República de Colombia
Departamento Nacional de Planeación
Dirección de Estudios Económicos

ARCHIVOS DE ECONOMÍA

Yet another lagging, coincident and leading index for the colombian economy.

Carlos Alberto CASTRO IRAGORRI

Documento 233
9 de Septiembre de 2003.

Yet another Lagging, Coincident and Leading Index for the Colombian Economy[1]

Carlos Alberto Castro Iragorri
ccastro@dnp.gov.co
August 2003

Abstract

This paper sums up the results of an ongoing research on the construction of indexes for Colombian economic activity and the characteristics of the business cycle. The author uses the statistical framework known as the generalized dynamic factor model (Forni, Lippi, Hallin, Reichlin, 2000) to build a lagging, coincident, and leading quarterly index for Colombian economic activity.

JEL classification: C53, C82, E32.
Keywords: generalized dynamic factor model, coincident indexes, leading indexes.

1) *Introduction*

Initial interest on coincident and leading indicators began with the methods suggested by Burns and Mitchell (1946). Their method basically consisted in selecting economic time series which showed clear turning points contemporary or in advanced of the "reference cycle". The series are standardized and averaged to provide a composite cyclic indicator. However, much critique aroused on the lack of statistical criteria used on the definition of the global state of the economy and on the optimality of the weighting scheme used to construct the leading indicators, by Stock and Watson (1989 and 1991) and Emerson and Hendry (1996). From this criticism the use and subsequent publication of coincident and leading indicators for the United States and the U.K.[2], by national statistical bureaus, cease in the middle of the nineties. In spite of the criticism there is still somewhat of an academic interest in these measurements of economic activity. The OECD still produces leading

[1] The opinions expressed here are those of the author and not necessarily those of the Departamento Nacional de Planeación. I express my thanks to Jesus Otero, Gabriel Piraquive and Manuel Ramírez for helpful comments and suggestions. Any remaining errors are my own.
2 In light of much criticism, the Office for National Statistics stopped publishing these indicators in 1996; however the publication was taken up by a private agency. At approximately the same time, the United States Bureau of Census stopped publishing these indicators, but they were taken up by the Conference Board.

indicators for most of its members following the traditional method[3]. There has also been an important development of techniques based on econometric and time series analysis.

Stock and Watson (1989 and 1991), (SW henceforth) have used a state space model with observable and predetermined coincident and leading variables. The main idea behind their methodology is to obtain an unobservable process as the coincident index and use the 6-month forecast of this unobserved factor, as the leading index, obtained from a modified vector autoregressive system of this factor and a set of leading variables.

Another approach is the EuroCoin™, which is a coincident indicator of the euro area business cycle[4]. This index is estimated using a set of monthly statistics of the euro area (951 series). This method builds on the previous research on coincident and leading indexes by Forni, Hallin, Lippi and Reichlin (1999, 2000, 2001, and 2003) (FHLR henceforth). The statistical model used is based on the generalization of the dynamic factor model and will be explained in greater detail in section 2.

In Colombia past approaches concentrated on replicating the NBER or OECD methodologies, Melo *et al.* (1988), Ripoll *et al.* (1995), Maurer and Uribe (1996), Maurer *et al.* (1996), Pelaez (2001). The most recent approach by Melo and Nieto (2001), Melo *et al.* (2002), Nieto (2003) and Melo, Nieto and Ramos (2003) is a modification of the SW methodology.

In this paper the methodology and software developed by FHLR is used to construct a quarterly self-contained system of coincident and leading indicators for the Colombian economy. In section 2 the statistical model and theoretical aspects of it are described; in section 3 an overview of the estimation procedure is presented; in section 4 the data used is described as well as the calibration of the statistical model for the Colombian economy; in section 5 the results obtained from the empirical application to the Colombian economy are presented. Finally the last section presents the conclusions, strengths and weaknesses of the procedure.

3 Give or take some revisions, modifications and fine tuning of the methods. For more information see www.oecd.org/std/cli.
4 The EuroCoin™ is published monthly by the CEPR (Center for Economic Policy Research).

2) *Statistical Model*

The essence of the method in FHLR is a factor model[5], where the dynamics (covariance) of a panel of macroeconomic variables can be described by a small number of commonalities in the set. Therefore each variable can be expressed as the sum of a common component (shared accordingly with the other variables in the panel) and an idiosyncratic (orthogonal) component. The SW approach also originates from a factor model, but the classification of the variables as coincident is performed *a-priori*. As stated by FHLR (1999) in their procedure and analogous to the NBER averaging methodology *"the first step is to eliminate from each series in the panel, that part of the dynamics which is poorly correlated with the rest of the economy and hence considered as idiosyncratic. Then, in a second step we select coincident and leading indicators by analyzing the phase shifts between these 'cleaned' time series. Finally, we aggregate coincident and leading variables into coincident and leading indexes and establish turning points. A major novelty of our methodology is that these steps are not conceptually disjoint operations, but are all consistently nested within a unified theoretical setting"*[6]. The steps of the procedure will be further explained in section 3.

The following paragraphs will summarize the construction and assumptions of the FHLR model, naturally a more comprehensive treatment of the model can be found in FHLR (1999, 2000, 2001, and 2003).

a. Identifying the common components

Define $\mathrm{x}_t = (x_{1t},...,x_{nt})'$ as the panel of n macroeconomic series suitably transformed[7]. Since the goal is to summarize in a small number of indexes the commonality of the variables in the panel we look for q processes z_{ht}, $h=1,..,q$ that satisfy the following conditions:

i. z_{ht} is a linear combination of the leads and lags of the variables of the panel:

$$z_{ht} = \mathrm{p}_h(\mathrm{L})\mathrm{x}_t, \qquad h=1,..,q$$

5 See Harman (1967) for an introduction to factor analysis.
6 FHLR (1999), pg 2.
7 Guaranteeing stationarity for all the series and standardized so the different units of each series do not overshadow the explained variance

ii. z_{ht} and z_{kt} are mutually orthogonal at any lead and lag $h \neq k$ and the filters $\mathrm{p}_h(\mathrm{L})$ are normalized such that:

$$\mathrm{p}_h(\mathrm{L})\mathrm{p}_k(\mathrm{F})' = 0, \quad \text{For } h \neq k$$

$$\mathrm{p}_h(\mathrm{L})\mathrm{p}_h(\mathrm{F})' = 1,$$ [8]

iii. the filters $\mathrm{p}_h(\mathrm{L})$ and associated processes z_{ht}, $h=1,..,q$ are such that the sum of the explained variance is maximized:

$$\sum_{j=1}^{n} \mathrm{var}(\gamma_{jt}{}^{q})$$

$\gamma^q{}_t = (\gamma^q{}_{1t},..,\gamma^q{}_{nt})'$ is the projection of x_t on the past, present and future of $\mathrm{z}^q{}_t = (z^q{}_{1t},..,z^q{}_{nt})'$ given the following decomposition of x_t on the above mentioned aggregates (hence $\gamma^q{}_{it}$ for $i=1,..,n$ is the commonality of each series in the panel).

$$\mathrm{x}_t = \gamma^{\mathrm{q}}{}_{\mathrm{t}} + \zeta_t{}^q = \mathrm{C}^{\mathrm{q}}(\mathrm{L})\mathrm{z}^{\mathrm{q}}{}_{\mathrm{t}} + \zeta_t{}^q = \mathrm{K}^{\mathrm{q}}(\mathrm{L})\mathrm{x}_t + \zeta_t{}^q \qquad (1)$$

Where the residual vector is $\zeta_t{}^q$ and $\mathrm{C}^{\mathrm{q}}(\mathrm{L})$ and $\mathrm{K}^{\mathrm{q}}(\mathrm{L})$ are the following filters:

$$\mathrm{C}^{\mathrm{q}}(\mathrm{L}) = (\mathrm{p}_1(\mathrm{F})' \ldots \mathrm{p}_{\mathrm{q}}(\mathrm{F})')$$

$$\mathrm{K}^{\mathrm{q}}(\mathrm{L}) = \mathrm{C}^{\mathrm{q}}(\mathrm{L})\mathrm{C}^{\mathrm{q}}(\mathrm{F})' = \mathrm{p}_1(\mathrm{F})\mathrm{p}_1(\mathrm{L})' + \ldots + \mathrm{p}_{\mathrm{q}}(\mathrm{F})\mathrm{p}_{\mathrm{q}}(\mathrm{L})'$$ [9]

The processes $z_{1t},...,z_{nt}$ that satisfy requirements, i), ii) and iii) are called the dynamic principal components of x_t. The dynamic principal components are related to the eigenvalues and eigenvectors of the spectral density matrix of x_t, akin to the static case where they are related to the eigenvalues and eigenvectors of the variance-covariance matrix. The main difference between the dynamic and static case is that the relationship between the principal components (in this case z_{ht} for $h=1,..,q$) and the original series (in

8 Where $\mathrm{F} = \mathrm{L}^{-1}$, L and F as usual are the backward and forward shift operators, respectably.
9 This automatic re-alignment of the variables exploits completely the information of the panel not only the information of the coincident variables, but it also includes the leading and lagging ones in order to identify more thoroughly the common component.

this case the panel x_t) are in terms of all the values of z_{ht} and x_t, at different times rather than a single z_h and x_n [10].

The filters are derived from the eigenvectors $\mathrm{p_h}(e^{-i\theta})$, corresponding to the h*th* - eigenvalue $\lambda_h(\theta)$ in descending order, from the spectral density matrix $\Sigma(\theta)$, at frequencies $-\pi < \theta < \pi$. By setting $\lambda_h = \int_{-\pi}^{\pi} \lambda_h(\theta)d\theta$, the maximal explained variance is given by $\lambda_1 + ... + \lambda_q$ and the percentage of explained variance is given by the ratio $\frac{\sum_{i=1}^{q} \lambda_i}{\sum_{i=1}^{n} \lambda_i}$, as seen in the following subsection and section 3 this ratio provides a useful indicator for the choice of *q*. The exact estimation of filter $\mathrm{K^q(L)}$, used to derive the common components from x_t is derived in Appendix A of FHLR (1999).

b. Establishing a bridge between the principal components and the generalized dynamic factor model

The use of principal components has introduced a method to extract the commonalities; however there is still a need to define a procedure to choose the relevant number of components. This is where the use of the dynamic factor approach lends a hand. The factor model that FHLR have in mind represents the sum of two unobservable components: the common components (common to all the variables in the panel) and a set of idiosyncratic components uncorrelated with the common components.

Let the panel x_{nt} be a construction of the first *n* elements of an infinite sequence x_{jt}, *j=1,...*∞, then for each n*th*-element x_{nt}.

$$x_{jt} = \chi_{jt} + \xi_{jt} = \mathrm{b_j(L)u}_t + \xi_{jt},$$

where χ_{jt} is the common component, $\mathrm{u}_t = (u_{1t},...,u_{qt})'$ is the vector of common shocks[11], $\mathrm{b_j(L)}$ is a vector of two-sided filters and the idiosyncratic component ξ_{jt}, which is

10 For a quick overview of principal component analysis in the frequency domain see Jolliffe (2002) and for a more comprehensive treatment see Brillinger (1981).

11 Here lies an important departure from the model proponed by SW (1989), where there is one common shock. Since there is one common shock it can only be loaded contemporaneously by all of the variables in the panel. Hence none of the variables in the panel can be leading or lagging and there must be only one source of common variation within the panel (although this also makes their common cycle stronger).

orthogonal to u_{t-k} for any k and j . Stacking over n we have the generalized dynamic factor model:

$$x_{nt} = \chi_{nt} + \xi_{nt} = B_n(L)u_t + \xi_{nt} \qquad (2)$$

This model has the following properties:

Let $\lambda^{\chi}{}_{hn}(\theta)$, *h=1,..,n* be the h*th*–eigenvalue of the spectral density matrix of χ_{nt}. Similarly, $\lambda^{\xi}{}_{hn}(\theta)$, *h=1,..,n* be the h*th*–eigenvalue of the spectral density matrix of ξ_{nt}.

i. $\lambda^{\xi}{}_{hn}(\theta) < \Delta$, as $n \to \infty$, is bounded in $[-\pi, \pi]$ for *h* and *n*.

ii. $\lim_{n\to\infty} \lambda^{\chi}{}_{hn}(\theta) = \infty$, the first *q* eigenvalues diverge in $[-\pi, \pi]$ for $h \leq q$.

Returning to equation (1) and making explicit its dependence on *n*.

$$x_{nt} = \gamma_{nt} + \zeta_{nt} = C_n(L)z_{nt} + \zeta_{nt} \qquad (3)$$

Now this model has the following properties:

iii. $\lambda_{hn}(\theta) < \Delta$, as $n \to \infty$, for *h=q+1,..,n* in $[-\pi, \pi]$, the last *n-q* eigenvalues of x_{nt} are bounded.

iv. $\lim_{n\to\infty} \lambda_{hn}(\theta) = \infty$, for $h \leq q$ in $[-\pi, \pi]$, the first *q* eigenvalues of x_{nt} diverge.

Under these assumptions there is a strong similarity between equations (2) and (3). FHLR (1999) show that conditions iii, and iv hold for the eigenvalues of x_{nt} $\Leftrightarrow$ the generalized factor representation exists (2). They also show that for *n* large γ_{nt} is a good approximation of χ_{nt}. In their own words *"these results build a firm bridge linking principal components and factor analysis. The basic intuition behind them is that, by taking the principal components, we are taking an average of the x's. When n is large, we get a kind of Large Number result. The idiosyncratic components, which are poorly correlated, disappear, so that we are essentially left with linear combinations of the (leads and lags of) the common components. Such linear combination spans almost the same dynamic space as the common factors…"* [12]

The bridge established above suggests a criterion for the choice of the number of principal components to maintain. Since $\lambda_{hn}(\theta)$ in $[-\pi, \pi]$ is bounded for *h*>*q* and diverges for $h \leq q$ as $n \to \infty$, then for a large *n* we expect a "jump" (in the own words of the authors)

12 FHLR (1999), pg 6.

between λ_{qn} and λ_{q+1n}. This suggests adding principal components until the increase in the explained (marginal gain) is larger (smaller) than some prespecified value.

c. One-sided estimation and forecasting for the end-of-sample problem caused by two-sided filtering

The use of the two-sided filter $\mathrm{K}^{q}(\mathrm{L})$ creates a problem the end (or at the beginning) of the sample. Even thought we are interested in the historical performance of the index (central part of the sample) our main practical interest is the performance of the index at the end of the sample. However, we do not wish to loose the automatic realignments introduced by the two-sided filter. With this in mind FHLR (2003) suggest a one-sided filter for the end of the sample, also used in forecasting the common components. The authors use the dynamic principal components method along with the method developed by SW (2002) for generating forecast, in a factor model, using static principal components. Both methods share the same objective of finding a set of aggregates that *span* approximately the same dynamic space as the factors in a factor model. The hybrid two-step estimator developed by FHLR (2003), first estimates the covariance matrix for the common ($\Gamma_{n0}^{\chi^T}$) and idiosyncratic component ($\Gamma_{n0}^{\xi^T}$) obtained through the dynamic method; in the second step these matrices are used to obtain contemporaneous averages that minimize the fraction of idiosyncratic variance contained in the aggregates. Later these aggregates can be used for an in-sample or out-of-sample estimation of the common components.

d. An example of advantages of the two-sided filter

To gain a clearer perspective of the advantages of the two-sided filter (automatic realignment) for a more thorough approximation of the common factor space, let's look at the following simple example[13]:

Assume that $x_{1t} = \chi_{1t} + \xi_{1t}$ and $x_{2t} = \chi_{2t} + \xi_{2t}$ where $\begin{matrix} \chi_{1t} = u_t & \operatorname{var}(\xi_{1t}) = \operatorname{var}(\xi_{2t}) = 1 \\ \chi_{2t} = u_{t-1} & \operatorname{cov}(\xi_{1t}, \xi_{2t}) = 0 \end{matrix}$

[13] This example is from FHLR (2003).

This implies that the two variables x_{1t} and x_{2t} share one common shock u_t loaded contemporaneously for the first variable and lagged one period for the second variable. Also the idiosyncratic and common variance ratio is 1 for both variables. Given these set of assumptions we can average these variables to obtain the relevant aggregates:

a. Through a Contemporaneous Average:

$$\frac{x_{1t} + x_{2t}}{2} = \frac{(u_t + u_{t-1}) + (\xi_{1t} + \xi_{2t})}{2}$$

Since the common shock is serially independent the idiosyncratic component is as large as the common component. No clear advantage in using this kind of average.

b. Through an Aligned Average

$$\frac{x_{1t-1} + x_{2t}}{2} = \frac{(u_{t-1} + u_{t-1}) + (\xi_{1t} + \xi_{2t})}{2} = u_{t-1} + \frac{(\xi_{1t-1} + \xi_{2t})}{2}$$

In this case the idiosyncratic variance is only ½ of the common variance. Through this average the fraction of the idiosyncratic variance contained in the aggregate is minimized.

3) *The Procedure*

Following the theoretical background established in section 2 we now look at the procedure used in the construction of coincident and leading indexes for the Colombian economy.

a. Organizing and choosing the variables

The first step is to transform the variables in order to guarantee stationarity and standardize the variables. The next step is to define *a-priori* the group of core variables (which, *a-priori*, show an important commonality between them and with GDP) that must be in the panel and a group of candidate variables (non-core).

b. Core analysis

Using the variables defined in the core (Table 1), we set a predetermined number of factors q which we will later validate according to the criterion defined in section 2b and set a data dependent rule [M= round($\sqrt{T/4}$)] for the estimate of the sample covariance matrix. Then we use the discrete Fourier transform to estimate the spectral density matrix $\Sigma(\theta)$ of the panel x_{nt}. In the frequency domain a filter is constructed out of the first q eigenvectors from the estimated spectral density matrix (the dynamic principal components). Finally using the inverse discrete Fourier transform we obtain an estimate of filter $\mathrm{K}^{\mathrm{q}}(\mathrm{L})$; this filter is used to acquire the common component for each of the variables in the core. The idiosyncratic components are obtained as a residual (since they are orthogonal). We also get a scalar estimate of the idiosyncratic component as an average of the idiosyncratic components in the core; let's call this the "overall idiosyncratic component (OYC henceforth)" for this panel. For the moment only the core variables are included in this panel –the core panel-.

c. Non-core analysis

In the non-core analysis the procedure used in obtaining the common components is the same as the one mentioned for the core variables. However since the non-core variables are candidate[14] variables, the core panel is augmented by each of the non-core variables (one at a time). For each of these augmented panels the OYC is estimated and compare to the OYC of the core panel. If the OYC for the augmented panel is smaller than the OYC for the core panel then the candidate variable is included in the final panel. This final panel, naturally, includes the core variables and the non-core variables that reduce the OYC. This is equivalent to maximizing the overall commonality between the variables, which is our main objective.

14 Remember that we do not want to include variables in our final panel that have a small commonality with the other variables and a large idiosyncratic component.

d. Validation of the number of factors

After determining the final panel we must test if the q chosen *a-priori* is optimal. Now following the criterion established in section 2b we know that the procedure must estimate the dynamic eigenvalues $(\lambda_1(\theta),...,\lambda(\theta)_n)$ in descending order, obtain their values in $[-\pi,\pi]$, and report the percentage of explained variance[15], given by the ratio $\frac{\sum_{i=1}^{k}\lambda_i}{\sum_{i=1}^{n}\lambda_i}$ for $k \leq n$. In sum the criterion tell us to include factors until the marginal contribution of an additional factor to the total explained variance is below a constant (α), when this happens q is optimal.

e. Phase analysis and classification of the variables (leading, coincident or lagging)

Once the common components are estimated for each of the series of the final panel we must classify each of them as being *"in phase"* or in *"phase opposition"* with respect to the common component of the GDP, which is a reference point to classify the variables as leading, coincident or lagging. With this in mind, we proceed as follows: first we use the estimate of $\Sigma^{\chi}(\theta)$[16] to compute the cross-spectral density of each common component with respect to the common component of GDP. Second we compute the argument of these densities, which is the phase angle delay (Appendix A) with respect to GDP, at frequency zero. Let $\phi_j(\theta)$ in $[-\pi,\pi]$ be the phase angle shift for the common component χ_{jt}. At frequency zero lets define the new series as:

$$\omega_{jt} = \begin{cases} \chi_{jt} & if \quad \phi_j(0) = 0, \quad in \quad phase \\ -\chi_{jt} & if \quad \phi_j(0) = \pi, \quad phase \quad opposition \end{cases}$$

Using the series ω_{jt} we compute the phase angle shift, $\psi_j(\theta^*)$, with respect to the GDP at a typical business cycle for the Colombian economy (the calibration of θ^* will be explained

15 Since the data is standardized $\sum_{i=1}^{n}\lambda_i = 1$.

16 The spectral density matrix of the common components.

in section 4). We also need to define a maximum phase angle lead, τ, according to which the classification of the variables will be defined as follows:

$$\begin{aligned} |\psi_i(\theta^*)| &< \tau, \quad \textit{Coincident} \\ \psi_i(\theta^*) &> \tau, \quad \textit{Leading} \\ \psi_i(\theta^*) &< -\tau, \quad \textit{Lagging} \end{aligned}$$

f. Construction of the indexes and the end-of-sample correction

From the classification given above the indexes are constructed as the averages of the coincident and leading common components. The level indexes are constructed as the cumulated sums of the original indexes. Since the estimated common components come from a two-sided filter $K^q(L)$, these estimates at the beginning and at the end of the sample are not adequate. To overcome this FHLR (2003) use contemporaneous averages of the original variables or the one-sided filter mentioned in section 2c for the beginning and last three observations in the sample.

4) Data and calibration for the Colombian economy

The panel constructed from the Colombian data is a set of 70 economic time series, 5 core and 65 non-core variables in the quarterly sample period 1984:01 – 2003:01 (Table 1). Each variable was analyzed to determine the order of integration using unit root test (Dickey-Fuller, Phillips-Perron and KPSS) and the HEGY[17] test for seasonal unit roots in quarterly series. Following the results of these tests the variables were transformed to guarantee stationarity (by first difference) and to remove seasonality (deterministic or stochastic). Most of the variables showed relevant deterministic seasonality (seasonally adjusted through the use of seasonal dummies) or no seasonality (Table 2). The variables that showed stochastic seasonal patterns were adjusted with the relevant filter identified

17 S. Hylleberg, R.F. Engle, C.W.J. Granger y B.S. Yoo, "Seasonal Integration and Cointegration", Journal of Econometrics, 1990, 44, pg 215-38.

with the HEGY test). Also all of the seasonally adjusted and not seasonally adjusted series show some evidence of a unit root except for 18 series[18] (Table 3).

The estimation procedure described in section 3 was calibrated for Colombia following Maurer and Uribe (1996) and Maurer, Uribe and Birchenall (1996) for the choice of the length of the business cycle for the Colombian economy. According to these authors the length of the business cycle, in Colombia, is 4 to 5 years. For the empirical application the length of the cycle chosen is 4 years (the results are not sensitive to choosing 5 years). As it was explained in section 3 the length of the cycle is fundamental in the phase analysis to determine the relevant frequencies associated to the cycle and to calibrate the timelead (phase angle lead in the frequency domain) between the series, given a particular cycle. The maximum phase lead is set to one month (expressed in quarters $\tau = 0.3\overline{3}$).

In choosing the optimal number of factors q following the criterion, established in section 2b and explained in detail in section 3d, we must set a floor for the marginal contribution of an additional factor to the total explained variance. For the empirical application α was fixed to 5%, given this calibration q=2 (two common factors).

[18] SIT, AMA, EPT, VOP, ER3, ES6, OVN, PRC, VCC, TSO, PCA, IPU, AM1, CCP, EXC, CDT, LCO and PMA.

5) *Results from an empirical application to the Colombian economy*

The lagging, coincident and leading indexes are derived after calibrating the model. From the first step we obtain the final panel which includes the variables in the core and only two candidate variables SIT (Current economic conditions) and OVN (Car Sales). These are the only variables outside the core that reduce the OYC. These results indicate that the evolution of the real cycle is poorly correlated with the evolution of prices and wages, monetary and financial cycle, trade cycles, fiscal cycles, the evolution of asset prices and the construction cycle. This seems a bit harsh; however this might be the result of using indexes with in the core and non core (such as SIT and IPR) which could sum-up indirectly the dynamic of some of these cycles.

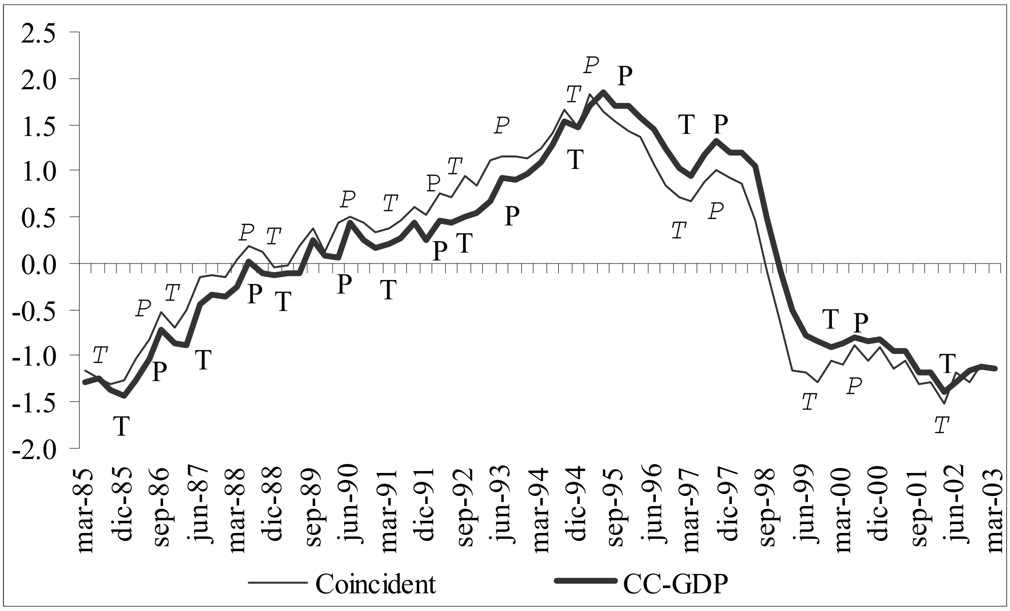
The final panel only includes 7 variables, which poses an important issue since the methodology is base on a large n. The next step after defining the final panel and validating the number of factors (q=2) is the analysis of the time phase lead (or delay) of each variable with respect to the GDP. In sum the criteria for variable classification, explained in section 3b and calibrated according to section 4, is that a variable is lagging if its time phase delay is larger than a month ($0.3\overline{3}$ quarters), its leading if the time phase lead is larger than a month ($0.3\overline{3}$ quarters), and all other variables in between these definitions are considered as coincident. Using these rules the classification of the variables in the final panel is as follows:

Code of the variable	Time lead *	Classification
PIB	0	Coincident
CUT	0.7240	Leading
TSD	0.0662	Coincident
ENE	-0.0249	Coincident
IPR	0.3361	Leading
SIT	-0.2745	Coincident
OVN	-0.5824	Lagging

*time leads are expressed in quarters.

a. Turning Points

From the coincident index we can determine the turning points as the dates t^* in which the index reaches a local maxima (peak) or minima (trought). To avoid the inconvenience of having two local maxima (or minima) too close together and following Maurer et al. (1996) procedure for identifying turning points a condition is established such that no cycle can be shorter than 4 quarters.



Turning Points for the coincident index

Episode	Trought	Peak	Lenght in Months Expansion	Contraction	Cycle	Years Cycle
0	Mar-02	?				
	Sep-99	Jun-00	10	22	32	
1	Mar-97	Sep-97	7	25	32	5
	Dic-94	Mar-95	3	25	28	
2	Jun-92	Mar-93	10	22	32	5
	Dic-90	Mar-92	16	4	20	
3	Dic-88	Jun-90	19	7	26	3
	Dic-86	Jun-88	19	7	26	
4	Sep-85	Sep-86	13	4	17	3

Following the criterion we can identify eight complete cycles and an incomplete cycle (beginning in March of 2002) for the period 1985:01 to 2003:01. However, since we calibrated the model for a business cycle length of 4 years we have aggregated these shorter cycles in order to have 4 episodes. Episodes 2 and 3 are within the range of the ones identified by Maurer et al. (1996) for the same period and the predominant expansion characterized by episodes 3 and 4 are consistent with Ocampo and Villar (1993) historical account of the period[19]. The comparison of the first and second episode with the third and the fourth reveal a lengthening of the cycle in the nineties.

The turning points for the common component of GDP are similar in structure give or take a few changes in the dates of 2 peaks and 3 troughts (Appendix B).

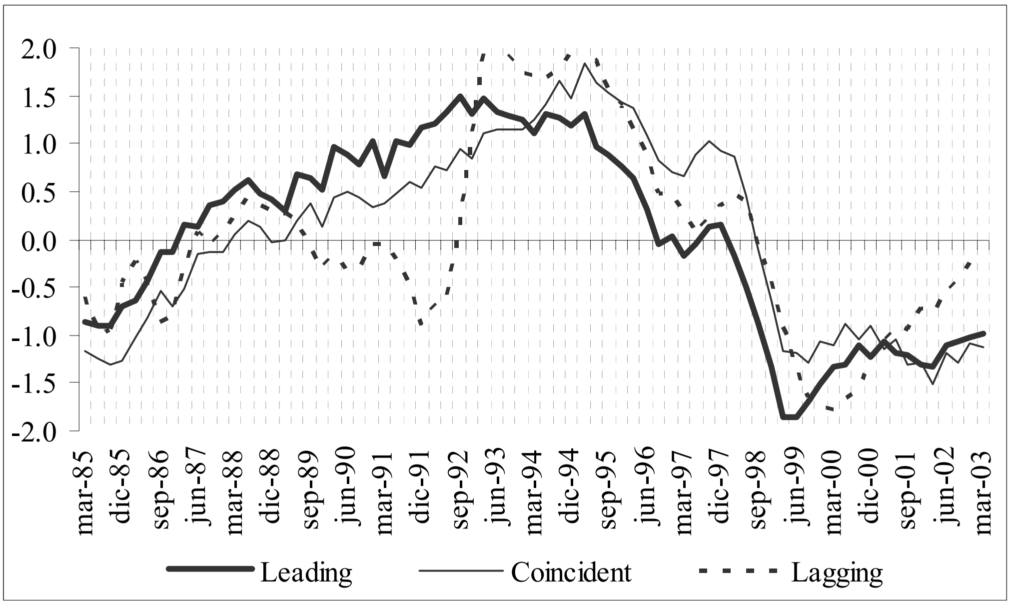
b. Lagging-Coincident-Leading Indexes

The leading variables are the Capacity Utilization Rate and the Industrial Production index, this is no surprise and it is also found on the empirical application of FHLR (1999) for the EURO area. However, it is surprising that a variable such as unemployment is coincident, because labor market variables are considers anti-cyclical and in most cases lagging[20].

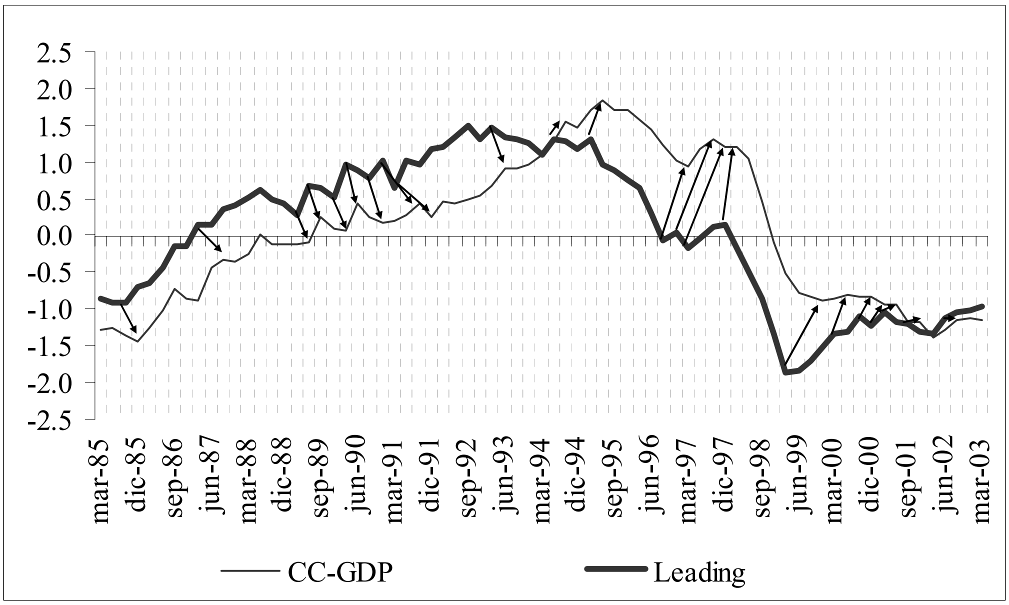
With these results we can construct the lagging, coincident and leading indexes for the Colombian economy.

[19] As described in Maurer et al. (1996) pg 9.

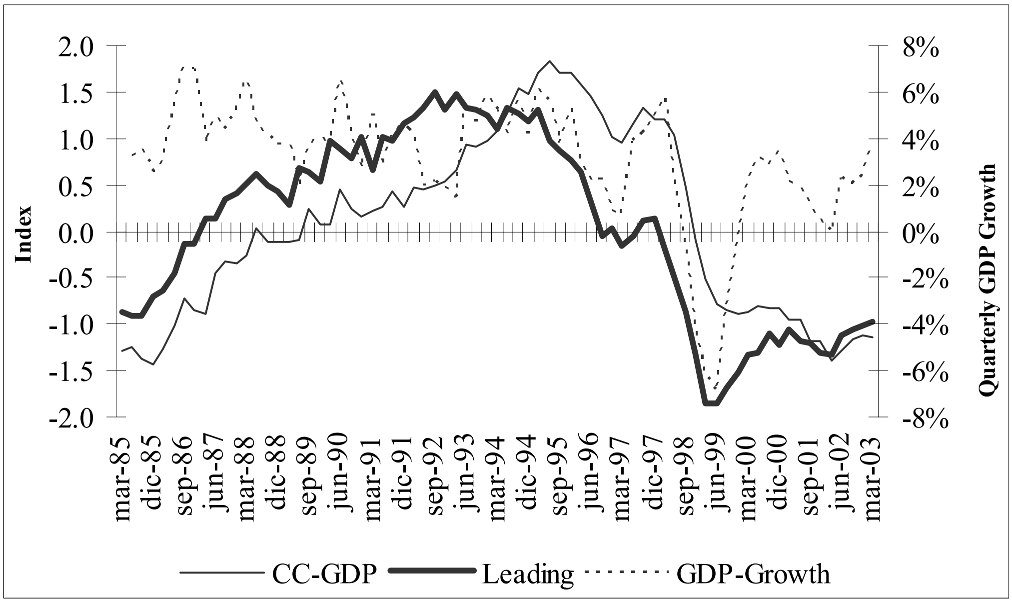
[20] Maurer et al.(1996) also classify unemployment within their coincident index.



The first observation of the indexes is that there is only a clear lead or lag with respect to the coincident index in some of the turning points, especially in the lagging index. Even though we cannot identify a clear lead for the last recession (1999) there is a strong lag (of a quarter) in the peak (September-97) and trought (September-99) of that episode. For a clearer look at the leading and coincident relations, let's take a look at the leading index and the common component of the log of GDP.



The leading index shows a stronger leading relation with the common component of the GDP, however, not all of the leads identified (in arrows) coincide with the peaks and troughts identified for the common component of GDP. The leading index manages to anticipate by a quarter the slowdown of economic activity at the end of 1995, the short turn around of economic activity in 1997, the beginning of the recession in 1998 and the lowest point of the recession in 1999. The latest turning point in March 2002 is not anticipated.



6) *Conclusions*

This paper sums up the results of an ongoing research on the construction of coincident and leading indexes for the Colombian economic activity and the characteristics of the business cycle. The statistical model (and software[21]) has a different approximation in the construction of such indexes then the ones applied with Colombian data before. The greatest strength of the methodology developed by FHLR is that it is a self contained system where no *a-priori* assumption on the coincident or leading characteristics of the series is needed. However, since the asymptotics (a large final panel, n) guarantees the consistency of the estimates the use of a considerable small number of series (70) in the Colombian case relative to the multi-country applications for the EURO area (246), brings forth consistency issues.

There are still a few issues to be addressed in future research (both theoretically and empirically for the Colombian case), such as: small sample performance of the two-sided and one-sided filter, small sample diagnostics, forecasting the coincident index, and the construction of a monthly index for the Colombian economy using the generalized dynamic factor model.

[21] The software has been supplied by the authors (www.dynfactors.org).

References

- Altissimo, F., Bassanetti, A., Cristadoro, R., Forni M., Lippi, M., Reichlin, L., Veronesse, G. (2001) "EUROCOIN: A real time coincident indicator of the Euro area business cycle", Center for Economic Policy Research, Discussion Paper, No. 3108.
- Brillinger, D. (1981). Time Series: Data Analysis and Theory, Ed. Holden-Day, Chapter 9, pgs. 337-367.
- Brockwell, P., Davis, R. (1991). Time Series: Theory and Methods, Ed. Springer-Verlag.
- Forni, M., Hallin,M.,Lippi, M. and Reichlin, L. (1999) "Reference cycles: the NBER methodology revisited".
- Forni, M., Hallin, M., Lippi, M. and Reichlin, L. (2000) "The generalized factor model: identification and estimation".
- Forni, M., Hallin, M., Lippi, M. and Reichlin, L. (2003) "The generalized dynamic factor model: one-sided estimation and forecasting".
- Franses P.H. (2001). "Some Comments on Seasonal Adjustment", Revista de Economía del Rosario, 4, junio.
- Ghysels E., Perron P. (1993). "The effects of seasonal adjustment filters on test for a unit root, Journal of Econometrics, 55, pg. 57-98.
- Ghysels E., Lee H., Noh J. (1994). "Testing for unit roots in seasonal time series", Journal of Econometrics, 62, pg. 415-442.
- Granger C.W.J., Hatanaka, M. (1964). Spectral Analysis of Economic Time Series, Princeton University Press.
- Harman, H. (1967). Modern Factor Analysis, 2nd Edition, University of Chicago Press.
- Hamilton, J. (1994). Time Series Analysis, Princeton University Press.
- Hylleberg S., Engle R.F., Granger C.W.J. y Yoo B.S. (1990). "Seasonal Integration and Cointegration", Journal of Econometrics, 44, pg 215-38.
- Jolliffe, I.T. (2002). Principal Component Analysis, 2nd Edition, Ed. Springer-Verlag.
- Maurer, M., Uribe, M. (1996). "El ciclo economico en Colombia", Planeación y Desarrollo, Vol. 27, No. 1, pg. 111-140.
- Maurer, M., Uribe, M., Birchenall, J. (1996). "El Sistema de indicadores lideres para Colombia", Archivos de Macroeconomía, DNP, No. 49.
- Melo, L.F., Nieto, F.H. (2001). "About a coincident index for the state of the economy", Borradores semanales del Banco de la República, Banco de la República, No. 194.

- Melo, L.F., Nieto, F.H., Posada, C.E., Betancourt, Y.R., Báron, J.D. (2002). "Un índice coincidente para la actividad económica de Colombia", Ensayos sobre política economica, Banco de la República, No. 40.
- Nieto, F.H. (2003). "Identifability of a coincident index model for the Colombian economy", Borradores semanales del Banco de la República, Banco de la República, No. 242.
- Melo, L.F., Nieto, F.H. (2003). "A leading index for the Colombian economic activity", Borradores semanales del Banco de la República, Banco de la República, No. 243.
- Sargent, T. (1987). Macroeconomic Theory, 2nd Edition, Academic Press.
- Stock, J.H., Watson, M.W. (1989). "New indexes of coincident and leading indicators", NBER Macroeconomic Annuals.
- Stock, J.H., Watson, M.W. (2002). "Macroeconomic Forecasting using diffusion indexes", Journal of Business and Economic Statistics, Vol. 20, No. 2.

Appendix A

Definitions: A few relevant concepts you ought to know about time series analysis in the frequency domain

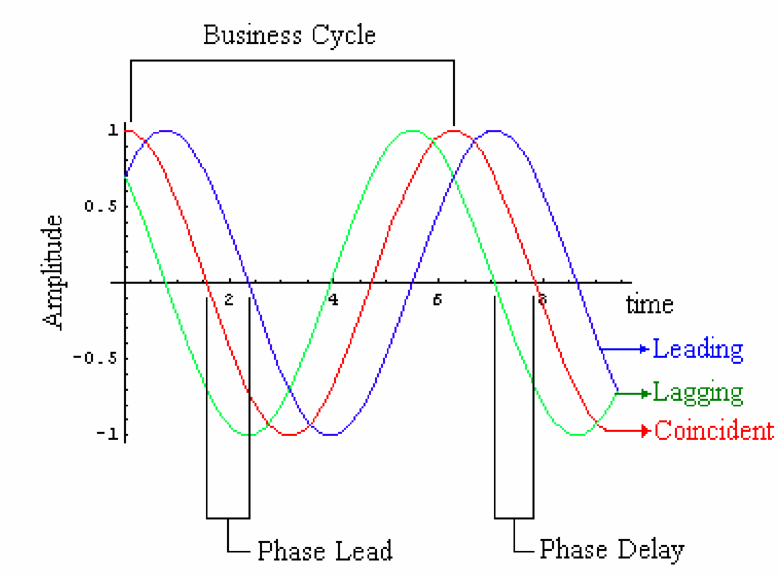
- FOURIER SERIES: Fourier series are expansions of periodic functions $f(x)$ in terms of an infinite sum of sines and cosines of the form:

$$f(x) = \sum_{n=0}^{\infty} a'_n \cos(nx) + \sum_{n=0}^{\infty} b'_n \sin(nx)$$

Fourier series make use of the orthogonality relationships of the sine and cosine functions, which can be used to calculate the coefficients a_n and b_n in the sum. The computation and study of Fourier series is known as harmonic analysis[1].

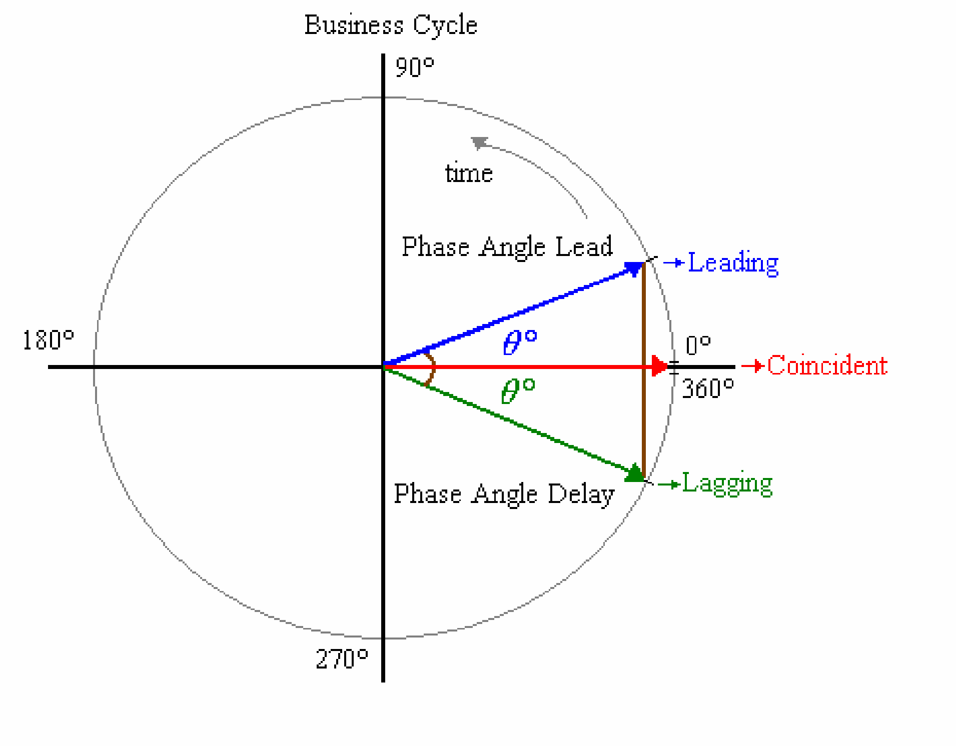
- PHASE: Angular position of a quantity. In our case we are interested in the phase difference between the frequency components of as set of processes. The phase can be expressed in units of time or in degrees.

1. Phase Lead (Delay): as a small time lead (delay) between two waveforms at a given frequency.



[1] Taken from http://mathworld.wolfram.com/FourierSeries.html

2. Phase Angle: as a percentage of the entire wave period in degrees.



APPENDIX B
Turning Points for the common component of GDP

Episode	Trought	Peak	Lenght in Months Expansion	Contraction	Cycle	Years Cycle
0	Mar-02	?				
	Dic-99	Jun-00	7	22	29	
1	Mar-97	Sep-97	7	28	35	5
	Dic-94	Jun-95	7	22	29	
2	Jun-92	Jun-93	13	19	32	5
	Dic-90	Mar-92	16	4	20	
3	Dic-88	Jun-90	19	7	26	3
	Mar-87	Jun-88	16	7	23	
4	Dic-85	Sep-86	10	7	17	3

Table1

Code	Description	Original Frequency	Source
CORE			
PIB	Seasonally Adjusted Real GDP	Quarterly	DANE
CUT	Capacity Utilization Rate 1/	Quarterly	Fedesarrollo
TSD	Unemployment 1/	Quarterly	DANE
ENE	Demand of Energy	Monthly	ISA
IPR	Industrial Production index	Monthly	DANE
NON-CORE			
A. Expectations on Production			
SIT	Current economic conditions 1/	Monthly	Question 1 Business Survey (Fedesarrollo)
AMA	Production activity compared to the previous month 1/	Monthly	Question 2 Business Survey (Fedesarrollo)
EPT	Stocks at the end of the month 1/	Monthly	Question 3 Business Survey (Fedesarrollo)
PMA	Received orders compared with previous month 1/	Monthly	Question 4 Business Survey (Fedesarrollo)
VOP	Volume of orders compared with previous month 1/	Monthly	Question 5 Business Survey (Fedesarrollo)
NVP	Number of orders 1/	Monthly	Question 6 Business Survey (Fedesarrollo)
SDM	Intalled capacity, given the current situation of demand 1/	Monthly	Question 7 Business Survey (Fedesarrollo)
EP3	Production expectations for the next 3 months 1/	Monthly	Question 8 Business Survey (Fedesarrollo)
ER3	Price expectations for the next 3 months 1/	Monthly	Question 9 Business Survey (Fedesarrollo)
ES6	Expectations on the economy during the next 6 months 1/	Monthly	Question 10 Business Survey (Fedesarrollo)
EDA	Actual installed capacity given the number of orders 1/	Monthly	Question 11 Business Survey (Fedesarrollo)
B. Economic Activity			
OVN	Car Sales	Monthly	Colmotores
IPE	Entries of foreing passengers (Air Transport)	Monthly	Aerocivil
IPS	International departures of passengers (Air Transport)	Monthly	Aerocivil
CNC	Flight Load	Monthly	Aerocivil
PNC	Domestic passengers (Air Transport)	Monthly	Aerocivil
PRC	Cofee Production	Monthly	Federación Nacional de Cafeteros (Boletín Mensual)
PPE	Oil Production	Monthly	Banco de la República
SGA	Livestock sacrifice	Monthly	DANE
VCC	Value of coffee crops	Monthly	Federación Nacional de Cafeteros (Boletín Mensual)
IVC	Sales index excluding combustibles	Monthly	DANE
IEC	Comercial employment index	Monthly	DANE
TSO	Employment 1/	Quarterly	DANE
PUS	Real GDP USA	Quarterly	Bureau of Economic Analysis (http://www.bea.gov/)
C. Prices and Wages			
POI	International oil price	Monthly	FMI
PCA	International cofee price	Monthly	Federación Nacional de Cafeteros (Boletín Mensual)
IPC	Consumer price index	Monthly	DANE
IPP	Producer price index	Monthly	DANE
ICC	Heavy contruction cost index	Monthly	DANE
IPU	Producer price index USA	Monthly	Bureau of Economic Analysis (http://www.bea.gov/)
ISI	Index of the real wage in manufacturing industries	Monthly	DANE
D. Monetary and financial sector			
BAS	Real monetary base	Monthly	Banco de la República
EFE	Currency in circulation in real terms	Monthly	Banco de la República
AM1	Real Money Supply (M1)	Monthly	Banco de la República
AM2	Real M2	Monthly	Banco de la República
AM3	Real M3 plus bonds	Monthly	Banco de la República
CCP	Private Real Checking Accounts	Monthly	Banco de la República
CCO	Public Real Checking Accounts	Monthly	Banco de la República
CTN	Real loan portafolio of the financial system	Monthly	Banco de la República
DCC	Total Real Checking Accounts	Monthly	Banco de la República
PSE	Total value of deposits in real terms	Monthly	Banco de la República
CUD	Portafolio in real terms	Monthly	Banco de la República
TAH	Total value savings accounts in real terms	Monthly	Banco de la República
TCT	Total values of certificate of deposits accounts in real terms	Monthly	Banco de la República
TDE	Total value of available deposits in real terms	Monthly	Banco de la República
TFD	Total values of fiduciary deposits in real terms	Monthly	Banco de la República
CED	Values of Certificates in real terms	Monthly	Banco de la República
TBO	Total Bonds in real terms	Monthly	Banco de la República
E. Trade			
RES	Net International Reserves	Monthly	Banco de la República
EXC	Cofee Exports in real terms	Monthly	Federación Nacional de Cafeteros (Boletín Mensual)
DBC	Current Account Deficit	Monthly	Banco de la República
EXP	Total Exports in real terms (FOB)	Monthly	DIAN-DANE
IMP	Total Imports in real terms (CIF)	Monthly	DIAN-DANE
IBC	Imports of consumption goods in real terms	Monthly	DIAN-DANE
IBI	Imports of intermediate goods in real terms	Monthly	DIAN-DANE
IBK	Imports of capital goods in real terms	Monthly	DIAN-DANE
F. Fiscal			
DEF	Deficit of the Central Goverment (as % of GDP)	Quarterly	CONFIS
G. Asset Prices			
TER	Terms of trade	Monthly	Banco de la República
ITC	Real exchange rate index	Monthly	Banco de la República
CDT	Real Interest rates of 90-day deposits for banks and corporations 1/	Monthly	Banco de la República
H. Construction Sector			
LCO	Approved building area	Monthly	DANE
PAC	Approved Mortgage Loans (Construction companies)	Monthly	ICAV
PAI	Approved Mortgage Loans (Individuals)	Monthly	ICAV
PEC	Mortgage Loans (Construction companies)	Monthly	ICAV
PEI	Mortgage Loans (Individuals)	Monthly	ICAV

1/ Variables not in logs

Table 2

Seasonal Unit Root Test -HEGY- Quarterly Data

Code	Statistic (Ho=Xt~I4(1)) t(π4)	Critical Value (α=5%)	Statistic (Ho=Xt~I34(1,1)) F(π3,π4)	Critical Value (α=5%)	Ljung-Box (p-value, 18)	Deterministic components(1)
CORE						
CUT	-1.441	-1.940	5.284	6.600	0.856	5
TSD	-4.328	-1.940	40.212	6.600	0.504	5
ENE	-4.038	-1.960	37.799	6.570	0.376	3
IPR	-0.637	-1.960	11.506	6.570	0.470	3
NON-CORE						
A. Expectations on Production						
SIT	-5.400	-1.940	34.948	6.600	0.530	5
AMA	-2.637	-1.960	31.527	6.570	0.857	3
EPT	-3.492	-1.960	20.219	6.570	0.782	3
PMA	-0.232	-1.650	15.780	2.980	0.679	4
VOP	-4.279	-1.940	36.899	6.600	0.737	5
NVP	-5.029	-1.940	49.944	6.600	0.524	5
SDM	-3.450	-1.650	47.180	2.980	0.997	4
EP3	-3.992	-1.680	21.620	3.080	0.131	2
ER3	0.693	-1.940	13.465	6.600	0.437	5
ES6	-3.101	-1.960	8.469	6.570	0.616	3
EDA	-7.018	-1.680	31.855	3.080	0.736	2
B. Economic Activity						
OVN	-4.744	-1.960	35.496	6.570	0.813	3
IPE	-0.521	-1.650	0.461	2.980	0.673	4
IPS	-3.718	-1.960	29.126	6.570	0.791	3
CNC	-3.294	-1.960	24.063	6.570	0.996	3
PNC	-0.280	-1.680	1.568	3.080	0.893	2
PRC	-0.361	-1.960	9.809	6.570	0.760	3
PPE	-3.514	-1.680	27.115	3.080	0.945	2
SGA	-3.816	-1.680	26.807	3.080	0.422	2
VCC	-1.246	-1.940	12.915	6.600	0.423	5
IVC	0.580	-1.960	11.494	6.570	0.300	3
IEC	-4.115	-1.940	34.680	6.600	0.569	5
TSO	-3.018	-1.960	26.763	6.570	0.983	3
PUS	-6.476	-1.650	57.375	2.980	0.896	4
C. Prices and Wages						
POI	-3.366	-1.680	17.835	3.080	0.973	2
PCA	-4.553	-1.680	25.430	3.080	0.698	2
IPC	-1.017	-1.650	2.714	2.980	0.584	4
IPP	-2.314	-1.680	4.117	3.080	0.241	2
ICC	-0.933	-1.680	0.913	3.080	0.173	2
IPU	-4.415	-1.650	27.071	2.980	0.481	4
ISI	-3.655	-1.940	18.640	6.600	0.773	5
D. Monetary and financial sector						
BAS	-5.174	-1.960	49.664	6.570	0.311	3
EFE	-3.343	-1.960	14.118	6.570	0.212	3
AM1	-5.625	-1.940	56.746	6.600	0.732	5
AM2	-6.715	-1.960	61.499	6.570	0.783	3
AM3	-6.576	-1.960	49.659	6.570	0.851	3
CCP	-3.679	-1.960	9.152	6.570	0.642	3
CCO	-3.841	-1.960	31.662	6.570	0.996	3
CTN	-2.485	-1.680	5.098	3.080	0.626	2
DCC	-1.884	-1.960	5.196	6.570	0.907	3
PSE	-3.478	-1.680	7.111	3.080	0.964	2
CUD	-6.632	-1.680	54.759	3.080	0.393	2
TAH	-4.973	-1.650	13.245	2.980	0.432	4
TCT	-6.742	-1.680	48.859	3.080	0.913	2
TDE	-4.095	-1.960	35.571	6.570	0.674	3
TFD	-2.221	-1.960	16.052	6.570	0.929	3
CED	-4.709	-1.680	12.392	3.080	0.801	2
TBO	-6.041	-1.680	31.082	3.080	0.804	2
E. Trade						
RES	-3.797	-1.960	18.424	6.570	0.311	3
EXC	-0.703	-1.960	12.182	6.570	0.912	3
DBC	-0.457	-1.680	29.214	3.080	0.833	2
EXP	-1.361	-1.650	14.470	2.980	0.395	4
IMP	-2.942	-1.680	22.405	3.080	0.524	2
IBC	-1.562	-1.680	9.463	3.080	0.315	2
IBI	-2.352	-1.940	25.357	6.600	0.692	5
IBK	-3.771	-1.680	23.123	3.080	0.869	2
F. Fiscal						
DEF	-5.837	-1.680	40.876	3.080	0.980	2
G. Asset Prices						
TER	-3.462	-1.680	28.696	3.080	0.449	2
ITC	-2.697	-1.680	7.375	3.080	0.563	2
CDT	-5.173	-1.680	20.418	3.080	0.573	2
H. Construction Sector						
LCO	-3.076	-1.680	21.080	3.080	0.375	2
PAC	-4.226	-1.680	43.675	3.080	0.996	2
PAI	-3.955	-1.960	53.237	6.570	0.241	3
PEC	-5.828	-1.960	31.328	6.570	0.727	3
PEI	-5.160	-1.960	71.143	6.570	0.183	3

(1) Deterministic Components: 1- None, 2- Constant, 3-Constant and seasonal dummy variables,
4- Constant and Trend (linear), 5- Constant, seasonal dummy variables and trend (linear).

Table 3

Unit Root Test

Code	ADF			Phillips-Perron		KPSS	
	Statistic (Ho=Xt~I(1)) τt,τμ or τ	Critical Value (α=5%)	Ljung-Box (p-value, 18)	Statistic (Ho=Xt~I(1))	Critical Value (α=5%)	Statistic (Ho=Xt~I(1))	Critical Value (α=5%)
CORE							
PIB	-1.920	-2.890	1.000	-2.172	-2.900	0.927	0.463
CUT	-0.934	-2.890	0.707	-1.581	-2.900	0.539	0.463
TSD	-1.119	-1.950	0.910	-0.511	-1.945	0.480	0.463
ENE	-1.910	-2.890	0.832	-2.713	-2.900	0.901	0.463
IPR	-1.431	-2.890	1.000	-1.775	-2.900	0.776	0.463
NON-CORE							
A. Expectations on Production							
SIT	-2.302	-1.950	0.791	-2.173	-1.945	0.462	0.463
AMA	-3.530	-3.450	0.440	-4.946	-3.470	0.068	0.146
EPT	-2.632	-1.950	0.913	-4.576	-3.470	0.103	0.146
PMA	-2.373	-1.950	0.933	-4.517	-3.470	0.064	0.146
VOP	-3.719	-3.450	0.384	-3.937	-3.470	0.070	0.146
NVP	-1.510	-1.950	0.979	-2.534	-1.945	0.607	0.463
SDM	-0.727	-1.950	0.961	-0.997	-1.945	0.799	0.463
EP3	-0.548	-1.950	1.000	-1.020	-1.945	0.275	0.463
ER3	-3.830	-3.450	0.995	-10.446	-3.470	0.145	0.146
ES6	-1.394	-1.950	0.605	-3.154	-1.945	0.389	0.463
EDA	-1.037	-1.950	0.510	-0.892	-1.945	0.812	0.463
B. Economic Activity							
OVN	-2.081	-1.950	0.995	-1.695	-1.945	0.168	0.463
IPE	-1.175	-2.890	0.824	-0.465	-2.900	0.901	0.463
IPS	-2.192	-1.950	0.957	-0.629	-1.945	0.897	0.463
CNC	-1.563	-1.950	0.881	-1.528	-1.945	0.577	0.463
PNC	-1.520	-2.890	0.701	-0.815	-2.900	0.779	0.463
PRC	-2.680	-1.950	0.706	-7.691	-1.945	0.203	0.463
PPE	-2.540	-2.890	0.856	-2.595	-2.900	0.803	0.463
SGA	-2.081	-2.890	0.806	-1.737	-2.900	0.611	0.463
VCC	-3.003	-2.890	0.280	-5.983	-3.470	0.131	0.146
IVC	-1.312	-1.950	0.982	-2.123	-1.945	0.609	0.463
IEC	-1.892	-1.950	1.000	0.425	-1.945	0.698	0.463
TSO	-1.964	-1.950	1.000	-2.240	-1.945	0.416	0.463
PUS	-0.629	-2.890	0.980	-0.883	-2.900	0.957	0.463
C. Prices and Wages							
POI	-0.967	-1.950	0.992	-2.856	-2.900	0.256	0.463
PCA	-3.552	-3.450	0.841	-2.180	-3.470	0.100	0.146
IPC	-0.540	-3.450	0.372	-3.788	-3.470	0.232	0.146
IPP	-1.753	-1.950	0.980	-2.490	-1.945	0.948	0.463
ICC	-0.097	-3.450	0.735	-4.698	-3.470	0.247	0.146
IPU	-3.512	-3.450	0.957	-2.746	-3.470	0.127	0.146
ISI	-2.906	-3.450	0.992	-5.521	-3.470	0.155	0.146
D. Monetary and financial sector							
BAS	-1.750	-1.950	0.891	-1.543	-1.945	0.514	0.463
EFE	-1.387	-3.450	0.999	-3.022	-3.470	0.183	0.146
AM1	-3.259	-3.450	0.940	-1.844	-3.470	0.065	0.146
AM2	-1.026	-1.950	0.890	-1.200	-1.945	0.894	0.463
AM3	-1.061	-1.950	0.982	-0.828	-3.470	0.126	0.146
CCP	-3.728	-3.450	0.968	-3.172	-3.470	0.069	0.146
CCO	-1.920	-1.950	1.000	-1.977	-1.945	0.624	0.463
CTN	-2.121	-2.890	0.871	-1.831	-2.900	0.755	0.463
DCC	-2.413	-2.890	0.721	-2.031	-2.900	0.250	0.463
PSE	-1.018	-1.950	0.970	-1.273	-1.945	0.863	0.463
CUD	-1.332	-2.890	0.810	-1.392	-2.900	0.875	0.463
TAH	-1.176	-1.950	0.584	-1.498	-1.945	0.883	0.463
TCT	-1.355	-2.890	0.898	-1.189	-2.900	0.818	0.463
TDE	-3.383	-3.450	0.370	-1.439	-3.470	0.191	0.146
TFD	-3.038	-2.890	1.000	-2.197	-2.900	0.737	0.463
CED	-0.424	-1.950	0.771	-0.270	-1.945	0.145	0.463
TBO	-0.884	-1.950	0.596	-0.844	-2.900	0.692	0.463
E. Trade							
RES	-1.905	-2.890	0.948	-1.237	-2.900	0.839	0.463
EXC	-2.540	-1.950	0.996	-5.792	-1.945	0.198	0.463
DBC	-0.176	-1.950	0.998	-2.737	-2.900	0.300	0.463
EXP	-0.526	-1.950	0.149	-1.704	-1.945	0.925	0.463
IMP	-1.505	-2.890	0.996	-0.715	-2.900	0.891	0.463
IBC	-1.318	-2.890	0.679	-0.650	-2.900	0.903	0.463
IBI	-0.640	-1.950	0.767	-0.628	-1.945	0.920	0.463
IBK	-0.810	-1.950	0.893	-0.871	-2.900	0.838	0.463
F. Fiscal							
DEF	-0.521	-1.950	1.000	-0.439	-1.945	0.472	0.463
G. Asset Prices							
TER	-0.375	-1.950	0.904	-0.245	-1.945	0.199	0.463
ITC	-0.772	-2.890	0.852	-1.922	-2.900	0.486	0.463
CDT	-0.927	-1.950	0.994	-2.103	3.120	0.275	0.463
H. Construction Sector							
LCO	-2.100	-2.890	0.992	-3.132	-2.900	0.158	0.463
PAC	-0.486	-1.950	0.975	-0.638	-1.945	0.299	0.463
PAI	-1.486	-1.950	0.994	-1.617	-1.945	0.291	0.463
PEC	-0.904	-1.950	0.995	-1.022	-1.945	0.380	0.463
PEI	-1.772	-1.950	0.190	-1.616	-1.945	0.265	0.463

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
1	La coyuntura económica en Colombia y Venezuela	Andrés Langebaek Patricia Delgado Fernando Mesa Parra	Octubre 1992
2	La tasa de cambio y el comercio colombo-venezolano	Fernando Mesa Parra Andrés Langebaek	Noviembre 1992
3	¿Las mayores exportaciones colombianas de café redujeron el precio externo?	Carlos Esteban Posada Andrés Langebaek	Noviembre 1992
4	El déficit público: una perspectiva macroeconómica.	Jorge Enrique Restrepo Juan Pablo Zárate Carlos Esteban Posada	Noviembre 1992
5	El costo de uso del capital en Colombia.	Mauricio Olivera	Diciembre 1992
6	Colombia y los flujos de capital privado a América Latina	Andrés Langebaek	Febrero 1993
7	Infraestructura física. "Clubs de convergencia" y crecimiento económico.	José Dario Uribe	Febrero 1993
8	El costo de uso del capital: una nueva estimación (Revisión)	Mauricio Olivera	Marzo 1993
9	Dos modelos de transporte de carga por carretera.	Carlos Esteban Posada Edgar Trujillo Ciro Alvaro Concha Juan Carlos Elorza	Marzo 1993
10	La determinación del precio interno del café en un modelo de optimización intertemporal.	Carlos Felipe Jaramillo Carlos Esteban Posada Edgar Trujillo Ciro	Abril 1993
11	El encaje óptimo	Edgar Trujillo Ciro Carlos Esteban Posada	Mayo 1993
12	Crecimiento económico, "Capital humano" y educación: la teoría y el caso colombiano posterior a 1945	Carlos Esteban Posada	Junio 1993
13	Estimación del PIB trimestral según los componentes del gasto.	Rafael Cubillos Fanny Mercedes Valderrama	Junio 1993
14	Diferencial de tasas de interés y flujos de capital en Colombia (1980-1993)	Andrés Langebaek	Agosto 1993
15	Empleo y capital en Colombia: nuevas estimaciones (1950-1992)	Adriana Barrios Marta Luz Henao Carlos Esteban Posada Fanny Mercedes Valderrama Diego Mauricio Vásquez	Septiembre 1993
16	Productividad, crecimiento y ciclos en la economía colombiana (1967-1992)	Carlos Esteban Posada	Septiembre 1993
17	Crecimiento económico y apertura en Chiley México y perspectivas para Colombia.	Fernando Mesa Parra	Septiembre 1993
18	El papel del capital público en la producción, inversión y el crecimiento económico en Colombia.	Fabio Sánchez Torres	Octubre 1993
19	Tasa de cambio real y tasa de cambio de equilibrio.	Andrés Langebaek	Octubre 1993
20	La evolución económica reciente: dos interpretaciones alternativas.	Carlos Esteban Posada	Noviembre 1993
21	El papel de gasto público y su financiación en la coyuntura actual: algunas implicaciones complementarias.	Alvaro Zarta Avila	Diciembre 1993
22	Inversión extranjera y crecimiento económico.	Alejandro Gaviria	Diciembre 1993

No	Título	Autores	Fecha
		Javier Alberto Gutiérrez	
23	Inflación y crecimiento en Colombia	Alejandro Gaviria Carlos Esteban Posada	Febrero 1994
24	Exportaciones y crecimiento en Colombia	Fernando Mesa Parra	Febrero 1994
25	Experimento con la vieja y la nueva teoría del crecimiento económico (¿porqué crece tan rápido China?)	Carlos Esteban Posada	Febrero 1994
26	Modelos económicos de criminalidad y la posibilidad de una dinámica prolongada.	Carlos Esteban Posada	Abril 1994
27	Regímenes cambiarios, política macroeconómica y flujos de capital en Colombia.	Carlos Esteban Posada	Abril 1994
28	Comercio intraindustrial: el caso colombiano	Carlos Pombo	Abril 1994
29	Efectos de una bonanza petrolera a la luz de un modelo de optimización intertemporal.	Hernando Zuleta Juan Pablo Arango	Mayo 1994
30 .	Crecimiento económico y productividad en Colombia: una perspectiva de largo plazo (1957-1994)	Sergio Clavijo	Junio 1994
31	Inflación o desempleo: ¿Acaso hay escogencia en Colombia?	Sergio Clavijo	Agosto 1994
32	La distribución del ingreso y el sistema financiero	Edgar Trujillo Ciro	Agosto 1994
33	La trinidad económica imposible en Colombia: estabilidad cambiaria, independencia monetaria y flujos de capital libres	Sergio Clavijo	Agosto 1994
34	¿’Déjà vu?: tasa de cambio, deuda externa y esfuerzo exportador en Colombia.	Sergio Clavijo	Mayo 1995
35	La crítica de Lucas y la inversión en Colombia: nueva evidencia	Mauricio Cárdenas Mauricio Olivera	Septiembre 1995
36	Tasa de Cambio y ajuste del sector externo en Colombia.	Fernando Mesa Parra Dairo Estrada	Septiembre 1995
37	Análisis de la evolución y composición del Sector Público.	Mauricio Olivera G. Manuel Fernando Castro Q. Fabio Sánchez T.	Septiembre 1995
38	Incidencia distributiva del IVA en un modelo del ciclo de vida.	Juan Carlos Parra Osorio Fabio José Sánchez T.	Octubre 1995
39	Por qué los niños pobres no van a la escuela? (Determinantes de la asistencia escolar en Colombia)	Fabio Sánchez Torres Jairo Augusto Núñez M.	Noviembre 1995
40	Matriz de Contabilidad Social 1992.	Fanny M. Valderrama Javier Alberto Gutiérrez	Diciembre 1995
41	Multiplicadores de Contabilidad derivados de la Matriz de Contabilidad Social	Javier Alberto Gutiérrez Fanny M. Valderrama G.	Enero 1996
42	El ciclo de referencia de la economía colombiana.	Martin Maurer María Camila Uribe S.	Febrero 1996
43	Impacto de las transferencias intergubernamentales en la distribución interpersonal del ingreso en Colombia.	Juan Carlos Parra Osorio	Marzo 1996
44	Auge y colapso del ahorro empresarial en Colombia: 1983-1994	Fabio Sánchez Torres Guillermo Murcia Guzmán Carlos Oliva Neira	Abril 1996
45	Evolución y comportamiento del gasto público en Colombia: 1950-1994	Cielo María Numpaque Ligia Rodríguez Cuestas	Mayo 1996

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
46	Los efectos no considerados de la apertura económicaen el mercado laboral industrial.	Fernando Mesa Parra Javier Alberto Gutiérrez	Mayo 1996
47	Un modelo de Financiamiento óptimo de un aumento permanente en el gasto público: Una ilustración con el caso colombiano.	Alvaro Zarta Avila	Junio 1996
48	Estadísticas descriptivas del mercado laboral masculino y femenino en Colombia: 1976 -1995	Rocío Ribero M. Carmen Juliana García B.	Agosto 1996
49	Un sistema de indicadores líderes para Colombia	Martín Maurer María Camila Uribe Javier Birchenall	Agosto 1996
50	Evolución y determinantes de la productividad en Colombia: Un análisis global y sectorial	Fabio Sánchez Torres Jorge Iván Rodríguez Jairo Núñez Méndez	Agosto 1996
51	Gobernabilidad y Finanzas Públicas en Colombia.	César A. Caballero R	Noviembre 1996
52	Tasas Marginales Efectivas de Tributaciónen Colombia.	Mauricio Olivera G.	Noviembre 1996
53	Un modelo keynesiano para la economía colombiana	Fabio José Sánchez T. Clara Elena Parra	Febrero 1997
54	Trimestralización del Producto Interno Bruto por el lado de la oferta.	Fanny M. Valderrama	Febrero 1997
55	Poder de mercado, economías de escala, complementariedades intersectoriales y crecimiento de la productividad en la industria colombiana.	Juán Mauricio Ramírez	Marzo 1997
56	Estimación y calibración de sistemas flexibles de gasto.	Orlando Gracia Gustavo Hernández	Abril 1997
57	Mecanismos de ahorro e Inversión en las Empresas Públicas Colombianas: 1985-1994	Fabio Sánchez Torres Guilllermo Murcia G.	Mayo 1997
58	Capital Flows, Savings and investment in Colombia: 1990-1996	José Antonio Ocampo G. Camilo Ernesto Tovar M.	Mayo 1997
59	Un Modelo de Equilibrio General Computable con Competencia imperfecta para Colombia.	Juan Pablo Arango Orlando Gracia Gustavo Hernández Juan Mauricio Ramírez	Junio 1997
60	El cálculo del PIB Potencial en Colombia.	Javier A. Birchenall J.	Julio 1997
61	Determinantes del Ahorro de los hogares. Explicación de su caída en los noventa.	Alberto Castañeda C. Gabriel Piraquive G.	Julio 1997
62	Los ingresos laborales de hombres y mujeres en Colombia: 1976-1995	Rocío Ribero Claudia Meza	Agosto 1997
63	Determinantes de la participación laboral de hombres y mujeres en Colombia: 1976-1995	Rocío Ribero Claudia Meza	Agosto 1997
64	Inversión bajo incertidumbre en la Industria Colombiana: 1985-1995	Javier A. Birchenall	Agosto 1997
65	Modelo IS-LM para Colombia. Relaciones de largo plazo y fluctuaciones económicas.	Jorge Enrique Restrepo	Agosto 1997
66	Correcciones a los Ingresos de las Encuestas de hogares y distribución del Ingreso Urbano en Colombia.	Jairo A. Núñez Méndez Jaime A. Jiménez Castro	Septiembre 1997
67	Ahorro, Inversión y Transferencias en las Entidades Territoriales Colombianas	Fabio Sánchez Torres Mauricio Olivera G. Giovanni Cortés S.	Octubre 1997

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
68	Efectos de la Tasa de cambio real sobre la Inversión industrial en un Modelo de transferencia de precios.	Fernando Mesa Parra Leyla Marcela Salguero Fabio Sánchez Torres	Octubre 1997
69	Convergencia Regional: Una revisión del caso Colombiano.	Javier A. Birchenall Guillermo E. Murcia G.	Octubre 1997
70	Income distribution, human capital and economic growth in Colombia.	Javier A. Birchenall	Octubre 1997
71	Evolución y determinantes del Ahorro del Gobierno Central.	Fabio Sánchez Torres Ma. Victoria Angulo	Noviembre 1997
72	Macroeconomic Perforrmance and Inequality in Colombia: 1976-1996	Raquel Bernal Mauricio Cárdenas Jairo Núñez Méndez Fabio Sánchez Torres	Diciembre 1997
73	Liberación comercial y salarios en Colombia: 1976-1994	Donald Robbins	Enero 1998
74	Educación y salarios relativos en Colombia: 1976-1995 Determinantes, evolución e implicaciones para la distribución del Ingreso	Jairo Núñez Méndez Fabio Sánchez Torres	Enero 1998
75	La tasa de interés "óptima"	Carlos Esteban Posada Edgar Trujillo Ciro	Febrero 1998
76	Los costos económicos de la criminalidad y la violencia en Colombia: 1991-1996	Edgar Trujillo Ciro Martha Elena Badel	Marzo 1998
77	Elasticidades Precio y Sustitución para la Industria Colombiana.	Juán Pablo Arango Orlando Gracia Gustavo Hernández	Marzo 1998
78	Flujos Internacionales de Capital en Colombia: Un enfoque de Portafolio	Ricardo Rocha García Fernando Mesa Parra	Marzo 1998
79	Macroeconomía, ajuste estructural y equidad en Colombia: 1978-1996	José Antonio Ocampo María José Pérez Camilo Ernesto Tovar Francisco Javier Lasso	Marzo 1998
80	La Curva de Salarios para Colombia. Una Estimación de las Relaciones entre el Desempleo,la Inflación y los Ingresos Laborales: 1984- 1996.	Fabio Sánchez Torres Jairo Núñez Méndez	Marzo 1998
81	Participación, Desempleo y Mercados Laborales en Colombia.	Jaime Tenjo G. Rocio Ribero M.	Abril 1998
82	Reformas comerciales, márgenes de beneficio y productividad en la industria colombiana	Juán Pablo Arango Orlando Gracia Gustavo Hernández Juán Mauricio Ramírez	Abril 1998
83	Capital y Crecimiento Económico en un Modelo Dinámico: Una presentación de la dinámica Transicional para los casos de EEUU y Colombia	Alvaro Zarta Avila	Mayo 1998.
84	Determinantes de la Inversión en Colombia:E videncia sobre el capital humano y la violencia.	Clara Helena Parra	Junio 1998.
85	Mujeres en sus casas: Un recuento de la población Femenina económicamente activa	Piedad Urdinola Contreras	Junio 1998.
86	Descomposición de la desigualdad del Ingreso laboral Urbano en Colombia: 1976-1997	Fabio Sánchez Torres Jairo Núñez Méndez	Junio 1998.

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
87	El tamaño del Estado Colombiano Indicadores y tendencias: 1976-1997	Angela Cordi Galat	Junio 1998.
88	Elasticidades de sustitución de las importaciones para la economía colombiana.	Gustavo Hernández	Junio 1998.
89	La tasa natural de desempleo en Colombia	Martha Luz Henao Norberto Rojas	Junio 1998.
90	The role of shocks in the colombian economy	Ana María Menéndez	Julio 1998.
91	The determinants of Human Capital Accumulation in Colombia, with implications for Trade and Growth Theory	Donald J. Robbins	Julio 1998.
92	Estimaciones de funciones de demanda de trabajo dinámicas para la economía colombiana, 1980-1996	Alejandro Vivas Benítez Stefano Farné Dagoberto Urbano	Julio 1998.
93	Análisis de las relaciones entre violencia y equidad.	Alfredo Sarmiento Lida Marina Becerra	Agosto 1998.
94	Evaluación teórica y empírica de las exportaciones no tradicionales en Colombia	Fernando Mesa Parra María Isabel Cock Angela Patricia Jiménez	Agosto 1998.
95	Valoración económica del empleo doméstico femenino no remunerado, en Colombia, 1978-1993	Piedad Urdinola Contreras	Agosto 1998.
96	Eficiencia en el Gasto Público de Educación.	María Camila Uribe	Agosto 1998.
97	El desempleo en Colombia: tasa natural, desempleo cíclico y estructural y la duración del desempleo: 1976-1998.	Jairo Núñez M. Raquel Bernal S.	Septiembre 1998.
98	Productividad y retornos sociales del Capital humano: Microfundamentos y evidencia para Colombia.	Francisco A. González R. Carolina Guzmán R. Angela L. Pachón G.	Noviembre 1998.
99	Reglas monetarias en Colombia y Chile	Jorge E. Restrepo L.	Enero 1999.
100	Inflation Target Zone: The Case of Colombia: 1973-1994	Jorge E. Restrepo L.	Febrero 1999.
101	¿ Es creíble la Política Cambiaria en Colombia?	Carolina Hoyos V.	Marzo 1999.
102	La Curva de Phillips, la Crítica de Lucas yla persistencia de la inflación en Colombia.	Javier A.Birchenall	Abril 1999.
103	Un modelo macroeconométrico para la economía Colombiana	Javier A.Birchenall Juan Daniel Oviedo	Abril 1999.
104	Una revisión de la literatura teórica y la experiencia Internacional en regulación	Marcela Eslava Mejía	Abril 1999.
105	El transporte terrestre de carga en Colombia Documento para el Taller de Regulación.	Marcela Eslava Mejía Eleonora Lozano Rodríguez	Abril 1999.
106	Notas de Economía Monetaria. (Primera Parte)	Juan Carlos Echeverry G.	Abril 1999.
107	Ejercicios de Causalidad y Exogeneidad para Ingresos salariales nominales públicos y privados Colombianos (1976-1997).	Mauricio Bussolo Orlando Gracia Camilo Zea	Mayo 1999.
108	Real Exchange Rate Swings and Export Behavior: Explaining the Robustness of Chilean Exports.	Felipe Illanes	Mayo 1999.
109	Segregación laboral en las 7 principales ciudades del país.	Piedad Urdinola	Mayo 1999.
110	Estimaciones trimestrales de la línea de pobreza y sus relaciones con el desempeño macroeconómico Colombiano: (1977-1997)	Jairo Núñez Méndez Fabio José Sánchez T.	Mayo 1999

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
111	Costos de la corrupción en Colombia.	Marta Elena Badel	Mayo 1999
112	Relevancia de la dinámica transicional para el crecimiento de largo plazo: Efectos sobre las tasas de interés real, la productividad marginal y la estructura de la producción para los casos de EEUU y Colombia..	Alvaro Zarta	Junio 1999
113	La recesión actual en Colombia: Flujos, Balances y Política anticíclica	Juan Carlos Echeverry	Junio 1999
114	Monetary Rules in a Small Open Economy	Jorge E. Restrepo L.	Junio 1999
115	El Balance del Sector Público y la Sostenibilidad Fiscal en Colombia	Juan Carlos Echeverry Gabriel Piraquive Natalia Salazar Ma. Victoria Angulo Gustavo Hernández Cielo Ma. Numpaque Israel Fainboim Carlos Jorge Rodriguez	Junio 1999
116	Crisis y recuperación de las Finanzas Públicas lecciones de América Latina para el caso colombiano.	Marcela Eslava Mejía	Julio 1999
117	Complementariedades Factoriales y Cambio Técnico en la Industria Colombiana.	Gustavo Hernández Juan Mauricio Ramírez	Julio 1999
118	¿Hay un estancamiento en la oferta de crédito?	Juan Carlos Echeverry Natalia Salazar	Julio 1999
119	Income distribution and macroeconomics in Colombia.	Javier A. Birchenall J.	Julio 1999.
120	Transporte carretero de carga. Taller de regulación. DNP-UMACRO. Informe final.	Juan Carlos Echeverry G. Marcela Eslava Mejía Eleonora Lozano Rodriguez	Agosto 1999.
121	¿ Se cumplen las verdades nacionales a nivel regional? Primera aproximación a la construcción de matrices de contabilidad social regionales en Colombia.	Nelly.Angela Cordi Galat	Agosto 1999.
122	El capital social en Colombia. La medición nacional con el BARCAS Separata N° 1 de 5	John SUDARSKY	Octubre 1999.
123	El capital social en Colombia. La medición nacional con el BARCAS Separata N° 2 de 5	John SUDARSKY	Octubre 1999.
124	El capital social en Colombia. La medición nacional con el BARCAS Separata N° 3 de 5	John SUDARSKY	Octubre 1999.
125	El capital social en Colombia. La medición nacional con el BARCAS Separata N° 4 de 5	John SUDARSKY	Octubre 1999.
126	El capital social en Colombia. La medición nacional con el BARCAS Separata N° 5 de 5	John SUDARSKY	Octubre 1999.
127	The Liquidity Effect in Colombia	Jorge E. Restrepo	Noviembre 1999.
128	Upac: Evolución y crisis de un modelo de desarrollo.	Juan C Echeverry Orlando Gracia B. Piedad Urdinola	Diciembre 1999.
129	Confronting fiscal imbalances via intertemporal Economics, politics and justice: the case of Colombia	Juan C Echeverry Verónica Navas-Ospina	Diciembre 1999.

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
130	La tasa de interés en la coyuntura reciente en Colombia.	Jorge Enrique Restrepo Edgar Trujillo Ciro	Diciembre 1999.
131	Los ciclos económicos en Colombia. Evidencia empírica: (1977-1998)	Jorge Enrique Restrepo José Daniel Reyes Peña	Enero 2000.
132	Colombia'natural trade partners and its bilateral trade performance: Evidence from 1960 to 1996	Hernán Eduardo Vallejo	Enero 2000.
133	Los derechos constitucionales de prestación y sus implicaciones económico- políticas. Los casos del derecho a la salud y de los derechos de los reclusos	Luis Carlos Sotelo	Febrero 2000.
134	La reactivación productiva del sector privado colombiano (Documento elaborado para el BID)	Luis Alberto Zuleta	Marzo 2000.
135	Geography and Economic Development: A Municipal Approach for Colombia.	Fabio José Sánchez T. Jairo Núñez Méndez	Marzo 2000.
136	La evaluación de resultados en la modernización del Estado en América Latina. Restricciones y Estrategia para su desarrollo.	Eduardo Wiesner Durán	Abril 2000.
137	La regulación de precios del transporte de carga por carretera en Colombia.	Marcela Eslava Mejía	Abril 2000.
138	El conflicto armado en Colombia. Una aproximación a la teoría de juegos.	Yuri Gorbaneff Flavio Jácome	Julio 2000.
139	Determinación del consumo básico de agua potable subsidiable en Colombia.	Juan Carlos Junca Salas	Noviembre 2000.
140	Incidencia fiscal de los incentivos tributarios	Juan Ricardo Ortega Gabriel Armando Piraquive Gustavo Adolfo Hernández Carolina Soto Losada Sergio Iván Prada Juan Mauricio Ramirez	Noviembre 2000.
141	Exenciones tributarias: Costo fiscal y análisis de incidencia	Gustavo A. Hernández Carolina Soto Losada Sergio Iván Prada Juan Mauricio Ramirez	Diciembre 2000
142	La contabilidad del crecimiento, las dinámicas transicionales y el largo plazo: Una comparación internacional de 46 países y una presentación de casos de economías tipo: EEUU, Corea del Sur y Colombia.	Alvaro Zarta Avila	Febrero 2001
143	¿Nos parecemos al resto del mundo? El Conflicto colombiano en el contexto internacional.	Juan Carlos Echeverry G. Natalia Salazar Ferro Verónica Navas Ospina	Febrero 2001
144	Inconstitucionalidad del Plan Nacional de Desarrollo: causas, efectos y alternativas.	Luis Edmundo Suárez S. Diego Mauricio Avila A.	Marzo 2001
145	La afiliación a la salud y los efectos redistributivos de los subsidios a la demanda.	Hernando Moreno G.	Abril 2001
146	La participación laboral: ¿qué ha pasado y qué podemos esperar?	Mauricio Santamaría S. Norberto Rojas Delgadillo	Abril 2001
147	Análisis de las importaciones agropecuarias en la década de los Noventa.	Gustavo Hernández Juan Ricardo Perilla	Mayo 2001
148	Impacto económico del programa de Desarrollo alternativo del Plan Colombia	Gustavo A. Hernández Sergio Iván Prada Juan Mauricio Ramírez	Mayo 2001

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
149	Análisis de la presupuestación de la inversión de la Nación.	Ulpiano Ayala Oramas	Mayo 2001
150	DNPENSION: Un modelo de simulación para estimar el costo fiscal del sistema pensional colombiano.	Juan Carlos Parra Osorio	Mayo 2001
151	La oferta de combustible de Venezuela en la frontera con Colombia: una aproximación a su cuantificación	Hernando Moreno G.	Junio 2001
152	Shocks fiscales y términos de intercambio en el caso colombiano.	Ómer ÖZAK MUñOZ.	Julio 2001
153	Demanda por importaciones en Colombia: Una estimación.	Igor Esteban Zuccardi	Julio 2001
154	Elementos para mejorar la adaptabilidad del mercado laboral colombiano.	Mauricio Santa María S. Norberto Rojas Delgadillo	Agosto 2001
155	¿Qué tan poderosas son las aerolíneas colombianas? Estimación de poder de mercado de las rutas colombianas.	Ximena Peña Parga	Agosto 2001
156	Elementos para el debate sobre una nueva reforma pensional en Colombia.	Juan Carlos Echeverry Andrés Escobar Arango César Merchán Hernández Gabriel Piraquive Galeano Mauricio Santa María S.	Septiembre 2001
157	Agregando votos en un sistema altamente desistitucionalizado.	Francisco Gutiérrez Sanín	Octubre 2001
158	Eficiencia -X en el Sector Bancario Colombiano	Carlos Alberto Castro I	Noviembre 2001
159	Determinantes de la calidad de la educación en Colombia.	Alejandro Gaviria Jorge Hugo Barrientos	Noviembre 2001
160	Evaluación de la descentralización municipal. Descentralización y macroeconomía	Fabio Sánchez Torres	Noviembre 2001
161	Impuestos a las transacciones: Implicaciones sobre el bienestar y el crecimiento.	Rodrigo Suescún	Noviembre 2001
162	Strategic Trade Policy and Exchange Rate Uncertainty	Fernando Mesa Parra	Noviembre 2001
163	Evaluación de la descentralización municipal en Colombia. Avances y resultados de la descentralización Política en Colombia	Alberto Maldonado C.	Noviembre 2001
164	Choques financieros, precios de activos y recesión en Colombia.	Alejandro Badel Flórez	Noviembre 2001
165	Evaluación de la descentralización municipal en Colombia. ¿Se consolidó la sostenibilidad fiscal de los municipios colombianos durante los años noventa.	Juan Gonzalo Zapata Olga Lucía Acosta Adriana González	Noviembre 2001
166	Evaluación de la descentralización municipal en Colombia. La descentralización en el Sector de Agua potable y Saneamiento básico.	Maria Mercedes Maldonado Gonzalo Vargas Forero	Noviembre 2001
167	Evaluación de la descentralización municipal en Colombia. La relación entre corrupción y proceso de descentralización en Colombia.	Edgar González Salas	Diciembre 2001
168	Evaluación de la descentralización municipal en Colombia. Estudio general sobre antecedentes, diseño, avances y resultados generales del proceso de descentralización territorial en el Sector Educativo.	Carmen Helena Vergara Mary Simpson	Diciembre 2001
169	Evaluación de la descentralización municipal en Colombia. Componente de capacidad institucional.	Edgar González Salas	Diciembre 2001

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
170	Evaluación de la descentralización municipal en Colombia. Evaluación de la descentralización en Salud en Colombia.	Iván Jaramillo Pérez	Diciembre 2001
171	External Trade, Skill, Technology and the recent increase of income inequality in Colombia	Mauricio Santa María S.	Diciembre 2001
172	Seguimiento y evaluación de la participación de los resguardos indígenas en los ingresos corrientes de la Nación para el período 1998 y 1999.	Dirección de Desarrollo Territorial	Diciembre 2001
173	Exposición de Motivos de la Reforma de la Ley 60 de 1993. Sector Educación y Sector Salud	Dirección de Desarrollo Social	Diciembre 2001
174	Transferencias, incentivos y la endogenidad del gasto Territorial. Seminario internacional sobre Federalismo fiscal - Secretaría de Hacienda de México, CEPAL, ILPES, CAF - Cancún, México. 18-20 de Mayo de 2000	Eduardo Wiesner Durán	Enero 2002.
175	Cualificación laboral y grado de sindicalización	Flavio Jácome Liévano	Enero 2002.
176	OFFSETS: Aproximación teórica y experiencia Internacional.	Nohora Eugenia Posada Yaneth Cristina Giha Tovar Paola Buendía García Alvaro José Chávez G.	Febrero 2002.
177	Pensiones: conceptos y esquemas de financiación	César Augusto Merchán H.	Febrero 2002.
178	La erradicación de las minas antipersonal sembradas en Colombia - Implicaciones y costos-	Yilberto Lahuerta P. Ivette María Altamar	Marzo 2002.
179	Economic growth in Colombia: A reversal of "Fortune"?	Mauricio Cárdenas S.	Marzo 2002.
180	El siglo del modelo de desarrollo.	Juan Carlos Echeverry G	Abril 2002.
181	Metodología de un Modelo ARIMA condicionado para el pronóstico del PIB.	Juan Pablo Herrera S. Gustavo A. Hernández D.	Abril 2002.
182	¿Cuáles son los colombianos con pensiones privilegiadas?	César Augusto Merchán H.	Abril 2002.
183	Garantías en carreteras de primera generación. Impacto económico.	José Daniel Reyes Peña.	Abril 2002
184	Impacto económico de las garantías de la Nación en proyectos de infraestructura.	José Daniel Reyes Peña.	Abril 2002
185	Aproximación metodológica y cuantitativa de los costos económicos generados por el problema de las drogas ilícitas en Colombia (1995 - 2000)	Ricardo Pérez Sandoval Andrés Vergara Ballén Yilberto Lahuerta P	Abril 2002
186	Tendencia, ciclos y distribución del ingreso en Colombia: una crítica al concepto de "modelo de desarrollo"	Juan Carlos Echeverry G. Andrés Escobar Arango Mauricio Santa María S.	Abril 2002.
187	Crecimiento y ciclos económicos. Efectos de los choques de oferta y demanda en el crecimiento colombiano	Igor Esteban Zuccardi H.	Mayo 2002.
188	A general equilibrium model for tax policy analysis in Colombia. The MEGATAX model.	Thomas F. Rutherford. Miles K. Light	Mayo 2002.
189	A dynamic general equilibrium model for tax policy analysis in Colombia.	Thomas F. Rutherford. Miles K. Light Gustavo Hernández	Mayo 2002.
190	Sistema Bancario Colombiano: ¿Somos eficientes a nivel internacional?	Alejandro Badel Flórez.	Junio 2002.

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
191	Política para mejorar el servicio de transporte público urbano de pasajeros.	DNP: DIE- GEINF	Junio 2002.
192	Two decades of economic and social development in urban Colombia: a mixed outcome	Carlos Eduardo Vélez Mauricio Santa María, Natalia Millán Bénédicte De La Brière World Bank (LAC / PREM)	Junio 2002.
193	¿Cuáles colegios ofrecen mejor educación en Colombia?	Jairo Núñez Méndez Roberto Steiner Ximena Cadena Renata Pardo CEDE, U. de los Andes	Junio 2002.
194	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Las nuevas teorías y enfoques conceptuales sobre el desarrollo regional. ¿Hacia un nuevo paradigma? Separata 1 de 7	Edgard Moncayo J.	Julio 2002.
195	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Las políticas regionales: Un enfoque por generaciones Separata 2 de 7	Edgard Moncayo J.	Julio 2002.
196	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Un mundo de geometría variable: Los territorios que ganan y los que pierden. Separata 3 de 7	Edgard Moncayo J.	Julio 2002.
197	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Enfoques teóricos y evidencias empíricas sobre el desarrollo regional en Colombia. Separata 4 de 7	Edgard Moncayo J.	Julio 2002.
198	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Las políticas regionales en Colombia. Separata 5 de 7	Edgard Moncayo J.	Julio 2002.
199	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Tendencias del desarrollo regional en Colombia. -Polarización, apertura y conflicto- Separata 6 de 7	Edgard Moncayo J.	Julio 2002.
200	Nuevos enfoques de política regional en América Latina: El caso de Colombia en perspectiva histórica. Marco conceptual y metodológico para el diseño de una nueva generación de políticas de desarrollo regional en Colombia. Separata 7 de 7	Edgard Moncayo J.	Julio 2002.
201	Viabilidad de los servicios públicos domiciliarios en la ciudad de Santiago de Cali.	Mauricio Santa María Francisco Bernal Carlos David Beltrán David Villalba	Agosto 2002
202	Optimal enforcement: Finding the right balance	Jaime Andrés Estrada	Agosto 2002
203	Does corporate governance matter for developing countries? An overview of the Mexican case.	Paula Acosta Márquez	Agosto 2002

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
204	Reflexiones sobre el proceso de paz del gobierno de Andrés PASTRANA y las FARC-Ep: (1998-2002)	Camilo Leguízamo	Agosto 2002
205	Contratación pública en Colombia y teoría Económica.	Yuri Gorbaneff	Septiembre 2002.
206	Does planning pay to perform in infrastructure? Deconstructing the babylon tower on the planning/ performance relationships in energy, telecommunications and transport sectors – colombian case.	Daniel Torres Gracia	Septiembre 2002.
207	A dynamic analysis of household decision making in urban Colombia, 1976-1998 Changes in household structure, human capital and its returns, and female labor force participation .	Fabio Sánchez Torres Jairo Núñez Méndez	Octubre 2002.
208	Inversión pública sectorial y crecimiento Económico: Una aproximación desde la Metodología VAR.	Alvaro A. Perdomo S.	Octubre 2002.
209	Impacto macroeconómico y distributivo delImpuesto de seguridad democrática.	Ömer Özak Muñoz. Oscar Mauricio Valencia	Octubre 2002.
210	Empleo informal y evasión fiscal en Colombia.	Jairo A. Núñez Méndez	Octubre 2002.
211	Diagnóstico del programa de reinserción enColombia: mecanismos para incentivar la desmovilización voluntaria individual.	Maria Eugenia Pinto B. Andrés Vergara Ballén Yilberto Lahuerta P.	Noviembre 2002.
212	Economías de escala en los hogares y pobreza. Tesis para optar el título de Magíster en Teoría y Política Económica de la Universidad Nacional de Colombia.	Francisco Javier Lasso V.	Noviembre 2002.
213	Nueva metodología de Encuesta de hogares. ¿Más o menos desempleados?	Francisco Javier Lasso V.	Noviembre 2002.
214	Una aproximación de la Política Comercial Estratégica para el ingreso de Colombia al ALCA.	Ricardo E. Rocha G.. Juan Ricardo Perilla Ramiro López Soler	Diciembre 2002.
215	The political business cycle in Colombia on the National and Regional level.	Allan Drazen Marcela Eslava University of Maryland	Enero 2003.
216	Balance macroeconómico de 2002 y Perspectivas para 2003.	Dirección de Estudios Económicos	Enero 2003.
217	Women workers in Bogotà 's Informal sector: Gendered impact of structural adjustment Policies in the 1990s. Tesis para optar el título de Magíster en Estudios de Desarrollo del Instituto de Estudios Sociales de The Hague - Holanda.	Jairo G. Isaza Castro	Febrero 2003.
218	Determinantes de la duración del desempleo en el área metropolitana de Cali 1988-1998. (Documento elaborado por profesores del Departamento de Economía de la Universidad del Valle)	Carlos E. Castellar P. José Ignacio Uribe G.	Marzo 2003.
219	Conflicto, violencia y actividad criminal en Colombia: Un análisis espacial.	Fabio Sánchez Torres Ana María Díaz Michel Formisano	Marzo 2003.
220	Evaluating the impact of SENA on earnings and Employment.	Alejandro Gaviria Uribe Jairo A. Núñez Méndez	Abril 2003.
221	Un análisis de la relación entre inversión extranjera y Comercio exterior en la economía colombiana.	Erika Bibiana Pedraza	Abril 2003.

ARCHIVOS DE ECONOMIA

No	Título	Autores	Fecha
222	Free Trade Area of the Americas. An impact Assessment for Colombia.	Miles Kenneth. Light Thomas Fox Rutherford	Abril 2003.
223	Construcción de una Matriz de Contabilidad Social Financiera para Colombia.	Gustavo Adolfo Hernández	Mayo 2003.
224	Elementos para el análisis de Incidencia tributaria.	Andrés Escobar Gustavo Hernández Gabriel Piraquive Juan Mauricio Ramirez	Mayo 2003.
225	Desempeño económico por tipo de4 firma: Empresas nacionalesvs. Grandes y pequeñas receptoras De inversión extranjera.	Erika Bibiana Pedraza	Mayo 2003.
226	El balance estructural del Gobierno Central en Colombia.	Natalia Salazar Diego Prada	Junio 2003.
227	Descentralización y Equidad en América Latina: Enlaces Institucionales y de Política	Eduardo Wiesner	Junio 2003.
228	Ciclos económicos y mercado laboral en Colombia: ¿quién gana más, quién pierde más? 1984-2000.	Fabio Sánchez Luz Magdalena Salas Oskar Nupia	Julio 2003.
229	Efectos de un acuerdo bilateral de libre comercio con Estados Unidos	Direcciones de Estudios Económicos y de Desarrollo Empresarial del DNP	Julio 2003.
230	Pobreza, crimen y crecimiento regional en Colombia. (Versión para comentarios)	Ricardo Rocha Hermes Martínez	Agosto 2003.
231	Contracciones leves y profundas: Efectos asimétricos sobre la pobreza El caso colombiano 1984-2000.	Jorge E. Sáenz Castro Juan Pablo Herrera S. Oscar E. Guzmán Silva	Agosto 2003.
232	Sistema de modelos multivariados para la proyección del Producto Interno Bruto	Carlos Alberto Castro I.	Septiembre 2003.
233	Yet another lagging, coincident and leading index for The Colombian economy.	Carlos Alberto Castro I.	Septiembre 2003.