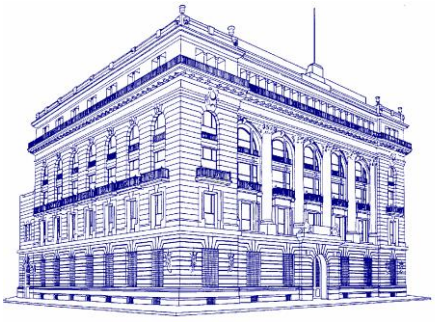
Inflation Report

January – March 2011



BANCO DE MÉXICO

MAY 2011

INFLATION REPORT

This report analyzes the development of both inflation and the economy in Mexico, as well as different domestic economic indicators, in compliance with Article 51, last section, of Banco de México's Law.

FOREWARNING

This text is provided for the reader's convenience only. Discrepancies may possibly arise between the original document and its translation to English. The original and unabridged Inflation Report in Spanish is the only official document.

Unless otherwise stated, this document has been prepared using data available as of May 9, 2011. Figures are preliminary and subject to changes.

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1. Introduction

The world economy continued its recovery in the first quarter of 2011, even though uncertainty about its prospects has increased. Economic growth in advanced economies was moderate due to the slow recovery of private demand, while emerging economies maintained a vigorous economic expansion.

Although at a slower pace than in the previous quarter, U.S. economic activity increased during the first quarter of 2011, with the strong expansion of the industrial production standing out. In turn, private consumption grew at a more moderate pace, affected by the increase in the price of fuels. In the labor market, the unemployment rate remained high, although certain signs of improvement were observed. Also, the housing market and its prospects remained stagnated. In this way, uncertainty still persists as to the sustainability of the economic recovery in the U.S. once the fiscal and monetary stimuli are withdrawn.

International commodity prices continued to show an upward trend in the first quarter of the year. Increases registered in the energy price quotes were noteworthy. This was a consequence of the rapid growth of emerging economies, which has increased the demand for such products. In addition to this, in the case of crude oil, the supply has been affected by political instability in the Middle East and North Africa.

In the major advanced economies, headline inflation and its short-term expectations registered an increase associated with the rebound of commodity prices. However, core inflation remained low, due to the excess of existing capacity and still weak conditions in the labor market. In turn, long-term inflation expectations remained anchored. The U.S. Federal Reserve announced that: a) next June it would conclude its program of net purchase of Treasury bonds, as it had been originally announced, and it would maintain its present policy of reinvestment of principal payments from its securities portfolio; b) it would regularly review the amount and the composition of its security holdings; and c) it expected that economic conditions would probably warrant the target of the federal funds rate to remain at exceptionally low levels for an extended period. In turn, at the beginning of April the European Central Bank decided to increase its policy rate by 25 basis points, claiming higher risks to price stability in the medium term. Besides, central banks of other advanced economies, such as Canada, Sweden and Australia, have also increased their reference interest rate. The aforementioned has led to a depreciation of the USD with respect to the currencies of other advanced countries.

Higher inflationary pressures were observed in several emerging countries, which reflected both the commodity price increase and the fact that some economies are going through an advanced phase of their business cycle. Some of them even registered signs of overheating, hence their central banks increased their reference rates, which for many of these countries implied the continuation of the withdrawal of the significant monetary stimulus that they introduced.

In the international financial markets, the conflicts in the Middle East and North Africa, as well as the natural disasters in Japan, have had relatively limited effects so far. Global financial conditions registered an improvement since the end

of 2010, with the exception of Europe, where the tensions, caused by the precarious fiscal situation in some of the countries in the region and the uncertainty about some banking systems' soundness, persist. Therefore, a possibility of a new crisis is not ruled out.

During the first three months of the year, capital flows to emerging countries showed volatility. Nevertheless, starting from the end of March a recovery of these flows has been observed, and, in general, the appreciation trend of emerging economies' currencies was intensified. An environment of lower risk aversion in the international financial markets contributed to this.

In Mexico, during the first quarter of 2011 the dynamism of the external demand continued to pass through to the components of domestic expenditure, which led to aggregate expenditure consolidating its positive trend and presenting a more balanced composition. Thus, productive activity and employment kept registering a positive trend. However, various indicators of the conditions prevailing in the markets of the main production factors, as well as an evaluation of the balance between economy's income and expenditure, suggest that no generalized pressures on prices are observed.

In this sense, annual headline inflation significantly decreased during the first quarter of 2011, reaching 3.04 percent in March, while at the end of the previous quarter it was 4.40 percent. This performance was congruent with the forecast published by Banco de México in the last Inflation Report. Annual core inflation also continued exhibiting a downward trend. Essentially, this was influenced by the monetary policy conduction and by the absence of labor cost related pressures. Besides, the fading effects of various shocks presented last year and, notably, the exchange rate appreciation contributed to this result. Thus, the reduction of headline inflation in Mexico, contrary to the development observed in most countries, was due to the fact that the impact of the international energy price increase had a bounded influence on domestic prices given the policy of increments applied in their determination, in addition to the previously mentioned elements. In this sense, it is noteworthy that non-core inflation performed better than expected, which could revert in the future.

Considering the abovementioned, Banco de México's Board of Governors decided to maintain the target for the Overnight Interbank Interest Rate unchanged from January to April 2011. In any event, the Board of Governors will continue to monitor the performance of inflation expectations, output gap and, especially, grain and other commodity prices, as well as diverse inflation determinants that might signal unexpected and widespread pressures on prices. Thus, if, according to the Board of Governors, this eventuality materializes, the Central Institute will adequately adjust the monetary policy stance in order to reach the convergence of inflation to its 3 percent permanent target.

2. Recent Developments of Inflation

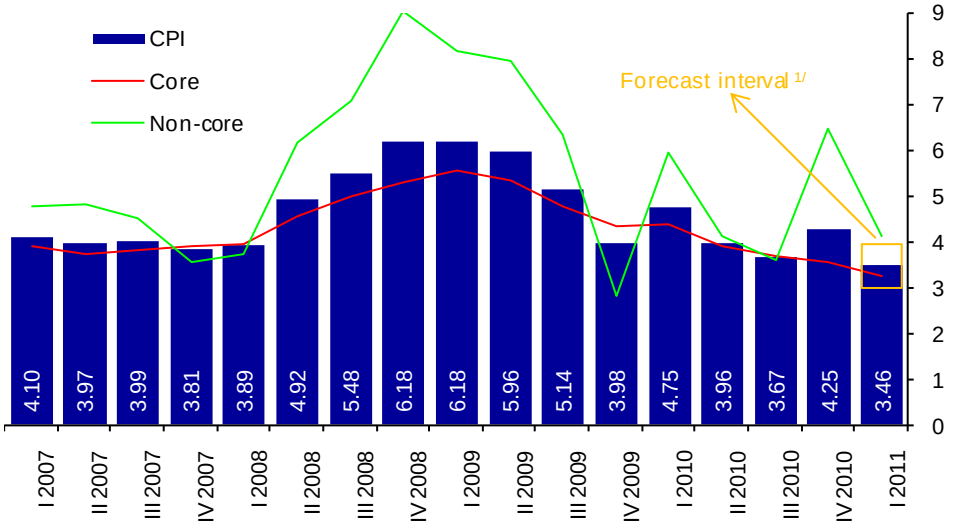
2.1. Inflation

During the first quarter of 2011, annual headline inflation significantly decreased. At the end of this period it was 3.04 percent, 1.36 percentage points lower as compared to the figure of December 2010 (Table 1). This result was congruent with the one forecasted by Banco de México in the previous Inflation Report. Particularly, the forecast located annual average headline inflation in the analyzed quarter within an interval of 3 to 4 percent, and the result was 3.46 percent (Table 1 and Graph 1).

Table 1
Consumer Price Index and Components
Annual change in percent

	Annual Change				Average percent	
	Dec-2010	Jan-2011	Feb-2011	Mar-2011	Q-IV 2010	Q-I 2011
CPI	**4.40**	**3.78**	**3.57**	**3.04**	**4.25**	**3.46**
Core	**3.58**	**3.27**	**3.26**	**3.21**	**3.57**	**3.25**
Merchandise	**3.82**	**3.60**	**3.71**	**3.97**	**3.68**	**3.76**
Foods, beverages and tobacco	4.35	4.51	4.78	5.55	3.84	4.94
Non-food merchandise	3.38	2.88	2.86	2.75	3.55	2.83
Services	**3.36**	**3.00**	**2.89**	**2.57**	**3.47**	**2.82**
Housing	2.64	2.34	2.12	2.10	2.72	2.18
Education (tuitions)	4.64	4.62	4.49	4.46	4.65	4.52
Other services	3.58	3.06	3.07	2.34	3.75	2.82
Non-core	**7.09**	**5.39**	**4.53**	**2.46**	**6.47**	**4.12**
Agricultural	**6.96**	**4.03**	**3.09**	**-1.69**	**5.21**	**1.76**
Fruit and vegetables	14.00	7.50	4.76	-6.36	9.37	1.71
Onion	-0.63	-30.89	-48.56	-68.05	-5.58	-52.38
Zucchini	51.11	-13.39	-26.67	-16.87	30.04	-18.95
Chayote	100.30	23.57	-23.17	-46.82	57.22	-19.92
Tomatillo	49.39	16.09	-13.62	-20.27	23.37	-8.39
Livestock	2.46	1.77	2.04	1.86	2.50	1.89
Egg	-8.51	-9.08	-6.48	-5.99	-6.32	-7.18
Energy and Governm. Approved Fares	**7.16**	**6.15**	**5.32**	**4.96**	**7.28**	**5.47**
Energy	6.44	6.12	5.88	5.96	6.69	5.99
Government approved fares	8.39	6.20	4.38	3.27	8.26	4.60

Graph 1
Consumer Price Index
Annual average change in percent



Source: Banco de México.
1/ This forecast was originally published in the Inflation Report, October - December 2010.

The monetary policy stance has been congruent with the convergence of inflation towards its target. The decline exhibited by headline inflation during the analyzed period was driven by various factors that resulted in lower growth rates of the CPI core and non-core components (Table 1). In this regard, the following elements stand out:

1. Fading of the effects associated with fiscal adjustments and with the increase in fares and public prices approved by different levels of the government that took effect at the beginning of 2010.[1]
2. The economy still restrained from making full use of its productive factors. In particular, this was reflected in the absence of inflationary pressures associated with the labor costs of production.
3. Appreciation and lower volatility of the exchange rate contributed to mitigating pressures on the price formation process in the economy.
4. Reduction in the growth rate of agricultural products' price subindex.

Annual core inflation, corresponding to the CPI basket that is subject to greater influence from the monetary policy, decreased during the analyzed period. This occurred despite the changes in relative prices in the world economy that Mexico, like the rest of the economies, has to absorb. In particular, in the period of December 2010 to March 2011 this inflation indicator dropped from 3.58 to 3.21 percent.

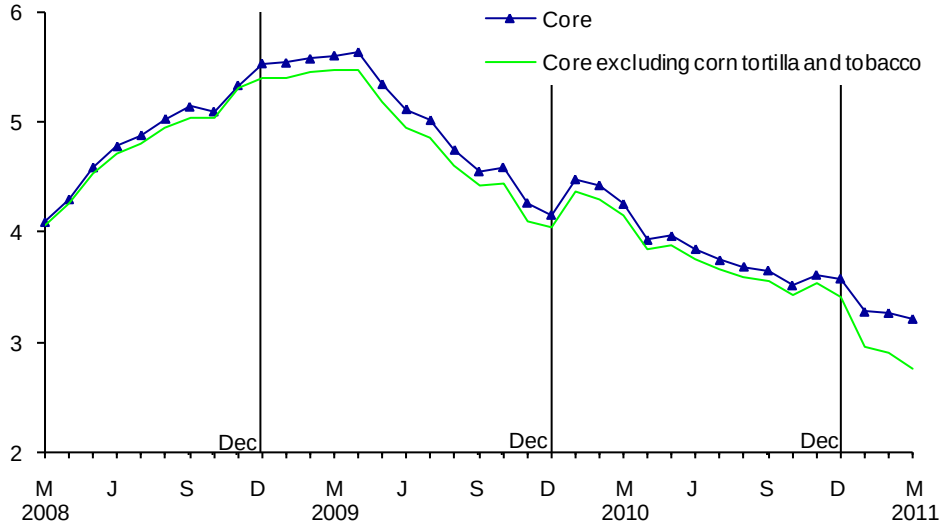
The core component groups, whose prices slowed their growth rate, were the services and non-food merchandise. In contrast, in the case of foods, beverages and tobacco, their annual change rate increased. This, to a large extent, was a consequence of increments in the price of corn tortilla and cigarettes: the former, due to the growth in the international corn prices, and the

[1] Details on the referred fiscal adjustments can be consulted in the Addendum to the Inflation Report, July – September 2009.

latter, due to the increase authorized by the Congress in the Excise Tax *(Impuesto Especial sobre Producción y Servicios*, IEPS) on tobacco of 35 cents per cigarette.

When evaluating core inflation performance during the first quarter of 2011, it is clear that no widespread contagion of the increase in international grain prices to other prices was observed. Even if both cigarettes and corn tortilla were excluded from the core CPI basket, annual inflation of this component would have decreased by a greater proportion than the observed one, going from 3.42 to 2.76 percent in the period of December 2010 to March 2011 (Graph 2).

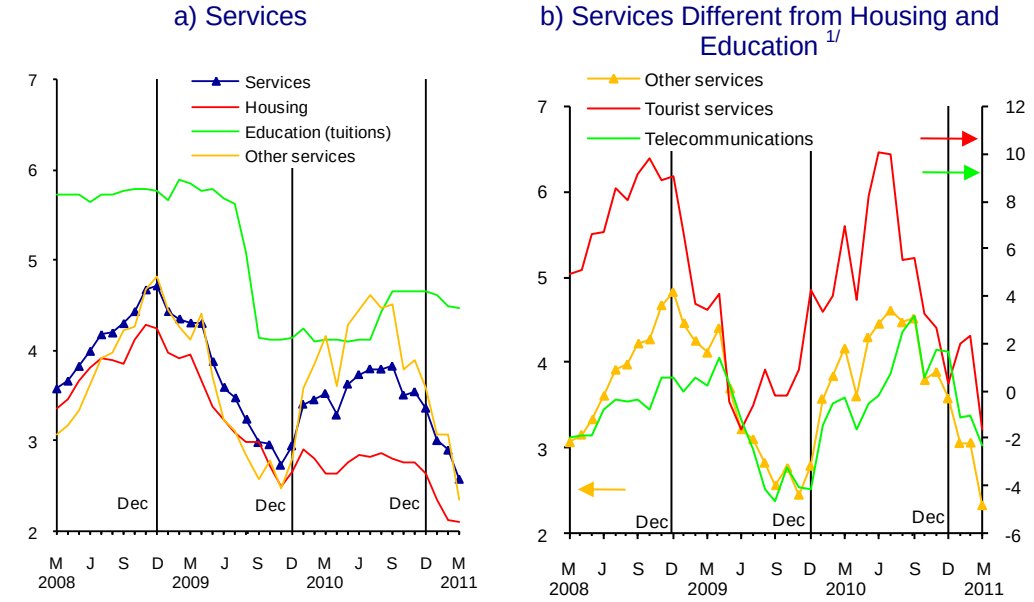
Graph 2
Subindices of Core Prices and Core Prices Excluding Corn Tortillas and Tobacco
Annual change in percent



The annual change of the services price subindex dropped from 3.36 to 2.57 percent in the period of December 2010 to March 2011 (Graph 3a and Table 1). This resulted from lower growth rates shown by the three constituting groups (housing, education and remaining services, Table 1). This has been mainly influenced by the monetary policy stance and the beforementioned fading of the effects of the fiscal adjustments determined by the Congress last year, as well as by other factors, among which stand out the following: i) price decreases in different telecommunication services given an intensification of competition levels (Graph 3b); ii) in various cities in the north of Mexico, the situation of insecurity is apparently mitigating the price increase in the case of different services; and, iii) the effect on prices of certain tourist services associated with the change in the Easter holidays calendar, since this implied a relatively high base of comparison for the calculations of the annual change of March 2011.

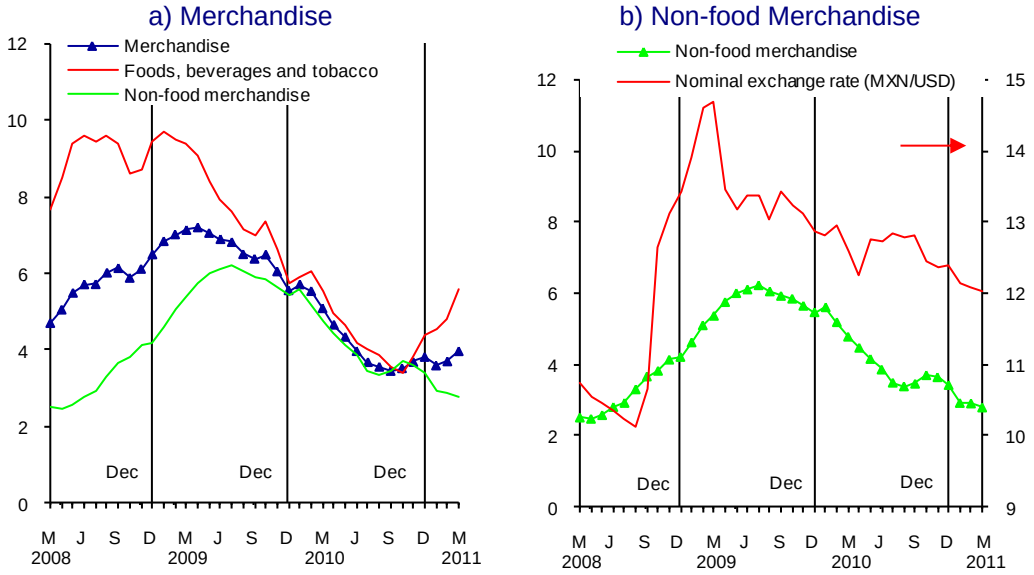
On the other hand, the annual growth rate of the merchandise core subindex increased from 3.82 to 3.97 percent between the end of the fourth quarter of 2010 and the first quarter of 2011. This result, as stated before, is due to the performance of the foods, beverages and tobacco group, whose annual change increased from 4.35 to 5.55 percent. In contrast, the annual inflation of the remaining merchandise dropped from 3.38 to 2.75 percent (Graph 4a and Table 1). The last group's performance has been influenced by the exchange rate parity appreciation (Graph 4b).

Graph 3
Core Services Subindices
Annual change in percent



Source: Banco de México.
1/ Tourist services include: Package tourism services, Air transport, Interstate buses and hotels. Telecommunications include: Mobile telephone service, Fixed local phone service, National long distance, International long distance, Pay television Service and Internet service.

Graph 4
Core Merchandise Subindices
Annual change in percent



Source: Banco de México.

Regarding the non-core component, its contribution to headline inflation significantly diminished. In the period between the end of the fourth quarter of 2010 and the first quarter of 2011, annual non-core inflation dropped from 7.09 to

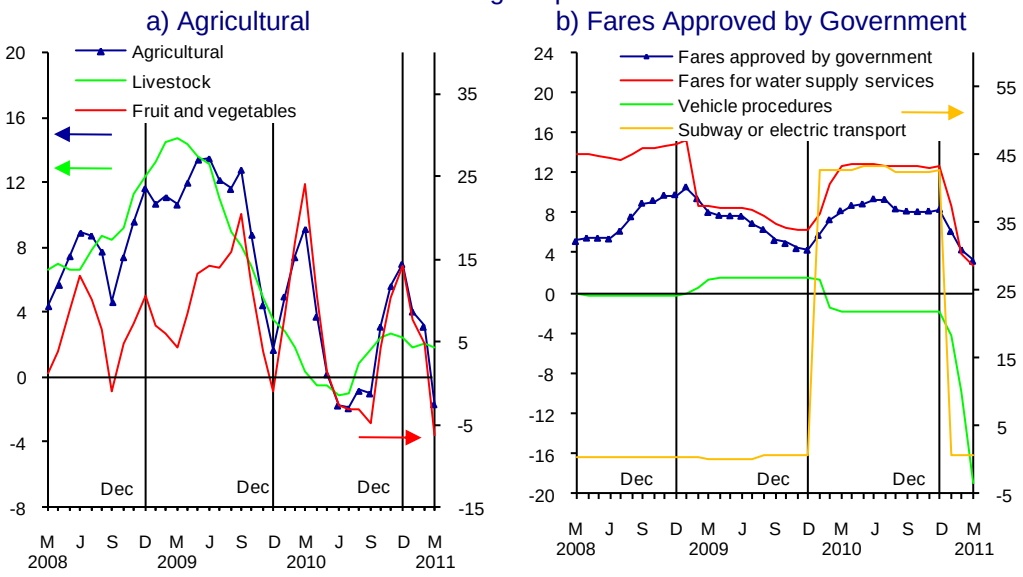
2.46 percent. Part of this reduction will surely be temporary, and it is expected to revert in the following months. This result was determined by two main elements:

a. A significant price reduction of diverse agricultural products associated with relatively favorable supply conditions, which are usually of short-lived effect. This group's annual growth rate dropped from 6.96 to -1.69 percent in the period of December 2010 to March 2011 (Table 1 and Graph 5a).

b. Lower increments in fares approved by local governments, in relation to the same period last year. In this regard, stands out the reduction in the incidence of inflation of public transport, fares for water supply services and for vehicle procedures (Graph 5b). The annual change exhibited by this group between the end of 2010 and the first quarter of 2011 fell from 8.39 to 3.27 percent.

Besides, the non-core component evolution, unlike what happened in other countries, maintained relatively isolated from increases registered in international energy prices, this, due to the policy of increments that presently governs the determination of domestic gasoline and LP gas prices. In the same way, the ordinary electricity fares showed an average annual increment of 3.8 percent. Thus, in March 2011 the annual change in energy consumer prices was 5.96 percent, while in December 2010 it was 6.44 percent (Table 1). Graph 6 demonstrates the growing difference between domestic and foreign gasoline price quotes. This was also the case of other energy prices.

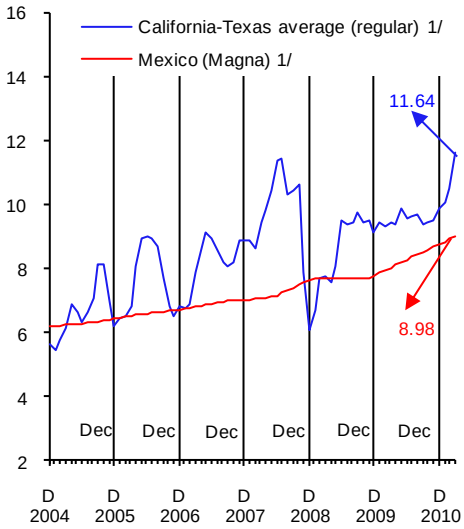
Graph 5
Non-core Price Subindices
Annual change in percent



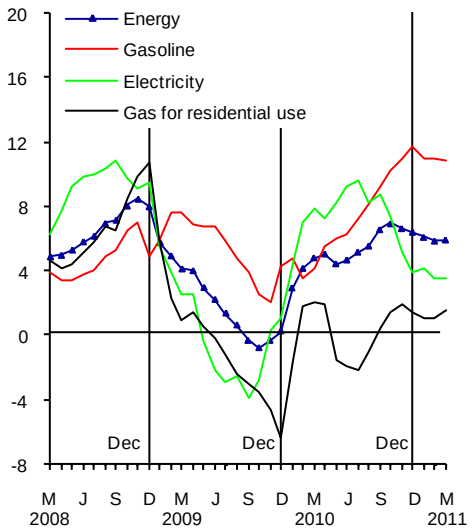
Source: Banco de México.

Graph 6
Energy Price Subindices

a) Gasoline Price: Mexico and U.S.
MXN per liter



b) Annual change in percent



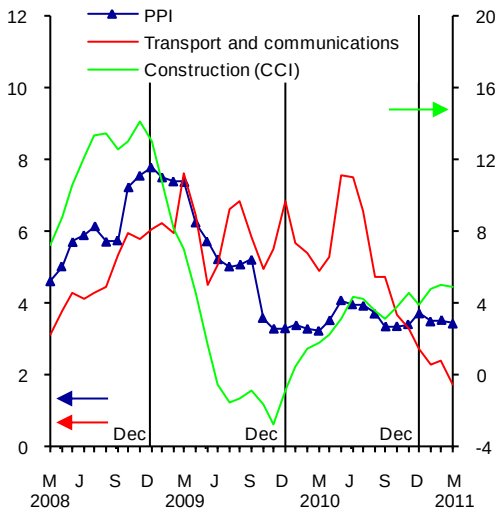
Source: Banco de México and Energy Information Administration.
1/ Monthly average.

2.2. Producer Price Index

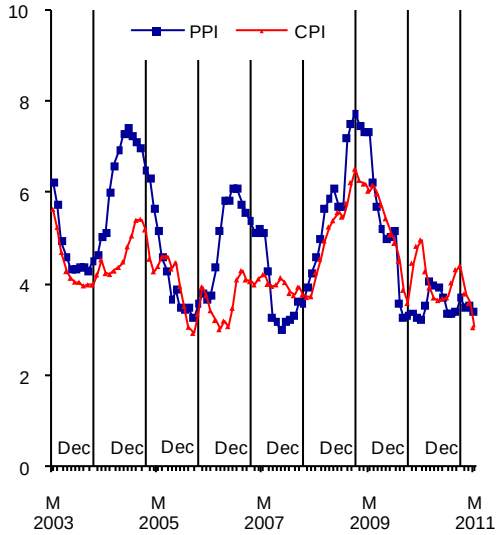
During the first quarter of 2011 the annual inflation of the Producer Price Index (PPI) of finished goods and services, excluding crude oil, declined. This indicator dropped from 3.70 to 3.42 percent in the period of December 2010 to March 2011, mainly influenced by the disinflation observed in the group of transport and communications (Graph 7a). Nevertheless, the fall was partially counteracted by a higher growth rate observed in the construction sector price subindex. The recent evolution of the PPI suggests that this indicator did not generate significant pressures on consumer prices (Graph 7b).

Graph 7
Consumer and Producer Price Indices
Annual change in percent

a) PPI and Selected Components



b) PPI and CPI



Source: Banco de México.

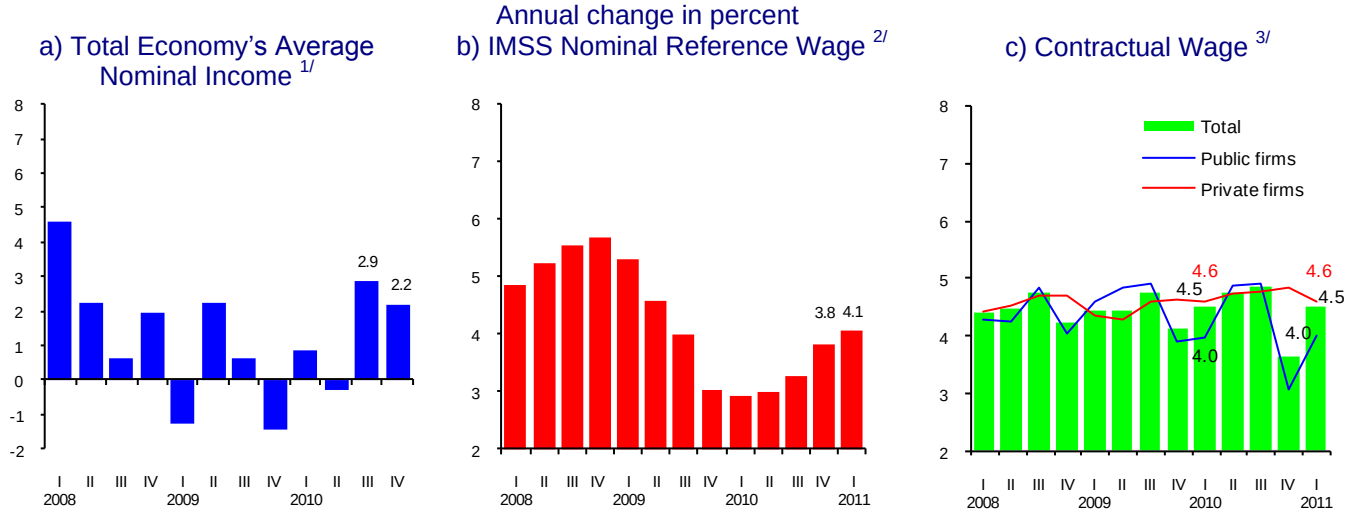
2.3. Wages

The recent development of the main wage indicators continued pointing to the absence of labor cost-related pressures on inflation, which, in turn, kept contributing to an increase in employment. Thus, the average nominal income growth of total economy's workers was 2.2 percent in annual terms in the fourth quarter of 2010 (this figure was 2.9 percent in the previous quarter, Graph 8a). The IMSS reference wage, the wage indicator of the formal sector, exhibited an annual average change of 4.1 percent during the first quarter of 2011 (3.8 percent during the fourth quarter of 2010, Graph 8b). The contractual wage increase negotiated by firms under federal jurisdiction was 4.5 percent (this figure equals the one observed in the same period last year, Graph 8c).[2]

The recent evolution of the wages, combined with the increments observed in the labor productivity of the economy, has implied a decrease in the unit labor costs (see Section 4). This has contributed to both limiting possible pressures on prices, and promoting job creation.

[2] The IMSS reference wage considers the daily average earnings of IMSS-insured workers during a certain period and some fringe benefits (e.g., end-of-year bonuses, vacation bonuses and commissions). Contractual wages, on the other hand, include only direct increases in the reference wage rate negotiated by workers of firms under federal jurisdiction that will be in effect for the following 12 months. It is noteworthy that the monthly composition of this indicator is based on information from firms that were engaged in wage settlements, usually during the same period of the year and, for this reason, it follows a seasonal pattern. As a result, when analyzing the reference wage it is preferable to compare successive time periods, while in the case of contractual wages the relevant comparison is interannual.

Graph 8
Wage Indicators
Annual change in percent



Source: Calculated by Banco de México with data from INEGI, IMSS and STPS.
1/ The average monthly income is calculated based on the hourly wage and the number of hours worked in the given period.
2/ During the first quarter of 2011 an average of 14.8 million of contributors were registered in the abovementioned institute.
3/ The number of workers in firms under federal jurisdiction that annually report their wage increases to the Secretary of Labor and Social Welfare (*Secretaría del Trabajo y Previsión Social* (STPS)) equals approximately 1.9 million.

3. Economic and Financial Environment

3.1. International Environment

3.1.1. World Economic Activity

World economic recovery continued in the first quarter of 2011. However, apart from various risks that have increased uncertainty about the global economic prospects, the growth rate remains uneven among countries and regions. Advanced economies have expanded at a moderate pace, partly reflecting continuous weakness of their private demand. In turn, emerging economies have maintained a vigorous growth.

The world economy faces significant challenges both in the short and in the medium term. In the U.S., the gradual recovery of private demand has been accompanied by an improvement in the labor market. Nevertheless, the unemployment rate remains elevated, the same as households' debt level, while the housing market and its prospects continue depressed. In this context, uncertainty persists about the sustainability of the U.S. economic recovery once the fiscal and monetary stimuli, adopted to boost it, are withdrawn. At the same time, the energy price increases caused a rebound of inflation. Also, the ratio of public debt to GDP has reached historically high levels of approximately 90 percent. In some countries of the Euro zone, fiscal problems and problems of solvency of the financial system persist. In turn, geopolitical tensions in the Middle East and North Africa, and the situation in Japan after the recent natural disasters that affected the country have contributed to greater economic uncertainty worldwide.

In the U.S., the pace of economic activity slowed down at the beginning of 2011 relative to the one observed in the last quarter of 2010. Thus, according to preliminary data, real GDP rose 1.8 percent at an annualized quarterly rate during the first quarter, which was below the rate of 3.1 percent registered in the previous quarter. This led to a reduction in the growth prospects for this year according to the economic analysts. Consumer spending increased at a lower rate than in the previous quarter, partly due to the gasoline price increase (Graph 9a), and, partly, to the fact that it also resented the effects of the slow net wealth recovery of households derived from the continuous fall in housing prices.

Furthermore, the expansion of non-residential investment moderated during the first quarter. Although expenditure on equipment and software increased its growth rate, spending on construction contracted sharply, affected by adverse weather conditions. In turn, residential investment remained depressed given the weakness of demand, in a context of a large inventory of houses on sale. Net exports stopped to contribute positively to output growth, because imports registered a recovery. Finally, government spending contributed negatively to GDP growth, to a large extent, due to the decrease in federal spending on defense, as well as in state and local spending.

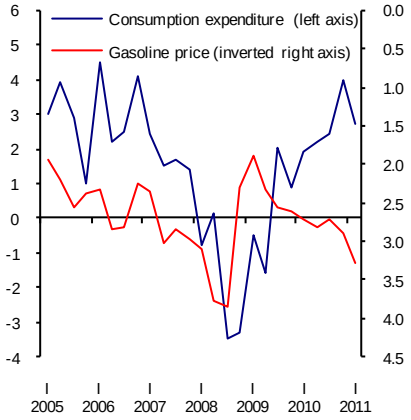
Industrial production registered some strengthening during the quarter, with a growth of 6.0 percent at an annualized quarterly rate (Graph 9b), which was above the increase of 3.2 percent observed in the previous quarter. Some timely indicators, such as the index of purchasing managers and manufacturing orders,

suggest that the expansion of this sector will continue. However, industrial production has still not recovered the level it reached before the recession.[3]

During the first months of the year, some signs of improvement in the labor market were observed. The non-farm payroll employment grew, on average, by 192 thousand positions a month from January to April, as compared to 97 thousand in the previous four-month period. Furthermore, the unemployment rate fell from 9.4 percent in December 2010 to 9 percent in April 2011. Nevertheless, this improvement partly reflected a decrease in the labor force participation rate, while the employment-population ratio has remained practically unchanged since the beginning of the recovery (Graph 9c). Although the proportion of the long-term unemployed (27 weeks or more) declined compared to that of the end of 2010, it remained at historically very high levels.

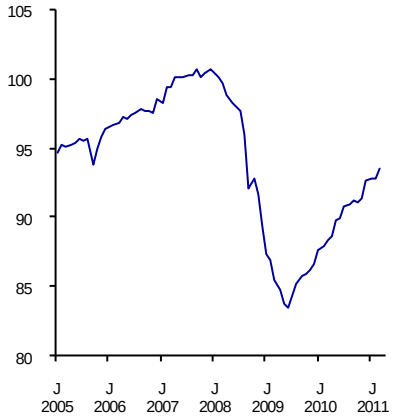
Graph 9
U.S. Economic Activity

a) Real Expenditure on Personal Consumption and Gasoline Price[1/]
Annualized quarterly change, s. a., and USD per gallon



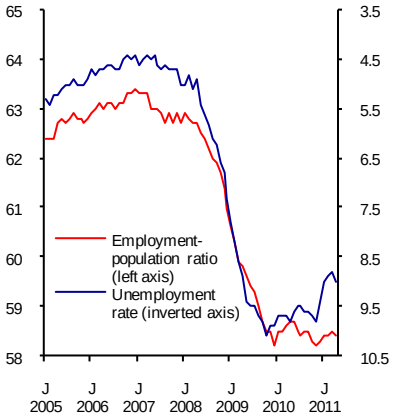
s. a./ Seasonally adjusted figures.
1/ Gasoline price refers to the quarterly average of the retail prices of regular gasoline.
Source: BEA and EIA.

b) Industrial Production
Index 2007=100, s. a.



s. a. / Seasonally adjusted figures.
Source: U.S. Federal Reserve.

c) Unemployment Rate and Employment-Population Ratio[1/]
In percent, s. a.



s. a. / Seasonally adjusted figures.
1/ Population over 16 years of age.
Source: BLS.

In the Euro zone, several indicators (the purchasing managers' index, the confidence indicator of the economy and the industrial activity, among them) suggest that economic activity improved its performance in the first quarter of 2011 relative to the one observed at the end of 2010. In particular, the favorable performance of Germany's economy, based on the strengthening of both domestic spending and exports, stands out. However, there are marked differences in the performance of this region's countries. This reflects the impact of the fiscal consolidation processes and the concern about the elevated levels of public debt in some countries. The region's activity continues resenting uncertainty provoked by the continuous deterioration of the credit profile of some of its members. In particular, difficulties in the negotiation of the financial rescue package for Portugal and doubts about the fiscal solvency of Greece have affected the region's performance and prospects.[4] In turn, this concern about

[3] The level of industrial production is 7.0 percent lower than the one reached in December 2007.
[4] For example, the comments of various European authorities in mid-April generated speculations about a possible restructuring of the sovereign debt of Greece in the short term.

fiscal sustainability in different countries of the region has fueled again uncertainty about the solvency of various financial institutions highly exposed to the countries, whose governments are characterized by very precarious public finances.

Japan's economic recovery in the first two months of 2011 was interrupted by the effects of the earthquake and tsunami that occurred in March in this country. The authorities implemented a series of measures, described below, aimed at mitigating the effects of the natural disasters and reducing uncertainty. The market expectation is that the consequences of the catastrophe will strongly affect Japan's GDP growth during the first and second quarter of 2011, but that the output decrease will be temporary. Furthermore, global production chains are expected not to be affected in a significant way in the medium term and the reconstruction effort is expected to boost the country's activity from the second half of 2011 onwards.

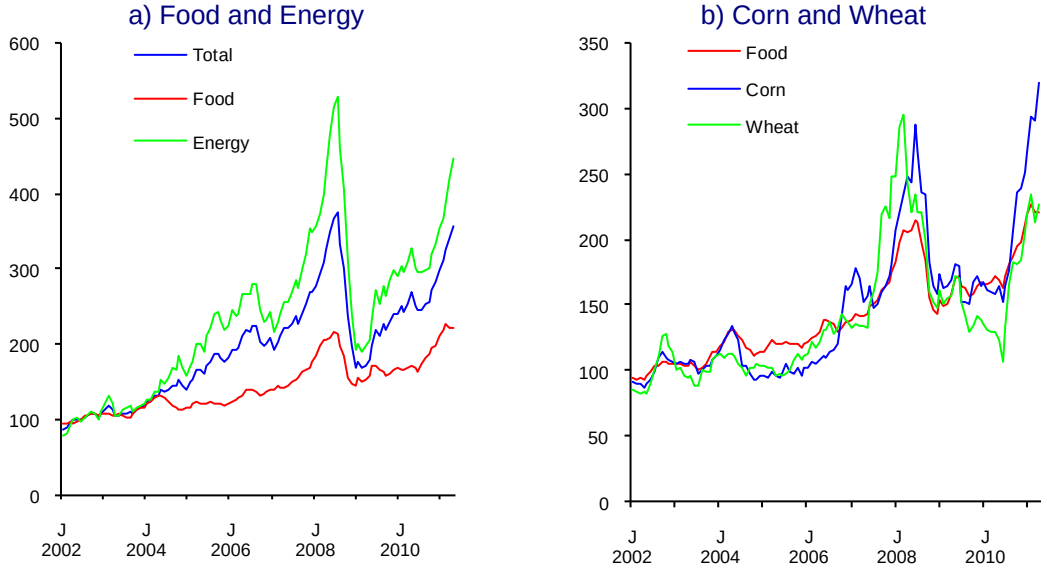
Emerging economies maintained a vigorous growth during the first quarter, supported by a strong domestic demand and favorable international liquidity conditions. Several of these economies are going through an advanced stage of their expansion cycle. Some of them even show signs of overheating. In the first quarter, China's GDP expanded at an annual growth rate of 9.7 percent (9.8 percent in the previous quarter). In turn, industrial production in India and Brazil registered certain moderation in the expansion rate in the referred period, although it remains at historically high levels.

3.1.2. Commodity Prices

During the first months of 2011, international commodity prices continued exhibiting an ascending trajectory, started in the second part of 2010. In particular, the commodity price index published by the International Monetary Fund (IMF) accumulated an increase of 19.3 percent between January and April (Graph 10a). Energy prices registered the highest growth in the analyzed period (26.1 percent). In general, the commodity price increase was driven by the emerging economies' dynamism and by the highly expansionist monetary policy of the main advanced economies. Besides, energy prices were affected by the decrease in oil production derived from the geopolitical instability in the Middle East and North Africa.

International prices of food commodities grew during the first four-month period of this year. Nevertheless, the increase in this period (8.1 percent) was lower than the one observed during the last third of 2010 (16.6 percent, Graph 10b). Within this group of commodities, the growth of 27.1 percent in the price of corn stands out. To a large extent, this is due to greater demand for this grain, for human consumption in China and for ethanol production in the U.S. In contrast, wheat prices showed a smaller increase (9.7 percent), because world production of this grain has recovered due to better weather conditions after last year's adverse effects registered in Australia and Russia.

Graph 10
Commodity Prices
Index 2002=100



Source: IMF. Source: IMF.

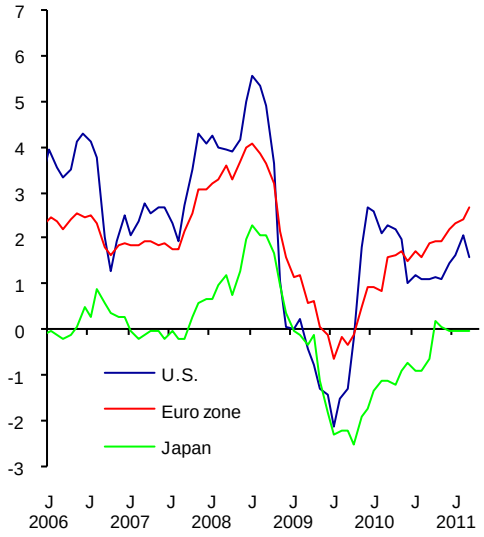
3.1.3. World Inflation Trends

Headline inflation and its short-term expectations rose in the main advanced economies, mainly as a result of commodity price increases. On the other hand, with a few exceptions, such as the United Kingdom, core inflation has remained low, due to the large amount of idle productive capacity and slack conditions in the labor market that prevailed in these countries. Even more, long-term inflation expectations have maintained relatively stable.

In the U.S., headline inflation grew from 1.5 percent last December to 2.7 percent in March (Graph 11a), to a large extent, due to a rapid increase in gasoline price. In turn, core inflation remained low, but registered certain acceleration, moving from 0.8 percent to 1.2 percent in the same period (Graph 11b). In the context of the moderate recovery of economic activity, and anticipating that the inflation increase, derived from higher prices of energy and other commodities, would be temporary, the U.S. Federal Reserve Bank has decided in its recent Monetary Policy Committee meetings to continue with the quantitative stimulus till June, as planned. This will be realized by completing its program of net purchase of Treasury securities (QE2) and through the reinvestment of principal payments from its securities portfolio. The Federal Reserve also stated in its press release of April 27 that it would regularly review the amount and the composition of its security holdings. It would also maintain the federal funds target rate within the present interval of 0 to ¼ percent, and it would continue assuming that economic conditions will probably warrant the federal funds rate to maintain at exceptionally low levels for an extended period.

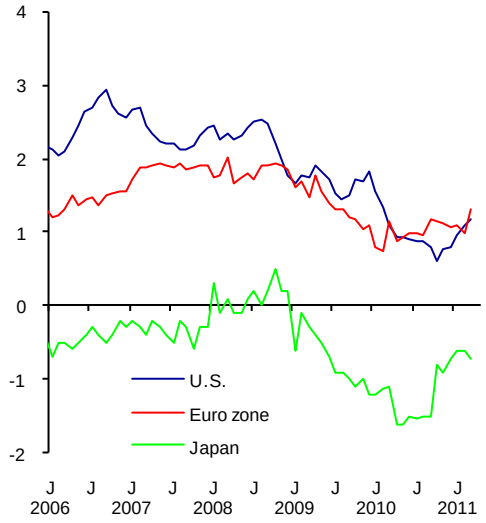
Graph 11
Inflation in Advanced Economies
Annual change in percent

a) Headline



Source: BLS, Eurostat and Statistics Bureau of Japan.

b) Excluding Foods and Energy



Source: BLS, Eurostat and Statistics Bureau of Japan.

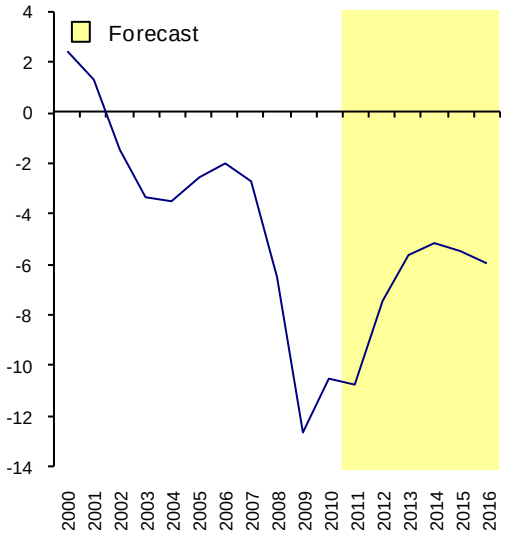
The discussion about the future of the U.S. monetary policy has been influenced by the state of this country's public finances. The increase in the deficit and public debt (due to cyclical effects, income decrease and growth of expenditure on the adopted stimulus measures), has come on top of the structural problems stemming from pension and medical assistance programs. All this has resulted in a deterioration of the medium-term fiscal sustainability outlook (Graph 12). Although the U.S. economic strength and its role as the issuer of the world's reserve currency, which reduces its financing costs, make facing an insolvency problem unlikely, the international organizations and rating agencies have emphasized the risks that postponing the implementation of a credible fiscal consolidation strategy would imply in the medium term.[5,6]

Due to the abovementioned, fiscal policy is not perceived to play an additional role in strengthening economic activity in the near future. On the contrary, the budget proposal for the fiscal year 2012 seeks to halve the deficit by 2013. Thus, if there are additional economic stimulus measures, monetary policy is expected to carry out most of them. In this sense, perhaps the most relevant aspect of the Federal Reserve decisions in the following months is for how long the abovementioned Central Institute will maintain the quantitative easing level that is expected to be reached in June, that is, when it will start reducing its total security holdings, and will stop reinvesting the resources from previous investments at maturity.

[5] The rating agency S&P downgraded in April its outlook of the long-term rating of the U.S. sovereign debt from stable to negative.
[6] See IMF Fiscal Monitor of April 2011.

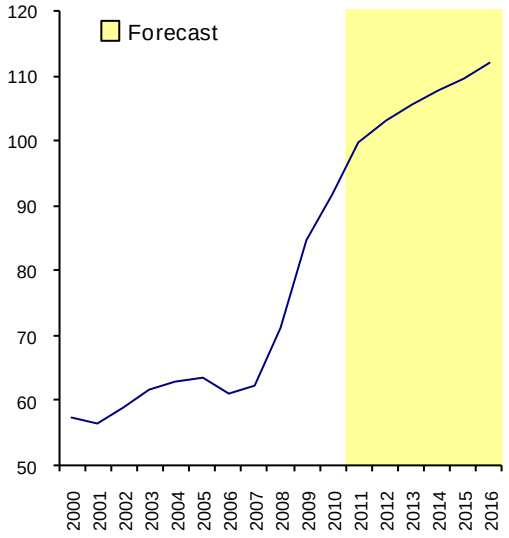
Graph 12
U.S.: Fiscal Deficit and Gross Public Debt
In percent of GDP

a) Fiscal Deficit



Source: Fiscal Monitor, April 2011, IMF.

b) Gross Public Debt



Source: Fiscal Monitor, April 2011, IMF.

In the Euro zone, the annual headline inflation rate also reflected the rapid growth in commodity prices. From December 2010 on, this indicator remained above the upper limit of 2 percent, and in March it reached 2.7 percent. In turn, core inflation located at 1.3 percent in March, as compared to 1.0 percent at the end of the previous quarter. In this environment, at the beginning of April the European Central Bank (ECB) increased its policy rate by 25 basis points to 1.25 percent, after having maintained it at 1.0 percent during the last two years. The ECB based this measure on the presence of greater risks to price stability in the medium term, despite the financing problems of some members and the differences in growth among the region's countries.

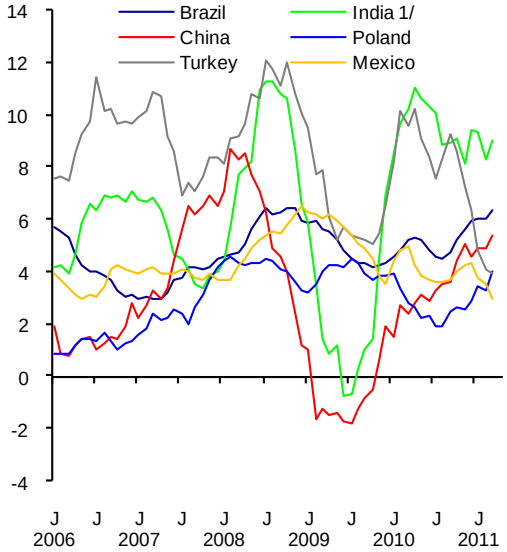
In Japan, annual consumer inflation remained unchanged at 0.0 percent since December 2010, after registering positive figures in October and November. In turn, even though it remained negative, the annual change of the core subindex located at -0.1 percent in March, as compared to -0.4 percent in December. The Bank of Japan has maintained its policy rate close to zero and continued with its quantitative easing program, while having to face new challenges provoked by the critical situation due to the recent natural disasters. Thus, in March the Bank of Japan conducted extraordinary liquidity injections and increased its asset-purchase program, in an effort to stabilize the money market and facilitate the banking activity, in order to support reconstruction projects. In turn, the G7 authorities agreed to undertake a coordinated exchange rate intervention aiming to depreciate the currency of Japan.

Inflationary pressures partly driven by higher commodity prices were observed in various emerging economies, whose expansion phase of the economic cycle is in an advanced stage (Graph 13). In China, consumer inflation located at 5.4 percent in March, above the 4.6 percent observed in December. In India, wholesale prices increased at an annual rate of 9.0 percent in March, as

compared to 9.4 percent in December. In the case of Brazil, inflation raised from 5.9 percent in December to 6.3 percent in March. In this environment, the monetary authorities of various emerging economies continued withdrawing the strong monetary stimulus, introduced in the context of the international financial crisis, and adopted other restrictive measures.

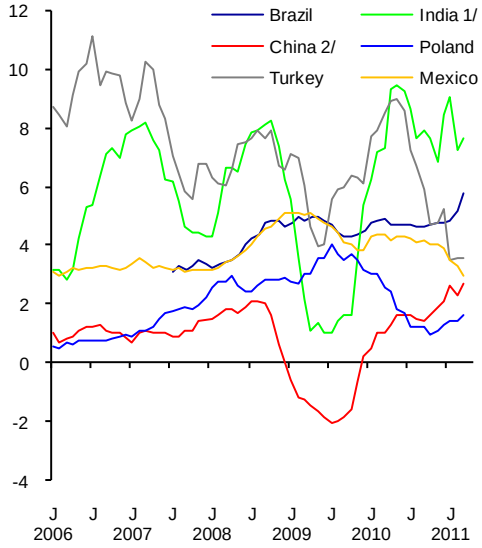
Graph 13
Inflation in Emerging Economies
Annual change in percent

a) Headline



1/ Referring to inflation of wholesale prices.
Source: Country's Statistics Bureaus.

b) Excluding Foods and Energy



1/ Referring to inflation of wholesale prices.
2/ Headline inflation excluding foods.
Source: Country's Statistics Bureaus.

3.1.4. World Financial Markets

International financial market conditions improved during the first quarter. Nevertheless, tensions caused by doubts about the fiscal solvency of some of Europe's economies and about their banking systems soundness persisted in the region. The impact on the international financial markets caused by the conflicts in the Middle East and North Africa, as well as the natural disasters occurred in Japan has not been significant.

With the purpose of safeguarding financial stability of the Euro zone, the European Union achieved significant progress in the efforts to strengthen the crisis management strategy, the coordination of its policies and its government structure during the first quarter of 2011. With regard to crisis management, the European authorities pledged to establish the effective lending capacity of the European Financial Stability Facility (EFSF) at EUR 440 billion. Besides, an effective financing capacity of EUR 500 billion was determined for the European Stability Mechanism (ESM), by means of various financing schemes.[7] The decision of granting financial support under the ESM will require a unanimous approval of the European Union members, once an analysis, with the IMF

[7] The ESM will come into force in June 2013 and will assume the role of the EFSF and of the European Financial Stabilization Mechanism (EFSM) as a provider of financial assistance to member countries of the European Union.

participation, of the debt level sustainability of the applicant country is carried out. Furthermore, the European Union countries reaffirmed their intention of conducting stricter stress tests in order to evaluate the soundness of the important financial institutions of the region.[8,9] Other elements incorporated in the crisis management strategy include: the insertion, from June 2013 on, of collective action clauses in the issuance of sovereign debt securities by the European Union countries and the assignation of preferential creditor status to the loans extended through the ESM.

On the other hand, the Euro zone authorities agreed to implement a closer supervision and make specific commitments every year in different areas, among which stand out the ones relative to pension and medical care schemes, and to fiscal frameworks and financial regulation frameworks. Besides, they supported the legislative proposals aimed at strengthening the Stability and Growth Pact, and their coordination through the so-called European Semester.[10]

Given the growing refinancing problems, at the beginning of March Portugal decided to apply for financial assistance from the European authorities and the IMF. In the first days of May the government of this country announced that it had reached an agreement with these entities as to the commitments it would assume in order to be eligible for financial assistance. The package amount is EUR 78 billion, of which EUR 26 billion will be extended by the IMF, and the remaining EUR 52 billion, by the European Union. Portugal committed itself to reducing its budget deficit to 3 percent of GDP by 2013, to implementing structural reforms to promote growth, and to strengthening its financial system. Nevertheless, volatility persists in the debt markets of some countries given a possibility of a new fiscal and/or banking crisis in the area. During the first quarter, the credit ratings of Spain, Portugal and Greece were downgraded by the rating agencies.[11]

The long-term interest rates in the main advanced economies showed an upward trend from mid-October 2010 on, as its economic recovery has been improving. However, starting from mid-February, given the dissemination of some economic indicators signaling a weaker recovery than expected, particularly in the U.S., the emergence of political instability in the Middle East and North Africa and the natural disasters in Japan, the long-term rates of the main advanced countries interrupted this upward trend (Graph 14a and Graph 14b).

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[8] The recently created European Banking Authority (EBA) established in March the criteria and scenarios for banks' stress tests, which will be conducted before June 2011.

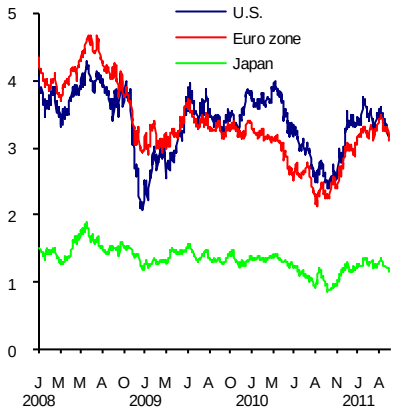
[9] At the end of March, Ireland announced the results of the stress tests realized in its banks, which showed that for the capital requirements to remain above the required minimum, around EUR 24 billion additionally are needed.

[10] The European Semester is a new governance structure approved last September, by means of which the authorities of the European Union and of the Euro zone will coordinate ex-ante their economic and budgetary policies, with the purpose of guaranteeing their consistency both with the Stability and Growth Pact and with the so-called Europe 2020 strategy.

[11] The credit rating of Greece was downgraded once again on May 9, 2011.

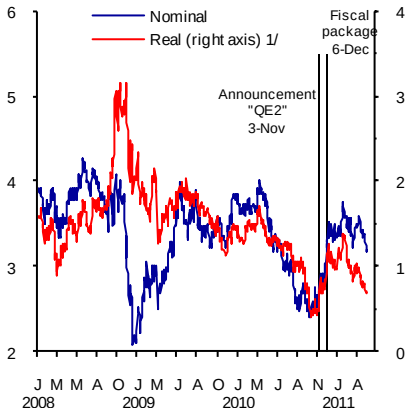
Graph 14
Interest Rates and Exchange Rate

a) Advanced Economies: Nominal Yield of 10-year Treasury Bonds
In percent



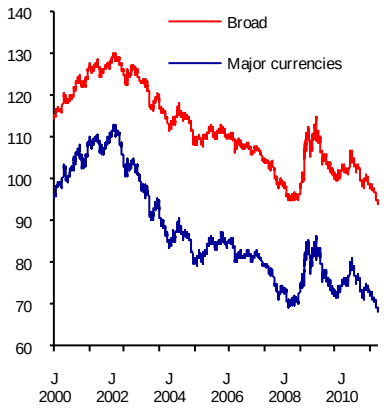
Source: Bloomberg.

b) U.S.: Nominal and Real Yield of 10-year Treasury Bonds
In percent



Note: "QE2" refers to the second program of quantitative monetary easing.
1/ Yield of Treasury bonds indexed to inflation.
Source: U.S. Federal Reserve.

c) U.S.: Index of Effective USD Exchange Rate 1/



1/ Broad Index Jan-97=100 and major currencies Mar-73=100. An index increase is equal to an USD appreciation.
Source: U.S. Federal Reserve.

As to the exchange market, the USD depreciated against the majority of currencies during the first quarter of 2011 and so far in the second (Graph 14c). Although the geopolitical events in the Middle East and North Africa, as well as the natural disasters in Japan stimulated greater demand for U.S. assets, it was not sufficient to counteract the downward trend shown by the USD since mid-2010. The EUR appreciation accelerated due to the increase in the policy interest rate implemented in April by the ECB. Although the JPY lost value against the USD during this quarter, with the help of massive interventions for this purpose by G7 central banks, it registered pressures to appreciate due to the expected capital repatriation necessary to reconstruct its infrastructure. The securities markets in advanced countries demonstrated lower profits as compared to the previous quarters, but they were still significant.

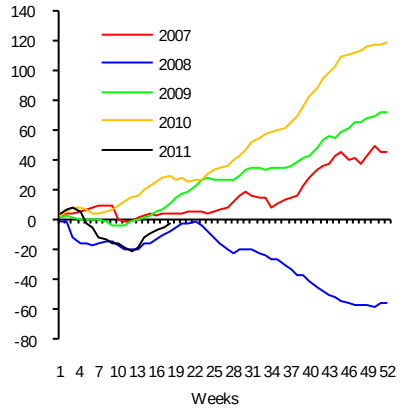
During the first three months of the year, capital flows to emerging economies registered volatility. This occurred particularly due to the uncertainty given the events in the Middle East and North Africa, as well as in Japan, but also because of the concern about some of these economies' overheating. Demand for the sovereign debt securities of these countries remained basically unchanged during the quarter, while equity investment experienced a sustained drop during most of the quarter (Graph 15a). The latter was reflected in the falls in the stock markets of several of these economies (with exceptions, such as China) (Graph 15b), as well as in the increment in their sovereign risk indicators.

Nevertheless, from the last week of March onwards, certain recovery of capital flows to emerging countries, and some portfolio adjustments, implying these flows' rebalancing among countries, have been observed. And, in general, the appreciation trend of their currencies was intensified (Graph 15c). The environment of lower risk aversion in the international financial markets contributed to the aforesaid. In some cases the authorities even implemented

additional measures to restrict capital flows or moderate their effects on their economies.[12]

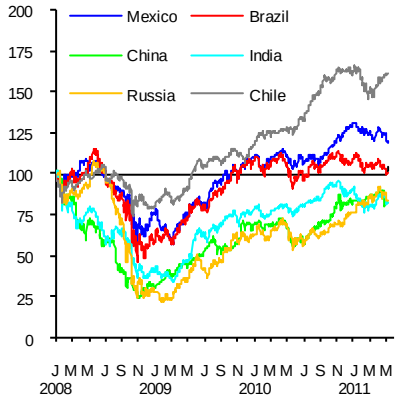
Graph 15
Financial Indicators in Emerging Economies

a) Accumulated Flows to Emerging Economies (Equity and Bonds) 1/
USD billion



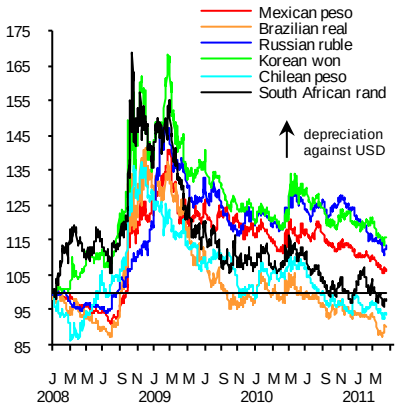
1/ The sample covers funds used for the purchase-sale of equity and bonds of emerging economies, registered in advanced economies' markets. Flows exclude portfolio yields and exchange rate fluctuations.
Source: Emerging Portfolio Fund Research.

b) Stock Markets in Selected Emerging Economies
Index 01/01/2008=100



Source: Bloomberg.

c) Exchange Rates in Selected Emerging Economies
Index 01/01/2008=100



Source: Bloomberg.

3.2. Developments in the Mexican Economy

3.2.1. Economic Activity

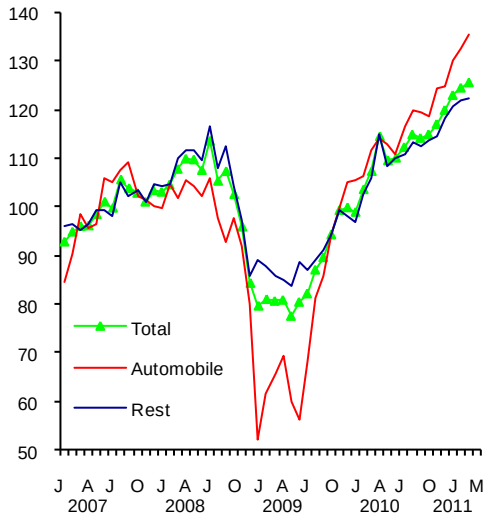
During the first quarter of 2011, aggregate demand accelerated, reflecting both the dynamism of the external demand and a more widespread reactivation of the domestic expenditure components. As a result, aggregate expenditure has continued to show a favorable trend and presents a more balanced composition.

The most recent foreign trade indicators show that merchandise exports have maintained a substantial dynamism, especially those corresponding to the manufacturing sector. This evolution has spread through different categories of goods and is the result of higher exports to both the U.S. and the rest of the world (Graph 16).

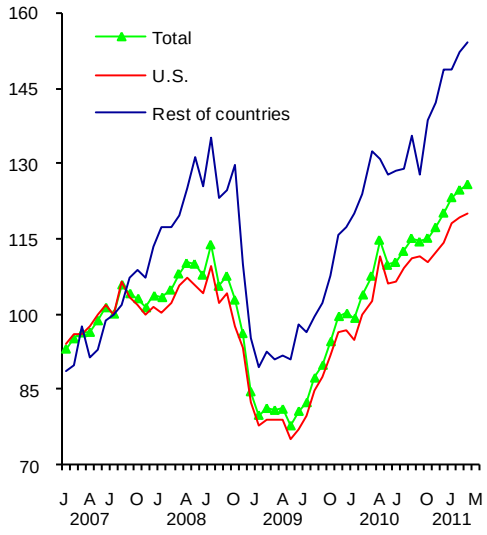
[12] For example, in Brazil at the beginning of 2011 a minimum reserve requirement of 60 percent was introduced on short USD positions held by local banks, on the sums that exceed the amount, either of USD 3 billion or of the value of their tier-one capital. Furthermore, the tax on financial operations (*el impuesto sobre operaciones financieras*, IOF) on the loans in foreign currency for terms up to two years, taken by local institutions, increased to 6 percent. In January in Korea, a 15-percent tax on government securities holdings of foreign investors was introduced. In January in Taiwan, the authorities increased the minimum reserve requirement on accounts in local currency, held by non-residents, to 90 percent of stocks exceeding the outstanding balance on December 30, 2010. Stocks lower than the levels of the end of 2010 were subject to a minimum reserve requirement of 25 percent. In March in Indonesia a limit of 30 percent of the capital for short-term loans in foreign currency, subscribed by the banks, was established again.

Graph 16
Foreign Trade Indicators
Index 2007=100; seasonally adjusted data

a) Manufacturing Exports



b) Manufacturing Exports by Region of Destination



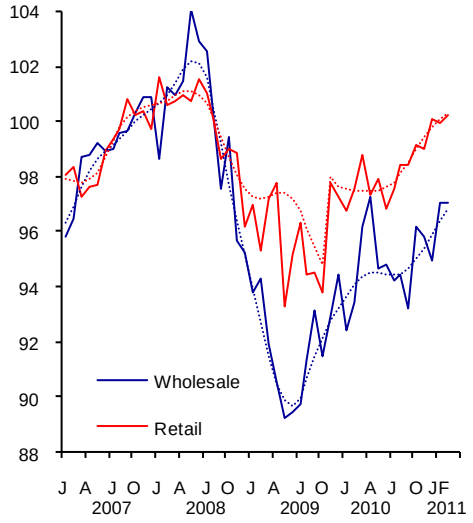
Source: Banco de México.

With regard to domestic demand, timely indicators of private consumption show that it continues registering a positive trend. In fact, for the period analyzed in this Inflation Report this aggregate is estimated to have reached levels similar to those observed before the global crisis (Graph 17a). In turn, investment has exhibited clearer signs of reactivation in recent months. However, it is still at levels below those observed before the crisis (Graph 17b).

The evolution of domestic expenditure reflects the fact that several of its determinants continue to show a recovery. In particular, the real wage bill of the formal sector of the economy has showed a significant increase, as a result of higher employment levels in this sector (Graph 18a). In turn, producers' and consumers' confidence indicators in general have also shown certain improvement, despite still locating below pre-crisis levels (Graph 18b). Workers' remittances recovered in the recent months, although they still remain at levels below the ones registered up to mid-2007 (Graph 18c). Finally, commercial banks' financing for consumption continued reactivating in the first months of 2011, though at a moderate pace (Graph 18d), while the banks' financing to private non-financial firms continues growing at higher rates.

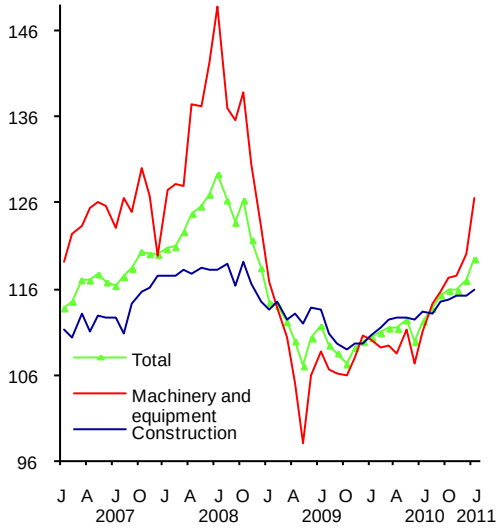
Graph 17
Domestic Demand Indicators

a) Commercial Establishments' Sales
Index 2008=100; seasonally adjusted and trend data



Source: Prepared by Banco de México with data from the Monthly Survey on Commercial Establishments (*Encuesta Mensual sobre Establecimientos Comerciales*), INEGI.

b) Investment and its Components
Index 2005=100;
seasonally adjusted data



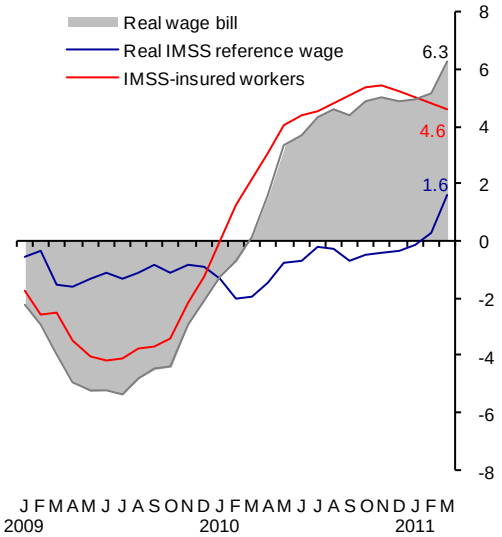
Source: Prepared by Banco de México with data from México's System of National Accounts, INEGI.

Derived from the aforementioned, productive activity continued registering a positive trend. In particular, during the last months the industrial activity accelerated (Graph 19a), as a result of a greater expansion pace of both the manufacturing and the construction sectors (Graph 19b). In turn, the upward trend presented by some services starting from mid-2009 has been spreading, following the reactivation in the domestic spending. Indeed, apart from the growth exhibited since the beginning of the recovery by services, primarily related to the external sector (such as commerce and transport), the growth of those services aimed at the domestic market (such as telephone service, business support services, education and financial services), has also shown a greater dynamism.

Thus, the most recent indicators suggest that in the first quarter of 2011 GDP would present an increase in quarterly seasonally adjusted terms of approximately 0.6 percent, thereby maintaining its positive trend registered since the second half of 2009 (Graph 20a). This would imply an annual GDP change in the first quarter of 2011 above 5.0 percent (4.6 percent in the fourth quarter of 2010; Graph 20b).

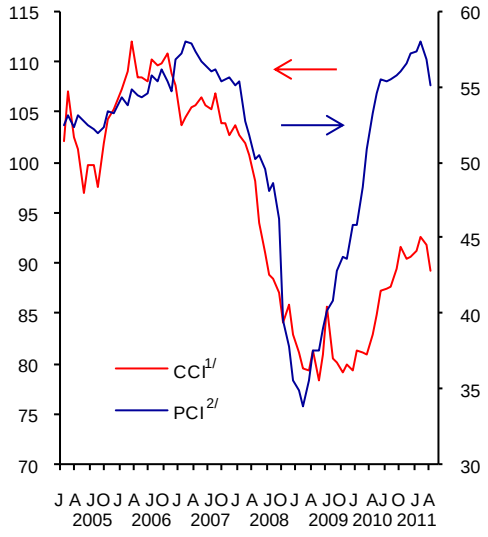
Graph 18
Real Wage Bill and Confidence Indicators

a) Formal Sector's Real Wage Bill
Annual change in percent



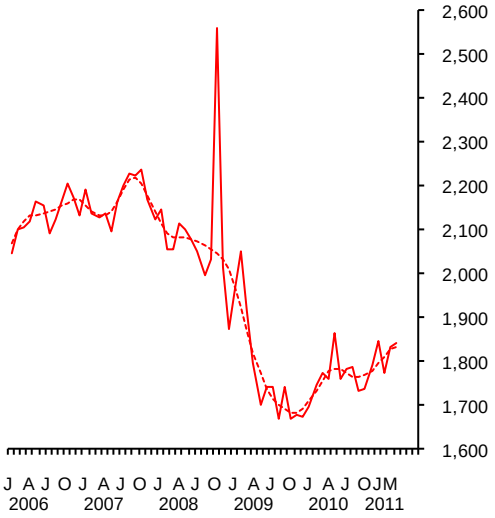
Source: Prepared by Banco de México with data from IMSS.

b) Consumer (CCI) and Producer (PCI) Confidence Indices
Seasonally adjusted data



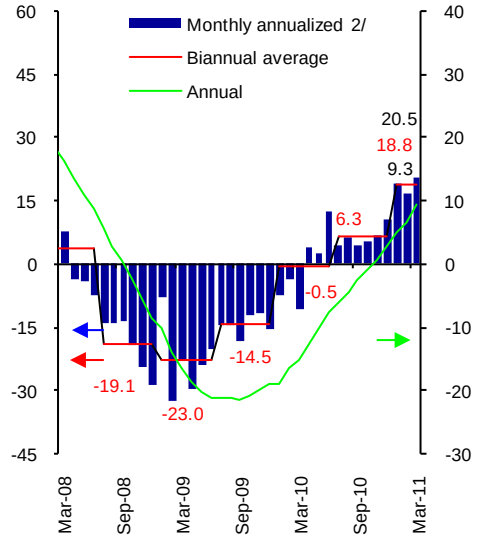
Source: National Survey on Consumer Confidence (*Encuesta Nacional sobre la Confianza del Consumidor*) and Monthly Survey on Business Opinion (*Encuesta Mensual de Opinión Empresarial*); INEGI and Banco de México.
1/ January 2003=100.
2/ Indicator with 50 point reference.

c) Workers' Remittances
USD million; seasonally adjusted and trend data



Source: Banco de México.

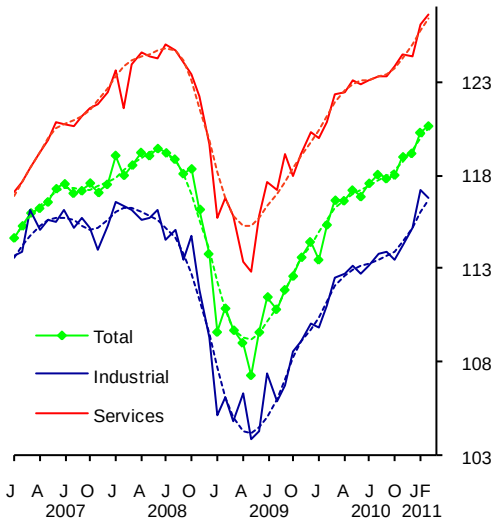
d) Commercial Banks' Performing Credit for Consumption 1/
Real change in percent



1/ Includes credit portfolio of credit-card regulated SOFOM: *Tarjetas BANAMEX, Santander Consumo, Ixe Tarjetas* and *Sociedad Financiera Inbursa*. From February 2009, figures are affected by the reclassification from consumer credit to credit granted to non-financial firms.
2/ Seasonally adjusted figures.
Source: Banco de México.

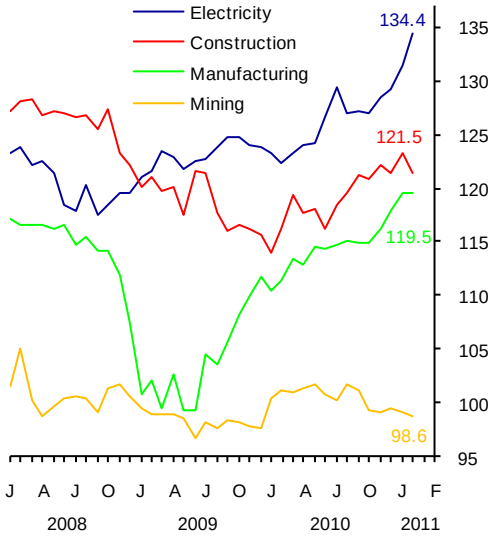
Graph 19
Economic Activity Indicators

a) Global Economic Activity Indicator (IGAE)
Index 2003=100;
seasonally adjusted and trend data



Source: Mexico's System of National Accounts, INEGI.

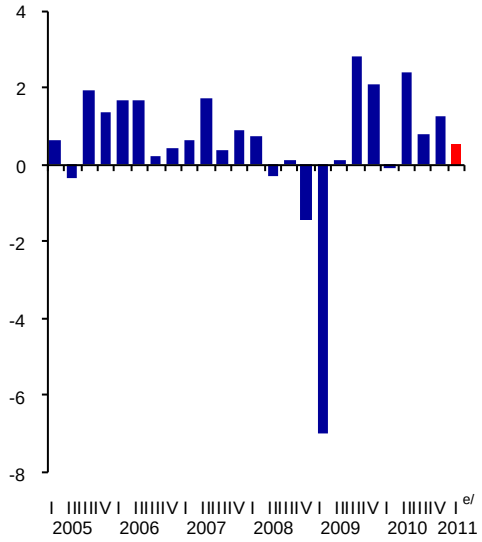
b) Industrial Activity
Index 2003=100;
seasonally adjusted data



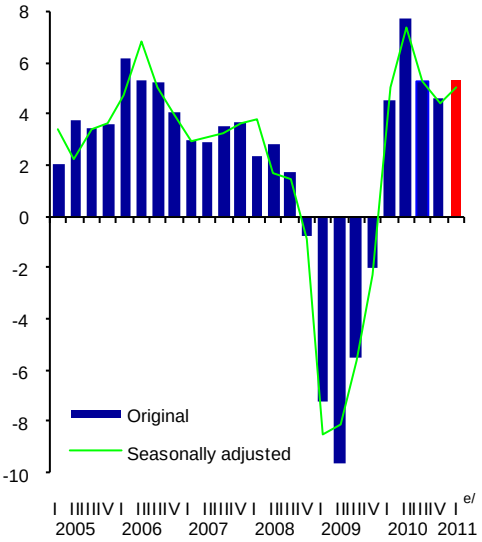
Source: Industrial Activity Indicators, Mexico's System of National Accounts, INEGI.

Graph 20
Gross Domestic Product

a) Quarterly change in percent
Seasonally adjusted data



b) Annual change in percent



Source: Mexico's System of National Accounts. INEGI. Seasonal adjustment up to the first quarter of 2011 by Banco de México.
e/ Estimated by Banco de México.

3.2.2. Financial Saving and Financing in Mexico

The available financial resources of the economy continued increasing. In the fourth quarter of 2010, the annual flow of financial resources (coming from sources) was 9.4 percent of GDP, slightly above the one observed in the previous quarter (Table 2). Thus, the annual flows registered in the last two quarters of

2010 have been the highest since this statistic is elaborated (the fourth quarter of 2002).

In the first quarter of 2011, financial saving of the economy continued showing a favorable performance, reflecting both a greater amount of resources coming from abroad and an increase in the domestic sources of financing (Graph 21a). The annual flow of this saving as percentage of GDP was one of the highest in the last decade. Non-residents' financial saving was a reflection of favorable performance of the Mexican economy and its prospects, as well as the environment of global liquidity combined with the high interest rate spreads between Mexico and the U.S. (Graph 21b and c). The conflicts in the Middle East and North Africa, as well as the natural disasters in Japan had limited effects on the capital flows to Mexico.

In turn, residents' financial saving demonstrated real growth rates above the ones registered in the previous quarter, particularly referring to voluntary saving, which, to a large extent, resulted from higher levels of economic activity (Graph 21b). Nevertheless, in the same way as in the fourth quarter of 2010, residents' financial saving was influenced by the increase in medium- and long-term interest rates that occurred during most of the analyzed quarter, negatively affecting the assets' valuation.

With regard to the use of financial resources, in the fourth quarter of 2010, in the same way as in previous periods, the public sector and the international reserve accumulation by Banco de México absorbed approximately two thirds of the available financial resources. The increase in the public sector borrowing requirements (PSBR) in 2010 was the result of implementing various stimulus programs in the economy to face the negative effects of the international financial crisis. Furthermore, in the first quarter of 2011 the important accumulation of international reserves has maintained, which has allowed strengthening of Mexico's external position given the possibility of a renewed turbulence in the global financial markets.[13] The use of financial resources by the private sector, in an environment characterized by a recovery in the economic activity, has maintained an upward trend, noting the increased flow of financing to households registered in the fourth quarter of 2010 (Table 2).

[13] In the first quarter of 2011, the international reserve accumulation reached USD 9,112 million.

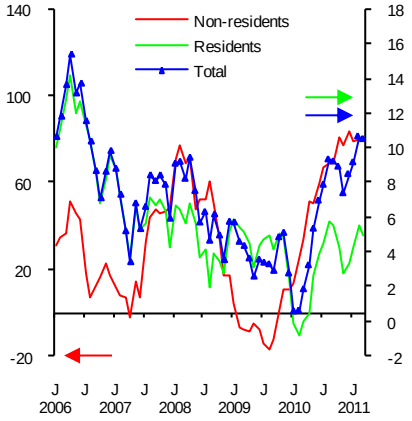
Table 2
Total Funding for the Mexican Economy (Sources and Uses)
Percentage of GDP

	Annual Flows						Stock 2010 IV	
	2009 III	2009 IV	2010 I	2010 II	2010 III	2010 IV	% GDP	Est. %
Total Sources	**3.8**	**4.0**	**5.5**	**7.8**	**9.1**	**9.4**	**78.4**	**100.0**
Domestic Sources 1/	4.7	3.3	3.0	4.1	4.9	4.2	55.2	70.3
Foreign Sources 2/	-0.9	0.7	2.5	3.7	4.1	5.2	23.3	29.7
Total Uses	**3.8**	**4.0**	**5.5**	**7.8**	**9.1**	**9.4**	**78.4**	**100.0**
Public Sector	3.8	3.4	3.1	3.5	3.7	3.8	39.1	49.9
Public Sector (PSBR) 3/	3.3	2.6	2.2	2.6	3.1	3.4	36.7	46.8
States and Municipalities	0.5	0.8	0.9	0.9	0.7	0.4	2.5	3.2
International Reserves 4/	-0.9	0.5	1.8	2.8	3.2	2.2	10.7	13.6
Private Sector	-0.4	0.0	0.7	1.5	2.0	2.5	31.3	39.9
Households	0.1	0.0	0.1	0.3	0.4	0.9	13.5	17.2
Consumption	-0.6	-0.5	-0.3	-0.1	0.0	0.2	3.8	4.8
Housing 5/	0.7	0.5	0.4	0.4	0.4	0.8	9.7	12.4
Firms	-0.5	0.0	0.6	1.2	1.6	1.6	17.8	22.7
Domestic 6/	0.3	0.4	0.5	0.6	0.9	1.1	10.6	13.6
Foreign	-0.8	-0.4	0.1	0.6	0.7	0.5	7.2	9.2
Commercial Banks' Foreign Assets 7/	0.1	-0.5	-0.3	-0.4	0.1	0.5	2.0	2.5
Other 8/	1.2	0.6	0.3	0.5	0.0	0.4	-4.7	-6.0

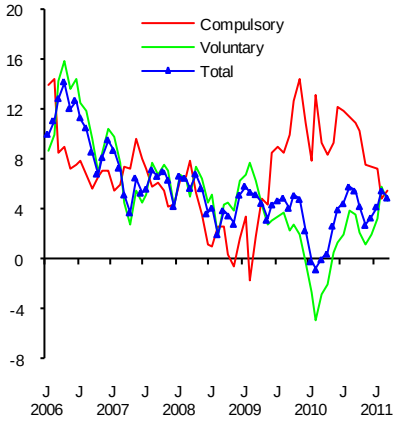
Source: Banco de México.
Note: Figures may not add up due to rounding. Figures expressed as a percentage of average GDP of the last four quarters. The information on (revalued) flows is stripped from the effect of exchange rate fluctuations.
1/ Includes monetary aggregate M4 held by residents. Annual revalued flows of domestic sources exclude the effect of the reform to the ISSSTE Law on monetary aggregate M4. Information on the stock of domestic sources includes the effect of this reform.
2/ Includes monetary aggregate M4 held by non-residents, foreign financing for the federal government, public institutions and entities, and foreign financed investment projects (PIDIREGAS), commercial banks' foreign liabilities and financing to the non-financial private sector.
3/ Public Sector Borrowing Requirements (*Requerimientos Financieros del Sector Público*, RFSP or PSBR, for its acronym in English) and historical stock of Public Sector Borrowing Requirements (HSPSBR or SHRFSP, for its acronym in Spanish) as reported by the Ministry of Finance (SHCP). Figures of revalued flows exclude the impact of the reform to the ISSSTE Law on PSBR. Information on HSPSBR does include the effect of this reform on the public debt.
4/ As defined by Banco de México's Law.
5/ Total portfolio from financial intermediaries and from the National Housing Fund (*Instituto del Fondo Nacional de la Vivienda para los Trabajadores,* Infonavit), and from the ISSSTE Housing Fund (*Fondo de la Vivienda del ISSSTE*, Fovissste). Includes debt-restructuring programs.
6/ Total portfolio of financial intermediaries. Includes debt-restructuring programs.
7/ Includes assets from abroad and foreign financing.
8/ Includes capital accounts and results and other assets and liabilities of commercial and development banks, Banco de México, non-bank financial intermediaries and INFONAVIT, as well as non-monetary liabilities from IPAB, among others.

Graph 21
Financial Saving

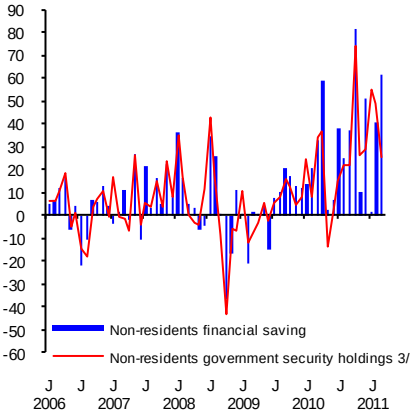
a) Total Financial Saving 1/ 2/
Real annual change



b) Residents Financial Saving 2/
Real annual change



c) Non-residents Financial Saving and Government Security Holdings
Monthly change in MXN billion



Source: Banco de México.
1/ Defined as monetary aggregate M4 minus the stock of banknotes and coins held by the public.
2/ Excludes the impact of the reform to the ISSSTE Law on this aggregate.
3/ Holdings of government securities in nominal value. Figures available up to March 31, 2011.

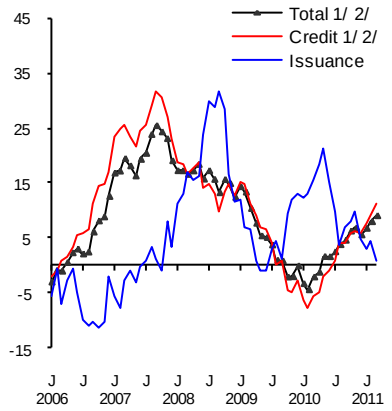
Total financing to the private non-financial business sector continued its recovery since mid-2010, showing positive real growth rates, after a period of contraction due to the international financial crisis. To a large extent, this responds to the increase in credit demand that occurred in an environment of better economic prospects.

During the first quarter of 2011, domestic financing to non-financial private firms kept growing, in real terms, at higher rates, reflecting a more favorable dynamism of the credit granted by commercial banks.[14] The referred rate located at 9.0 percent in March, which is congruent with the phase of the business cycle the economy is going through, and suggests that this financing is supporting the economic activity recovery (Graph 22a and b). Furthermore, firms continued increasing their placement abroad. Based on the preliminary data on the issuances realized in March 2011, in the first quarter of 2011 new placements of a total of USD 3,534.1 million were realized in the international financial markets, while during the two previous quarters a total of USD 658.9 million of securities was issued abroad.

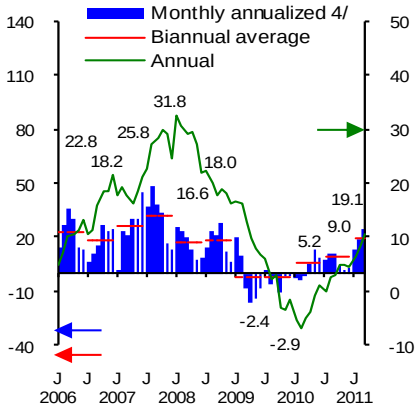
In March 2011, commercial banks' performing credit for consumption maintained, for the fifth consecutive month, a greater rate of expansion (Graph 22c), as a result, among other factors, of the growing employment levels and of greater consumer confidence. In turn, the housing sector continued its positive growth (Graph 22c), while its delinquency rates remain at low levels and continue their downward trend.

Graph 22
Domestic Financing to Non-financial Private Sector

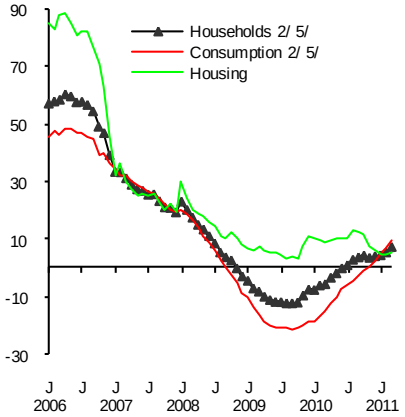
a) Domestic Financing to Non-financial Private Firms
Real annual change in percent



b) Commercial Banks' Performing Credit to Non-financial Private Firms[2/ 3/]
Real change in percent



c) Commercial Banks' Performing Credit to Households
Real annual change in percent



Source: Banco de México.
1/ These figures are affected by the disappearance of some non-banking financial intermediaries and their conversion to non-regulated Sofom.
2/ From February 2009 onwards, figures are affected by the reclassification of credit granted to small- and medium-size firms (PyMES, for its acronym in Spanish) from consumer credit to credit granted to non-financial firms.
3/ Figures adjusted in order to avoid distortions due to the reclassification of credit granted to business sector for housing construction.
4/ Seasonally adjusted figures.
5/ Figures as of March 2008 include total consumer credit portfolio of commercial banks' subsidiaries Sofom E.R.

[14] Given that foreign direct financing statistics are obtained with a certain lag, some aspects regarding domestic financing, as well as foreign financing by means of securities issuance will be highlighted below.

4. Monetary Policy and Inflation Determinants

The monetary policy stance is aimed at achieving the convergence of inflation to its 3 percent target, and has therefore been fundamental for propitiating the reduction of inflation.

In particular, between January and April 2011, Banco de México's Board of Governors maintained its Overnight Interbank Interest Rate at a level of 4.5 percent (Graph 23). This was in line with:

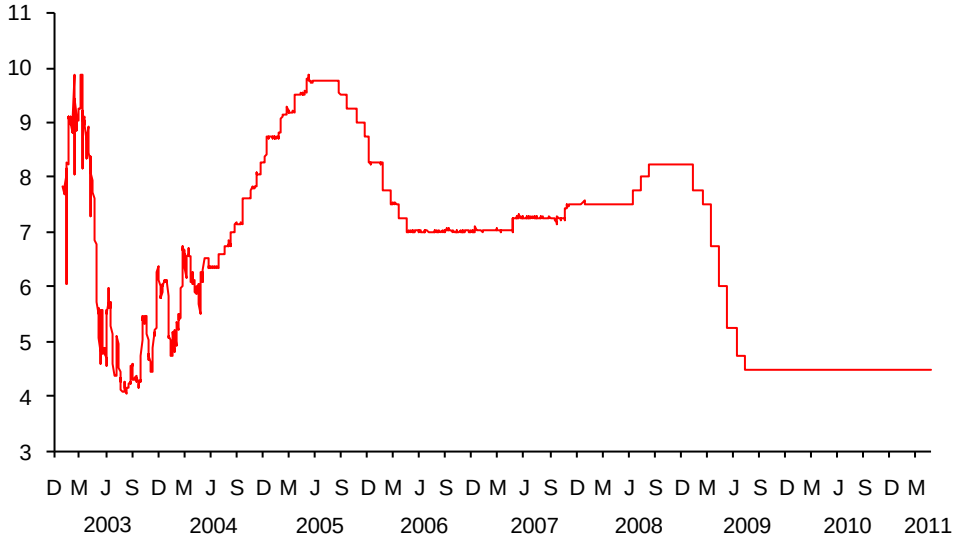
i. The recovery of productive activity, which has led the economy towards a more advanced phase of the economic cycle, still without generating pressures on prices.

ii. An appreciation and lower volatility of the exchange rate.

iii. The fact that increases in international commodity prices did not result in a generalized contamination of neither domestic prices, nor inflation expectations.

iv. The inflation expectations, which remain anchored within the variability interval of plus/minus one percentage point around the 3 percent permanent target, although being located above that level.

Graph 23
Overnight Interbank Interest Rate[1/]
Percent annual



1/ The target for the Overnight Interbank Interest Rate is shown since January 21, 2008.

It is particularly relevant that, despite an environment of greater dynamism in the economic activity, analysts' inflation expectations for different horizons have maintained relatively stable during the last months. With respect to the short-term inflation expectations, their average for the end of 2011, as reported by Banco de México's survey, was located around 3.9 percent from

January to April 2011 (Graph 24).[15] Regarding this, it should be noted that the average for the expectations of the core subindex has maintained close to 3.7 percent, so the implicit non-core inflation expectations remain approximately at 4.6 percent. For longer-term horizons, the average expectations for the end of 2012 remained close to 3.8 percent.[16] In turn, the mean reported for the next 4-year average has remained at 3.6 percent and the average for the next 5 to 8-year period at 3.5 percent. This shows that the expectations for all time horizons are anchored within the variability interval of plus/minus one percentage point around the 3 percent permanent target (Graph 25a).

These results are congruent with those obtained from a statistical analysis of the evolution of the whole distribution of inflation expectations reported by economic analysts in Banco de México's survey, and not only with the evolution of the average responses (Box 1).

Despite the favorable inflation behavior, especially the downward trend shown by its core component, inflation expectations remain above the 3 percent target. With regard to this, it is noteworthy that even when inflation of energy prices is lower than in other countries, it is considerably above the 3 percent level. This is one of the elements that have led to the fact that over time non-core inflation tends to be located above 3 percent, a factor influencing the level where headline inflation expectations are located.

Complementing the analysis of inflation expectations, break-even inflation and inflationary risk (difference between the nominal yield on 10-year bonds and the real yield of the same term indexed debt instruments), after having reached 4.3 percent in mid-January, recently reduced to levels close to 4.0 percent (Graph 25b). Considering that the inflationary risk premia is positive, this implies that long-term inflation expectations implicit in the referred instruments are located at levels clearly below 4.0 percent, in line with the information from surveys of economic analysts. [17,18]

[15] In the case of the Infosel survey of January 7, 2011, the average of the expectations for the end of 2011 was 3.90 percent, while the corresponding figure for the May 6, 2011 survey was 3.87 percent.

[16] The average of inflation expectations reported in the Infosel survey of May 6, 2011 for the end of 2012 was 3.75 percent.

[17] Because of their nature, these indicators tend to be affected by changes in the liquidity conditions prevailing in the money market. Therefore, they should be interpreted carefully given the volatility commonly observed in their behavior.

[18] Based on a model for the term structure of interest rates (Cortés and Ramos-Francia [2008], "A Macroeconomic Model of the Term Structure of Interest Rates in Mexico", Working Paper 2008-10, Banco de México), which allows the risk premia to vary over time, it is estimated that between July 2001 and March 2011 the inflationary risk premium implicit in 10-year nominal interest rate bonds was, on average, around 42 basis points.

Box 1
Analysis of Inflation Expectations based on Banco de México's Survey

This box presents an analysis of the evolution of the distribution of inflation expectations reported by economic specialists in Banco de México's monthly survey. The results indicate that despite the environment of greater dynamism of the economic activity, as mentioned in the present Inflation Report, in the last months the economic specialists' inflation expectations for various horizons remain anchored within the variability interval of plus/minus one percentage point around the target of 3 percent, although located above this level.

1. Tools Used

Different statistics of the distributions derived from the responses obtained in the referred survey, in addition to the mean, are analyzed. Also, the concept of stochastic dominance is used to analyze whether the changes reported on a monthly basis in the surveys are of a generalized character. For this purpose, in the first case, box plots are used, and in the second, cumulative distribution functions. It is considered that to estimate the evolution of inflation expectations (and other variables gathered in the surveys) in a more comprehensive way, it is necessary to go beyond the evolution of the mean. For example, it is clear that the probability of the mean of the responses gathered in any survey to be equal from one month to another is zero, although they can be statistically equal. Indeed, it would be necessary to see more distribution moments to obtain more solid conclusions.

1.1 Box Plot

Box plots are a graphic representation of some of the statistics of a set of data or observations. In general, these diagrams are used in economics to graphically represent data sets for their analysis, which allows displaying and comparing some of the properties of the analyzed data set. To explain the interpretation of a box plot, its construction is shown using a hypothetical data set. Consider then the following data set: 2.0, 1.0, 10.5, 11.5, 11.0, 8.0, 12.5, 13.0, 14.0, 13.5, 17.0, 16.0 and 12.0. The steps to follow to construct the box plot are:

a) The median of the data set is estimated (12 in this example). This value determines the line cutting the box in the diagram (Graph 1a).

b) The first quartile, or percentile 0.25 (10.5 in this example), is obtained, determining the lower bound of the box.

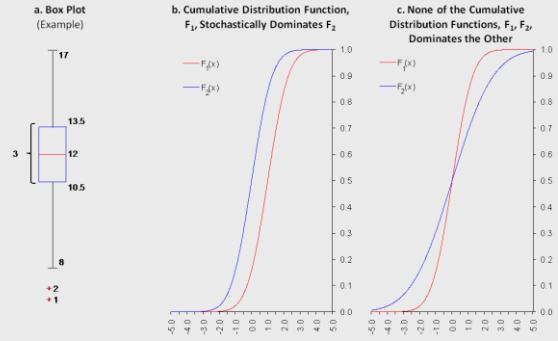
c) The third quartile, or percentile 0.75 (13.5 in this example) is estimated, determining the upper bound of the box.

d) The interquartile range, which corresponds to the difference between the third and the first quartile (3 in this example), is calculated, determining the height of the box.

e) To establish the lower outliers and the bottom whisker of the diagram, the point determined by the first quartile minus 1.5 times the interquartile range is considered, i.e., 10.5 – (1.5 x 3) = 6. Observations below this point are considered outliers and are denoted by a cross (1 and 2 in the example). The bottom whisker is drawn from the lower bound of the box to the lowest possible observation (8 in the example) that does not go beyond the point determined by the first quartile minus 1.5 times the interquartile range (6 in the example).

f) To determine the higher outliers and the upper whisker of the box, the point determined by the third quartile plus 1.5 times the interquartile range is considered, i.e., 13.5 + (1.5 x 3) = 18. Data larger than this value are considered outliers; in this case there are no higher outliers. The upper whisker is drawn from the upper bound of the box to the highest observation (17 in the example), that does not go beyond the third quartile plus 1.5 times the interquartile range (18 in the example), as shown in Graph 1a.[1]

Graph 1



1.2 Cumulative Distribution Function

In economics, a significant number of phenomena are probabilistic and a recurrent problem in their study is the ordering of two random variables. The problem is that given two random variables, it is not trivial to define an order between them. The existence of this order entails a preference between the referred variables.[2] Formally, a probabilistic phenomenon is associated with a random variable **X**, which in turn is related to a cumulative distribution function, denoted by F(x). This function indicates, given a value x, the probability that the referred random variable is smaller or equal to the value x, i.e., $F(x) = \Pr\{\mathbf{X} \leq x\}$.

For the definition of stochastic dominance, consider two random variables $\mathbf{X}_1$, $\mathbf{X}_2$ and, also, two cumulative distribution functions $F_1(x)$ and $F_2(x)$, associated with the two random variables, respectively. It is said that $F_1(x)$ stochastically dominates $F_2(x)$ if $F_1(x) \leq F_2(x)$ for all x; and also, $F_1(x) < F_2(x)$ is satisfied for some x.

Graph 1b presents two cumulative distribution functions, $F_1(x)$ and $F_2(x)$, such that $F_1(x)$ stochastically dominates $F_2(x)$. Note that the first inequality is satisfied and the second inequality is strictly satisfied for, e.g., x = 0. However, there is the possibility that given two random variables, none of them stochastically dominates the other. For this reason, it is not always possible to determine an ordering between them under this criterion. Graph 1c presents two cumulative distribution functions, $F_1(x)$ and $F_2(x)$, where none of them stochastically dominates the other.

Once the procedure to construct the tools is described, the analysis of inflation expectations is presented.

2. Inflation Expectations

This section presents the analysis of inflation expectations for different horizons, such as for the end of 2011, the end of 2012, the average for the next 4 years and the average for 5 to 8 years. The data of inflation expectations, generally considered in the analysis of the Quarterly Inflation Reports, refer to the average of expected inflation by economic analysts. Clearly, a more detailed statistical analysis providing additional information about the dynamics of inflation expectations can be carried out by studying the evolution of the distribution of these expectations. For this reason, the results of this analysis are presented using the two previously described tools.

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[1] See Rice, John, (1994), Mathematical Statistics and Data Analysis, Duxbury Press.

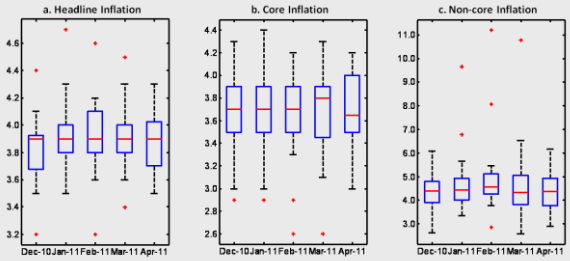
[2] This is a generalization of the case of ordering two numbers. For example, if numbers 3 and 5 are considered, it is possible to order them from the smallest to the biggest number.

First, using box plots, it is determined whether the inflation expectations distribution has changed over the last months. In this way, it is possible to see the evolution of the median, the dispersion and the outliers of inflation expectations in Banco de México's survey in the last months.[3] Second, the analysis of the cumulative distribution function and stochastic dominance for the data obtained in the surveys of December 2010, February and April 2011 is conducted, with the purpose of determining if the inflation expectations among different participants of the survey have been widely modified throughout the last months.

2.1 Inflation Expectations for the End of 2011

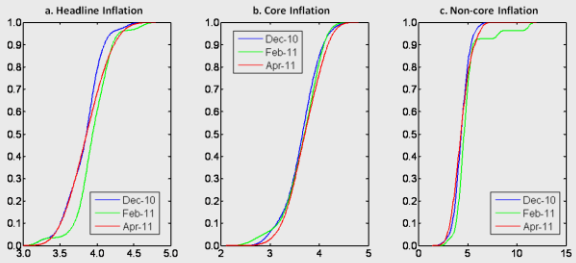
Regarding the short-term expectations (with a horizon of less than 12 months), these, as expected, have presented changes in their distributions, in accordance with the publication of each inflation observation. Nevertheless, these changes do not point in any direction in particular, nor are they generalized. Thus, as it can be seen in Graph 2a, the median of the expectations for the headline inflation for the end of 2011, obtained by Banco de México's surveys in December 2010, January, February, March and April 2011, have not registered important changes, remaining at 3.9 percent. However, they did present small increments in the height of the box, with a lower concentration of observations resulting in a bigger interquartile range. With regard to the core inflation expectations for the end of 2011, it can be observed that their median remained at 3.7 percent level, perhaps with the exception of the March survey, although the interquartile range does not show any important changes and the length of the lower whisker to the median has been increasing (Graph 2b). Finally, with respect to implicit expectations of the non-core inflation, slight movements in the median around 4.4 percent and a recent reduction in the amplitude of whiskers in both directions can be observed (Graph 2c).

Graph 2
Box Plots of Inflation Expectations: End of 2011. Banco de México's Survey
Percent



According to the box plot analysis, the inflation expectations dynamics have not been modified in a generalized manner. This can be more clearly observed in Graph 3, based on the exercises of the cumulative distribution function used to examine if there is any case of stochastic dominance among the expectations distribution from one month to another. As stated before, under the criterion of stochastic dominance, when the cumulative distribution functions cross, it is not possible to determine the ordering among them. In particular, for the end of 2011 it is not possible to observe a generalized change in inflation expectations, given that the cumulative distribution functions cross. Although a slight change can be perceived in headline inflation in the period from December to February, it is not clear whether all the surveyed specialists have revised their expectations in the same direction in April. Besides, from February to April the cumulative distribution function slightly shifts to the left (Graph 3a). Similar behavior is observed in the case of the core inflation expectations and the implicit expectations of the non-core inflation, which highlights that while some revised their expectations upwards, others revised them downwards. For this reason, there is no generalized adjustment in some direction (Graphs 3b and 3c).

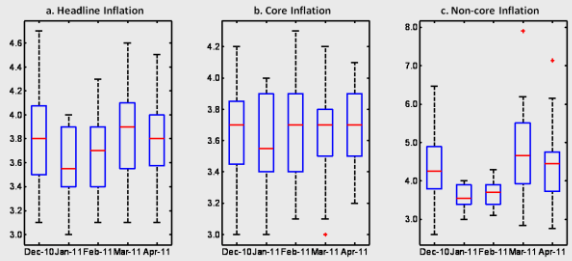
Graph 3
Cumulative Distribution Functions of Inflation Expectations: End of 2011. Banco de México's Survey
Percent



2.2 Inflation Expectations for the End of 2012

Regarding headline inflation expectations for the end of 2012, as observed in Graph 4a, the median has remained at around 3.8 percent in the period between the survey of December 2010 and the survey of April 2011. In this case both the interquartile range and the length of whiskers decreased. With respect to the core inflation expectations for the end of 2012, a similar performance to the one of headline inflation is observed, where the median was located around 3.7 percent in the last months (Graph 4b). In the case of non-core inflation, implicitly obtained from the headline and core inflation, greater variability is observed, both in the case of the median and the interquartile range.

Graph 4
Box Plots of Inflation Expectations: End of 2012. Banco de México' Survey
Percent

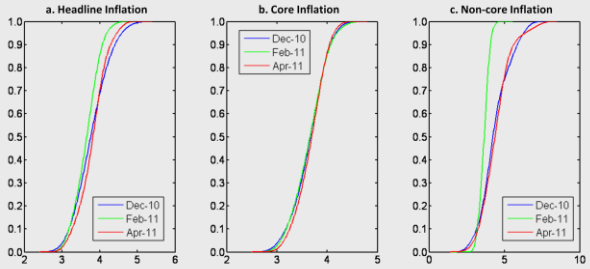


Similar to the expectations for the end of 2011, the box plots for headline, core and non-core inflation do not show generalized changes of inflation expectations for the end of 2012. This can also be seen in Graph 5, which shows that there is no stochastic dominance for the cumulative distribution functions of the expectations for the end of 2012. Indeed, the analysts' expectations adjustments have been in both directions.

In this way and as previously mentioned, despite the environment of greater dynamism in the economic activity, as described in the Inflation Report, inflation expectations for the end of 2011 and 2012 have maintained stable. Although short-term expectations have presented certain volatility, as can be anticipated in expectations with a horizon of less than 12 months, they have not registered an upward or downward trend.

[3] The results are similar when instead of the median, the mean of the expectations for different horizons and subindices is considered.

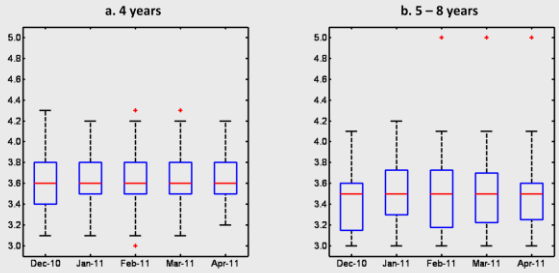
Graph 5
Cumulative Distribution Functions of Inflation Expectations: End of 2012. Banco de México' Survey
Percent



2.3 Longer-term Inflation Expectations

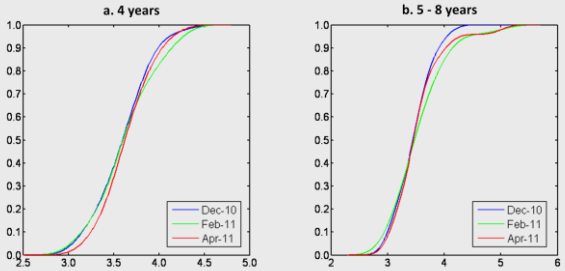
To conclude this analysis, it is important to emphasize that the analysts' expectations distributions for the average for the next 4 years, as well as for the average for the following 5 to 8 years, have remained without considerable changes in the last months. In the case of the average for the next 4 years, as can be seen in Graph 6, the median remains unchanged at 3.6 percent from December 2010 until April 2011. In turn, the box and whiskers' length have presented slight variations. Regarding the inflation expectation for the average for the following 5 to 8 years, the median has also remained stable, at 3.5 percent, and in this case the dispersion has also maintained without significant changes up to the moment.

Graph 6
Box Plots of Inflation Expectations: 4 years and 5 to 8 years. Banco de México's Survey
Percent



This analysis can be confirmed by considering the cumulative distribution functions (Graph 7). In none of the cases stochastic dominance of the cumulative distribution functions of the expectations is observed, which indicates that it is not possible to determine an order among the distributions of the expectations of longer-term headline inflation, or a generalized change in some direction in the referred expectations.

Graph 7
Cumulative Distribution Functions of Inflation Expectations: 4 years and 5 to 8 years. Banco de México's Survey
Percent

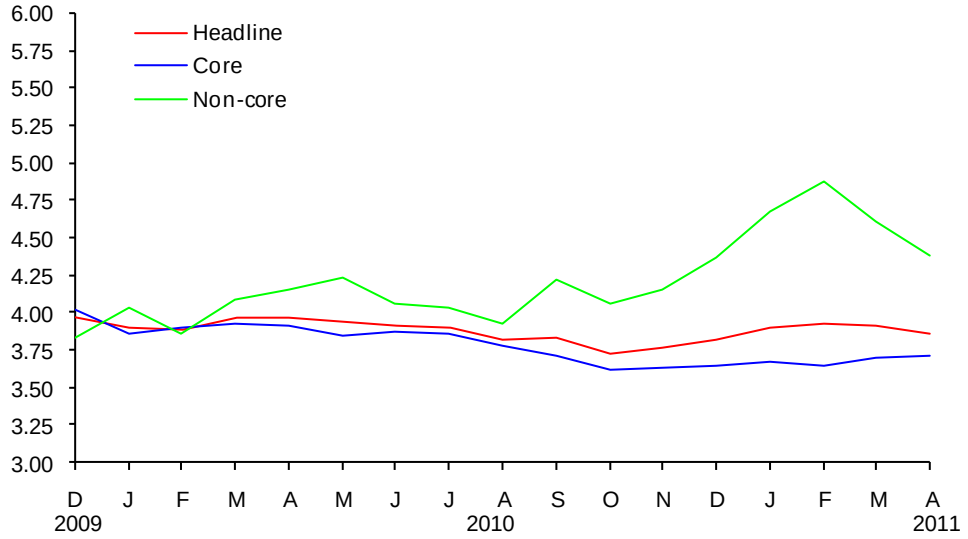


3. Conclusions

As can be seen, the inflation expectations obtained in Banco de México's survey for different time horizons have not presented important changes in the recent months. Indeed, taking into consideration the exercises presented in this box, it can be said that economic analysts' inflation expectations for various horizons remain anchored within the variability interval of plus/minus one percentage point around the target of 3 percent, although located above the referred level.[4]

[4] These results are similar if the distributions of the survey responses reported by both Infosel and Banamex are analyzed.

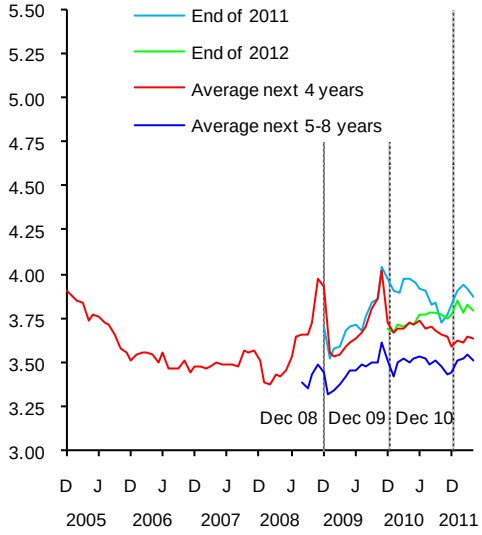
Graph 24
Headline, Core and Non-core Inflation Expectations for 2011
Percent annual



Source: Banco de México's Survey.

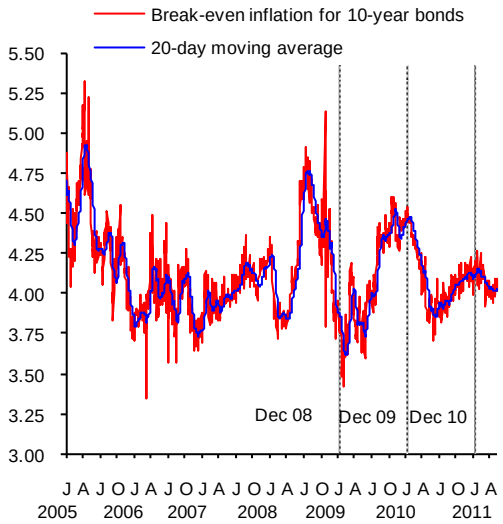
Graph 25
Annual Headline Inflation Expectations and
Break-even Inflation and Inflationary Risk in Long-term Bonds
Percent annual

a) Annual Headline Inflation Expectations



Source: Banco de México's Survey.

b) Break-even Inflation and Inflationary Risk[1/]



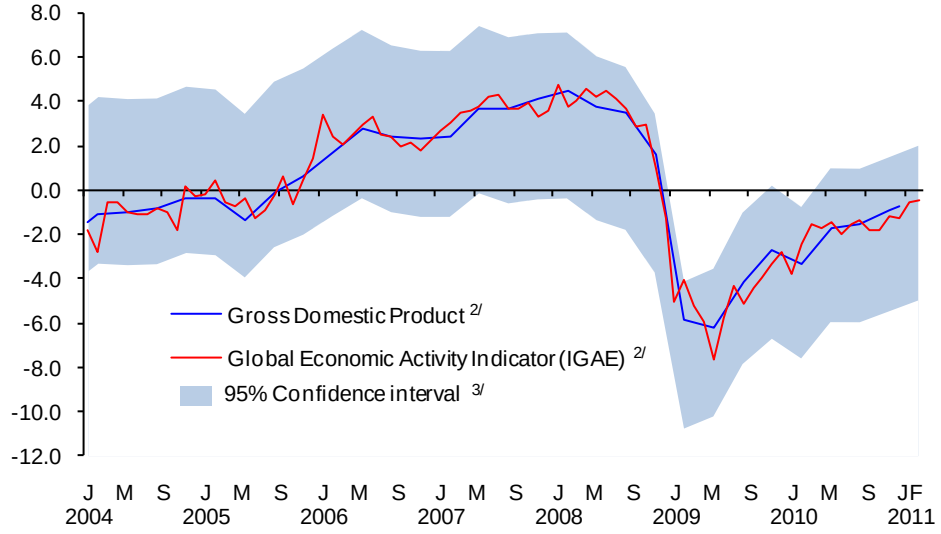
1/ The break-even inflation and inflationary risk implicit in 10-year bonds is calculated based on nominal and real interest rates from the secondary market.
Source: Banco de México estimate with data from Bloomberg.

In order to assess the conditions determining the price setting in the economy, first, it is necessary to evaluate if economy's aggregate expenditure currently constitutes or could become a factor of pressure in the foreseeable future; i.e., if the expenditure increase has led the economy to operate at levels consistent with the potential GDP. Besides, given that the latter concept is not

directly observable and, hence, needs to be estimated by statistical methods, the results obtained should be interpreted as subject to a certain degree of statistical uncertainty.

Taking these considerations into account, despite the fact that the output gap has been closing, at present it is not statistically different from zero; i.e., zero is contained within a 95 percent confidence interval around the gap estimations, which considers the uncertainty regarding its calculation (Graph 26). This would suggest that, presently, the levels at which the economy is operating do not generate pressures on prices.

Graph 26
Output Gap Estimation 1/
Percentage of potential output



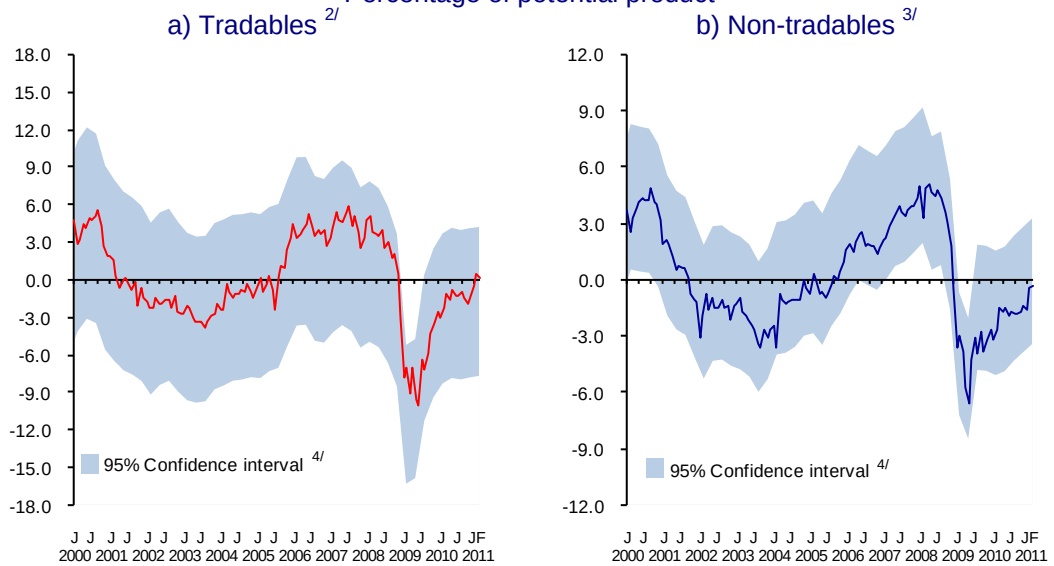
Source: Prepared by Banco de México with data from INEGI.
1/ Estimated using the Hodrick-Prescott (HP) filter with tail corrections; see Banco de México (2009), "Inflation Report, April-June 2009", p.69.
2/ GDP figures up to the fourth quarter of 2010, IGAE figures up to February 2011.
3/ Confidence interval of the output gap calculated with an unobserved components method.

The pace at which the output gap has been closing differs among the sectors producing internationally tradable goods and those producing non-tradable goods and services (Graph 27). In particular, in the second case, there still seems to be a negative gap, suggesting that this sector has not reached its productive potential yet, although this gap does not appear to be different from zero from a statistical viewpoint. On the other hand, in the tradable goods' sector, greater dynamism of external demand has already led the output gap to be located around zero. Nevertheless, as will be seen later, other indicators suggest that relatively slack conditions persist in this sector.

In addition to the output gap analysis, it is important to study the conditions prevailing in the markets of main production inputs, which, to a large extent, determine the evolution of the gap. Indeed, an important channel for evaluating whether aggregate expenditure could lead to pressures on the general price level corresponds to a greater demand in the markets for main production factors. In turn, it is also relevant to carry out an analysis of economy's income and expenditure balance, measured by the current account balance. Finally, given

that the first sector that started a recovery process was the manufacturing sector, it is considered convenient to study its current conditions.[19]

Graph 27
IGAE Gap Estimation 1/
Percentage of potential product



Source: Prepared by Banco de México with data from INEGI.
1/ Estimated using the Hodrick-Prescott (HP) filter with tail corrections; see Banco de México (2009), "Inflation Report, April-June 2009", p.69.
2/ Excluding agricultural.
3/ Includes services, electricity, gas, water and construction.
4/ Confidence interval for the output gap calculated with an unobserved components method.

The analysis of the different input markets suggests that no widespread pressures on their prices, neither on the country's external accounts, are observed, and they will possibly not be observed in the following months. Moreover, the conditions, currently determining the manufacturing sector, both in terms of availability of skilled labor for production and the level of productive capacity utilization, are not the ones observed in an economy that is growing above its productive potential. In particular, the following stands out:

a) In line with the evolution of productive activity, increased formal employment levels have been registered in the labor market (Graph 28a). Nevertheless, several indicators suggest that sluggish conditions still persist. In particular, unemployment and underemployment rates remain at levels above those observed in 2008, before the onset of the global crisis (Graph 28b). In this environment, firms constituting the manufacturing sector do not seem to have faced problems of skilled labor availability in order to increase their production (Graph 28c).[20]

[19] Since the North American Free Trade Agreement came into force, it has been observed in Mexico, with some exceptions, like in 2001, that in general the manufactures tend to lead in the economic cycle with respect to services.

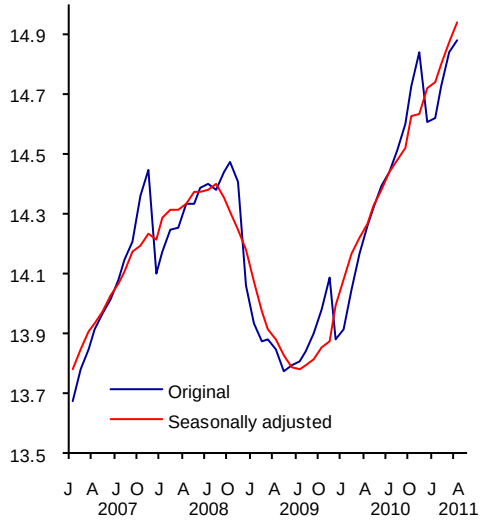
[20] In general, both in Mexico and in other countries, it would be expected that, as the business cycle progresses, it is in the hiring of more skilled labor where tighter labor market conditions would start to be observed.

Labor market conditions have contributed to moderate wage increases. On the one hand, the average income level of the jobs generated during the economy's recovery is lower than that of the jobs lost during the recession (Graph 28d). On the other hand, econometric exercises suggest that the observed wage increments have been lower than those historically presented in similar business cycle phases (Box 2).

b) The fact that the levels of installed productive capacity utilization are below pre-crisis levels has allowed the reactivation of production levels to be greater than that observed in employment. Thus, an important increase in workers' average productivity level has been observed. This, together with remuneration evolution, has resulted in a decline in labor unit costs (Graph 29) and an increase in firms' competitiveness. The aforementioned has favorably affected price behavior and has contributed to an increased creation of jobs.

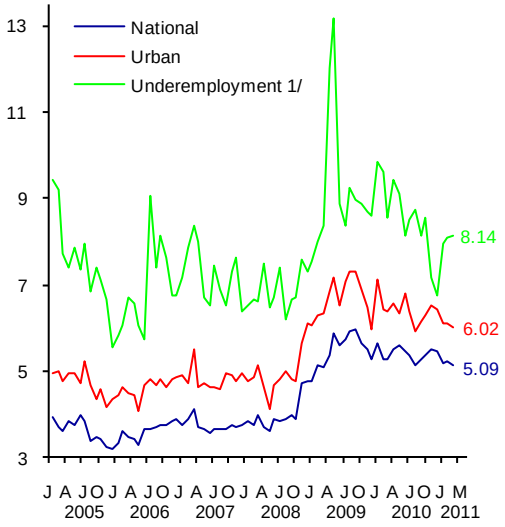
Graph 28
Labor Market Indicators

a) IMSS-insured Workers
Millions of persons



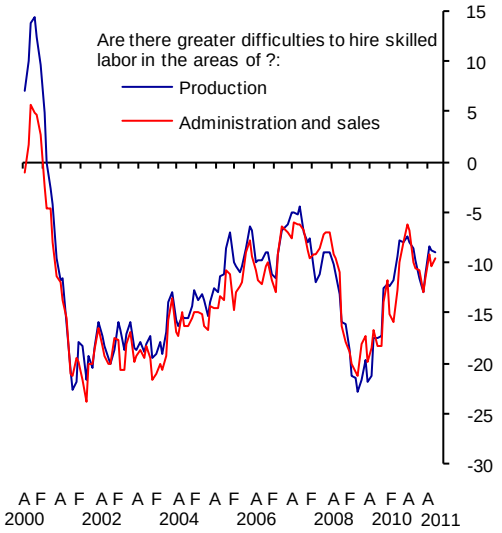
Source: Seasonal adjustment by Banco de México with data from IMSS.

b) Unemployment and Underemployment Rates
Percent; seasonally adjusted data



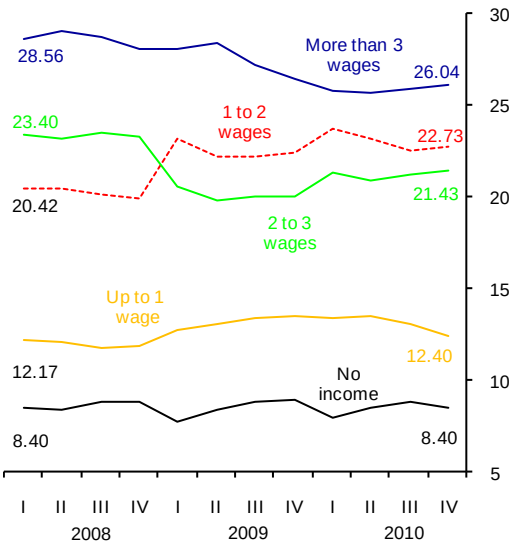
Source: National Employment Survey (*Encuesta Nacional de Ocupación y Empleo*), INEGI.
1/ Original Series.

c) Indicator of Labor Market Slack
Two-month moving average of balance of responses



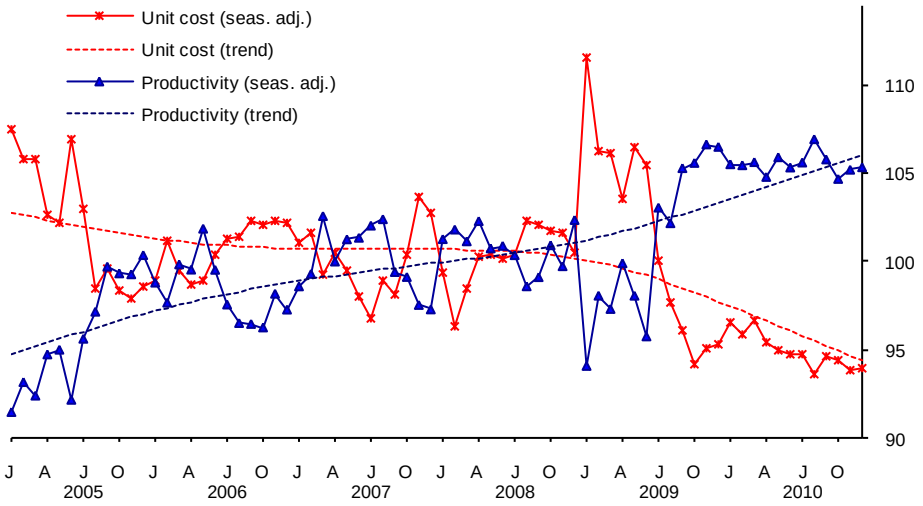
Source: Monthly Manufacturing Business Tendency Survey (*Encuesta Mensual de Coyuntura en el Sector Manufacturero);* Banco de México.

d) Employment by Minimum Wage Range
Percentage of employed population



Source: Prepared by Banco de México with data from the National Employment Survey (*Encuesta Nacional de Ocupación y Empleo*), INEGI.

Graph 29
Productivity and Unit Cost of Manufacturing Sector's Labor Force
2007 = 100, seasonally adjusted and trend data



Source: Prepared by Banco de México with seasonally adjusted data from the Extended Industrial Survey (*Encuesta Industrial Ampliada*), INEGI.

Box 2
Phillips Curve and Slack Conditions in the Mexican Labor Market

This box briefly describes a statistical exercise carried out in order to analyze the response of wage increments to prevailing conditions in the economy during the present business cycle. Certainly, wage dynamics are a fundamental determinant of inflation conditions in the economy. In particular, the exercise is based on the estimation of what is commonly known in the economic literature as "expectations-augmented Phillips Curve."

1. Phillips Curve Fundamentals

As well known, the Phillips Curve owes its name to the article published by A. W. Phillips in 1958,[1] presenting evidence of a negative correlation between changes in the nominal wage rate and the unemployment rate in the United Kingdom. This finding can be interpreted in terms of the relation that would be expected between wages and slack labor market conditions throughout the economic cycle. Indeed, a relatively high unemployment level would indicate a high slack in the labor market and, in this context, it would tend to result in lower pressures on wage increases. On the other hand, a relatively low unemployment level could suggest a "tight" labor market and, consequently, there would be greater upward pressures on wages. As will be seen below, in later research regarding the Phillips Curve the relevant concept of labor market slack, that has been used, corresponds to the deviation of the observed unemployment rate from the level which could be considered as its long-run equilibrium level.

In general, greater economic activity levels are associated with higher employment levels and, therefore, with lower unemployment rates. Hence, the inverse relationship between wage inflation and deviations of the unemployment rate from its equilibrium level can alternatively be expressed as a positive relationship between wage inflation and the deviations of GDP from its potential level, i.e., the output gap. Indeed, a positive deviation of the economic activity level from its potential would tend to be associated with upward pressures on wages by inducing higher labor demand. In parallel, a relatively reduced aggregate demand, implying a negative output gap, would result in lower pressures on the nominal wage level.

The original relation estimated by Phillips included unemployment and nominal wage changes. The sample considered by this author to estimate this relation was characterized, except for certain volatility caused by the prices of import goods, by a relatively stable general price level.[2] Nevertheless, in the second half of the 20th century and, especially, in the seventies, the price growth started to behave more unpredictably and, in particular, at the global level, supply shocks provoked elevated inflation increases. Thus, although in a context of relatively low and stable inflation, the Phillips Curve seemed to have been successful in explaining the relation between wage inflation and slack labor market conditions, in a new environment of volatile inflation the Phillips Curve observed considerable deterioration in its predictive power. This problem was analyzed by Friedman (1968)[3] and Phelps (1968).[4] Friedman argued that, although an increase in the price level would lead in the short term to a reduction in the real wage level with a consequent increase in employment and production, in the long-run the price increase would be fully incorporated in the nominal wage setting process, so that employment and production would return to their equilibrium levels.

In line with the abovementioned, Phelps postulated that the Phillips Curve would tend to shift upwards in proportion to increases in inflation expectations, reflecting the impact that the changes in expectations would have on wage negotiations. Thus, the arguments of these authors imply that the Phillips Curve, where wage inflation relates to the deviation of the unemployment rate from its equilibrium level (or, alternatively, to the output gap), should be augmented by a term measuring inflation expectations, and whose coefficient should be one. Hence, the augmented Phillips Curve can be written as follows:

1) $$\Delta W = \pi^e + \alpha(Y - Y^*).$$

where ΔW is the change in wages, π^e is expected inflation, Y is the observed output level, Y^* is the potential output level, and α is the coefficient measuring the effect that a certain output gap has on wage changes for a given level of expected inflation. In the next section, a version of this specification is estimated for the Mexican case, and afterwards it is used to evaluate the nominal wage behavior during the last business cycle.[5]

2. Empirical Analysis for the Mexican Case

Given the previous discussion, an econometric model was estimated where the annual change of nominal wage (measured by the IMSS reference wage) depends on its own lags and the lags corresponding to the following independent variables:

- Gap between Global Economic Activity Indicator (IGAE, for its Spanish acronym) and its potential level, in seasonally adjusted terms; and,
- Expected inflation for the next twelve months, obtained from Banco de México's survey on expectations of private sector' economic specialists (*Encuesta sobre las Expectativas de los Especialistas en Economía del Sector Privado*).

For this estimation, monthly data from March 1999 to March 2011 were used. In order to adequately capture the short-term dynamics of the variables incorporated in the model, initially a specification with many lags was estimated, which was simplified later on, using the econometric approach known as "General to Specific".[6] In particular, the initial specification included nine lags of the variables, from which the lags that did not result statistically significant were subsequently removed. The resulting model corresponds to equation 2) presented below. Following, this dynamic equation is solved in order to calculate the coefficients of the augmented Phillips Curve, which is presented in equation 3).

2.1 Simulation of the Recent Development of the Nominal Wage

The dynamic equation estimated with this procedure is as follows:

2) $$\Delta W_t = \underset{(0.0008)}{0.0009} + \underset{(0.1254)}{0.386}\ \Delta W_{t-1} + \underset{(0.1172)}{0.508}\ \Delta W_{t-2} + \underset{(0.0153)}{0.042}\ BY_{t-2} + \underset{(0.0332)}{0.103}\ \pi^e_{(t+12)-5},$$

[1] Phillips, A. W. (1958). "The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1861-1957". Economica, 25 (November), pp. 283-299.

[2] Fuhrer, J.; Kodrzycki, Y.; Little, J; and Olivei, G. (2009) "The Phillips Curve in Historical Context. Understanding Inflation and the Implications for Monetary Policy: Phillips Curve Retrospective. Cambridge, London: MIT Press, pp.1-68.

[3] Friedman, M. (1968). "The Role of Monetary Policy". American Economic Review, 58 (1), pp. 1-17.

[4] Phelps, E. (1968). "Money Wage Dynamics and Labor Market Equilibrium". Journal of Political Economy, 76 (July/August, part 2), pp. 678-711.

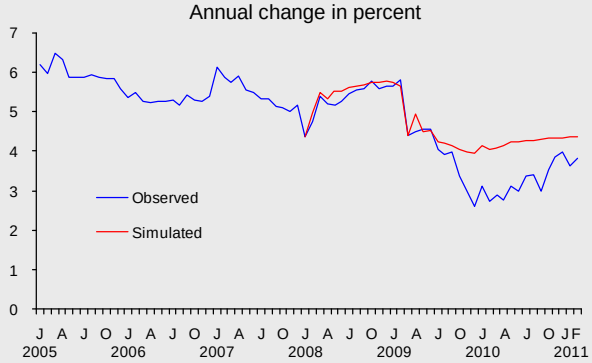
[5] For the purpose of this box, this specification was particularly useful. However, it should be clarified that the most recent literature presented more micro-based specifications of the Phillips Curve. Especially, noteworthy: "New Keynesian Phillips Curve"; see description in Fuhrer, J.; Kodrzycki, Y.; Little, J; and Olivei, G. Op. Cit.

[6] See Hendry, D. F. (1995) Dynamic Econometrics, Oxford University Press, Oxford, and Campos, J., Ericsson N. and Hendry, D.F. (2005). "General-to-Specific Modeling: An Overview and Selected Bibliography," International Finance Discussion Papers 838, Board of Governors of the Federal Reserve System (U.S.).

where: W is the IMSS reference wage in nominal terms; BY is the gap between IGAE and its potential level; $\pi^{e}_{(t+12)-5}$ is the expected inflation for the next twelve months lagged five periods; and Δ refers to the logarithmic difference with respect to the same month of the previous year. The figures in parentheses are the standard errors of the corresponding coefficient.

Using the previous equation, first was realized an in-sample dynamic simulation of the behavior that, according to this relationship, the IMSS reference wage for the period of January 2008 to February 2011 would have in the short term. Graph 1 presents the results. As can be seen, during 2008 and most of 2009, the IMSS reference wage showed a behavior similar to the one that would be expected, given the IGAE gap and the economic agents' inflation expectations. In contrast, during most of the economy's recovery phase (between the last months of 2009 and February 2011), annual changes of nominal wage were lower than those that would have been predicted given the evolution registered by IGAE gap and inflation expectations. This result suggests that, as compared to previous economic cycles, during this last one, the conditions observed in the labor market have led to wage increments *lower* than those forecasted by the estimated Phillips Curve in the short term.

Graph 1
Simulation of the Recent Development of the IMSS Reference Wage: January 2008 to February 2011
Annual change in percent



Source: IMSS and Banco de México estimations.

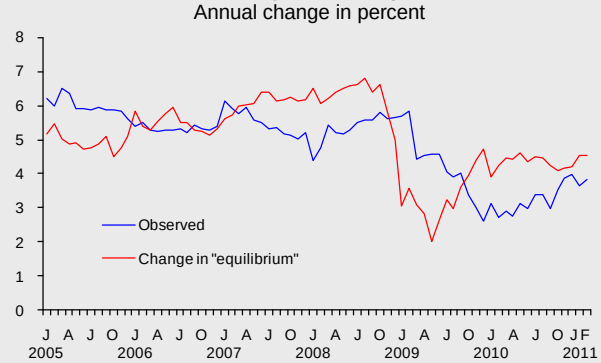
2.2 IMSS Reference Wage and its Equilibrium Level

Based on the estimated dynamic model, it is possible to derive the "long-run equilibrium" expression, which would represent the nominal wage behavior in absence of rigidities. Note that this equation indeed would seem to have an augmented Phillips Curve interpretation. In particular, the inflation expectations' coefficient is not significantly different from one (suggesting, as postulated by Friedman and Phelps, that the Phillips Curve shifts upwards in proportion to the increases in these expectations, i.e., there is no "money illusion" in the wage setting). Besides, a positive effect of the output gap on the wage setting is identified; i.e., a positive gap induces higher wage increments, as it is related to less slack labor market conditions:

$$3)\quad \Delta W_t = \underset{(0.0072)}{0.009} + \underset{(0.1407)}{0.394}\, BY_t + \underset{(0.1353)}{0.973}\, \pi^{e}_{(t+12)}$$

Graph 2 compares the observed changes in nominal wages with those that would be predicted by the previous relation. Again, the results suggest that the observed IMSS reference wage, from the last months of 2009 onwards, has registered a *lower* growth than the one that might be considered its "equilibrium" growth, although in the last months a convergence of the annual change of the IMSS reference wage to its equilibrium growth rate can be appreciated. This could be congruent with a gradual reduction of the labor market slack.

Graph 2
IMSS Reference Wage and its Equilibrium Level
Annual change in percent



Source: IMSS and Banco de México estimations.

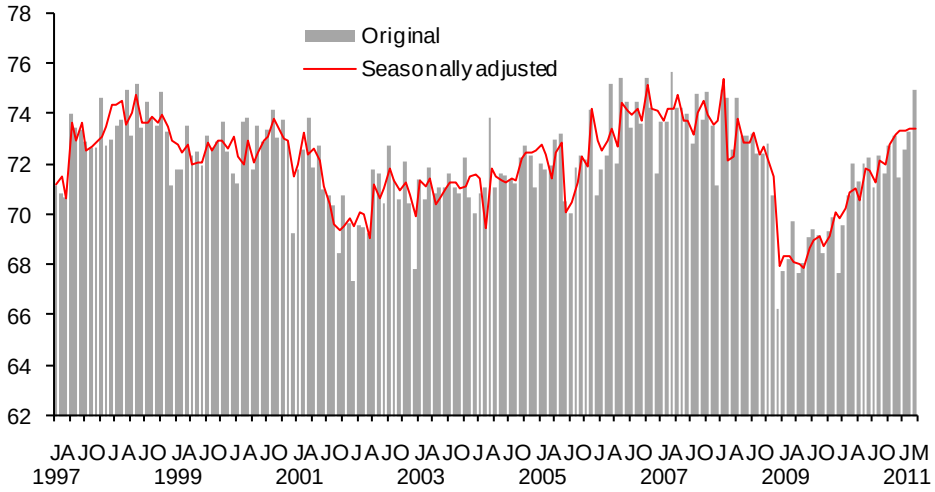
3. Conclusion

The results shown in this box suggest that, even though nominal wage increments in the formal sector have shown an increasing trend since the beginning of 2010, its level is still below the one that would be in line with the behavior of its fundamental determinants, although in the recent months this gap has been closing. Thus, wage increases observed in the current recovery phase turn out lower than those historically presented in similar phases of the economic cycle, according to an augmented Phillips Curve. In turn, this suggests that the level of labor market slack, observed in the present phase of the economic cycle, is possibly greater than the one observed in similar phases of previous cycles.

c) In turn, although the seasonally adjusted utilized productive capacity in the manufacturing sector continues to increase, it is still at levels below the ones registered in the first months of 2008 and below the ones of similar phases of previous business cycles (Graph 30).

d) Commercial banks' credit to the private sector continues expanding in line with the aggregate demand growth, suggesting that its evolution is supporting the recovery of economic activity. Nevertheless, the credit in Mexico is increasing from a very low base, in addition to the fact that country's banking institutions are highly capitalized and very liquid. This means that there also seem to be widespread slack conditions in the Mexican credit market, so the extension of financing can accelerate without inducing increases in firms' costs in the foreseeable future.

Graph 30
Installed Capacity Utilization: Manufacturing Sector
Percent

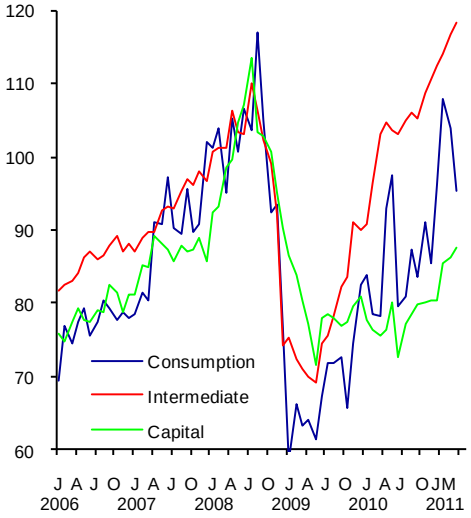


Source: Monthly Manufacturing Business Tendency Survey (*Encuesta Mensual de Coyuntura en el Sector Manufacturero*). Banco de México.

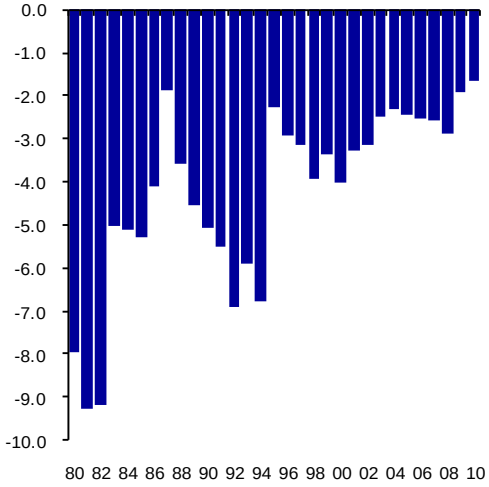
e) Even though the growth in the economic activity has been reflected in a recovery of imports (Graph 31a), the fact that the export growth rate is high implies that the trade balance would be positive in the reported quarter, after having observed moderate deficits in the three previous quarters. Thus, the non-oil current account deficit as a share of GDP has reached its lowest level in the last 30 years, indicating that the economy is far from a situation where absorption presents a risk of being too high (Graph 31b). In addition, the external accounts performance has also contributed to the exchange rate appreciation.

Graph 31
Imports of Goods and Non-oil Current Account

a) Imports of Consumer, Capital and Intermediate Goods; Index 2008=100
Seasonally adjusted data



b) Non-oil Current Account as GDP Share
Percentage



Source: Banco de México.

With respect to international commodity prices, during the analyzed quarter they maintained the upward trajectory which started in the second half of the previous year. In this period the increases registered by foreign energy prices stood out. Nevertheless, their impact on domestic prices was limited due to the policy of increments determining prices of gasoline, diesel and LP gas, although this also led to an increasing fiscal cost. On the other hand, international grain prices also increased, especially the prices corresponding to corn (more details in Section 3.1.2). This was mainly reflected by domestic prices of tortilla, but so far it has not affected other food items. In the future, it cannot be ruled out that commodity prices will continue increasing, given the high growth of emerging economies and the specific shocks affecting the supply of different commodities. Although, as mentioned before, the international commodity price shocks, so far, have not had a significant impact on the inflation evolution in Mexico, this could change during the next months.

The previous elements have been jointly reflected in the yield curve dynamics. On the one hand, the short-term interest rates remained without major changes during the first four months of the year, around 4.5 percent, in a context where the Overnight Interbank Interest Rate remained unchanged. In turn, during the first three months of the year, an increase in the longer-term interest rates was registered, leading to a steepening of the referred curve. In particular, the 30-year bond interest rate went from a level of 7.9 percent at the end of 2010 to a level of 8.6 percent in mid-March (Graph 32). It is important to note that this rise was not due to an increase in inflation expectations, but rather due to:

- An increase in the real component of interest rates, as reflection of the greater dynamism expected for the economic activity in Mexico.

- Although U.S. interest rates remain at reduced levels, during the first quarter and until mid-March they registered certain increases, also in line with the improved economic prospects that have been generating in that country.

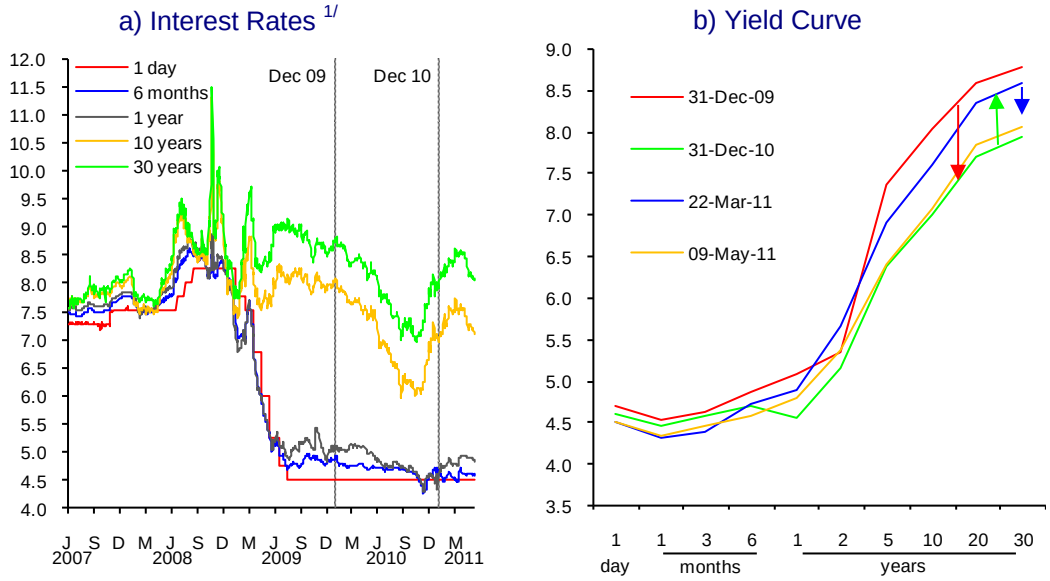
Nevertheless, from mid-March until present, this steepening has reversed. Thus, the 30-year bond yield went from the before mentioned 8.6 percent to 8.1 percent during the last days. This has resulted from several aspects, among which stand out:

- Greater demand for Mexican Government's debt instruments, in a context of increased search for yields in the international financial markets.

- Anchored domestic inflation expectations.

- From March onwards, a moderation in growth expectations in the U.S. has presented, negatively affecting its longer-term interest rates.

Graph 32
Interest Rates in Mexico
Percent annual



1/ Since January 21, 2008, the one-day (overnight) interest rate corresponds to the target for the Overnight Interbank Interest Rate.

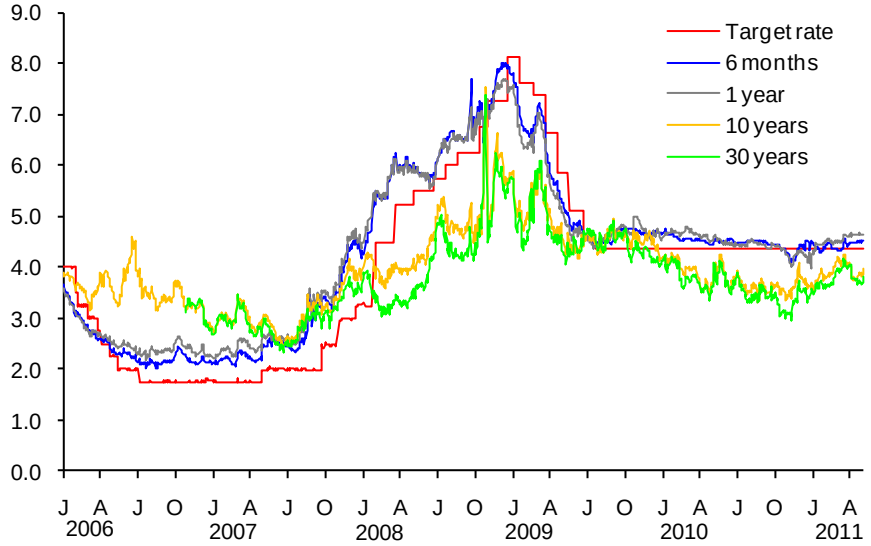
In the described context, during the first months of 2011, the nominal exchange rate continued showing an appreciation trend, moving from levels close to 12.4 MXN/USD at the end of December 2010 to a level of 11.6 MXN/USD recently. This has been the consequence of various factors:

a) Better economic growth outlook in Mexico.

b) The extraordinary quantitative easing in the United States has implied elevated interest rate spreads between Mexico and the U.S. (Graph 33), which led to substantial foreign capital inflows, mainly channeled to government security purchases (Graph 34).

The high capital inflows to Mexico have considerably contributed to the exchange rate appreciation. Naturally, this has led to more stringent monetary conditions in Mexico, also favoring inflation evolution (Graph 35). Indeed, the reduced levels of U.S. interest rates have propitiated a relative tightening of monetary conditions in Mexico as compared to the economy with which it holds a high degree of trade and financial integration and which, in addition, issues the reserve currency. Thus, this monetary transmission channel has been fundamental for the reduction of inflation in Mexico.

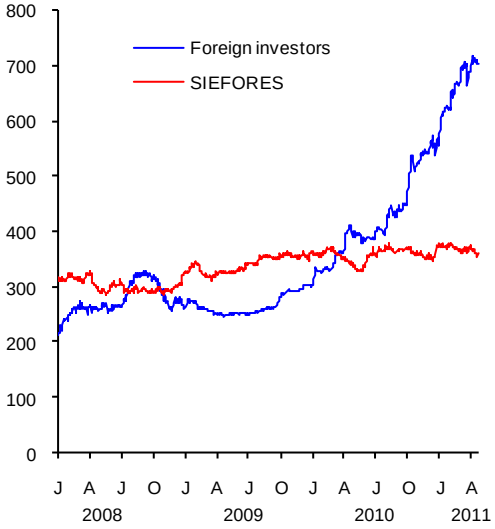
Graph 33
Interest Rate Spreads between Mexico and the United States [1/]
Percent



1/ For the U.S. target rate, the average of the interval considered by the Federal Reserve is used.
Source: Banco de México and North American Treasury Department.

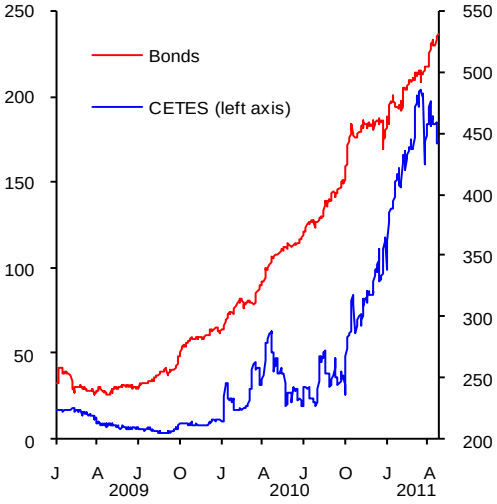
Graph 34
Government Security Holdings
MXN billion

a) Government Security Holdings



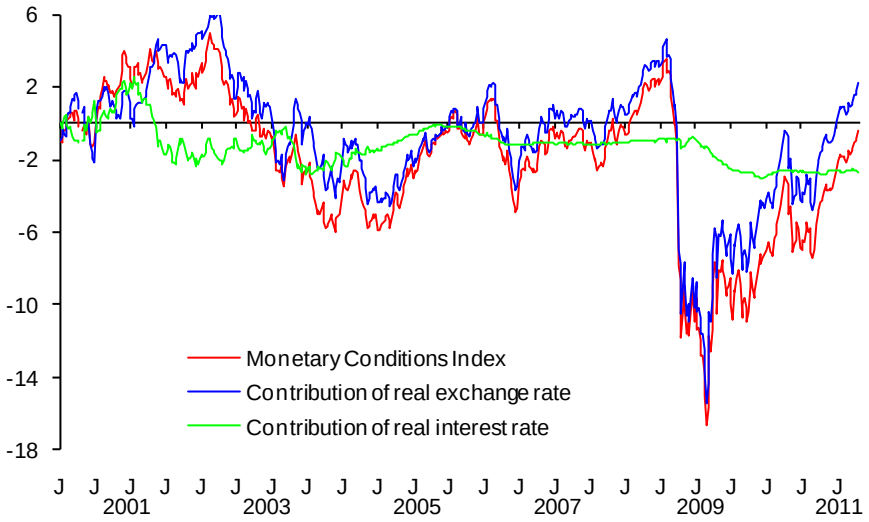
Source: Banco de México.

b) Government Security Holdings by Foreign Investors



Source: Banco de México.

Graph 35
Monetary Conditions Index [1/ 2/]
Change in percent with respect to January 2000



1/ The Monetary Conditions Index (MCI or ICM for its Spanish acronym) is calculated as the weighted average of the changes in indicators of real interest rate and real exchange rate with respect to their average level during January 2000. The contribution weights of both indicators to the MCI are 0.5 and 0.5, respectively. The use of diverse analytical tools shows that these values are a good approximation to the contribution that the real interest rate and the real exchange rate have to the monetary conditions faced by the aggregate demand. An exchange rate appreciation and/or a real interest rate increase lead to an increase in the MCI. Therefore, an MCI increase suggests relatively more stringent monetary conditions.

2/ The weekly index of the bilateral real exchange rate with respect to the USD is calculated using the weekly average of the FIX exchange rate, the weekly average of the daily U.S. Consumer Price Index (linear interpolation of the CPI) and the weekly average of the daily Mexican CPI (linear interpolation of CPI). In turn, the weekly real interest rate is defined based on the weekly average of the nominal interest rate of the 28-day CETES and the inflation expectation for the next 12 months of the weekly Infosel survey.

Summing up, when analyzing the evolution of an important number of indicators providing information about the price and wage formation process in the economy, there is no evidence pointing to the existence of generalized inflationary pressures, although certainly there are risks ahead. Even though the output gap is closing rapidly, conditions in the factor markets are not characterized by a full employment situation, suggesting that there is still room for growth without accelerating inflation. On the other hand, monitoring is necessary, given the possibility of increased pressures resulting from commodity price behavior, the growing fiscal costs derived from gasoline subsidies, in addition to the fact that a reversal of capital flows cannot be ruled out, which could affect the exchange rate evolution.

5. Inflation Forecasts and Balance of Risks

The macroeconomic scenario presented below is based on the following considerations:

a) U.S. GDP showed lower growth in annualized quarterly terms in the period of January-March 2011 (1.8 percent) compared to the one registered in the last three months of 2010 (3.1 percent). In contrast, U.S. industrial production showed an expansion in annualized quarterly terms of 6.0 percent in the first quarter, which exceeded the growth of 3.2 percent in the period of October-December 2010.

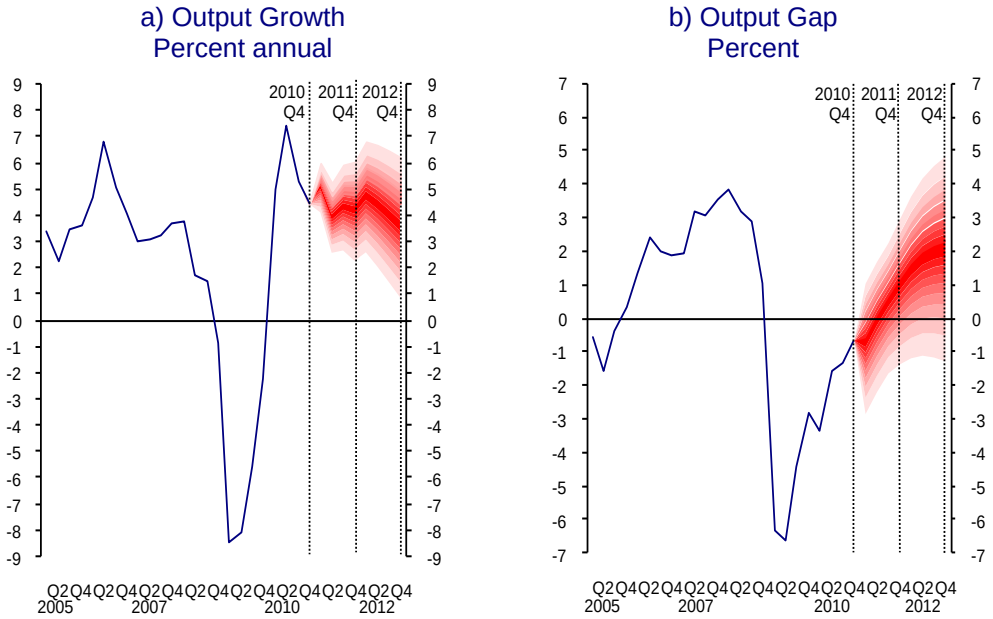
b) Despite industrial dynamism registered in the United States, the slowdown of its domestic economy suggests a GDP growth in the following years slightly lower than the one forecasted in the Inflation Report, October – December 2010. In particular, growth rates of 2.7 and 3.2 percent are expected in 2011 and 2012, respectively (3.2 and 3.3 percent in the previous Inflation Report). In contrast, in the case of industrial production, increases of 5.0 and 4.2 percent are expected in 2011 and 2012, as compared to the figures of 4.4 and 4.1 percent for the same years presented in the previous Inflation Report.[21] This upward revision in the industrial growth expectations for 2011 reflects to a large extent the results already observed in the first quarter of the year.

Growth of the Mexican Economy: In the short term, the boost coming from U.S. industrial production is expected to continue. In turn, various indicators suggest a strengthening of domestic demand in Mexico during the first quarter of 2011. Consequently, the recent evolution of the economy and of the expectations of its main determinants, suggest that in 2011 GDP growth in Mexico could be greater than the one forecasted in the previous Inflation Report. Consequently, the forecast interval is adjusted from one of 3.8 to 4.8, to one of 4 to 5 percent. In turn, for 2012 the forecast remains unchanged, with the growth forecasted to be between 3.8 to 4.8 percent (Graph 36a).[22] It is estimated that in the remainder of 2011 and in the first months of 2012 the output gap will continue closing, but it will be statistically located around zero. This, together with the presented analysis of conditions prevailing in the input markets, implies that no generalized pressures on prices are expected (Graph 36b).

[21] These expectations are based on the average forecast by economic analysts interviewed by Blue Chip in May 2011.

[22] It should be noted that the Fan Chart for the annual output growth shows the probability of realization of these forecasts for the given time horizon. The darker shaded areas represent the projection more likely to occur. The bands of each side with the same color but with lighter tones accumulate in total 10 percent of probability, and so successively until adding up 90 percent of probability. The same technique is used in the case of output gap and inflation forecasting. For more details on the construction and interpretation of this kind of graphs see Box 3 "Fan Charts for Illustrating the Probability of Economic Variable Forecasts Realization" in the Inflation Report, July – September 2010. Thus, what the fan charts illustrate is the degree of uncertainty existing around the GDP and output gap forecasts for the period 2011-2012, presented in this section. For this reason, these graphs' intervals differ from the ones presented in Graph 26 of Section 4 of the present Inflation Report, where the objective is to illustrate the degree of imprecision in the statistical estimation of the output gap levels for the period from January 2004 to February 2011.

Graph 36
Fan Charts



Employment: Economic activity growth, as anticipated for 2011 and 2012, suggests the creation of between 600 and 700 thousand new formal jobs, in each of these two years, taking as a reference the number of IMSS-insured workers.

Current Account: It is expected that the gradual expansion of domestic demand will lead to a more widespread reactivation of imports. Therefore, in 2011 the trade balance and current account deficits are expected to be higher than those observed in 2010. Nevertheless, the observed dynamism of exports suggests that these deficits will remain at reduced levels. In particular, the trade balance is anticipated to register a deficit of USD 5.7 billion (0.5 percent of GDP), while the current account would present a deficit of USD 11.3 billion (1.0 percent of GDP). These figures are compared to the deficits registered in 2010 of USD 3.1 billion in the trade balance and of USD 5.7 billion in the current account. These forecasts are based on the assumption that the price of Mexican export crude oil will reach an average of USD 99 per barrel during 2011.

The liquidity conditions anticipated to prevail in international financial markets, the expectations of greater foreign direct investment flows, as compared to those of 2010, as well as the fact that the Mexican Government already prefinanced its external debt amortization program for 2011 and 2012, suggest a loose situation for the current account financing.

Diverse risks to the economic growth scenario prevail. In particular, although 2011 and 2012 are expected to be good years for the growth of the Mexican economy, greater risks to global growth begin to arise, especially in the medium term. These risks, if materialized, might affect aggregate expenditure growth in Mexico:

i. As already mentioned, uncertainty persists with respect to the sustainability of U.S. recovery. This could have implications on the speed at which the output gap closes in Mexico.

ii. The complicated political situation in some countries in the Middle East and North Africa has contributed to higher registered international oil prices.

iii. Global imbalances, after a cyclical correction, begin to expand again.

iv. Fiscal imbalances and the vulnerability of the banking systems, presented by some European economies, could generate episodes of instability in international financial markets.

v. The possible correction of the extremely lax monetary policy stance by the central banks of advanced economies or greater risk aversion of investors could induce a reversal of capital flows which have been directed to emerging economies. There is also a risk of an increase in interest rates at the global level, higher than currently expected, especially given the fiscal weakness in most of the advanced economies.

vi. At the national level, according to economic specialists surveyed by Banco de México, public insecurity and the absence of structural changes in the country continue being factors that could adversely affect the growth of the Mexican economy.

On several occasions Banco de México has reiterated how medium- and long-term growth has been affected by diverse institutional features that influence the allocation of productive resources. In this context, the deepening of the structural reform process is considered vitally important.

Inflation: The inflation forecast remains unchanged. Thus, it is considered that annual headline inflation will be congruent with the 3 percent inflation target during the next two years, considering a plus/minus one percent variability interval. In this regard, it is noteworthy that the forecast implies that during the whole horizon the most likely annual headline inflation trajectory will be between 3 and 4 percent (Graph 37).

The most likely trajectory of core inflation lies below the one expected for headline inflation, ranging between 3 and 3.5 percent during 2011 and slightly below 3 percent in 2012 (Graph 38).

The risks to which the world economy and, consequently, the economic activity in Mexico are subject to can clearly affect the Mexican inflation outlook. Also, the uncertainty surrounding the inflation forecast increases inasmuch as the forecast horizon extends. All this uncertainty is attempted to be captured by the fan chart for annual inflation (Graph 37). Regarding the upward risks that are considered to affect the expected inflation trajectory, stand out:

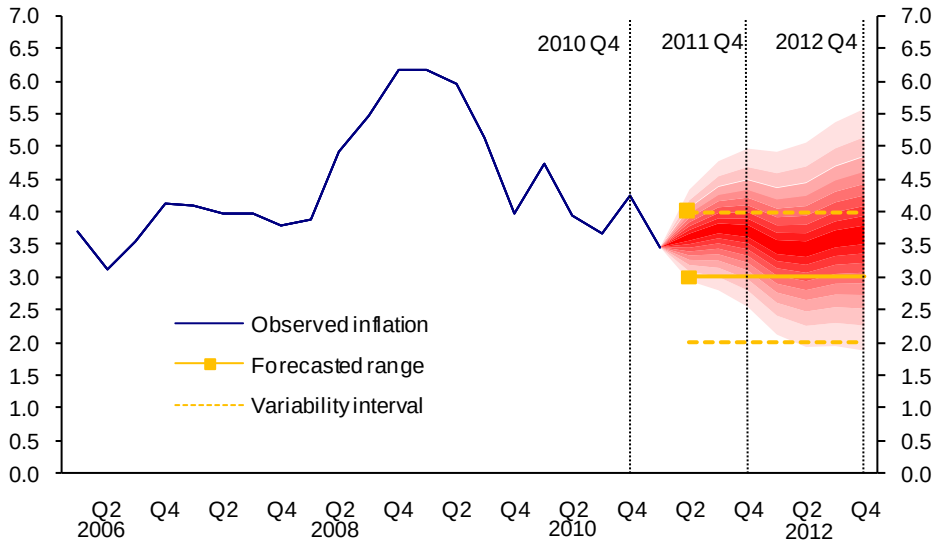
1. Potential increases in the prices of grains, in particular corn, and other commodities, which might influence the price formation process of diverse products. This turns out to be especially relevant since the

market structure prevailing in some industries raises the risk of producers trying to coordinate price increases. It should also be considered that in the medium term, if international energy prices remain high, such wide gaps between domestic and external prices are not sustainable.

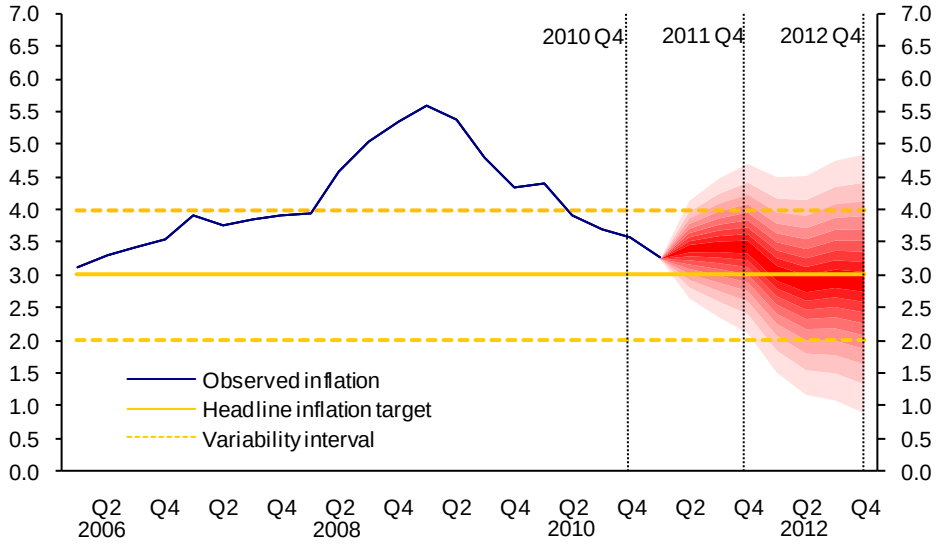
2. The possibility that, given episodes of turbulence in international financial markets which can lead to the reallocation of portfolios and capital flows, pressures on the exchange rate would be reflected in price increases.

On the other hand, existing concerns regarding the possibility that the U.S. economy will maintain its dynamism, given the evident consequences on the performance of the Mexican economy, implies a downward risk to the expected inflation trajectory.

Graph 37
Fan Chart: Annual Headline Inflation
Percent annual



Graph 38
Fan Chart: Annual Core Inflation
Percent annual



As stated before, the expected levels of the CPI non-core inflation component generate a difference in the headline and core inflation trajectories for the next two years. This is mainly associated with three elements: i) the policy of increments in energy prices aimed at reducing the existing gap between these and their international references, especially given the recent increase of the latter ones; ii) the expected revisions of different fares approved by local governments at a pace higher than the expected headline inflation; and, iii) during 2012, the group of fruit and vegetables is expected to make a greater contribution to inflation, given the biannual pattern presented by their prices. Banco de México has already mentioned on previous occasions that the misalignment between domestic and international energy prices entails significant fiscal and economic costs. For this reason, the policy of increments oriented at decreasing the abovementioned misalignment will allow the government to have sound public finances. This is an important element in order to maintain an environment of low inflation.

In this context and taking into consideration the elements pointed out in the Inflation Report, Banco de México will monitor the performance of inflation expectations, output gap and, especially, grain and other commodity prices, as well as diverse inflation determinants that might signal unexpected and widespread pressures on prices. Thus, if, according to the Board of Governors, this eventuality materializes, the Central Institute will adequately adjust the monetary policy stance in order to reach the convergence of inflation to the 3 percent permanent target.

Technical Chapter Exchange Rate Pass-through to Prices

This technical chapter addresses the topic of the effect of exchange rate fluctuations on prices of goods and services in Mexico. Based on several studies carried out at the General Economic Research Directorate *(Dirección General de Investigación Económica)*, evidence is presented that the effect of exchange rate fluctuations on prices seems to have declined since the adoption of an inflation-targeting regime. This result is important, since for the design and conduction of monetary policy it is fundamental to know how fluctuations in the exchange rate parity affect inflation. In turn, it is also necessary to carefully analyze the interaction between exchange rate movements and inflation in order to establish whether the floating regime in Mexico facilitates the adjustment of the real exchange rate given external shocks.

1. Introduction

In 2001, Banco de México formally adopted an inflation-targeting regime. Under this scheme, an explicit inflation target is announced, as well as the institutional commitment to reach this target.[23] In order to meet the announced goal, it is important for the Central Institute to identify the transmission mechanisms of monetary policy and to adequately respond to external or domestic shocks that affect the economy and, in particular, the price dynamics in Mexico.

In economies like the Mexican one, that in general are price takers in international markets, the exchange rate is one of the most important transmission mechanisms of monetary policy.[24] In particular, nominal exchange rate fluctuations tend to affect domestic prices of goods and services through diverse channels, which is known in literature as exchange rate pass-through to prices. In general terms, first and second round effects of exchange rate movements on consumer prices can be distinguished. With respect to the first ones, two channels can be mentioned: direct and indirect. The direct channel is observed through an adjustment of the price of imported consumer goods. Also, prices of imported inputs and capital goods directly affect the cost structure of producers, which, in turn, at least partially, is passed on to final consumers. The indirect effect occurs through the mechanisms which influence aggregate domestic demand and which are transferred to final prices. In other words, an exchange rate depreciation will make imported goods more expensive with respect to domestic goods, which increases the demand for domestic goods, generating upward pressures on consumer prices.

Regarding the second round effects, the transmission channel depends on how inflation expectations are formed. In an environment of high and volatile inflation, and in particular if the monetary authority's commitment to price stability is not credible, inflation expectations tend not to be well anchored. In this context,

[23] A note on the inflation-targeting scheme is available at the following link: http://www.banxico.org.mx/politica-monetaria-e-inflacion/material-de-referencia/intermedio/politica-monetaria/%7B5C9B2F38-D20E-8988-479A-922AFEEBB783%7D.pdf

[24] Except for large-scale economies, like the United States or China, the rest of the countries, that are engaged in transactions at the global level, are considered as price takers in the international markets and are usually known as "small open" economies, since their transactions do not affect international prices of the products they trade.

given the consumer price increase associated with the first round effects mentioned before, economic agents expecting higher inflation might respond with upward price adjustments (including wages), thereby generating greater inflationary pressures. This last channel corresponds to the second round effects of the exchange rate movements on domestic price changes.

The pass-through of exchange parity changes is an important aspect in the monetary policy design. A high degree of pass-through can generate a depreciation-inflation spiral, affecting the inflation target (Obstfeld, 1982). In such case, the monetary policy would need to be coordinated with the exchange rate policy in order to reduce the impact of exchange rate fluctuations on inflation. On the other hand, if the pass-through degree is low, the Central Institute would have more freedom in conducting a monetary policy independent from exchange rate fluctuations, as well as in implementing an inflation-targeting scheme.[25]

An important determinant of the degree of pass-through is the inflation environment. Low and stable inflation, derived from a credible monetary policy, resulting in well anchored inflation expectations, tends to moderate the inclination of firms to pass through depreciation-related cost shocks to consumers. This basically occurs given the fact that in such an environment, with a credible monetary anchor, a depreciation is not always considered permanent, since exchange rate movements are also perceived to possibly go in the opposite direction. Under these circumstances, workers will also tend to moderate their demand for wage increments in an environment with a more depreciated exchange rate. Hence, when economic agents expect the monetary authority to act decisively in order to maintain inflation under control, they are less inclined to change prices in the case of depreciation. This occurs given that, in an environment of price stability and with a flexible exchange rate regime, agents tend to perceive exchange rate shocks as temporary. In this way, the pass-through can decrease under an adequate monetary policy.

This chapter demonstrates that there has been an important change in the pass-through of exchange rate movements to prices since the implementation of an inflation-targeting scheme. In order to do this, an empirical analysis is carried out for the years when the exchange rate in Mexico has floated freely. In particular, the analysis is presented for two different subsamples, before and after 2001, coinciding with the date when an inflation-targeting scheme came into force in Mexico (and with the fact that inflation changed from being an unstable to a stable process, as described in the Technical Chapter of the previous Inflation Report).[26]

[25] Some studies addressing the topic of exchange rate pass-through to price movements for the Mexican case are: Conesa (1998), González (1998), Garcés (1999), Goldfajn and Ribeiro da Costa (2000), Hausmann et al. (2000), Santaella (2002), Schwartz et al. (2002) and Baqueiro et al. (2003).

[26] In the Technical Chapter of the Inflation Report, October – December, 2010 it was shown that since the adoption of an inflation-targeting scheme by Banco de México, inflation has reached a low and stable level. In particular, evidence was presented that both the level of headline and core inflation have had diverse structural changes and that since the beginning of the century both are fluctuating around its lowest level since 1969, year when the CPI was first used for measuring inflation. The results also indicate that both inflations are no longer highly persistent processes, since they turned to be more stable processes around the year 2001. As explained in this chapter, inflation is said to be very persistent if the shocks affecting it have effects that last over time. On the other hand, if persistence is low, inflation tends to be more stable because it has a shorter memory of the disturbances affecting it and therefore, tends to return to its medium-term level.

First, the response of the Mexican Consumer Price Index (INPC for its Spanish acronym, CPI in the following) to exchange rate fluctuations is analyzed. Also, the pass-through of exchange rate fluctuations to different price indices along the distribution chain is studied, in particular, the responses of the price index of imports; of the main components of the Mexican Producer Price Index (INPP for its Spanish acronym): merchandise ("producer price for tradable goods") and services ("producer price for non-tradable goods") price index; as well as the responses of the main CPI components: price indices of merchandise and agricultural products ("consumer price for tradable goods"), services ("consumer price for non-tradable goods") and administered and regulated goods. The proportion of goods affected by shocks can decrease along the distribution chain, implying a decline in the magnitude of price adjustment along this chain. For instance, the share of imported goods affected by exchange rate shocks could be higher than the proportion of affected consumer goods (Bachetta and van Wincoop, 2002). The effect of exchange rate changes on price fluctuations is estimated considering the inflation of tradable and non-tradable goods and services separately. This is due to the different effects that exchange rate movements have on inflation, once the difficulty of trading goods and services internationally is considered.

This chapter is organized as follows. The second section describes the historical relation in Mexico between inflation and nominal exchange rate changes as a first illustration of the pass-through of these changes on prices. The third section presents the results of a Vector Autoregressive (VAR) model on the pass-through of exchange rate movements to CPI movements, as well as to other price indices.[27] The model uses a sample from January 1997 to December 2010, period when Mexico had a floating exchange rate regime.[28] The last section presents some final remarks.

2. Relationship between Inflation and Nominal Exchange Rate Changes

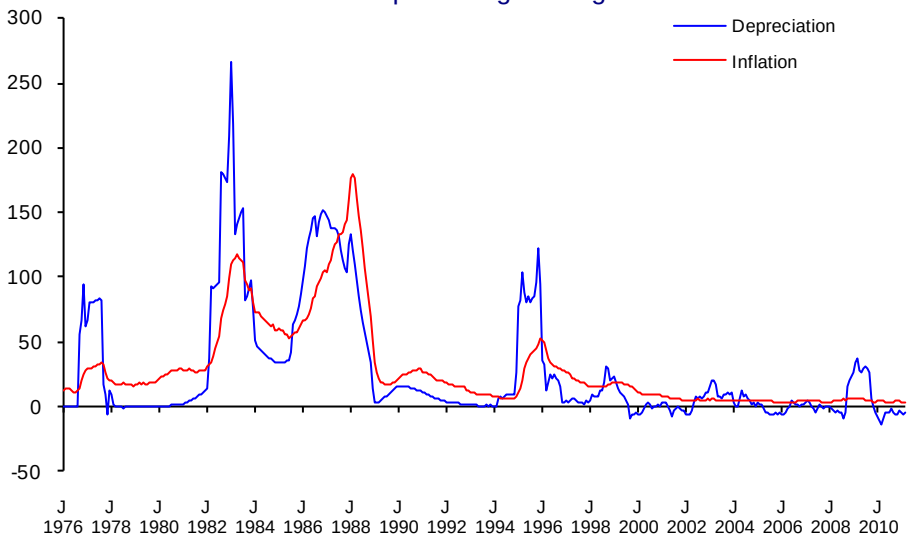
In order to provide a broader perspective on analysis to be presented, it is useful to start by analyzing the historical relationship between exchange rate changes and inflation in Mexico. Therefore, Graph 39 shows the paths of inflation and nominal exchange rate depreciation from 1976 to March 2011. As can be seen, from 1976 to 2000 both were closely related. In fact, the correlation coefficient between these two series for the referred period was 0.81. The devaluations occurred in 1976-1977, 1982-1983, 1987-1988 and 1995 were accompanied by considerable increases in inflation. Since 2001, date coinciding with the adoption of an inflation-targeting scheme, the relation between inflation and depreciation starts to decline. In this graph it can also be observed that the depreciation in 2008-2009, compared to previous devaluations, did not have significant effects on inflation. Indeed, the correlation coefficient between inflation and nominal depreciation from 2001 to March 2011 was 0.40. This result suggests that the implementation of an inflation-targeting regime has contributed to

[27] A VAR model is a system of equations where the variables are usually modeled as endogenous variables, i.e., each one of them is written as a linear function of their own lagged values, as well as the lagged values of all the other variables in the system plus a statistical error term.

[28] The study period used in the VAR model starts in 1997 and not in 1995, when the free floating exchange rate regime came into force, since it is considered that the data from 1995 and, to a lesser extent, from 1996, might present different dynamics since it corresponds to a transition period between the crisis and the new equilibrium of the economy.

anchoring inflation expectations, thereby generating an environment of low and stable inflation, which, in turn, has favored an environment where exchange rate depreciations do not seem to have permanent effects on inflation.

Graph 39
Inflation and Nominal Depreciation Rate: 1976- 2011
Annual percentage change



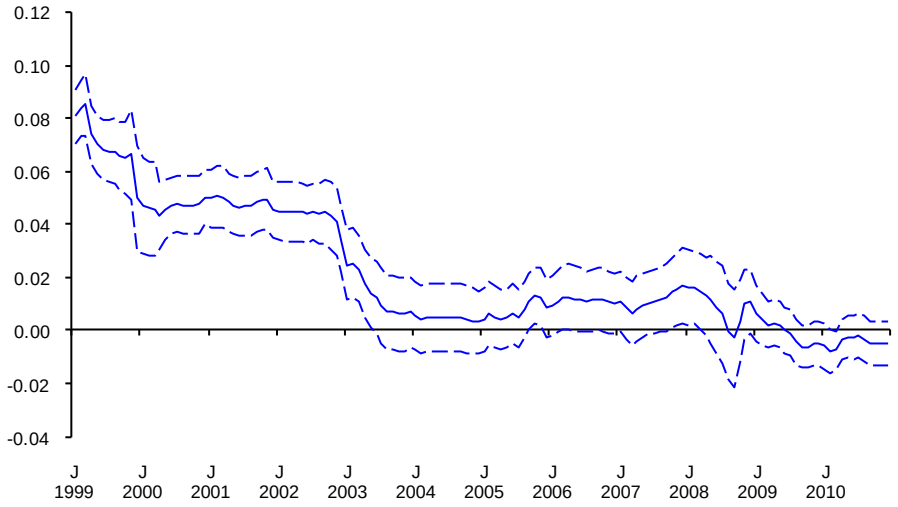
Source: Banco de México.

One way of calculating the pass-through of exchange rate movements over time is by estimating a moving regression of the annual inflation rate on the annual depreciation rate of the exchange rate, a constant and a lag of inflation, using monthly data from 1995 to 2010 with four-year rolling windows; i.e., the first estimation is done using a subsample of the first four years (48 observations), while in the following estimations one observation (the first one) is removed and another observation is added at the end of window, so that the estimation window moves along the whole sample. In this case, the sample starts from the date when the free floating exchange rate regime came into force.

Graph 40 shows the regression coefficient corresponding to the annual depreciation rate since 1999, year when the first window ends, as well as 90 percent confidence intervals. It can be observed that the degree of pass-through, measured this way, seems to decline since the year 2003.[29] This evidence is in line with the hypothesis of Taylor (2000), which indicates that in an environment of low and stable inflation, derived from an efficient and credible monetary policy, firms are less inclined to pass through cost shocks to consumers, expecting that monetary policy actions will pursue an explicit inflation target. In fact, it can be seen in the graph that in the environment of low and stable inflation that Mexico has had during recent years, the pass-through seems to have been particularly low, as indicated by the coefficient estimates which are close to zero in the most recent subsamples.

[29] The graph shows the change until the year 2003 and not 2001, when an inflation-targeting regime was adopted. This is because, when using rolling windows, the change is detected after it occurs, since the windows, including this change, also include data previous to the date when the change occurred.

Graph 40
Moving Regression between Inflation and Nominal Depreciation
Regression coefficient and 90 percent confidence intervals



Source: Estimations carried out with data from Banco de México.

3. Estimating the Effect of Exchange Rate Shocks on Inflation

The previous exercise did not consider the interactions of the exchange rate and inflation with other macroeconomic variables, such as the economic activity or the interest rate. For this reason, in the following, a model that captures these and other interactions is estimated. At the same time, the model allows showing how exchange rate disturbances affect the general price level.

3.1 Model Description

The analysis presented in this chapter is based on a VAR model, which is a tool commonly used for estimating the pass-through of exchange rate movements to inflation.[30] Unlike the exercise with rolling windows, presented in the previous section, the VAR allows analyzing the effect of the exchange rate shocks conditionally, i.e., controlling for other variables that could possibly affect prices.

The included variables are those typically used for modeling economies which are price takers in the international markets, as well as for identifying disturbances to the exchange rate. The endogenous variables are the Global Economic Activity Index (IGAE for its Spanish acronym) (Y), the 91-day Cetes interest rate (R), MXN/USD exchange rate (S), and the different price indices mentioned before. The baseline model considers the consumer price index (PC), while the expanded model considers the indices of imports prices (P^m), producer prices for tradable goods (PP^t), producer prices for non-tradable goods (PP^{nt}), consumer prices for tradable goods (P^t), consumer prices for non-tradable goods (P^{nt}), and administered and regulated prices (P^{ar}). The Global Economic Activity Indicator (IGAE, for its Spanish acronym) is included in order to control for the

[30] Some empirical studies that have used a model of this type to analyze this pass-through include Choudhri et al. (2005), Hahn (2003), McCarthy (2000) and Stulz (2007).

economic activity. The interest rate is included to control for the monetary policy.[31] The U.S. Industrial Production Index (Y^*), 3-month U.S. treasury bonds interest rate (R^*) and the U.S. Consumer Price Index (P^*), as well as the international commodity price index (P^{com}) calculated by the International Monetary Fund (IMF) are included as exogenous variables.[32] The assumption of exogeneity implies that in this VAR model, the U.S. variables and the international commodity prices affect domestic variables, but not vice versa, since the model presents Mexico as a price taker at the global level. The reduced form model is presented as follows:

$$y_t = c + A(L)y_{t-1} + B(L)x_t + u_t$$

where $y_t = [\Delta_{12} \log Y_t, R_t, \Delta_{12} \log S_t, \Delta_{12} \log PC_t]$ is the endogenous variables vector, $x_t = [\Delta_{12} \log Y_t^*, R_t^*, \Delta_{12} \log P_t^*, \Delta_{12} \log P^{com}{}_t]$ is the exogenous variables vector, c is the vector of constants and u_t is the vector of residuals. $A(L)$ and $B(L)$ are matrix polynomials in the lag operator L. All variables are expressed as annual growth rates (Δ_{12} represents the twelfth order differences), except the interest rates. The Bayesian Information Criterion (BIC), used for evaluating the necessary number of lags, determined that one lag adequately captured the system's dynamics.[33]

The study period is from January 1997 to December 2010. Besides studying the whole sample, the analysis is also carried out for two subsamples, before and after June 2001. The division is done in this month due to several reasons. In particular, as shown in the Technical Chapter of the previous Inflation Report, there is evidence of a change in the persistence of inflation around the year 2001. Indeed, in line with the results shown in this chapter, headline inflation seems to have turned from being a stochastic trend process to a stationary process around the year when an inflation-targeting regime was adopted in Mexico. It is possible that this has also changed the transmission mechanism through which factors like the output gap, the exchange rate, as well as diverse costs, affect inflation: e.g., Gaytán and González-García (2008) and Sidaoui and Ramos-Francia (2008) present evidence with respect to the possible change in the transmission mechanisms of diverse shocks to inflation around the same year.

The mechanism used for identifying exchange rate shocks is recursive. The exchange rate is ordered before the prices, allowing the shocks in the first variable mentioned to be immediately passed on to the latter ones. It also implies that the monetary authority observes price shocks with a lag.[34] Following Peersman and Smets (2001) and Kim and Roubini (2000), the IGAE is ordered first. This implies that the real activity reacts with one lag to interest rate shocks, while the exchange rate responds immediately to shocks in the IGAE and the

[31] In this model the interest rate is used as a monetary policy instrument. Nevertheless, during the study period other instruments have been used. Between 1995 and 2008, Banco de México used a reserves requirement target usually denominated "Corto". Starting from 2008, it officially adopted the use of the interest rate as a monetary policy instrument. However, since 2004, the Central Institute sent signals to the market about the desired interest rate level (Banco de México, 1996; 2007), in addition to the fact that the Central Institute implicitly had an interest rate target through the "Corto".

[32] Data for Mexico are obtained from Banco de México, U.S. data, from the Federal Reserve, and the international commodity price index, from the IMF. The import price indices are expressed in local currency. The exchange rate refers to the period's average in order to settle liabilities denominated in foreign currency.

[33] A more detailed description of the used VAR, as well as additional exercises carried out using this model, can be found in Capistrán et al. (2011).

[34] This assumption has been used in other studies in order to identify monetary policy shocks, e.g., in Sims and Zha (1998) and Kim and Roubini (2000).

interest rate. These assumptions allow recovering the series of exchange rate shocks.

Alternatively, results of disaggregated domestic prices are also presented. The vector of the endogenous variables used in the complete model is the following:

$$y_t = \begin{bmatrix} \Delta_{12} \log Y_t \,, R_t, \Delta_{12} \log S_t \,, \Delta_{12} \log P^m{}_t \,, \Delta_{12} \log PP^t{}_t \,, \Delta_{12} \log PP^{nt}{}_t \,, \\ \Delta_{12} \log P^t{}_t \,, \Delta_{12} \log P^{nt}{}_t \,, \Delta_{12} \log P^{ar}{}_t \end{bmatrix}$$

The ordering of the variables in the model with nine variables implies that exchange rate shocks simultaneously affect the prices along the distribution chain, going from imports to the producer and, finally, to the consumer.[35]

It should be clarified that the use of this recursive VAR model for identifying the exchange rate shock presents both advantages and disadvantages. Among the first mentioned, the VAR considers all variables that are usually included in small-scale macroeconomic models for price taking economies. In addition, the used ordering and the recursive approach have also been used in other studies at the international level in order to analyze the price dynamics given diverse shocks. Among the disadvantages, it can be mentioned that the used VAR model does not consider possible long-term relationships among the variables, neither other structural changes that might have occurred in the used sample, nor other identification mechanisms of shocks, like those presented by a structural VAR or a VAR with restrictions derived from micro-based models. Nevertheless, it should be noted that the presented results are consistent with the ones obtained from a VAR estimated with variables in levels, considering possible long-term relations among the variables. In the same way, by carrying out an analysis for subsamples, the disadvantage of not considering other possible structural changes is diminished.

3.2 Effects of Exchange Rate Movements on Inflation

Using the VAR model explained in the previous section, the pass-through of exchange rate movements to different prices is estimated using impulse response functions. The system is disturbed by a unitary exchange rate shock, representing a 1 percent depreciation of the exchange rate. Graph 41 shows the impulse response functions of the CPI, as well as the exchange rate itself to an exchange rate shock. The responses are presented for a 24-month horizon with 90 percent confidence intervals.[36]

Graph 41a shows the response of the exchange rate to a 1 percent depreciation. This is the shock that is used to analyze price dynamics. Although the exercise consists in observing the response of the different price indices to a one-time exchange rate shock, the model considers the dynamics of the exchange rate. Hence, in this graph it can be observed that the initial shock lasts approximately 24 months until it disappears.

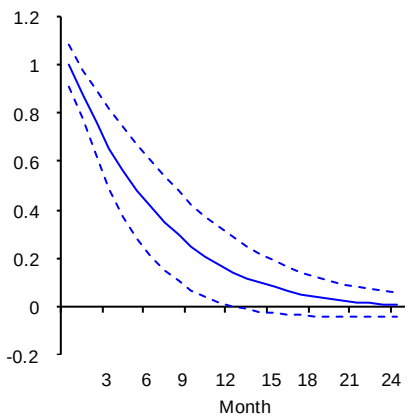
[35] This ordering has been used by Choudhri et al. (op. cit.), Hahn (op. cit.) and McCarthy (op. cit.). The impulse response functions may be sensitive to the ordering used. Therefore, the sensitivity of the results to different orderings is examined, although the results are not presented here due to space limitations. Given the low contemporary correlation between the residuals of the used variables, the results are robust to different orderings.

[36] In particular, the analytical method is used for estimating the standard errors of the impulse response functions. For details about the estimation, see Lütkepohl (1989).

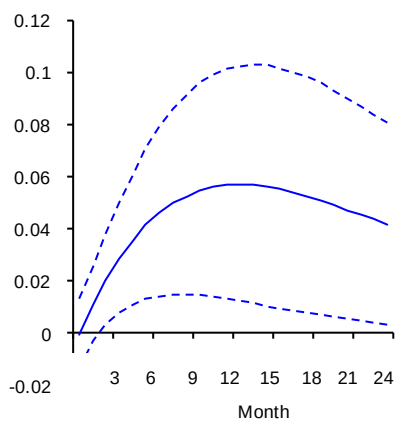
Graph 41b shows the dynamics of the pass-through of exchange rate movements to CPI inflation. This graph corresponds to the impulse response function typically presented in studies that use VAR models. Nevertheless, to facilitate the interpretation, Graph 41c shows the effect in terms of elasticities. In this case, the vertical axis indicates the accumulated change in inflation given a 1 percent exchange rate depreciation. The accumulated responses of inflation can be interpreted as percentage changes in the price index given a 1 percent depreciation of the exchange rate, i.e., the pass-through elasticities.[37] As can be seen, the pass-through elasticity is positive and statistically significant. In the long term, this elasticity is approximately 0.16.

Graph 41
Effect of a Depreciation on the Exchange Rate and on the CPI

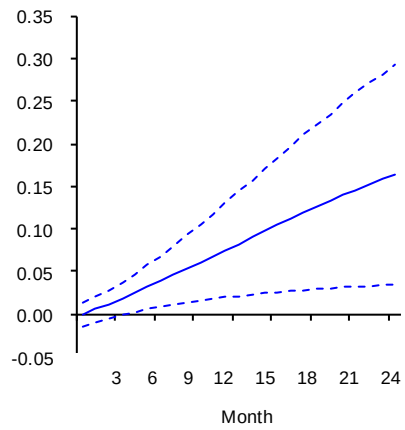
a) Impulse Response Function of the Exchange Rate
Sample: 1997M1-2010M12



b) Impulse Response Function of Inflation
Sample: 1997M1-2010M12



c) CPI Elasticity
Sample: 1997M1-2010M12



Source: Estimations carried out with data from Banco de México, U.S. Federal Reserve and IMF.

It is noteworthy that, for firms an exchange rate depreciation acts as a cost shock, which is passed through to consumers depending on factors such as the market structure, the price elasticities of goods and services, as well as diverse nominal and real rigidities (such as, e.g., "menu costs"). In an economy which is a price taker in the international market, it is expected that, in general, there would be a complete pass-through of exchange rate fluctuations to tradable goods' prices. When homogenous goods are traded in an integrated global market, the arbitrage eliminates the price spread expressed in a common currency. This means that the law of one price applies, and that a depreciation will imply an increase in domestic prices by the same amount in order to reestablish the ratio of relative prices, at least in the long term. Nevertheless, Dornbusch (1987) shows that in situations of imperfect competition or imperfect substitution between domestic and imported goods, the exchange rate pass-through can be incomplete. This is due to the fact that firms strategically change their price setting methods and households change their consumption patterns in order to increase or reduce their demand for consumption goods.

[37] The accumulated pass-through elasticity (PT) in period τ is calculated as follows:

$$PT_{\tau} = \frac{\Delta\%P_{t,t+\tau}}{\Delta\%e_{t,t+\tau}}$$

where $\Delta\%P_{t,t+\tau}$ is the percentage change in the price level τ periods after the shock, and $\Delta\%e_{t,t+\tau}$ is the percentage change of the exchange rate in the same period.

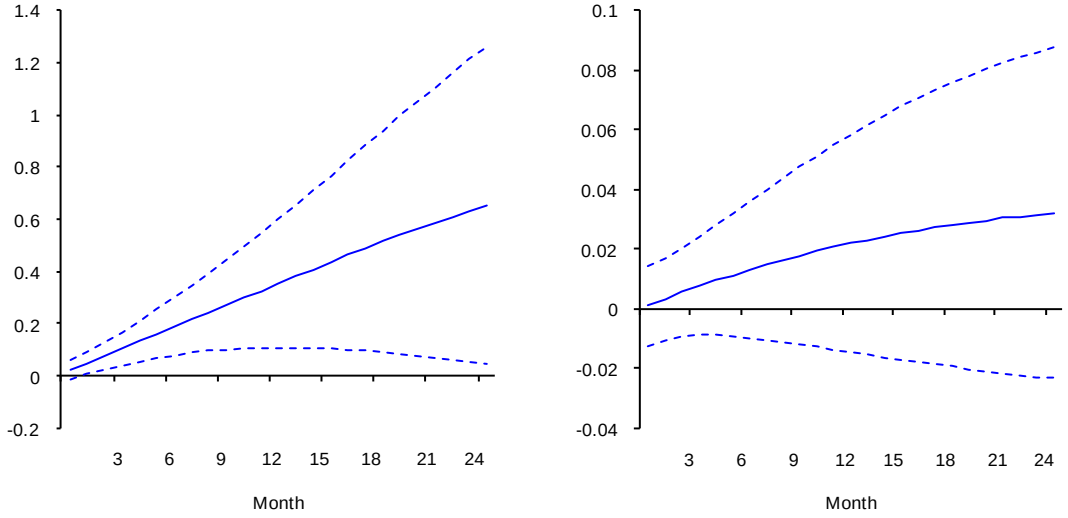
3.3 Evidence of Change in the Pass-through of Exchange Rate Shocks to Prices

Using the same VAR model, this section presents evidence of a change in the pass-through of exchange rate fluctuations to price movements starting from June 2001. As mentioned before, in that year Banco de México adopted an inflation-targeting scheme, which has been a determining factor in reaching price stability. Now, as in an economy characterized by price stability, firms tend to perceive cost shocks associated with exchange rate fluctuations as temporary, they are less inclined to pass them on to consumers.[38] This phenomenon is mainly due to the fact that, as already mentioned, agents expect monetary policy actions to pursue an explicit inflation target (Taylor, op. cit.). Hence, a lower degree of exchange rate pass-through provides more freedom in following an independent monetary policy and facilitates the control of inflation.

Graphs 42a and 42b show the impulse response functions before and after 2001, respectively. As can be observed in the left graph, the pass-through elasticity is higher in the period before June 2001. Prior to the change in inflation persistence (documented in the previous Technical Chapter) around 63 percent of the depreciation was transferred to the price level in the long term. After the change in persistence, less than 3 percent of the nominal depreciation is passed through to prices in the long term, besides the fact that this response is statistically not significant.[39] In other words, since 2001, exchange rate shocks seem to have lower effects on inflation.

Graph 42
Change in the Pass-through of Disturbances to the Exchange Rate to CPI Movements
Elasticities

a) Sample: 1997M1-2001M5 b) Sample: 2001M6-2010M12



Source: Estimations carried out with data from Banco de México, U.S. Federal Reserve and IMF.

[38] This evidence is related to the fact that the monetary regime is an important determinant of the pass-through degree, as Choudhri and Hakura (2006) point out in an international analysis. In the same way, it is in line with the evidence reported by Gagnon and Ihrig (2004) and Bailliu and Fujii (2004), documenting a decline in the exchange rate pass-through on consumer prices in the majority of industrialized countries.

[39] The response is statistically equal to zero at a 10 percent significance level, since the 90 percent confidence intervals include zero. It is noteworthy that these intervals are quite wide, thus, after 24 months the pass-through elasticity could reach 0.09 for the sample starting in 2001.

The presented evidence about the change in the pass-through is in line with the hypothesis of Taylor (op. cit.), which indicates that low and stable inflation derived from an efficient and credible monetary policy dampens the inclination of firms to pass through cost shocks; i.e., the intensity of the pass-through of exchange rate movements is reduced to the extent to which inflation declines, mainly because the firms have less power to determine their prices. When inflation is high, the change in the price of a good is caused, to a large extent, by the change in the general price level, and to a lesser extent by a change in the relative price. On the other hand, when inflation is low, the changes in the price of a good are mainly due to changes in the relative prices. In the same way, in situations of high inflation, there is greater uncertainty regarding inflation expectations. Thus, it is more difficult to distinguish which part of the price changes is due to changes in the general price level and which is due to changes in the relative prices. In this case, for the firms it is easier to pass through increments in the input prices to their sales prices.

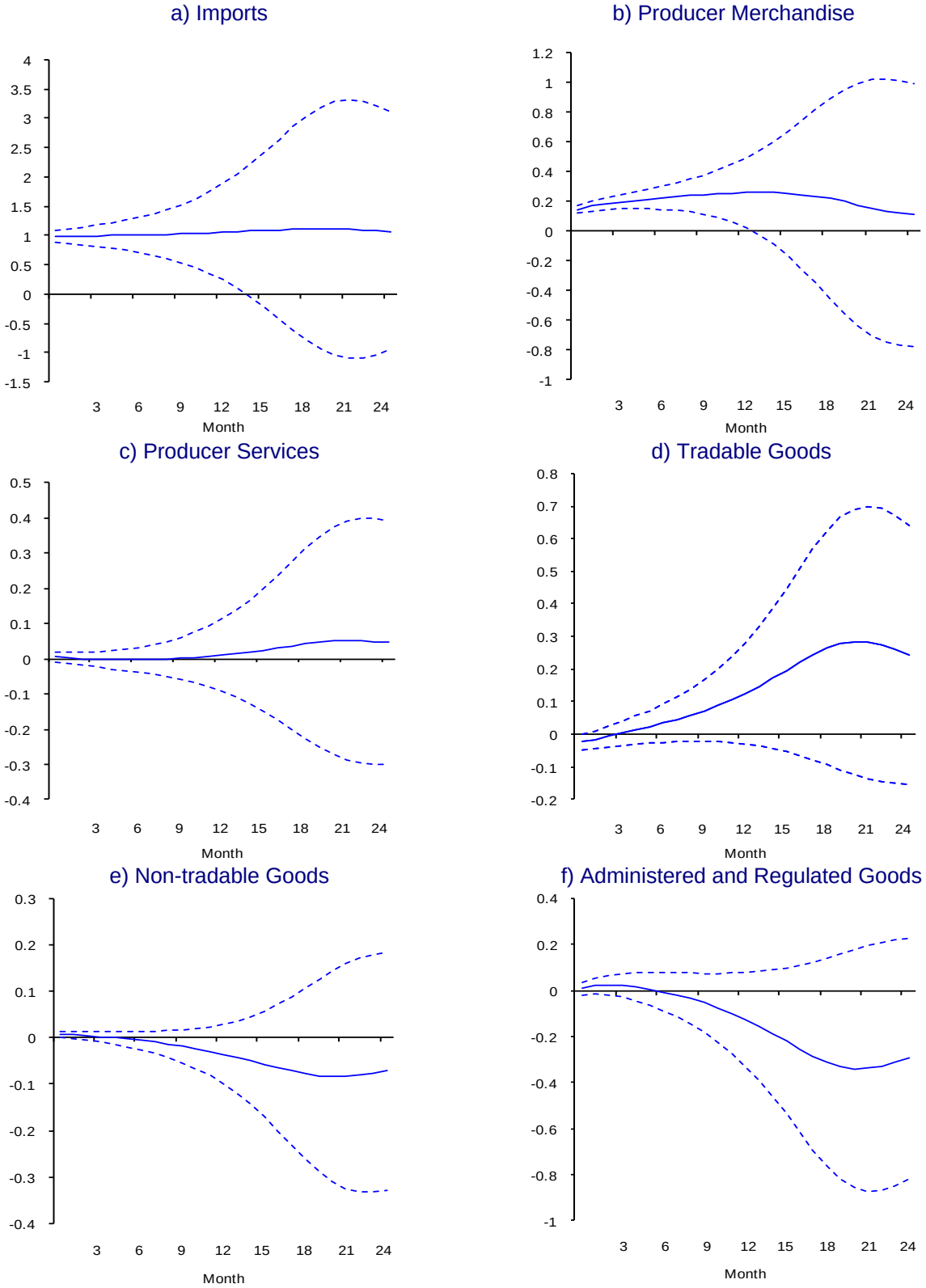
This hypothesis suggests that once inflation is stabilized at low levels, the exchange rate pass-through weakens and the exchange rate fluctuations exert less pressure on inflation. So, the economy starts experiencing the benefits of a flexible exchange rate. Under this regime, interest rates are determined in such a way that price stability is reached, while the nominal exchange rate adjusts freely in order to make foreign accounts reach an equilibrium too. Once price stability is achieved, when the economy is affected by an adverse disturbance of the terms of trade, the necessary depreciation of the real exchange rate is reached much faster when the nominal exchange rate depreciates, as compared to waiting until the price level decreases, as would be the case under a fixed exchange rate regime. Finally, also the real sector is isolated from external disturbances. This is possibly what happened in Mexico in response to the international financial crisis at the end of 2008. Indeed, when the Mexican economy was affected by different adverse external shocks, the nominal exchange rate depreciated immediately, in a context where inflation was little affected, allowing the real exchange rate to depreciate as well and the external accounts to adjust orderly.

3.4 Exchange Rate Pass-through on Prices along the Distribution Chain

In this section, the results of estimating the effects of exchange rate disturbances along the distribution chain are presented. The determination of prices is realized at three different levels: prices of imported goods, producer prices and consumer prices. At each of these levels, prices are affected by domestic supply and demand shocks, as well as external shocks. In the presence of price rigidities, there may be lags in the price adjustment, implying a decline in the speed of adjustment along the distribution chain (Blanchard, 1987).

Graph 43 shows the impulse response functions of different indices to an exchange rate shock along the distribution chain for the period after June 2001. It is observed that the pass-through to the prices of imports is the highest, with a pass-through elasticity approximately equal to one in the first period. This can be explained since this index contains tradable goods. After 14 months, the effect of the exchange rate on the imports prices is not significant.

Graph 43
Effect of a Depreciation on Different Price Indices
Elasticities. Sample: 2001M6-2010M12



Source: Estimations done with data from Banco de México, U.S. Federal Reserve and IMF.

The response of the producer merchandise price index is less than the responses of imports prices. The initial elasticity is 0.15, it reaches its maximum of 0.26 after 14 months, and it stops being significant after 13 months. The response of the producer service price index is not statistically significant. This is mainly due to the fact that this index is composed of non-tradable goods.

As indicated by the graphs, the degree of the pass-through decreases along the production chain, being statistically equal to zero in the case of consumer prices of tradable goods. The pass-through elasticity of exchange rate shocks to consumer prices of tradable goods is approximately 0.02 after 6 months and reaches 0.11 12 months after the shock, although it is not statistically significant. This result is consistent with other studies of the pass-through of exchange rate shocks at the international level, for example, McCarthy (2000) and Gagnon and Ihrig (2004). In the case of the price indices of non-tradable consumer goods and administered and regulated goods, as well as the index of producer prices of non-tradable goods (Graph 43c), the effects of the exchange rate are statistically not significant.

These results indicate that indeed the firms respond to exchange rate shocks, but that the degree of the response varies along the production chain. As described before, the pass-through is higher to imports prices, followed by producer prices, and finally consumer prices. This may be due to the lower fraction of goods affected by the corresponding shocks in the price indices in the last stages of the distribution chain; i.e., the proportion of tradable goods, which are more prone to external shocks, tends to decrease along the distribution chain. The price indices incorporate different costs, such as transport or distribution costs (Burstein, et al., 2003), thus, the pass-through is decreasing along the production chain. The imports price index is the most affected because it includes tradable goods that are considered to be at the first stage of the production process. On the other hand, the consumer price index receives a lagged and lower impact since it presents the last stage of the distribution chain. For the production of consumer goods, imports and domestically produced goods are combined (Bacchetta and van Wincoop, 2002).

4. Final Remarks

In this chapter, the effects of exchange rate disturbances on prices in Mexico are analyzed empirically. In line with the literature and the experience of other countries, regarding the fact that price stability and effectiveness of monetary policy are important determinants of the magnitude of the exchange rate pass-through, this chapter presents evidence that there is practically a complete pass-through to imports prices (expressed in national currency) in Mexico, but that this pass-through is decreasing along the production chain (it is lower for producer prices and still lower for consumer prices). It is also documented that the effect on tradable goods is greater than on non-tradable ones.

The presented results suggest that the magnitude of pass-through has decreased after 2001, date coinciding with the change in inflation persistence, documented in the Technical Chapter corresponding to the Inflation Report, October – December 2010, as well as with the date when an inflation-targeting scheme came into force. In this way, the evidence is consistent with the premise that the monetary policy scheme that has permitted having a low and stable

inflation, as well as anchored inflation expectations (although still above the target established by the Central Bank), has also allowed consumer prices to be less affected by exchange rate fluctuations.

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