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In Number 2nd presented in Section of Economy an article *Determination of the stochastic NPV and real options* by Mendoza-Sergio, with adscription in the Instituto Politécnico Nacional, in Section of Computing *Internet broadcast by light cables* by Zamora- Eduardo, with adscription in the Universidad de Londres, in Section of Optimization an article *Determination of financial capital with aperiodicity Fractal* by Villegas-Estefania, Vargas-Jose and Romero-Rodrigo, with adscription in the Universidad Tecnologica de México, in Section of Risks an article *Is it predictable the nominal exchange rate in the long term through its monetary fundamental? The evidence for Mexico 1995-2008* by Téllez-Elizabeth with adscription in the Centro de Investigación y Docencia Económica , in Section of Finance an article *Causes of World Financial Crisis 2007-2009 evidence from United States* by Azis-Bilal with adscription in the University of Punjab, in Section of Administration an article *Internal control as a tool to improve efficiency in public management* by Huerta- Darío,with adscription in the Universidad Nacional Autónoma de México, in Section of Net Business an article *Mandelbrot sets in diversifying markets with Julia sets* by Moreno- Christian, Manzanarez- César, with adscription in the Instituto Tecnológico de Estudios Superiores Monterrey, Universidad Latina, respectively.

Content

Article **ECORFAN Journal-Mexico**
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Determination of the stochastic NPV and real options

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In this investigation a methodology sets out that standardizes the use of real options with jumps to the Net Present Value (VAN), besides to tie the cash flow of the company analyzed to a structure of term created from the model of short rate of Vasicek. All it in order to equip the analyst with a right value that contemplates so much the own macroeconomic effects of the random movements of the interest rate like the process of diffusion with own jumps of the unfolding of a company.

VAN, Cash flow, Interest rate

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Approach to the Problem of Dynamic Stochastic Optimization (PDSO)

The expected present value, F_t, at the time *t*, of a project by calculating the discounted cash flows can be summarized as:

$$F_t = \mathrm{E}\left[\int_t^{\infty} \phi_s e^{-\lambda u} \mathrm{d}u \mid \Im_t\right], \quad (1.1)$$

Where ϕ_s represents the expected cash flow during the project development at time *s*, λ is the appropriate discount rate by sector and leverage ratio of the project and $\Im_t$ is all the relevant information (Avaliable) at the time *t*.

In this research, we propose to add to the value of the project, F_t, the value of the premium for "risk of ownership," which is to be modeled as a real option. To justify this approach, the existence of a risk adverse, infinitely lived investor who has access to a credit risk-free bond is assumed, B_t, whose performance (percentage change) is given by:

$$\frac{\mathrm{d}B_t}{B_t} = r\,\mathrm{d}t, \quad (1.2)$$

Where r represents the risk free rate (default) paid for the bond. This agent also has access to a risky asset, i.e., the project, F_t, whose performance is given by a process of diffusion of the form:

$$\mathrm{d}F_t = \left(\mu_F \mathrm{d}t + \sigma_F \mathrm{d}W_{1t}\right) F_t, \quad (1.3)$$

Where μ_F is the average expected return of the project, σ_F is the project's instantaneous volatility and W_{1t} is a Brownian motion, i.e. $W_{1t} \square N(0,t)$, in which case it holds that $\mathrm{E}\left[\mathrm{d}W_{1t}\right] = 0$ y $\mathrm{Var}\left[\mathrm{d}W_{1t}\right] = \mathrm{d}t$.

In the case of expropriation, the almost unpredictable nature of the time of occurrence of the act of authority requires the modeling through American options, making it possible to assume that the investor's portfolio is comprised of long positions in a bond, B_t, that pays a risk-free rate and the risky asset, F_t, plus a short position in a call option on such asset, φ_t, this is:

$$\prod_t = a_t(\omega_1 F_t + \omega_2 \varphi_t + \omega_3 B_t), \quad (1.4)$$

Where ω_i represents the proportion of wealth that the investor assigns to each asset in its portfolio. The need to simplify the problem, leads to the assumption of a single date on which the government must decide whether or not to exercise the purchase option it has over the risky asset, making the American call on an European, which is analytically most treatable. Moreover, the non-financial nature of the underlying renders necessary the application of the methodology of real options for valuation, for further reference see: Abel (1983), Dixit and Pindyck (2000) or Trigeorgis (1996), to make a reference to the best known ones.

Broadly speaking, the real options methodology is based on applying the technology of financial options on contingent investment projects whose realization depends on the performance of a major project that serves as the underlying. Under this approach, the position and type of option is determined by the nature of the project analyzed, in the particular case of the risk of ownership, as explained above, it is a short position in a call option that is to say an actual closure option. The contingent nature of the option, ie, its derivative nature, leads to the use of Itô calculus in determining the stochastic differential equation that governs its premium. Applying the rules of stochastic calculus [1] to the performance of European call option, we get:

$$\frac{\mathrm{d}\varphi}{\varphi_t} = \left(\mu_\varphi \mathrm{d}t + \sigma_\varphi \mathrm{d}W_{1t},\right), \tag{1.5}$$

That is nothing but the stochastic differential equation (SDE) of the performance of the closure's real option that models the "risk of ownership." In this case it holds that:

$$\mu_\varphi = \left(\frac{\partial\varphi}{\partial t} + \frac{\partial\varphi}{\partial F_t}\mu_F F_t + \frac{1}{2}\frac{\partial^2\varphi}{\partial F_t^2}\sigma_F^2 F_t^2\right)\frac{1}{\varphi_t}$$

y

$$\left(\frac{\partial\varphi}{\partial F_t}\sigma_F\right)\frac{1}{\varphi_t} = \sigma_\varphi.$$

To complete the statement of the problem of dynamic stochastic optimization (PDSO), it is necessary to establish a profit function that reflects the increasing preference at decreasing rates for the benefits the agent analyzed presents.

For this, a profit function of the following form is proposed:

$$\Pi_t\left(B, F_t, \varphi_t\right) = \Pi_t^\gamma / \gamma \equiv \phi_t,$$

Which is supposed concave in accordance with risk averse agents.

PDSO Solution, structure of flat periods and returns on the underlying Brownian

After obtaining the differential equations that model the returns of the three assets that the investor has access to, we are in position to model the stochastic dynamic of the performance of their wealth, a_t, that is given by the following stochastic differential equation (SDE):

$$\mathrm{d}a_t = a_t\omega_1\mathrm{d}F_t + a_t\omega_2\mathrm{d}\varphi_t + a_t\left(1-\left(\omega_1+\omega_2\right)\right)\mathrm{d}B_t - \Pi_t\mathrm{d}t. \tag{1.6}$$

To determine the solution of the problem of maximizing (1.1) subject to (1.6), it is necessary to establish the optimal holdings of each of the assets to which the agent has access to, as well as the optimal expected profit[2]. For this you have to pose the maximization of the expected value of the discounted investor profits [3] by the appropriate rate, λ, subject to the budget constraint of their wealth, ie:

$$\underset{\Pi_t}{\text{Maximizar}} \quad \mathrm{E}\left[\int_t^\infty \frac{\Pi_t^\gamma}{\gamma} e^{-\lambda u}\mathrm{d}u \,\middle|\, \Im_t\right]$$

s. a.

$$\mathrm{d}a_t = a_t\omega_1\mathrm{d}F_t + a_t\omega_2\mathrm{d}\varphi_t + a_t\left(1-\left(\omega_1+\omega_2\right)\right)\mathrm{d}B_t - \Pi_t. \tag{1.7}$$

Where $\Im_t$ represents all the relevant information available at the time *t*. To solve this problem (see, for example, Chiang (1992)), we resort to the value function.

$$J\left(a_t, t\right) = \max_{\Pi_t} \mathrm{E}\left(\int_t^\infty \frac{\Pi_t^\gamma}{\gamma} e^{-\lambda s}\mathrm{d}s \,\middle|\, \Im_t\right).$$

[1] As references see Lamberton and Lapeyre (1996), Mikosch (1998) and Gikhman y Skorokhod (2004).

[2] It must be remembered that profit is a random variable given the stochastic nature of asset returns.

[3] Typically proposed as the discount rate is the WACC (Weighted Average Capital Cost) of all assets from which the analyzed investor gets benefits.

From which the following recursive equation is obtained:

$$J\left(a_t,t\right)=\max_{\Pi_t}\mathrm{E}\left(\int_t^{t+dt}\frac{\Pi_t^{\gamma}}{\gamma}e^{-\lambda s}\mathrm{d}s+\int_{t+dt}^{\infty}\frac{\Pi_t^{\gamma}}{\gamma}e^{-\lambda s}\mathrm{d}s\,\middle|\,\Im_t\right). \tag{1.8}$$

After observing that the second addend within the expectation is the same functional J evaluated an instant after the starting point, if its value is approximated using the Fréchet differential and the mean value theorem of the integral in the first addend, we obtain:

$$0=\max_{\Pi_t,\omega_{1t},\omega_{2t}}\mathrm{E}\left[\left(\frac{\Pi_t^{\gamma}}{\gamma}e^{-\lambda s}+J_t+J_a a_t\left(r+\left(\mu_F-r\right)\omega_{1t}+\left(\mu_\varphi-r\right)\omega_{2t}-\frac{\Pi_t}{a_t}\right)+\frac{J_{aa}a_t^2}{2}\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)^2\right)\mathrm{d}t+o\left(\mathrm{d}t\right)+J_a a_t\left(\sigma_F\omega_1+\sigma_\varphi\omega_2\right)\mathrm{d}W_{1t}\right]. \tag{1.9}$$

If expectations are taken, it is divided over $\mathrm{d}t$ and the limit is taken when $\mathrm{d}t$ tend to zero, we obtain that:

$$0=\max_{\Pi_t,\omega_{1t},\omega_{2t}}\left[\frac{\Pi_t^{\gamma}}{\gamma}e^{-\lambda s}+J_t+J_a a_t\left(r+\left(\mu_F-r\right)\omega_{1t}+\left(\mu_\varphi-r\right)\omega_{2t}-\frac{\Pi_t}{a_t}\right)+\frac{J_{aa}a_t^2}{2}\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)^2\right]. \tag{1.10}$$

Now, the separable function is proposed as the solution candidate $J\left(a_t,t\right)=\beta(a_t^{\gamma}/\gamma)e^{-\lambda t}$.

After performing some substitutions, a Hamiltonian of the following form is obtained:

$$0=\max_{\Pi_t,\omega_{1t},\omega_{2t}}\left[\frac{\Pi_t^{\gamma}}{\gamma}+\lambda\beta\frac{a_t^{\gamma}}{\gamma}+\beta a_t^{\gamma}\left(r+\left(\mu_F-r\right)\omega_{1t}+\left(\mu_\varphi-r\right)\omega_{2t}-\frac{\Pi_t}{a_t}\right)+\frac{\beta a_t^{\gamma}(\gamma-1)}{2}\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)^2\right]. \tag{1.11}$$

Differentiating this expression with regard to each of the decision variables, Π_t, ω_{1t} y ω_{2t}, the following system of equations for the first order conditions (FOD) is obtained:

$$\begin{aligned}
&\frac{\partial H}{\partial\Pi_t}=0: && \Pi_t^{\gamma-1}-\beta a_t^{\gamma-1}=0,\\
&\frac{\partial H}{\partial\omega_{1t}}=0: && \beta a_t^{\gamma}\left(\mu_F-r\right)+\beta a_t^{\gamma}\left(\gamma-1\right)\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)\sigma_F=0,\\
&\frac{\partial H}{\partial\omega_{2t}}=0: && \beta a_t^{\gamma}\left(\mu_\varphi-r\right)+\beta a_t^{\gamma}\left(\gamma-1\right)\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)\sigma_\varphi=0.
\end{aligned} \tag{1.12}$$

If you use the last two equations, it is possible to determine that the premiums to the risk of the risky assets in the portfolio are identical, ie:

$$\frac{\mu_F-r}{\sigma_F}=\frac{\mu_\varphi-r}{\sigma_\varphi}.$$

If the mean and variance of the derivative (real option), given in equations (1.13) and (1.15) are replaced, the partial differential equation of second order of Black-Scholes (1973) is obtained, namely[4]:

$$0=\frac{\partial\varphi}{\partial t}+\frac{\partial\varphi}{\partial F}F_t r+\frac{1}{2}\frac{\partial^2\varphi}{\partial F^2}F_t^2\sigma_F^2-r\varphi. \tag{1.13}$$

The above equation models the risk of ownership. Under the above assumptions, the boundary conditions of the real option are: $\max\left[F_T-K,0\right]$ and $\varphi_T\left(0,T\right)=0.$ The solution to (1.13) is given by:

$$\varphi_t=F_t N\left(d_1\right)-Ke^{-r\left(T-t\right)}N\left(d_2\right) \tag{1.14}$$

$$d_1=\frac{\ln\left(\frac{F_t}{K}\right)+\left(r+\frac{\sigma_F^2}{2}\right)\left(T-t\right)}{\sigma_F^2\sqrt{T-t}}\qquad d_2=d_1-\sqrt{T-t},$$

[4] See Venegas-Martínez (2008) or Neftci (2000).

Where the value of the "risk of ownership," φ_t, is expressed as a function of the value of the original project, F_t, the value of the compensation, K, the risk-free rate of default, *r*, the volatility of the original project, σ_F^2, and the time that the government has to make the decision, $T-t$. Once established, under the above assumptions, the solution of Black-Scholes as a proxy for the value of the "property risk" faced by the shareholders of a company, which represents a possible expropriation, the sensitivity of this risk facing changes in their incident factors can be established. Perhaps the most important of these factors is the compensation, K, to be paid by the government to those affected and can be established unilaterally by itself depending on his power or urgency. Making an anology with the financial options, it is viable to display the "*kappa*", $\kappa = \partial\varphi(\cdot)/\partial K$, as a measure of the change in the value of the premium received to a change in compensation that the government must provide to shareholders.

It can be demonstrated that $\kappa < 0$ for long positions in the options, so it is logical that for a short position it is taken that $\kappa > 0$, since this increases the probability of retaining the premium. To interpret this result, the analysis refers to the equation (1.4), which is accompanied by a positive sign to the ratio of wealth intended for the real option, which means that as the compensation increases, it is more likely for the shareholders to retain the value of the premium when the "nationalization" less attractive. Therefore, it is plausible to assume that the observed drop in market prices facing the announcement of an expropriation will be lower if a higher value of fixed compensation is set. Another factor is the volatility of the underlying, ie, of the original project which is represented by $\upsilon = \partial\varphi(\cdot)/\partial\sigma_F$.

Again, we can show a positive relationship between the volatility of the original project, σ_F, and the value of the option in a long position, $\varphi(\cdot)$, this is, Reversing the sign given the short position in the portfolio reviewed, we have: $\upsilon < 0$, which implies that the higher the volatility in the business the higher the increase in government incentives to control the company, thereby increasing the probability of exercising the real option, resulting in a negative effect on the value of the shares on the market; thereby undermining shareholder wealth. It is important to note that the solution to equation (1.13) is given by the familiar formula of Black-Scholes, which is valid if it has a structure of flat deadlines, complete markets, perfect divisibility of the underlying and normal distribution of returns of the underlying asset. Throughout this work the first and last cases will be flexibilized.

PDSO solution with Vasicek's cut rate and Brownian Yields of the Underlying

The next step in the extension of the modeling of the value of the "risk of ownership" is to suppose a flat term structure, which de facto represents a liquidity premium and produces more realism. For this a similar short rate to the one specified by Vasicek (1977) is used. The proposed model assumes that diffusion processes, both the interest rate, dW_{1t}, as well as the risky assets, dW_{2t}, are different but correlated. This assumption is a generalization of the developments in Mossin (1966), Sharpe (1964) and Treynor (1962), in which a relationship between free rate risk (with a structure of flat term) and performance of the risky assets is stablished, given by the known model CAPM. The relationships described above are represented by assuming that the short rate is driven by the EDE Vasicek, namely:

$$\frac{\mathrm{d}B_t}{B_t} = \mathrm{d}r_t = \alpha(b - r_t)\mathrm{d}t + \sigma_B \mathrm{d}W_{2t}, \tag{1.15}$$

where α represents the speed of adjustment of the short rate, r_t, to the long term rate, b, and σ_b is the volatility of the short rate. On the other hand, the EDE that governs risky asset performance follows the equation (1.13). As a consequence of his, EDE that leads the perfomance of the real option that models the "risk of ownership," is given by equation (1.15). The stochastic dynamic optimization problem the agent has to solve is similar to the one proposed in equation (1.17), except for the budget constraint, which leads to:

$$0 = \max_{\Pi_t, \omega_{1t}, \omega_{2t}} \mathrm{E}\left[\begin{array}{l} \left(\frac{\Pi_t^\gamma}{\gamma} e^{-\lambda s} + J_t + J_a a_t\left(\alpha(b - r_t) + \left(\mu_F - \alpha(b - r_t)\right)\omega_{1t} + \left(\mu_\varphi - \alpha(b - r_t)\right)\omega_{2t} - \frac{\Pi_t}{a_t}\right) + \right. \\ \left. \frac{J_{aa} a_t^2}{2}\left(\sigma_B^2(1 - \omega_1 - \omega_2)^2 + \left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)^2 + 2\rho\sigma_B(1 - \omega_1 - \omega_2)\left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\right)\right) \mathrm{d}t \\ + 0(\mathrm{d}t) + J_a a_t\left(\left(\sigma_F \omega_1 + \sigma_\varphi \omega_2\right)\mathrm{d}W_{1t} + \sigma_B(1 - \omega_1 - \omega_2)\mathrm{d}W_{2t}\right) \end{array}\right]. \tag{1.16}$$

As before, you should take the expectation of equation (1.16), divide it by and taking the limit when it tends to zero, which gives:

$$0 = \max_{\Pi_t, \omega_{1t}, \omega_{2t}} \left[\begin{array}{l} \frac{\Pi_t^\gamma}{\gamma} e^{-\lambda s} + J_t + J_a a_t\left(\alpha(b - r_t) + \left(\mu_F - \alpha(b - r_t)\right)\omega_{1t} + \left(\mu_\varphi - \alpha(b - r_t)\right)\omega_{2t} - \frac{\Pi_t}{a_t}\right) + \\ \frac{J_{aa} a_t^2}{2}\left(\sigma_B^2(1 - \omega_1 - \omega_2)^2 + \left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)^2 + 2\rho\sigma_B(1 - \omega_1 - \omega_2)\left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\right) \end{array}\right]. \tag{1.17}$$

Again, you must propose a candidate solution of the form $J(a_t, t) = \beta(a_t^\gamma / \gamma)e^{-\lambda t}$ to determine the partial differential equation of second order governing φ. Then its partial derivatives are obtained and substituted into (1.17) to obtain the Hamiltonian, namely:

$$0 = \frac{\Pi_t^\gamma}{\gamma} + \frac{\lambda\beta a_t^\gamma}{\gamma} + \beta a_t^\gamma\left(\alpha(b - r_t) + \left(\mu_F - \alpha(b - r_t)\right)\omega_{1t} + \left(\mu_\varphi - \alpha(b - r_t)\right)\omega_{2t} - \frac{\Pi_t}{a_t}\right) + \frac{(\gamma - 1)\beta a_t^\gamma}{2}\left(\sigma_B^2(1 - \omega_1 - \omega_2)^2 + \left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)^2 + 2\rho\sigma_B(1 - \omega_1 - \omega_2)\left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\right). \tag{1.18}$$

From this Hamiltonian, it is possible to obtain the first order conditions (Necessary conditions) deriving it with respect to the variables whose optimum is sought, namely:

$$\begin{array}{ll} \frac{\partial H}{\partial \Pi_t} = 0: & \Pi_t^{\gamma - 1} - \beta a_t^{\gamma - 1} = 0 \\ \frac{\partial H}{\partial \omega_{1t}} = 0: & \beta a_t^\gamma\left(\mu_F - \alpha(b - r_t)\right) + \frac{\beta a_t^\gamma(\gamma - 1)}{2}\left(-2\sigma_B^2(1 - \omega_1 - \omega_2) + 2\left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\sigma_F\right) + \\ & \frac{\beta a_t^\gamma(\gamma - 1)}{2}\left(2\rho\sigma_B\left((1 - \omega_1 - \omega_2)\sigma_F - \left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\right)\right) = 0 \\ \frac{\partial H}{\partial \omega_{2t}} = 0: & \beta a_t^\gamma\left(\mu_\varphi - \alpha(b - r_t)\right) + \frac{\beta a_t^\gamma(\gamma - 1)}{2}\left(-2\sigma_B^2(1 - \omega_1 - \omega_2) + 2\left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\sigma_\varphi\right) + \\ & \frac{\beta a_t^\gamma(\gamma - 1)}{2}\left(2\rho\sigma_B\left((1 - \omega_1 - \omega_2)\sigma_\varphi - \left(\sigma_F \omega_{1t} + \sigma_\varphi \omega_{2t}\right)\right)\right) = 0. \end{array} \tag{1.19}$$

The first important result of this extension is weak corroboration of Fisher's separation theorem; see in this respect, Fisher (1930). What in fact means that the policy of dividend payments, as a proportion of wealth is independent of the investment policy of the firm provided that the deposit rates are equal to the active for equal installments and unrestricted investment opportunities. It is said that corroboration is weak, since the value of β in terms of the proportions of wealth allocated to each asset, which change before changes in the budget constraint, remain constant. This statement corresponds to the equality between the first equations of the CPOs of the two PDSOs despite changes in the risk-free rate, the inclusion of a new source of uncertainty in the problem and the consequent alteration of the course of the wealth of the individual.

The second important result of this exercise, is given by equalizing the past two CPOs so that the premiums to the risk of both assets are equal, that is:

$$\frac{\left(\mu_F-\alpha\left(b-r_t\right)\right)-\left(1-\gamma\right)\sigma_B^2\left(1-\omega_1-\omega_2\right)-\rho\sigma_B\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)}{\sigma_F}=\left(1-\gamma\right)\left(\sigma_F\omega_1+\sigma_\varphi\omega_2+\rho\sigma_B\left(1-\omega_1-\omega_2\right)\right)$$

$$\frac{\left(\mu_\varphi-\alpha\left(b-r_t\right)\right)-\left(1-\gamma\right)\sigma_B^2\left(1-\omega_1-\omega_2\right)-\rho\sigma_B\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)}{\sigma_\varphi}=\left(1-\gamma\right)\left(\sigma_F\omega_1+\sigma_\varphi\omega_2+\rho\sigma_B\left(1-\omega_1-\omega_2\right)\right), \quad (1.20)$$

Which in turn can be rewritten as:

$$\frac{\mu_F-\alpha\left(b-r_t\right)-\eta}{\sigma_F}=\frac{\mu_\varphi-\alpha\left(b-r_t\right)-\eta}{\sigma_\varphi},$$

Where:

$$\eta=\left(1-\gamma\right)\sigma_B^2\left(1-\omega_1-\omega_2\right)+\rho\sigma_B\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right).$$

The above equality can be brought to a partial differential equation of second order.

In effect, after replacing μ_φ and σ_φ in the above equation, we have:

$$\frac{\partial\varphi}{\partial t}+\frac{1}{2}\frac{\partial^2\varphi}{\partial F_t^2}F_t^2\sigma_F^2+\frac{\partial\varphi}{\partial F_t}F_t\alpha\left(b-r_t\right)-\varphi\alpha\left(b-r_t\right)+\frac{\partial\varphi}{\partial F_t}F_t\eta-\eta\varphi=0, \quad (1.21)$$

Where $\alpha\left(b-r_t\right)$ is the deterministic part (trend) of the short rate and $(\partial\varphi/\partial F_t)F_t\eta-\eta\varphi$ is added in response to the new source of uncertainty provided by the short rate specified in equation (1.15).

This result implies that the real option modeling the "risk of property" is beyond the Black-Scholes formula, because of the last two terms. For its solution, you can always resort to numerical methods or the Monte Carlo simulation method.

If you want to know the optimal proportions of wealth allocated to each asset, it is necessary to start from the system of equations expressed in (1.20) and denote:

$$\lambda_i=\frac{\mu_i-\alpha\left(b-r_t\right)}{\sigma_i},$$

As the Premium to the risk (market) paid to each risky asset, from which it is obtained by matching that:

$$\lambda_F-\frac{1-\gamma}{\sigma_F}\left(\sigma_B^2-\sigma_B^2\omega_1-\sigma_B^2\omega_2-\sigma_F\omega_1-\sigma_F\omega_2\right)=\lambda_\varphi-\frac{1-\gamma}{\sigma_\varphi}\left(\sigma_B^2-\sigma_B^2\omega_1-\sigma_B^2\omega_2-\sigma_F\omega_1-\sigma_F\omega_2\right), \quad (1.22)$$

From where we obtain:

$$\omega_1=\frac{\left(\lambda_F-\lambda_\varphi\right)\sigma_F\sigma_\varphi}{\left(\sigma_B^2+\sigma_F\right)\left(1-\gamma\right)\left(\sigma_\varphi-\sigma_F\right)}-\omega_2\left(\sigma_B^2+\sigma_\varphi\right)-\sigma_B^2.$$

If this expression is substituted in and if we denote.

$$\Omega=\frac{\left(\lambda_F-\lambda_\varphi\right)\sigma_F\sigma_\varphi}{\left(\sigma_B^2+\sigma_F\right)\left(1-\gamma\right)\left(\sigma_\varphi-\sigma_F\right)},$$

We obtain that:

$$\omega_2=\frac{\frac{\lambda_F}{1-\gamma}+\Omega\left(\rho\sigma_B-\frac{\sigma_B^2}{\sigma_F}\right)+\sigma_B^2\left(\frac{\sigma_B^2+\sigma_F+1}{\sigma_F}-\sigma_F-\rho\sigma_B\right)-\rho\sigma_B}{-\left(\left(\sigma_B^2+\sigma_F+-1\right)\left(\frac{\sigma_B^2}{\sigma_F}-\rho\sigma_B\right)+\left(\sigma_B^2+\sigma_\varphi\right)\left(-\sigma_F-1\right)+\sigma_\varphi\left(1-\frac{1}{\sigma_F}\right)\right)}.$$

The value of ω_1 can be obtained substituting ω_2 in any of the equations of the system given in (1.20).

Solution of the PDSO with Vasicek's short rate and performance correlated with jumps

For the last stage of the theoretical analysis of the work, we will suppose an environment of financial crisis in which the performance of the company subject to expropriation, may undergo abrupt jumps that are outside the explanatory power of the purely Brownian diffusion proceses, which is outside of the scope of the traditional methodology of real options. The presence of these jumps will be modeled by a Poisson distribution with intensity λ and average jump size equal to ζ, which will allow the existence of "extreme" performances that are beyond what was forecast by a normal distribution, ie.

Beyond the assumption of a Brownian diffusion process. Although it is known that the quarterly yields of low frequency, Vg., are distributed as normal random variables, it is interesting to note that under conditions of financial crisis, yields have jumps that can not be explained by the normal distribution. Given the empirical evidence, we have simulated a group of performances governed by a diffusion process with jumps whose jump threshold is given by the probability of a random variable that follows a Poisson distribution that can only present a jump per period of timeIn this case, the average jump size is obtained as the average excess of the yields, ie yields above two standard deviations from a normal distribution, which coincides with what is traditionally considered as an excess after the VaR; this is an abnormal performance. For this analysis, it is valid to start with the PDSO's approach when the underlying follows a jump-diffusion process. The approach to this problem is similar to the above, the only change to be made is given by the stochastic differential equation followed by the yields of the risky asset in a crisis, namely:

$$\mathrm{d}F_t = \left(\mu_F \mathrm{d}t + \sigma_F \mathrm{d}W_{1t} + \zeta \mathrm{d}N_t\right) F_t. \tag{1.23}$$

Where a Poisson jump process was added to the diffusion process, (3) $\mathrm{d}N_t$, which on average jumps once at the instant $\mathrm{d}t$ with a probability (proportional to the average intensity λ.)

So the probability of a jump not happening is given by $1-\lambda \mathrm{d}t + o(\mathrm{d}t)$, and the probability of more than one jump per unit of time is given by $o(\mathrm{d}t)$.

The inclusion of this new element responds to the need to model the abrupt change in the yields of the company caused by the rumor of government intervention. In general, it is untimely and the effects can be, given the quarterly basis, encompassed in a single event, which coincides fully with the modeling through Poisson jumps. In this case, it is possible to demonstrate that this infinitesimal of higher order than the first tends to zero as the study interval collapses to the same point, that is:

$$\lim_{\mathrm{d}t \to 0} \left[\frac{o(\mathrm{d}t)}{\mathrm{d}t} \right] = 0.$$

Similarly, it can be demonstrated that:

$$\mathrm{E}\left[\mathrm{d}N_t\right] = \mathrm{Var}\left[\mathrm{d}N_t\right] = \lambda dt.$$

Where μ_φ and σ_φ are given like in (1.5), while the stochastic differential equation governing the short rate, is still expressed in (1.15), ie, the model of Vasicek (1977).

The above equation reflects the inclusion of the Poisson process (jump) in the differential equation that governs the yields of the real option through which the expropriation risk is modeled.

In general, this option has no value (is deeply out of the money), except for the moments in which a credible rumor about nationalization "activates" the jump component, $\mathrm{d}N_t$, and atkes it to levels where it existence affects the value of the implicit portfolio [5] of the shareholders.

Again, in the problem statement the changes made on the equations that govern the yields of the risky asset and the derivative will be noticeable until the differential functional is obtained, $\mathrm{d}J\left(a_t,t\right)$. The reason for this change is the inclusion of the restriction (which includes the "active" option modeling the risk of ownership) in the search for the optimum. To solve the problem at hand, we have:

$$0=\max_{\Pi_t,\omega_{1t},\omega_{2t}} \mathrm{E}\left[\begin{array}{l}\left(\frac{\Pi_t^{\gamma}}{\gamma}e^{-\lambda s}+J_t+J_a a_t\left(\alpha\left(b-r_t\right)+\left(\mu_F-\alpha\left(b-r_t\right)\right)\omega_{1t}+\left(\mu_{\varphi}-\alpha\left(b-r_t\right)\right)\omega_{2t}-\frac{\Pi_t}{a_t}\right)+\right.\\ \left.\frac{J_{aa}a_t^2}{2}\left(\sigma_B^2\left(1-\omega_1-\omega_2\right)^2+\left(\sigma_F\omega_{1t}+\sigma_{\varphi}\omega_{2t}\right)^2+2\rho\sigma_B\left(1-\omega_1-\omega_2\right)\left(\sigma_F\omega_{1t}+\sigma_{\varphi}\omega_{2t}\right)\right)\right)\mathrm{d}t+o\left(\mathrm{d}t\right)\\ +J_a a_t\left(\left(\sigma_F\omega_1+\sigma_{\varphi}\omega_2\right)\mathrm{d}W_{1t}+\sigma_B\left(1-\omega_1-\omega_2\right)\mathrm{d}W_{2t}\right)+J_a a_t\left(v\omega_{1t}+\left(\varphi\left(F_t\left(1+v\right),t\right)-\varphi\left(F_t,t\right)\right)\omega_{2t}\right)\mathrm{d}N_t\end{array}\right].$$

(1.25)

Again, it is neccesary to take the expectation of the above expression and taking its limit when the analyzed interval collapses to toz ero, which gives:

$$0=\max_{\Pi_t,\omega_{1t},\omega_{2t}} \frac{\Pi_t^{\gamma}}{\gamma}e^{-\lambda s}+J_t+J_a a_t\left(\alpha\left(b-r_t\right)+\left(\mu_F-\alpha\left(b-r_t\right)\right)\omega_{1t}+\left(\mu_{\varphi}-\alpha\left(b-r_t\right)\right)\omega_{2t}+\zeta\left(\omega_{2t}+\omega_{1t}\right)-\frac{\Pi_t}{a_t}\right)+$$
$$\frac{J_{aa}a_t^2}{2}\left(\sigma_B^2\left(1-\omega_1-\omega_2\right)^2+\left(\sigma_F\omega_{1t}+\sigma_{\varphi}\omega_{2t}\right)^2+2\rho\sigma_B\left(1-\omega_1-\omega_2\right)\left(\sigma_F\omega_{1t}+\sigma_{\varphi}\omega_{2t}\right)\right),$$

(1.26)

Note that this expression differs from the previous similar PDSO only in the average value of the jump, $\zeta\left(\omega_{2t}+\omega_{1t}\right)$, which is added to the expectation of the partial derivative with respect to the wealth of the functional, $J_a\left(a_t,t\right)$.

Indeed, the average jump size in the value of assets under expropriation risk affects the average investor's wealth in $J_a a_t \zeta\left(\omega_{2t}+\omega_{1t}\right)$ units, not its variance, thereby modifying its budget constraint and, therefore, its affordable set of benefits.

By proceeding with the solution of the PDSO it is necessary to establish as a candidate

$$J\left(a_t,t\right)=\beta\frac{a_t^{\gamma}}{\gamma}e^{-\lambda t},$$

of solution, for (1.26). Since the objective function remains unchanged in all three approaches, you can use the same candidate to a solution for them all, so the following Hamiltonian is obtained, where only the average wealth was altered as follows:

$$0=\frac{\Pi_t^{\gamma}}{\gamma}+\frac{\lambda\beta a_t^{\gamma}}{\gamma}+\beta a_t^{\gamma}\left(\alpha\left(b-r_t\right)+\left(\mu_F-\alpha\left(b-r_t\right)\right)\omega_{1t}+\left(\mu_{\varphi}-\alpha\left(b-r_t\right)\right)\omega_{2t}+\zeta\left(\omega_{1t}+\omega_{2t}\right)-\frac{\Pi_t}{a_t}\right)+$$
$$\frac{\left(\gamma-1\right)\beta a_t^{\gamma}}{2}\left(\sigma_B^2\left(1-\omega_1-\omega_2\right)^2+\left(\sigma_F\omega_{1t}+\sigma_{\varphi}\omega_{2t}\right)^2+2\rho\sigma_B\left(1-\omega_1-\omega_2\right)\left(\sigma_F\omega_{1t}+\sigma_{\varphi}\omega_{2t}\right)\right).$$

(1.27)

After taking the partial derivatives of the Hamiltonian with respect to each of the control variables, the following set of conditions is achieved:

[5] In the literature of asset valuation with real options it is established that any project has a number of embedded real options, Vg. expansion, closure, postponement, etc.., affecting the value of the project. Overall, the project can be seen as a portfolio of risky assets (the project) and a number of options on it.

$$\frac{\partial H}{\partial \Pi_t}=0: \quad \Pi_t^{\gamma-1}-\beta a_t^{\gamma-1}=0$$

$$\frac{\partial H}{\partial \omega_{1t}}=0: \quad \beta a_t^{\gamma}\left(\mu_F-\alpha\left(b-r_t\right)+\zeta\right)+\frac{\beta a_t^{\gamma}\left(\gamma-1\right)}{2}\left(-2\sigma_B^2\left(1-\omega_1-\omega_2\right)+2\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)\sigma_F\right)+$$
$$\frac{\beta a_t^{\gamma}\left(\gamma-1\right)}{2}\left(2\rho\sigma_B\left(\left(1-\omega_1-\omega_2\right)\sigma_F-\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)\right)\right)=0$$

$$\frac{\partial H}{\partial \omega_{2t}}=0: \quad \beta a_t^{\gamma}\left(\mu_F-\alpha\left(b-r_t\right)+\zeta\right)+\frac{\beta a_t^{\gamma}\left(\gamma-1\right)}{2}\left(-2\sigma_B^2\left(1-\omega_1-\omega_2\right)+2\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)\sigma_\varphi\right)+$$
$$\frac{\beta a_t^{\gamma}\left(\gamma-1\right)}{2}\left(2\rho\sigma_B\left(\left(1-\omega_1-\omega_2\right)\sigma_\varphi-\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)\right)\right)=0.$$

(1.28)

As in the two approaches of the previous sections, we can see that the optimal path of expected dividends. Given by the first partial derivative remains unchanged, namely: $\Pi_t=\beta^{1/(\gamma-1)}a_t,$
which confirms again the weak enforcement of the Fisher theorem. Note that the inclusion of a Poisson jump correlated with asset returns affects only the best proportions of options and underlying, ω_1 y $\omega_2,$ that the investor should keep in their portfolio, not their benefits.
This solution is in that, in a time of uncertainty caused by the announcement of a possible expropriation, the investor changes the delta coverage ratio of the risky asset. The amount and direction of this change will be the result of the market perception of the expropriation, ie, on the value of the jump, $\zeta.$ Now it only remains to find the partial differential equation governing the second order derivative price necessary to cover the risk for property under the assumptions explained in the PDSO resolved above. In fact, matching the Hamiltonian partials regarding the optimal proportions, ω_{1t} and $\omega_{2t},$ we obtain that:

$$\frac{\left(\mu_F-\alpha\left(b-r_t\right)\right)+\zeta-\left(1-\gamma\right)\sigma_B^2\left(1-\omega_1-\omega_2\right)-\rho\sigma_B\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)}{\sigma_F}=\left(1-\gamma\right)\left(\sigma_F\omega_1+\sigma_\varphi\omega_2+\rho\sigma_B\left(1-\omega_1-\omega_2\right)\right)$$
$$\frac{\left(\mu_\varphi-\alpha\left(b-r_t\right)\right)+\zeta-\left(1-\gamma\right)\sigma_B^2\left(1-\omega_1-\omega_2\right)-\rho\sigma_B\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right)}{\sigma_\varphi}=\left(1-\gamma\right)\left(\sigma_F\omega_1+\sigma_\varphi\omega_2+\rho\sigma_B\left(1-\omega_1-\omega_2\right)\right).$$

(1.29)

This implies that the risk premium of the real option and the underlying asset are, as in the previous exercises, the same. In this case, the risk premium is affected by both the volatility of the assets in the portfolio and by the short rate correlation with the risk of expropriation associated with the underlying, $\rho.$

After matching the above equations, and substituting μ_φ and $\sigma_\varphi,$ a partial differential equation of the second order similar to that obtained in previous PDSO's is obtained, that is:

$$\frac{\partial \varphi}{\partial t}+\frac{1}{2}\frac{\partial^2\varphi}{\partial F_t^2}F_t^2\sigma_F^2+\frac{\partial \varphi}{\partial F_t}F_t\alpha\left(b-r_t\right)-\varphi\alpha\left(b-r_t\right)+\frac{\partial \varphi}{\partial F_t}F_t\eta_\zeta-\eta_\zeta\varphi, \quad (1.30)$$

Where:

$$\eta_\zeta=\zeta+\left(1-\gamma\right)\sigma_B^2\left(1-\omega_1-\omega_2\right)+\rho\sigma_B\left(\sigma_F\omega_{1t}+\sigma_\varphi\omega_{2t}\right).$$

As can be seen in the above expression, the new PDE (Partial Differential Equation) incorporates the average value of the jump, $\zeta,$ maintaining the traditional form of the PDE's followed by derivatives. It is also necessary to note that the PDE from previous optimization exercise is nonlinear and its solution is beyond the scope of the proposal by Black and Scholes. Similarly, its solution is beyond the scope of the methods traditionally used in the valuation of real options, since the presence of jumps precludes the use of recombinant trees. It is important to note that so far we have only talked about the average value of the jump size, $\zeta,$ without mentioning the distribution of this one. This issue has been put aside intentionally as there are specific cases that shed closed solutions, eg. if the jump size is distributed as a log-normal random variable, Merton (1976) finds that the solution to the parabolic partial differential equation is given by:

$$C_{jd} = \sum_{n=0}^{\infty} \frac{e^{\lambda(1+\kappa)(T-t)}\left(\lambda(1+\kappa)(T-t)^{n}\right)}{n!} C_{BS}\left(S, X, r_n, \sigma_n^2, T-t\right) \quad (1.32)$$

Where $\lambda,$ is the parameter of the intensity of the jumps process $C_{BS}(\cdot),$ e is the value of a Black-Scholes purchase option, it is the average of the size distribution of the jump, X is the exercise price, $\sigma_n^2 = \sigma^2 + \frac{n\delta^2}{T-t},$ is the volatility of the underlying y $r_n = r - \lambda\kappa + \frac{n\ln(1+\kappa)}{T-t}.$

This particular solution to the problem posed by (1.30) represents the value of the premium for the risk of expropriation. We recommend taking this approach with caution as the nature of the phenomenon under study implies the possibility of extreme values in the jump size.

The solution of the PDE, in this section, is the basis of the valuation of the assets of a banking institution in Mexico, it is assumed that the yields of the action (global) are correlated with the rate of risk free rate of the United States and its performance was affected by the notice of the intention of the U.S. government to become the largest shareholder of the company. The next step will be the reply to the previous theoretical exercise data from a Mexican company.

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Internet broadcast by light cables

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The modern technologies of illumination used in the fiber optic network allows that the same fibers that are used for the administrative technical applications, to have the potential to provide services to third. This I articulate denotes to the well-known technology like PLC or PLT (Powerline Communication/Powerline Telecommunication) that is a process to insert or to inject a signal of greater frequency (1-30 MHz) to the electrical signal (60Hz) in the lines of copper used to trasmit electrical energy. This allows that interference is not generated with the electrical service since they work in very different ranks of frequency.

PLC, PLT, frequency.

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Introduction

Mexico was the first Latin-American country to have access to this network. The 28th of February of 1989, a link was made through a private analogic line of 9600 bits per second to form an internet node with the University of Texas, in San Antonio, USA.

This way the ITESM had the first name server for the .mx domain. The same year the UNAM, through their institute of Astronomy (IA), established an agreement to link to the network of the National Science Foundation in the United States, which was realized through the Mexican satellite Morelos II between the IA and the National Center for the Atmosphere Research (NCAR) with residence in Boulder, Colorado; also, the first link to connect the local area networks between the Institute of Astronomy and the Department of Academic Computing Services of the UNAM was made, using optical fiber links. It was in 1993 when the CONACYT and the Autonomous Technological Institute of Mexico connected to the internet through a satellite link to the NCAR.

Until then only educational and research institutions had access, but in 1994 the company PixelNet was the first to offer the service commercially. The Broadband in Mexico and its suppliers. In Mexico access to broadband Internet is predominantly via ADSL and Cable.

- ADSL: companies that offer this modality are: Telmex, Alestra, Terra and Maxcom. Telmex is offered with its Prodigy Infinitum service, Terra and Alestra use Telmex's network to provide their service. Connection speeds ranging from 512 Kbps up to 5 Mb / s.

- Cable: The companies that offer the service are: Cablecom, Cablemas with Cablered, Cablevision, Cablevision Monterrey Intercable, Megacable with Megared and Telecable with Cybercable. Speeds range from 256 Kb / s to 50 Mb / s. Through mobile: Movistar offers the service using UMTS / HSDPA.

- Telcel through WCDMA / UMTS and Iusacell through CDMA / EVDO.

- 3G connection through the computer: Iusacell offers 3G Internet service on its CDMA network through EVDO since 5 years ago at a maximum speed of 3.1 Mb / s. Telcel also does but on its UMTS network since 2008 with a maximum speed of 1.8 Mb / s. Movistar announced the availability of its UMTS / HSDPA network in November 2008 with a top speed of 14.4 Mb / s.

- Through Satellite: Jaba Networks Satellite Communications in Critical Situations, global network, and Pegaso Broadband.

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- Wireless Internet: E-Go of MVS provides wireless Internet service; it also has agreements with Alestra (Masternet) and Axtel (known before as Avantel with its Netvoice service) to use its infrastructure. WideLAN provides wireless Internet service in the city of Tepic, in the state of Nayarit. Accesa Communications is a company that provides wireless Internet service in the city of Merida in the state of Yucatan, Mexico.

- WiMax: The paid TV provider by coaxial cable, Ultravisión was the first WiMax in Mexico since 2006 [3] Currently offered in the cities of Aguascalientes, Coatzacoalcos, Matamoros, Puebla, Tampico and Veracruz. However, Axtel is the largest Wimax services provider in Mexico with coverage in 39 cities nationwide.

The innovation of telecommunications

The tremendous acceptance in recent years that the access to internet has shown has exploded the number and type of services offered using IP as the network protocol. Many of these services require unattainable band widths for the user until only a few years ago, which explains the success of technologies such as ADSL have obtained and are still obtaining. However these solutions are linked to the subscriber loop holdings, currently held by the dominant operator. PLC can compete in this segment with advantage in both cost and bandwidth, and contribute to a true liberalization of the subscriber loop.

Companies like DS2, design chips capable of transmission speeds up to 200 Mbps over lines of Low and Medium Voltage, rivaling metropolitan and access networks, while allowing telecommunications operators to extend its range of final services including voice, video and data transmission -what is known as Triple-Play- on the same infrastructure. The deployment without the need of civil work of this equipment in existing electrical distribution lines (with a population coverage of higher than 90%) makes PLC into a very competitive alternative in cost and performance over current broadband solutions.

Status of the research

It's implemented in other countries in Europe, South America and some cities in Mexico, as it is waiting for bids from other entities.

In European countries, China and Japan, this technology is already installed with an internet transfer rate of 7MB of "upload" and "download". These computer terms are to indicate the upload and download of information from or to the network.

Approach

The internet connection at home virtually always passes through the air in the form of a WiFi signal. The benefits are too many to stay anchored to the cable network, at least when we want to access the network in each and every one of the places in the house without running wires everywhere.

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However, it is not always possible to have wireless connectivity or it gives us more problems than solutions.

Then the PLC technology (Power Line Communications) or communications thorough the power line are the best alternative nowadays.

The PLC technology will allow us to access the Internet and create a data network using only the cables of the wiring at home. Thus, each outlet will be an access point.

Introduce new technology that is being used in different countries, and that the project is about to get implemented here in particular.

Broadband over Powerline (BPL, for short) is the service that is provided through the existing distribution network of electrical power of low and medium voltage.

The transmission of the BPL is comparable to DSL and cable modem. BPL can be provided to homes using existing electrical connections and outlets.

The BPL is an emerging techinology, currently available in very limited areas. It has a significant potential because power lines are installed virtually everywhere, alleviating the need to build new broadband facilities for each consumer.

General objective

Explain the evolution of internet access in Mexico, defining all ISPs out there at the moment; and the implementation of internet through light networks and wiring. Also, the structure that the service has both at home and at external connections.

Some prototypes that have been used in other countries will be seen and how are they used. And their benefits.

Specific objective

To see the benefits of optic fiber information networks through electric light connections. Since this service uses infrastructure already avaliable for the distribution of light in the country and the increased users, data transfer thorugh a faster bandwidth than other market competitors.

Development

PLC stands for Power Line Comunication, the technology that allows the transmission of voice and data over the existing power grid. This system currently allows data transmission at speeds up to 200 Mbps.

The electrical network is the largest in the world, it is made up of thousands of miles of cable, it reaches over 3,000 million people and even offers services to those places where there is no phone.

Use this extensive network for voice and data transmission, connect to the Internet at high speed and use the telephone line into any outlet is a tangible reality by this technology.

Currently, this technology offers an alternative to broadband since PLC use infrastructure that is already deployed, such as electric cables. Just a simple plug is enough to be connected. It offers high speed, provides multiple services with the same platform and allows one to have a permanent connection.

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Additionally, when using electrical cables, as the transmission medium, home wiring behaves as a data network where each plug is a potential point of connection to the world of Internet. PLC stands for Power Line Comunication, the technology that allows the transmission of voice and data over the existing power grid. This system currently allows data transmission at speeds up to 200 Mbps

The electrical network is the largest in the world, it is made up of thousands of miles of cable, it reaches over 3,000 million people and even offers services to those places where there is no phone. Use this extensive network for voice and data transmission, connect to the Internet at high speed and use the telephone line into any outlet is a tangible reality by this technology.

Currently, this technology offers an alternative to broadband since PLC use infrastructure that is already deployed, such as electric cables. Just a simple plug is enough to be connected.

Also, it offers high speed, provides multiple services with the same platform and allows one to have a permanent connection.

Additionally, when using electrical cables, as the transmission medium, home wiring behaves as a data network where each plug is a potential point of connection to the world of Internet.

Theoretical Framework

PLC technology is simply a set of elements and transmission systems, based on a classical transport and power distribution infrastructure, it allows us to offer services of a classical telecom operator to the customers.

Between 1 and 1.5 Mbps can be achieved for the particular user. Thus it becomes possible to offer Internet services, data transmission at high speed and even IP telephony. Although its use for internet access its something new, the fact of using the electrical infrastructure for the transmission of data is nothing new.

Power companies have been using this technology for many decades, to reach the most remote locations of their generation networks, such as hydroelectric centrals or remote transformers located on any mountain of the geography, where of course the telephone network doesn't reach. High voltage lines are used then to transmit data, with very small velocities, but enough for the remote.

What is new is that the research teams have recently achieved rates up to 3 Mbps using a new chip, which has once again awakened the possibility of providing information at high speed through the electric network.[6]

General principles of operation

PLC technology is simply a set of elements and transmission systems, based on a classical transport and power distribution infrastructure, it allows us to offer services of a classical telecom operator to the customers.

[6] Información general PLC, Foro de PLC, (2008) Web: "http://www.plcforum.org"

Between 1 and 1.5 Mbps can be achieved for the particular user. Thus it becomes possible to offer Internet services, data transmission at high speed and even IP telephony.[7]

The idea is simple: conditioning the current electricity infrastructure so that it can transmit two types of signal simultaneously is enough: The low frequency (50 or 60Hz) for power transmission and the high frequency (1MHz band) for data transmission, both circulating through the copper wires.[8]

The new adapted network is called High Frequency Conditioned Power Network (HFCPN), allowing simultaneous transmission of energy and information.[9]

In electrical substations (or local transformers) servers that connect to the Internet generally via optic fiber are installed. The network layer protocol is IP without any conversion. Of the three parts into which the grid is composed (sections of low voltage, medium and high voltage), only the low voltage section is used (or what in the telephone network is known as the last mile).

Stretch connecting houses with transformer substations (or what would be the telephonic equivalent to a local central).[10]

This technology uses the electrical network to send and receive digital information at high speed, which makes conventional electrical outlets into potential connections to the telecommunications network for broadband applications.

The CFE, along with various private and educational institutions, has assessed the scope and feasibility of the PLC technology, both with teams that use the DS2 technological standard as well as with Homeplug, to be implemented as a telecommunications network.

Similarly, the work needed to determine the potential of the PLC technology in applications related to the improvement of the operation of the electrical service has begun.

Cooperation agreements have been celebrated in order to analyze the feasibility of PLC as a telecommunications network on projects with social purposes in rural locations, as in the case of the agreement signed between CFE and the Government of the State of Veracruz, to operate with social purposes, a pilot project with PLC technology in the town of Zongolica.

Derived from various technological tests conducted by the CFE, it has been concluded that PLC is a technically feasible alternative to last mile broadband access, which can be used to provide access to broadband services over the IP protocol.

What's more, the NAtional Polytechnic Institute has concluded that the exploitation of PLC technology in Mexico is technically feasible and that the incidental radiation accompanying the technology does not pose a risk to health and in general to the telecommunication environment.

[7] Competencia y regulación de la energía, Noticias de PCL (2008) Web:"http://www.competenciayregulacion.cl/news.php?edicion=18&news=112"

[8]Encarta, Electricidad(2010) Web: "http://es.encarta.msn.com/encyclopedia_761566543_3/Electricidad.html"

[9] Electro industria, Web: "http://www.emb.cl/electroindustria/articulo.mv?xid=392&rank=1"

[10] HFCPN: High Frequency & Conditioned Power Network. Red eléctrica acondicionada para las altas frecuencias.

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On the commercial side, the CFE has been exploring mechanisms so PLC technology can be marketed in Mexico. Because of this, we have identified a business model in which the CFE adopts a neutral position in the telecommunications market and makes PLC technology available to various telecom operators, under non-discriminatory conditions and strictly on the market basis.

However, the application of this model has been suspended until the PLC technology will stand at a level of matirity sufficient to make it economically viable.

However, we have worked with various authorities, both from telecommunications and competition, to promote the use of PLC technology as an alternative to increase connectivity in the country. On this point, the Federal Competition Commission, the Ministry of Economy (COFECO) issued a notice supporting the project and providing general guidelines; For its part, the Federal Telecommunications Commission (Cofetel) informed the CFE of the rules to be used for the approval of PLC equipment.

We have continued with the promotion of PLC technology between dealers and the analysis has begun for the implementation of electrical applications, assuming that with the convergence of telecom and electrical applications, the PLC technology would have greater economic viability.

Elements for the provision of internet by PLC

First of all, we must know that power grids convert (by transformers located at the substations), the voltages of medium voltage (used for the transport of energy) to 220V low voltage lines as close as possible to the users.

In order to avoid the losses that occur at low power.[11]

PLC technology is simply a set of elements and transmission systems, based on a classical transport and power distribution infrastructure, it allows us to offer services of a classical telecom operator to the customers. Between 1 and 1.5 Mbps can be achieved for the particular user.

Thus it becomes possible to offer Internet services, data transmission at high speed and even IP telephony. It is enough to condition electrical infrastructure so that these two kinds of signals transmit without affecting each other; the low frequency (50-60 Hz) for power transmission and the high-frequency (1 MHz) for data transmission, both flowing through the copper pair.

The new adapted network is called High Frequency Conditioned Power Network (HFCPN), allowing simultaneous transmission of energy and information. In electrical substations (or local transformers) servers that connect to the Internet generally via optic fiber are installed.

[11] Banda Ancha, (2010) Web: "http://www.mincomunicaciones.gov.co/mincom/src/user_docs/Archivos/Sectorial/ComBandaAnchaOrbitel.pdf"

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Stretch connecting houses with transformer substations (or what would be the telephonic equivalent to a local central). [12]

Transformers

Each transformer distributes, typically between 3 and 6 low voltage lines, with an average length of about 250 meters. Each provides power to about 50 customers.[13]

Single electric power phase meter based on a completely electronic meassure core, has a pulse output of the "Open Collector" type that enables remote automatic reading of the measurement information.

User modem

Each user must install a modem to enable the sending and receiving of data over the power line.[14]

There is the option for the user to install a home gateway, between the modem (placed near the counter input) and a possible internal LAN, so that it enables different users to share the connection and at the same time to interconnect among them using any electrical outlet or plug in the building.

In turn, any external data source (xDSL, coax, wireless, bluetooth) can be connected to the home gateway for it to distribute and manage multiuser connection.[15]

The PLC modems transmit at ranges of high and medium frequency (carrier signal of 1.6 to 30 MHz). Asymmetric modem speed is generally from 256 kbit / s to 2.7 Mbit / s. In the repeater situated in the meter room (in the case of supply in a building) the speed is up to 45 Mbit / s and can be connected to 256 PLC modems. In the medium voltage stations, the speed from the network control centers ("head end") to Internet is up to 135 Mbit / s. To connect to the Internet, electric companies can use a "backbone" optical fiber or wireless links.

Head Modem

The header PLC modem located in the medium voltage substation of the electrical operator, engages and disengages the data signal of the electrical signal.

[12] Comisión Interamericana de Telecomunicaciones, "Aspectos de la Tecnología de Comunicación por Linea de Potencía (PLC)". (2008) Web:"http://www.citel.oas.org/newsletter/2008/diciembre/plc_e.asp"

[13] Huidrobo José M y Davis Roldán. (2005)"Serie Telecomunicaciones redes y Servicios de banda ancha, Tecnología y Aplicaciones, Primera Edición, Editorial MCGraw-Hill, (2005), 133-134, 255-259.

[14] Dgtv, "Manuales de Plc", (2010) Web: "http://dgtve.sep.gob.mx/tve/serv_edusat/manuales/pdf/energia.pdf"

[15] Rediris, "Plc", 2010 Web:"http://www.rediris.es/rediris/boletin/68-69/enfoque4.pdf"

Since the low voltage electrical network is shared by 4-6, the head modem will handle all the traffic from those users, dynamically placing the capacity of the data channels available to the users based on their instantaneous demand and the type of data traffic to send; since traffic such as real-time data (such as voice or video) that require a minimum delay, are given priority over other types of traffic.[16]

The transformer substations will be joined together by PLC or other technology, linking one of them to the service center connected to the Internet or to other telecommunications networks, and from which you can also remotely monitor and control the PLC equipment installed and manage data about the customers such as meassure reading.

Finally, the operator must also, in some cases, install in the meassure room of each building, a residential gateway; which is a repeater responsible of amplifying the signal and retransmit it to all outlets of the homes or offices.

Graphic 1 Head Modem[17]

The client, when hiring the service, must purchase and install a small PLC modem where data transmission equipment will be connected, such as a PC. This modem will have a port to be connected to the plug and another, usually USB (although, depending on the model, can be RS-232 or Ethernet) to be connected to the PC the same way as an ADSL modem.

The PLC modem is responsible for separating the low frequency signal of the power supply (50 Hz in Europe and 60 Hz in the U.S.) from the one that carries the data (1.6 to 30 MHz currently). This operation is very similar to the ADSL splitter, which separates the traditional analog voice signal (which occupies the band 300-3400 Hz) from the data.

To do this, the modem has two filters inside, one low-pass, which will allow electricity to circulate and to which appliances, televisions and other household appliances will be connected to; and a high pass that separates the carrier wave of information.

[16] Tecnología PLC, J. R. González y, F. J. Vieira. (2010) Web:"http://www.rediris.es/rediris/boletin/68-69/enfoque4.pdf"

[17] Tecnología PLC, J. R. González y, F. J. Vieira. (2010) Web:"http://www.rediris.es/rediris/boletin/68-69/enfoque4.pdf"

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The latter will be treated by the modem in order to turn it into useful data for the PC (video, image, voice, etc.) as an IP protocol.

This filter is also responsible for cleaning the variable noise generated in the network by all connected appliances and that could introduce very significant distortions in the data, and to provide privacy to the data communication based on VLAN and also protection through encryption mechanisms.

Due to the architecture of the low voltage network, the bandwidth is shared by all subscribers connected to a single transformer substation; so if the head modem in the processing center can support 45 Mbps and serves 150 subscribers, of which 30% opt for PLC as a form of Internet access, each of them can reach at least 1 Mbps, although the rates may be higher when the rest of subscribers are not connected.

On the side of the electric company, and the transformer substation, you must also place the data reception modem. Whereby a high speed connection powerful enough to serve all users is guaranteed.

From this point, and through a fiber or a radio link, we will connect with the service provider (ISP). Shown in the figure under the acronym HE.[18]

Architecture of a PLC access network.

- The network topology is in bus, causing that the bandwidth provided by each processor, must be shared by all the users who hang from it. There is an average of 150 homes in Europe per transformer[19].

- Any plug or plug of the house is a communications port provided you have a PLC modem. It incorporates two filters inside to separate signals carrying information (high-pass) and electric current (low-pass).

- There are some distance limitations for both the interior to the house section as well as to the the access section, these being about 400 m to the access section and 50 m for the in-home portion (in home).[20]

- The access controller or PLC head modem is responsible for interconnecting the different service networks (Internet, television, telephone) with the low voltage line.

[18] IEEE Std 802.1Q-199 "IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks" Mar, (1999)

[19] Tanebaum, Andrew."Computer Network", Third Edition, Prentice Hall, New Jersey. (1996) Pág.102-169

[20] Barreto Alexis. "Estudio y análisis de las distintas tecnologías, De acceso que un proveedor de servicios de internet puede implementar", tomo ii, (1999), pág. 218, 233, 257, 306.

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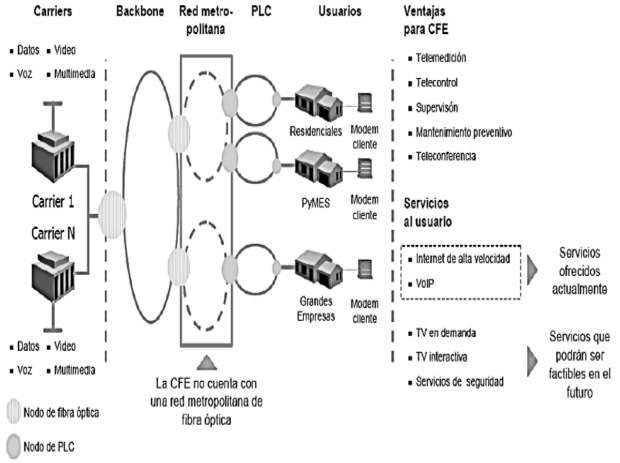


It can be seen that all carriers of information will be transmitted via optical fiber to all users, PLC is responsible for connecting lines of low and medium voltage to the fiber optic network. The backbone is part of the metropolitan network to which the entire PLC system will connect to.

Note that the Internet will not be provided by CFE, but by leading companies in this service. CFE would make available the electricity network converted into PLC, this by using medium and low voltage equipments, couplers and user equipment (modems), which are placed in residences, industries and large companies, all of this, in order to give a good service and signal quality.

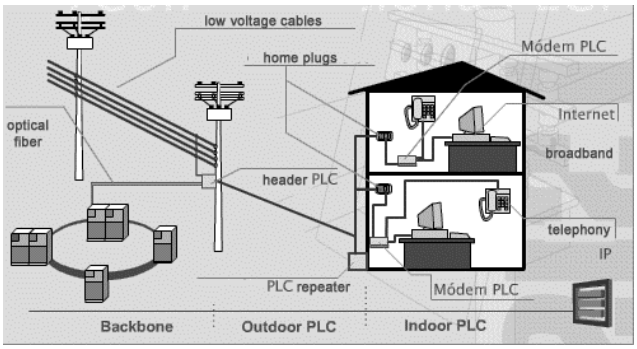
Services will be provided to the client using the low voltage network commonly called "last mile". Note that this system will help to improve the operations of CFE and in turn give access to the end user ("Last Mile") to broadband and voice services over the IP protocol.

Each area has a substation transformer, three medium voltage wires and 4 low voltage wires.

The 3 medium voltage wires enter the transformer, which is responsible for reducing the voltage and from this the 4 low voltage wires will come out, of which 1 is neutral and the others are alive.

Employing the above, different combinations will be done in order to feed the houses that surround the substation.

Now in Figure 6.8 we can see that in the transformer is placed a PLC system with a transmitter / receiver, which receive signals from the satellite for later transmission through the cables. For the signal to stay with a good quality and not suffer much attenuation, repeaters will be placed every 200 meters.[21]



Graphic 2

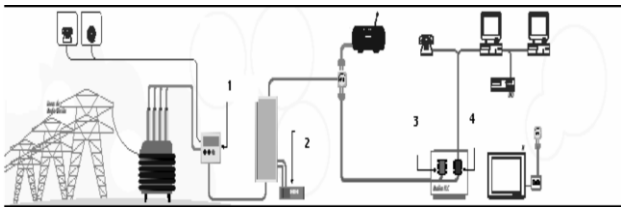
How does it work?

The grid can be considered to be divided into three classes of sections: high, medium and low voltage, or subscribers stretch.

[21] CFE, "Arquitectura PLC" (2010) "http://catarina.udlap.mx/u_dl_a/tales/documentos/lem/santos_p_sc/capitulo6.pdf "

The PLC technology does not use all of the electrical network for data transmission, but only the low voltage section, due among other things to the fact that the data signals can not pass through the transformers. In the processing center or electric substation there will be a node connected to Internet through a "Backbone" of optical fiber or wireless. There the optical signal is converted into an electrical signal through the PLC head.

Then through the light cable two signals arrive at homes: the low frequency ones, that transmit power, and the high-frequency signals that transmit data. If the distance from the subscriber to the PLC head is greater than 300mts one repeater PLC is required, which would be connected a the measurement center.



Graphic 3

1. PLC head**
2. PLC repeater
3. Low band filter
4. High band filter
5. MODEM (made by 3,4)

Interconnection with other technologies

As mentioned above, the PLC technology is no substitutive but it can complement others already installed on both the entry section and in the house (in-home).

The graph shows how we can use this technology to reach both the building (access sections) as well as to distribute Internet access via cable that reaches us up to the building.

What we need to do to start using this technology is to get us a PLC adapter kit. We will place one next to the modem or router and since then Internet will be distributed through the electrical system of the house along with the electricity.

When we want to connect a computer to the Internet we only have to place another adapter into a nearby outlet and from it takes the Ethernet cable that will go to the corresponding port.

For Blu-Ray players with a BD-Live profile, multimedia hard drives or gaming consoles, it is an economical solution if we compare it with what it would cost us to get Wifi adapters, which certainly do not exist for all teams. In addition, the adapter can be used with the equipment you want.[22]

For those who really want to get rid of the wires, there are already in the market PLC extenders that connect to a plug to recieve the connection to Internet but then emit the signal to the laptop for example without needing to connect the Ethernet cable.

HomePlug

Currently two standards are imposed on the market: HomePlug and DS2 (UPA). Both have managed to reach 200 Mbps in household electricity networks.

[22] Javier Penalva, 13 De Febrero De (2009), Web: "http://www.xataka.com/hogar-digital/especial-plc-alternativa-a-la-conectividad-wifi-ii"

These figures are theoretical, and as we shall see in a couple of tests we've done, the speed you get will depend on the distance and status of the installation of our house.

HomePlug is the specification that has more compatible products on the market, and thinks not only about Internet but also about VoIP and HDTV as key elements to carry together with the electricity.

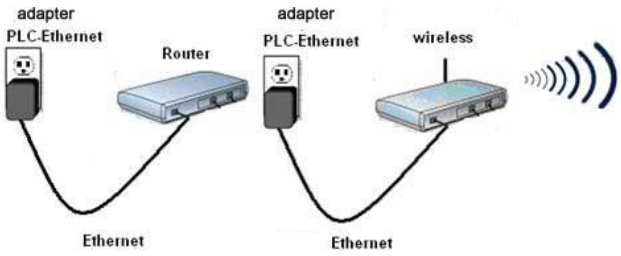
It is compatible with most home network technology because it is based in Ethernet. HomePlug technology does not interfere with other technologies. In fact, much work was done to ensure that products with HomePlug technology could coexist with other methods of home networks.

Because outlets are found on almost every wall of a house, is a logical choice as a conduit for the data connection.

HomePlug technology also eliminates some of the problems with wireless networks, allowing access points at the most convenient locations in the house, reducing the need for multiple wireless access points.

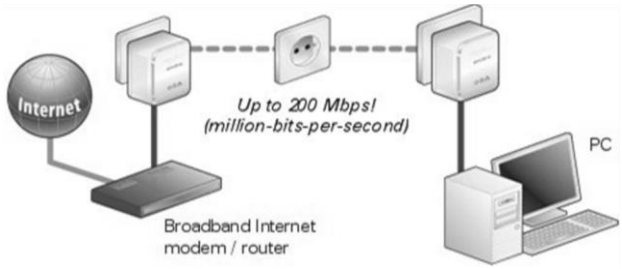
Using the PLC in conjunction with WiFi connectivity

WiFi and PLC are far from technologies that can not exist simultaneously. Typically, the first is replaced by the second, but if we want, we can take advantage of both.



A clear example is to bring WiFi connectivity to areas of the house that need it the most. Imagine a house with several floors where the WiFi router is in the living room of the first floor and we want to have WiFi installed in an office on the second or third, where we can have Wifi signal coverage problems.

What we can do is move the fixed point where the WiFi router is positioned to the desired level, and still enjoy WiFi where we need it most.



Transmission speed is not bad at all, it can be up to 200 Mbps, and the connection is permanent and a perfect complement to ADSL and wireless connectivity.[23]

Contributions

The development and implementation of PLC technology would allow the following benefits and applications to develop:

[23] Xataka, 13 De Febrero De (2009), Web: "http://www.xataka.com/hogar-digital/especial-plc-alternativa-a-la-conectividad-wifi-ii"

- Expansion of the broadband market.
- Use of existing electrical infrastructure.
- Expansion of products and services through PLC.
- Innovation when implementation of a cutting edge technology is done by a company.
- Creating closed and secure connections between ISPs and customers.
- Optimization of the use of optical fiber infrastructure.
- Creation of PLC networks with wider coverage than the telephone network.
- Implementation of PLC networks without requiring the development of civil works to ensure that each outlet is a potential node of connection.
- Transmission of voice, data, image and electricity; all at the same time and by a single driver.
- Simplicity and economy for system development.
- Internet always on.
- Execution of multimedia applications through the Internet. Exploitation of IP telephony.
- Creation and development of remote monitoring and security services.
- Service integration.
- The technical services of appliance manufacturers, they will learn the possible malfunctions and budget the group repairs.
- Implementation of video conferencing between customers and company.
- Use of IP protocols, without having to travel to their home.
- Economy on the installation of telephone networks and computer networks.
- Creation of virtual networks to transmit voice and data within the organization.
- Enabling PLC work in a broadband IP network.
- This allows each subscriber to be identified in the universe of users who are using the service while allowing the use of technologies and services based on the IP protocol.
- Speed and economy in the deployment of PLC.
- Integration and regional coverage.

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Xataka, 13 De Febrero De (2009), Web: http://www.xataka.com/hogar-digital/especial-plc-alternativa-a-la-conectividad-wifi-ii

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Determination of financial capital with aperiodicity Fractal

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In this article the development of financial variables as Fixed Capital, Cost and Margin with Lagrange, Finite condicionada and Koch models applied to the company Bachoco, to determine if it is profitable is presented. Based on the Lagrange matrix of the Mexican stock exchange in the month of April, it was gradually working in each of the models. When performing the calculation steps allowed us to observe the share price and thus have a prediction of the amount of the gain according to the expected values according to the modeling. projections were made , which provide you visualize the behavior and calculation of profit. To conclude a comparison was made between the 3 prediction models, identifying the scope, cost and fixed capital that each one presents. It was determined which could be profitable for the company.

Fractal, production, holding, shares, stock.

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† Researcher contributing as first author.

Introduction

The company was founded in 1952 in the State of Sonora, Mexico, and is officially incorporated as Industrias Bachoco, S.A.B. de C.V., on April 17, 1980, for an indefinite period. The Company is commercially known as Bachoco. In 1963, the Company began operations in the cities of Navojoa, Los Mochis and Culiacan, and in 1971 in Culiacan. In 1974, the productive operation was established in Celaya, later in 1993 the company moved its corporate city of Celaya, and opened a new operation in the city of Tecamachalco, south of Mexico. In 1994, I continue the growth of the Company, this time with a production complex in the city of Lagos de Moreno in Jalisco, totaling up to that point with four integrated manufacturing operations,the Company purchased the assets and equipment of MACSA, S.A. de C.V., which led the Company to the opening of 3 distribution centers in the state of Baja California Sur.Bachoco Group has no financial activity in Mexico in the field of food production sector is distributed with meat and derivatives with economic activity, the sector of Bachoco is frequently consumed products.

Its main products are processed chicken, egg and pork. The economic activity pure holding shares through its subsidiaries production processing and marketing of chicken, egg production and marketing, production and sale of pork.Total Shares representing the share capital of the Company: 600'000,000Total shares outstanding at the end of the reporting period: 600'000,000.The Company has authorized Trust Certificates Program for an amount of $ 5,000,000,000. under authorization of the National Banking Commission.We determine the Fixed Capital, Margin and Cost.

The fixed capital is defined as all assets of the companies in which said materialize in installations or, put another way is part of the capital that is invested in goods or services that will be linked permanently, such as machinery, office furniture Etc.The original model of fixed capital is structured as follows:

$$\mathrm{CF} = \left[\frac{\mathrm{AC}}{\mathrm{PPP}}\right]^{\pi-1} \quad (1)$$

CF is defined as variable and fixed capital will not be useful to verify the profitability of the company to analyze, in this case Bachoco, S.A. de C.V.It is essential to mention each of the variables in order to understand the analysis.Then exemplified with information collected on April 16, 2016, it is important to mention this because none of our variables is fixed, the timing of change in the value of these variables is impossible to define.The variables obtained have the following values:AC: 600,000,000,PPP: 76.45 and Inflación: 2.75 ,substituting in the model:

$$CF = \left[\frac{600,000,000}{76.45}\right]^{2.6-1} [7848266.84]^{1.6} = 1.07 \quad (2)$$

The final value is the fixed capital of Bachoco, S.A. de C.V. with the date information provided. Having made the proper breakdown of the original model Lagrangian apply a transformation, this method uses the differential calculus, and is used for converting large numbers in small numbers, this can be and optimization purposes or cost reduction. The model is defined with the following mathematical model:

$$CF = \frac{\log AC\ (\ln PPP)}{\pi-1} \quad (3)$$

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Similarly, the relationship with the information obtained on the date given above is exemplified. Substituting in the model:

$$CF = \frac{(\log(600{,}000{,}000))\,(\ln 76.45)}{2.6-1} = 23.73 \quad (4)$$

This transformation is made from Lagrangian model, focused on the oscillations of closing prices, it is a tool that uses differential calculus to carry out the transformation of the previous financial profile.

$$CF = \frac{\lim AC\,(\frac{\mathrm{d}}{\mathrm{d}_1} PPP)}{\pi-1} \quad (5)$$

Exemplified same manner as the above. Substituting in the model:

$$CF = \frac{((0.68)(600{,}000{,}000))\,((0.5)(76.45))}{2.6-1} = 9687.5 \quad (6)$$

Relying on the lagrange profile of our model of fixed capital, we apply this methodology in order to complete the analysis of the profitability of the company, the model developed by this method is as follows:

$$CF = \frac{\frac{1}{2} AC\,(\frac{3}{4} PPP)}{\pi-1} \quad (7)$$

Exemplified with the information obtained from the relevant date. Substituting in the model:

$$CF = \frac{((0.5)(600{,}000{,}000))((0.75)(76.45))}{2.6-1} = 1.06 \quad (8)$$

The margin or net interest margin in this case is a difference between the yields obtained from the company through the various financial products and the costs generated by external resources.The original model that defines the variable margin is comprised of:

$$Mg = LP[AC]^{\frac{TC-Ti}{\frac{3}{4}}} \quad (9)$$

Where again we see within its structure to the outstanding shares, but it is important to mention the other variables in order to make comprehensible the model.*i)*LP: The long term is one of the variables to manage in this analysis indicates no more than a periodicity which has a value of 1 year or 12 months.*ii)*TC: Refers to the exchange rate in our case corresponding to dollars, and the information is equally available on the official website of BANXICO.*iii)*IT: The interest rate is the payment stipulated above an amount paid, this information like the TC is available in BANXICO, it is important for the model, select the target rate which is directly related to the country of our company to be treated.Exemplified with the information collected:*TC: 17.55,IT: 3.75 and LP meses*

Substituting in the model:

$$Mg = 12[600{,}000{,}000]^{\frac{17.55-3.75}{0.75}} = 12[1.46E110] = 1.75 \quad (10)$$

Applying the transformation to the original model profile is as follows:

$$Mg = \frac{\log LP[\ln AC]}{\frac{TC-Ti}{\frac{3}{4}}} \quad (11)$$

Substituting in the model:

$$Mg = \frac{\log 12[\ln 600{,}000{,}000]}{\left(\frac{17.55-3.75}{0.75}\right)} = 1.17 \quad (12)$$

Applying the transformation to model Finite profile is as follows:

$$Mg = \frac{\lim LP\left[\frac{\mathrm{d}}{\mathrm{d}_1} AC\right]}{\frac{TC-Ti}{\frac{3}{4}}} \quad (13)$$

Exemplifying the data obtained. Substituting in the model:

$$Mg = \frac{((0.68)(12))[(0.5)(600{,}000{,}000)]}{\left(\frac{17.55-3.75}{0.75}\right)} = 133043478.3 \quad (14)$$

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Applying the transformation to model Finite profile is as follows:

$$Mg = \frac{\frac{1}{2}LP\left[\frac{3}{4}AC\right]}{\frac{TC-Ti}{\frac{\partial}{\partial_{II}}}} \quad (15)$$

Exemplifying the data obtained.Substituting in the model:

$$Mg = \frac{((0.5)(12))[(0.75)(600,000,000)]}{\left(\frac{17.55-3.75}{0.25}\right)} = 48913043.47 \quad (16)$$

We can understand the meaning of this variable as the monetary value of resources that should provide a good or a service, but not always, the elements to determine the costs are variants depending on the company to analyze.Here the original cost profile is defined to carry out the analysis, which has the following form:

$$CT = CP[AC]^{\left(\frac{TC}{Ti}\right)^{\frac{1}{2}}} \quad (17)$$

Exemplified with the same information excluding the long-term is not in this profile yet more if we have the CP which is defined as the short-term and indicates a period of time you have an overall value of 6 months.The values of the variables are as follows:CP: 6 ,AC: 600,000,000 ,TC: 17.55 and Ti: 3.75 substituting in the model:

$$CT = 6[600,000,000]^{\left(\frac{17.55}{3.75}\right)^{0.5}} = 6[9.13E18] = 5478 \quad (18)$$

Applying the transformation to the original model profile is as follows:

$$CT = \left[\frac{\log CP[\ln AC]}{\frac{TC}{Ti}}\right]^{\frac{1}{2}} \quad (19)$$

Exemplified same manner as the above. *Substituting in the model:*

$$CT = \left[\frac{\log 6[\ln 600,000,000]}{\left(\frac{17.55}{3.75}\right)}\right] = [3.32]^{0.5} = 1.82 \quad (20)$$

Applying the transformation to model Finite profile is as follows:

$$CT = \left[\frac{\lim CP\left[\frac{\mathrm{d}}{\mathrm{d}_1}AC\right]}{\frac{TC}{Ti}}\right]^{\frac{1}{2}} \quad (21)$$

Exemplified same manner as the above.Substituting in the model:

$$CT = \left[\frac{((0.68)(6))[(0.5)(600,000,000)]}{\left(\frac{17.55}{3.75}\right)}\right]^{0.5} = 16172.15 \quad (22)$$

Applying the transformation to model Finite profile is as follows:

$$CT = \left[\frac{\frac{1}{2}CP\left[\frac{3}{4}AC\right]}{\frac{TC}{Ti}}\right]^{\frac{\partial}{\partial_I}} \quad (23)$$

Exemplified same manner as the above. Substituting in the model:

$$CT = \left[\frac{((0.5)(6))[(0.75)(600,000,000)]}{\left(\frac{17.55}{3.75}\right)}\right]^{0.75} = 2213430.73 \quad (24)$$

After removing all the results will have to make a sum total of Proposals Finite Formulas, Lema Itto and Koch

$$\sum 0 = 23.73 + 1.17 + 1.82 = 26.72 \quad (25)$$

$$\sum 1 = 9687.5E6 + 133043478.3 + 13172.15 = 9820559650 \quad (26)$$

$$\sum 2 = 1.06E10 + 48913043.47 + 2213430.73 = 1.06 \quad (27)$$

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With the proposed formulas with their results will have to make a sum of each of the summations

$$\sum = 26.72 + 9820559650 + 1.06E10 = 2.04 \quad (28)$$

Then divided by 3 to get if you have performance or has lost in the bag with the result obtained earlier mind:

$$\sum = \frac{2.04e10}{3} = 6{,}800{,}000{,}000 \quad (29)$$

If it happens that if the result is large should use the log to be reduced and clearly appreciates what it takes see below

$$\sum = \log(6{,}800{,}000{,}000) = 9.88 \quad (30)$$

Conclusions

With this result it will be appreciated having lost in the bag as it only covers 9.88% in Mexico to cover the market selling fresh chicken and derivatives thereof, and is very reasonable, since in all the Mexican Republic is one food that is essential in the diet of Mexicans therefore is not only Bachoco which sells this product but also in supermarkets, shops selling cold meats and markets, leading to have that percentage, but that does not implies that this evil because as sells also has hatcheries causing you to have control of what is generating and not as in other places only buy the product and then sell it without knowing whether it is good or have a good quality control but still and it has a low percentage loss generating it rather than have a promising performance.

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Is it predictable the nominal exchange rate in the long term through its monetary fundamental? The evidence for Mexico 1995-2008

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In this work the relation of long existing term between the fundamental type of nominal change and its monetary ones is analyzed, within the framework of the present exchange regime of flotation (1995-2008). Specifically the predictability of the movements in the fundamental type of change from its monetary ones is investigated. The analysis of the predictability of the type of change is motivated because a) exists few studies on the subject in Literature for Mexico, since most of the studies on the type of change in Mexico they have been elaborated to establish his determinants, and b) at the present time does not exist a consensus on the subject and it is tried to contribute to the debate demonstrates empiricist for the case of Mexico.

RCF, Nominal Exchange rate, Predictability.

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Introduction

The origin of the current debate is about the work of Nelson Mark (1995), since this approach caused controversy among researchers such as Kilian (1997), Berkowitz and Giorgianni (1997), Groen (1997) and Berben and Van Dijk (1998) who question the statistical robustness of the results. On the other hand, there is favorable evidence for the exchange rate predictability in MacDonald and Taylor (1993), Chinn and Meese (1995), Chen and Mark (1996), MacDonald and Marsh (1997) and in the present paper for Mexico (1995-2008).

This research aims to contribute to the empirical debate showing evidence for the Mexico case on the predictability of the exchange rate movement based on the basic variables derivated from the monetary model.

The research hypothesis focuses on two main objectives: the first one is to prove that the the nominal exchange rate is cointegrated in the long-term with predicted determinants by the monetary model, and the second is to examine the ability of monetary fundamental to predict changes in the nominal exchange rate in regard to its fundamental value. This latter aspect is analyzed estimating error correction models for the unrestricted case.

Econometric model

In this section the econometric model that examines the hypothesis if the research is specified:

- If the fundamental value (f_t) and the nominal exchange rate (S_t) are cointegrated.

- If the deviations of the nominal Exchange rate of its fundamental value (x_t) help to foresee S_{t+k},, through the Engle and Granger cointegration approach, and if there is evidence of cointegration, an error correction model (ECM) will be estimated to incorporate short-term relations.

The use of the cointegration approach can be restricted or irrestricted; in this research the irrestricted model is used. Even if a great amount of empriricla research have studied the restrict monetary model, [24] other authors [25] are against imposing restrictions a priori to the coefficients of the econometric model of the exchange rate's monetary approach, when we want to prove that it returns to its fundamental value in the long term. Therefore, to give more robustness to the model, all the parameters are considered.

[24] Messe y Rose (1990), Chinn y Meese (1995), Mark (1995), Blomberg y Hess (1997) y Mark y Choi (1997).

[25] Cheung y Lai (1995), quienes observaron que las restricciones sesgan el resultado para no alcanzar el equilibrio a largo plazo. Además la evidencia en García y González (2000) señala que el poder explicativo de modelo monetario del tipo de cambio sin imponer restricciones a los coeficientes permite obtener el equilibrio de largo plazo del tipo de cambio spot.

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The first step in the construction of the econometric model is specify on what S_t is based, in the presence of "rational bubbles" the function is specified next:

$$S_t = \gamma [m_t^s - m_t^{s*} - \lambda (y_t - y_t^*)] \quad (1)$$

Where *St* is the logarith of the spot exchange rate, m_t^s is the logarithm of the domestic money supply, m_t^{s*} is the logarithm of the foreign money supply, y_t is the logarithm of the domesctic country product, and y_t^* is the logarithm of the foreign product.

Now X_t is defined as follows:

$$X_t = f_t - s_t \quad (2)$$

Where x_t is the deviation of the spot Exchange rate regarding its fundamental, f_t is the monetary fundamental and s_t is the spot exchange rate.

Irrestrict cointegration model.

Since for the econometrician is important to estime coefficients for each of the fundamentals, the irrestrict equation of (1) is:

$$S_t = \beta_1 m_t - \beta_2 m_t^* - \beta_3 y_t + \beta_4 y^* + u_t \quad (3)$$

And is defined: X_t^m as follows:

$$X_t^m = s_t - \beta_1 m_t + \beta_2 m_t^* + \beta_3 y_t - \beta_4 y_{t^*} = u_t \quad (4)$$

The irrestrict model can be estimated with Ordinary Least Square (OLS), since Engle and Granges (1987) demonstrated that if there is conintegration, the OLS estimator is consistent.

This result is given even though f_t is correlated with the error term. More surprisingly, authors show that the difference ($\square_{\square OLS}$ - $\square\square\square$ tends to zero at about the same rate as T^{-1} tends to zero as T.

This has more speed than the standard convergence of $T^{-1/2}$ of the OLS estimator of the classic regression, this is the reason why it is called superconsistent and can be used to estimate the parameters of the long term relationship. But the estimators resulting from the OLS for a small sample are inefficient and biased.

Therefore, to avoid debate on the simple size, the model will be etimated with Dynamic Ordinary Least Square (DOLS).

The estimator obtained through dynamic ordinary least square was proposed by Saikkonen (*Econometric Theory*, 1991) and includes *p* lags and advances of the *ft* differences in the cointegrating regression: model with Dynamic Ordinary Least Square (DOLS).

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The estimator obtained through dynamic ordinary least square was proposed by Saikkonen (*Econometric Theory*, 1991) and includes *p* remnants and advances of the *ft* differences in the cointegrating regression:

$$S_t = f_t \beta + \quad \Delta f_t + {}_j\delta_j + v_t \qquad (5)$$

The motivation is suppres the serial correlation of the error term adding sufficient conductors and remnants to the regression. This estimator is asyntotically efficient.

For the short term the adjustment model is specified in the next section.

Error correction model

From the long term relationship we have:

$$S_t = \beta_{OLSD} f_t^m + u_t \qquad (6)$$

Then, the short term relationship will be:

$$\Delta s = \varphi_1 \Delta s_{t-1} + \varphi_2 \Delta f_t^m + \varphi_3 (s_{t-1} - \beta\ OLSD\ f_{t-}{}^m{}_1) + u_t \qquad (7)$$

Remanents of $\Delta s + \Delta f.$ can be included. And if $\varphi_3 < 0$ and significative, then the deviations of the exchange rate in regard to its fundamentals help to predict the deviations in the exchange rate.

Econometric methodology and estimation analysis

The first step of the econometric methodology consists on determining the order of the series integration through correlograms[26] and the augmented unit root Dickey-Fuller test for the information criteria of Akaike, Schwarz, modified Akaike and modified Schwarz.

The Dickey-Fuller-GLS test is also obtained in order to have a test range that validate the results.

If in the first step it is found that the logarithms of the series have a unit root, the order of integration of the series can be identified, and if all have the same integration order, the second stpe will proceed.

Then, the results for the long-term model that was specified in (3) by OLS and DOLS estimation methods are obtained.

It should be noted that for the DOLS Estimator, it is possible to do inferences as follows: Frist, (5) is estimated "augmented cointegration model", where the long term relation is augmented in order to include □ which will "absorb" the endogeneity of f_t , plus *p* leads and lags of □ □ f_t which will control by residual autocorrelation

Then, the hypothesis H_0:=0 can be assesed using the ratio-t rescaling as follows:

$$* = \left(\sigma_v^2 / \lambda^2_v \right)(t) \rightarrow t - distribución\ \ t -$$

[26] Éstos no se repotan en los resultados, puesto que son varias series y por cuestión de espacio sólo se menciona su comportamiento en los resultados.

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The term σv^2 is the error variance in the regression (5), the parameter $\sigma^2 v$ is the long term variance and can be obtained from an auxiliary regression AR(s), using the (*) residuals, so σv is obtained from the relation:

$$\lambda^2_v = \frac{\sigma_w^2}{\varphi_{1-\ldots-\varphi s})^2} \quad \text{con} \quad \sigma_w^2 = (T-s)^{-1} \quad w_t^2$$

In the second step a cointegration analysis with the Engel and Granger approach is performed. For the specific case of I variables (1) thatwe have, it ios established that if $f_t \sim I$ (1) and $s_t \sim I$ (1), then f_t and s_t are conintegrated if there is a value α, as that the linear combination $(s_t - \alpha f_t) \sim I(0)$.

This case is detonated f_t , $s_t \sim CI(1,1)$. This means, simply, that f_t and s_t do not tend to separate (diverge) through time or that will keep the same distance and, then, the equation $s_t = \alpha f_t + u_t$ will have sense and will capture the long term relationship between f_t and s_t.

When considering cointegration existence, we have an equilibrium relationship to which f_t and s_t converge over time. In this case, the error term u_t can be interpreted as a desequilibruim error I the *t* moment.

So after getting the long term relationship, the (1) estimated remainders by OLS are obtained to prove the cointegrating hypothesis with unit root tests.

The test consists of the following explanation: if $X_t^m = u_t \sim I(1)$ there would be a unit root, which indicates that the series is not stationary and there will not be cointegration; but if $X_t^m = u_t \sim I(0)$ there is not unit root so the series is stationary and there is cointegration.

Step three is performed if there is evidence of cointegration, since the short-term relationship can be estimated with an error correction model specified in (7), which is estimated with DOLS estimator for being more efficient than the OLS.

Although the latter has the property of super-consistency for a large number of data, it may be subject to bias due to endogeneity and autocorrelation problems. And even when there are 163 data in our study which is considered "a large enough sample", it is estimated with DOLS.

In the next section, the econometric analysis results for Mexico during its flexible exchange rate regime are shown.

Statistical Analysis of Series

In this section, the econometric results of the studied period, 1995:06-2008:12, are displayed to analyze the empirical evidence derived from the data of Mexico to the discussion of the predictability of the exchange rate based on their monetary fundamentals. It begins by showing the series used in this study and then presents empirical results based on the sample for Mexico

Series description

The period of study of this research includes a period from June 1995 to December 2008, on a monthly basis; the variables used in the study are:

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- The spot exchange rate (ER) obtained from the IMF database, to the closure of the national markets and in the end of the period, the units are given in pesos for U.S dollar and for this variable, the stationarity adjustment is not applied.

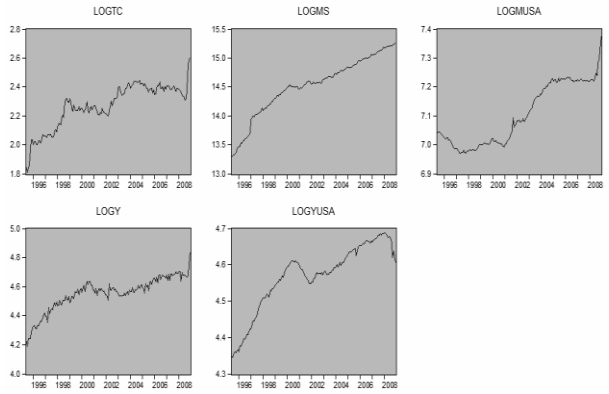
- The series used to represent the moneatry supply (ms) is obtained from the IFM as the sum of money plus near money, both reflect the current state of the economic activity levels. The unit is million pesos and is presented seasonally adjusted.

- The series used to measure the product of Mexico is the industrial production rate which refers to the volume of output generated by production units[27] according to the data

- The series for the U.S. monetary supply (yusa) was obtained from the IFM with entry M1, which reflects the economic activity level. The unit is million pesos and is seasonally adjusted.

- The series for industrial production rate (yusa) is obtained from the IMF and is seasonally adjusted.

The research was done with 163 observations and all series were he obtained the April 10, 2009. The chart each of the series at levels (applying the logarithm to each series) presented below.



Graphic 1

It is observed that all the series have a tendency in the same direction, which gives a first encounter to the presence of a long term equilibrium to which the economic system convegreges through time, even when each series has a stochastic tendency. For that, the statistics for each series are presented in the next section.

Statistical analysis of the series

Covarianza	LOGTC	LOGMS	LOGMUSA	LOGY	LOGYUSA
LOGTC	0.022510				
LOGMS	0.067762	0.245483			
LOGMUSA	0.012097	0.041359	0.011033		
LOGY	0.015026	0.054209	0.007982	0.013153	
LOGYUSA	0.011875	0.043019	0.006593	0.009788	0.007986
Correlación	LOGTC	LOGMS	LOGMUSA	LOGY	LOGYUSA
LOGTC	1.000000				
LOGMS	0.911563	1.000000			
LOGMUSA	0.767637	0.794713	1.000000		
LOGY	0.873288	0.954011	0.662617	1.000000	
LOGYU	0.8856	0.9715	0.7023	0.9550	1.0000

[27] Las unidades de producción están clasificadas en sectores industriales: C (minería), D (Industria manufacturera) y E (energía eléctrica, gas y agua) conforme a la Clasificación Industrial Internacional Uniforme de todas las Actividades Económicas (CIIU Rev. .3).

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Chart 1 shows that the logtc, the log, musa, the logy and the logyusa have a similar standard deviation in their data around 0.1, while logms has a standard deviation of 0.5 and suggest that the series do not distance from their mean and that reflects the presence of a long term equilibrium, analized formally in the long term model section.

Covariance and correlation of the series in levels.

$\alpha_p + \mathbf{A}\not{\xi}_{k,p}\beta_k$ diverge at the rate $n^{1/2}$.

	LOG	LOG	LOGM	LOG	LOGY
Media	2.269	14.52	7.10408	4.552	4.56834
Mediana	2.297	14.56	7.08179	4.570	4.58394
Máximo	2.605	15.25	7.37763	4.837	4.68757
Mínimo	1.806	13.29	6.96941	4.187	4.34419
Dev. Std.	0.150	0.496	0.10536	0.115	0.08964
Observaci	163				

Chart 2

Chart 2 shows that the Exchange rate has a higher covariance with the monetary supply of Mexico; moreover, in the correlation analysis, it can be seen that all are positive and relatively high, which suggest a coomon direction in the series. specifically, that the correlation between logtc and logms is 0.91 suugests that the exchange rate will answer mucho more to its monetary fundamental ms.

This gives the monetary policy a wide scope for action to establish the exchange rate when when a rigid exchange rate stability is required. IV.

Results of the econometric analysis

Correlograms of the series with the logarithm transformation were observed to determine the integration oreder of the series by levels, and a slow decay was identified, therefore it is concluded that the series have a unit root.

Analysis of series and unit root

To be certain of the presence of unit root, augmented Dickey-Fuller unit root tests were run: the logarithm and the difference of the logarithm of the series with 13 lags, intercept and slope.

Order of integration of the series

Stationarity analysis with 13 lags Monthly dates 06:1995-12:2008					
Variables	ADF statistic Schwarz Information criteria		DF-GLS statistic Schwarz information criteria		integration order
at levels with intercept and tendency					
Log: is the logarithm of the variable	test value	p-value	test value	critical value: 1% 5% 10%	I(d)
LogTC	-3.092272	0.1117	-1.710264	-3.505600 -2.968000 -2.678000	I(1)
LogMs	-3.112727	0.1069	-0.496945	-3.505600 -2.968000 -2.678000	I(1)
LogMusa	-1.572504	0.7996	-0.690928	-3.509200 -2.971000 -2.681000	I(1)
LogY	-3.090000	0.1123	-1.161720	-3.508000 -2.970000 -2.680000	I(1)
LogYusa	-0.954016	0.9462	-0.407077	-3.509200 -2.971000 -2.681000	I(1)

Chart 3

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At Firtst differences with intercept

DLog: it is the first difference of the variable logarithm	test value	p-value	test value	Critical Value : 1% 5% 10%	I(d)
DLogTC	-11.32073	0.0000	-9.788603	-2.579315 -1.942805 -1.615400	I(0)
DlogMs	-11.14273	0.0000	-9.639493	-2.579315 -1.942805 -1.615400	I(0)
DLogMusa	-1.854313	0.3532	-1.780658	-2.579495 -1.942830 -1.615384	I(0)*
DLogY	-12.09620	0.0000	-12.06353	-2.579404 -1.942818 -1.615392	I(0)
DLogYusa	-4.139053	0.0011	-4.153127	-2.579495 -1.942830 -1.615384	I(0)

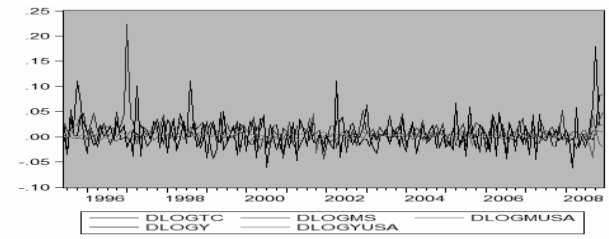
Mackinnon critical value to reject the hypothesis of unit root
* it is (0) to the 10% of significance according to DF-GLS test.

Thus, in the chart 3, the stationarity analysis of each one of the series is shown at levels and in differences of logarithms, with ADF and DF-GLS tests and Schwarz information criteria [28] with 13 lags. The results of the unit root analysis show that in the series at levels have unit root, as the *p*-vablue is greater than 0.05, making it impossible to reject the null hypothesis and meaning that the series at levels are not stationary; in contrast to this result, the difference of the logarithm for all series are stationary for not having unit root under the DF-GLS test with 90 % of reliability.

The result reached with the unit root analysis is that series at level are integrated of order 1, I(1).[29] The logarithms series in differences are integrated of order 0, I(0) and, therefore, stationaries.

In order to visualize the stationarity of the series in differences of logarithms, the graphic 2 is presented below.

Stationeries Series



Graphic 2

Once determined the integration order, step 1 result, which characterize ARIMA processes (p,1,q) given the unit root tests before shown, the second step of the econometric methodology proposed in the previous chapter proceeds in order to do an cointegration analysis with the Engwl and Granger approach.

Results of cointegration analysis

In this section, the results of the econometric estimation of the long-term model and the cointegration test with the Engel and Granger approach are presented. Remember that to describe the long term relationship we specified the irrestric model in (3) in the section I. So the estimation of the irrestrict cointegration model by OLS and DOLS are shown below:

Irrestrict cointegration model:
OLS estimator

[28] For reasons of space the Augmented Dickey-Fuller tests are not presented with other information criteria, but were run in order to give greater strength to the inferences obtained and it is observed that reaches similar conclusions.

[29] Las series I(1) presentan principalmente las siguientes propiedades: el efecto de un choque es permanente, la varianza es creciente y la autocorrelación teórica es h 1 para todo h cuando t.

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DOLS Estimator

$$S_t = 0.399822m_t - 0.123892m_t^* \_ 0.324041y_t - 0.259361y_t^* + 0.231641\Delta m_{t+1} + 0.480326\Delta m_{t+1}^* - 0.070536\Delta y_{t+1} - 0.517340\Delta y_{t+1}^* - .260073\Delta m_{t-1} + 0.912685\Delta m_{t-1}^* + 0.034993\Delta y_{t-1} + 0.867047\Delta y_{t-1}^*$$

Since the DOLS estimator is used to obtain reliable estimates of the cointegration relationship, is only necessary to adjust the classic ratio-t and contrast it with the classical t-distribution, as noted in the econometric methodology, in order to make statistical inference.

In both cases, estimating with OLS or DOLS, the estimated coefficents for logms are significative in 95% reliability, which shows the power of manipulating the money supply in determining the nominal exchange rate in the long term. In the irrestrict model estimated by DOLS it is obtained that logms, logmusa, logy and logyusa explain the logtc; besides, the expected and future growth rate of the national money supply, as well as the national income explains the logtc, with a reliability of 90%

The interpretation [30] of the long term relationship will be made over the coefficients estimated by DOLS that is asintotically efficient.

Results of the cointegration test.

Conintegration test ´ Schwarz criteria 0 lags		Interpretation of the cointegration test	
Test value	p-value	Test value	p-value
-3.171462	0.0017	It is rejected H_0: unit root $u_t \sim I(0)$	There is cointegration to the 99 % of reliability

Chart 4[31]

Therefore, when the money supply increases by 1% the exchange rate depreciates by 0.39%, a 1% increase in the U. S money supply, will appreciate the exchange rate in 0.12%, a 1% increase in the production rate of Mexico will appreciate in 0.32% the exchange rate and a 1%in the production rate of U.S. will appreciate the exchange rate in 0.25%. Note that the signs expected by the theory were similar to those for logms, logmusa and logyusa.

[30] La interpretación de cada coeficiente se realiza ceteris paribus.

[31] Se observó, uno de los resultados más importantes de Engle y Granger (1987), que el estimador OLS dela relación de largo plazo (de cointegración) es "superconsistente" a pesar del problema de endogeneidad y posible autocorrelación de errores. Desde un punto de vista práctico se utiliza el estimador de OLS porque: (i) se cuenta con un número relativamente grande de observaciones (ii) los problemas de endogeneidad y autocorrelación no son importantes. Además se podría decir que las variables del lado derecho son, de hecho, exógenas y no existe autocorrelación, entonces el estimador de OLS es válido. Sin embargo, con el fin de obtener estimaciones confiables de la relación de cointegración se estima con DOLS.

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Chart 4 shows the results of the cointegration test about the estimated remainder. It is found that the null hypothesis of the unit root is rejected with 99% of reliability, which implies that there is not unit root and thus the remainder are stationaries; this proves that there is cointegration between the exchange rate and monetary fundamental. This verifies one of the two hypotheses posed at the beginning of this research; it is now possible to estimate the step three of the econometric methodology.

Results of the error corection model

Chart 5 shows the estimated coefficients of the equation (7) and the results of the test are presented over the remainders to verify if they are white noise with 95% reliability.

Error correction model (ECM)

Error correction model	Values of short term parameters	RB test over the remainders of the model Schwarz critera 0 lag	
Model	Error Correction Model	test value	p-value
(7) 1995:06-2008:12	$\Delta s_t = 0.241046\Delta s_{t-1} + 0.793503\Delta \log musa + 0.158203\Delta \log y + 1.057268\Delta \log yus$ (0.0044) (0.0045) (0.0934) (0.0029) $-1.275956\Delta \log yusa_{t-1} - 0.124606\left(s_{t-1} - \beta_{(a,s,p)} f^{*}_{t-1}\right)$ (0.0004) (0.0016)	-12.86429	Remainders RB 0.0000

Chart 5

In chart 5, it is observed that from the equation (7) is obtained the adjustment term that allows the nominal exchange rate to return to its fundamental value, this is -0.124606 and is significative to 99% of reliability. Precisely this term links the short term behavior with its long term value, moreover, it is noted that the sign hold is correct (negative) and close to zero, which implies that long term equilibrium will be slow, and indicates higher adjustment costs. The previous demonstrates the empirical evidence of the exchange rate through deviations of the nominal exhchange rate of its fundamental value.

Therefore, we conclude that favorable evidence in Mexico for the exchange rate predictability through their fundamental monetaries with an irestrict model had been found and more reliability is given to the resulst found by letting the parameters being freely estimated.

Conclusions

En este trabajo se utilizó un modelo monetario del tipo de cambio basado en la relación del tipo de cambio nominal y los fundamentales monetarios.

The empirical results show favorable evidence, for the Mexico case, about predictability of exchange rate movement during the 1995-2008 period. It was shown that the hypothesis of this research is satisfied, because: a) the nominal exchange rate is cointegrated with its fundamental monetary value, and b) deviations of the exchange rate from its fundamental value allow to predict movements in the nominal exchange rate, for the used sample.

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Although evidence suggests that in the case of Mexico between 1995-2008 the money supply is significantly associated with the nominal exchange rate in the long term and predicts the direction of their changes properly in the short term, it is important to note that the estimates of the error correction models indicate that the correction process towards long term equilibrium is slow.

A possible extension of this research would be to consider nonlinear adjustment process of the exchange rate to its fundamental value.

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Causes of world Financial crisis 2007-2009 evidence from United States

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This paper seeks to explain the causes of the U.S. subprime mortgage crisis, and how this crisis has led to a generalized credit crunch in other financial sectors that ultimately affects the real economy. The currently observed turmoil in financial markets, which is believed to have been ignited by the collapse of the subprime mortgage market, has recently brought to prominence the ideas of Hyman Minsky (1919–1996), a prominent member of the post-Keynesian school of economics. Many commentators are of the view that Minsky's framework of thinking accurately anticipated the current financial crisis Wray (2007), McCauley (2008). Some of them called this situation a "Minsky moment" (Whalen 2007, Magnus 2007). While some economists have the view that Government Actions and Fed's role created and deepened this crisis Taylor (2009). In this paper we would discuss how this crisis started and proceeded? What role U.S housing market played? And how lack of transparency and accountability deepened the crisis?

Financial Innovations, Subprime Mortgage Crisis, Mortgage Back Securities (MBS), Housing Bubble, Collateralized Debt Obligations.

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Introduction

Financial Crises are the result of the normal functioning of the economic and financial systems over the course of the business cycle. Endogenous processes take place near the peak of the expansion phase of the business cycle, in particular, the deterioration of the financial condition of the business sector, which set the stage for a financial crisis (Wolfson, 1994). There is no precise definition of "financial crisis," but a common view is that disruptions in financial markets rise to the level of a crisis when the flow of credit to households and businesses is constrained and the real economy of goods and services is adversely affected. One thing is common in all crises that "All Crises are Crises of Success" (Portes & Vines, 1997). 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.

"The classic explanation of financial crises, going back hundreds of years, is that they are caused by excesses—frequently monetary excesses—which lead to a boom and an inevitable bust. In the recent crisis we had a housing boom and bust which in turn led to financial turmoil in the United States and other countries" (Taylor, 2008).

The term financial crisis is applied broadly to a variety of situations in which some financial institutions or assets suddenly lose a large part of their value. In the 19th and early 20th centuries, many financial crises were associated with Banking Panics and many recessions coincided with these panics.

Financial Crisis 2007-2009

How it is Started & Proceeded

The origin of the current financial crisis which is called the "Financial Tsunami" by some leading economists (Lim, 2008), clearly the worst financial Crisis since the Great Depression 1930, is much divided. Some economists believe that the causes of the current crisis go back to the Great Depression of 1930 (Eichengreen, 2008). While others believe that a housing market bubble began in the late 1990s and accelerated in the early-mid 2000s became the root cause of this crisis (Crotty, 2008). While others have different idea "The classic explanation of financial crises, going back hundreds of years, is that they are caused by excesses—frequently monetary excesses—which lead to a boom and an inevitable bust. In the recent crisis we had a housing boom and bust which in turn led to financial turmoil in the United States and other countries" (Taylor, 2008).

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Due to the housing bubble banks and mortgage brokers pushed mortgage sales because they earned fees in proportion to the volume of mortgages they wrote. Wall Street took in $27 billion in revenue from selling and trading asset-backed securities (Farzad, 2007). Banks earned large fees securitizing mortgages, selling them to capital markets in the form of mortgage backed securities (MBSs) and collateralized debt obligations (CDOs), and servicing them after they were sold. The volume of Mortgage backed securities (MBS) originated and traded reached $3 Trillion in 2005 in a United States housing mortgage industry of $10 Trillion (Farzad, Goldstein et al., 2007b). Since, it was generally believed that banks distributed most of these mortgages to capital markets as asset-backed securities; it was expected that little if any bank risk was involved in the process. Many large housing developers aggressively pushed mortgages to borrowers in order to boost sales. For Example, Pulte Home (the country's largest developer by market capitalization) provided mortgages for 90% of the houses they built (Lim, 2008). Institutional investors such as hedge funds and insurance companies demanded these complex, risky products because they were given high – often AAA – ratings by credit ratings agencies, yet they had higher returns than equivalently rated corporate bonds whose yield was constrained by the low interest rates of the era.

Demand for high yield products based on mortgages was so great and bank fees so large that banks and brokers began to sell mortgages to those who could not afford them under terms that were bound to trigger large defaults when the housing price bubble evaporated and/or interest rates rose. The whole process was driven by accelerating leverage.

Subprime mortgages simply mean lending to house borrowers with weak credit. Lenders did so by providing teasers like minimal or zero down payment, and low introductory adjustable rate mortgages, as well as lax documentation and credit checks. Between 2004 and 2006, $1.5 Trillion (15% of total United States housing loans) of subprime mortgages were booked (Brooks and Mitchell, 2007).

Total subprime loans form 25% of the housing mortgage market (Capell, 2007). These subprime loans were fine as long as the housing market continued to boom and interest rates did not rise. When these conditions disappeared the countdown started (Lim, 2008). Home sales peaked in late 2005 and home construction spending and housing prices topped out in early 2006.

When the subprime mortgage crisis erupted in mid 2007, the entire building began to collapse. The crisis began in the US, but since mortgage-based financial products had been dispersed around the world, we soon had a global financial crisis.

Some economists believe that the Subprime Mortgage defaults did not cause the financial crisis, it only acted as a trigger (Lim, 2008). This crisis is fundamentally a consequence of three imbalances: Wealth and income imbalance, Current Account imbalance and Financial Sector imbalance (Lim, 2008). While others are of the view that Government actions and interventions caused, prolonged and worsened this financial Crisis (Taylor, 2008).

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While subprime defaults were the root causes, the most identifiable event that led to the systematic failure was most likely the collapse on June 20, 2007, of two highly levered Bear Stearns (The fifth-largest investment bank)-managed hedge funds that invested in subprime assets –backed securities (ABSs) and the bankruptcy of the Lehman Brothers (Acharya, Philippon, Matthew et al., 2008). Lehman Brothers (The Forth-largest investment bank) filed for bankruptcy on September 12, 2008. Lehman contained considerable systemic risk and led to the near collapse of the financial system. Lehman Brothers episode revealed "too big to fail" label for the financial institutions.

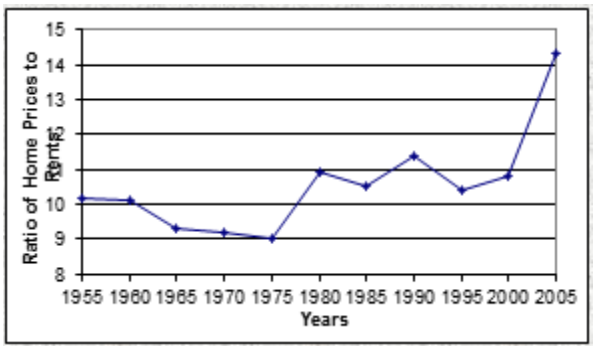
Nearly two years after the outbreak of the credit crisis (which may be dated to early 2007 when major losses were announced by the U.S. subprime-based investors), key issues remain to be resolved. At the most basic level the big question: What caused the crisis? This financial crisis is not the result of only single factor rather it is the combination of many factors. I am discussing the role of U.S housing market and transparency issues.

Housing Boom, Bubble & Bust.

A housing bubble is a type of economic bubble that occurs periodically in local or global markets. It is characterized by rapid increases in valuation of real property such as housing until they reach unsustainable levels relative to income and other economic elements. The driving force behind the mortgage and financial market excesses that led to the current credit crisis was the sustained rise in house prices and the perception that they could go no where but up (Baily, Litan et al. 2008).

Graphic 1 plots data on the ratio of the total value of residential real estate to a measure of the rental value at an annual rate. Equivalent to a price-earnings ratio for equity, data beginning in 1955 make clear how extraordinary the first five years of the 21st century were. Normally, home prices are between 9 and 11 times the annual level of rent paid. That makes sense, as it implies an average user cost of housing of around 10 percent. But since 2000, prices have skyrocketed, leaving rents in the dust. The price-to-rent ratio peaked at the end of 2006, reaching the rather extraordinary level of 14.5, clearly suggesting the existence of a "bubble" in residential housing. Home prices were at levels far higher than justified by fundamental values (or replacement costs).

Ratio of Home Prices to Rents



Graphic 1

The residential real estate price rise that began in 2000 had a number of important side effects. First, when the value of housing rises, it creates wealth and wealthier people consume more. This consumption-wealth effect is substantial.

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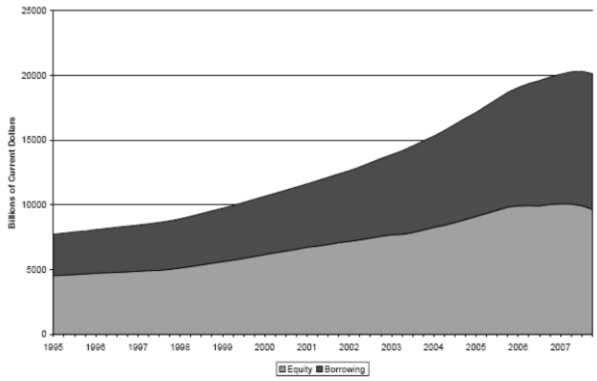
The simplest way to convert housing wealth into consumption is to borrow. And this is where, in hindsight, we can find the second sign of trouble. Graphic 2 separates the value of residential housing into owners' equity and borrowing (combining mortgages and home equity loans). What we see is that as the value of residential real estate rose, mortgage borrowing increased even faster. Since 1995 home equity has fallen from 58, already far below the 69 percent level a decade earlier, to 52 percent of home value.

Evolution of Equity and Borrowing in Residential Real Estate



Source: (Cecchetti, 2008)

Graphic 2

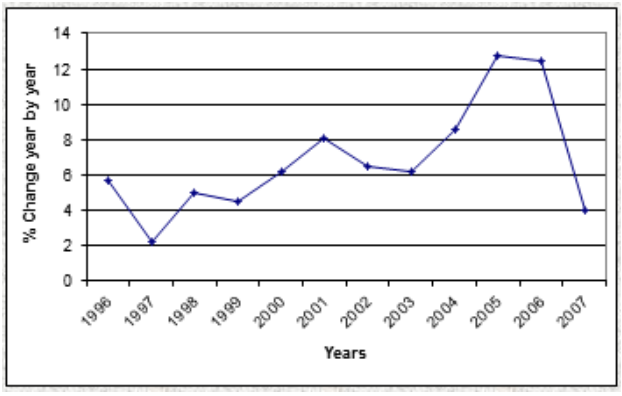
To recap, by the beginning of 2007 we can say:

A. Home prices were at unprecedented levels.
B. Home owners had more leverage than ever before.
C. Mortgage quality had declined substantially.

This sets the stage for the crisis (Cecchetti, 2008). House prices in some regions grew rapidly after interest rates declined in 2001.

Adjusting for inflation, real U.S. house prices rose 34% during 2000-2005 (they rose 51% if not adjusted), which is more than double any five-year rate in the past 30 years. Specific regions experienced even faster appreciation; in 2004 alone, housing in Miami, Los Angeles, and West Palm Beach appreciated more than 20% and Las Vegas appreciated 35%. Graphic 3 shows that the rate of house price appreciation, year over year, reached 13% in 2006, and then plunged to 3% by mid-2007.

Appreciation of House Prices, 1996-2007
(Percentage change year by year)



A survey held by (Case and Shiller, 2003) report that the overwhelming majority of persons surveyed in 2003 agreed with or strongly agreed with the statement that real estate is the best investment for long-term holders.

Respondents expected prices to increase in the future at 6 to 15 percent a year, depending on location.

Graphic 4 below shows that, between 1975 and 1995 real home prices went through two cyclical waves: rising after 1975, falling in the early 1980s and then rising again before falling in the early 1990s.

From 1975 until 1995 housing did increase faster than inflation, but not that much

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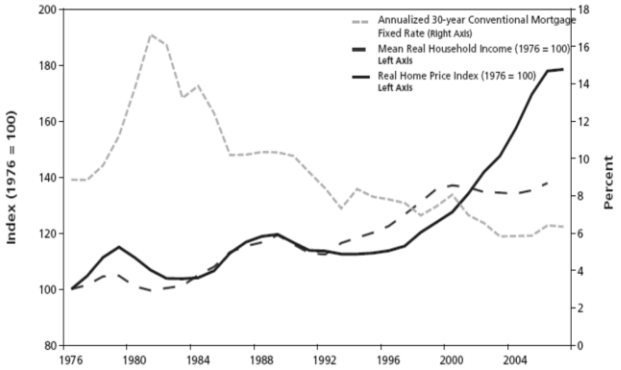
faster. After the mid 1990s, however, real house prices went on a sustained surge through 2005 making real estate a great investment opportunity. In 1995-2000 household income per capita rose substantially, contributing to the increase demand.

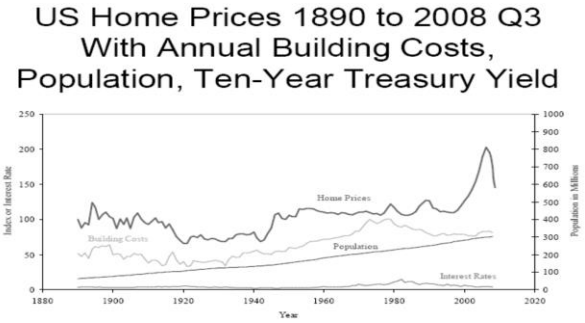
Real home Prices and Real household income (1976=100); 30-year conventional Mortgage Rate



Graphic 4

But what happened after is a constant surge in the housing prices from 1995 to the onwards. The increasing trend regardless of the constant decreasing household per capita income clearly shows a bubble in the housing market. In general experience of the other countries supports the view that the decline in mortgage interest rates was a key factor in triggering the run up of housing prices (Green and Wachter, 2007).

Graphic 5 below shows four parameters: Home prices, building costs, population and interest rates. Apart from the Home prices the other factors remained steady. Since 2000 an unprecedented appreciation has been seen in the housing factor which is very abnormal. Rapid housing appreciation clearly depicts a bubble in the housing sector.



Graphic 5

Source: Taken from Wikipedia. Robert Shiller's plot of U.S. home prices, population, building costs, and bond yields, from Irrational Exuberance

Was the Boom a Bubble?

In the aftermath of the housing boom, the question that economists are heatedly debating is how much of the increase in housing prices was due to economic fundamentals, and how much was due to a bubble-a rise in price due to "irrational exuberance" about future price appreciation (Alan Greenspan).

There were also reasons for housing prices to rise based on market fundamentals, however, such as rising incomes and falling mortgages rates (Getter, Jickling et al. 2007). They put mainly two questions: First why did borrowers increasingly use ARMs rather than locking in a relatively low fixed rate, which would have had no risk of future interest rate increases? And second, why did mortgage lenders and investors not factor in rising rates when estimating the future probability of ARM delinquencies? Outcome of the results suggests that many borrowers might have been motivated by the prospect for short-term financial gains and investors turned to riskier types of MBS and these investments create a housing bubble which ultimately becomes the main reason of Subprime Default.

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Lack of Transparency & Accountability

"Throughout the housing finance value chain, many participants contributed to the creation of bad mortgages and the selling of bad securities, apparently feeling secure that they would not be held accountable for their actions. A lender could sell exotic mortgages to home-owners, apparently without fear of repercussions if those mortgages failed. Similarly, a trader could sell toxic securities to investors, apparently without fear of personal responsibility if those contracts failed. And so it was for brokers, realtors, individuals in rating agencies, and other market participants, each maximizing his or her own gain and passing problems on down the line until the system itself collapsed. Because of the lack of participant accountability, the originate-to distribute model of mortgage finance, with its once great promise of managing risk, became itself a massive generator of risk." Former Fed Chairman Paul Volcker has observed that problems of financial crisis began with a lack of accountability in mortgage lending and the trading of mortgage-backed securities. Financial executives spawned a proliferation of mortgage backed securities without integrity and traded them in non-transparent markets. According to (Larson, 2009) CEOs and Boards of Directors failed to be accountable to shareholders and to the public. They took on growing risk, ran reputable companies into the ground and paid themselves fat bonuses.

This attitude of individuals and even companies raises question of lack of transparency and accountability during the financial crisis.

One of the essences of a well functioning free market is that the market itself holds players to account simply through who gets to sell their wares & who does not.

It appears that this market function has not helpful because Financial Crisis tells us the different story. According to (Larson, 2009) the German multinational firm Siemens recently agreed to fines of over $1.6 billion to German and American authorities to resolve charges that it had systematically bribed public officials around the world in order to gain billions in government contracts. About one hundred U.S. firms were prosecuted by the Justice Department in 2008 for similar offences. Recently, Halliburton and Kellogg Brown & Root agreed to pay $579 million in fines related to bribes paid in Nigeria (Larson, 2009).

Federal Bureau of Investigation (FBI) has opened investigations into more than 500 cases of alleged corporate fraud, including 38 that involve important firms and are "directly related" to the national economic crisis. Deputy Director of FBI John Pistole told Congress that 38 companies are significantly large companies, everyone knows about them but he cannot comment publicly. In addition to major corporate fraud, Pistole testified that the number of mortgage fraud cases investigated by the FBI has risen from 881 in fiscal year 2006 to 1,600 in fiscal year 2008 (Jason, 2009). According to (Tatom, 2008) The origins of the problem go back to 2004-2006 when a large share of new mortgage loans were made to subprime borrowers, borrowers who had relatively low credit scores and could not qualify for conventional mortgage loans at normal market interest rates (Tatom, John 2008). Many of these loans began to default much earlier than the normal experience from the past (Demyanyk and Hemert, 2008). In fact, some of them went into default without ever making a payment.

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Table-1 below provides some statistics of mortgage origination. Annual originations grew from $2.2 trillion in 2001 to nearly $4 trillion in 2003 before settling around a figure of about $3 trillion in the years 2004-06. Of that, subprime originations grew from just $190 billion in 2001 to $625 billion in 2005; as a percent of the dollar value of total originations, subprimes grew from 8.6% to 20% of the market. Over the same period, the percent of subprimes securitized increased from 50.4% to 80% which shows a growing trend of securitization.

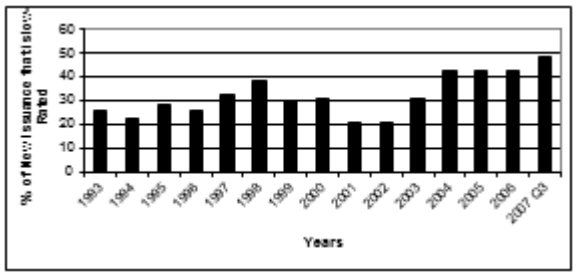
Mortgage Origination Statistics

	Mortgage Originations ($Billions)	Sub Prime Originations ($ Billions)	Subprime share in Total Originations % of $ Value	Subprime mortgage Backed Securities ($ Billions)	% Subprimes Securitized (% of dollar Value)
2001	2215	190	8.6	95	50.4
2002	2885	231	8	121	52.7
2003	3945	335	8.5	202	60.5
2004	2920	540	18.5	401	74.3
2005	3120	625	20	507	81.2
2006	2980	600	20.1	483	80.5

Table 1

Moreover, poor underwriting practices such as no down payments, no verification of income, assets, and jobs exacerbate the issue much. Over the past several years, the quantity and quality of loans across a variety of markets has weakened in two important ways. In terms of quantity, there was a large increase in lower-rated issuance from 2004 to 2007.

Quality of New Debt Issuance, 1993–2007



Graphic 6

Graphic 6 above shows the quality of new debts issued from 1993 to 2007. Most of debts are low rated (B). From 2004 sudden increase in the issuance of low rated loans has been observed from as compared to the past years.

Quality wise we have seen increase in high combined loan-to-value*. Graphic 7 below shows the issuance of loans with limited documentation.

* Combined Loan to Value (ratio) (CLTV) is the proportion of loans (secured by a property) in relation to its value. The term "Combined Loan to Value" adds additional specificity to the basic Loan to Value which simply indicates the ratio between one primary loan and the property value. When "Combined" is added, it indicates that additional loans on the property have been considered in the calculation of the percentage ratio. The aggregate principal balance(s) of all mortgages on a property divided by its appraised value or Purchase Price, whichever is less. Distinguishing CLTV from LTV serves to identify loan scenarios that involve more than one mortgage. For example, a property valued at $100,000 with a single mortgage of $50,000 has an LTV of 50%. A similar property with a value of $100,000 with a first mortgage of $50,000 and a second mortgage of $25,000 has an aggregate mortgage balance of $75,000. The CLTV is 75%.

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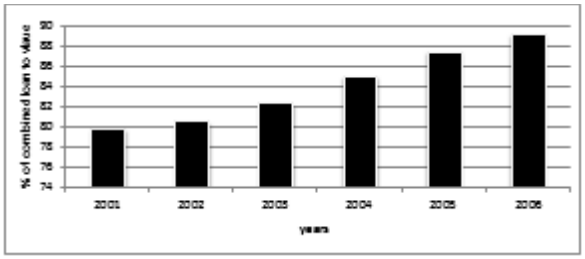
Combined loan to value



Graphic 7

Table 2 below shows the evolution of underwriting standards for subprime loans. The %age of such loans with adjustable rates rose from 74% to 93% in the years 2001 to 2005. Interest-only loans rose from zero to nearly 38% and the low or no doc share rose from 29% to more than 50%. In other words, the riskiest types of subprimes ARMS and hybrid ARMS were favorites with securitizes. Debt payment to income ratio has been increased from almost 40% to 43% while average loan to value ratio has been decreased.

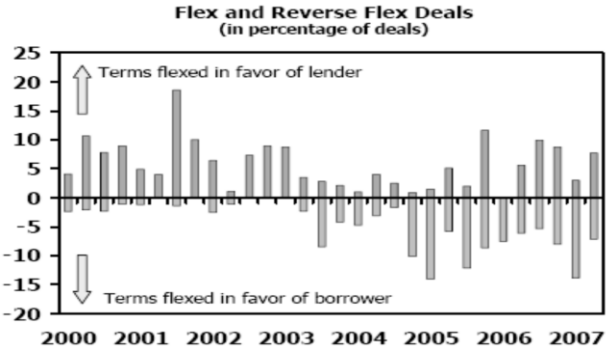
Underwriting Standards in Subprime Home-Purchase Loan

Year	ARM Share	Interest-Only Arm Share	Low-No-Doc Share	Debt Payment-to-Income Ratio	Average Loan-to-Value Ratio
2001	73.80%	0.00%	28.50%	39.7	84.04
2002	80.00%	2.30%	38.60%	40.1	84.42
2003	80.10%	8.60%	42.80%	40.5	86.09
2004	89.40%	27.20%	45.20%	41.2	84.86
2005	93.30%	37.80%	50.70%	41.8	83.24
2006	91.30%	22.80%	50.80%	42.4	83.35

Table 2

Regardless of increase in low quality credit issuance and decrease in quantity there has been a parallel weakening of credit discipline in corporate credit markets, seen in the "flexing" of deals in favor of borrowers. Figure-8 below shows how credit risks have been increased by flex and reverses flex deals.

From 2000 to 2002 we have seen terms flexed in favor of lenders while from 2003 to 2007 observed opposite.



Graphic 8

Source:IMFhttp://www.imf.org/external/pubs/ft/fmu/eng/2007/charts.pdf

In 2006 and 2007 a sharp increase has been seen in the volume of Cov-lite* or covenant lite loans. Cov-lite lending is seen as more risky because it removes the early warning signs lenders would otherwise receive through traditional covenants. Graphic 9 below shows a tremendous increase in the use of Cov-Lite loans in the years 2006 and 2007. Especially in the year 2007 it cross the $100 billion marks. Low credit quality and easy access to the credit made this possible. Firms looking for customers and eager to increase their share give loans even by compromising basic principles.

Loans were granted on the minimum documentation possible and standard of documentation decreased.

Volume of Covenant-Lite Loans

* Covenant lite is financial jargon for loan agreements which do not contain the usual protective covenants for the benefit of the lending party. It has been observed that cov-lite loans simply reflected changes in bargaining power between borrowers and lenders, and followed from the increased sophistication in the loans market where risk is quickly dispersed through syndication or credit derivatives

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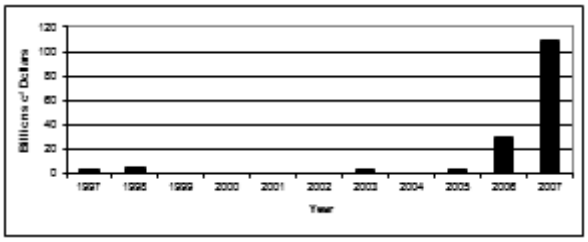
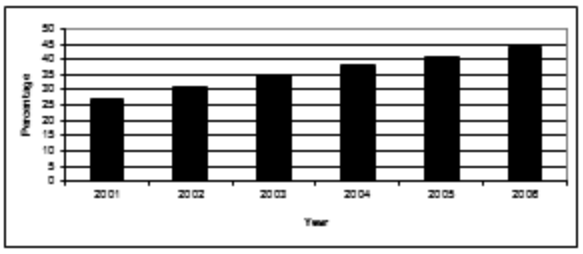


Graphic 9

The Fed and other regulators generally supported new financial innovations. There may be some truth to both views. On the one hand, credit was widely available across all markets—mortgage, consumer, and corporate loans—with characteristics that suggested poorer and poorer loan quality.

Graphic 10 below shows the loans which were issued during the period 2001 to 2007 with limited documentation. Percentage of limited documentation has increased from 27% in 2001 to 44% in 2006.

Limited Documentation %

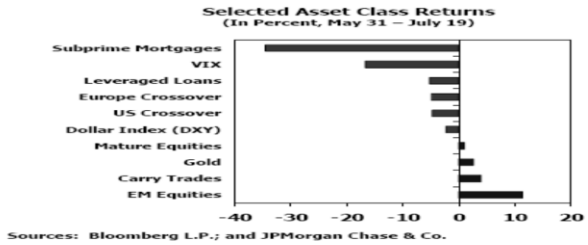


Graphic 10

One explanation for deteriorating loan quality is the huge growth in securitized credit.

This is because the originate-to-distribute model of securitization reduces the incentives for the originator of the claims to monitor the creditworthiness of the borrower, because the originator has little or no skin in the game.

According (Jaffee, 2008) securitization process has created a "moral hazard," allowing subprime lending risks to be passed in a sequence starting with mortgage brokers, then to lenders, then to securitizes, and ending as risks in investor portfolios. Although it is understandable that each of these transactors might participate in the chain as long as they were confident they could transfer the risk to the next stage. Large quantity of risky loans with low quality creates troubles in credit markets. Loans were even given to those persons who don't afford it. It results in a mess in the credit market. Returns on these loans started to shrink and creates problems for the lenders.



Graphic 11

Source:IMFhttp://www.imf.org/external/pubs/ft/fmu/eng/2007/charts.pdf

Graphic 12 below shows the subprime 60 days delinquency rate which is constantly rising from 2006 to 2008. Subprime delinquency has been increase from 0% in 2006 to alarming rate of almost 34%.

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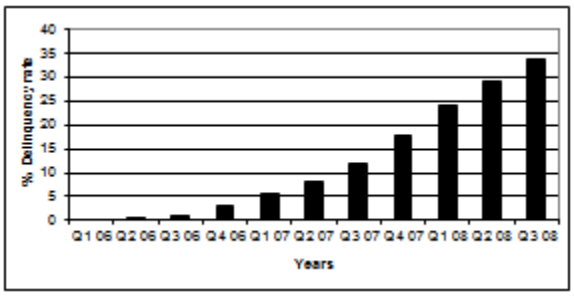
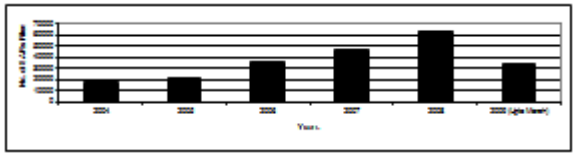
Subprime 60 days Delinquency Rate



Graphic 12

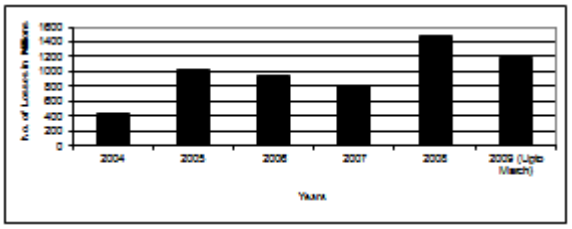
Lack of transparency and accountability in financial institutions motivated borrowers to borrow more and more even if they are not eligible. Apart from the low standard of credit and minimum documentation there have been cases of massive frauds in mortgage loans. Federal Bureau of Investigation (FBI) issued a report on mortgage frauds in financial institutions. According to this report, Suspicious Activity Reports (SARs) from financial institutions indicate an increase in mortgage fraud reporting. There were 63,713 mortgage fraud related SARs filed in Financial Year 2008, a 36-percent increase from Financial Year 2007. Graphic 13 below shows increasing trend of SARs filed from the period 2004 to 2008.



Graphic 13

In the same period, Graphic 14 below shows SARs reported losses which are in $Billions. SARs in FY2008 revealed losses of more than $1.4 billion, an increase of 83.4 percent from FY2007.

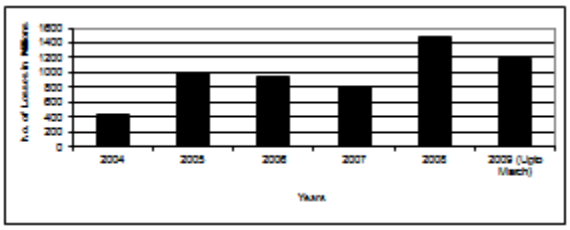
Mortgage Fraud SAR losses ($ Millions) From 2004 TO MARCH 2009



Graphic 14

FBI mortgage fraud investigations totaled 1,644 in FY2008, a 37% increase from FY-2007 and a 100% increase from FY-2006. Sixty-three percent (1,035) of all pending FBI mortgage fraud investigations as of FY-2008 involved dollar losses of more than $1 million. Graphic 15 below shows the story

Increase in FBI Mortgage Fraud Pending Investigations from 2004 TO MARCH 2009



Graphic 15

According to (Crotty, 2008) main source of investment bank income has recently shifted from traditional activities such as advising on M&As and bringing IPOs to market to fee income from securitization and trading on their own account. Much of the trading is in mortgage-backed securities, which they create and both sell to others and hold in their own trading accounts.

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Citigroup was one of the biggest players in the mortgage securitization frenzy having global M&As worth $3.8 trillion at their peak in 2006, 11% higher than in the super year of 2000 (Crotty, 2008). Goldman Sachs, the number one bank in the M&A business that year, achieved record profits from this sector in 2006. Economist (23rd Dec. 2006) reported that 70% of Goldman's total net income came from gambling with the firm's own capital. These profits with high risk strategies enabled the firms to reward its executives. Top traders and executives receive sky high bonuses in years in which risk-taking behavior generates high profits.

In 2006, Goldman Sachs' bonus pool totaled $16 billion. Top executives of Wall Street received bonuses up to $50 million that year (Crotty, 2008). According to Financial Times 18th January 2008, the five largest investment banks – Merrill, Goldman Sach, Morgan Stanley, Lehman Brothers and Bear Stearns paid out about $66 billion in compensation in 2007, including an estimated $40 billion in bonuses. Despite the decline in profit the bonus figure was higher than the $36 billion last yearThese sever lack of transparency and accountability practices generate the mess in which we are now. Strange part of the story is that still no proper accountability has been fixed on any one. For transparency and accountability in future US Govt. has taken two steps. First, Financial Stability Plan has been constituted with the purpose "to protect taxpayers and ensure that every dollar is directed toward lending and economic revitalization, the Financial Stability Plan will institute a new era of accountability, transparency and conditions on the financial institutions receiving funds" Second congress has passed Commission on Financial Crisis Accountability Act 2009.

The purpose of which "To establish a commission* on the tax and fiscal implications of the regulation of financial products and arrangements and to study the current financial crisis, its causes and impact on the Federal deficit and tax revenues." Commission would have following duties:

- In General- The Commission shall conduct a study of the financial system in the United States. In conducting such study, the Commission shall examine the current financial crisis, its causes and its impact on the Federal deficit and tax revenues, including- regulation and transparency, fraud and abuse, the fairness and equity of the tax treatments of financial products and arrangements, and the role of any and all participants in the financial services industry that the Commission deems necessary, including-- government agencies, including the Department of Housing and Urban Development, Department of Treasury, the Securities and Exchange Commission, and any other agency the Commission considers necessary, government-sponsored entities, including the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation, the Board of Governors of the Federal Reserve System, and its banks and leadership, the executive, legislative and judicial branches of government, credit rating agencies, and the Federal Deposit Insurance Corporation and the Commodities Futures Trading Corporation. Report- The Commission shall prepare a report to the Congress on its findings pursuant to the study conducted under subsection (a). Such report shall include a detailed statement of the findings, conclusions, and recommendations of the Commission and shall address the following:

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The causes of the current financial crisis and how this kind of crisis can be avoided in the future. The stage the current financial crisis is in and what can be expected in subsequent stages. The impact of the current financial crisis on Federal revenues. The extent to which the financial regulatory structure should be restructured. The tax treatment of financial products and arrangements and how to make them more fair and equitable. Shareholder Bill of Rights- The Commission shall also make recommendations for investor's bill of rights, which shall include necessary protections, as determined by the Commission, to prevent shareholders from being deprived of their rights and their savings.

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Article **ECORFAN Journal-Mexico**
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Internal control as a tool to improve efficiency in public management

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The public administration has been changing its approach towards the control of its activities, and towards a permanent process of surrender of accounts that implies being transparent its operation. In this frame, the present times require that the servants public have a new mentality, that implies the fact to recognize the enormous responsibility that has in the handling of the resources public. In addition to the risks that run to be sanctioned, to incur practices outside the applicable normatividad, derived from the inadequate, irregular, doloso handling, or default of the resources property of the Government, if we considered that the ignorance of the law does not exempt of its consequences by his procedural nonapplication.

Government, Public Good, Contraloria.

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Introduction

The limited view we have of the processes, poor or inadequate coordination and communication among the different areas even though they are physically together, among others; arise the inevitable need to think about preventive measures to help avoid possible damage that these situations might do to government operation and consequently affect the achievement of its objectives.

In this vein, it is important to note the significant and effective contribution made by the General Comptroller of the Federal District through Internal Control to the public administration of the Federal District, to reach the achievement of its objectives and to avoid possible risks arising from the performance of public servants.

The preventive approach that gave the Genral Comptroller of the Federal District with Internal Control was instrumental to advance in the care of the problems presented, leaving behind the limitations of the detective and corrective controls, which did not solve the root of the problem.

The need for Internal Control in the public administration of the Government of the Federal District is crucial, considering that according to my experience at the Internal Comptroller in the Administrative Office, I found that regularly the activities of the audit institutions tend to review the same issues, repeatedly finding that the same practices prevail, which result in penalties for the officials in turn.

For the above, it is of interest to students of Public Administration, to discuss about this issue with the purpose and intent of raising awareness of the need for internal controls in the performance of any employment, position or commission within the Public Sector to achieve the objectives in the first instance and secondly, to avoid in the meassure of what is possible to fall in practices that contravene applicable regulations and cause corruption.

Derived from the above considerations, this paper aims to:

- To generate from a practical perspective, a research paper that demonstrates the importance of Internal Comptroller in a public organization such as the "Federal District" as a tool for the healthy fulfilling of their objectives and the search for efficiency; all with a critical view which only allows professional experience.

It should be noted that this document was based on two types of information: a) the one generated by documentary research; and b) the one generated by systematic presentation of information that has been obtained from empirical sources based on professional experience. Defined the object of study and research technique, the relevant method that led to knowledge in an orderly manner, to respond to the problem raised, was the "Deductive Method", as it allowed going from general premises, to particular conclusions. The theoretical depth with which the research was conducted was the "explanatory" one, because it allowed us the recomposition of knowledge, establishing a cause-effect relationship.

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It should also be clarified that the investigation was located in time at a "transversal" level, as this allowed an exploration of the subject at the present.

Having done this research, during the theoretical-methodological debugging, we faced a serious limitating difficulty: not delving into political situations, not to mention that they are a primary explanatory factor of various phenomena.

In this sense, the work is structured based on the work experience had during the period going from February 1 2003 to March 15 2007 as head of the Division of Internal Control.

This paper is closed with a generic conclusion that through three different, but matching, perspectives, intend to leave on the reader the final thoughts about the benefits of internal control to prevent where possible, the risk on the responsibilities of public servants and the perspectives that are displayed to the General Comptroller of the Federal District in the near future.

Of its Main Reasons

At the beginning of the administration of Andres Manuel Lopez Obrador as the Head of Government of the Federal District, the General comptroller of the Federal District conducted through its Internal Comptrollers the characteristic functions of audit institutions, mainly including: audits of the corrective type; formulate observations and make recommendations; monitoring the care given to the recommendations; the preparation of technical reports of unmet observations; and the application of sanctions to public servants.

The audit work consisted in the review and examination of the functions carried out by the dependencies, delegations and institutions, which gave as a result to support the executive function of the core staff; the previous within a corrective field, where deficiencies were found and the corresponding sanctions, were applied.

The type of audit performed by the General Comptroller through its Internal Comptrollers, was an independent activity that sought to support the leadership role, and focused on an objective, systematic and evaluatory exam of the period, in order to determine the degree of economy, effectiveness, efficiency, impartiality, honesty and adherence to the standards with which public resources were managed. We identify the following as the main achievements:

- The areas recognized that they were susceptible, to audits being done to them, because in some cases none had been practiced on them in the past.

- The areas recognized their mistakes.

- The areas were found the need to investigate the applicable regulations, to work and solve the observations made to them.

- The areas began to take responsibility for their duties, to see the consequences of their actions in the operation, despite the problems posed by the excessive rotation of staff.

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- The middle and senior management began to engage in the comprehensive activities of their areas, in order to avoid responsibilities falling onto them; trying to be extra careful in handling the resources allocated to them.

- The areas sought to adhere more to the regulations in the performance of their functions; and were concerned about establishing some controls.

- Took care of lagging issues sometimes involving damage to the treasury.

Nevertheless, such was the extent of the deficiencies that the actions performed were not enough the because many of them prevailed and that merited other kind of measures to ensure the permanent solution of the problems; This led to search for a new approach in the General Comptroller of the Federal District for the activities made by the Internal Comptroller, that was eminently preventive, based on the establishment of mechanisms or tools to carry out their new roles, which led to Implementation of Internal Control Systems with a modern vision.

Concerning the Internal Control

The General Comptroller of the Federal District with the purpose of contributing to the construction of a more efficient and effective public administration that clearly shows the use of public resources and to combat corruption directly.

It left behind the audit in the Internal Comptrollers as the primary function, changing the supervisory and corrective approach, to a preventive way of acting [32] and in strict accordance with the regulations, to help achieve the objectives of Government Units; advising and accompanying their holders in decision-making.

In this regard, the amendments to the Rules of Procedure of the Civil Service of the Federal District that were made on May 21, 2002 were consolidated, in which the establishment of internal control systems are included, with this new preventive purpose, a methodology based on the model "COSO" (the New Concepts of Internal Control, COSO Report) was structured, which proved to be a valuable tool in order to achieve harmony in the operation of the Internal Comptrollers, providing them with an effective tool to identify key risks in the processes realized by the Government Units and providing elements to assess and implement internal controls.

The Internal Comptrollers are characterized by having a real and professional commitment to the Government of the Federal District, seeking to support it to meet all situations that involve risks and that were found and attending the development of its functions.

This preventive aspect of the Internal Comptroller was identified by an attempt to root out the problems and risks identified in the dependencies, delegations and institutions through the implementation of Internal Control Systems.

[32] BLANCO Illescas Francisco. El Control Integrado de Gestión. Editorial Limusa S. A., impreso en México, año 1980. Pág. 70.

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As part of the methodology established by the General Directorate of Internal Comptrollers, Diagnostics were made to the Government Units, that managed to clearly identify the main problems of dependencies, delegations and institutions, and the significant risks that arise in their operation, which allowed to make proper planning in order to take care of the most important needs, prioritizing them according to their level of risk.

The works for the Implementation of Internal Control Systems and its monitoring provided positive results, because of the participation of the various intervented areas, which contributed to their implementation, making them useful and functional tools.

It should be noted that the General Comptroller of the Federal District, reports directly to the Head of the Government of the Federal District, and belongs to the central government[33].

Objective of the General Comptroller of the Federal District

Monitor and evaluate the Public Management of the dependencies, Public Entities and Decentralized Organs of the Federal District and manage with honesty, efficiency and transparency the resources allocated to the General Comptroller, to ensure the effective operation of the same, based on the policies, rules, procedures and applicable laws[34].

Control Background

Early in the administration, controls were defined as the mechanisms or practices used to prevent or detect unauthorized activity. Later, the purpose of the contrls was expanded to include the concept of "getting things done". Current stream defines it as any effort made to increase the chances that the objectives are achieved.

The concept of control appeared with a negative character,that is to say, to prevent events from happening and to restrict wrong performance accordingly. That rationale had its reasons and was fully justified by the constant frauds that were committed to the detriment of business owners, but over time it changed into positive ways. Today the concept of internal control involves the strong support to the efforts made to achieve the goals and objectives set.

[33] GOBIERNO del Distrito Federal. Reglamento Interior de la Administración Pública del Distrito Federal. Publicado en la Gaceta Oficial del Distrito Federal No. 224 del 28 de diciembre de 2000, págs. 3-6, y reformas publicadas en la Gaceta Oficial del Distrito Federal No. 70 del 3 de mayo de 2006. Art. 6 y 7.

[34] GOBIERNO del Distrito Federal. Manual Administrativo de la Contraloría General del Distrito Federal. Publicado en la Gaceta Oficial del Distrito Federal No. 93-BIS del 11 de agosto de 2006. Integrada por 760 páginas.

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Nature of controls

The control is in the first instance, a function within the administrative process of government administration, for the realization of different activities towards the fulfillment of previously set objectives, to define policies, strategies, programs, and develop and implement appropriate administrative processes to ensure optimum performance.

The concept of control, therefore, is part of the various activities of human beings, and in the case of administrative activities, the whole operation is part of a process, which should be automatically checked to ensure the fulfillment of its objectives. Herein lies the importance of taking the time for the implementation and dissemination of the control systems in government administration, as their lack or deficiency hinders the achievement of objectives.

Note that its meaning is generic, but their goals are specific, so it is convenient to say so in its content, as it guides the search for efficiency, protection and safeguarding of financial, human and material resources of public administration of the Government of the Federal District, as well as the personal safeguard of the ones responsible for those functions.

The control is embedded, without exception, in all levels of the public administration of the Federal District, regardless of the sector and its specific purposes, ie private or public and can identify its nature by the association with the levels of the administrative process.

Definition of Internal Control

The Government of the Federal District defines Internal Control, in general terms, as a process carried out by the Public Administration: holders, governing bodies and the staff of the unit, designed to provide reasonable assurance when achieving their objectives in the following categories:

- Effectiveness and efficiency of operations of Public Management.
- Reliability of financial reports.
- Compliance with legal provisions.
- Protection of government property.
- Fighting Corruption [35].

The first category refers to the fulfillment of the basic objectives of the work of the unit; includes programmatic and budgetary performance objectives and, in some cases, of productivity, and verification that the various public services required by the citizens are made with adherence to administrative regulations applicable to each case, to legitimate the government programs.

[35] CONTRALORÍA General del Distrito Federal. Metodología para la Elaboración del Diagnóstico e Implantación del Control Interno 2004. Emitidos en archivo electrónico por la Contraloría General del Distrito Federal. Circular No. 049 de fecha 18 de octubre de 2004. Pág. 9.

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The second relates to the preparation of reliable financial and operational states that are published, including interim statements, the condensates and selected financial and operating data, derived from those reports, as appropriate, the regular publication of financial statements. The third deals with the implementation of those laws, regulations and standards to which the unit is subject to. The fourth relates to the measures required or not by the regulations, intended to protect the assets of the government and, fifth, to the detection and suppression of illicit practices.

Talking about Internal Control, is to refer to a valuable tool that can contribute largely to ensure compliance with a unit, securing it with a reasonable margin[36], achieving its basic objectives or at least the survival of the unit,area or function itself. It is important to remark that it only operates when the internal control actually attends to the risks faced by the processes made by the unit, area or function, and the decision has been made at board level, to operate with the appropriate staff. Consequently, success of internal control depends on various predominantly internal factors.

It is important to reiterate that an internal control system, no matter how well designed it is and how well it works, can only give a reasonable degree of certainty, not absolute, as for the achievement of the objectives of the unit.

An internal control can only "help" to the achievement of the objectives of the unit; however, an internal control cannot make bad officials responsible for its operation, to become good officials.

Internal Control is also a safeguard against waste, inefficiency, it promotes the security that operating policies are being met and are met by competent and loyal staff.

In the implemented processes, it is necessary to point out that the internal control system cannot meet its target, if daily activities are not continuously in the hands of primarily qualified personnel.

Proper internal control requires monitoring mechanisms set to be periodically reviewed in order to determine if they are valid and ensure that the results are as expected.

The evaluation of internal control is the core stage of the audit work. Once evaluated it must document whether if the internal control mechanisms served fully, partially or not achieved their purpose.

Internal control consists of a coordinated plan between accounting, employee functions and procedures so that the administration of an institution can depend with a reasonable degree of reliability of these elements for getting secure information, adequately protect their property and promote operational efficiency and adherence to prescribed administrative policy.

[36] PERDOMO Moreno Abraham. Fundamentos de Control Interno. Impreso por Internacional Thomson Editores S. A. de C. V. en México, año 2000. Pág. 318.

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The obligation of the Internal Auditor is to oversee that the control is effective, and not fall into very common mistakes such as thinking that establishing internal controls ensure efficiency; or creating it in a vacuum, without considering the possibilities and needs of the agency; or believe that control is to prevent theft and restrict expenditure and fields.

Internal control requires attention and must ensure that its objectives are met, because when this does not happen, wrong decision can be made in prejudice of the unit.

To have a good internal control, we do not have to forget considering:

- Should be established according to the particular needs of the area that needs it.
- Should be applied where the possibility of using methods of measurement exist.
- Must be favorable.
- Must demonstrate deviations immediately and ideally should avoid them.
- Must be positive, in helping the achievement of the goals.
- Must be combined with other functions such as planning, organization, etc.
- Must be simple and understandable.
- Must be economic.
- Must be a countinous activity

What internal control can achieve

Internal control can help the unit of government to achieve its performance goals and objectives and, where appropriate, productivity, as well as prevent loss of resources.

It can also help ensure the reliability of financial and operational reports, ensure that the laws are met, avoiding damage to its reputation and other consequences. In sum, it can help get the government unit where they want to be and avoid failures and surprises along the way.

Context of Internal Control

Internal control falls within the framework of policies, strategies, lines of action, goals and objectives established by the General Development Program of the Federal District 2000-2006, as an instrument to perform the government project of managing in matters of governance and public security, sustainable development, progress with justice and managing and finances, to contribute to the harmony, the comprehensive content, consistency of public policies and the search for a new staff for a new city, under the principles of honesty, professionalism, transparency, efficiency and austerity. It was the guiding principle of the restructuring of the functions of law, audit, assessment, diagnosis and operation of internal comptrollers, to reinforce the concept of a new intervention model that privileges the activities of assisting, prevent, advice and support to holders of administrative bodies in making decisions and contribute to a more honest, efficient, austere government that release more resources to the society through basic schemas of wellness.

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Public management through internal control refocuses its efforts to monitor the compliance of law, regulations and administritve, not only in terms of information, statistics, organization, procedures, hiring and remuneration of staff, systems for recording and accounting, procurement, leases, services, public works, conservation, use, destination, affectation alienation and low of movable and immovable property, warehouses, and other assets; but also to favor adequate provision of various public services required and paid by city users through their tax contributions.

A Preventive Comptroller

Internal control is part of a management philosophy that places special importance on preventive actions, establishing systems that provide support to public servants in the control of processes under their responsibility, thus contributing to a better performance of their work, increasing efficiency and social productivity, within a framework of transparency, honesty, accountability and efficiency in the use of public resources.

In this scheme, the General Comptroller of the Federal District, as part of its restructuring, focused its efforts on developing internal control systems predominantly preventive; what it is to prevent deficiencies occur, from risk control situations that cause them. This is about avoiding deficiencies by controlling risk situations that cause them.

Scope of Competence

The jurisdiction of the General Comptroller is stated in the Article 34 of the Organic Law of the Federal District Public Service (Ley Orgánica de la Administración Pública del Distrito Federal), it states that the office of the matters relating to the monitoring and evaluation of public management departments, administrative units, decentralized agencies, political-administrative bodies and entities of the Federal Public Service District are part of it tthrough the Directorate General of Internal Comptroller (Dirección General de Contralorías Internas), who was responsible for integrating the Program Implementation and Monitoring Internal Control, to coordinate internal comptrollers during the evaluation process, implementation and monitoring of internal control systems in the units that are attached, and thus comply with the duties mentioned in Articles 112 and 113 of the Regulations of the Civil Service of the Federal District [37].

Limitations of Internal Control

The internal control system, no matter how good their design and operation are, can provide only a reasonable security to the unit of government concerning achieving their objectives. The ability to achieve these objectives is affected by the inherent limitations of any internal control system including:

[37] GOBIERNO del Distrito Federal. Reglamento Interior de la Administración Pública del Distrito Federal. Publicado en la Gaceta Oficial del Distrito Federal No. 224 del 28 de diciembre de 2000, y reformas publicadas en la Gaceta Oficial del Distrito Federal No. 70 del 3 de mayo de 2006. Integrada por 96 y 28 páginas.

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- Judgment. The effectiveness of controls will be limited by the risk of human error in decision-making.

- System dysfunctions. Despite being well designed, internal control systems can fail. Staff may misunderstand instructions or make errors in judgment.

- Evasion. Of controls by Senior Officials. The internal control system cannot be more effective than those responsible for its operation. Even in government units that have a good control environment (those with high levels of integrity and control consciousness) there is a possibility that senior officials evade the Internal Control System.

- Conspiracy. The plot by two or more people may cause failure in the control system. When people act collectively to commit and cover an act.

- Cost-benefit. Resources are always scarce; institutions must consider the costs and benefits related to the implementation of controls.

Therefore, while internal control can help a unit of government achieve its objectives, it is not a panacea.

Roles and Responsibilities

All the staff of the unit of government is responsible for the operation of the internal control system:

– Holders. The holder has the primary responsibility and must take ownership of the system. More than any other individual, the holder puts the "example from above" influences the integrity, ethics and other factors of a positive control environment. In every unit, the holder fulfills the duty to exercise leadership and provide direction for CEOs, executives and of area, and review how they control the functions delegated to the unit. Managers at the same time, assign responsibility for establishment of more specific internal control policies and procedures to staff responsible for the functions in the unit of government. In small units, the influence of the holder is usually more direct.

In any case, in any unit in a downline, any boss really are the holder of his area of responsibility. Executive managers and staff are especially important, whose control activities cover up and down and side to side of the units of government.

- Internal Comptrollers. Internal comptrollers contribute in the design and effectiveness of the control systems and contribute to its ongoing evaluation. Because of their independent organizational position and powers with respect to the unit of government, the role of the comptroller plays an important role in monitoring the system.

Internal control is, with difference of degree, the responsibility of all members of the unit of government, therefore, must be explicitly or implicitly a part of the job description of all.

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Virtually all employees produce information used in the internal control system or carry other actions.

External surveillance

Of the government of the federal District, the Directorate General Audit of the Comptroller General of the Federal District makes a part. Contributes to the strengthening of internal control through objective and independent reviews of the government units, intended to help in meeting objectives and the effectiveness of processes and risk management.
Del Gobierno del Distrito Federal, una parte es realizada por la Dirección General de Auditoría de la Contraloría General del Distrito Federal. Contribuye al fortalecimiento del control interno a través de revisiones objetivas e independientes de las unidades de gobierno, dirigidas a ayudar en el cumplimiento de objetivos y a la efectividad de los procesos y la gestión de riesgos. Another is carried out by citizen comptrollers who participate with their monitoring processes in key government units.

An additional number of external parties often contribute to the achievement of objectives of the unit of government.

The external auditors provide an independent and objective view, contribute directly through the audit of financial statements and indirectly through providing useful information to the holder and the governing body in order fulfill its responsibilities.

Other segments that provide information to the unit useful in the operation of internal control are legislators and watchdogs of other powers of government, the contributor users who are suppliers and others who transact with the unit, the media and citizens.

However, outside groups are not responsible, nor part of the internal control system of the unit of government.

About what they did to the Internal Control

Afterwards on date April 9, 2007, the Comptroller General of the Federal District issues the "Agreement establishing the General Guidelines for Internal Control in the Federal Public Service District " through which the responsibility is transferred to holders of the administrative and governing bodies of the Federal District, to establish and preserve the internal control system required to achieve its objectives and goals ; assigning to the Comptroller General through the Internal Comptroller attached to it, monitoring and evaluating the operation of the internal control system in government units[38].

"Con esta disposición, se da un giro muy importante a la manera en que operó durante 6 años el Control Interno, al pasarle la responsabilidad de implementarlo a las áreas y, internal comptrollers were devoted exclusively to monitoring. Aunque en la práctica no se implementaron nuevos controles internos, sólo se dio seguimiento a los existentes."

[38] GOVERNMENT of the Federal District. Agreement establishing the overall internal control guidelines for the government of the Federal District issued by the Comptroller General of the Federal District and published in the Official Gazette No. 57 of 9 April 2007 composed of 112 pages, consulted at http://www.df.gob.mx/wb/gdf/gaceta_oficial.

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With this arrangement, a major shift to the way the Internal Control operated for 6 years is done, by tranfering the responsibility of implementing it to the areas and, internal comptrollers were devoted exclusively to monitoring. Even though new internal controls were not implemented in practice, only monitoring to the existent ones began.

Currently are in force reforms of April 30, 2008 published in the Official Gazette of the Federal District, made to article 113 of the Regulations of the Civil Service of the Federal District, where the authority granted regarding the implementation of Internal Control is abrogated and a relevant aspect, that is the attribution to perform regular and special audits in all areas prevented by such legal provision, is contributed to the Internal Comptroller of Units, Decentralized Organs, delegations and institutions. [39].

This in order to give strength and relevance to the Internal Comptroller, in addition to another image, since Internal Control Bodies interventions are designed to monitor and verify, correct and prevent strict compliance of the applicable regulations and the objectives of the agencies, bodies, decentralized, suboffices and agencies of the Federal District Public Management, this in order to avoid possible performance of practices that contravene applicable regulations and cause corruption

It is wanted to determine the degree of economy, efficiency, effectiveness, impartiality, honesty and adherence to standards with public resources with these new attributions, granting the Internal Comptroller, the allocation for preventive and corrective recommendations in case of evident deficiencies.

Since this latter disposicion is in force, the role of Internal Control of the government of the Federal District is abrogated. Internal comptrollers again become eminently audit institutions and a cycle, a fashion, a way of doing politics is closed; which had many advantages that are currently paying control dividends.

Conclusions

From the theory: The theoretical aspect was the guiding principle of the actions and work of Internal Controls Implementations, which gave positive results by the participation of the various areas that contributed to their integration, making that they become useful and functional instruments. The tools that were used for the Implementation and Monitoring of Internal Control Systems that were materialized, proved their effectiveness and efficiency; but also showed their weaknesses, those that were susceptible to improvement. As is known since the year two thousand and one, the attributions of the Comptroller General, were modified, it was given a perspective of assistance, accompanying support to units and other offices of the Public administration of the Federal District, thereby limiting the Internal Comptroller to , a purely preventive approach as was the internal control.

[39] GOVERNMENT of the Federal District. Internal Regulations of the Civil Service of the Federal District. amendments published in the Official Gazette of the Federal District No. 325 Published on April 30, 2008. Consulted at http://www.df.gob.mx/wb/gdf/gaceta_oficial.

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Although it is important to note that the Comptroller General of the Federal District continued to conduct audits through its Directorate General of Audit; it was a fact that it did not have the sufficient structure to cover all the city government, but through internal Comptroller and internal control reached this objective.

It must be noted also, that during this period, Cabe Comptroller largely achieved efficiency and the expected results, under the fulfillment of the principle of contribution, they denoted irregularities or deviations to various areas, giving them an opportunity to correct their acting. This situation implied that comptrollers were attracted by the areas to ask for advice in decision making in a constant way; nevertheless, this caused that they were substantially away from its fundamental presence as a watchdog.

Internal control was the mean through which the units achieved in the interceded process:

- Reasonably ensure the achievement of goals and objectives.
- Fight corruption.
- Provide an appropriate structure for accountability and promote transparency.
- Be responsible for the management at all levels and in all areas.
- Prevent risks that may impede the achievement of goals and objectives.
- Promote the efficiency, effectiveness and economy in the handling and application of resources.

Preventive vision proposed from the beginning, is definitely the strategic factor that stands out. At first glance we can see the many benefits of the Internal Control System, however, it was also found that through time was equivalent to a six-year simple fashion.

As a final conclusion, I can state unequivocally that I am convinced that the prime role of the Internal Comptroller is largely the audit, which is implemented through internal audits, but what good is finding faults, prosecute servants and penalize them if this becomes a recurring cycle because every time you do some revision again the same practices prevail.

Therefore, I hereby make the following proposals, which aim to close the cycle of operation of the Internal Comptroller, including both audit oversight functions and Implementation of Internal Control Systems:

- Auditing. Internal comptrollers should make the audit as the core of its activity, with the purpose of contributing to the detection of irregularities and proceed according to established law. Besides informing intervened areas, as well as staff responsible for conducting the implementation of Internal Control Systems, of observations raised to complement the actions undertaken by the Internal Comptroller.

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- Internal Control. After identifying serious problems in operations thrown by audits conducted previously, Internal Control systems essentially preventive should be implemented so that as far as possible inconsistencies and irregularities found not happen again.

- Feedback. Through annual diagnostics to determine the priorities that units or agencies have, with the purpose of intervening areas at greatest risk in your operation. Seeking to close open circles with audits of the previous period.

The operation of the Internal Comptroller would be carried as shown in chart 1, regardless of the activities related to internal complaints and reports areas. With this important achievements could be reached, laying the groundwork for hereinafter, and despite the six-year changes and staff replacement, control is not lost. All this, reinforced by being registered the introductions as part of formal procedures to which different servants in turn are obligated.

Internal comptrollers operation proposal

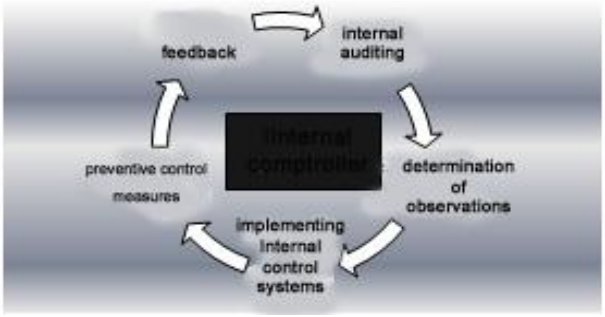

Chart 1

Experience. The labor in the Suboffice of Internal Control of the Internal Comptrallor of the Administrative Office of the Comptroller General of the Federal District provided a unique opportunity to broaden my view, of how the job must be done in any job, position or commission in the public sector.

Working in an area where the responsibility for the operation mainly lies with other, allowed a good apprenticeship, to identify clearly and accurately the risks of public administration, and the obligations under Article 47 of the Federal Accountability Act Public Servants in the performance of any employment, position or commission; as well as the sanctions to which he becomes debtor in case of administrative offense under Article 53 of the Act [40]. This story makes no sense, if after the experience in the Division of Internal Control of the Internal Comptroller in the Administrative Office, it had not permanently identified during the work done, the risks faced by public servants for breach of the Law commented. Because as public servants, when it comes to government, we can not detach ourselves from the laws and regulations governing its resources, as well as breach risk and even corruption, which derives in critical situations by being exposed to heavy penalties by audit institutions such as removal, disqualification, repair of damage and of course jail, as seen graphically in Chart 2. This is something that is certainly very important, so public servants consider the need to conduct themselves with honesty, fairness, impartiality, efficiency and attached to the law since their preparation, because ignorance of the law does not exempt from its consequences.

[40] GOVERNMENT Federal District. Federal Law of Responsibilities of Public Servants. Published in the Official Gazette on December 31, 1982. Pags. 17-22.

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Risk of Civil Servants

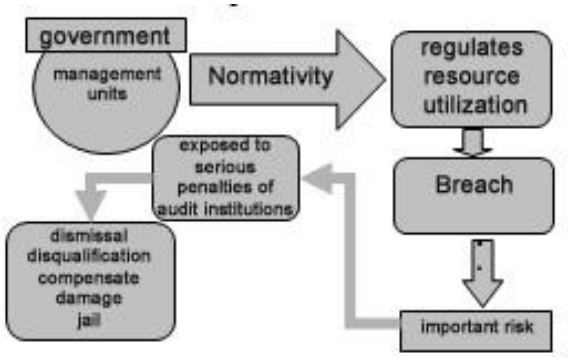

Chart 2

Framed in these reflections, we can understand deeply and clearly, the importance of the work done by the Comptroller General of the Federal District, by encouraging preventive activities of internal control above the corrective that regularly involved penalties for public servants

This work by the Internal Comptroller linked to Internal Control Systems, strengthened them and helped without fear of misjudgment, to streamline the public administration of the Federal District by establishing control mechanisms that enabled, ensure that Government agencies of Federal district healthily met its objectives; because without a doubt, prevention is better than cure.

Hence the importance, that derivated from the last modifications to the normativity applied to Internal Comptrollers, of encouraging a new form of work that implies recovering this primordial function as control is, to complement the actions of what we might call the new Internal Comptroller of the XXI century.

Prospects. Despite the experience in applying the principles and methodology established by the Comptroller General of the Federal District on Internal Control, the results were satisfactory but incomplete; especially because it is considered necessary to have parameters for comparison between previous reality to the implementation of the Internal Control System on the premises and the situation after.

This situation generated by the lack of quantification of the achievements in several areas, precludes an objective assessment of what has been achieved. It is not enough to know what has been improved, it is necessary to know what the actual impact was.

Also, there was a lack of crossovers as handled in auditing, of different Internal Control Systems in order to obtain a comprehensive view of Public management and detect and intervene opportunely the operations that imply any important risk.

The participation areas in the handling of processes implies a permanent searching attitude, looking for new ways of doing things optimally and become Control Processes. Keeping them always under study facilitates decision.making and magagement simplification.

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The user or owner area of a process is the most appropriate to suit your operating needs. This is consistent with one of the principles of internal control: Comptroller is not who should perform the Control, operational areas are responsible to carry out it, as it was encouraged since 2007, although this measure as it was posed, announced the end of the era of internal control.

Finally, it can be concluded that the basis for the operation of the Internal Comptroller on Systems of internal control were given were useful and added value in achieving the objectives of public institutions, however, there is room for improvement, because this work involves ongoing actions for keeping the risks updated and how to manage them. But we noted that internal control should not be thrown into oblivion, by being displaced by the regulations that currently operates.

Because according to the experience, it was observed that a new form of public management requires not only identify and punish, but to perform the actions so that the events detected are not repeated and the processes that led them are corrected through eminently preventive Internal Control Systems.

The road traveled during the period in which internal control systems were implemented, provides important elements for viewing in the future that we can move forward.

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Mandelbrot sets in diversifying markets with Julia sets

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In this article an analysis of one of the so many slopes of the geometry fractal was made applied to the financial market, that given its dynamic and volatile system, is resembled the variations of a fractal.
With base in the sets of Mandelbrot and Julia, a model from application to the financial market of capitals at local and international level with the purpose was developed of obtaining short term prognoses of the prices of the actions for the decision making.

Fractal, iteration, numbers complex, disturbance

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Introduction

One of the mathemathical advances with higher complexity, for leaving standards that the mathematician community had implemented for many centuries, is the fractal geometry, developed by the polish mathematician Benoit Mandelbrot (1924-) in 1975. It was motivated to replicate irregular or "natural" forms that Euclidean geometry could not represent, with the purpose of understanding disordered structures and its formation by random processes.

Mandelbrot did so through what he called "fractals", name inspired in the Latin adjective "fractus" which means fragmented. Benoit Mandelbrot postulated fractal geometry in various literary works[41], based on the ideas of two French mathematicians: Gaston Maurice Julia (1893-1978) and Pierre Joseph Fatou (1878-1929), who following an iterative process over the numbers field created the well-known Julia sets and its complement, the Faotu sets; at the same time, Mandelbrot worked specially over a subset of the Julia set, that have his name.

Fractals have two properties that highlight their essence: self-similarity and fractal dimension, acquired by its scaled invariance, this is, the more its scale expands, they do not lose their original shape. The fractal concept is used to identify order in many problems of non-linear characteristics, in fact, without the help of fractals, complex systems cannot be designed in detail.

Many applications of fractal geometry have emerged thanks to its ability to identify, quantify and analyze repetitive patterns; the objective of this work is to develop its application in the Financial Market, since this is a dynamic system, because it contains variables with the same characteristics of fractals. Fractal geometry is used to enlarge small variations or fluctuations of a time series using iterative processes, thus creating the qualitative large-scale changes.

Mandelbrot himself directed fractal geometry to this field[42] by analizing cotton price variations, because this variable have a non-linear dynamic; he found that movement curves of the prices in different times have the same form, facilitating the prediction.

Afterwards, Mandelbrot delved into financial subjects relative to temporal variability of speculative prices in his work "Fractal and Scaling in Finance" in 1997; because financial markets develop between chaos and order, where initial small changes produce large changes in the movements of consumer prices. This property is the main idea for the development of mathematical models that provide short-term forecasts by modeling the behavior of prices, in order to make the best possible decisions (purchase or sale)

Fractal analysis is linked to the Chaos theory because it recognizes that not all studied models are linear. Such is the case of the models used to analyze financial markets; since they are nonlinear dynamic systems that may change the initial values by interacting with past or external values, causing totally different results to those expected.

[41] Benoit Mandelbrot, "*The fractal geometry of nature",* Freeman, New York, 1982; y, Benoit Mandelbrot , "*Fractals; Form, Chance and Dimension"*, Freeman, New York, 1977

[42] Benoit Mandelbrot,*" Fractal and Scaling in Finance",* Springer, New York, 1997, 551 p

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Iterative process of Nonlinear Functions

In simple terms, a fractal is a geometric form repeating itself at any scale in which it is observed. Rigorously, a fractal is the final result of the infinite iteration of a determined geometric process, in particular, resulting from the composition of functions of a quadratic function on a complex field. First, we will define the characteristic properties of fractals, then delving into its construction.

Fractal properties:

Self-similarity: it means that each fragment of the object have the same characteristics of the complete figure, and can be repetead infinitely; they are based on complex numbers.

There are two types of fractals:

Linear: they are the same at different scales and therefore tend to infinity.

Non-linear: emerge from complex distortions, and are found in nature.

Fractal dimension: reveals that the dimension of the fractal do not correspond to an integer but to a fraction.

Because the theory of fractals comprises the field of complex numbers, we give a brief introduction to them.

Comment 1

The set formed by the numbers of the form $a+bi$ with $a,b \in \Re$, $i=\sqrt{-1}$ are known as complex numbers.

If $z=a+bi$ is a complex number. We will call the real part of z to the real a, and the imaginary part of z to the real b

The complex number field is denoted by C. We mention the most important properties of complex numbers:

- The modulus of z, denoted by $|z|$ equals $|z|=\sqrt{a^2+b^2}$
- Where $z=a+bi$ and $x=c+di$

Then:

Sum:

$$z+x=(a+c)+i(b+d)$$

Product:

$$zx=(ab-cd)+i(ac+bd)$$

- The conjugate of a complex number $z=a+bi$, is denoted as $\bar{z}$ and corresponds to $\bar{z}=a-bi$
- Exponential notation of z $z=|z|\exp(i\theta)$ with $0\le\theta\le 2\pi$
- Polar notation of z

$$z=|z|(\cos(\theta)+i\,\mathrm{sen}(\theta))$$

with $0\le\theta\le 2\pi$

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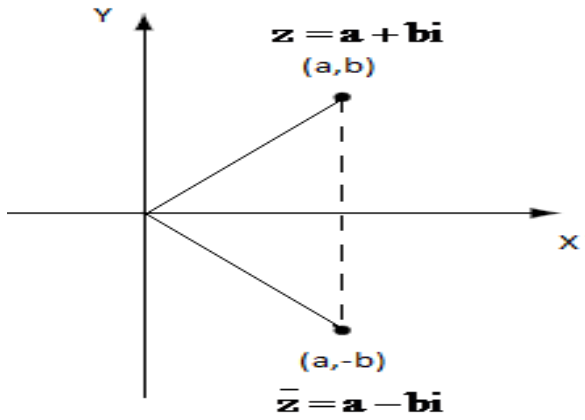
Complex plane



Graphic 1

From the geometric point of view, complex numbers can be identified with the points of the carthesian plane making the point (a,b) correspond to the complex $z=a+bi$, as shown in the graphic 1.

The topology of the complex plane can be conceived through the equivalence established between the Riemman sphere and the complex plane, this is, the projection of the points of the sphere of unitary radius centered at N, tangent to the complex plane, over it, following a bijection application. In Graphic 2 we can visualize this projection.

The origin of the fractal geometry theory dates back to the work of French mathematicians Gaston Julia (1893-1978) and Pierre Fatou (1878-1929) who in their manuscripts postulated the sets that bear their names, within a complex dynamic system, observing the behavior of an orbit of a point c over the extended complex plane, defined as $\hat{C}=C\cup\{\infty\}$, applying iterationally a quadratic function f.

Despite being the precursors of the fractal theory, Fatou and Julia could not see graphically their sets due to the difficulty of the arithmetic calculus.

Comment 2

A discrete dynamical system is a pair $(\mathbf{X},f)$ where $\mathbf{X}$ is a field and $f:\mathbf{X}\to\mathbf{X}$. Given a point $x\in\mathbf{X}$, the set $\{x,f^1(x),f^2(x),f^3(x),f^4(x),\ldots\}$ will be called the orbit of x, where $f^n(x)=f\circ\cdots\circ f(x)$.

The point $x\in\mathbf{X}$ that satisfies $f(x)=x$ is called fixed point or "point of balance" of the function f.

The point $x\in\mathbf{X}$ that satisfies $f^n(x)=x$ and $f^i(x)\neq x$ with $i>n$ is called periodic point of the function f of period $n>1$.

Making $\mathbf{X}=C$, the classification of fixed points according to their properties in a complex dynamic system (C,f), are the following:

- $z_0\in C$, z_0 is an attractor point if $|f'(z_0)|<1$ (1.1.1)
- $z_0\in C$, z_0 is a repeller point if $|f'(z_0)|>1$ (1.1.2)
- $z_0\in C$, z_0 is an indifferent point if $|f'(z_0)|=1$ (1.1.3)

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- $z_0 \in C$, z_0 is a super attractor point if $\left|f'(z_0)\right| = 0$ (1.1.2)

Comment 3

It is said that a dynamic system is stable if the dynamic does not change under small perturbations of f.

After classifying fixed points on (C, f), let us define the Julia sets.

Julia sets and FATOU set

Julia sets occur in complex dynamic systems, like an example we have physical, biological, computational, social and economics systems. Such systems generally exhibit invariance at different scales, because their behavior does not change by the rescaling of the space-time variables that define and govern their dynamic.

Julia and Fatou by 1918, implemented the iterative process under the transformation $f_c(z) = z^2 + c$, to obtain the orbit of the z point.

Comment 4

If (C, f) is a complex dynamic system, with $f_c : C \to C$ such that $f_c(z) = z^2 + c$, with $c, z \in C$, the Julia set under f_c is given by:

$$J_c(f) = \text{clausura}\{z \in C \text{ t.q. } z \text{ es un punto periódico repulsor de } f\} \quad (121)$$

Comment 5

The closure of Ω is defined as the intersection of all closed sets which contain Ω. The Julia set by definition, are all points that divide $\bar{C}$ in two parts, those that, following the iterative process, have an inestable orbit and those for which its orbit converges.

Iterative Process on C

Iterative process for computing the orbit of a point $z_0 \in C$ in (C, f)

if $f : C \to C$ so then $f = z^2 + c$ with $c \in C$,

for $n = 1, 2, \ldots$, then :

$$f^1(z_0) = z_0^2 + c$$

$$f^2(z_0) = f \circ f(z_0)$$

$$\vdots$$

$$f^n(z_0) = f \circ \cdots \circ f(z_0)$$

Graphic 2

For the particular case $f_c(z) = z^2$, the periodic points of the period $n > 1$ are those such that $f_c^n(z) = z^{2^n} = z$, hence $z^{2^n - 1} = 1$, equivalent to $|z| = 1$, then:

$$\left|f^n(z)\right| = \left|z^{2^n}\right| = \left|z^{2^n - 1}\right| = 2^n\left|z^{2^n - 1}\right| = 2^n(1) > 1$$

It therefore appears that all periodic point of $f_c(z) = z^2$ of period $n > 1$ is repellent, then the Julia set is given by:

$$J_c(f) = \text{cerradura}\{z \in C \text{ t.q. } |z| = 1\}$$

From this reasoning, we can find the repellent periodic p-points, that belong to the Julia set, this is, we have to find the roots of polynomials of degree 2^p, as for $f_c^2(z)$ with f_c a quadratic function, is a polynomial of degree 4, for is a polynomial of degree 8, and so on; then, find the condition that must be fulfilled by z, in order to be a repellor point; this proceeding difficults the construction of a Julia set, because of the arithmetic calculus it has.

The following theorema provides an alternative way of calculating the Julia set, in a simple way:

Theorem 1

Sí $z \in J_c(f)$, then:

$$J_c(f) = \text{cerradura}\left(\bigcup_{n>0} f_c^{-n}(z)\right) \qquad (1.2.2)$$

This theorema states that $J_c(f)$ is an attractive set of f^{-1}, and provides a simple algorithm to plot the Julia set through computational calculations, in the following way:

The inverse of the function f_c^k for $k \to \infty$ must be calculated, valued at a fixed repellor point, i e , for a $z_0 \in C$ resulting $f_c(z_0) = z_0$ and meet $|f_c'(z_0)| > 1$; by definition $z_0 \in J_c(f)$, then is $Z_0 = \{z_0\}$

We iterate the function $f_c(z_0)$, with the aim that in the k-th step, the set $Z_{k-1} = \{z_0, \ldots, z_{k-1}\}$ is cosntructed; we take eacha $z_i \in Z_{k-1}$ and images of the inverse function f_c are calculated, this is: $f_c^{-1}(z_i)$. We repeat the process until a great amount of numbers are calculated and we draw them.

On the other hand, we can define the Julia set based on the border of the area of attraction of a fixed point z.

Comment 6

If $z \in C$ is an attractive fixed point; the attraction área of z is defined as:

$$A(z) = \{y \in X \text{ t.q } \lim f^n(y) = z\} \qquad (1.2.3)$$

If $y \in A(z)$ then it has the orbit of y. If $z \in C$ is a periodic point of period $n > 1$, its orbit is called cycle, given byr:

$$\{z, f^1(z) = z, f^2(z) = z, f^3(z) = z, \ldots, f^n(z) = z\}$$

Then, the attraction area of the cycle is defined as:

$$A(z) = \bigcup_{i=0}^{n} A\left(f^i(z)\right) \qquad (1.2.5)$$

From this, the Julia set is defined as the frontier of the area of attraction of a fixed point z.

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Comment 7

A point $z \in C$ is a frontier point of Ω if:

$1.-B_r(z) \cap \Omega \neq \varnothing$

$2.-B_r(z) \cap (C/\Omega) \neq \varnothing$

Definition 8

The Fatou set is given by $C/J_c(f)$, i e, is the complement of the Julia set in C.

Theorem 2

The complement of a closed set is open.

This theorem does not say that the Fatou set is the maximum open such that the orbit of points converges, therefore has been dimensioned.

In other words, Julia and Fatuo observed that in certain cases, according the the values of c, the orbit of the points around the origin of a unit circle, converge in a fixed point of the function f_c, and are part of the attractionarea of c, while the orbit of the points most distanced from the origin tend to infinity.

Each of these two types of points constitutes a region, and in the middle remains what is called border, which is "infinitely thin", known as Julia set. In short, Julia sets are constituted by those periodic points of order $n>1$ so its orbit is delimited and because they are the frontier of the attraction. Julia sets have a fractal structure that with the aid of computers have become visibles. What is more, Julia and Fatou proved that Julia sets associated to trasformations f_c, for any complex number c, could be of two types: connected or disconnected.

Comment 9

If $\Omega \neq \varnothing$, Ω is connected if and only if there are two open sets A and B then:

$1.-\Omega \subset (A \cup B)$

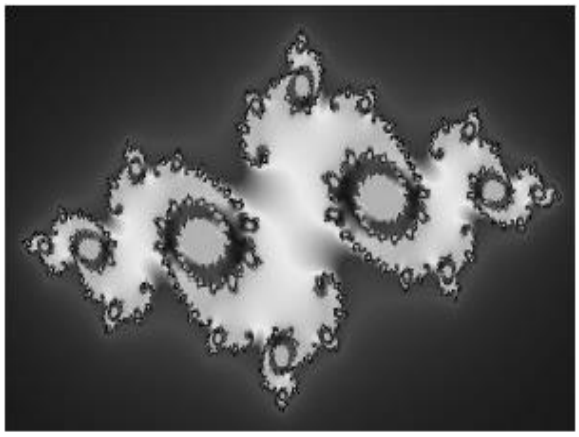
$2.-A \cap \Omega \neq \varnothing$ ó $B \cap \Omega \neq \varnothing$

$3.-(A \cap \Omega) \cap (B \cap \Omega) = \varnothing$

A result proved by Julia,in which he states that the Julia set associated with f_c is connected, according to the orbit of a fixed point $z_0 = 0$, with a value c arbitrary do not diverge or,is not connected if it does. This divergence lies totally on the norm of the complex constant c, as specified ahead:

Mandelbrot graphically represented the mathemathical work of Julia and Fatou; and he specifically focused in a subset of Julia sets, the connected Julia sets (see graphic 4).

Examples of not connected Julia sets (up), connected Julia set (bottom)



Graphic 4

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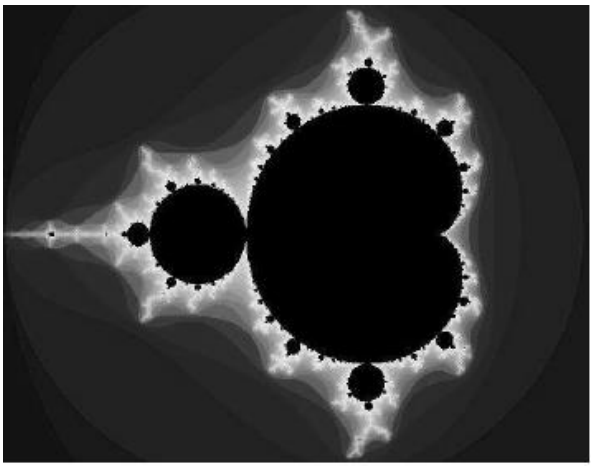

Fractal models in the financial market

The phenomenon of financial market have complex and dynamic nature, because the varibles composing it have a behaviour with self-similarity, brownian movements, non linearity, scale invariance, etc., so its is necessary to study them under the complexity theory; for example, financial market statistics have a behavior simikar to fractals (self similarity and similarity). The complex market dynamic is characterized by collective anomalus fluctuations that keep in mind the memories of critical phenomena, for example, the rate fluctuations do not merely follow a random process and the volatility of profitability is adjusted to autocorrelations in the long term, then we can say that the financial market is not a totally deterministic system nor totally stochastic but a combination of both, ie, it can be described by a series of equations nor through the theory of independent increments, nor identical distributions for different time intervals.

Therefore, it is required to create analysis techniques different from the traditional ones, since many of these involve linearity, seasonality, cause-effect relationships, among others, which makes them restrictive models that yield predictions unfaithful and / or imprecise, and then it is convenient to create new models that fit the reality of the financial data. Following this argument, Mandelbrot emphasized the description of the behavior of financial series, arguing the following four points:

- The pronounced changes in certain asset prices are much more frequent than the predicted by the Gaussian model, reflecting a leptokurtic character in the prices, this is, the probability of events associated with the tails of the distribution, is higher than what is assumed in theory.

- Great instant price changes occur very often, and give the impression that they must be explained causally as they do not conform to a stochastic prediction.

- The financial time series do not seem stationary, and the variance differs in various time periods.

- Changes in prices are not independent, showing diversity of patterns that provide some bases to technical analysis.

Under these four points, Mandelbrot assembled the fractal theory over the time series of stock returns (asset prices, financial rates, etc), since any kind of time series can be generated by a stochastic process and the information set observed is considered as a particular performance of the underlying stochastic process.

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The fractal hypothesis (FH) of a financial series implies self-similarity; if accepted (FH true), it is said that economic cycles have long-term memory and this is much higher than the detected by autoregressive models, in which the process at a time h depends on their own values observed at previous periods.

R/S Analysis

The reescaled range analysis or R/S analysis is an estatistic method used to evaluate the occurrence of rare events, so it is used to describe financial shocks and collapses. The performance of a R/S analysis does not have to be limited to rare events, but rather be applied to any time series.

The result of a R/S analysis is the Hurst coefficient (also named fractal exponent), expressed by H, which is an indicator to determine if a time series has fractal behavior and, it measures the intensity of dependency in a long term of a time series.

The values H are found between 0 and 1, for which:

- $0 < H < .5$:= there is a negative correlation in the increseases to the time t
- $H = .5$ Is the Brownian movement, in which the increases are in dependent and, therefore, of correlation zero.
- $.5 < H < 1$:= there is a positive correlation between the increases, ie, if the graphic of X_t increases for a time t, then i t tends to keep increasing for $t' > t$.

It is noteworthy that there are softwares[43] able to calculate Hurst coefficient for any time series through different methods. In a time series with fractal structure is expected that the Hurst coeffiecnts calculatred by different methods[44] are similar.

Another field of study of Mandelbrot was the relation between his own fractal theory and the chaos theory, which is applied under circunstances where the process are random and the systems are dynamic, for this reason is widely used in economics and financial markets. Once discovered the Mandelbrot sets graphics, the role of fractals within the chaos theory could habe been seen, since both are iterative and dynamic systems; we can say that a fractal implies chaos, but a chaotic system not always generates fractal figures, in fact fractals seem to be a weird attractor in chaotic systems. Generally, chaos theory studies comples dynamic systems, within a framework of nonlinear relationships and presenting "sensibility to initial conditions" withouth existing divergence.

Chaotic systems are characterized by:

- Non-linear systems: a necessary condition is that the relationships that govern the system are non-linear; otherwise, it is impossible to generate endogenous dynamics aperiodic.

[43] El coeficiente de Hurst, puede ser calculado mediante el Programa H, implementado en lenguaje pascal, puede ser descargado de la siguiente dirección electrónica: http://www.bi.upv.es/~algarsal/hurst/hurst.zip; Otros softwares que tienen como utilería su cálculo, son Visual Chart, C++, entre otros.

[44] Los modelos mayormente usados para calcular el coeficiente de Hurst son: Crecimiento del Rango, Crecimiento del momento de orden dos y Momento de orden dos local.

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- Perturbed systems: given the induction of a disturbance, the system reacts by changing its trajectory and evolving differently from its original state, ie the pre-disturbance state.

- They have sensitivity to initial conditions: Given an infinitesimal change in the values of the initial parameters, the evolution of the system diverges radically from its original state. Furthermore, the divergence is so large that makes it impossible to predict the final state of the system.
- They have attractor dynamics: while the system evolves in totally irregular and unpredictable form, it does not diverge, then long-term evolution remains bounded within a given subspace.

Chaos theory allows studying unstable systems with high volatility, divergences in their evolution, abrupt changes and no periodic cycles. Therefore, its main field of application in economics have been the stock markets.

Final considerations

The idea is to accept uncertainty as an unavoidable and decisive component of the financial marketsthus learn to live with it is the basic need to cover in the financial models, rather than minimize or ignore them as traditional models do. The question is "what to do" or "what research" in a chaotic system, and deepen in the study of Chaos Theory and Mandelbrot fractals is a priority; then the research should focus on the study of the uncertainty surrounding economic phenomena.

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Abstract

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Contribution

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Instructions for authors

Introduction

Text in Times New Roman No.12, single space.

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.

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

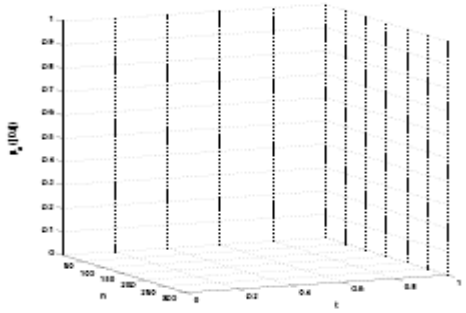
[Title No.12 in Times New Roman, single spaced and Bold]

Products in development No.12 Times New Roman, single spaced.

Including graphs, figures and tables-Editable

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.

[Indicating the title at the bottom with No.10 and Times New Roman Bold]



Graphic 1 Title and Source (in italics).

Should not be images-everything must be editable.

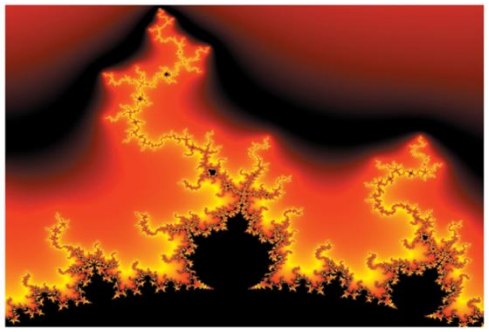


Figure 1 Title and Source (in italics).

Should not be images-everything must be editable.

Table 1 Title and Source (in italics**).**

Should not be images-everything must be editable.

Each article shall present separately in **3 folders**: a) Figures, b) Charts and c) Tables in .JPG format, indicating the number and sequential Bold Title.

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.

Data Sheet

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

Journal Name
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

Author Name (s)
Email Correspondence to Author
References

Mexico, D.F ____, ____ 20_____

Originality Format

I understand and agree that the results are final dictamination so authors must sign before starting the peer review process to claim originality of the next work.

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Article

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Signature

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Authorization form

I understand and accept that the results of evaluation are inappealable. If my article is accepted for publication, I authorize ECORFAN to reproduce it in electronic data bases, reprints, anthologies or any other media in order to reach a wider audience.

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