained by low oil prices until 1999 and the appreciation of the dollar from 1995, which together with the incipient deflation in some key countries, such as Japan made it easier to contain inflation in The United States, as well as the right mix of economic policy consisting of a contractionary fiscal policy associated with an expansionary monetary policy, which was possible due to the low rates of inflation recorded The United States, which were carried out by the Federal Reserve.

Defense spending of the United States, 1991-2000 (millions of dollars)
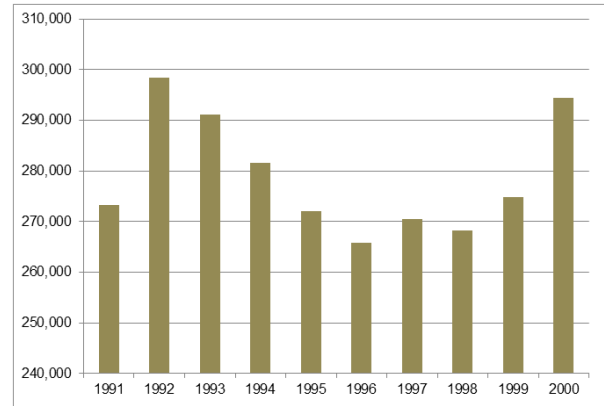
Graphic 5

Source: Own calculations based on statistics from the Bureau of Economic Analysis.

The second period of the twin deficits, 2001-2008

In the era of George W. Bush (2001-2008), a budget deficit, due in part to his campaign promises of lower taxes, for which he signed several laws fiscal reforms to reduce them (Mankiw was recorded, 2009: 592-593);

Moreover the fall of the twin towers in September 2001, sparking military invasion of Afghanistan and Iraq and a recession that led to an increase in spending.

It should be noted that the budget deficit in the Bush administration is mainly due to the increased costs of national defense and social security expenses and specific social program called Medicare. Invasions of the United States in both Afghanistan and Iraq led to an increase in spending increases on defense ("national security"), with the consequent return of the economy 'Voodoo'. That is, a key factor is the budget deficit increased yoy in defense spending (see Graphic 6).

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This has caused Americans to save less and spend more, which has influenced deficit incurred in the current account balance, which went from 2.9% in 1997-2000 to 4.1% in 2001-2004.

While the United States has saved less, the countries that have saved are the countries of Asia including China (Mankiw: 2009: 726-727).

Defense spending of the United States, 2001-2010 (millions of dollars)
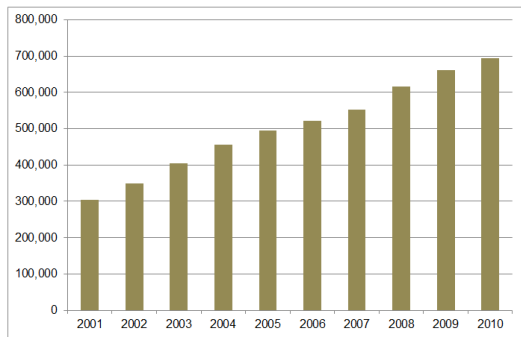
Graphic 6

Source: Own calculations based on statistics from the Bureau of Economic Analysis.

The economic logic is that if a country has a deficit, another nation has to have a surplus, which must be sought in the trading partners of the United States such as China, Japan and German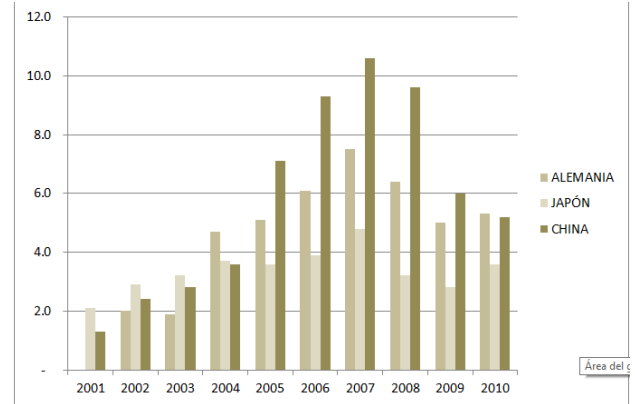y as well as in the oil-exporting countries due to high oil prices that occurred in the past decade. In Graph 7 the trade surplus seen Germany, Japan and China in the period 2001-2010 is shown.

Current account balance to GDP, 2001-2010

Graphic 7

Source: Own calculations based on statistics to the IMF, World Economic Outlook, April 2011.

Economist Ben Bernanke (Chairman of the Federal Reserve since 2006) uses the term "Global Savings Glut" to refer to global savings has been generated as a result of the surplus in the current account balance in different countries. This saving has financed the current account deficit of the United States, because Asian central banks, especially China, have bought Treasuries United States. However, this willingness of central banks can change the depreciation of the dollar, causing losses to the countries that buy these bonds at low interest rates granted by the United States or to the loss of interest of these countries to maintain fixation system of the Chinese currency to the dollar. Consequently, the United States is in a very vulnerable situation because its deficit of current account went from 3.9% in 2001 to 6% in 2006 and then placed in 5% by 2008. Coupled with the budget deficit recorded a figure of 1.9% in 2001 to 3.5% in 2008, so it shows that both deficits are correlated, ie twins (see Graphic 8).

Twins deficit of the United States relative to GDP, 2000-2010 (percent)
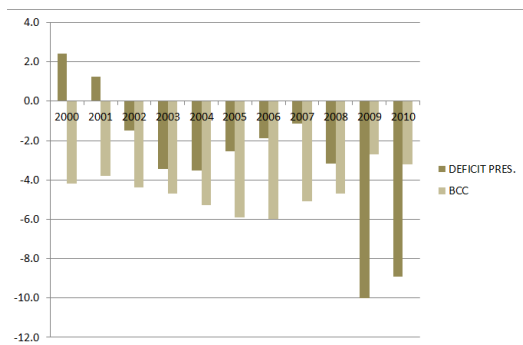
Graphic 8

Source: Own calculations based on statistics from the Bureau of Economic Analysis.

Conclusions

This research examines the twin deficits in the U.S., in order to check the correlation between the budget deficit and the deficit in the current account balance for the period 1981-1988 and 2001-2008.

This is part of a theoretical framework based on the identity-S_público S_privado + I = XN, from which evidence of twin deficits sample is obtained in those periods a correlation between the budget deficit and the deficit account current, which is explained in terms of which to register a budget deficit, public saving fell, which coupled with a decline in private saving and an increase in investment, led to a deficit in the current account balance. Verifying the fact that a deficit in current account occurs when an investment exceeds domestic savings or a level of national saving is less than investment.

The budget deficit in the periods 1981-1988 and 2001-2008 is explained by an increase in defense spending coupled with tax cuts resulting in a decrease in tax revenue.

This correlation between the budget deficit and the deficit in the current account balance, has an exception that is the last four years of the Clinton administration, 1998-2001, in which a budget surplus and a deficit is observed in the balance of trading account at the same time. The first is explained by a decrease in defense spending, because they did not take out new military invasions and the fall of the Berlin Wall and the end of the Cold War.

The second by an increase in investment and consumption of American families that causes a decline in foreign savings. This despite the fact that during the Clinton administration increased the rate of 4% in opening trade following the signing of NAFTA and China's entry to the WTO.

In all cases the deficit in the current account balance is funded through the global savings derived from surpluses in its balance of countries like Germany, China and Japan, among others, who buy Treasuries United States. Which leads to the U.S. economy as the main problem has scarce savings that comes from excessive consumption of households and the public sector, so it is best policy to decrease public spending, increasing savings public and increase tax revenues to increase private savings and reduce consumption within the country and increase consumption in the world, as some measures to correct the external deficit.

Guadalupe C. Padilla F. The twin deficits of the United States, a comparison of two periods (1981-1988, 2001-2008). ECORFAN Journal-Mexico 2012, 3-6: 486-494

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ADMINISTRATION

Statistical and econometric techniques for employment in the informal sector in Mexico

FERNÁNDEZ- Oscar*

Universidad Instituto Politécnico Nacional, Av Juan de Dios Bátiz S/N, Gustavo A. Madero, Residencial La Escalera, 07738 Ciudad de México, Distrito Federal, México

A set of statistical and econometric techniques is applied in order to know if there is relationship between variables that are considered implied with the informal sector. Relation of the Occupation in the Informal Sector with the Gross Domestic Product and the Index of Human Development are analyzed. Also it is investigated if there are statistically significant differences in the proportion of men and women who work in the informal sector. is also analyzed the relation that exists between the age of people and the rate of participation in informal economy, on the one hand the adolescents and young people from 14 to 19 years and by another one adults majors of 60 years; both ends of the labor pyramid are related with respect to the adults in primary labor age: people aged 30 to 39 years. It is also analyzed how much "urban", is the Urban Informal Sector.

Informal Sector, tests of hypothesis, linear regression.

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*Correspondence to Author (email: *oscar.fernandez@inegi.org.mx)
† Researcher contributing first author.

Introduction

From the second half of the past century, the growth of countries developing was accompanied by increased micro unregistered owned by households, over time was coining the term "informal sector" to refer to these micro. Mexico is not exempt from this phenomenon, an important fraction of the economically active population works in this sector. The National Institute of Statistics and Geography (INEGI 2004) emphasizes that those employed in the informal sector represent more than a quarter of total employment in the country.

The growth of the informal sector in the world, has led to institutions such as the International Labour Organization (ILO), the United Nations (UN), and many others, have dedicated resources and research efforts in order to meet adequately the situation of this sector. As a result international recommendations have been issued to allow progress in understanding the informal sector and the generation of statistical information on the same; has also been improving the international comparability of the figures, to the extent that different countries in this sector generate statistics based on international recommendations.

Defining the informal sector

For the purpose of proposing a solid foundation of scientific conceptual, presented here the definition of informal sector established by the ILO (1993) at the XV International Conference of Labour Statisticians (ICLS XV) and the UN in the SNA 93 (UN et, al 2000).

This methodological conceptualization is a key aspect of this research and in particular the quantification and study of employment in the informal sector.

Extract from the resolution adopted on January 28, 1993, by the XV International Conference of Labour Statisticians (ICLS XV), convened by the International Labour Organisation

Concept: The informal sector may be broadly characterized as consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons involved in such activity. These units typically operate at a small scale, with a rudimentary organization in which there is little or no division between labor and capital as factors of production. Labour relations-where they exist - are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees.

Production units of the informal sector have the characteristic features of household enterprises. Fixed assets and other securities not belong to the company itself, but to their owners. The units as such can not engage in transactions or enter into contracts with other units, nor incur obligations in its name. The owners have to raise the necessary funds on their own risk and are personally liable, without limit, for any debts or obligations contracted in the production process.

In many cases, it is impossible to clearly distinguish between the portions of expenses allocable to production activities of the company and simply corresponds to the normal household expenses also certain goods, such as buildings or vehicles may be used interchangeably for commercial purposes and for personal home use.

The activities carried out by the production units of the informal sector are not made with the deliberate intention of avoiding payment of taxes or social security contributions, or infringing labor legislation and other legal provisions or certain requirements and administrative procedures. Thus, the concept of informal sector activities should be differentiated from hidden or subterránea. Inside the economy of the household sector, the informal sector comprises: i) "informal business people who are self-employed," and ii) an additional component consisting of "enterprises of informal employers." Informal sector is defined irrespective of the workplace where it is carried out productive activity, the degree of utilization of fixed capital assets, the duration of the activity enterprise (perennial, seasonal or occasional) and the fact that the case of the main activity or a sideline of owner households empresa.Empresas: According to the System of National Accounts of the United Nations, business households (ie, firms that belong to households that are unincorporated).

They differ from corporations and quasi-corporations based on the legal organization of the units and the type of accounting they carry.

Household enterprises are units engaged in the production of goods or the provision of services that do not constitute a separate legal entity from the home owner or the members thereof, and no complete sets of accounts (including balance sheets of assets and liabilities) to allow a clear distinction between the production activities of the company and the other activities of their owners, as well as income flows and capital between the company and the owners. Companies households include unincorporated enterprises owned and operation are controlled by one or more members of a household.

Studies in Mexico on the informal sector in Mexico and purpose of this work

In the case of Mexico there have been several efforts to understand the situation of the informal sector and have made significant advances. The informal subsector of households in Mexico generates approximately 12% gross (INEGI, 2004A; INEGI 2006) Domestic Product, and occupies more than a quarter of the economically active population. Of all those employed in manufacturing in Mexico 34% are informal; on the other hand informal microenterprises building occupy 67% of all employed in construction in the country; A very large proportion of those employed in trade (42%) and personal services (16%) do so in the field of informality.

It follows from the urgent need to continue research on the Informal Sector, that factor in determining the occupation of manufacturing and construction and services in Mexico.

ADMINISTRATION

Work in the informal sector is characterized by low productivity, precarious and low living standards. Required to develop public policies and programs for this population improve their welfare and working condition. This research aims to contribute to this knowledge, to this end different empirical analysis with data obtained from surveys of employment and population censuses are conducted in Mexico, and the results offered by the System of National Accounts, and information published by UN agencies related to economic development and analyze social.Se is used, inter alia, the relationship between the evolution of gross domestic product (GDP) compared to the rate Industry Occupation Informal (Tosi); also studied the functional link between the Human Development Index (HDI) and the informality rate for each of the entities of the Republic. Moreover, it is investigated whether there were significant differences in the proportions of men and women working in the informal sector. Also, is analyzed the relationship between age of individuals and the rate of participation in the informal economy, the intention is to show that in the informal sector focus or are more involved age groups found in the extreme age of the population trabaja.Esta research has been carried out with the intention of making inferences in support of decision making and the design of public policies in Mexico, for the development of labor markets and improving in the living conditions of the population employed in the informal sector and their families.

Is there a relationship between movements in real GDP and Employment Rate in the Informal Sector?

Here we analyze the growth rate of employment in the informal sector, with respect to the evolution of real GDP. The underlying assumption in this study finds that these variables have divergent trends, showing that increasing real gross domestic product tends to decrease the rate of employment in the informal sector. Table I.1 shows the information collected for the purposes of this analysis.

Necessary Information for comparative analysis of changes in real GDP and Employment Rate in the Informal Sector, 2005-I to 2010-IV

Periodos			Variaciones	
Trimestre inicial		Trimestre final	Variación porcentual PIB	Variación porcentual TOSI
2005/01	A	2005/02	4.4	0.4
2005/02	A	2005/03	0.3	-0.4
2005/03	A	2005/04	3.5	1.4
2005/04	A	2006/01	-2.0	-2.8
2006/01	A	2006/02	3.6	-1.4
2006/02	A	2006/03	0.2	-1.5
2006/03	A	2006/04	2.3	-0.7
2006/04	A	2007/01	-3.0	1.1
2007/01	A	2007/02	3.5	0.7
2007/02	A	2007/03	0.7	-0.7
2007/03	A	2007/04	2.6	1.5
2007/04	A	2008/01	-4.3	0.4
2008/01	A	2008/02	4.0	0.4
2008/02	A	2008/03	-0.4	-1.5
2008/03	A	2008/04	0.1	-0.4
2008/04	A	2009/01	-10.5	4.4
2009/01	A	2009/02	1.3	-0.4
2009/02	A	2009/03	4.1	0.4
2009/03	A	2009/04	3.8	0.4
2009/04	A	2010/01	-4.5	1.1
2010/01	A	2010/02	4.4	0.7
2010/02	A	2010/03	1.8	-2.8
2010/03	A	2010/04	3.1	-2.9

Table I.1

Source: Own elaboration with data from INEGI, Information System of National Accounts of Mexico (SCNM) and the National Survey of Occupation and Employment (ENOE), various years.

For this analysis the information published by INEGI was consulted, real GDP recorded since the second quarter of 2000 to the fourth quarter of 2004; information for those quarters on the proportion persons employed in the informal sector to total employment was also obtained. It then calculated the changes in GDP QoQ along the time series under study and the same was done with the proportion of workers in the informal industry. The numbers shown in most cases, the variables in study move in different directions, that is, during periods when real GDP increased, the rate of informal employment and vice versa. To better observe this different behavior of the variables were plotted together their variations (Graphic I.1) allowing a visual assessment of this phenomenon.

Changes in real GDP and the Employment Rate in the Informal Sector
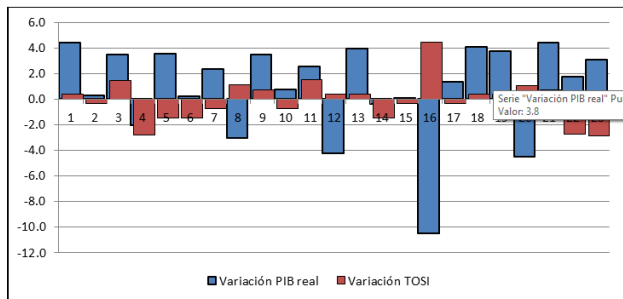

Graphic I.1

Source: Own elaboration with data from INEGI, Information System of National Accounts of Mexico (SCNM) and the National Survey of Occupation and Employment (ENOE), various years.

The next step was to decide on a list of technical analysis, which was the most suitable to study this phenomenon and to determine whether the observed could be attributed to random or chance variations or maintained a pattern that would make it more rigorous inferences hereinafter.

In Graphic I.1 can be seen that often manifest changes in opposite directions, real GDP increases while the rate of employment in the informal sector decreases. Therefore, it was decided that the appropriate statistical analysis technique to study these variations was proof Spearman rank correlation, as to determine whether there is statistical evidence that there is a certain correlation between these two variables.

With the data sorted by rank, we proceeded to perform the test of Spearman. Needless to say before showing the results of this test, the null hypothesis (H0) is the assertion that there is no correlation between changes. In contrast, the alternative hypothesis (H1) if there prove to be accepted any correlation between these two variables or rather, between changes in these variables. The significance level was 5% test for which the limit test value obtained from the statistical tables was -0.3430.

We proceeded to apply the test for based on their results, draw some conclusions. Table I.2 shows the test cases and results.

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Test Spearman rank correlation

	Rs calculado	-0.3678
Hipotesis:		
H0: No hay correlación	Alfa	0.05
H1: Hay correlación		
	Rs en tablas	-0.3430
Resultado: Se rechaza H0		

Table I.2

Source: Own elaboration with data from INEGI, Information System of National Accounts of Mexico (SCNM) and the National Survey of Occupation and Employment (ENOE), various years.

Test Results: The estimated value of the Spearman coefficient was -0.3678, therefore, because the estimated value is greater than the table value (-0.3430) Spearman coefficient; H0 is rejected and the alternative hypothesis H1 is accepted, with the above is accepted that there is a correlation between the variables, as well as the sign of the estimated coefficient is negative, it was concluded that the relationship between the variables is reversed, ie, if the Real GDP increases the rate of employment in the informal sector decreases and vice versa.

Women, informal more than men for necessity

The purpose of this section, such as the three subsequent, is to help design appropriate to support the sectors most vulnerable population and occupation of public policy, taking into account the particular characteristics of these sectors. This section is intended to demonstrate that the rate of employment in the informal sector is different when you take into account the gender of the person. The data reported by employment surveys, often show greater informality rate for women than for men, the intention is to see if this happens by chance and really equal informality rates of men and women.

It seeks to establish whether there were significant differences that allow us to say with certainty that informality rates are higher for either sex. Informality rates for men and women over a series of time from the first quarter of 2005 to the third quarter of 2010: the information necessary to perform this test are shown in Table II.1.

Employment Rate in total Informal Sector and sex 2005-I to 2010-III

Año	Trimestre	Total	Hombres	Mujeres
2005	Primer trimestre	27.97	27.56	28.72
2005	Segundo trimestre	28.11	27.47	29.22
2005	Tercer trimestre	28.01	26.97	29.82
2005	Cuarto trimestre	28.43	27.89	29.36
2006	Primer trimestre	27.63	27.14	28.45
2006	Segundo trimestre	27.22	26.73	28.05
2006	Tercer trimestre	26.76	26.09	27.88
2006	Cuarto trimestre	26.62	25.95	27
2007	Primer trimestre	26.87	26.55	27.42
2007	Segundo trimestre	27.13	26.75	27.77
2007	Tercer trimestre	26.87	26.39	27.65
2007	Cuarto trimestre	27.28	26.53	28.52
2008	Primer trimestre	27.44	27.12	27.97
2008	Segundo trimestre	27.5	26.85	28.57
2008	Tercer trimestre	27.13	26.71	27.83
2008	Cuarto trimestre	26.99	26.39	27.99
2009	Primer trimestre	28.21	27.7	29.06
2009	Segundo trimestre	28.12	27.49	29.18
2009	Tercer trimestre	28.17	27.4	29.43
2009	Cuarto trimestre	28.32	27.25	30.07
2010	Primer trimestre	28.58	28	29.53
2010	Segundo trimestre	28.78	27.98	30.09
2010	Tercer trimestre	27.98	27.05	29.5

Table II.1

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE).

A first observation of the series of data on the occupancy rate in the informal sector for men and women shows that in most cases latter reported a higher rate of informality; in order to establish whether there is a difference that is statistically significant between informality rates reported by men and women decide to apply hypothesis testing for differences in sample means.

The test conditions are: the significance level is 2.5%; the null hypothesis (H0) states that there is no difference in the sample means observed for men and women and therefore can be considered equal the rate of informal employment in both sexes, on the other hand, if H0 is rejected and therefore accepts the alternative hypothesis (H1) is set accordingly, any of the two sexes has a higher rate of informality than the other.

II.2 The table shows the calculations and the results obtained from the application of the test mean difference.

Test for difference of sample means for occupancy rates in the informal sector of men and women.

INDICADORES	X1: TOSI mujeres	X2: TOSI hombres	Diferencia de medias	
Media	28.69	27.04	1.65	
Varianza	0.71	0.34	Valor de Z calculado=	7.705
Desviación estándar	0.84	0.59	Alfa=	0.025
Error estándar	0.21		Valor de Z en tablas=	1.960

H0: Las mujeres tienen igual tasa de ocupación en el sector informal que los hombres

H1: Las mujeres tienen mayor tasa de ocupación en el sector informal que los hombres

RESULTADO: Se rechaza H0 por amplio margen, por lo tanto hay evidencia empírica de que las mujeres tienen una tasa de ocupación en el sector informal mayor que los hombres

Table II.2

Source: Own elaboration with data from INEGI.National Survey of Occupation and Employment (ENOE), various years.

The acceptance limit value was obtained in table 1.96. The obtained value of the test statistic in the foregoing table is 7.705 can be seen immediately that the statistic obtained far exceeds the acceptance limit, so you should reject H0 and accept H1.

This shows that there is a statistically significant difference between the two sample means, in this case we can establish that the informality rate of women is higher than men.

The explanation of this phenomenon is mostly in women of reproductive age should share the time of economic work, domestic, regarding the parenting and housework; therefore some informal activities that have higher barriers to entry such as the sale of food or other items in the street or at home, and do not have a strict schedule requirements, are often the only options for women want to have some occupation and income derived therefrom.

The Urban Informal Sector

It has been said that informality is a phenomenon of the big cities, some researchers even call SIU (Urban Informal Sector), characterizing it as a proper economic phenomenon of major cities (Rendón and Salas 1991, 1992 and 2000, Abeles 1978; STyPS 1975, 1976 and 1977).

With quarterly data from the National Survey of Occupation and Employment proceeded to review the empirical evidence that was in this respect; point of interest here was the proportion of people employed in the informal sector in the more urbanized areas, cities with 100,000 inhabitants or more; and certainly its counterpart, the less urbanized locations ranging from rural communities to small towns with a population under 100,000 inhabitants. Table III.1 shows the information needed for this analysis.

Employment Rate in total Informal Sector and more and less urbanized areas, 2005-I to 2010-III

Año	Trimestre	Total	Áreas más urbanizadas	Áreas menos urbanizadas
2005	Primer trimestre	28.0	26.1	30.0
2005	Segundo trimestre	28.1	26.2	30.2
2005	Tercer trimestre	28.0	26.8	29.3
2005	Cuarto trimestre	28.4	27.2	29.8
2006	Primer trimestre	27.6	25.5	30.0
2006	Segundo trimestre	27.2	25.3	29.3
2006	Tercer trimestre	26.8	24.2	29.6
2006	Cuarto trimestre	26.6	23.5	30.1
2007	Primer trimestre	26.9	23.9	30.2
2007	Segundo trimestre	27.1	24.5	30.1
2007	Tercer trimestre	26.9	24.3	29.8
2007	Cuarto trimestre	27.3	24.9	30.0
2008	Primer trimestre	27.4	24.7	30.6
2008	Segundo trimestre	27.5	25.0	30.3
2008	Tercer trimestre	27.1	24.5	30.2
2008	Cuarto trimestre	27.0	24.7	29.6
2009	Primer trimestre	28.2	25.4	31.4
2009	Segundo trimestre	28.1	25.4	31.2
2009	Tercer trimestre	28.2	25.7	30.9
2009	Cuarto trimestre	28.3	26.1	30.8
2010	Primer trimestre	28.6	26.4	31.1
2010	Segundo trimestre	28.8	26.6	31.3
2010	Tercer trimestre	28.0	25.7	30.5

Table II.1

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE), various years.

As you can see higher informality rates are not in the big cities of over 100,000 inhabitants, but rather these are observed in the less urban areas, so this does not remain a mere superficial observation without statistical support, the test appears in table III.2.

Test for difference of sample means for occupancy rates in the informal sector into more and less urbanized areas.

Indicadores	X1: tosi en áreas menos urbanizadas	X2: tosi en áreas más urbanizadas	Diferencia de medias	
Media	30.27	25.33	4.94	
Varianza	0.37	0.95	Valor de z calculado=	20.609
Desviación estándar	0.61	0.97	Alfa=	0.025
Error estándar	0.24		Valor de z en tablas=	1.960

H0: zonas menos urbanizadas (< 100 000 habitantes) tienen igual tasa de ocupación en el sector informal que las grandes ciudades (=> 100 000 habitantes)
H1: zonas menos urbanizadas (< 100 000 habitantes) tienen mayor tasa de ocupación en el sector informal que las grandes ciudades (=> 100 000 habitantes)

Resultado: se rechaza h0 por amplio margen, por lo tanto hay evidencia empírica de que las zonas menos urbanizadas (< 100 000 habitantes) tienen mayor tasa de ocupación en el sector informal que las grandes ciudades (=> 100 000 habitantes)

Table III.2

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE), various years.

The results of this test are categorical; informality rate is higher in large cities, but in less urbanized areas.

The explanation for this situation is the fact that in rural communities and peoples of no economic formal sector units: no stores, no banks, no universities, and federal offices and state government where people can be employed; all those companies and institutions that represent the formal sector are located in large cities. Logic is that if there is no formal employment in rural communities and small towns, there are people not employed in the formal sector in these localities.

The adolescent and youth work occurs primarily in homes and frequently in the Informal Sector

One hypothesis that has been shown in previous research (ILO, 1993; Fernández, 2007) is that teenagers and young adults (14-19 years) participating in the informal sector to a greater extent than adults in primary working age (30 to 39 years), in fact the International Labour Organization in the recommendations issued in 1993 to generate statistics of employment in the informal sector, warns about the fact that this sector is largely concentrated in children working. With this in mind this test was designed, in Table IV.1 shows the information available to perform the same.

Informality rates in adolescents and young adults 14 to 19 years, and primary working age adults 30 to 39 years. 2005-I to 2010-III

Año	Trimestre	Total	14 a 19 años	30 a 39 años
2005	Primer trimestre	28.0	30.5	27.0
2005	Segundo trimestre	28.1	31.2	26.9
2005	Tercer trimestre	28.0	29.7	26.9
2005	Cuarto trimestre	28.4	30.1	27.2
2006	Primer trimestre	27.6	29.9	26.9
2006	Segundo trimestre	27.2	29.2	26.2
2006	Tercer trimestre	26.8	28.8	26.5
2006	Cuarto trimestre	26.6	28.9	25.6
2007	Primer trimestre	26.9	30.3	25.5
2007	Segundo trimestre	27.1	29.8	26.7
2007	Tercer trimestre	26.9	29.3	26.2
2007	Cuarto trimestre	27.3	30.5	26.6
2008	Primer trimestre	27.4	31.1	26.6
2008	Segundo trimestre	27.5	31.9	26.2
2008	Tercer trimestre	27.1	29.2	26.4
2008	Cuarto trimestre	27.0	31.5	25.8
2009	Primer trimestre	28.2	32.8	27.3
2009	Segundo trimestre	28.1	32.8	27.1
2009	Tercer trimestre	28.2	31.0	27.1
2009	Cuarto trimestre	28.3	32.3	27.2
2010	Primer trimestre	28.6	33.9	27.4
2010	Segundo trimestre	28.8	32.6	27.5
2010	Tercer trimestre	28.0	34.2	26.5

Table IV.1

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE), various years.

Child labor is present in developing countries like Mexico and other Latin American countries (INEGI, 2004b) and this work occurs primarily within the home, whether in agriculture, domestic work or informal subsector of households above is because children under 14 years can not legally work in formal enterprises, so when necessity must work, do so within their own homes, frequently in the informal sector. When People meet the legal working age (which in Mexico is 14 years), regularly continue to work within households in the informal sector, and only to be increasing age, are gradually integrated into the formal sector. Data provided by the Mexican employment survey allowed to accept or reject the hypothesis above. IV.2 shows the results of the test for this purpose.

Prueba para diferencia de medias muestrales para comparar la ocupación en el sector informal de adolescentes y jóvenes frente a los adultos en edad laboral primaria (ELP)

INDICADORES	X1: TOSI adolescentes y jóvenes	X2: TOSI adultos (ELP)	Diferencia de medias	
Media	30.92	26.64	4.28	
Varianza	2.51	0.31	Valor de Z calculado=	12.235
Desviación estándar	1.59	0.55	Alfa=	0.025
Error estándar		0.35	Valor de Z en tablas=	1.960

H0: Adolescentes y jóvenes tienen igual tasa de ocupación en el sector informal que los adultos en edad laboral primaria

H1: Adolescentes y jóvenes tienen mayor tasa de ocupación en el sector informal que los adultos en edad laboral primaria

RESULTADO: Se rechaza H0, por lo tanto hay evidencia empírica de que adolescentes y jóvenes tienen una tasa de ocupación en el sector informal mayor que los adultos en edad laboral primaria

Table IV.2

Source: Own elaboration with INEGI Data. Encuesta Nacional de Ocupación y Empleo (ENOE),

With the obtained results our hypothesis is confirmed, stablished with OIT base; rejecting H0 states that the sample means are not equal and therefore adolescents and youth (age 14 to 19 years) have an occupancy rate in the informal sector significantly greater than adults in primary working age (persons aged between 30 and 39 years).

This should be considered in the design of public policies both to improve the conditions of workers in the informal sector and plan to run a determined fight against child labor in the country and to generate formal jobs where teenagers and young people deal reach working age.

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We have opportunities for people 20 to 45 years older at this age, please do not occur

Many formal firms to carry out their recruitment set not to hire people after a certain age, therefore, as the age is older than 45-50 years, often the only option is to work informality.

Another hypothesis considered in this research is in certain formal employment is difficult hired after 45 or 50 years, this is exacerbated as people reach retirement age, ie 60 years or more, for those without an opportunity to obtain a retirement pension and have to continue working into old age working the natural choice for them is precisely the informal sector.

Table V.1 presents the available data to perform this test.

Employment Rate in the Informal Sector in older adults and people in primary working age, 2005-I to 2010-III.

Año	Trimestre	Total	30 a 39 años	60 años y más
2005	Primer trimestre	28.0	27.0	35.5
2005	Segundo trimestre	28.1	26.9	35.3
2005	Tercer trimestre	28.0	26.9	35.7
2005	Cuarto trimestre	28.4	27.2	37.1
2006	Primer trimestre	27.6	26.9	36.3
2006	Segundo trimestre	27.2	26.2	35.5
2006	Tercer trimestre	26.8	26.5	33.9
2006	Cuarto trimestre	26.6	25.6	34.5
2007	Primer trimestre	26.9	25.5	34.1
2007	Segundo trimestre	27.1	26.7	33.9
2007	Tercer trimestre	26.9	26.2	34.4
2007	Cuarto trimestre	27.3	26.6	34.7
2008	Primer trimestre	27.4	26.6	34.6
2008	Segundo trimestre	27.5	26.2	35.5
2008	Tercer trimestre	27.1	26.4	35.0
2008	Cuarto trimestre	27.0	25.8	33.8
2009	Primer trimestre	28.2	27.3	36.3
2009	Segundo trimestre	28.1	27.1	36.1
2009	Tercer trimestre	28.2	27.1	36.2
2009	Cuarto trimestre	28.3	27.2	36.1
2010	Primer trimestre	28.6	27.4	36.4
2010	Segundo trimestre	28.8	27.5	37.4
2010	Tercer trimestre	28.0	26.5	35.5

Table V.1

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE), various years.

One of the major deficiencies that manifests the informal sector is that it has no access to social security or pension funds, the elderly, who have worked in the informal sector or in other of occupation of the household sector, having no way to get a pension are forced to continue working for their livelihood until their forces allow them, their jobs is logically the informal sector, therefore, in countries with underdeveloped labor markets, it is foreseeable that the informality rate is higher under the age of employed increases. Table V.2 shows the calculations and results to the test in which the rate of informality of seniors 60 years reached contrasted against adults in primary working age, people who are between 30 and 39.

Test for difference of sample means to compare employment in the informal sector of elderly people compared to adults in primary working age (ELP) os.

Indicadores	X1: tosi adultos tercera edad	X2: tosi adultos en elp	Diferencia de medias	
Media	35.38	26.64	8.74	
			Valor de Z	
Varianza	1.03	0.31	calculado=	36.218
Desviación estándar	1.02	0.55	Área del gráfico =	0.025
			Valor de Z	
Error estándar		0.24	en tablas=	1.960

H0: Adultos mayores tienen igual tasa de ocupación en el sector informal que los adultos en edad laboral primaria
H1: Adultos mayores tienen mayor tasa de ocupación en el sector informal que los adultos en edad laboral primaria
Resultado: Se rechaza H0 por amplio margen, por lo tanto hay evidencia empírica de que los adultos mayores tienen una mayor tasa de ocupación en el sector informal que los adultos en edad laboral primaria

Table V.2

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE), various years.

From the results we can say that the elderly or persons (60 years or more) deal in greater proportion in the informal sector that people in primary working age (30-39 years), this confirms the hypothesis posed at the beginning.

Relation between Human Development Index (HDI) reached by the states of the country, and the occupancy rate in the Informal Sector in each of these entities

We are interested in analyzing the relationship of the Human Development Index with the Employment Rate in the Informal Sector.

The hypothesis is that the HDI represents to some extent the economic and social development of a state, is related to the proportion of workers in the informal sector in the state, that is, entities economically less developed (poorer), with lower per capita income, lower literacy rates, fewer children enrolled in school, and lower life expectancy, , if is true what is said, a greater proportion of the population is working in the informal sector.

The first thing we did was get the information needed for this test, it came to the databases that have the INEGI and Programme of United Nations Development Programme (UNDP) nations; with the information published by these two institutions was obtained HDI and Tosi for each of the states in 2005; The state with the highest HDI Federal District was 90.5 (on a scale of 1 to 100) and the lowest with 73.0 Chiapas. Then included in the Information Box, the rate of employment in the informal sector (Tosi) for each of the entities in that year, this rate had values ranging from 38.8% (Tlaxcala) and 15.1% (Chihuahua). Table VI.1 shows information of the variables that are supposed functionally related.

Occupancy rate and the Informal Sector Human Development Index for the states of the Mexican Republic, 2005

| Entidad Federativa	Tasa de Ocupación en el Sector Informal (TOSI)	Indice de Desarrollo Humano (IDH)
Aguascalientes	23.4	83.9
Baja California	18.8	85.2
Baja California Sur	16.7	85.2
Campeche	23.3	84.3
Coahuila de Zaragoza	23.3	84.7
Colima	16.1	82.3
Chiapas	25.5	73.0
Chihuahua	15.1	85.2
Distrito Federal	27.8	90.5
Durango	23.7	81.6
Guanajuato	29.1	79.1
Guerrero	36.3	74.9
Hidalgo	32.3	78.1
Jalisco	29.6	82.0
México	35.1	80.8
Michoacán de Ocampo	35.8	77.0
Morelos	34.7	81.9
Nayarit	25.6	78.8
Nuevo León	21.8	86.7
Oaxaca	34.3	74.9
Puebla	31.6	78.9
Querétaro	24.2	82.9
Quintana Roo	24.2	84.4
San Luis Potosí	26.9	80.2
Sinaloa	22.4	80.8
Sonora	23.5	84.2
Tabasco	22.0	79.7
Tamaulipas	23.3	83.7
Tlaxcala	38.8	79.0
Veracruz de Ignacio de la Llave	26.2	77.2
Yucatán	30.6	80.0
Zacatecas	23.5	78.7

Table VI.1

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE) 2005. Programme for the United Development Programme (UNDP) Human Development Index in 2005 Nations Mexico.

Correlation test of Spearman rank was used, the calculated Rs started the rejection region having negative sign implying that there is a correlation between the variables and is reverse, ie, while the HDI is high, the Tosi is low and vice versa. Once HR has shown that variables are correlated Tosi proceeds to apply a technique that gives us more information on how the variables are correlated, the aim is to determine the nature of the functional relationship between the index variables of Human development and Employment Rate in the Informal Sector, and estimate the parameters governing this function.

The first step was to determine the type of technique to be applied given the information and study needs raised, it was considered that the technique can be applied on regression fitting the data to a curve whose mathematical expression can be a linear polynomial a exponential or logarithmic function, or a polynomial of degree greater than one. To decide what type of model to apply in this regression proceeded to plot the dispersion map (Graphic VI.1) to visually assess any linear or other curve between these variables conformation.

Dispersion map Tosi vs IDH
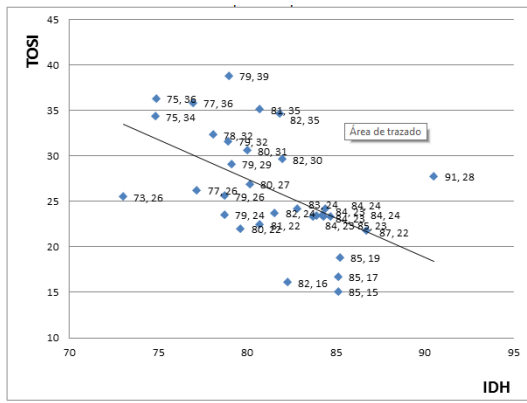
Graphic IV.2

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE) 2005. Programme for the United Development Programme (UNDP) Human Development Index in 2005 Nations Mexico.

As can be seen in the scatterplot, the points cluster in the vicinity of a line with negative slope, according to this, it was decided to use a methodology of linear regression, adjusted by the method of least squares to an equation of first grade. Contingency Table VI.2 shows results.

Linear regression by least squares method
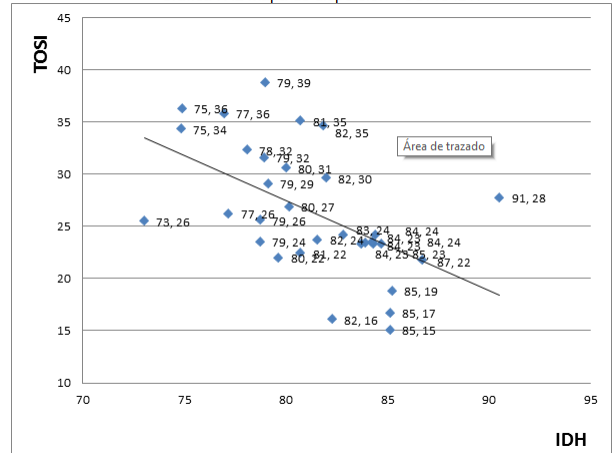
Table IV.9

Source: Own elaboration with data from INEGI. National Survey of Occupation and Employment (ENOE) 2005. Programme for the United Development Programme (UNDP) Human Development Index in 2005 Nations Mexico.

First it is necessary to say that an acceptable correlation coefficient indicating that the association between the variables is significant. As for the estimates of the regression parameters, the value of the intercept (B0) was 89.36 and the slope (B1) was -0770.

The regression results are quite acceptable and can explain how they are related functionally in the study variables; in this case the informality rate is the dependent variable and this varies largely as a response to changes in the Human Development Index observed in each of the states.

The negative correlation coefficient of -0.508 indicates that over 50% of the variation in informality rates are explained by the observed changes in the HDI for each of the states.

On the other hand the negative slope of -0770 states that for every point increase in the Human Development Index which achieves a given entity, decreases by 0.77 informality rate in that state. In other words as entities that manage to increase their level of development, decreases the rate of informality and precarious employment in these same entities.

It is prudent to mention here that the Federal District is an entity with atypical behavior because it has the highest HDI (90.5 on a scale of 1-100) and should have a rate of informality in the lower levels, around 20%, without But this does not occur because the Federal District also focuses a great deal of informal jobs.

The HDI in DF is above average due to various services in this state are concentrated universities and major hospitals in the country, increasing life expectancy and education indicators. Also are here, the federal powers, the executive, the legislature and the judiciary and also a significant amount of business in this state have their head offices and therefore their executive level positions tend to have income well above the average increasing national GDP per capita. Another feature in this entity is that there is a high concentration of income, and therefore associated with very high income there is a considerable number of people in poverty who are dedicated largely to work in the informal sector, so even the highest HDI in the country, also has a relatively high rate of informality.

While it is a little unusual entity, it was decided to leave the Federal District in the dataset for regression, in order to consider all Mexican states and found that the permanence of this entity in the regression significantly affect the data, the regression results remain reliable and have the advantage of considering in the calculations to all entities of Mexico.

Conclusions

Different methods of statistical and econometric used analysis showed that the assumptions made in this study are correct, and the analysis of information in a more comprehensive way, in fact here have shown the numbers, can be used as input in the design of public policies to improve the situation of people working in the informal sector in Mexico.

Particularly important is the demonstration concerning the relationship between occupancy rate in the informal sector with the insufficient economic and social development of the institutions of the country, (which in this case was associated with the Human Development Index), for this we show that the main reason that there is a high rate of informality in certain states and regions of the country is the lack of economic development.

The analyzes performed in this study also showed that the employed in the informal sector is not a homogeneous population but everything.

For example, women have a higher rate of informality than men, with little impact on access to social security and pension funds.

Also shown the tests applied to the employment in the informal sector is concentrated at the ends of the age groups, ie, adolescents and young people on the one hand and the people of the third age on the other. Finally, the statistical tests show evidence of a widespread misconception among scholars of the informal sector, who believe that this is a typical phenomenon of large cities; the results of this research show beyond doubt, that informality is higher in less urbanized areas.

This is because in indigenous communities in rural areas and in small towns do not have economic units in the formal sector, to work there, there are only subsistence farming and employment in the informal sector, so the employment rate in this sector is higher in such localities.

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Financial innovations: Role of CDOs, CDS and securitization during the US financial crisis 2007-2009

AZIZ- Bilal *

University of Punjab Lahore: 54590 Punjab: Pakistán.

This Paper seeks to explain the role of Financial Innovations behind the Financial Crisis 2007-2009 with a special focus on the Collateralized Debt Obligations, Credit Default Swaps and Securitization, there role in US Financial System and how these factors generated and worsen the crisis. Financial Crisis 2007-2009 which starts from the United States sub-prime Mortgage market and spread to US financial sector and later on spread to the rest of world is said to be the even bigger crisis than the Great Depression of 1929. This crisis is unique in this way that in history we haven't seen such a bigger impact world wide from any crisis. This paper would analyze the main causes which are right in the heart of the crisis and least discussed.

Credit default swaps, securitization , collateralized debt obligation, derivatives ,mortgage Back Securities(MBS).

*Correspondence to Author (email:magdags@uaeh.edu.mx)
† Researcher contributing first author.

Introduction

Innovation is said tobe blessing for the mankind but sometimes this blessing convert into curse when there is a misuse of the innovation. Financial innovations played an important role in this crisis. Introduction of so much financial innovations without ample time to judge their reliability was one of the reasons of this crisis. Although innovations always appreciated round the corner but these innovations require lot of time to implement them so that complexity of issues should be resolved.

This also happened in Financial Crisis of 2007-2009 when these innovations played a negative part. The term 'financial crisis' is used too loosely, often to denote either a banking crisis, or a debt crisis, or a foreign exchange market crisis. It is perhaps preferable to invoke it only for the 'big one': a generalized, international financial crisis. This is a nexus of foreign exchange market disturbances, debt defaults (sovereign or private), and banking system failures: a triple crisis, in which the interactions are the key to causality, depth, and persistence (Eichengreen and Portes, 1987). Financial Crises could involve either bank or currency crises or indeed, both of them could take place at the same time (Daianu&Lungu, 2008). Delargy and Goodhart (1999) argue that both the late 19th century crises and those in the late 20th were more likely when loose credit conditions in the lending countries were in place. Subsequently, when credit conditions suddenly adversely changed it generated a boom and bust economic cycle.

Financial Innovations especially which were introduced in 90's played a significant role in the Financial Crisis of 2007-2009. Innovations were introduced without proper verifying there results or giving them ample time to check their viability.

Some of them were so complex that it creates mess in the market. Greed of profit and will to expand the market over come the general procedures.

Apart from the introduction the paper has been divided into four main parts. First we would discuss the Collateralized Debt Obligation (CDO) their structure, functions and how they participated in the Financial Crises. Secondly the Credit Default Swaps (CDS), their structure, market and how this created mess in the market. Thirdly Securitization, how it works and what's its size and how it generated and worsens the crisis. Finally we would draw some conclusions.

Collateralized debt obligation (CDO)

Collateralized Debt Obligations (CDOs) were created in 1987 by Drexel Burnham Lambert Inc. Within 10 years, the CDOs had become a major force in the so-called Derivates Market. CDO is created when a financial institution, such as a bank, takes the debts owed by lots of borrowers, puts them together into a pool, divides that pool into different categories based on risk called "Tranches" and then sells off those tranches to investors such as hedge funds (Kennon, 2009). By combining similar loans into pools, the lender was able to pass the mortgage payment through to the certificate holders or investors (Cameron, 2003).

According to (Wright, 2009) CDO is an asset-backed security which uses a portfolio of bonds or loans as collateral, or security. A sponsor uses the portfolio to set up a special purpose investment vehicle which issues securities or CDOs, sometimes with a higher credit rating than any of the individual underlying assets. There may be reduced transparency in assessing the underlying risks.CDO structure is bit complicated. Let's have an example of how CDO works.

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NET BUSINESS

Mortgage brokers write loans to people with bad credit histories (or no credit histories or no verifiable income). Then the mortgage brokers sell these subprime mortgages to investment banks. The investment banks take thousands of subprime mortgages and repackage them into CDOs called mortgage backed securities.
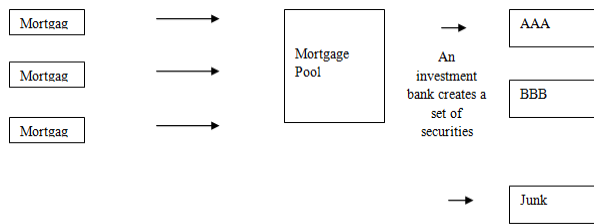
The investment banks sell these newly created securities to banks, pension funds, college saving funds, universities, cities, etc. As the mortgage holders (in most cases home owners) in this pool make their monthly payments, the AAA-security holders start receiving their payments. Once these AAA-security holders get their investment plus interest back, then the BBB-security holders start receiving payments. Assuming that the mortgage holders continue making payments, once the BBB-security holders get their promised payments, the junk bond holders start receiving payment.

In a CDO structure, there are different tranches from which debt obligations are issued to fund the purchase of the collateral assets such as MBS. Typically there are three different tranches (Josef, 2009). Understanding how those tranches work is crucial for grasping the whole concept of CDOs. The most senior tranche, often given AAA rating, is also the least risky one.

The senior tranche could be for example decomposed of the 20% best assets of the CDO, meaning that those investors buying the senior tranche will only have to bear losses if more than 80% of the whole assets in the CDO default. The middle tranche (Mezzanine) comprises e.g. the next 40% of the CDO, that is to say, money is lost in case more than 40% of the whole CDO default. The third tranche, the equity tranche, has to bear any default that occurs within the CDO and is the riskiest tranche of the construction. Naturally, interest rates differ across the tranches and are highest in the equity tranche and lowest in the most senior tranche.

Each tranche except for the equity tranche carries a credit rating. For example, AAA or AA rating is typically sought for the senior tranches, whereas no less than B is for the mezzanine tranches. The equity tranches receive only the residual cash flow and hence have no credit rating assigned. Typically, each tranche includes both floating and fixed rates.

(Prince, 2005) described the relation between asset-backed securities (ABS), MBS and CDOs in which the latter two are part of the first one. He argues hat CDOs constitutes approximately 14% of outstanding debt in the ABS market. However credit card receivables, auto and home equity loans make up about 60% of all ABS (Cameron, 2003). Figure-1 below shows the basic CDO security Structure.

Basic CDO Security Structure.

Graphic 1

There are two major types of CDOs – cash-flow CDOs and synthetic CDOs. In a cash-flow CDO, the issuer purchases a portfolio of underlying assets and finances its purchase by selling its own debt instruments. This legal transfer of ownership is accompanied by a transfer of the economic risks associated with the assets. Therefore, the CDO issuer creates direct exposure to the specific risks through owning the assets. In practice, cash-flow CDOs release a proportion of the regulatory capital held by financial institutions and remove illiquid bank loans from the balance sheet (Duffie and Garleanu, 2001). While synthetic CDO is a collateralized debt obligation that is based on credit default swaps rather than physical debt securities (KOHLER & ALAN, 2009). A CDS can be seen as an insurance policy which offers the buyer credit protection against default losses associated with the underlying assets. In exchange for the credit protection, the buyer in a credit default swap pays a regular premium to the seller.

Construction of CDOs is the result of a process of bargaining between the investment bank which puts them together, and the ratings agency which provides the ratings for the different tranches.

The investment bank is interested in creating as large an AAA tranches as possible, while the ratings agency is concerned to ensure that certain standards are maintained. However, the agencies are subject to a serious conflict of interest as the fees for rating CDOs are about twice as high as those for rating traditional corporate bonds, and in recent years this work has generated a substantial part of rating agencies' income (Crouhy, Jarrow et al. 2009)

Annual CDO issuances went from nearly zero in 1995 to over $500 billion in 2006. As CDO issuances grew, so did the share of them that was de¬voted to mortgages. (Mason and Rosner, 2007) tell us that 81 percent of the collateral of CDO's issued in 2005 was made up of MBS, or about $200 bil¬lion. Total issues increased from $157 billion in 2004 to $551 billion in 2006. Because CDOs appeared to offer higher rates of return than other assets with comparable ratings, they were quickly bought up by investors, including insurance companies, pension funds, banks and especially hedge funds.

Global CDO Market

| Years	Global CDO Market Total Issuance ($Millions)
2004	157, 418.5
2005	271, 303.3
2006	551,700.6
2007	485,726.3

Table 1

Self made table (Data Source: sifma.org)

Figure-2 below shows the breakdown of new CDOs issuance by currency denomination, in U.S. dollars and Euros. It is worth noting that their issuance in Euros began declining already in the second quarter of 2007, that is, before the outbreak of the subprime mortgage crisis, while at the same time their dollar denominated issuance was still on the rise.

In the figure below CDOS = total issuance in USD million, while CDODOL = USD issues and CDOEUR = EUR issues. The short-lived success of CDOs was made possible by the expansion of global savings. International investors were eager to purchase these high-yielding structured products since yields on U.S. Treasury bonds, were considerably lower.

Global CDO market issuance: Quarterly series.
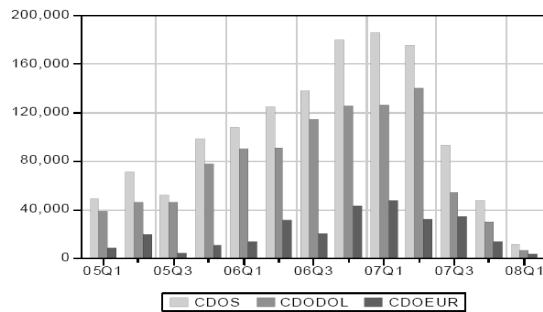
Graphic 2

Self made figure (Data Source: sifma.org)

First break in investor's confidence came in 2007 when a wave of mortgage defaults hit the CDOs tranches (Fisher, 2009). From the first Half of 2007 to the second half, CDO issuance dropped by 50%. CDOs of subprime mortgages were at the heart of the current credit crisis, as a massive amount of senior tranches of these securitization products have been downgraded from AAA rating to non-investment grade.

The reason for such an unprecedented drop in the rating of investment grade structured products was the significant increase in delinquency rates on subprime mortgages after mid-2005, especially on loans that were originated in 2005-06 (Crouhy, Jarrow et al. 2009).

Due to the downfall of housing market investors began to suspect the health of even highest tranches in some CDO instruments. Low confidence of the investors led to decrease in sales which ultimately made it difficult for banks and other institutions to perform "Mark to Market". These large write-offs in asset values by several major banks and investment institutions further make the situation more vulnerable. Rating Agencies played there role because it is very unlikely that the initial credit ratings on bonds were correct. If they had been rated correctly, there would have been downgrades, but not on such massive scale. Whatever the circumstances was the reality was that the sign of trouble was there in the CDO market. Unsurprisingly, as CDOs began experiencing losses or potential losses, the lawsuits have followed. Bethel et al. (2008) documented the CDOs on the path to liquidation and examined 193 CDOs (issued as far back as 2002), which have experienced events of default, acceleration, and liquidation.

A study by (Sabry, Sinha et al. 2009) found a tremendous increase in the losses of CDOs. They pointed out that signs of trouble means events of default (EOD), notices of acceleration, and liquidation. An event of default means the possibility of imperiled cash flows and losses to the note holders. A notice of acceleration is when the controlling note holders have voted to accelerate the maturity of the CDO notes outstanding. A notice of liquidation is when the controlling note holders have voted to terminate the CDO transaction and liquidate the portfolio collateral.

A liquidation event is when assets in the collateral pool are in the process of being sold or have been sold.

A study by (Sabry, Sinha et al. 2009) for example shows $7.3 billion in aggregate CDO issuance experienced events of default in October 2007. Of these, $3.5 billion have been liquidated, $0.75 billion have issued notices of liquidation, and $3 billion have issued notices of acceleration (as of 30 May 2008).

The 193 CDOs represent approximately $215 billion in issuance. Of these, 20 CDOs ($23 billion at issuance) have been liquidated, another 18 CDOs ($15 billion at issuance) have given notices of liquidation, and 67 CDOs (representing $77 billion at issuance) have provided notices of acceleration (through May 2008). As of May 2008, 87 CDOs had provided notices of events of default (representing $98 billion at issuance) while one CDO had retracted the notice of default (approximately $2 billion at issuance). The study shows the increase in the number of defaults in CDOs market and tremendous losses attached to these markets.
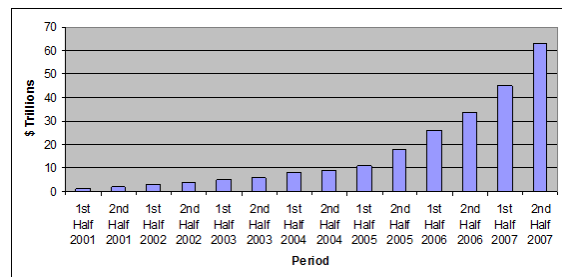
Credit Default Swaps (CDS)

A credit default swap (CDS) is a swap contract in which the buyer of the CDS makes a series of payments to the seller and, in exchange, receives a payoff if a credit instrument - typically a bond or loan - goes into default (fails to pay). Less commonly, the credit event that triggers the payoff can be a company undergoing restructuring, bankruptcy or even just having its credit rating downgraded.

Credit default swaps are a type of credit insurance contract in which one party pays another party to protect it from the risk of default on a particular debt instrument. If that debt instrument (a bond, a bank loan, a mortgage) defaults, the insurer compensates the insured for his loss (Lewit, 2008).

- CDS Market: The market for the credit default swaps has been enormous. Since 2000, it has ballooned from $900 billion to more than $45.5 trillion — roughly twice the size of the entire United States stock market. The biggest player is J.P. Morgan Chase & Co., which has roughly $16 trillion to $18 trillion in CDSs while Bear Stearns Cos. has $2.5 trillion CDSs (Soros, 2008). Figure below illustrates the exponential growth in the CDS market since 2000. The size of outstanding CDS reached a stag¬gering $60 trillion in 2007. As of September 2008, AIG, a financial guarantor, had itself sold nearly $500 billion worth of CDS — most of it insuring ill-fated CDOs. This ever increasing trend reflects the interest of the investors in Credit Default Sweep (CDS).

Value of CDS

Graphic 3

Self-Made Figure (Data Source International Securities and Derivative Association)

Commercial banks are among the most active in this market, with the top 25 banks holding more than $13 trillion in credit default swaps — where they acted as either the insured or insurer — at the end of the third quarter of 2007, according to the Comptroller of the Currency, a federal banking regulator: JP Morgan Chase, Citibank, Bank of America and Wachovia were ranked among the top four most active members.

Credit default swaps were seen as easy money for banks when they were first launched more than a decade ago because the economy was booming and corporate defaults were few back then, making the swaps a low-risk way to collect premiums and earn extra cash. The swaps focused primarily on municipal bonds and corporate debt in the 1990s, not on structured finance securities. Investors flocked to the swaps in the belief that big corporations would seldom go bust in such flourishing economic times (Morrissey 2008).

The amount at stake on the Credit Default Swap market is more than the World GDP (Varcharver, 2008). According to Varcharver (2008) because CDS are contracts rather than securities or insurance, they are easy to create: Often deals are done in a one-minute phone conversation or an instant message.

Many technical aspects of CDS, such as the typical five-year term, have been standardized by the International Swaps and Derivatives Association (ISDA). That only accelerates the process. You strike your deal, fill out some forms, and you've got yourself a $5 million - or a $100 million - contract. Due to the housing boom and Federal Reserve cut interest rates, Americans started buying homes in record numbers, mortgage-backed securities became the hot new investment.

Mortgages were pooled together, and sliced and diced into bonds that were bought by just about every financial institution imaginable: investment banks, commercial banks, hedge funds, pension funds.

For many of those mortgage-backed securities, credit default swaps were taken out to protect against default. "These structures were such a great deal, everyone and their dog decided to jump in, which led to massive growth in the CDS market," says Rohan Douglas, who ran Salomon Brothers and Citigroup's global credit swaps research division through the 1990s (Philips, 2008).

According to Gilani (2008) Credit default swaps are not standardized instruments. In fact, they technically aren't true securities in the classic sense of the word in that they're not transparent, aren't traded on any exchange, aren't subject to present securities laws, and aren't regulated.

Then suddenly party becomes over when certain insurance companies such as American International Group (AIG), the world's largest insurer, MBIA and Ambac Financial Group Inc. faced rating downgrades because widespread mortgage defaults increased heir potential exposure to CDS losses. These firms had to obtain additional funds to offset this exposure.

A rating downgrade of these companies was devastating for banks and others who bought insurance protection from them to cover their corporate bond exposure (Morrissey 2008). When investment bank Lehman Brothers went bankrupt in September 2008, there was much uncertainty as to which financial firms would be required to honor the CDS contracts on its $600 billion of bonds outstanding.

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Merrill Lynch's large losses in 2008 were attributed in part to the drop in value of its un-hedged portfolio of collateralized debt obligations (CDOs) after AIG ceased offering CDS on Merrill's CDOs.

The loss of confidence of trading partners in Merrill Lynch's solvency and its ability to refinance its short-term debt led to its acquisition by the Bank of America. This situation triggered panic between investors and the lead to the collapse of the shadow Banking System.

"It made it a lot easier for some people to get into trouble," says Darrell Duffie, an economist at Stanford. Although he believes credit default swaps have been "dramatically misused," Duffie says he still believes they're a very effective tool and shouldn't be done away with entirely. Besides, he says, "If you outlaw them, then the financial engineers will just come up with something else that gets around the regulation."

Securitization Practices

Asset securitization or Securitization refers to the process that involves the pooling and repackaging of fixed income assets(loans) and the issuance of securities backed by these assets in the secondary market (Fabozzi and Modigliani, 2003).

Mortgage securitization is a particular type of asset securitization, specialized to issue securities collateralized by mortgage loans (liu, 2007). The Term "securitization" is derived from the fact that the form of financial instruments used to obtain funds from the investors is securities. In a simple lending scenario, a lender who decides to transfer mortgages loans into the secondary market through securitization will legally sell his loans to a company called Special Purpose Vehicle (SPV).

"The investment banker hires "Econometricians" or financial economists to demonstrate that the risks of default on interest and principle of some class of the securities it proposes to issue are so small that these instruments deserve to have an investment rating that implies a low interest rate" (Minsky,1987).

According to (Kuttner, 2007) securitized loans played a major role in the 1920s speculation that helped to bring on the 1930s collapse. While securitization is usually presented as a technological innovation that came out of private sector initiative to spread risk, in reality –as (Minsky, 1987) argued-it was a response to policy initiated by Chairman Volker in 1979 (Wray, 2007). Securitization allowed mortgage lenders to bypass traditional banks. Securitization pools mortgages or other debts and sells them to investors in the form of bonds rather than leaving loans of lender's balance sheets. (Getter, Jickling et al. 2007). Securitization was seen as a solution to the problems with the S&L model, as it freed mortgage lenders from the liquidity constraint of their balance sheets.

Under the S&L system, lenders could only make a limited number of loans based on the size of their balance sheet. The new system allowed lenders to sell off loans to a third-party, take it off their books, and use that money to make even more loans. The Government Sponsored Enterprises (GSEs), notably Fannie Mae and Freddie Mac, were created by the federal government in 1938 and 1970, respectively, to perform precisely this function: the GSE's bought mortgage loans that met certain conditions (called "conforming loans") from banks in order to facilitate mortgage lending and (theoretically) lower mortgage interest rates.
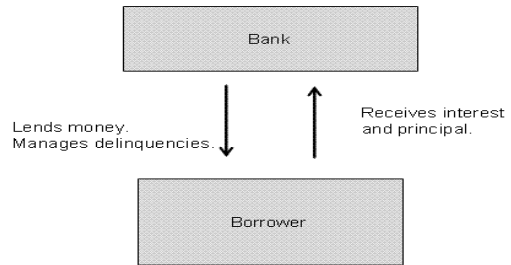
Securitization Structure

Prior to the widespread use of securitization, home finance typically involved a bank or savings institution granting a loan to a borrower. The lending institution would make the decision to grant credit, fund the loan, and collect payments.

In the event of borrower default, the same institution could choose to restructure the loan or foreclose on the property. The lender also might have an established relationship with the borrower, and, thus, be able to evaluate the relative long-term benefits of various alternatives. This relatively simple relationship between the borrower and lender illustrated in the diagram below has given way to a far more complicated securitization structure which includes multiple parties, each with unique and often divergent interests.

According to a study by FDIC the volume of subprime loans included in private-label securitizations grew to at least $672 billion by year-end 2006. Approximately 75 percent of the estimated $600 billion of subprime mortgages originated in 2006 were funded by securitizations.

Thus a substantial portion of subprime mortgages are ultimately funded by securitizations.Figure-4 below shows the traditional Borrower/lender Relationship while Figure -5 below shows the borrowing under the securitization.
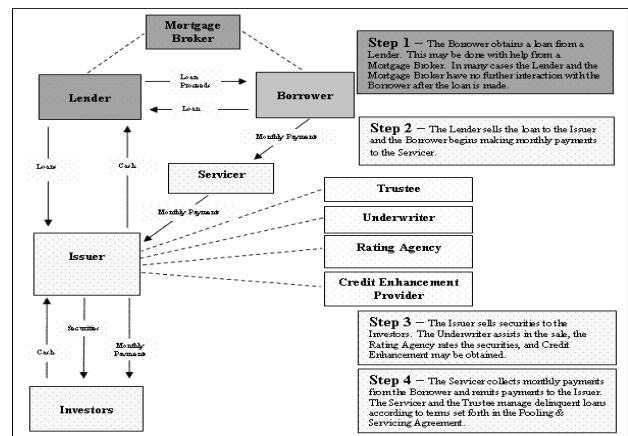
The Traditional Borrower/Lender Relationship

Graphic 4

Self-made Figure

Borrowing Under a Securitization Structure

Graphic 5

Source: Federal Deposit Insurance Company (FDIC)
www.fdic.gov

Securitization accelerated in Mid-1990s. The total amount of mortgage-backed securities issued almost tripled between 1996 and 2007to $7.3 trillion. The securitized share of subprime mortgages increased from 54% in 2001 to 75% in 2006. The securitization market started to close down in the spring 2007 and nearly shut-down in the fall of 2008. More than a third of the private credit markets thus became unavailable as a source of funds (Dymyanyk& Otto, 2008).

Securitization was already well established among conforming loans, as the GSEs had been securitizing them for two decades; 72 percent of conforming loans were securitized in 2001. The real boom in securitization since 2001 came from subprime, as the share of these loans that were securitized had jumped 75 percent since 2001.In light of the central role of the subprime mortgage market in the current crisis, critiques of the securitization process have gained increased prominence (Blinder & Stieglitz, 2007). Connection between securitization and subprime crisis relates to flaws on the part of underwriters, rate agencies and investors. There was inadequate disclosure and excessive reliance on untested models and ratings. While securitization was meant spread out risk away from the center of the financial system, exactly the opposite happened. When the credit crisis hit in August 2007, risk that was meant to be dispersed throughout the system was in fact heavily concentrated among leveraged institutions at the heart of the financial system (Baily et al. 2007). In the wake of the subprime mortgage crisis, a central question confronting market participants and policymakers is whether securitization had an adverse effect on the ex-ante screening efforts of loan originators and leads to Crisis. A study by (Keys, Mukherjee et al. 2008) shows that doubling of securitization volume is on average associated with about a 10-25% increase in defaults. However, delinquencies in the heavily securitized subprime housing market increased by 50% from 2005 to 2007, forcing many mortgage lenders out of business and setting off a wave of financial crises which spread worldwide.

Any effect on default behavior in one portfolio compared to another with virtually identical risk profiles, demographic characteristics, and loan terms suggests that the ease of securitization may have a direct impact on incentives elsewhere in the subprime housing market, as well as in other securitized markets" (Keys, Mukherjee et al. 2008). Securitization of mortgage assets went beyond the point of value and created assets that were not transparent. We know from economic theory that markets with information asymmetries are trouble and the compounding layers of securitization seem to have been designed to exacerbate this problem (Baily, Litan et al. 2007).

Conclusions

Financial institutions and credit rating agencies embraced mathematical models as reliable predictors of risks, replacing judgment in too many instances. Too often, risk management became risk justification.

Tremendous increase in CDO was possible due to the Expansion of Global Savings. First break in investor's confidence came in 2007 when a wave of mortgage defaults hit the CDOs tranches. From the first Half of 2007 to the second half, CDO issuance dropped by 50%. Significant increase in delinquency rates on subprime mortgages after mid-2005, especially on loans that were originated in 2005-06. CDOs of subprime mortgages were at the heart of the current credit crisis, as a massive amount of senior tranches of these securitization products have been downgraded from AAA rating to non-investment grade. The reason was significant increase in delinquency rates on subprime mortgages after mid-2005.

According to a study by FDIC the volume of subprime loans included in private-label securitizations grew to at least $672 billion by year-end 2006. Approximately 75 percent of the estimated $600 billion of subprime mortgages originated in 2006 were funded by securitizations. Thus a substantial portion of subprime mortgages are ultimately funded by securitizations.

A study by (Keys, Mukherjee et al. 2008) shows that doubling of securitization volume is on average associated with about a 10-25% increase in defaults delinquencies in the heavily securitized subprime housing market increased by 50% from 2005 to 2007, forcing many mortgage lenders out of business and setting off a wave of financial crises which spread worldwide.

Securitization of mortgage assets went beyond the point of value and created assets that were not transparent.

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Abstract

Title

Objectives, methodology

Contribution

(150-200 words)

Keywords

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† Researcher contributing as first author.

Introduction

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General explanation of the subject and explain why it is important.

What is your added value with respect to other techniques?

Clearly focus each of its features

Clearly explain the problem to be solved and the central hypothesis.

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In the article content any graphic, table and figure should be editable formats that can change size, type and number of letter, for the purposes of edition, these must be high quality, not pixelated and should be noticeable even reducing image scale.

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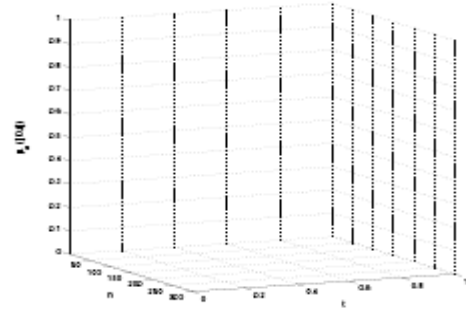
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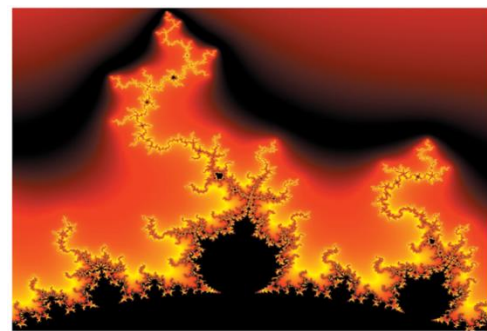
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For the use of equations, noted as follows:

$$Y_{ij} = \alpha + \sum_{h=1}^{r} \beta_h X_{hij} + u_j + e_{ij} \qquad (1)$$

They must be editable and number aligned on the right side.

Instructions for authors

Methodology

Develop give the meaning of the variables in linear writing and important is the comparison of the used criteria.

Results

The results shall be by section of the article.

Annexes

Tables and adequate sources thanks to indicate if they were funded by any institution, University or company.

Conclusions

Explain clearly the results and possibilities of improvement.

References

Using APA system, should **Not** be numbered, either bulleted, however, if necessary, will be because reference number or referred to in any of the article.

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Each article must submit your dates into a Word document (.docx):

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Article title
Abstract
Keywords
Article sections, for example:

1. Introduction
2. Description of the method
3. Analysis from the regression demand curve
4. Results
5. Thanks
6. Conclusions
7. References

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