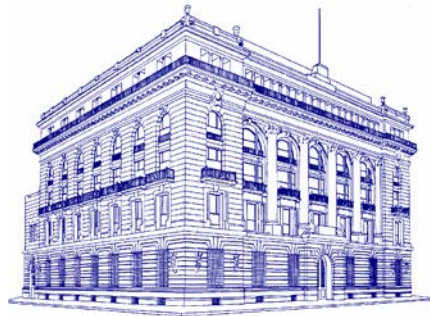


Inflation Report

April – June 2011



BANCO DE MÉXICO

AUGUST, 2011

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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 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 August 8, 2011. Figures are preliminary and subject to changes.

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1. Introduction

During the second quarter of 2011 the expansion of the world economy continued, although at a slower pace. The lower growth rate was partially due to temporary factors, such as the effects of natural disasters in Japan on the global production chains and high commodity prices.

To this environment of slower economic activity growth, downside risks for the world economy growth outlook are added, especially considering the complex issues faced by the United States and Europe. In this context, the balance of risks to the growth of the global economy has deteriorated.

In the U.S., country with which Mexico is considerably integrated, GDP growth decelerated during the first quarter of the year and remained weak in the second quarter. Although fiscal and monetary stimuli continue supporting consumption, diverse indicators suggest that it has been registering a lower growth pace during the last months. Considering households' still weak financial position, high unemployment, fragility of the housing market and firms' caution regarding hiring and expanding their investment, the possibility of persisting weak economic growth is high. This perception has been accentuated in the last days due to the credit rating downgrade of the U.S. Treasury debt by one of the rating agencies. Uncertainty about the pace of the eventual withdrawal of the fiscal stimulus and its possible effect on private spending is added to the aforementioned.

Although inflation has risen worldwide during this year, in most economies inflation levels are considerably lower than in previous economic cycles. The increase in headline inflation in advanced economies during the second quarter, although it started from very low levels, reflected the surge of commodity prices during the previous months. In turn, core inflation also increased, although it remains at reduced levels. It is noteworthy that in these economies a high degree of resource slack persists and that medium- and long-term inflation expectations remain anchored.

In the case of emerging economies, the overheating registered by some of them has been reflected in inflationary pressures. In response, some central banks continued withdrawing part of the strong monetary stimulus introduced in the past.

Reflecting the lower dynamism in world economic activity and the downward adjustment of its growth expectations, international commodity prices registered a decrease since the mid-second quarter. Accordingly, during the last weeks some central banks of both advanced and emerging economies have moderated their restrictive monetary policy stance.

During the analyzed period, international financial markets were affected by increased uncertainty. This was a reflection of the fear of the prolongation of the recent economic weakness of the major advanced economies, particularly in face of the eventual withdrawal of their fiscal and monetary stimuli; the difficulties in reaching a legislative agreement in the U.S. in order to raise the debt ceiling; and also the seriousness of the fiscal and financial problems of some European countries, associated with the high contagion risk.



Productive activity in Mexico continued presenting a positive trend during the second quarter of 2011. Industrial production and service sector activity showed further strengthening. Despite that, some indicators of domestic demand would seem to suggest a moderation in its growth pace. Even though formal employment continued recovering, the labor market still presents slack conditions. In turn, the evolution of financing is far from reflecting a problem of overheating in the economy and does not indicate pressures on interest rates. Thus, in the reported period no widespread pressures either on prices or on external accounts were observed in Mexico.

Headline inflation continued showing a downward trend during the analyzed quarter. Furthermore, so far in 2011, this indicator has remained within the variability interval of plus/minus 1 percentage point around the 3 percent permanent inflation target, approaching this target. In fact, in the referred period annual core inflation, mainly reflecting the medium-term trend of headline inflation, remained at levels close to 3 percent. It should be noted that both temporary phenomena and longer-lasting factors, which are analyzed in this Inflation Report, contributed to these results.

Considering the evolution of inflation, its outlook and determinants, Banco de México's Board of Governors maintained the Overnight Interbank Interest Rate at 4.5 percent during the period studied in this Inflation Report. This monetary policy decision was made in a context of extraordinary monetary easing in the U.S., implying high interest rate spreads between Mexico and that country. The aforementioned, together with solid macroeconomics fundamentals, contributed to the strengthening of the domestic currency. The anchored inflation expectations contributed to the good performance of the Mexican peso (MXN), generating a virtuous circle favoring the gradual convergence of inflation towards its 3 percent permanent target.

Banco de México's strong commitment to price stability has allowed the Central Institute to maintain inflation and its expectations under control in accordance with its priority mandate. In any event, the Banco de México's Board of Governors will continue monitoring the performance of inflation expectations, output gap, grain and other commodity prices, as well as diverse inflation determinants that might signal widespread pressures on prices. Thus, if this eventuality materializes, the Central Institute will adequately adjust its monetary policy stance in order to reach the convergence of inflation towards the 3 percent permanent inflation target.

2. Recent Developments of Inflation

2.1. Inflation

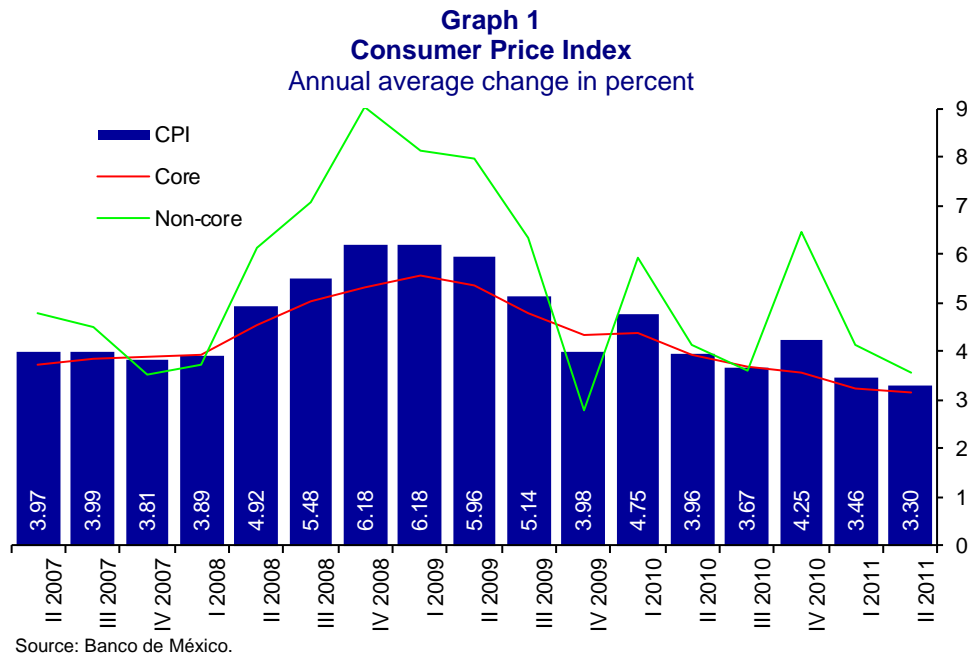
During the second quarter of 2011 the annual average headline inflation was 3.30 percent, which meant a reduction of 0.16 percentage points with respect to the previous quarter. This decrease was driven by both core and non-core inflation components' behavior (Table 1 and Graph 1). The former component reflects to a greater extent the medium-term inflation trend, while the latter is characterized by exhibiting a more volatile behavior.

The low level exhibited by headline inflation during the first part of 2011 is corroborated by the accumulated CPI changes. While in the first six months of 2011 the accumulated inflation was 0.30 percent, in the same period of last year it was 1.39 percent.

Table 1
Consumer Price Index and Components
Annual change in percent

	Annual change						Average percent	
	Jan-2011	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Q-I 2011	Q-II 2011
CPI	3.78	3.57	3.04	3.36	3.25	3.28	3.46	3.30
Core	3.27	3.26	3.21	3.18	3.12	3.18	3.25	3.16
Merchandise	3.60	3.71	3.97	4.07	4.12	4.36	3.76	4.18
Foods, beverages and tobacco	4.51	4.78	5.55	5.98	6.25	6.87	4.94	6.37
Corn tortilla	6.09	7.78	11.84	13.24	13.77	14.86	8.57	13.96
Cigarettes	29.10	30.47	30.59	30.55	30.49	30.50	30.06	30.51
Non-food merchandise	2.88	2.86	2.75	2.60	2.48	2.43	2.83	2.50
Services	3.00	2.89	2.57	2.44	2.30	2.19	2.82	2.31
Housing	2.34	2.12	2.10	2.19	2.14	2.11	2.18	2.14
Education (tuitions)	4.62	4.49	4.46	4.47	4.42	4.39	4.52	4.43
Other services	3.06	3.07	2.34	1.93	1.67	1.46	2.82	1.68
Non-core	5.39	4.53	2.46	3.90	3.45	3.34	4.12	3.57
Agricultural	4.03	3.09	-1.69	3.70	3.26	2.73	1.76	3.24
Fruit and vegetables	7.50	4.76	-6.36	5.71	4.14	1.62	1.71	3.91
Tomato	11.46	54.99	-8.68	71.32	33.68	11.76	14.62	43.16
Potato and other tubers	-24.19	-29.01	-25.87	-10.65	4.87	-1.35	-26.39	-2.63
Bean	-24.10	-23.21	-17.67	-14.59	-11.80	-9.30	-21.71	-11.95
Avocado	24.91	29.41	46.37	52.37	60.67	65.87	33.81	59.88
Livestock	1.77	2.04	1.86	2.33	2.87	3.69	1.89	2.96
Egg	-9.08	-6.48	-5.99	-8.15	-3.04	4.24	-7.18	-2.59
Energy and governm. approved fares	6.15	5.32	4.96	4.04	3.59	3.61	5.47	3.75
Energy	6.12	5.88	5.96	5.00	4.38	4.62	5.99	4.67
Government approved fares	6.20	4.38	3.27	2.62	2.84	2.51	4.60	2.66

Source: Banco de México.



The annual average core inflation during the analyzed quarter was 3.16 percent (in the first quarter it was 3.25 percent, Table 1). The low level exhibited by this indicator, in addition to the monetary policy stance, was influenced by other factors, among which stand out:

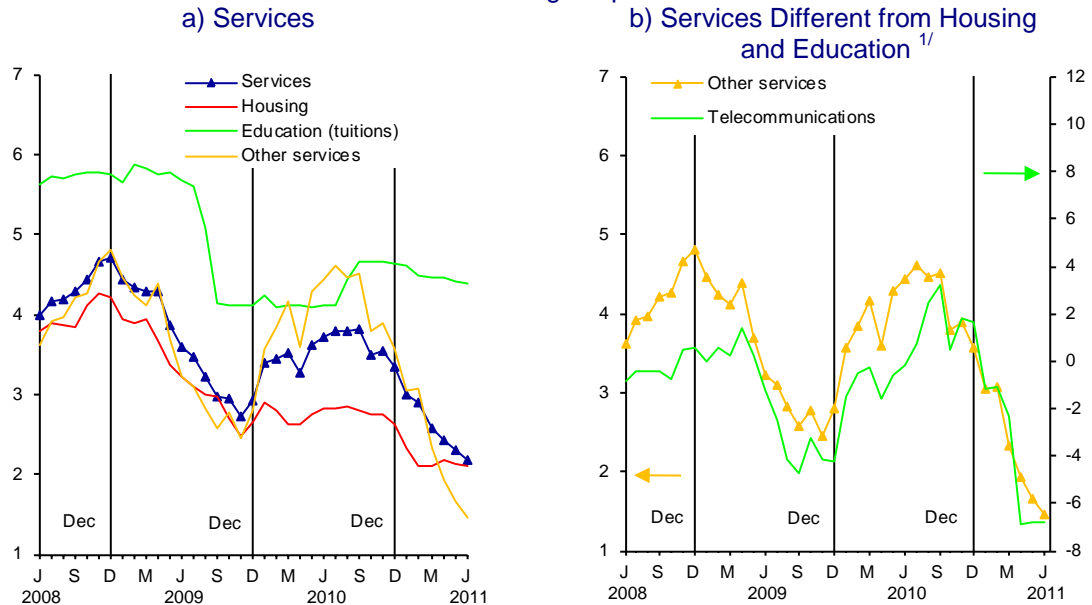
- a) Fading of the effects associated with fiscal adjustments that took effect at the beginning of 2010.¹
- b) Appreciation of the exchange rate.
- c) Absence of inflationary pressures associated with labor costs.
- d) Higher competition levels, especially in the commercial sector and telecommunications industry.
- e) Lower pace of the price increase of some services in the areas of the country affected by insecurity.

In particular, the reduction of core inflation was driven by lower growth rates of prices of services and merchandise other than foods, beverages and tobacco. As to the services subindex, it is relevant to consider that it is the one that best reflects the domestic factors affecting inflation and contains crucial information for the diagnosis of inflationary pressures. In this sense, it should be pointed out that this subindex' inflation, despite its resistance to decrease demonstrated in the previous years, is located at historically low levels. Thus, in the second quarter of 2011 this subindex registered an annual average change rate of 2.31 percent (in the previous quarter it was 2.82 percent). The three groups that make up this subindex (housing, education and other services) reduced their annual average growth rate during the analyzed quarter (Table 1 and Graph 2a). The most significant decrease was observed in the group of services different from housing and education, whose annual average change went from 2.82 to

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

1.68 percent. This result, to a great extent, was influenced by reductions presented in the prices of some telecommunications services, as a consequence of the increased competition in this sector (Graph 2b).

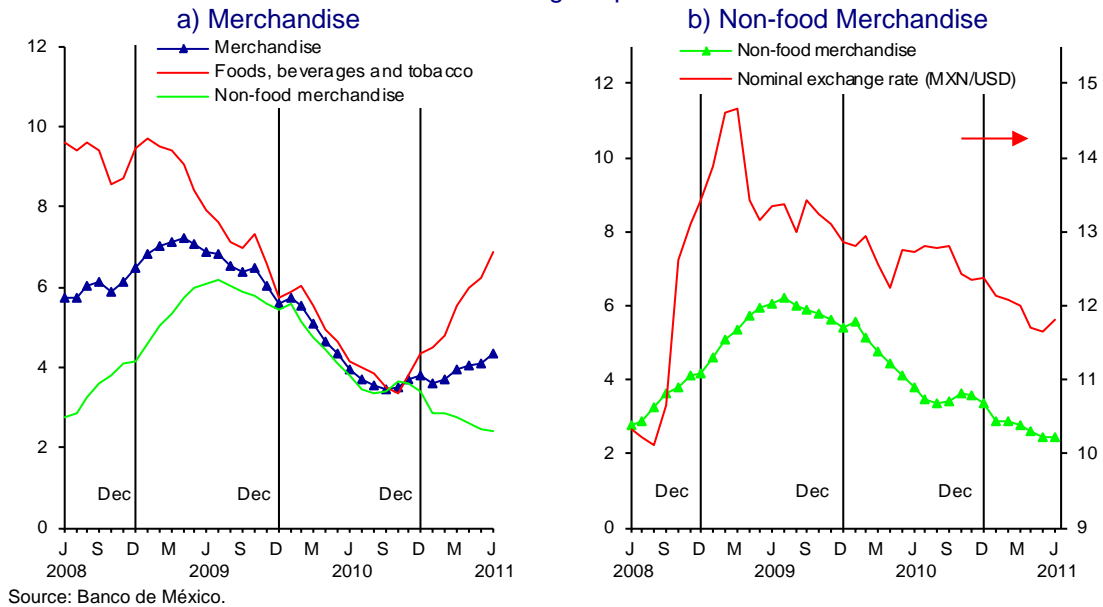
Graph 2
Subindices of Core Services Prices
 Annual change in percent



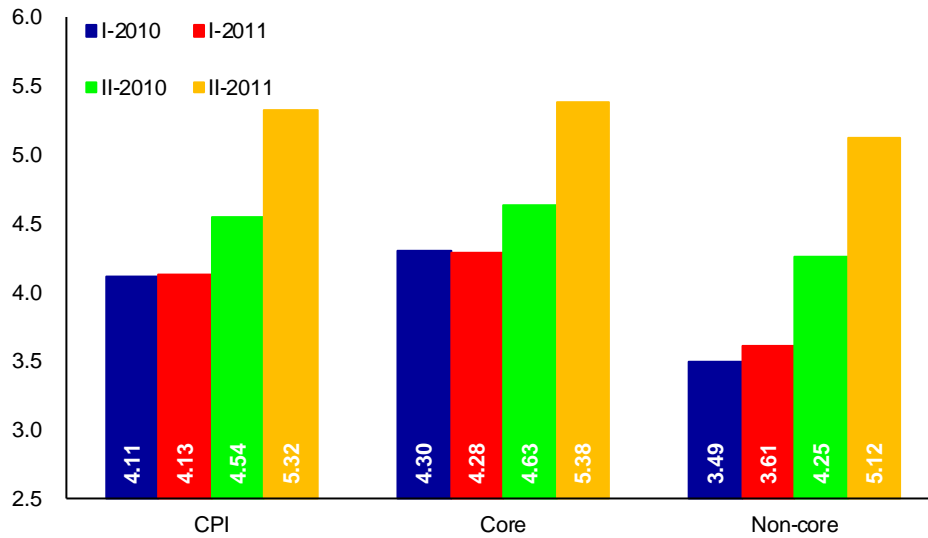
The annual growth rate of the merchandise price subindex presented an upward trajectory during the second quarter of 2011, which was the result of a greater contribution of the foods, beverages and tobacco group, given that the remaining merchandise demonstrated an opposite trend. The annual average change of this last group, as a consequence of greater competition among the commercial chains and the exchange rate appreciation, decreased from 2.83 to 2.50 percent (Table 1, Graph 3 and Graph 4). In contrast, the annual average change of the group of foods, beverages and tobacco increased from 4.94 to 6.37 percent between the first and the second quarter of 2011 (Table 1 and Graph 3a).

Higher inflation of the foods, beverages and tobacco group was to a great extent determined by the increase in the corn tortilla prices, whose annual change shifted from 8.57 to 13.96 percent between the first and the second quarter of 2011 (Table 1). Additionally, this group's annual inflation was also affected by the rise observed in cigarettes' prices at the beginning of the year, which was associated with the increase in the Excise Tax (*Impuesto Especial sobre Producción y Servicios*, IEPS) on this product. In fact, annual core inflation excluding corn tortilla and cigarettes registered an average level of 2.66 percent during the second quarter of 2011 (in the first quarter it was 2.87 percent, Graph 5).

Graph 3
Core Merchandise Subindices
Annual change in percent

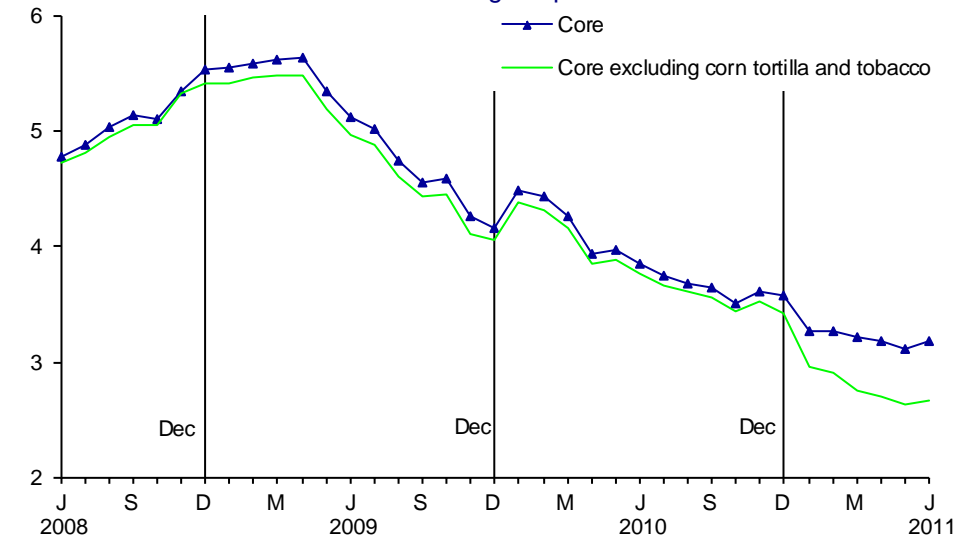


Graph 4
Frequency of Price Markdowns of Goods and Services in the CPI Sample ^{1/}
Percent



^{1/} The frequency of price markdowns refers to the percentage of items sold with special offer with respect to the total of items of the sample.
Source: Banco de México.

Graph 5
Subindex of Core Prices
 Annual change in percent



Source: Banco de México.

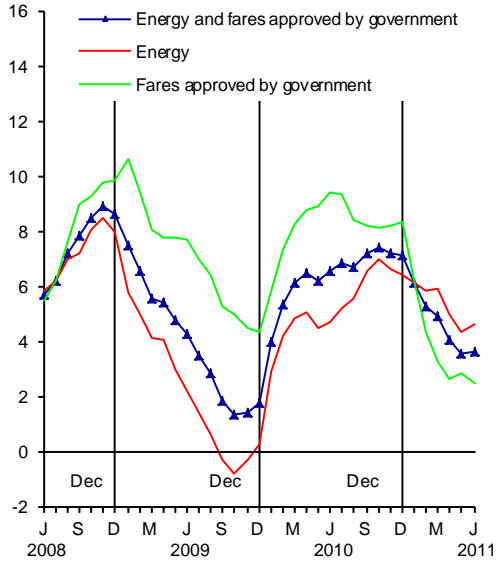
Annual non-core inflation registered a considerable decrease in the second quarter of 2011. In the referred period its average level was 3.57 percent (in the first quarter of 2011 it was 4.12 percent, Table 1 and Graph 1). This result is associated with a lower contribution of the subindex of energy prices and fares approved by different government levels, which presented a decrease of 1.72 percentage points with respect to the previous quarter, thus, locating at an average level of 3.75 percent (Table 1 and Graph 6a). To a great extent, this was a result of lower growth rates of public transport fares and the elimination of the car ownership tax in various states of Mexico (Graph 7).

The annual growth rate of the energy group prices maintained relatively isolated from increases observed in the international energy commodity prices. This was a consequence of the policy of increments adopted by the Mexican Government for domestic gasoline, LP gas prices and for ordinary electricity fares (Graph 8), although this incurred very high subsidies.

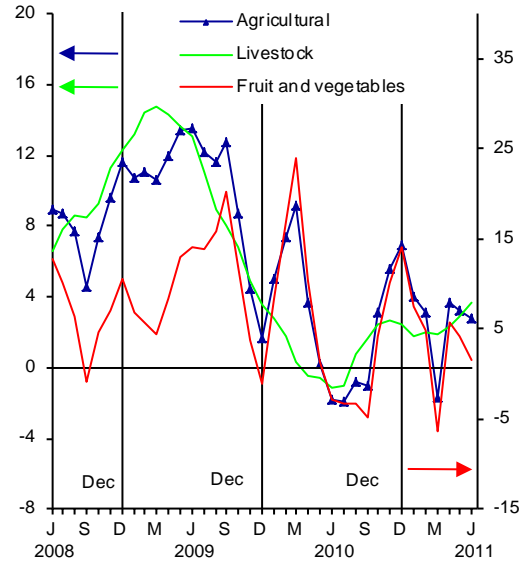
In contrast, the annual average change of the price subindex of agricultural products increased with respect to the previous quarter, moving from 1.76 to 3.24 percent (Table 1 and Graph 6b). Particularly, the frost that affected crops in Sinaloa during the first quarter of the year influenced the volatility of agricultural prices during the analyzed quarter.

Graph 6
Non-core Price Subindices
 Annual change in percent

a) Energy Prices and Fares Approved by Government

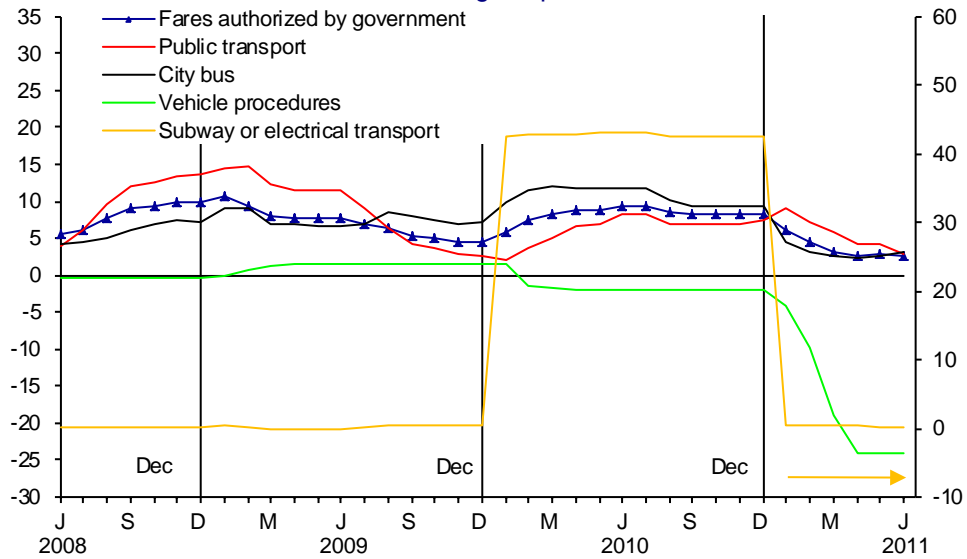


b) Agricultural



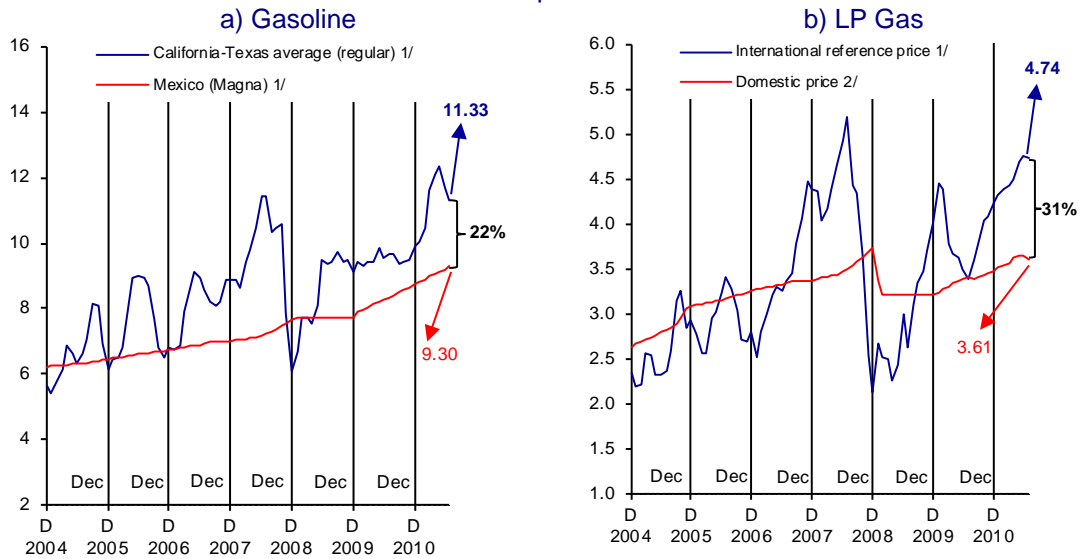
Source: Banco de México.

Graph 7
Subindices of Fares Approved by Government
 Annual change in percent



Source: Banco de México.

Graph 8
Energy Prices: Mexico and U.S.
 MXN per liter



1/ Monthly average.

Source: Banco de México and Energy Information Administration.

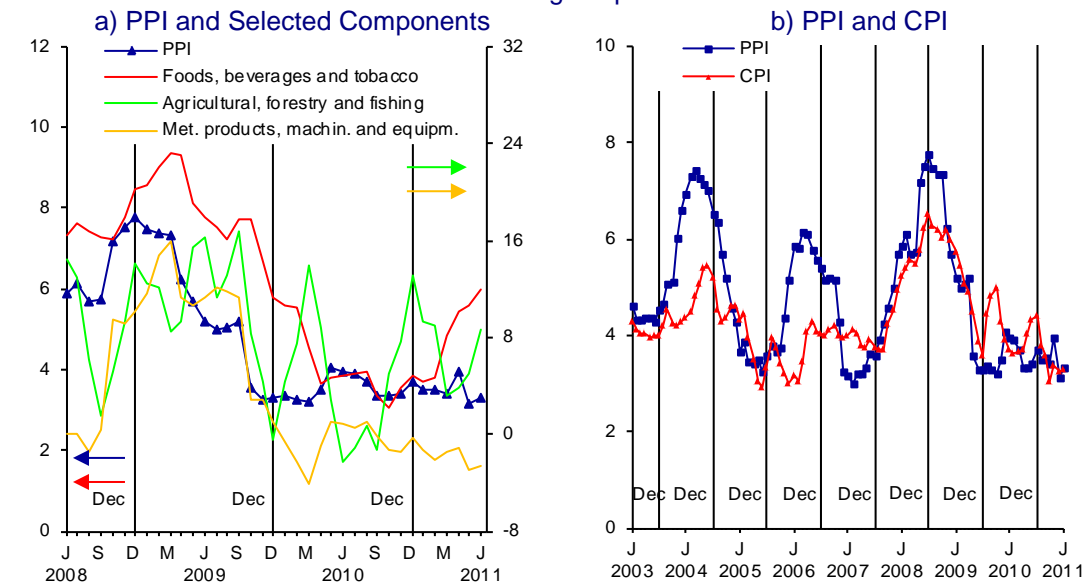
1/ Mont Belvieu.

2/ Pemex, average first hand sale price.

2.2. Producer Price Index

During the second quarter of 2011 the annual average change of the Producer Price Index (PPI) of finished goods and services, excluding crude oil, located at 3.46 percent (in the previous quarter it was 3.48 percent, Graph 9a). The relatively stable behavior of this indicator currently suggests the absence of considerable inflationary pressures associated with producer prices (Graph 9b).

Graph 9
Consumer and Producer Price Indices
 Annual change in percent

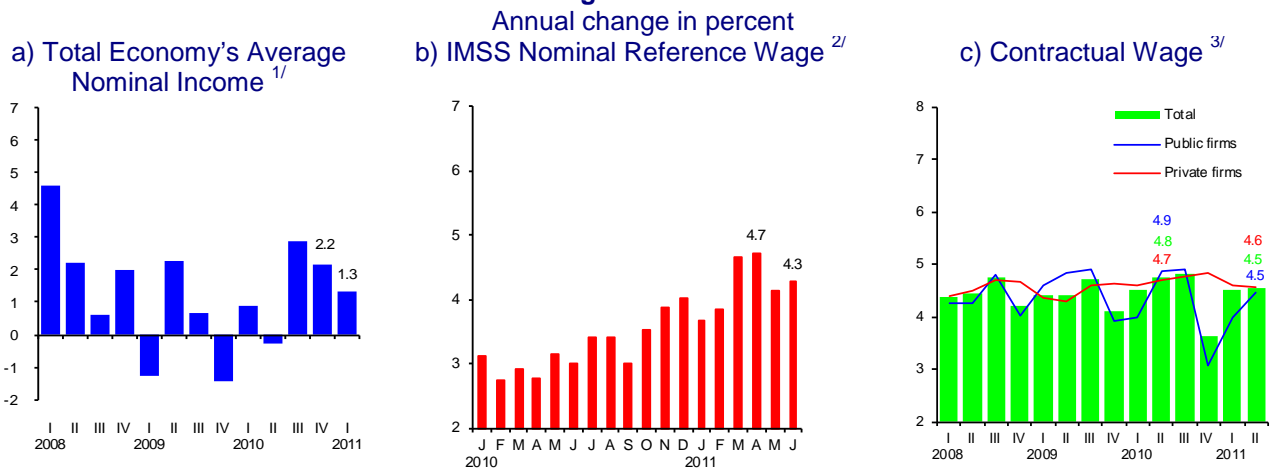


Source: Banco de México.

2.3. Wages

The recent development of the main wage indicators suggests the absence of labor cost-related pressures on inflation. Particularly, the average nominal income of total economy's workers increased 1.3 percent in annual terms during the first quarter of 2011, while in the previous quarter it was 2.2 percent (Graph 10a). Regarding the formal sector wages, the annual growth rate of the IMSS reference wage dropped from 4.7 percent in April to 4.3 percent in June 2011 (Graph 10b). Finally, the contractual wage increase negotiated by firms under federal jurisdiction during the second quarter of 2011 was 4.5 percent, while during the same period of last year it was 4.8 percent (Graph 10c).² It should be pointed out that the reduction in the growth rate of contractual wages was reflected in both private and public firms.

Graph 10
Wage Indicators



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 second quarter of 2011 an average of 15.0 million 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.

Source: Calculated by Banco de México with data from INEGI, IMSS and STPS.

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). On the other hand, contractual wages 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.

3. Economic and Financial Environment

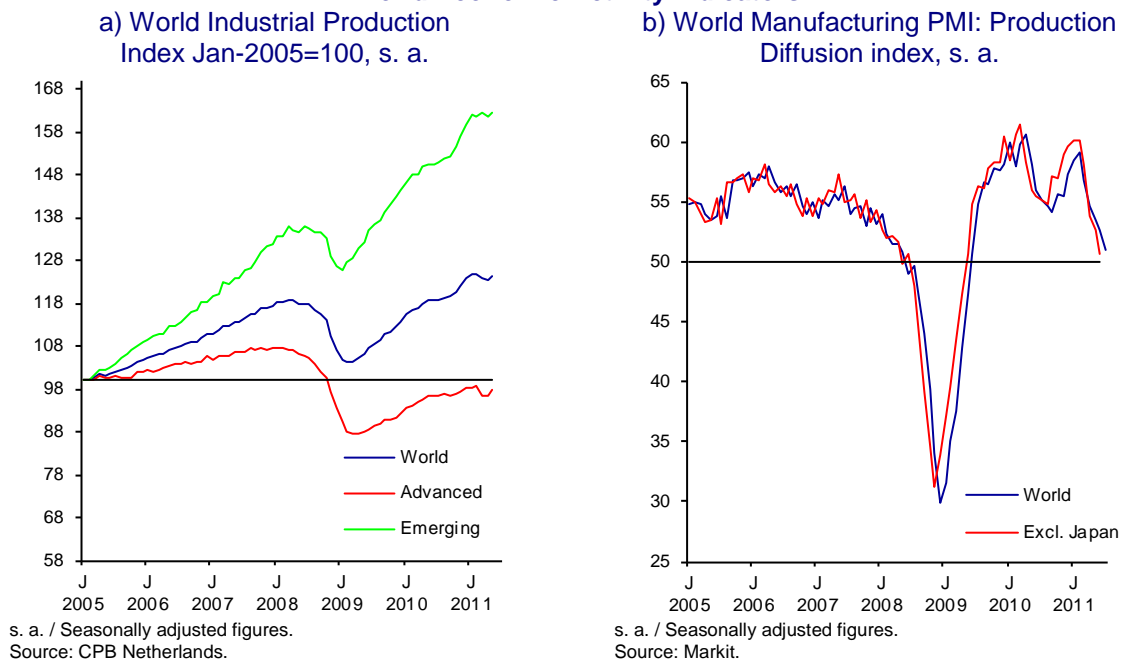
3.1. International Environment

3.1.1. World Economic Activity

The world economy moderated during the second quarter of the year. Temporary effects of the natural disasters in Japan on the global production chains and elevated commodity prices contributed to a marked decrease in the world industrial production growth and a deterioration of leading production indicators (Graph 11). In turn, emerging economies maintained a solid expansion rate, although in some cases presenting a moderation in the referred period.

This outlook of a less vigorous economic activity coincides with the increased downward risks to growth expectations for the world economy, stemming from complex problems faced by the U.S. and Europe.

Graph 11
World Economic Activity Indicators



U.S. economic growth remained weak during the second quarter, after a sharp deceleration in the first quarter. GDP grew 1.3 percent at an annualized quarterly rate, compared to 0.4 percent in the first quarter.³ In turn, industrial production grew at an annualized quarterly rate of 0.8 percent during the second quarter, which was substantially lower than the rate of 4.8 percent observed in the first quarter. As already mentioned, this is primarily due to the effects of the natural disasters in Japan on worldwide production chains. In particular, the

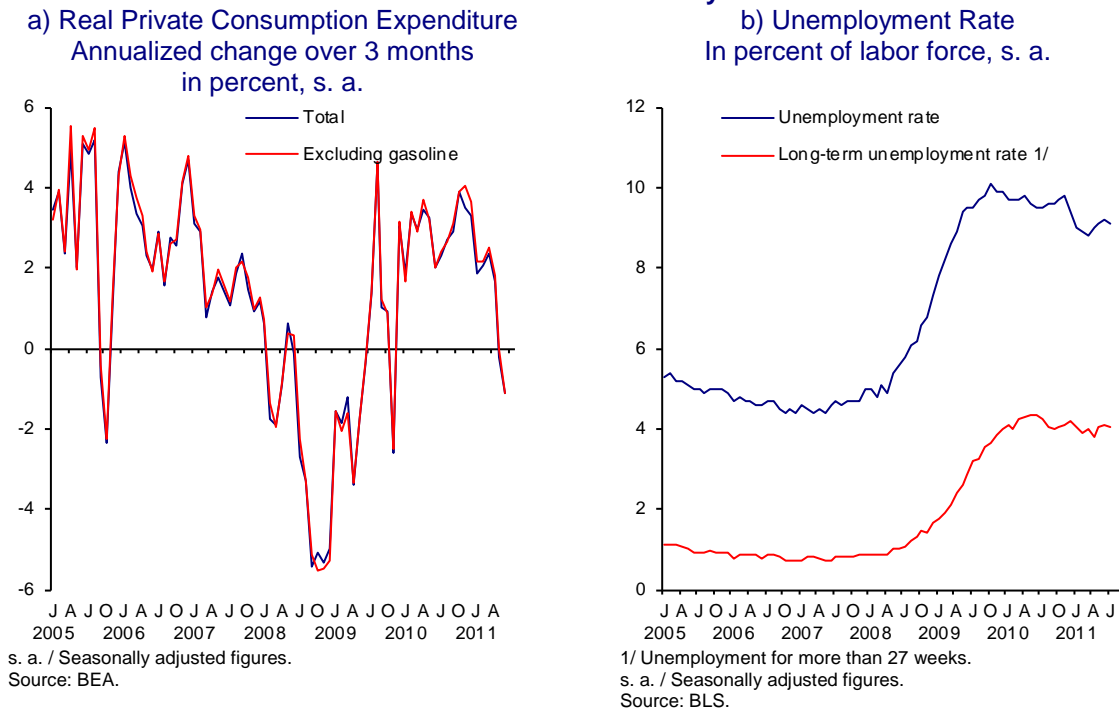
³ According to the advance report of the Bureau of Economic Analysis (BEA).

automobile sector was affected by the interruption of supplies from that country, registering a drop of 16.4 percent at an annualized rate during the second quarter.

Weakening of the U.S. economy during the second quarter was reflected in a smaller growth of private consumption. Despite fiscal and monetary stimuli, households' spending practically stagnated in this period, registering a growth of only 0.1 percent at an annualized quarterly rate, after having increased 2.1 percent in the first quarter of the year (Graph 12a). This was influenced by the negative impact of gasoline price increments during the first months of the year, which offset the increase in the disposable personal income.

Additionally, the labor market deteriorated unexpectedly during the second quarter of the year. After creating, on average, almost 200 thousand employments monthly during the first four months of the year, the non-farm payroll employment grew, on average, only by 50 thousand positions in May and June. In July the number of employments increased by 117 thousand. Slower employment growth resulted in a decrease in the employment to total population ratio from 58.5 percent in March to 58.1 percent in July, the lowest level in more than 25 years. The unemployment rate increased from 8.8 percent in March to 9.1 percent in July, despite the decrease in the labor force participation rate from 64.2 percent in March to 63.9 percent in July. Furthermore, the long-term unemployment rate (more than 27 weeks) remained at high levels during this period, at around 4 percent (Graph 12b).

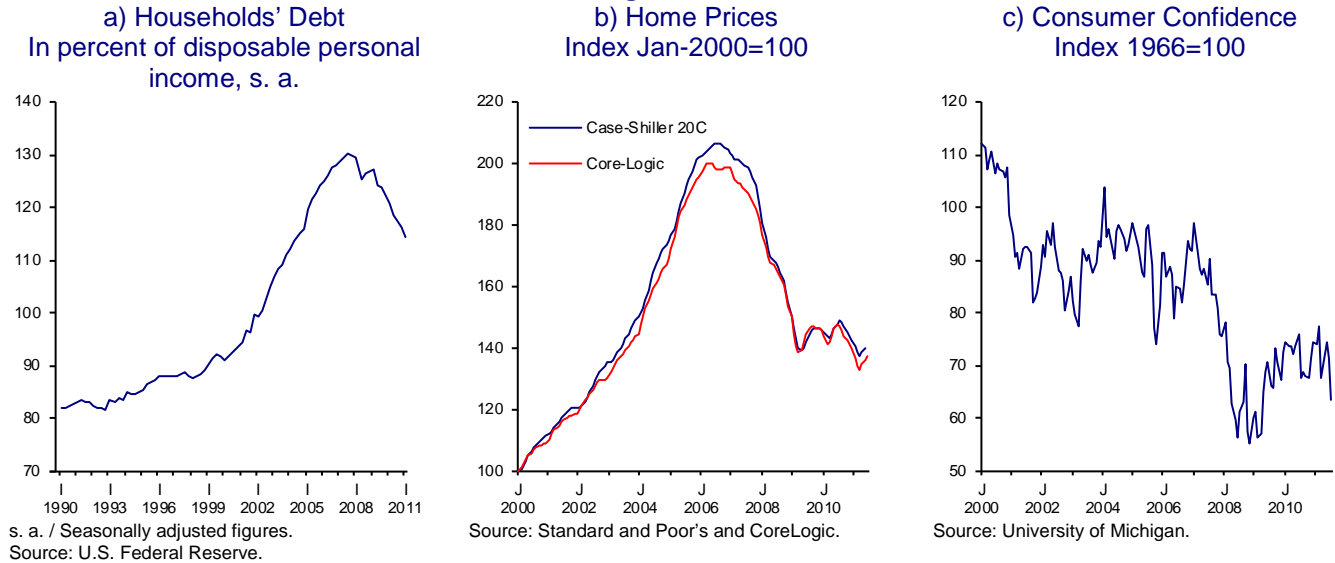
Graph 12
U.S. Economic Activity



The abovementioned suggests that the development of the U.S. economy in the following quarters is likely to continue being affected by households' weak financial position (Graph 13a), the high level of unemployment, a fragil housing market (Graph 13b), and firms' caution at hiring and expanding

investment. This has led consumer confidence to remain at very depressed levels (Graph 13c).

Graph 13
Balance of Households, Housing and Consumer Confidence in the U.S.



Furthermore, uncertainty regarding the pace of the eventual withdrawal of fiscal stimulus and its possible effect on private spending prevails. The completion of various measures adopted as part of the fiscal package of December 2010 implies a significant fiscal adjustment for 2012 and 2013 (Graph 14a).⁴ This will be complemented by measures that will be adopted as part of the negotiation on the increase of the debt-ceiling and that might negatively affect the economic recovery of this country in the short term.⁵ In this context, U.S. growth forecasts for 2011 and 2012 have been revised downwards (Graph 14b).

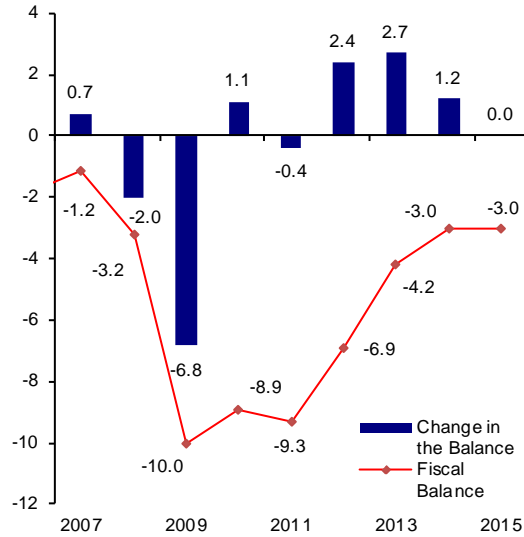
⁴ Among other measures, the current legislation stipulates the following: 1) tax cuts decreed for two years in 2010 are not extended; 2) the decrease of two percentage points of workers' payroll tax decreed for 2011 is not renewed; and, 3) the extinction of extraordinary unemployment insurance benefits after 2012.

⁵ At the beginning of August the U.S. Congress approved an increase in the federal government debt ceiling of at least USD 2.1 trillion. The agreement establishes an initial cut in public spending of USD 917 billion during the next 10 years, an initial increase of the debt ceiling of USD 900 billion and the creation of a two-party commission whose task is to propose additional measures of fiscal savings of USD 1.5 trillion that would have to be approved before December 24, 2011. If this fiscal target is met or if the U.S. Congress agrees to send a constitutional amendment for a balanced budget for its approval to the states (before the abovementioned date), the debt limit would rise by another USD 1.5 trillion. If the U.S. Congress does not approve of any of these two measures or does not save at least USD 1.2 trillion, the debt ceiling would be extended by only USD 1.2 trillion and automatic spending cuts of the same amount would take effect from 2013 on.

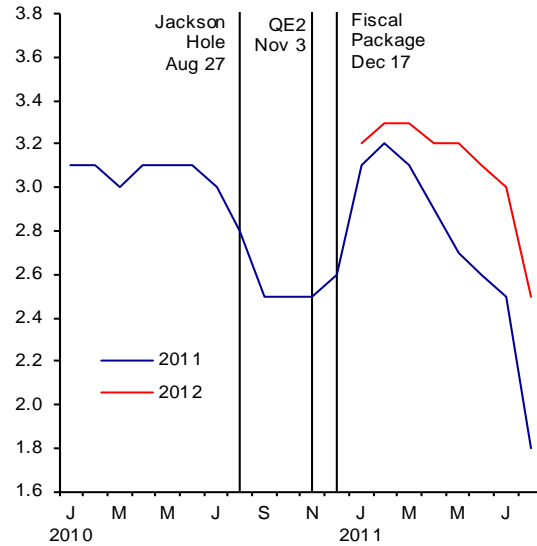
Graph 14
Fiscal Balance and Evolution of U.S. Growth Outlook

a) Fiscal Balance
In percentage points of GDP

b) GDP Growth Forecasts Evolution
for 2011 and 2012
In percent



Source: CBO.



Source: Blue Chip.

In Europe, available indicators also point to a deceleration of economic activity during the second quarter. Industrial production in the Euro zone grew at an annual rate of 5.4 and 4.5 percent in April and May, respectively, below 5.8 percent registered in March, while the manufacturing PMI continued its fall in July, going from 57.5 points in March to 50.4 points, although it still located within the expansion area. Retail sales continued shrinking in real terms in the second quarter, while the indices of business and consumer confidence do not show any improvement by July.

The European Union is still affected by a profound confidence crisis, in particular regarding the sustainability of fiscal consolidation programs in various countries. Although this has not been reflected in the short-term prospects of economic growth and employment in the region yet, the fiscal problems aggravation and the deterioration of conditions in the region's financial markets could adversely affect the dynamism of its economy with a consequent effect on the world economy.⁶ It is noteworthy that a lower amount of policy instruments, as well as adjustment mechanisms, available to these economies, due to their membership to the monetary union, could have made it more difficult to find a solution (see Box 1). The same macroeconomic weakness of the European Union has made its structural challenges more evident.

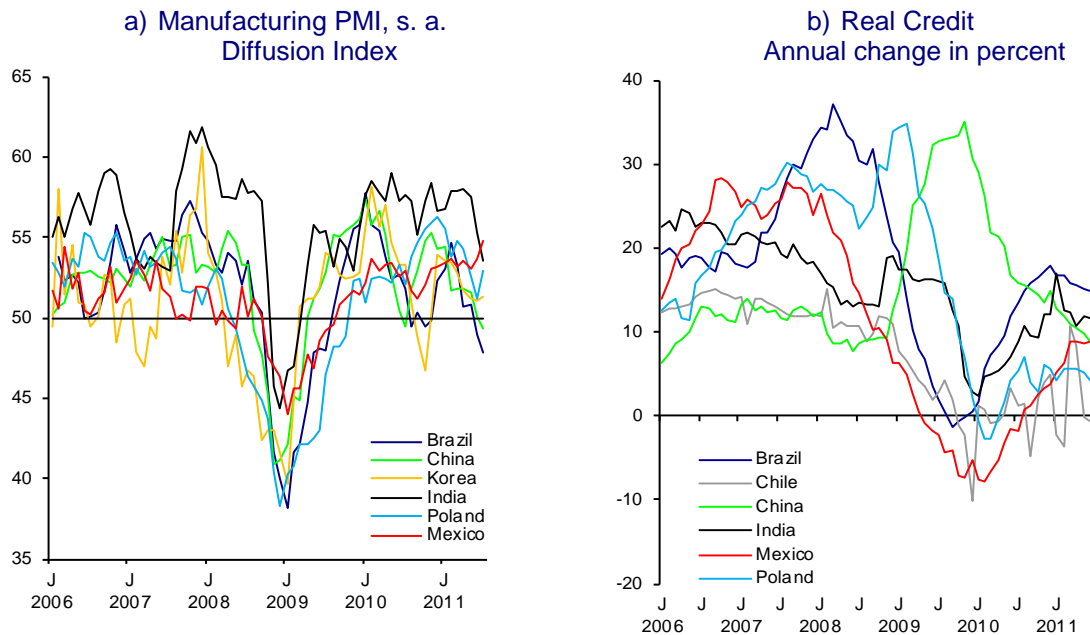
In Japan, various indicators suggest that the natural disasters' impact starts to vanish. Thus, industrial production increased 1.6, 6.2 and 3.9 percent in April, May and June at a monthly rate, respectively, after registering a contraction of 15.5 percent in March. In turn, the volume of exports expanded 4.6 and 8.6

⁶ For 2011, Euro zone growth expectations were revised upwards, from 1.7 percent in March to 2.0 percent in July, while for 2012 they were revised slightly downwards from 1.7 percent to 1.6 percent in the same period.

percent in May and June, as compared to reductions of 8.0 and 7.0 percent in March and April, respectively.⁷ A growth rebound is expected in the second quarter of the year, once productive chains and electricity supplies are fully restored.

Growth in most emerging economies remained high in the second quarter of the year, although recently, some of these economies have started to show moderation. In July, the manufacturing PMI of China located at 49.3 points, that is, in the area indicating the sector's contraction, compared to a level of 51.8 points in March. In India it was 53.6 points, lower than the 57.9 points registered in March (Graph 15a). In Brazil, the manufacturing PMI was 47.8 points, as compared to 53.3 points in March. In turn, credit growth in some of these economies has been significant, which has contributed to their overheating (Graph 15b). Despite the withdrawal of part of the stimuli, in most cases expansive monetary and fiscal stances are still maintained.

Graph 15
Manufacturing PMI and Credit in Emerging Economies



s. a. / Seasonally adjusted figures.
Source: Markit.

Source: Central Banks.

⁷ However, in June industrial production and exports will still be 5.3 and 2.8 percent below the level reached in February.

Box 1 Monetary Unions

1. Introduction

In general terms, a monetary union can be defined as an institutional arrangement where two or more economies adopt a single currency. Advantages and disadvantages of a monetary union is a topic which has been widely analyzed in the economic literature (Mundell 1961, McKinnon 1963, Kenen 1969, Mongelli 2002, De Grauwe 2003, Feldstein 2008, among others). In this context, the present box describes the benefits that a monetary union can generate for the participating economies, as well as the costs they incur. Then it describes the conditions which should ideally prevail in these economies in order to make a monetary union an arrangement which can last in the long term, generating the greatest benefits and the lowest costs for its members.

2. Benefits of a Monetary Union

In principle, the introduction of a common currency can propitiate greater economic efficiency. First, the creation of a monetary union contributes to reducing the transaction costs faced by national economic agents when carrying out international trade and financial operations. These operations require changing one currency for another, which generates certain costs, among others, payment of commissions or the buy-sell spread of the foreign currency. Therefore, the adoption of a common currency eliminates the need to carry out foreign exchange operations, thereby reducing transaction costs (De Grauwe 2003).

The introduction of a single currency also eliminates the foreign exchange risk among the members of the monetary union. In the case of two or more economies allowing free floating of their currencies, exchange rate fluctuations can be a source of uncertainty for the commercial and financial operations among the economic agents of these economies. In particular, episodes of high volatility in the foreign exchange market can have an adverse impact on trade and financial flows. For instance, investors can demand higher yields in order to hedge higher exchange risk. On the contrary, within a monetary union, by eliminating national currencies of the member countries, the foreign exchange risk among them disappears, leading to lower interest rates (Spiegel 2004).

For this reason, a monetary union would have a positive effect on trade and investment. Nevertheless, it is noteworthy that the extent of this benefit depends on the degree of financial development of the involved economies. Those economies where economic agents have access to instruments, such as financial derivatives, which allow hedging against exchange rate fluctuations, would tend to be less favored by the elimination of the foreign exchange risk associated with the monetary union. This is due to the fact that developed financial markets allow economic agents to diversify and distribute risks.

Another benefit of adopting a single currency is that it facilitates a comparison of prices among goods and services produced in the member countries, since these prices are expressed in the same units. The aforementioned propitiates greater discipline among sellers when setting prices and increases economic efficiency. In the case of differences in prices between tradable goods produced in different countries, expressing these prices in the same currency makes these differences more evident for economic agents and, consequently, price differentials tend to disappear more quickly due to arbitrage. In this way, higher price transparency propitiates that these prices tend to equalize among union members, in particular, prices of tradable goods (Allington et al. 2005).

3. Costs of a Monetary Union

First, given that a monetary union implies a substitution of the national currency for another one, there are costs for the economic agents of adapting to the latter one. For example, initially the firms of the member countries have to allocate resources to modify their invoices, price lists, databases, accounting systems, etc. (Mongelli 2002). The aforementioned represents a cost, which, although it is less important than other costs discussed in literature, should also be considered when carrying out a cost-benefit analysis regarding the creation of a monetary union.

Second, the adoption of a common currency among two or more countries implies that the monetary policy conduction would be undertaken by a

supranational institution. Under these conditions, member countries renounce having an independent monetary policy, since, although each country is represented in this institution, the decisions would be made jointly and not individually. Also, by not having a nominal exchange rate among the member countries, they cannot resort to a scheme of exchange rate flexibility as a mechanism to absorb adverse shocks originating from other union members. Even more, real exchange rate adjustments would need to be carried out by means of domestic price changes. Thus, an appreciation in real terms might occur due to higher inflation, while a real depreciation would require lower inflation.

Under these circumstances, a monetary union implies that its members have fewer policy instruments available in order to deal with domestic, as well as external shocks. The costs of not having an independent monetary policy and a flexible exchange rate can be illustrated by the following example. Consider the case of two economies, A and B, where both initially meet their inflation targets and produce at their potential levels. Given this situation, suppose that the first economy faces a positive demand shock and the second one, a negative shock. An example of this can be found in Mundell (1961) who supposes that economic agents shift their preferences away from goods produced in economy B to goods produced by A. In this scenario, in economy A inflation tends to locate above its target and the output gap tends to be positive, while the contrary occurs in economy B. In this example, the effects of the shock are asymmetric in the involved economies.

Given these conditions, the monetary policy response in economy A consists in tightening monetary conditions in order to propitiate inflation to return to its target and production to its potential level. In particular, the monetary authority would increase the policy interest rate, which would tend to moderate aggregate spending through various channels.¹ Among them can be mentioned an increase in the real interest rates leading households to postpone consumption, since this rate reflects the relative price of consumption today with respect to future consumption. Besides, firms would face higher financing costs, which tend to reduce investment. These effects mitigate the expansion of aggregate demand, thereby weakening inflationary pressures. On the other hand, the increase in domestic interest rates tends to attract foreign capital and, thus, to appreciate the national currency, which, in turn, also contributes to moderating the inflation increase, mainly by reducing the price of imported goods expressed in national currency.

In turn, the monetary policy response in economy B would be the exact opposite, i.e., reducing the reference interest rate. The mechanisms through which this economy would return to its equilibrium would operate in the direction opposite to those described before. Thus, the adjustment of the economies, given the mentioned shock, implies different monetary policy stances, as well as exchange rate movements among the involved economies.

If economies have agreed on adopting a common currency and a supranational institution has been put in charge of the monetary policy, this institution would make its decisions based on aggregate conditions prevailing in the monetary union. Thus, following the example described previously, if the economies concerned are of similar size, the negative output gap in one economy would offset the positive gap in the other one. Therefore, the output gap for the whole union could remain unchanged. In the same way, aggregate inflation could also not be affected, resulting from the fact that the inflation increase in one economy would offset the decline in the other one. In this environment, the authority in charge of the monetary policy might decide not to modify the monetary policy stance, when actually one economy needs a monetary easing and the other one the opposite.

¹ For a detailed explanation of the monetary policy's transmission mechanism, see Banco de México's Monetary Policy Program for 2010 (*Programa Monetario para 2010*).

In this case, production would deviate from its potential and inflation from its target in both economies. The monetary policy would not contribute to stabilizing the macroeconomic conditions in either of the economies, generating higher volatility of economic activity and inflation in both of them. This example illustrates that the reduced number of policy instruments available to the members in order to stabilize their economies presents a potential cost of a monetary union. Another manifestation of the same problem is that the ideal monetary policy for the whole union is not necessarily the appropriate policy for each country individually.

4. Conditions for Creating a Monetary Union

Given that the adoption of a monetary union has benefits and costs, the theory of optimal currency areas analyzes the circumstances under which the creation of a monetary union among two and more economies is desirable. In particular, this theory emphasizes the conditions that need to be met in the member countries, such that giving up their own monetary and exchange rate policies would imply the lowest possible costs. It is noteworthy, that even if these conditions are initially present, it is indispensable for the member economies to seek to maintain them in the long run, and even adopt measures to strengthen them. Otherwise, the viability of the monetary union in the long run might be questioned. In the following, these conditions are described.

Synchronized Economic Cycles

The cost of losing an independent monetary policy as an instrument for stabilizing the economy, and the nominal exchange rate as an adjustment mechanism to shocks, is lower to the extent to which countries' economic cycles are synchronized (Tower and Willett, 1976). When two or more economies tend to go through periods of expansion and recession at the same time, the desired monetary policy stance among these economies tends to coincide. Under these conditions, the costs incurred by the member countries, by accepting that a supranational institution conducts the monetary policy for the union as a whole, decline.

In this sense, the elimination of trade barriers among the economies tends to intensify the trade flow among them, and consequently propitiates that their economic cycles tend to move synchronized, thereby generating favorable conditions for the formation of a monetary union (Bean, 1992, Frankel and Rose, 1998). In this context, an economic integration process which creates a free trade zone can be interpreted as a precondition for the introduction of a single currency among two or more economies.

Despite the aforementioned, it is noteworthy that even when two or more countries are commercially integrated, they can still be affected by asymmetric shocks due to factors, such as differences in their production structures and preferences (Kenen, 1969). Even more, the same trade integration process, by propitiating that economies tend to specialize in those sectors where they have a comparative advantage, can generate different productive structures (Bertola, 1993, Krugman, 1993).

Labor Flexibility

Even if an economy within a monetary union does not have monetary and exchange rate policies at its disposal in order to deal with shocks, the economy could still adjust to these shocks by means of wage movements and/or labor mobility (Mundell, 1961).

Given an aggregate demand contraction, placing inflation below its target and propitiating a negative output gap, as well as conditions of greater slackness in the labor market, wages would tend to decline. In this environment, firms would respond by hiring more workers and consequently, expanding their production. Likewise, lower wages would tend to reduce the costs of goods, among them tradable goods, propitiating higher foreign demand for national products. In this way, this economy would tend to return to its initial position. On the other hand, the adjustment in an economy, which experiences a demand expansion, would imply a wage increase. Thus, it is evident that the costs of a monetary union can decrease under conditions of labor markets with flexible wages. In this context, a rigid labor market structure which limits wage flexibility, mainly downwards, reduces the effectiveness of this adjustment mechanism (OECD, 1999).

Another important element for reducing the costs of an asymmetric shock

among the economies within a monetary union is the free mobility of labor. This is due to the fact that they could adjust to a shock, like the one described before, by means of workers migrating among these economies (Mundell, 1961). In particular, workers would migrate from the economies that suffered a reduction in aggregate demand and, consequently, face slack labor market conditions towards those economies that experienced an expansion and tend to have excess demand in the labor market.

Under these circumstances, a regulation prohibiting or restricting workers' free mobility would tend to reduce the effectiveness of this adjustment mechanism. Even when there are no legal labor migration barriers, cultural factors such as language differences can de-facto limit labor mobility and thereby complicate economies' adjustment through this channel (Corden, 1972).

Financial Integration

Mobility of financial resources is another factor that contributes to facilitating economies' adjustment to a shock with asymmetric effects. A high degree of financial integration among union members facilitates the resource flow from those economies where the effect of a shock is positive to those where the impact is negative (Ingram, 1969). Thus, economic agents from the latter ones can obtain credit from financial institutions in the rest of the union members, thus attenuating the drop in their spending. Also, the elimination of the foreign exchange risk, described before, would allow them to access this financing at a relatively reduced cost.

Besides, financial integration among the member countries of a monetary union allows economic agents to hold more diversified portfolios, which generally contributes to diversifying the risk of asymmetric and/or idiosyncratic shocks among all union members (Mundell, 1973). In this context, the creation of a monetary union itself, by strengthening financial integration among its members, would tend to attenuate the impact of these shocks on the involved economies.

Nevertheless, for the aforementioned to be valid it is indispensable to have sound and solvent financial systems, which can efficiently perform the function of intermediating financial resources and to allow economic agents to distribute and diversify risks. It is noteworthy that a greater financial integration propitiates a greater interconnection among the markets and financial institutions of the member countries, which, in turn, increases the risk of contagion. Given this, a high degree of coordination and cooperation in financial regulation and supervision matters is indispensable in order to maintain stability of the financial system within the union.

Fiscal Integration

In addition to the aforementioned, another adjustment mechanism for the economies within a monetary union is the creation of a scheme that allows the transfer of fiscal resources among them (Kenen, 1969). In the presence of an asymmetric shock among the members of a monetary union, in those economies where the impact of the shock is negative, the economic activity would decline and unemployment would increase, the fiscal revenues would tend to decrease due to the contraction of the fiscal base. On the contrary, in those economies where the impact of the shock is positive, tax collection would tend to increase. Thus, in the former there would be a deterioration in the fiscal accounts, while in the latter there would be a strengthening.

In this scenario, in principle it could seem desirable to adopt an institutional arrangement which allows fiscal resource transfer from the economies with a more solid fiscal position to those with a weaker position (De Grauwe, 2003). This agreement could work like an automatic stabilizer in face of an asymmetric shock, reducing the cost of not having an independent monetary policy at their disposal to stabilize the economy.

Nevertheless, this arrangement could imply the centralization of decisions regarding taxes and public spending of the union member countries possibly in hands of a supranational authority, which could be interpreted as loss of sovereignty for the member countries. Further, in those economies with extraordinary fiscal revenues, the resource transfer to other economies could lead to discontent among the population and could

generate political pressures in order to avoid resource reallocation among the involved countries. The aforementioned could worsen if there is a perception that the weakness of fiscal accounts in the countries that would receive transfers is not only due to cyclical but also structural factors, such as a more generous social protection system.

On the other hand, such a fiscal transfer scheme has the disadvantage of generating moral hazard problems among member countries. In particular, given the outlook that an economy in recession can have access to fiscal resources of other economies, there are fewer incentives for adopting measures facilitating an orderly adjustment, like, for instance, the implementation of labor reforms aimed at flexibilizing the labor market.

Sustainable Debt Levels and Fiscal Discipline

Even without a fiscal arrangement like the one described before, it can be argued that an independent fiscal policy allows union members to respond to shocks (Feldstein, 2008). For instance, in the presence of a negative demand shock they can adopt an expansive fiscal policy; even more, greater financial integration within a monetary union, in principle, would allow them to finance a fiscal stimulus at lower costs.

Nevertheless, in order to make this work, debt sustainability is important, as well as fiscal discipline among union member countries (Buiter et al., 1992). First, it is fundamental that member economies hold debt levels perceived as sustainable in the long term, otherwise the access to foreign financing would be limited, and possibly at prohibitive costs, even in the context of a monetary union. It is also crucial that once the countries, which faced problems, recover they implement credible fiscal consolidation plans seeking to maintain their debt at sustainable levels in the long run.

In this context, even if initially debt levels of the member countries are not excessive, absence of fiscal discipline in some of these countries could propitiate the increase of the debt and make it eventually reach unsustainable levels. If this happens, creditors could become each time less willing to refinance this debt. In the extreme case this dynamic could lead to a fiscal crisis and sovereign default problems. To the extent to which the introduction of a common currency propitiates greater financial integration among the member countries of the union, it is to be expected that insolvency problems in one of the countries could end up affecting the other countries.

Given the possibility of contagion and the risk of generating a systemic problem, among member countries arises the need to take measures to avoid that this risk materializes. Among them are severe fiscal adjustments in the stressed economies and financial rescue plans with fiscal resources from remaining union members. Depending on the gravity of accumulated imbalances, it is the severity of the adjustment, and in some cases it can even not be viable politically, which complicates the situation even more.

Similar Productivity and Inflation Levels

In addition to the previous considerations for the countries adopting a common currency, it is desirable for them to have similar inflation (Flemming, 1971), as well as productivity growth levels (De Grauwe, 2003). Otherwise, there could be a trend of generating imbalances in the concerned countries' current accounts. On the one hand, the economies with lower productivity growth and/or higher inflation levels would tend to be each time less competitive in relation to the rest of the economies in the union. As a result, they would have an increasingly higher current account deficit. The opposite would occur in the economies with higher productivity growth and/or lower inflation levels.

In the context of exchange rate flexibility, these external imbalances could be corrected by means of a nominal exchange rate adjustment. In particular, the currency of the economies with current account deficit would depreciate while the opposite would occur in those economies with external surplus. Nevertheless, if these economies are members of a monetary union, an adjustment mechanism, like described before, would not be available. Under these circumstances, the imbalances could continue growing and could reach unsustainable levels in the long term. In this scenario, doubts about the payment capacity of deficit economies

could arise, and consequently their creditors would demand each time higher risk premia, and could even suddenly stop financing these economies. This could lead to a balance of payment crisis, which eventually could be transmitted to all economies in the monetary union through financial and trade linkages among them.

5. Final Remarks

It is prudent to show that, even if the creation of a monetary union can generate certain benefits for the member countries, there are also certain costs, mainly the cost of not having one's own monetary and exchange rate policies. In this sense, it has been discussed in the economic literature how certain factors contribute to attenuating these costs. In particular, the existence of alternative adjustment mechanisms has been emphasized. In this context, in order to reduce the costs of being part of a monetary union, it is important for the member economies to fulfill certain requirements right from the beginning. Further, for a monetary union to be an arrangement which can last in the long term, it is fundamental to pursue these conditions and even strengthen them.

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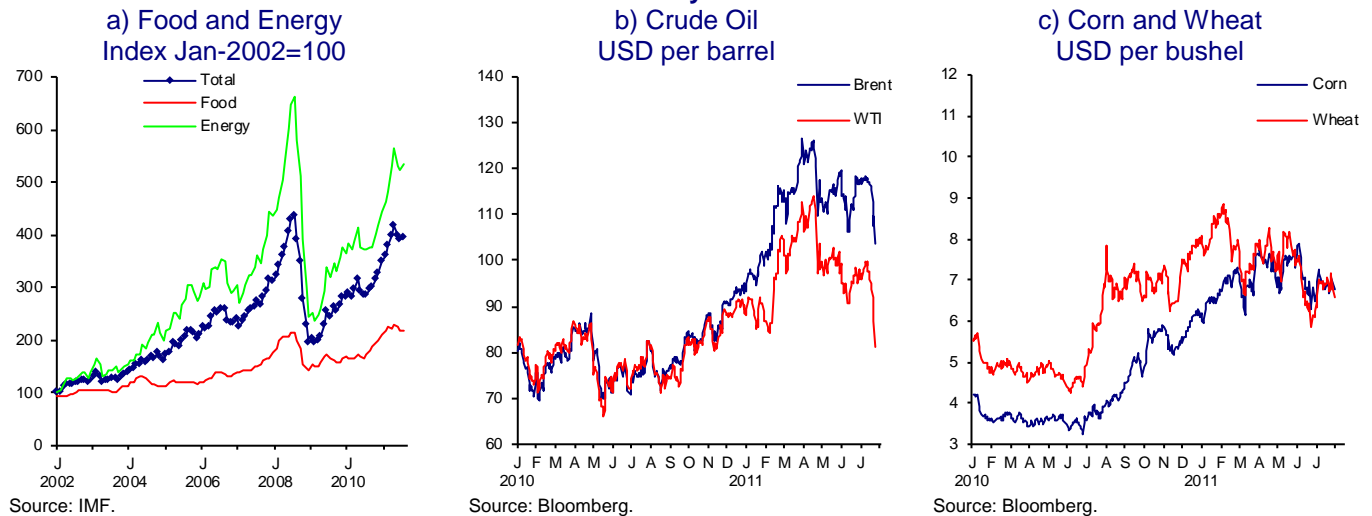
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3.1.2. Commodity Prices

Reflecting lower dynamism of world economic activity and the downward adjustment of its growth expectations, the international commodity prices have decreased since the mid-second quarter. The reductions observed in the energy and food price indices are noteworthy (Graph 16a). Other factors that contributed to the fall of international commodity prices were, in the case of oil prices, the decrease of the risk premium in its price associated with the geopolitical conflicts in the Middle East and North Africa, given less tension in these regions; and in the case of wheat and corn prices, the upward revision in cereals production projections for 2011, as a consequence of larger areas planted and higher yields per hectare. Nevertheless, grain inventories remain at relatively low levels, thus in case of adverse climatic events their prices could again experience high volatility.

Particularly, crude oil prices dropped 18.4 percent from the maximum levels observed at the end of April to August 8, 2011 (Graph 16b).⁸ In turn, corn and wheat prices registered reductions of 14.2 and 20.5 percent respectively from their maximum levels observed at the beginning of June and at the end of April (Graph 16c).

Graph 16
Commodity Prices



3.1.3. World Inflation Trends

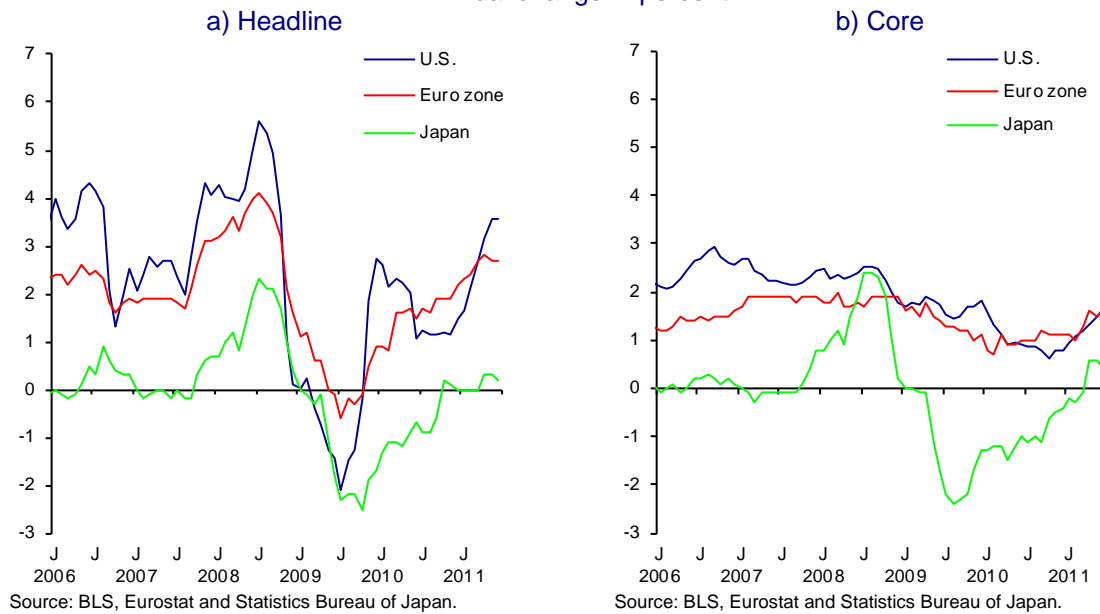
World inflation increased during the first quarter of 2011, although levels reached in most economies are substantially lower than in previous economic cycles. Headline inflation registered upward movements in advanced economies during the second quarter of the year, although starting from very low rates (Graph 17a). This was mainly due to increases in commodity prices in the first months of the year, particularly energy prices. In turn, core inflation also rose, although it remained at reduced levels (Graph 17b). It should be pointed out that in main advanced economies ample slack in the use of resources still prevails and medium- and long-term inflation expectations continue being well-anchored. Based on this, in the second half of the year inflation is expected to decrease in advanced countries, unless commodity prices resume their upward trend.

⁸ It refers to the North Sea Brent crude oil price.

In the U.S. annual headline inflation rebounded in the first six months of 2011 due to: the effect of higher commodity prices, in particular gasoline, and imported goods; and the impact on some prices derived from productive chain disruptions, stemming from the natural disasters in Japan. In June, headline inflation reached 3.6 percent, compared to 2.7 percent in March. In turn, core inflation increased from 1.2 to 1.6 percent in the referred period.

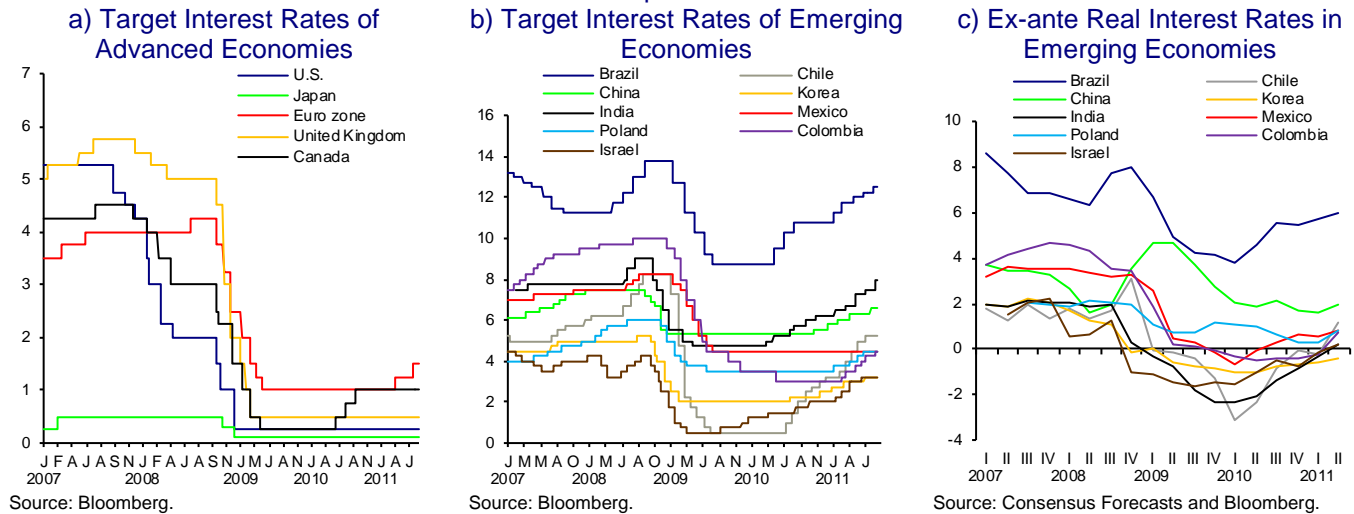
The Monetary Policy Committee of the U.S. Federal Reserve Bank pointed out in its press release of June 22, 2011 that inflation is expected to decline to levels congruent to or lower than those in its mandate, when the effects of energy and commodity price increments disappear. The Committee maintained the target range of the federal funds rate at 0 to 1/4 percent (Graph 18a) and anticipated that this target will be maintained at exceptionally low levels for a prolonged period. It is noteworthy that the U.S. Federal Reserve completed the program of extraordinary purchases of Treasury securities in June, as initially planned. Nevertheless, it pointed out that it would maintain its policy of reinvesting the principal payments from its securities portfolio, which implies that its balance will remain at current levels in the following quarters.⁹

Graph 17
Inflation in Advanced Economies
 Annual change in percent



⁹ However, the Monetary Policy Committee also indicated that it would regularly review the size and the composition of its securities portfolio and that it is prepared to adjust those holdings as appropriate.

Graph 18
Central Banks' Target Interest Rates and Real Interest Rates
 In percent



In the Euro zone, annual headline inflation remained above the target of the European Central Bank (ECB) during the quarter, locating in June at 2.7 percent (similar to the level registered in March). Inflation in the region reflected increments in commodity prices. In turn, core inflation also experienced a certain rebound, reaching 1.6 percent in June, as compared to 1.3 percent in March. In this context, the ECB increased its reference rate on two occasions, by 25 basis points in April and in July to 1.50 percent. However, in its August press release, it maintained its policy rate unchanged, bringing out the intensification of downward risks to economic growth.¹⁰ Furthermore, the ECB announced that, given renewed tensions in some financial markets of the Euro zone, it has decided, among other actions, to extend at least till January 2012 its unconventional liquidity measures.¹¹ It should be emphasized that, given the difficult fiscal and financial situation some European economies are going through, the ECB has provided support by means of sovereign bond purchases and the acceptance of higher-risk instruments as collateral, through refinancing operations with banks without access to funding markets. In this way, the size of its balance has maintained high and its composition has been deteriorating.

In Japan, annual headline inflation reached 0.2 percent in June, while the annual change of the core subindex continued being positive, locating at 0.4 percent.¹² On August 4, in its monetary policy meeting the Bank of Japan decided to maintain unchanged its monetary policy rate between 0 and 0.1 percent and to expand its program of assets' purchase from JPY 40 to 50 trillion.¹³ In its press release the Bank of Japan mentioned the possible negative effects of the uncertain international environment and the volatility of financial and exchange markets on the Japanese economy. Besides, it emphasized that certain time is likely to be needed to reach price stability.

¹⁰ Although it reiterated that it would continue closely monitoring the evolution of upward risks to prices.

¹¹ In particular, the ECB will continue conducting its main refinancing operations (MROs) at a fixed rate with full allotment as long as necessary and at least until January 17, 2012.

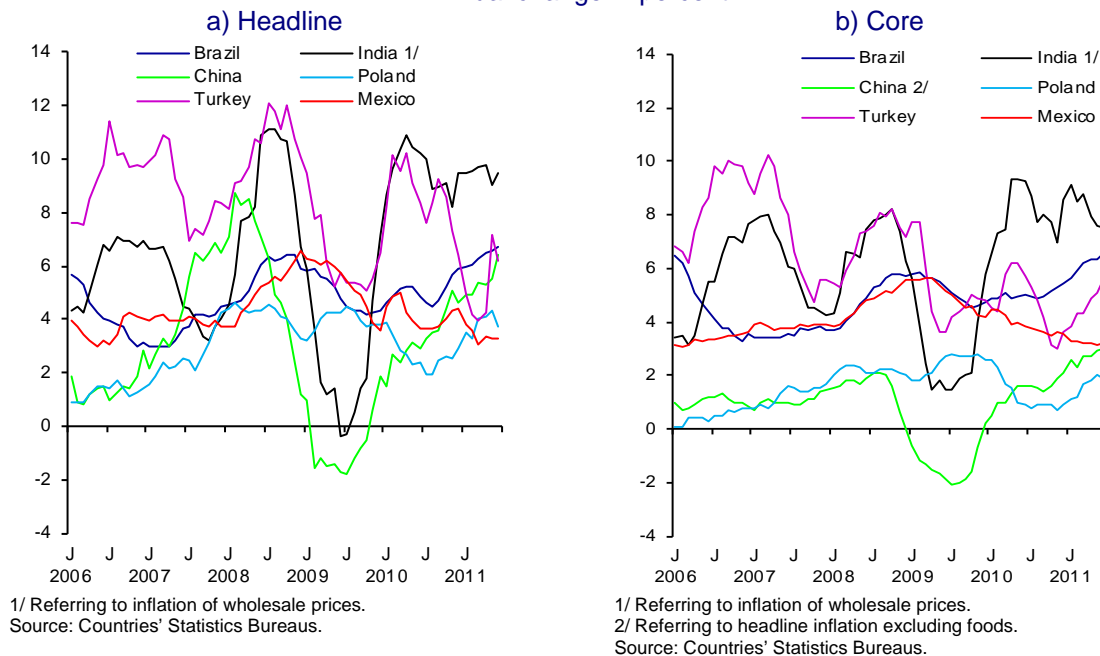
¹² It refers to headline inflation excluding fresh food.

¹³ The Central Bank is planning to conclude this purchase program until the end of 2012.

High growth rates still observed by some emerging economies have resulted in inflationary pressures (Graph 19a). For example, annual consumer inflation in China was 6.4 percent in June, figure above 5.4 percent registered in March. In Brazil inflation was 6.7 percent, which was above the 6.3 percent observed in March. In turn, inflation in India remained above 9 percent during the second quarter, although it fell slightly from 9.7 percent in March to 9.4 percent in June. Core inflation also exhibited upward pressures in these economies (Graph 19b). Given this, some central banks continued withdrawing part of the strong monetary stimulus they had introduced in the past. In this way, the rise in their reference interest rates has been reflected in a gradual increase in their real short-term interest rates (Graph 18b and Graph 18c). In this respect, it should be mentioned that the referred real short-term interest rates in Mexico have remained above the corresponding rates in most emerging economies.

In response to the decrease in commodity prices since the mid-second quarter and greater downward risks to the growth outlook of the world economy, some central banks, both of advanced and emerging economies, have moderated their restrictive monetary policy stance.

Graph 19
Inflation in Emerging Economies
 Annual change in percent



3.1.4. World Financial Markets

From the second quarter onwards international financial markets were affected by an increase in investors' uncertainty. This was a reflection of the deterioration in the growth outlook of the world economy, in particular in advanced economies, an aggravation of the sovereign debt crisis in the Euro zone and difficulties faced by the U.S. government to raise their debt ceiling.

On the one hand, there is fear that the economic weakness of various advanced countries will be longer than foreseen. Besides, there is uncertainty regarding the effect on the economic activity of the eventual withdrawal of the fiscal and monetary stimuli in the main advanced economies.

On the other hand, tensions in the financial markets reappeared, given the gravity of fiscal and financial problems in some European countries that had been accumulating in the last decade and also given the high contagion risk to other countries. This resulted in a considerable deterioration of sovereign risk indicators in countries facing fiscal problems, which aggravated due to the insistence of some European authorities that the private sector had to participate in a new rescue package for Greece. This was due to the fact that this measure would only delay the return to the debt markets of countries with fiscal difficulties. Additionally, the deterioration of the sovereign risk indicators of other countries derives from fear that in case of Greece establishing a precedent, part of the solution to the debt problem of other region's countries would also involve participation of the private sector (by means of debt restructuring).

Uncertainty, regarding the continuation of the International Monetary Fund (IMF) and the European Union (EU) programmed disbursements, as part of the support package to Greece, substantially increased. This was due to lower than programmed growth in economic activity in this country and to the failure to reach fiscal targets, which increased financing requirements and hindered Greece's access to debt markets. In response to this, the European authorities agreed to grant additional financing in return for Greek government's efforts to achieve fiscal consolidation, to implement growth-promoting structural reforms and to advance in the privatization of government assets. The Greek Parliament's approval at the end of June of a fiscal measures' package allowed the authorization of a new disbursement of resources to Greece.¹⁴

However, tensions reappeared in the sovereign debt markets during July, when a considerable downgrading of Portugal and Ireland's credit rating was registered, which increased the risk of contagion and the possibility of other countries also needing financial support in the future.¹⁵ Besides, uncertainty grew regarding private sector's participation in a new financial support package to Greece.

An important increment in sovereign risk indicators, particularly in such countries as Spain and Italy (Graph 20), has caused the European authorities to consider new measures to strengthen the existing strategy to face the crisis and to limit contagion. The Euro zone's Heads of State agreed in their meeting of July 21 on a new financial support program to Greece for EUR 109 billion, as well as an interest rate reduction and the extension of loan terms to Greece, Ireland and Portugal. Greece's new program also includes private sector's participation by means of debt restructuring. On the other hand, they agreed to grant greater flexibility to the European Financial Stability Facility (EFSF). With the new powers vested, the EFSF could approve precautionary credit lines, finance the recapitalization of financial institutions through credits to the European governments, as well as intervene in the secondary market of sovereign debt under extraordinary circumstances.

The initial response of analysts to the new support program for Greece was unenthusiastic, as sufficiency regarding the announced measures was questioned and doubts as to the implications of the private sector's participation in

¹⁴ Up to date, the European Union and the IMF have spent approximately EUR 65 billion out of the EUR 110 billion promised in May 2010.

¹⁵ On July 5, Moody's cut Portugal's credit rating by four levels, from Baa1 to Ba2, despite the approval of a financial assistance program by the EU and the IMF in the previous month (see the description in the Inflation Report, January-March 2011). The credit rating agency also reduced the credit rating of Ireland from Baa3 to Ba1 on July 12.

the case of Greece for other cases of the European countries with debt problems persisted.

Although reaching an agreement regarding a new financial support program for Greece was crucial, it will have to be complemented by considerable progress in fiscal consolidation and by reforms that would allow increasing economy's competitiveness. The fiscal sustainability problem of Greece and other European countries is multidimensional and requires diverse medium- and long-term reforms, apart from the creation of financial support mechanisms both for the public and the banking sector.

With regard to the situation of the European financial institutions, during the second quarter new bank stress tests were conducted with the purpose of evaluating their strength in an adverse scenario, and were published by the European Bank Authority (EBA) on July 15.¹⁶ The results of the stress tests, carried out in 90 banks of 21 countries, and representing approximately 65 percent of the system's assets, show that by the end of 2010:¹⁷ i) 8 banks would be below the basic capital requirement of 5 percent on the risk-weighted assets (Core Tier 1 ratio), which implies a missing capital of EUR 2.5 billion;¹⁸ and, ii) 16 institutions would have a basic capital to risk-weighted assets ratio of between 5 and 6 percent. Based on these results, the EBA published its first formal recommendation to the national supervision authorities: immediate subscription of the missing capital of those banks that have the basic capital ratio lower than 5 percent, and adoption of the necessary measures to strengthen the capital position of those institutions that barely meet the requirement of basic capital of 5 percent and that have high exposure to the sovereign risk of countries with debt problems.

Nevertheless, the credibility of these results has been questioned by economic analysts. This is due to the fact that, among other reasons, the deterioration in the sovereign bonds' value has not been reflected in the balance of many banks, the refusal of one German bank to allow the publication of its results and the possibility that the Spanish institutions that did not pass the test will not be obliged by their national regulators to increase their capital given the differences in the basic capital definitions.¹⁹

In these exchange markets, a relative stability during the second quarter, despite the nervousness stemming from the European situation. The EUR registered moderate variations, even when uncertainty regarding some Euro zone members' financial situation increased. The effective USD exchange rate registered a slight depreciation with respect to major trading partners (Graph 20c). In turn, the JPY presented a strong appreciation against the USD in July, which was partially reverted at the beginning of August after interventions in the exchange market and after the announcement of an additional monetary easing.

¹⁶ The stress test scenario is composed of three elements: 1) a set of EU shocks, related to the debt crisis; 2) a negative shock on demand caused by problems in the U.S.; and 3) USD depreciation. Besides, in June the EBA requested banks to conduct tests assuming additional losses with respect to a greater deterioration of the sovereign bonds and a reduction in the credit quality that would indicate a hypothetical default on payments. It is noteworthy that the EBA only coordinated the conduction of these stress tests, which were realized by the supervision authorities of each country.

¹⁷ These results include the effects of capital increase by EUR 50 billion between January and March 2011.

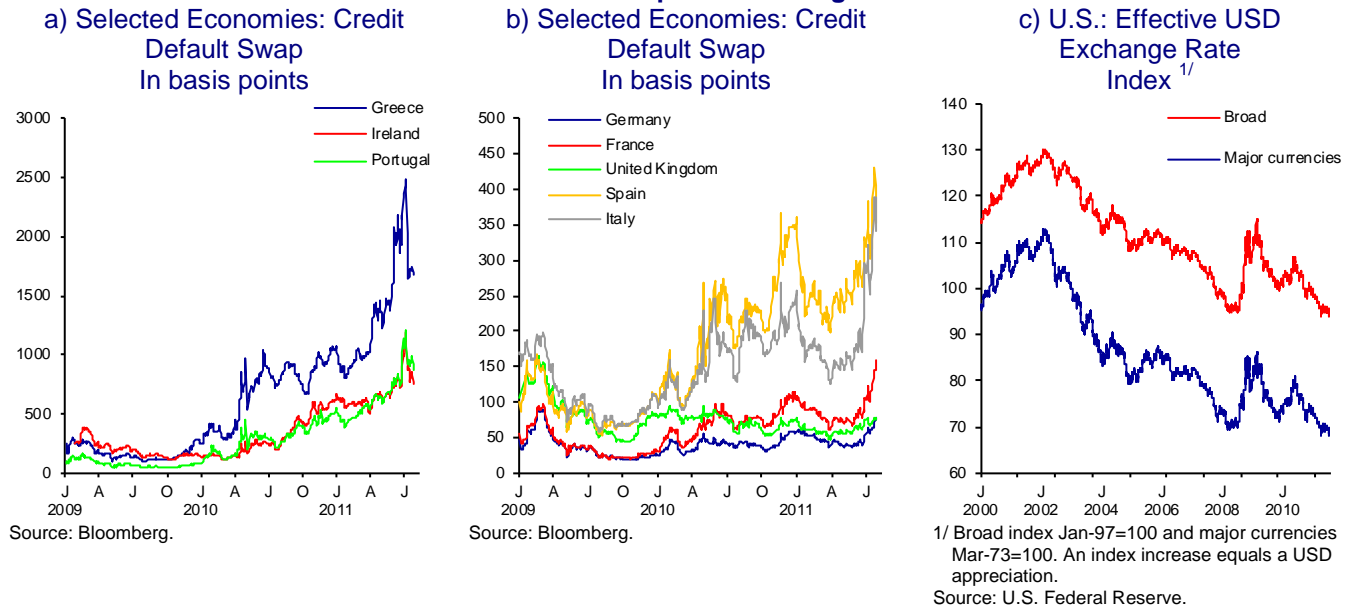
¹⁸ Out of which, 5 are Spanish, 2 are Greek and 1 is Austrian.

¹⁹ Spanish financial institutions that did not pass the stress test were the following: Caja de Ahorros del Mediterráneo; Caixa D'Estalvis de Catalunya, Tarragona I Manresa; Banco Pastor; Caixa D'Estalvis Unio de Caixes de Manlleu, Sabadell I Terrassa; and, Grupo Caja 3. It is noteworthy that none of these institutions has a considerable presence in Mexico.

Among emerging countries' currencies the appreciation of the Brazilian real and the Colombian peso stood out (Graph 21a).

The vast majority of the securities markets exhibited drops during the second quarter, which were intensified at the beginning of August due to uncertainty in Europe and deterioration of the growth outlook of the world economy. Emerging stock markets in general registered setbacks, with the cases of China, Colombia and Brazil standing out (Graph 21b).

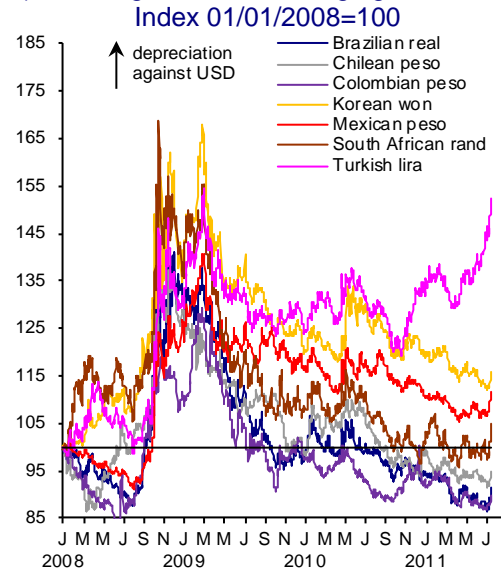
Graph 20
Credit Default Swap and Exchange Rate



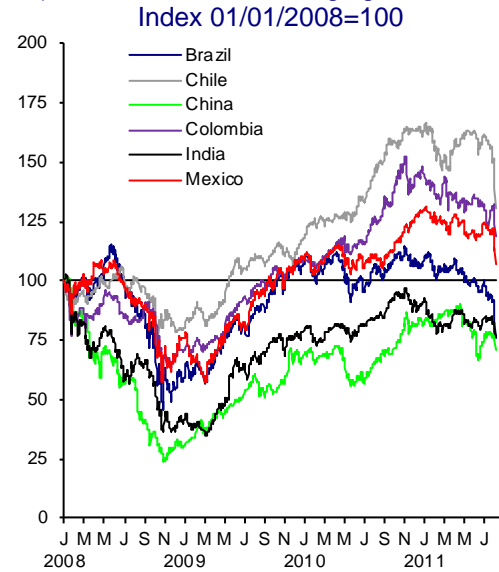
During the last weeks of July uncertainty in international financial markets rose considerably given the difficulty to raise the debt ceiling of the U.S. government and given the deterioration in the growth outlook. At the beginning of August, the perception that the fiscal adjustment measures agreed upon in the U.S. are not sufficient to reach stability of the public debt to GDP ratio in the medium term, and that political mechanisms to accomplish fiscal consolidation have weakened, led one of the rating agencies to reduce the long-term sovereign credit rating of that country.²⁰

Finally, the referred increase of investors' uncertainty in the financial markets propitiated that the capital flows to emerging economies showed a more volatile behavior during the last months.

²⁰ On August 5, Standard & Poor's reduced the long-term credit rating from "AAA" to "AA+" with a negative outlook.

Graph 21
Financial Indicators in Emerging Economies
a) Exchange Rates in Emerging Economies


Note: An index increase implies local currency depreciation against USD.
Source: Bloomberg.

b) Stock Markets in Emerging Economies


Source: Bloomberg.

3.2. Developments in the Mexican Economy

3.2.1. Economic Activity

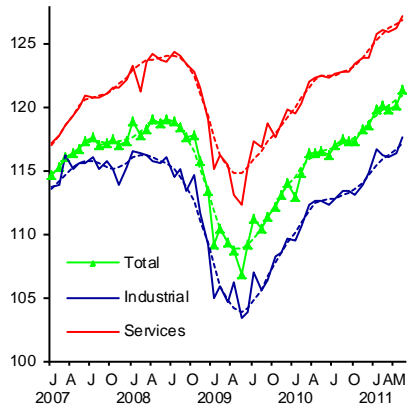
During the second quarter of 2011, the economic activity continued to register a positive trend. In particular, the Global Economic Activity Indicator (IGAE) exhibited a seasonally adjusted monthly growth of 0.27 and 0.97 percent in April and May, as compared to the variations of 1.00, 0.26 and -0.18 percent in January, February and March, respectively. However, some domestic demand components seem to be presenting a moderation in their expansion rate.

Industrial production showed seasonally adjusted monthly growth both in April and May of this year, which, to a great extent, reflected a rise in the manufacturing activity (Graph 22a and Graph 22b). Within this industry, the subsector of transport equipment registered a significant monthly seasonally adjusted increase in May, after being adversely affected in the previous month by factors with temporary effects (Graph 22c). In this regard, it should be pointed out that the productive chains of the automobile companies located in Mexico were temporarily affected in April, as a result of the interruption of parts' supply due to the natural disasters in Japan. In addition, some other firms stopped activities additional to those regularly stopped during Easter, with the purpose of adapting their automobile assembly lines for production of 2012 models. Subsequently, in May and June, vehicle production registered monthly increases in seasonally adjusted terms, and thus recovered from the fall registered in April.

In turn, during the reported quarter the service sector activities continued exhibiting a positive trend (Graph 22a). This development reflected the growth of both the services related to the external sector (such as commerce and transport) and those oriented to the domestic market (telephone service, professional services, education, business support and health services).

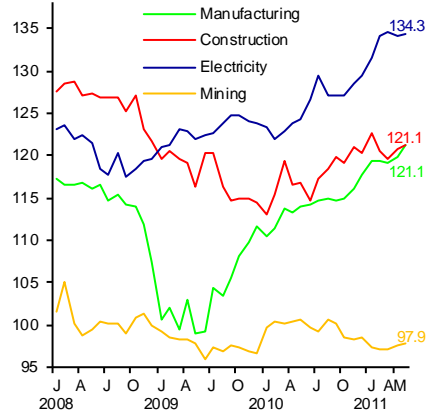
Graph 22
Economic Activity Indicators
Index 2003=100

a) Global Economic Activity Indicator (IGAE)
Seasonally adjusted and trend data



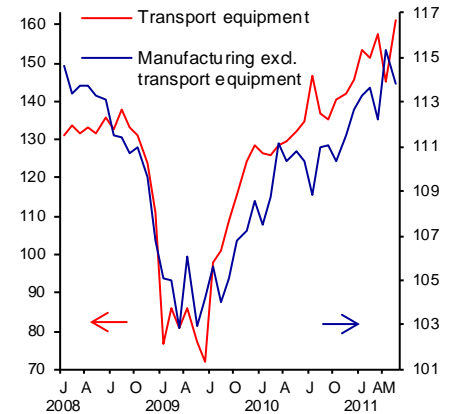
Source: Mexico's System of National Accounts, INEGI.

b) Industrial Activity
Seasonally adjusted data



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

c) Manufacturing
Seasonally adjusted data

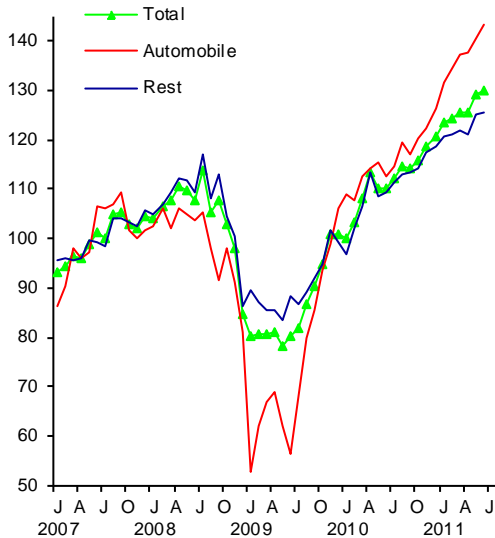


Source: Industrial Activity Indicators, Mexico's System of National Accounts, INEGI.

The external demand has continued to show a favorable development, which has been manifested by the dynamism of manufactured goods exports. This evolution is still present in a relatively generalized manner among different goods' categories and is the result of both higher exports to the U.S. and the rest of the world (Graph 23). Based on the abovementioned, no clear impact of the slowdown of the U.S. economy on domestic production has been observed yet.

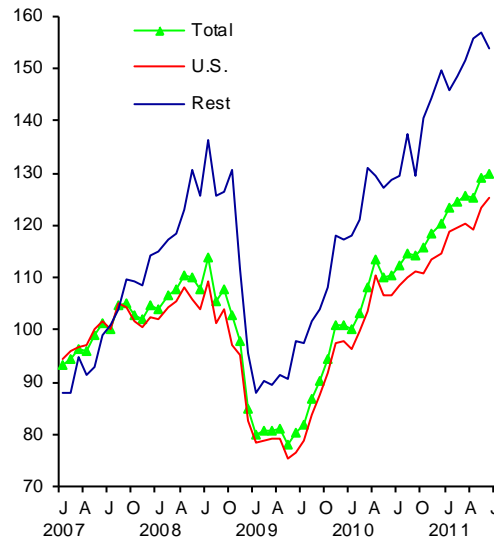
Graph 23
Foreign Trade Indicators
Index 2007=100; seasonally adjusted data

a) Manufacturing Exports



Source: Banco de México.

b) Manufacturing Exports by Region of Destination

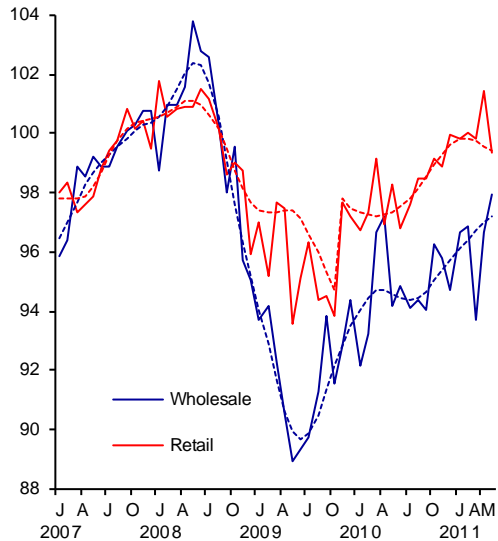


Regarding domestic demand, some indicators would seem to suggest a slowdown in its dynamism. Particularly, timely indicators of both private

consumption and investment have presented a moderation in their growth in the recent months (Graph 24). It should be mentioned that investment is still located at levels below those observed before the crisis.

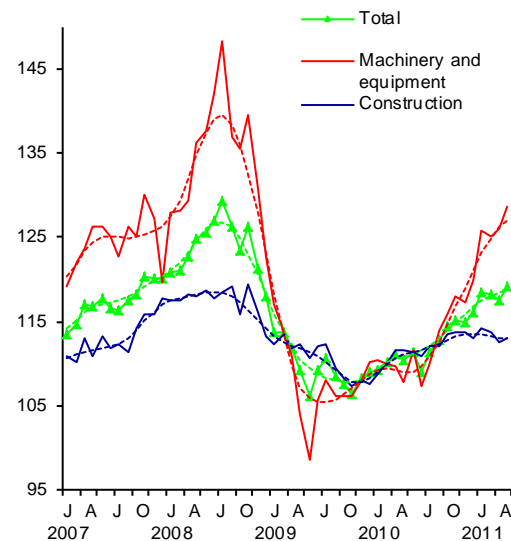
Graph 24
Domestic Demand Indicators

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



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

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



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

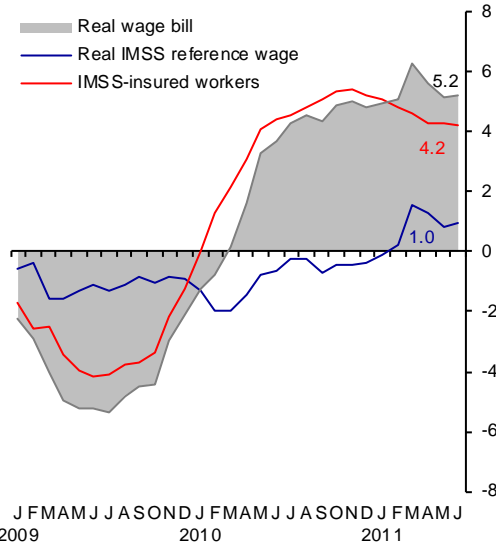
The referred evolution of domestic spending reflects the fact that, although some of its determinants continue to experience a gradual recovery, it remains at a low level. In particular, even when the real wage bill of the formal sector of the economy has continued showing a positive trend, it has moderated its growth pace (Graph 25a). In recent months the consumer confidence indicator has registered a certain improvement. However, it still remains at a level below that observed before the global crisis. In turn, the producer confidence indicator has recently started to register a downward trend (Graph 25b). Workers' remittances have continued to show a moderate recovery; nevertheless they still remain at seasonally adjusted levels below those observed before the mortgage crisis in the U.S. broke out (Graph 25c). Likewise, commercial banks' financing for consumption continued expanding at moderate rates (Graph 25d), while that given to private firms, although it presented a growth pace moderation, also maintained a positive trend (see Section 3.2.2.). It also stands out that the labor market continues with a considerable slack.

The most recent indicators suggest that, in the second quarter of 2011, GDP will have presented an annual change above 3.0 percent, as compared to the annual growth of 4.6 percent observed in the first quarter of the year (Graph 26a). For the April-June 2011 period, this result would imply an increase of approximately 1.2 percent in quarterly seasonally adjusted terms (0.52 percent in the first quarter, Graph 26b).

Graph 25

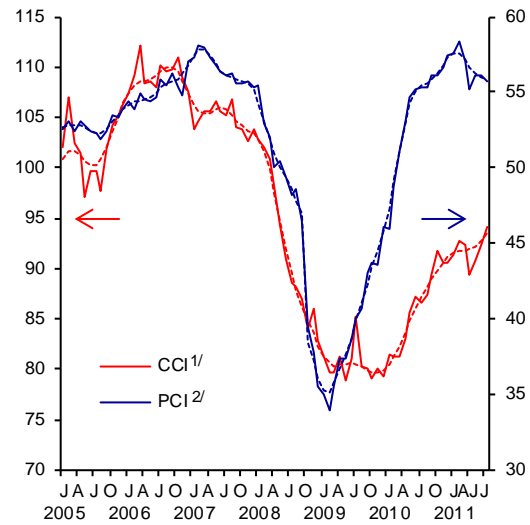
Real Wage Bill and Confidence Indicators

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



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

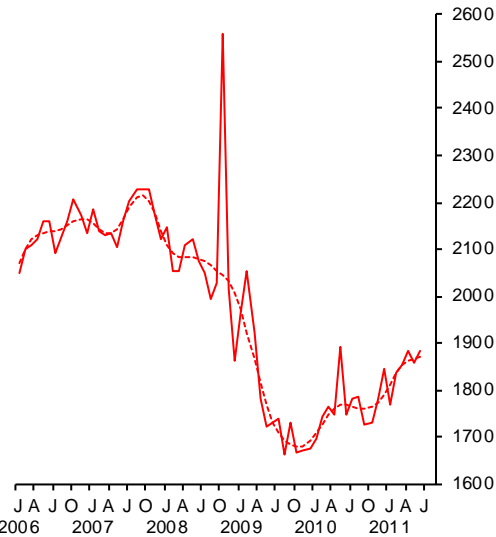
b) Consumer (CCI) and Producer (PCI) Confidence Indices
Seasonally adjusted and trend data



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.

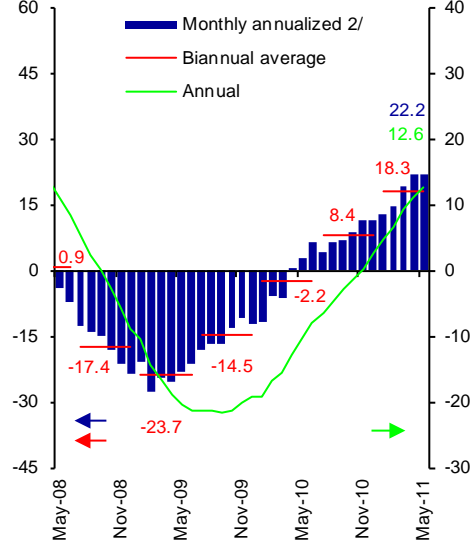
1/ January 2003=100.
2/ Indicator with 50 point reference.

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



Source: Banco de México.

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

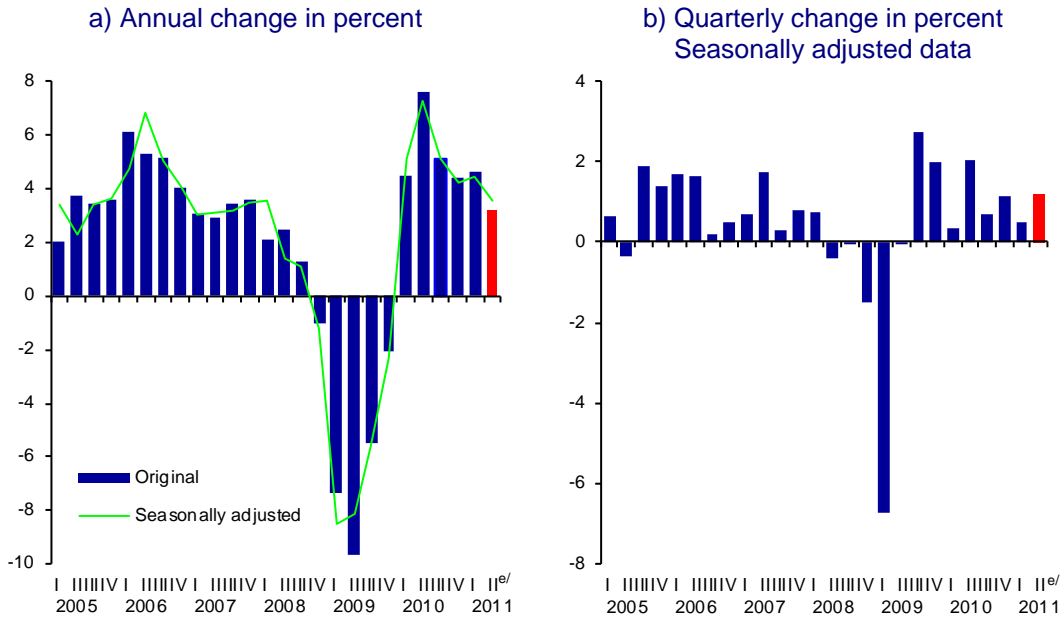


1/ Includes credit portfolio of credit-card regulated SOFOM: *Tarjetas BANAMEX, Santander Consumo, Ixe Tarjetas* and *Sociedad Financiera Inbursa*. From February 2009, figures are affected by the reclassification from consumer credit to credit granted to non-financial firms.

2/ Seasonally adjusted figures.

Source: Banco de México.

Graph 26
Gross Domestic Product



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

3.2.2. Financial Saving and Financing in Mexico

The annual flow of financial resources of the economy continues demonstrating high levels. Regarding the sources of resources, in the first quarter of 2011, this flow equaled 9.2 percent of GDP (Table 2). This behavior has been supported by the growth of foreign financing flows, which, from the first quarter of 2010 on, have registered the highest levels since these statistics are elaborated (the fourth quarter of 2002). In turn, the annual flow of domestic sources of financing has remained relatively stable in the first quarter of 2011, as compared to the fourth quarter of 2010.

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

	Annual flows						Stock 2011 I	
	2009 IV	2010 I	2010 II	2010 III	2010 IV	2011 I	% GDP	Est. %
Total sources	4.0	5.6	7.9	9.1	9.5	9.2	78.0	100.0
Domestic sources ^{1/}	3.3	3.0	4.1	5.0	4.2	4.1	54.6	69.9
Foreign sources ^{2/}	0.7	2.5	3.7	4.2	5.2	5.1	23.5	30.1
Total uses	4.0	5.6	7.9	9.1	9.5	9.2	78.0	100.0
Public sector	3.4	3.1	3.5	3.8	3.8	3.6	38.4	49.2
Public sector (RFSP) ^{3/}	2.6	2.2	2.6	3.1	3.4	3.3	36.0	46.1
States and municipalities	0.8	0.9	0.9	0.7	0.4	0.3	2.4	3.1
International reserves ^{4/}	0.5	1.8	2.8	3.2	2.2	2.5	10.9	14.0
Private sector	0.0	0.8	1.5	2.0	2.5	2.8	31.2	40.0
Households	0.0	0.1	0.3	0.4	0.9	1.1	13.7	17.6
Consumption	-0.5	-0.3	-0.1	0.0	0.2	0.3	3.8	4.9
Housing ^{5/}	0.5	0.4	0.4	0.4	0.8	0.8	10.0	12.8
Firms	0.0	0.6	1.2	1.6	1.6	1.7	17.5	22.4
Domestic ^{6/}	0.4	0.5	0.6	0.9	1.1	1.2	10.7	13.8
Foreign	-0.4	0.1	0.6	0.7	0.5	0.4	6.7	8.6
Commercial banks' foreign assets ^{7/}	-0.5	-0.3	-0.4	0.1	0.5	0.3	1.8	2.3
Other ^{8/}	0.6	0.3	0.5	0.0	0.4	0.0	-4.3	-5.5

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.

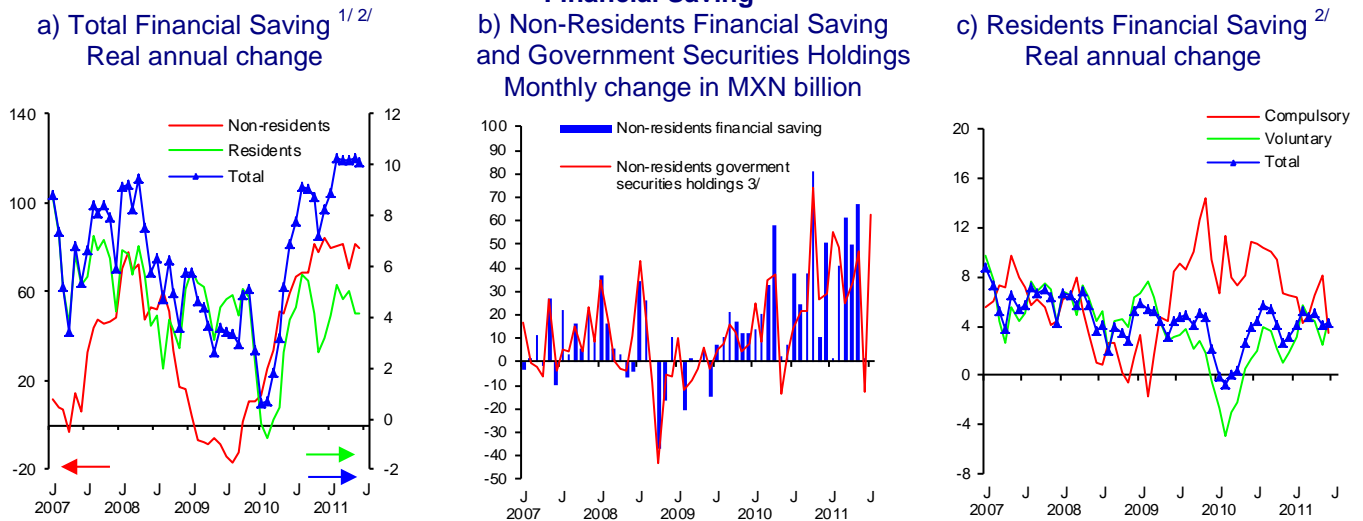
5/Total portfolio of financial intermediaries and of the National Housing Fund (*Instituto del Fondo Nacional de la Vivienda para los Trabajadores*, Infonavit), and of the ISSSTE Housing Fund (*Fondo de la Vivienda del ISSSTE*, Fovissste). It includes debt-restructuring programs.

6/Total portfolio of financial intermediaries. It includes debt-restructuring programs.

7/It includes assets from abroad and foreign financing.

8/It 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.

In the second quarter of 2011, a greater amount of resources coming from abroad, as well as an increase in domestic sources of financing, continued to be observed. Thus, the balance of the total financial saving registered, for the fifth consecutive month, a real annual change of approximately 10 percent, such growth rates had not been registered in previous years (Graph 27a). With respect to non-residents' financial saving, it continued growing due to prevailing conditions favoring capital flows to Mexico (Graph 27b). Among them the Mexican economy's solid macroeconomic fundamentals and a considerable interest rate spread versus advanced economies stand out. Nevertheless, due to an increase in uncertainty in the international financial markets, these flows' volatility grew in the last two months. In turn, residents' financial saving continued increasing at moderate rates (Graph 27c).

**Graph 27
Financial Saving**


Source: Banco de México.

1/ Defined as monetary aggregate M4 minus the stock of banknotes and coins held by the public.

2/ For the period from December 2008 to November 2009 the figures are adjusted to exclude the impact of the reform to the ISSSTE Law on this aggregate.

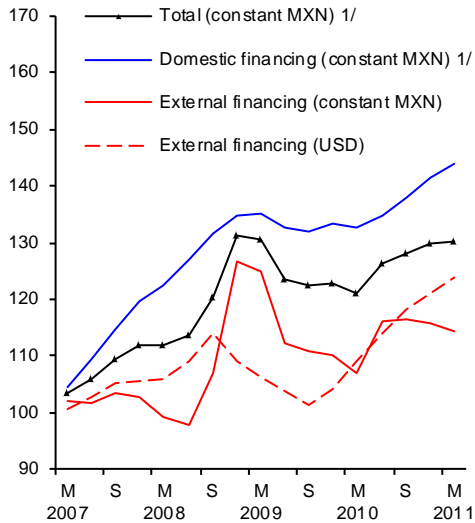
3/ Holdings of government securities expressed in nominal value. Figures available up to July 28, 2011.

With regard to the use of financial resources, in the first quarter of 2011, in the same way as in previous periods, the public sector and the international reserves' accumulation by Banco de México absorbed approximately two thirds of the available financial resources (Table 2). The moderation in the annual financing flow channeled to states and municipalities from the fourth quarter of 2010 onwards is noteworthy. In turn, in the second quarter, international reserves' accumulation equaled USD 6,641 million, amount which, although significant, turned out to be below the increase observed in the first quarter of the year (USD 9,111 million). This accumulation of international reserves has allowed strengthening Mexico's external position given a possibility of turbulence in the global financial markets. On the other hand, greater availability of financial resources in the economy is a factor that has supported the upward trend in the private sector's use of financing. Starting from the fourth quarter of 2010, the annual flow of credit to households has risen, while the annual financing flow to firms has maintained relatively stable after a rebound observed in the first half of the previous year (Table 2).

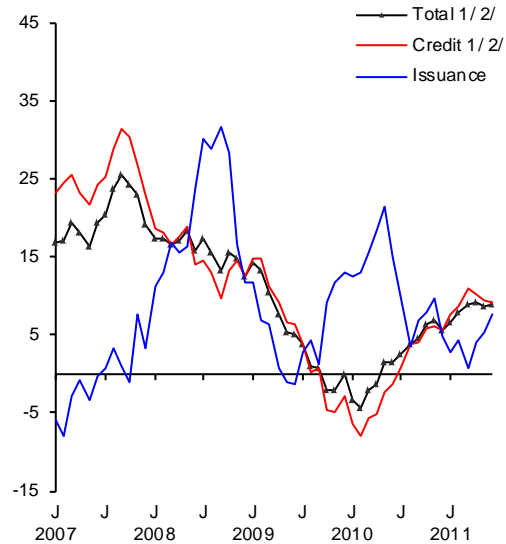
Financing to the non-financial private sector continued the moderate recovery it started in mid-2010, which was consistent with the recent performance and the outlook of the economic activity. The expansion of financing to firms has been mainly supported by the domestic component, particularly by the growth of domestic bank credit (Graph 28). In turn, financing obtained by means of placement of private securities, both in the domestic and foreign markets, registered an increase with respect to the level observed in the previous quarter (Graph 28).

Graph 28
Total Financing to Non-financial Private Firms

a) Total Financing to Non-financial Private Firms
Seasonally adjusted stocks
Index Dec-2006=100



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



Source: Banco de México.

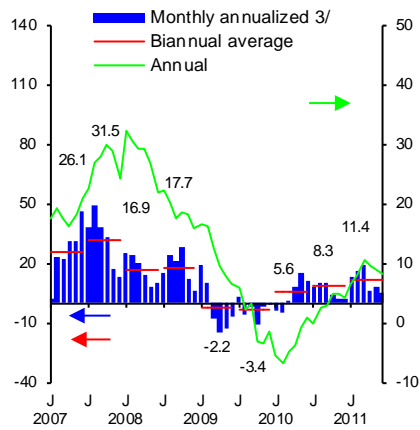
1/ These figures are affected by the disappearance of some non-banking financial intermediaries and their conversion to non-regulated Sofom.

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.

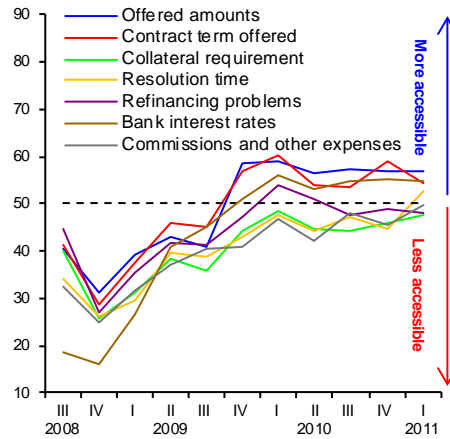
Credit granted by national commercial banks to firms has presented a moderation in its growth, which was congruent with the recent evolution of domestic spending (Graph 29a). It should be noted that firms have perceived, at the margin, better conditions of access and cost of bank credit. The results of the Credit Market Conditions Survey to Firms (*Encuesta de Evaluación Coyuntural del Mercado de Crédito a las Empresas*) in the first quarter of 2011, carried out by this Central Institute, point out that firms that obtained new bank credits in the referred period perceived more accessible conditions regarding the amounts and terms offered, and less expensive in terms of interest rates and commissions levied (Graph 29b). Likewise, with respect to the most urgent problem faced by all the surveyed firms in the first quarter of 2011, the access to financing registered the lowest percentage of responses, 2.8 percent, while in the previous quarter it was 4.9 percent (Graph 29c).

Graph 29
Commercial Banks' Credit to Firms and Perception of Access and Cost Conditions of the Bank Credit

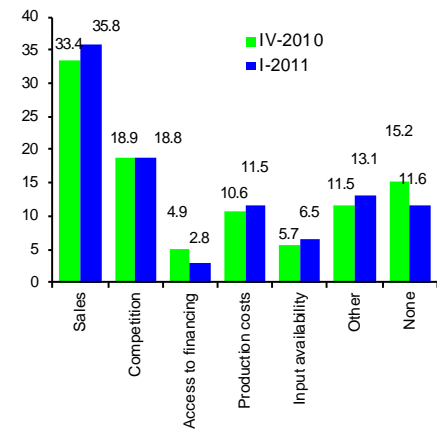
a) Commercial Banks' Performing Credit to Non-financial Private Firms^{1/ 2/}
 Real change in percent



b) Perception of Access and Cost Conditions of the Credit Market Firms with New Credits, Diffusion indices^{4/}



c) The Most Urgent Problem Faced by Firms in this Quarter Percentage of firms



Source: Banco de México.

1/ 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.

2/ Figures are adjusted in order to avoid distortions due to the reclassification of credit granted to business sector for housing construction.

3/ Seasonally adjusted figures.

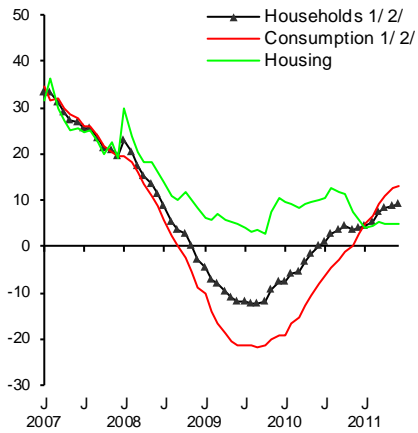
4/ Defined as the sum of the percentage of firms that mentioned that they were less expensive, plus half the percentage of firms that indicated that no changes were registered.

With regard to credit to households, it continues registering a gradual recovery as a result of, among other factors, higher employment levels. Credit to housing maintained its growth pace, while the credit for consumption continued increasing its expansion rate primarily due to higher credit activity for acquisition of durable goods (ABCD) and others (Graph 30a and b). The rapid expansion of this credit portfolio is due to the recent dynamism of the payroll credits, which are less expensive in comparison to credit cards. In turn, the segment of credit cards has recovered its growth. The presence of better supply conditions could also be contributing to this recovery. In accordance with the Report on the Basic Credit Card Indicators of April 2011, the number of credit cards increased by 8.6 percent between April 2010 and the same month in 2011, at the same time as their conditions of use have been increasingly accessible.²¹ Finally, the delinquency rates for both credit cards and for ABCD and other credits continued at low levels, although a slight increase in non-performing credit for consumption portfolio was observed in the last quarter (Graph 30c).

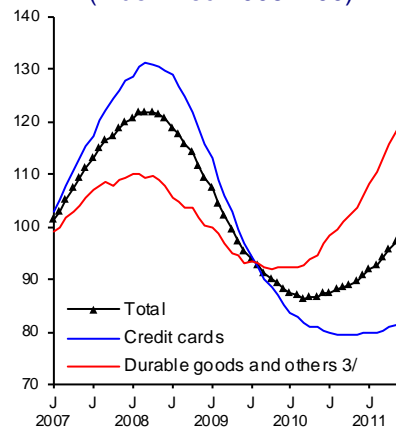
²¹ The data of this report correspond only to generally accepted cards, granted to individuals, that do not have late or delayed payments and that have registered a positive balance.

Graph 30
Financing to Households

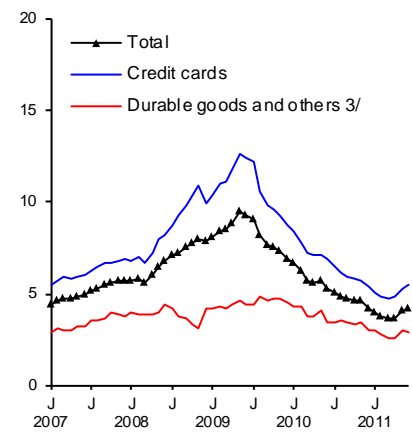
a) Commercial Banks' Performing Credit to Households
Real annual change in percent



b) Commercial Banks' Performing Credit for Consumption
Real seasonally adjusted balance^{1/ 2/}
(Index Dec-2006=100)



c) Delinquency Rates of Commercial Banks' Credit for Consumption^{4/}
Percent



Source: Banco de México.

1/ 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.

2/ Figures as of March 2008 include total consumer credit portfolio of commercial banks' subsidiaries Sofom E.R.

3/ It includes credit for property acquisition, automobile credits, personal credits, credit for payable leasing operations and other consumption credits.

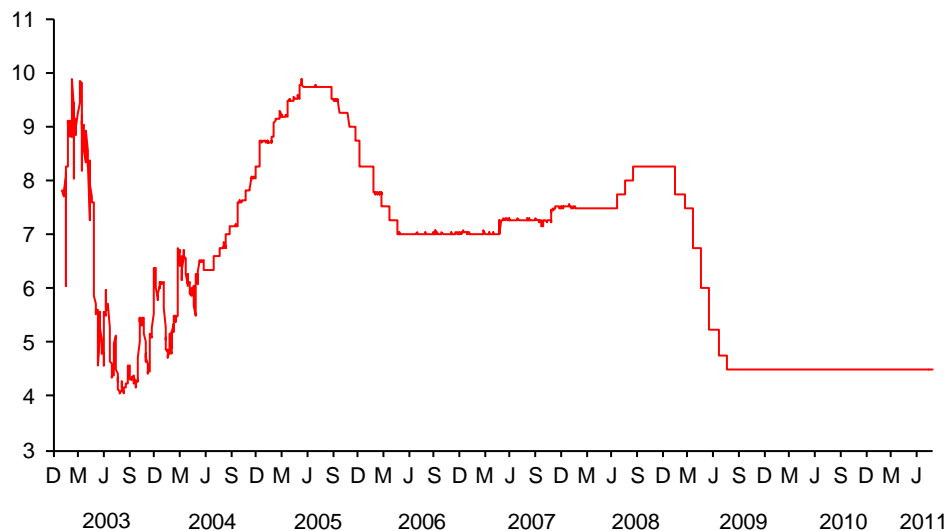
4/ The delinquency rate is defined as non-performing portfolio divided by total loan portfolio.

4. Monetary Policy and Inflation Determinants

The monetary policy stance has been oriented to achieving a gradual convergence of inflation towards the 3 percent permanent target. With this target in mind, between April and July of this year Banco de México's Board of Governors maintained its Overnight Interbank Interest Rate at 4.5 percent (Graph 31). Among the elements that influenced this decision are:

- i. A favorable evolution of the exchange rate, despite the increase in uncertainty in the international financial markets.
- ii. The reduction in the rate at which the output gap has been closing.
- ii. The limited impact of increases in international commodity prices on inflation and its expectations, which occurred in the first months of the year. Additionally, as already mentioned, recently these prices, especially grain prices, have registered a decrease.
- iii. Inflation expectations for different horizons that are well-anchored, within a variability interval of plus/minus one percentage point around the 3 percent permanent target.

Graph 31
Overnight Interbank Interest Rate ^{1/}
 Annual percent



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

In accordance with the downward inflation trend during the last months the economic analysts' inflation expectations for short-term horizons have fallen, although they have maintained above 3 percent. The average of the headline inflation expectations for the end of 2011 dropped from 3.87 percent in the April survey (Banco de México's survey) to 3.54 percent in the July survey (Graph

32a).²² Similarly, the mean of the core component expectations decreased from 3.71 to 3.45 percent, and the implicit expectation for the non-core inflation went from 4.39 to 3.83 percent in the referred period. In turn, the expectations mean of headline inflation for the end of 2012 registered a more moderate drop, from 3.80 percent in April to 3.69 percent in July.²³ In this case, the average of core inflation expectations for this horizon decreased from 3.67 to 3.52 percent in the same period, while the one corresponding to the non-core component went from 4.23 to 4.24 percent.

Regarding inflation expectations for the next 12 months, the average of those corresponding to headline inflation increased from the survey of April to June, from 3.96 to 4.08 percent, as a result of the rise of the implicit non-core inflation expectation, which went from 4.81 to 5.70 percent, while expectations corresponding to core inflation dropped from 3.71 to 3.59 percent in the same period.²⁴ The abovementioned suggested that this increment in headline inflation expectations for the next 12 months was temporary. In fact, in the July survey it again presented a reduction to levels of 3.96 percent. The one corresponding to core inflation continued decreasing to 3.53 percent and the one referring to the implicit non-core inflation registered a correction to 5.40 percent (Graph 32b).

In turn, for longer-term horizons inflation expectations remained stable in recent months. Inflation expectations for the end of 2013 and those referring to the average of the next 4 years remained at approximately 3.6 percent, while the one corresponding to the average for the period of 5 to 8 years stayed close to 3.5 percent.²⁵ Complementing the abovementioned, the trends in break-even inflation and inflationary risk (difference between the nominal yield on 10-year bonds and the real yield on the same term inflation-indexed debt instruments) have remained at levels close to 4 percent, although the timely indicator has shown certain volatility (Graph 33a).²⁶ This suggests that, considering that the inflationary risk premium is positive, long-term inflation expectations implicit in the referred instruments are located below 4 percent.

The abovementioned shows, as already mentioned, that inflation expectations for different horizons remain anchored below 4 percent, although above the 3 percent target (Graph 33b).

²² In the case of the survey of *El Semanario* of April 1, 2011, the average of headline inflation expectations for the end of 2011 was 3.89 percent, while the one corresponding to the survey of August 5, 2011 was 3.65 percent.

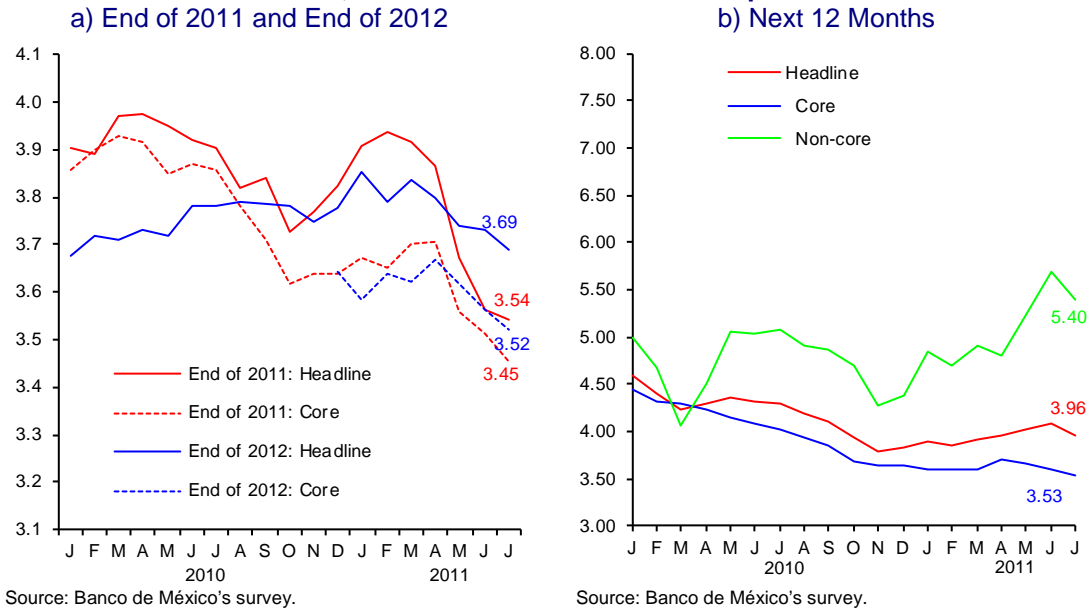
²³ The average of headline inflation expectations reported in the survey of *El Semanario* of April 1, 2011 was 3.82 percent for the end of 2012, while in the survey of August 5 the mean of the expectations was located at 3.78 percent.

²⁴ In accordance with the survey of *El Semanario* of April 1, 2011, the mean of the headline inflation expectations for the next 12 months was located at 3.79 percent, while in the survey of June 24 this mean registered 4.37 percent. Nevertheless, this increment has reverted recently as shown by the survey of August 5, 2011, where the mean of the expectations for this horizon observed a level of 4.23 percent.

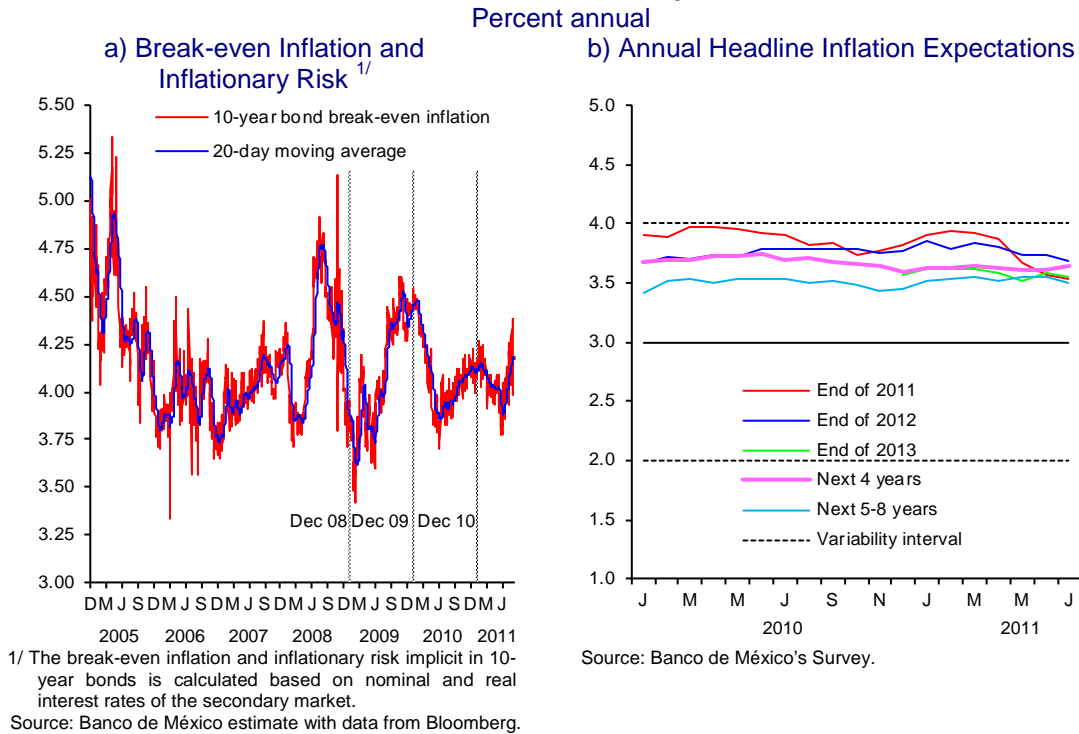
²⁵ In recent weeks the average of inflation expectations for the next 5 to 8 years reported in the survey of *El Semanario* is located at 3.44 percent.

²⁶ It is noteworthy that, given their nature, these indicators tend to be affected by changes in prevailing liquidity conditions in the money market. Therefore, they should be interpreted with caution given the volatility commonly observed in their behavior.

Graph 32
Headline, Core and Non-core Inflation Expectations

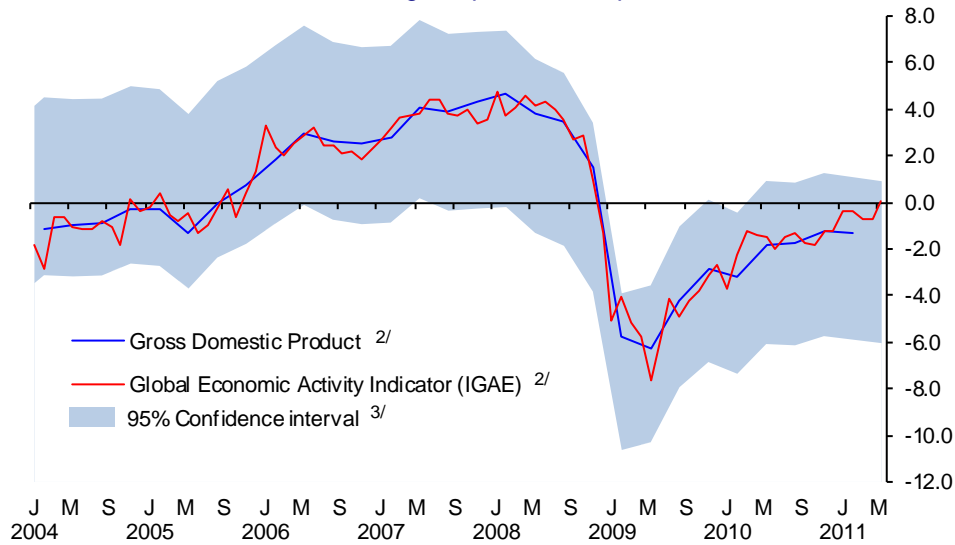


Graph 33
Break-even Inflation and Inflationary Risk in Long-term Bonds and Annual Headline Inflation Expectations



With respect to other inflation determinants, the available information indicates that the output gap has been closing at a slower rate than anticipated in the previous Inflation Report (Graph 34). In this context, the analysis of the output gap is complemented by the study of diverse indicators regarding input markets and the country's external accounts.

Graph 34
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 first quarter of 2011; IGAE figures up to May 2011.

3/ Confidence interval for the output gap calculated with an unobserved components method.

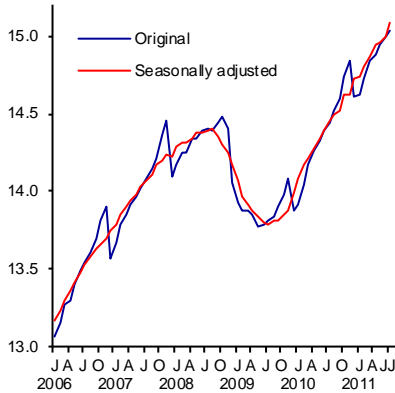
As will be seen below, various indicators suggest that no pressures are currently observed either on the main inputs' prices, or on the country's external accounts (which could signal an excess of aggregate spending in the economy).²⁷ In particular, the following should be mentioned:

- a) Although formal employment has continued to grow, as shown by the upward tendency that the number of IMSS-insured workers kept exhibiting (Graph 35a), other indicators suggest that slack conditions in the labor market still prevail. Particularly, the rates of unemployment, underemployment and employment in the informal sector remain at relatively high levels (Graph 35b and 35c).

²⁷ Indeed, if the aggregate spending of an economy exceeds its productive capacity, this would lead to a high demand for diverse productive factors (above these factors' availability). This, in turn, would lead to pressures on prices of these inputs, and, therefore, of diverse goods and services produced by the economy.

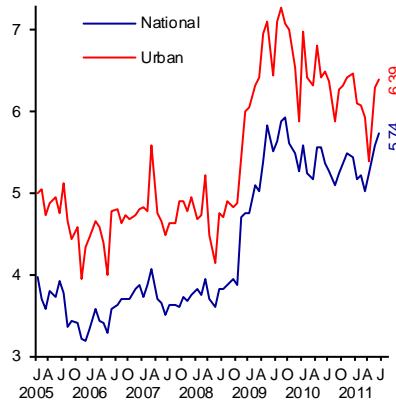
Graph 35
Labor Market Indicators

a) IMSS-insured Workers
Millions of persons



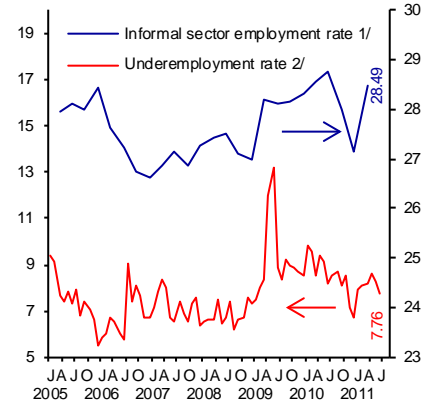
Source: Seasonal adjustment by Banco de México with data from IMSS.

b) Unemployment Rate
Percent; seasonally adjusted data



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

c) Underemployment Rate and
Employment in Informal Sector
Percent



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

1/ Seasonally adjusted data. Data up to the first quarter, 2011.

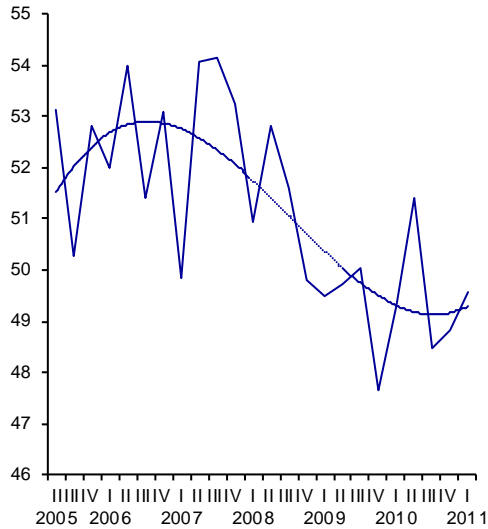
2/ Original data. Figures up to June, 2011.

Additionally, the job creation rate is at relatively low levels. The percentage of unemployed people who get hired every quarter continues at low levels with respect to levels observed before the crisis (Graph 36a). Also, the unemployment duration remains high as compared to the pre-crisis situation, which indicates that on average it currently takes longer for the unemployed to get a new job (Graph 36b).

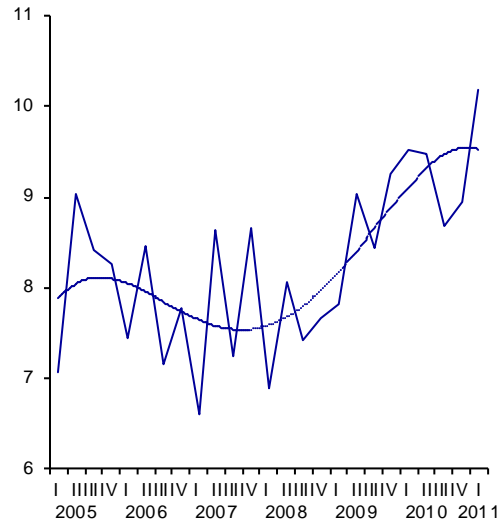
The referred slack in the labor market has contributed to the fact that, as mentioned before, wage increases continue being moderate (see Section 2.3). Likewise, it is noteworthy that the average income level of employments created during the economy's recovery seems to be below that of the jobs lost during the most critical phase of the recession. Particularly, between the first quarter of 2008 and the same period in 2011, the share of people who receive more than two minimum wages in the total employed population decreased, while the one corresponding to the people who earn less than two minimum wages increased (Graph 37a).

Graph 36
Rate of Employment Creation and Unemployment Duration

a) Unemployed who Became Employed in the Next Quarter^{1/}
Percent



b) Unemployment Duration
Average weeks searching jobs

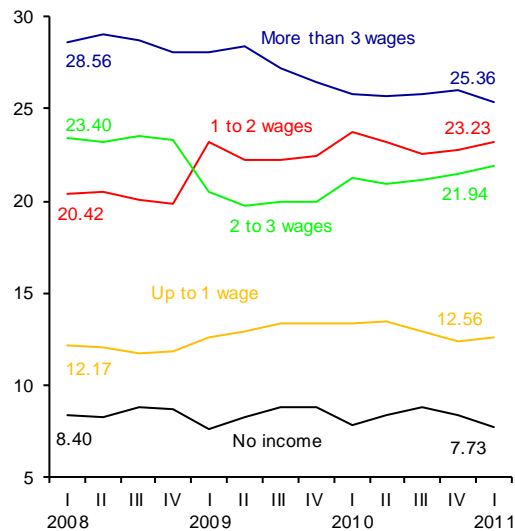


1/ Only considered the unemployed with a valid interview in the next quarter.

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

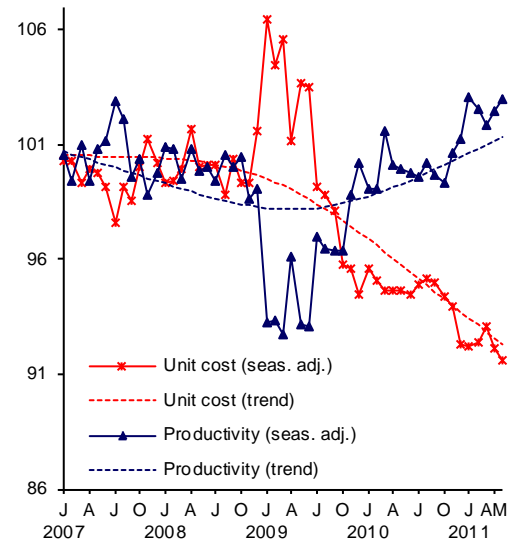
Graph 37
Employment, Productivity and Unit Labor Cost

a) Employment by Levels of Minimum Wage
Percentage with respect to employed population



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

b) Productivity and Unit Labor Cost
Index 2008=100; seasonally adjusted and trend data



Source: Prepared by Banco de México with seasonally adjusted data from Monthly Manufacturing Business Survey (*Encuesta Mensual de la Industria Manufacturera*), INEGI.

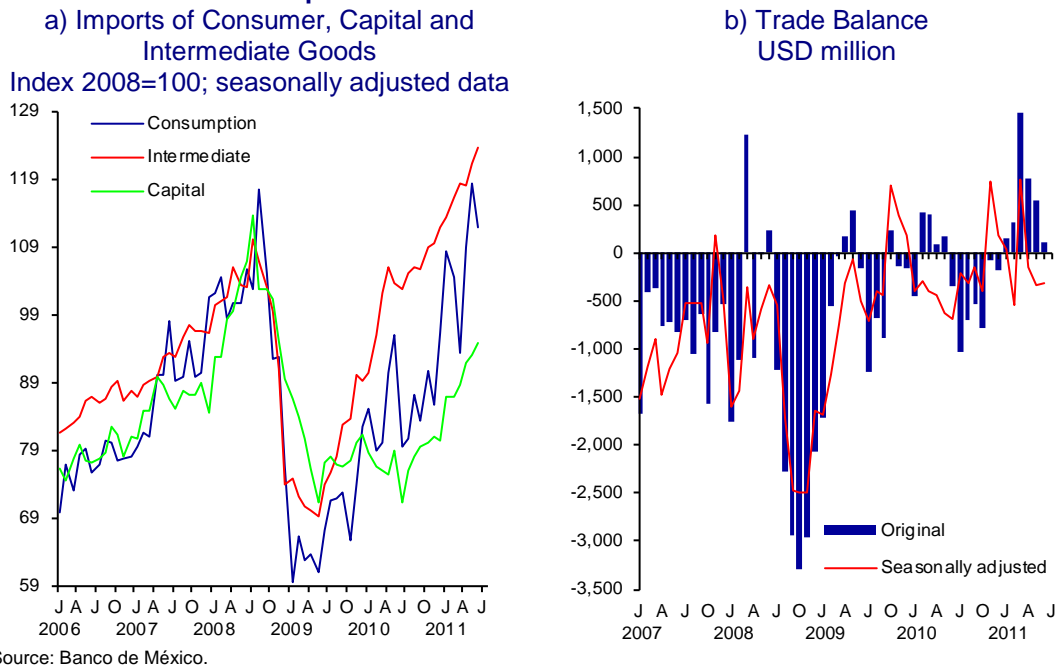
b) On the other hand, the workers' average productivity has continued its upward trend. This, together with the referred remuneration evolution, has translated in a reduction of labor unit costs (Graph 37b). In this way,

these costs have not become a pressure-generating factor on prices of different goods and services, and have contributed to greater competitiveness of the national productive force.

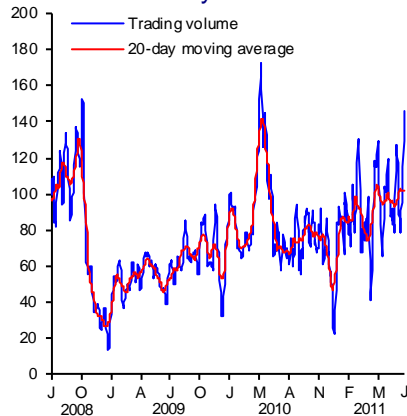
- c) Regarding commodity prices that have been showing significant increases, in general, they registered a considerable fall in the last months. This is particularly relevant in the case of grains. In the case of domestic energy, prices remained relatively isolated from rises in global energy prices given the policy of increments in gasoline, LP gas prices and ordinary electricity fares implemented by the Mexican Government.
- d) The expansion of total financing to the private non-financial sector is consistent with the current phase of the economy. The increase in capital demand could be financed without difficulties by the loanable funds market. In this way, the evolution of financing has not given any signals of a possible overheating of the economy, nor does it indicate pressures on interest rates.
- e) In accordance with the above, there are still no demand-related pressures on the country's external accounts. In this context, the current account deficit is estimated to continue at moderate levels and the economy is expected to receive financial resources from abroad by an amount that ensures easy financing of this deficit (Graph 38).

Graph 38

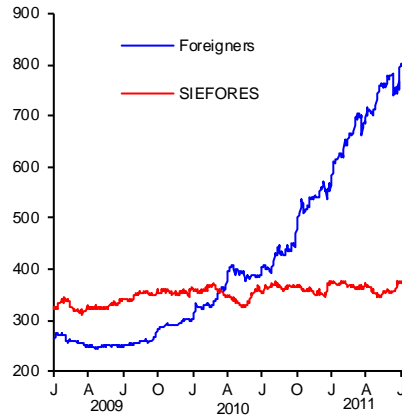
Imports of Goods and Total Trade Balance

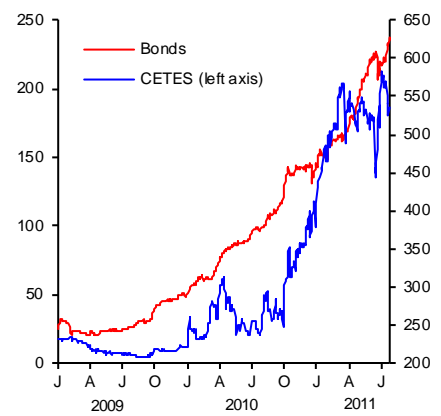


In the recent months, national financial markets, both the money and the foreign exchange markets, have been characterized by preserving their liquidity and high operating volumes, despite great turbulence in external markets (Graph 39).

Graph 39
Operating Volume in the Exchange Market and Government Securities Holdings
a) Operating Volume in the Exchange Market
 Index July 2008=100


Source: Banco de México and Reuters.

b) Government Securities Holdings ^{1/}
 MXN billion

^{1/} Includes Bonds and CETES.
 Source: Banco de México.

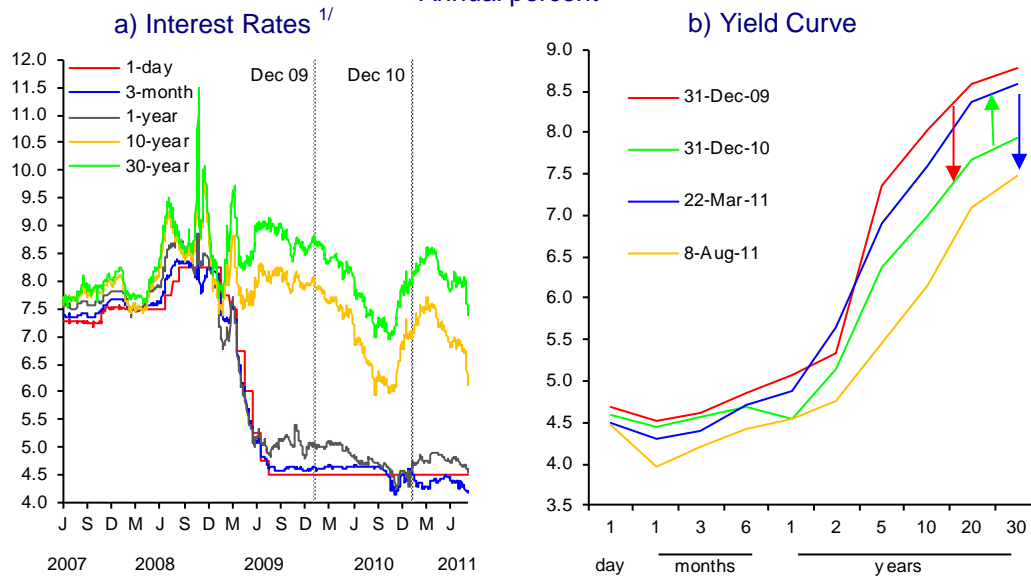
c) Government Securities Holdings
 by Foreign Investors
 MXN billion


Source: Banco de México.

In this context, during the last months very short-term interest rates have remained below 4.5 percent, while those of longer-term presented a decrease that flattened the yield curve. In particular, the interest rate for 10-year government bonds fell from approximately 7.6 percent in mid-March to around 6.4 percent at the beginning of August (Graph 40). This decrease was the result of:

- i. A greater demand by foreign investors for Mexican Government debt instruments, although it appeared in a context of search for yield in international financial markets. The composition of these flows indicates that this demand has been determined by mainly two factors: i) strength of the macroeconomic fundamentals of the Mexican economy as compared to other economies both advanced and emerging; and ii) expectations of domestic inflation that are well-anchored.
- ii. A moderation in the growth expectations of the world economy, in particular that of the U.S., and its consequent downward effect on the long-term interest rates in this country.

Graph 40
Interest Rates in Mexico
 Annual percent



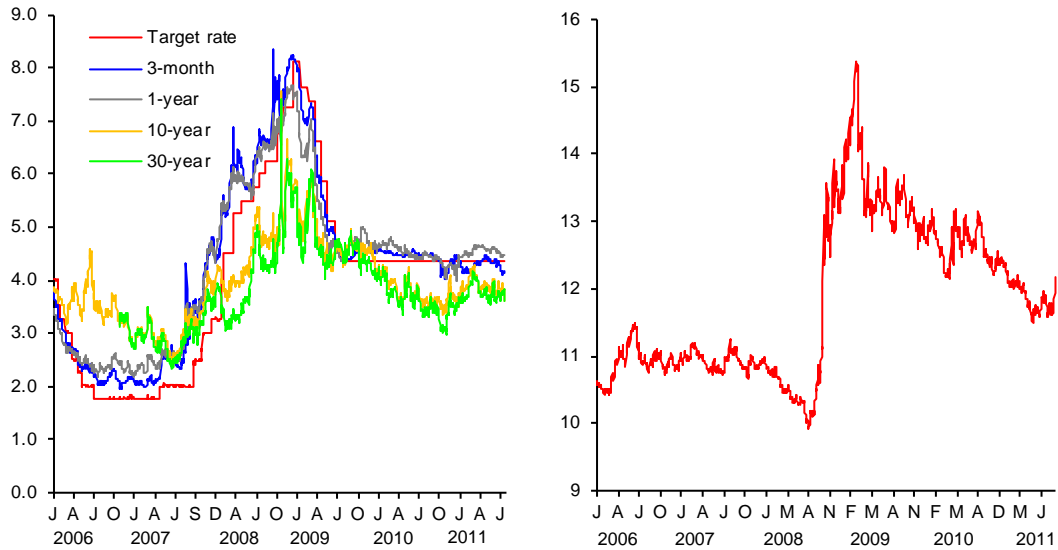
1/ Since January 21, 2008, the one-day (overnight) interest rate corresponds to the target for the Overnight Interbank Interest Rate.

As mentioned above, the extraordinary degree of monetary stimulus in the U.S. has maintained its interest rates at extremely low levels, which has meant elevated interest rate spreads between Mexico and the U.S. as compared to those registered during the years before the crisis (Graph 41a). These spreads, together with the strength of the Mexican economy's macroeconomic fundamentals, contributed to the fact that the nominal exchange rate continued registering an appreciation trend, although with certain volatility (Graph 41b). Thus, both the exchange rate appreciation and the favorable evolution of inflation expectations have been reflected in more stringent monetary conditions (Graph 42). This, in a context of well-anchored inflation expectations, is expected to continue contributing to a favorable evolution of inflation by means of a positive feedback between inflation and its expectations.

In short, the channels of exchange rate and economic agents' expectations in the monetary policy transmission mechanism have performed a fundamental part in the process of inflation convergence towards the 3 percent permanent target. Additionally, conditions in the factor markets, in particular in the labor market, the evolution of financing to the private sector, as well as the figures of deficit in the present and expected current account, point to the fact that there is room for growth without accelerating inflation, given that there are no signs indicating a generation of excess aggregate demand. This has contributed to the fact that no generalized inflationary pressures have presented.

Graph 41
Interest Rate Spreads and Nominal Exchange Rate

 a) Interest Rate Spreads between Mexico and U.S.^{1/}
Percent

 b) Nominal Exchange Rate
MXN/USD


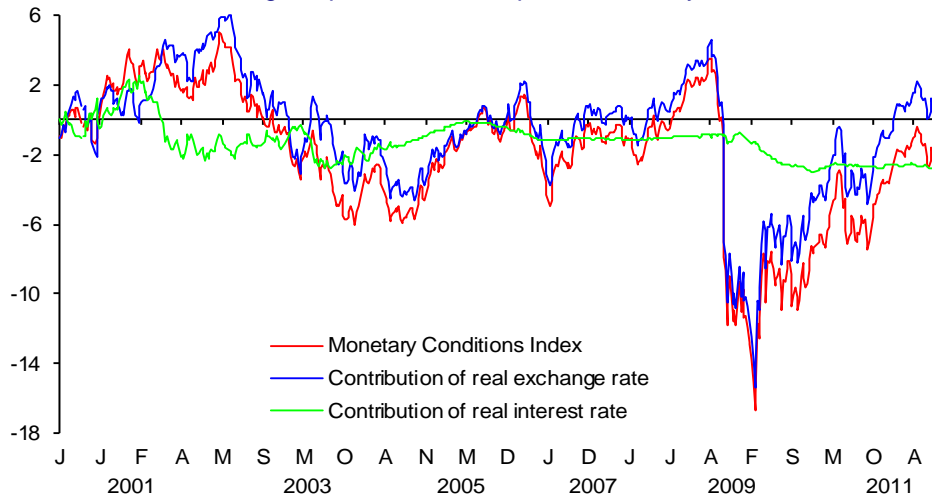
1/ For the U.S. target rate, the average of the interval considered by the Federal Reserve is used.

Source: Banco de México and North American Treasury Department.

Source: Banco de México.

Graph 42
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 *El Semanario* survey.

5. Inflation Forecasts and Balance of Risks

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

- a) In line with the most recent information about the performance of the U.S. economy, its growth prospects have been adjusted downwards during the last few months (see Section 3.1). This revision responds to both temporary factors affecting the first two quarters of 2011 and structural factors mentioned in this Inflation Report, among which stands out the uncertainty about the fiscal sustainability in the U.S., which affect the medium-term growth of that economy.
- b) In this context, while U.S. analysts still consensually forecast a certain recovery of economic activity in the second quarter of the year, as compared to the first quarter, the expected pace of this recovery has been revised downwards, especially with respect to that related to industrial activity.
 - I. In particular, U.S. annual GDP is expected to grow 1.8 and 2.5 percent in 2011 and 2012, respectively. These figures are compared to the 2.7 and 3.2 percent for the same period, as presented in the previous Inflation Report.^{28,29}
 - II. Given the relationship between the automobile sectors of both countries, the effects of the natural disasters in Japan were reflected in the U.S. mainly by a considerable deceleration of the industrial sector growth rate in the second quarter of 2011. Indeed, this sector presented an annualized quarterly change of only 0.8 percent in the period of April to June 2011, as compared to 4.8 percent in the previous quarter and 4.4 percent foreseen for the second quarter in the previous Inflation Report. Thus, analysts expect this indicator to register a more dynamic quarterly evolution in the second half of the year, with annualized growth rates of 3.3 percent in the third quarter and 3.4 percent in the fourth quarter.³⁰

In this way, industrial production is expected to grow by 3.8 and 3.3 percent in annual terms in 2011 and 2012, respectively, as compared to 5.0 and 4.2 percent for the same period, presented in the previous Inflation Report.³¹

Growth of the Mexican Economy: Taking into consideration the recent performance of Mexican economic activity, as well as the balance of risks of

²⁸ The expectations for the U.S. economy in this chapter are based on the consensus of the analysts surveyed by Blue Chip in August 2011.

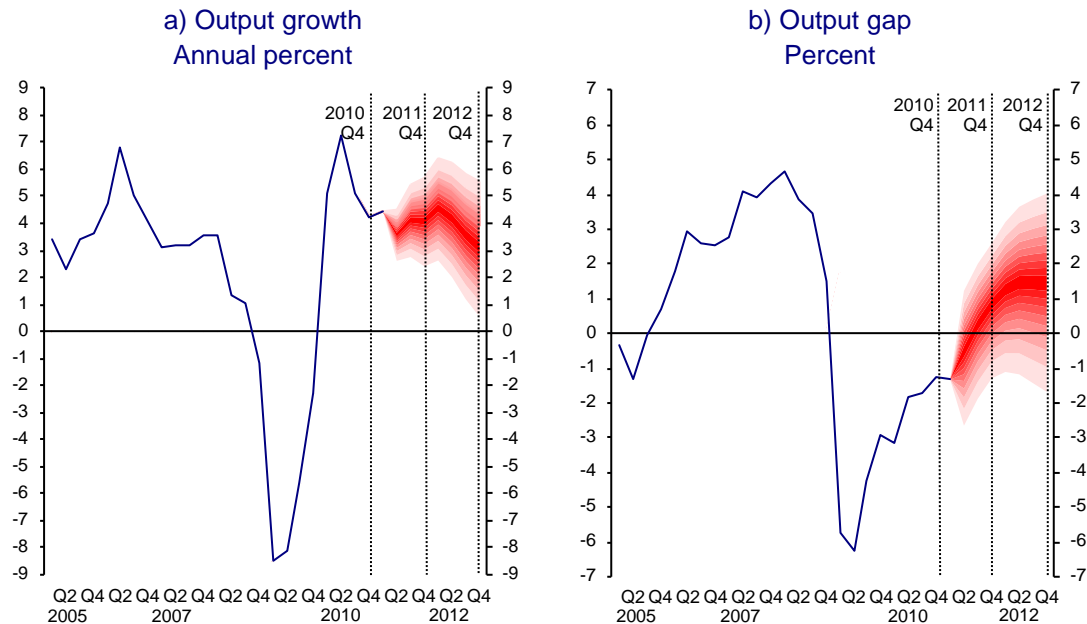
²⁹ It is noteworthy that after having shown a slight annualized quarterly change of 0.4 and 1.3 percent in the first and second quarters of 2011, the GDP is expected to register annualized quarterly growth rates of 2.2 and 2.5 percent in the third and fourth quarters, respectively. The corresponding figures in the previous Inflation Report were 3.2, 3.2 and 3.4 percent for the second, third and fourth quarters, respectively.

³⁰ It should be noted that the forecasts for this period, presented in the previous Inflation Report, were 4.6 percent for both quarters.

³¹ It should be pointed out that the performance observed in this sector in the recent months seems to suggest that these expectations could register new downward adjustments.

external conditions faced by the economy, GDP growth is estimated to be located between 3.8 and 4.8 percent in 2011, compared to the interval of 4.0 to 5.0 percent presented in the previous Inflation Report. In turn, given the deterioration of the growth outlook of the U.S. economy in 2012, for that year the interval of Mexican GDP growth of 3.8 to 4.8 percent, presented in the previous Inflation Report, is revised to an interval of 3.5 to 4.5 percent (Graph 43a)³². In the remainder of 2011 and during 2012, although the output gap is anticipated to continue closing, it is expected to happen at a slower pace than previously forecasted. In this way, no generalized pressures on prices are expected, especially if the high slackness prevailing in the labor market is considered (Graph 43b).

Graph 43
Fan Charts



Employment: The evolution of formal employment in the first part of the year, as well as the economic activity growth anticipated for the rest of 2011, is estimated to lead to the creation of between 575 and 675 thousand new formal employments. In turn, for 2012 the creation of between 570 and 670 thousand new formal employments is forecasted, taking as a reference the number of IMSS-insured workers.

Current Account: A deficit in the trade balance of USD 4.6 billion (0.4 percent of GDP) and a deficit in the current account of USD 12.9 billion (1.1 percent of GDP) are predicted for 2011. Likewise, a deficit of USD 11.0 billion in the trade balance (0.9 percent of GDP) and a deficit of USD 20.7 billion in the current account (1.6 percent of GDP) are estimated for 2012. These forecasts, together with the fact that the Mexican Government already prefinanced its external debt amortization program for 2011 and 2012, suggest that no problems will arise for financing the moderate current account deficit and there will be no pressures on the exchange rate, stemming from this source.

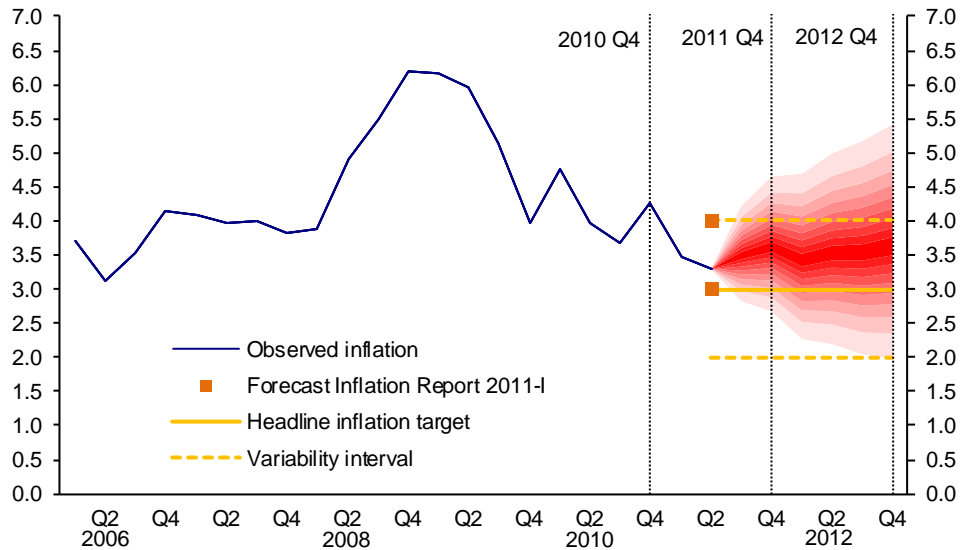
³² For more details on the construction and interpretation of this kind of graphs see Box 3 "Fan Charts for Illustrating the Probability of Economic Variable Forecasts Realization" in the Inflation Report, July-September 2010.

Naturally, diverse risks to the growth scenario of the Mexican economy prevail, some of which have increased in the recent months. Among them the following stand out:

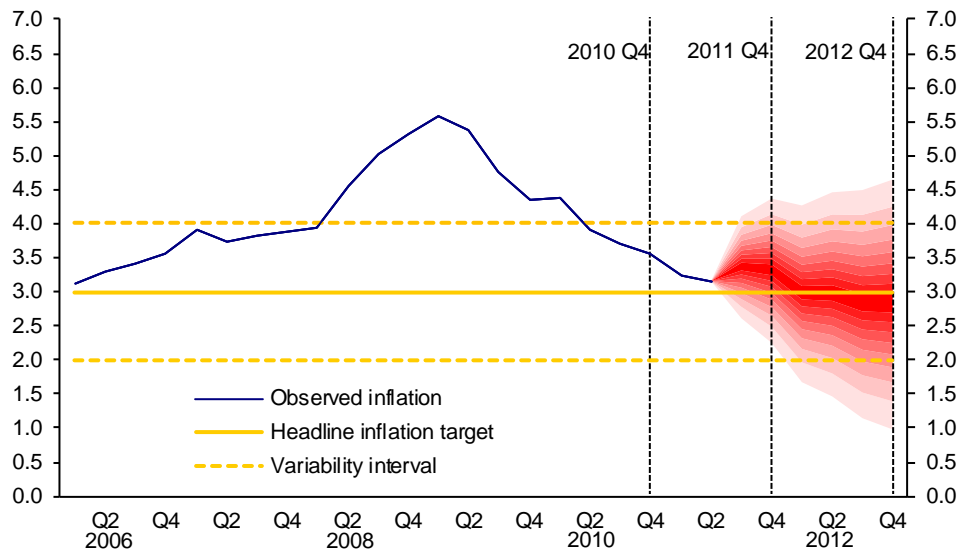
- i. Uncertainty with respect to the recovery strength of the economic activity in the U.S. has increased, and both its labor market and the housing market continue showing signs of weakness. On the other hand, although the U.S. fiscal consolidation would imply a positive effect on its fiscal sustainability in the long term, in the short term these adjustments could mean a smaller boost to that economy.
- ii. As it has been mentioned, the eventual withdrawal of the fiscal and monetary stimuli by more advanced economies could lead to lower dynamism of Mexico's external demand.
- iii. The precarious fiscal and financial situation in some European countries could result in contagion to the banking systems of those economies that are more exposed to these countries' debt, generating lower growth in advanced economies.
- iv. In this context of vulnerability in the international financial markets, greater uncertainty of investors could result in a reversal of capital flows that have been channeled to emerging economies, the Mexican economy among them.
- v. At the national level, according to economic specialists surveyed by Banco de México, public insecurity and absence of structural changes in the country continue being factors that could adversely affect the growth of the Mexican economy.

Inflation: It is confirmed that most probably in 2011 and 2012 the annual headline inflation will be located within the intervals published in the last Inflation Report, thus being congruent with the 3 percent permanent inflation target, considering a plus/minus one percentage point variability interval (Graph 44). Likewise, annual core inflation is expected to register a level between 3.0 and 3.5 percent during the second part of 2011, while at the beginning of 2012 it is forecasted to decrease, locating below 3 percent during the rest of the year (Graph 45).

Graph 44
Fan Chart: Annual Headline Inflation



Graph 45
Fan Chart: Annual Core Inflation



The balance of risks for the expected inflation trajectory has changed compared to that presented in the previous Inflation Report:

- i. Upward risks associated to the international commodity prices, including grains, have decreased, as suggested by a considerable decline observed during the last months.
- ii. The fact that the world economy might suffer a considerable loss of dynamism, which would affect the performance of the Mexican economy, persists as a downward risk.
- iii. In contrast, given the episodes of turbulence in the international financial markets, an increase in the exchange rate volatility continues

being a latent risk that could generate upward pressures on prices of different goods.

- iv. Additionally, the possibility of the rebound of some agricultural prices with the consequent effect on inflation cannot be ruled out.

In short, all of the abovementioned suggests that the balance of risks to the growth rate of the Mexican economy has deteriorated, while that corresponding to inflation has moderately improved.

It is noteworthy that progress made in terms of inflation has been reached in the context of strengthening of the macroeconomic policy conduction and, in general, in an environment of improvement of the economic fundamentals of the country. Thus, the monetary policy conduction, together with a prudent fiscal policy, a flexible exchange rate regime and an adequate regulation and supervision of the financial system have been determining elements in reaching a considerable reduction in the level, volatility and persistence of inflation in the last years, as well as progressing in convergence towards the 3 percent permanent inflation target.

This has distinguished Mexico from other emerging economies. In a context where the international commodity prices presented a considerable increase in the first months of the year, these economies were more affected in their inflation levels. In contrast, Mexico continued with the process of convergence towards its inflation target and it is forecasted to follow this direction.

On the other hand, as mentioned in other Inflation Reports, the uncertain international environment faced by Mexico confirms the need of continuing the macroeconomic strengthening of the country and the progress in its structural change. To reach the economic growth rhythm that would lead to a higher level of development, without inflationary pressures, it is necessary to increase the potential GDP growth rate of the country, for which the referred structural reforms are indispensable. This is the right time to boost the abovementioned reforms given the strong Mexican macroeconomic framework, reached thanks to a prudent fiscal policy and a monetary policy committed to price stability.

Banco de México will continue monitoring the behavior of inflation expectations, output gap, grain and other commodity prices, as well as diverse inflation determinants that could signal widespread pressures on prices. If this eventuality materializes, the Board of Governors will adequately adjust the monetary policy stance in order to reach the convergence of inflation to the 3 percent permanent target.

Technical Chapter Term Structure of Government Interest Rates in Mexico

This technical chapter studies the term structure of interest rates of bonds issued by the Mexican Government, as well as its relation with different macroeconomic variables. In particular, the relationship between short-term interest rates and long-term interest rates throughout the economic cycle is analyzed. The aim is to enrich the discussion about monetary policy in Mexico, presenting the results of diverse studies carried out by the General Directorate of Economic Research (*Dirección General de Investigación Económica*).

1. Introduction

The study of the term structure of interest rates is of great relevance to the monetary policy conduction since the relation of short-term to long-term interest rates is a key element of the monetary policy's transmission mechanism. This is due to the fact that, although the instrument of this policy is a short-term interest rate, the agents in the economy base many of their saving- and investment decisions on longer-term interest rates.

There is a wide collection of studies about this topic focused on advanced financial markets. In contrast, for the case of the Mexican financial market there are only a few specific studies. Therefore, in order to have an improved analysis about the term structure of interest rates of bonds issued by the Federal Government in Mexico, the present technical chapter formally proves that the so-called expectation hypothesis does not hold. This hypothesis states that longer-term interest rates are simply the result of an average of expected short-term interest rates. The test of the referred hypothesis is of utmost importance given that in case of finding evidence in favor of this hypothesis, the relationship between the short-term interest rate and the rest of interest rates could be inferred relatively easily.

Besides proving that the expectation hypothesis does not hold for the Mexican case, this chapter also documents stylized facts of the term structure of interest rates. In particular, the evidence shown suggests that: i) the major part of this structure's variability in Mexico can be explained by changes in its level around its mean, which, as will be argued, is an element pointing in favor of anchored inflation expectations; and ii) changes in the slope of the interest rates' term structure seem to be mainly affected by changes in the monetary policy stance throughout the economic cycle. Both results indicate that the development of Mexican bond markets in the recent years has brought that the interest rate adjustments throughout the economic cycle have been orderly, and that the dynamic of interest rates' term structure presents characteristics similar to those observed in developed bond markets.³³

The rest of the chapter is organized as follows: section 2 briefly describes the development of the Mexican government debt market in the last years; section 3 documents some properties of the dynamic of the term structure

³³ It is noteworthy, that the time series of Mexican interest rates, in particular the longer-term rates, are not as extensive as those corresponding to developed bond market studies. Thus, the results of the estimations presented in this chapter could be improved according to data availability.

of interest rates, formally proves that the expectation hypothesis does not hold for Mexico and analyzes the deviations of the term structure with respect to the referred hypothesis; section 4 analyzes stylized facts of the term structure of interest rates in Mexico, in particular its relation with different macroeconomic variables. To this end, the principal component methodology is used in order to document the most common movements of the referred structure of interest rates. The last section presents some final remarks.

2. Development of Government Bond Market in Mexico

During the last years, inflation in Mexico has converged towards relatively low and stable levels as a result of prudent fiscal and monetary policies, although it has still not fully reached its 3 percent inflation target. Other elements, such as the central bank independence and the adoption of a floating exchange rate regime, have contributed to this result. In particular, there is evidence that inflation in Mexico went from being a non-stationary to a stationary process in 2001.³⁴ Therefore, it seems reasonable to suppose that inflation in Mexico presently follows a stationary process fluctuating around a well-defined mean. Also, the macroeconomic stability, capital account liberalization and globalization, together with an important evolution of financial regulation, have been key points fostering financial sector's development and reaching its higher penetration. Especially, the government bond market has experienced a considerable growth in the Mexican case, as shown by Jeanneau and Tovar (2006), and Castellanos and Martínez (2008).

Among the factors leading to a sound development of the bond market stand out the following: i) an effort by authorities aimed at reducing vulnerabilities to foreign shocks by means of economic policies leading to greater macroeconomic stability; ii) fewer restrictions on foreign investment; iii) clear and predictable debt issuance policy; and, iv) development of institutional investors, such as Mexican pension funds (*Afores*). In this context, the development of the public debt market in Mexico has been characterized by the following elements:

- a) An increase in market size. From 2001 onwards, the amount of government securities in circulation has presented a significant increase from a level of around MXN 750 billion in January 2001 to approximately MXN 4,500 billion in July 2011.³⁵
- b) A change in the composition of government debt, with a lower relative weight of inflation-indexed bonds (*Udibonos*) and a higher relative weight of nominal bonds, which reduces the vulnerability to external shocks. For instance, the ratio of the circulating amounts of nominal bonds to indexed bonds increased from 2.5 in January 2001 to 3.9 in June 2011.³⁶
- c) A gradual extension of the average maturity of government debt. In the last decade, primary as well as secondary government bond markets

³⁴ Chiquiar, Noriega and Ramos-Francia (2007) conclude that inflation in Mexico seems to have changed from a non-stationary process to a stationary process at the end of the year 2000 or the beginning of 2001.

³⁵ Specifically, it refers to the following instruments: CETES, BONDES, BONDES D, UDIBONOS, BONDS, IPAB, BPAS, BPA182, BPAT, and BREMS.

³⁶ Despite the claim mentioned, it is relevant to point out the fact that the *Udibonos* market is one of the most liquid when referring to inflation-indexed government asset markets in emerging economies.

have considerably developed. The Mexican government has issued fixed rate 3-month bonds since 1978 and during the recent years it has managed to issue fixed rate bonds for longer terms. In 2000, the first bonds with terms longer than one year had been issued, while 30-year bonds were issued for the first time in October 2006. In this context, the average maturity of government securities in Mexico is around 7.5 years, indicating the scope and depth of the market at different maturities.³⁷ This extension provides the government with more degrees of freedom in issuing, placing and managing its debt. Further, it reduces the vulnerability of public finances to a possible liquidity crisis which could occur in financial markets.

The availability of long-term bonds is a useful reference for the pricing of other assets in the economy. Thus, a government bond market brings about the development of private instrument markets, which otherwise could not exist or would not have the same depth.

Additionally, an important feature of the financial market development is the capacity to attract foreign and institutional investors. This has been achieved in the Mexican case, thanks to: i) the accessibility of relevant and timely financial information; and ii) a continuous improvement in economic policies and the general performance of the economy.

In sum, the elements presented are part of the evidence on the development and the maturity of the government debt market in Mexico. Likewise, the mentioned features are part of the base necessary to make an adequate comparison between the interest rates associated with the government bond market in Mexico and the corresponding interest rates in other mature financial markets.

3. Main Properties of the Term Structure of Interest Rates

The following section describes the main properties of the term structure of interest rates of government bonds. The first subsection differentiates between the referred term structure and the coupon-paying yield curve. The second subsection presents the basic statistics of interest rates with different times to maturity. Finally, the following subsections describe the expectation hypothesis and the formal tests of this hypothesis are carried out.

3.1. The Term Structure of Interest Rates and the Coupon Yield Curve of Government Bonds

The term structure of interest rates measures the value, which economic agents assign today to nominal payments that, in principle in the case of governments, are risk-free and which will be made in the future, for different time horizons.³⁸ In other words, it measures the value of one peso today with respect to the value of one peso paid in the future. In this way, the term structure of interest rates is the graphic representation of maturities and the corresponding interest rates, expressed as if they were zero-coupon government bonds for all maturities, at a given point in time. A zero-coupon bond is the promise of the

³⁷ The average maturity of U.S. government debt is approximately 5.2 years.

³⁸ It is noteworthy that the assumption of bonds being risk-free is with respect to an MXN-denominated financial position.

issuer (Federal Government) to pay the principal or face value to the bond-holder as a single-payment at the maturity date. The purchase price of the bond is called market price or discount price. For any debt instrument there is a risk of market prices fluctuating throughout the time before the date of maturity.

The market price of a zero-coupon bond in period t , expiring in n periods with face value of one peso is given by $P_t(n)$. The corresponding interest rate of this bond is denoted by $y_t(n)$, thus, $P_t(n) = (1+y_t(n))^{-1}$.³⁹ In general, short-term bonds do not have coupons, while long-term bonds do.⁴⁰ This generates a distinction between the term structure of interest rates or zero-coupon yield curve and the yield curve or coupon-paying yield curve, whose difference depends on the coupons. Despite this distinction, given a set of bonds, its corresponding scheme of coupons and its respective market prices, the term structure of interest rates and the yield curves with coupon are two ways of presenting basically the same information. A more detailed explanation of the difference between the two curves can be found in the Appendix.

3.2. Basic Statistics

In the present technical chapter the monthly averages of the daily interest rates in Mexico from July 2002 to July 2011 are used.⁴¹ Table 3 presents the average of the interest rates (zero-coupon) for each time horizon. It can be observed that the interest rate levels are, on average, increasing with respect to maturity dates; i.e., the term structure of interest rates generally has a positive slope.⁴² The most common interpretation of this fact is that the long-term nominal bond holders are compensated for the higher risks of liquidity and inflation they are facing, as well as the fact that they have to wait longer to receive the return on their investment.

Table 3
Mean of Interest Rates^{1/}
Percent

Term	1 month	3 months	6 months	1 year	2 years	3 years	5 yearsrs	7 years	10 years
Mean	6.64	6.82	6.99	7.16	7.76	8.44	9.78	11.23	13.49
	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.18)	(0.25)

1/ The interest rates used are the monthly averages of daily data from July 2002 to July 2011. Standard errors are in parentheses.

Source: Estimations carried out with data from *Valor de Mercado* (Valmer).

Graph 46 presents the time series of the interest rates at different time horizons. From the information presented, two aspects should be pointed out:

- i. The short-term interest rate has a correlation with the longer-term interest rates, which diminishes as the horizon increases. That is, the correlation of the short-term interest rate (1 month) with the medium- and long-term rates declines as the horizon of the referred rates increases. This can be seen by the dissociation of the line movement throughout time when the time horizon increases. Table 4 shows that

³⁹ In the case of compound composition, if it were continuous, then $P_t(n) = \exp(-y_t(n))$.

⁴⁰ Usually, the coupon payment is scheduled periodically; for example, each six months.

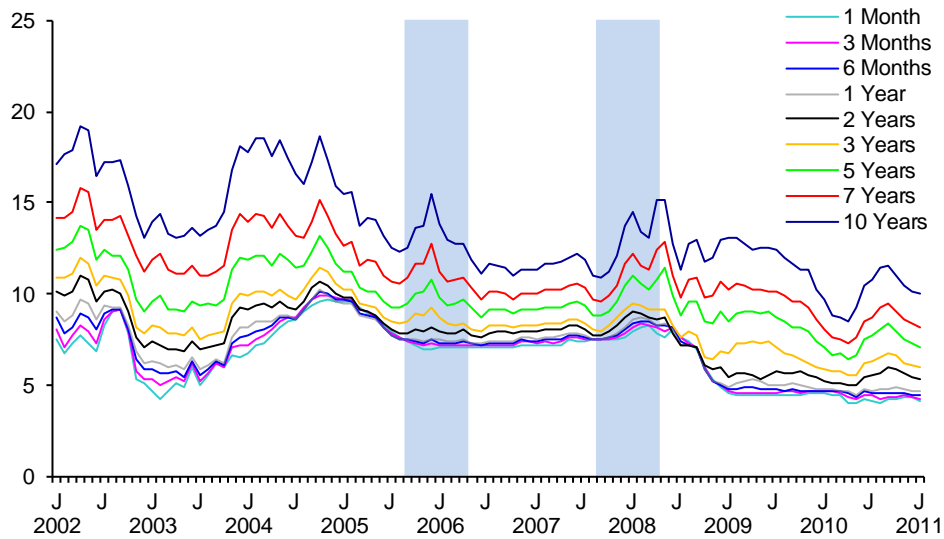
⁴¹ Interest rates associated with terms longer than 10 years are not included in the analysis in order to count with a bigger sample, since 20-year bonds started to be issued in October 2003 and the corresponding 30-year bonds, in October 2006. Although the data for 10-year bonds are available since 2001, the study period starts in July 2002 in order to avoid that data variability during the first months of the development of the secondary market affects the results. The source of the data is *Valor de Mercado* (Valmer).

⁴² This property is common in the interest rates of other countries, such as the U.S.

the correlations of the interest rates, $\text{corr}(y(i),y(j))$, for the terms $i, j = 1,2,3,\dots,6$ months, are high for the interest rates close to maturity, but they decline to the extent to which the difference between the time horizons increases.

- ii. Longer-term interest rates (5, 7 and 10 years) have a similar dynamic throughout time. Thus, they have a high correlation, indicating a similar component among them. This can be seen in the synchronized movements of the referred rates.⁴³

Graph 46
Interest Rates at Different Time Horizons ^{1/}
Percent



^{1/} The interest rates shown are the monthly averages of daily data from July 2002 to July 2011.
Source: *Valor de Mercado* (Valmer).

Table 4
Correlation Coefficients of Interest Rates ^{1/}

	1 m	3 m	6 m	1 yrs	2 yrs	3 yrs	5 yrs	7 yrs	10 yrs
1 m	1.0000								
3 m	0.9949	1.0000							
6 m	0.9770	0.9923	1.0000						
1 yrs	0.9486	0.9723	0.9930	1.0000					
2 yrs	0.8826	0.9177	0.9556	0.9793	1.0000				
3 yrs	0.8172	0.8581	0.9063	0.9432	0.9777	1.0000			
5 yrs	0.7190	0.7660	0.8224	0.8696	0.9246	0.9722	1.0000		
7 yrs	0.6334	0.6857	0.7476	0.8000	0.8736	0.9331	0.9827	1.0000	
10 yrs	0.5623	0.6149	0.6764	0.7310	0.8150	0.8871	0.9588	0.9874	1.0000

^{1/} m is/are month(s), yrs is/are year(s). The interest rates used are the monthly averages of daily data from July 2002 to July 2011.
Source: Estimates carried out with data from *Valor de Mercado* (Valmer).

Finally, in line with the results shown in Table 5, it is observed that the interest rates associated with all terms (lines) show high correlations with their own lagged values throughout time (columns), from one to six months; i.e., $\text{corr}(y_t(n),y_{t+k}(n))$, for $k = 1,2,3,\dots,6$ is high for the considered terms. Equivalently,

⁴³ Note that, although the 10-year interest rate of the yield curve located around 6.8% at the end of July, the interest rate of the same term of the term structure of interest rates is 9.9%, due to the difference in construction of these curves, as explained in the Appendix.

given an interest rate shock $y_t(n)$, the interest rates $y_{t+1}(n), \dots, y_{t+6}(n)$, would also be affected. Hence, these estimations suggest certain persistence in the interest rates, since the value of the interest rate in period t is correlated with the value of the same rate in period $t+k$ for $k = 1, 2, 3, \dots, 6$.

Table 5
Autocorrelations of Interest Rates^{1/}

	(t-1) m	(t-2) m	(t-3) m	(t-4) m	(t-5) m	(t-6) m
1 m	0.9630	0.9088	0.8464	0.7759	0.7132	0.6445
3 m	0.9672	0.9207	0.8670	0.8023	0.7406	0.6705
6 m	0.9718	0.9304	0.8841	0.8247	0.7610	0.6897
1 yrs	0.9724	0.9302	0.8850	0.8280	0.7638	0.6936
2 yrs	0.9721	0.9268	0.8839	0.8328	0.7729	0.7066
3 yrs	0.9608	0.9004	0.8468	0.7876	0.7234	0.6540
5 yrs	0.9439	0.8655	0.8117	0.7541	0.6761	0.5952
7 yrs	0.9408	0.8660	0.8227	0.7828	0.7229	0.6596
10 yrs	0.9422	0.8642	0.8118	0.7647	0.6934	0.6202

^{1/} Lags are from 1 to 6 months. **m** is/are month(s), **yrs** is/are year(s). The interest rates used are the monthly averages of daily data from July 2002 to July 2011.
Source: *Valor de Mercado* (Valmer).

The previous statistics provide a general description of the interest rates behavior at different horizons. With respect to this, two points should be mentioned:

1. There are common components in the movements of interest rates at different time horizons (high correlation coefficients).
2. Interest rates have an intertemporal dynamic with certain persistence (high autocorrelation coefficients).

3.3. Expectation Hypothesis

For a long time, the expectation hypothesis had been used as the basic tool for analyzing the term structure of interest rates.⁴⁴ This hypothesis establishes that the long-term interest rate equals the expected average of short-term interest rates. Formally, the referred hypothesis is defined by the following equation:

$$y_t(n) = E_t(y_t(1) + y_{t+1}(1) + y_{t+2}(1) + \dots + y_{t+n-1}(1))/n + K_1 \quad (1)$$

for all n . K_1 is a constant interpreted as reinvestment risk premium. E_t is the expectation conditional on the information available in period t . The referred hypothesis implies that, on average, it is the same, investing in a bond with maturity n for n periods (left side of (1)) and investing in a one-period bond for one period and reinvesting the resources in the same bond in the next period, repeating this operation $n-1$ times, plus a constant risk premium K_1 (right side of (1)). In this way, this operation involves the risk that the interest rates, at which investments will be conducted in the future, change during reinvestment.

The expectation hypothesis has the following implication which helps to test its validity. An increase in the interest rate with a time horizon n , $y_t(n)$, without changes in the short-term interest rate, $y_t(1)$, should be followed, on average, by an increase in the short-term interest rates in the periods $t+1, t+2, \dots, t+n-1$; i.e., $y_{t+1}(1), y_{t+2}(1), \dots, y_{t+n-1}(1)$. In order to explore this implication, the time series of the

⁴⁴ It is worth mentioning that the expectation hypothesis is not equivalent to the assumption of rational expectations.

1-month up to 10-year interest rates are considered, which are presented in Graph 46. It can be observed that the behavior of the interest rates occasionally approaches the implication of the expectation hypothesis. Specifically, if the longer-term interest rates increase with respect to the short-term rates -visually the lines diverge-, the short-term interest rates increase subsequently (visually the lines merge). This can be seen in Graph 46 in the shaded area on the right, during the first half of 2008. Nevertheless, there are other periods where the implication does not seem to hold, for example, around May 2006. See left-hand shaded area in the same Graph 46, where the long-term interest rates increase and, however, the short-term rates in the next periods remain unchanged. In sum, although the aforesaid is not a formal test, it could suggest that the referred hypothesis does not hold for the Mexican case, as will be proved in the next section.

3.4. Test of the Expectation Hypothesis

This section formally proves that the expectation hypothesis does not hold for Mexico.⁴⁵ To this end, two concepts used in the literature of bond valuation are defined:

- i. The holding period return of an n -period bond for 1 period. This return is obtained from buying an n -period bond in period t and selling it later in period $t+1$, when its maturity date is $(n-1)$ periods; formally defined as: $\text{hpr}_{t+1}(n) = \log(P_{t+1}(n-1)/P_t(n))$.⁴⁶
- ii. The forward rate in t of n to $(n+1)$ is the interest rate which can be guaranteed in period t in order to obtain the referred rate from period $(t+n)$ to $(t+n+1)$. This rate is defined as: $f_t^{(n \rightarrow n+1)} = y_t(n) \cdot n - y_t(n+1) \cdot (n+1)$.

Based on the expectation hypothesis, any of the following two equations can be obtained,⁴⁷

$$E_t(\text{hpr}_{t+1}(n)) = y_t(1) + K_2, \quad (\text{Risk Premia}) \quad (2)$$

$$E_t(y_{t+n}(1)) = f_t^{(n \rightarrow n+1)} + K_3, \quad (\text{Interest Rate Predictability}) \quad (3)$$

for all n , where K_2 and K_3 are constants interpreted as risk premia. Intuitively, equation (2) is interpreted as saying that, on average, the same return is obtained by investing for one period in any bond irrespective of the time to maturity, except for a constant interpreted as risk premium. The intuition behind equation (3) is that the rate which can be assured from period $(t+n)$ to period $(t+n+1)$ (i.e. forward rate) is equal, on average, to the interest rate of the bond acquired in $(t+n)$ with one period until maturity, except for a constant interpreted as a risk premium.^{48,49}

⁴⁵ The use of the expectation hypothesis, its later revision and refutation represented the watershed in the literature of term structure of interest rates. Thus, carrying out formal tests in order to examine whether the expectation hypothesis holds for the Mexican case is the right step to start a study about the relation between the short-term and long-term interest rates.

⁴⁶ The acronym hpr refers to "holding period return".

⁴⁷ For a proof, see Cochrane (2005).

⁴⁸ Note that the expectations are conditional on the information available in period t .

⁴⁹ Three additional points are noteworthy. First, the constants K_1 , K_2 and K_3 are not equal, but maintain relations among them. Second, the expectation hypothesis can be defined at levels or logarithms. The discrepancy between these two is given by Jensen's inequality. For the purpose of this document, logarithms are used. Third, the expectation hypothesis is given under risk neutrality. Nevertheless, the expectation hypothesis is not a sufficient condition in order to obtain risk neutrality of the agents.

3.4.1. Risk Premia

The concept of risk premia, in this context, refers to the return on holding a bond with time to maturity n for one period, less the one-period interest rate; i.e., $hpr_{t+1}(n) - y_t(1)$. The expectation hypothesis implies that the conditional expectation should be constant across time and for all n . To show this, equation (2) can be rewritten as $E_t(hpr_{t+1}(n) - y_t(1)) = K_2$, and by taking again the expectation, the following is obtained:⁵⁰

$$E(hpr_{t+1}(n) - y_t(1)) = K_2 \quad (4)$$

Thus, as one of the implications of the expectation hypothesis results that the unconditional expectation of holding period return of a bond, net the one-period interest rate, is constant. This equation is estimated below. The intuition of equation (4) is that, on average, irrespective of the time to maturity n of the bond invested for one period, the return less the one-period interest rate should be the same. In order to evaluate equation (4), Table 6 presents the expectations of the one-month holding risk premia, for bonds with time to maturity of $n = 1$ month, 3 months,... and 10 years (for each time horizon the left side of equation (4) is estimated). It is clear that they increase with longer maturity horizons and that the referred expectations are statistically different among each other, presenting evidence against the expectation hypothesis.

Table 6
Risk Premia
Holding for one month, percent ^{1/}

(%) n	1 m	3 m	6 m	1 yrs	3 yrs	5 yrs	7 yrs	10 yrs
$E(hpr(n)-y(1))$	-	0.41	0.76	1.26	5.31	9.38	14.24	21.91
std.e.	-	(0.08)	(0.18)	(0.37)	(1.35)	(2.88)	(4.98)	(9.41)

^{1/} m is/are month(s), yrs is/are year(s). **std.e.** denotes standard errors, which are in parentheses. $E(x)$ denotes unconditional expectation of x .

3.4.2. Predictability of Interest Rates

An additional test of the expectation hypothesis is to consider whether the current interest rates contain information to predict future interest rates. In this context, from equation (3), a regression is set up, measuring the degree of predictability of interest rates. Reconsidering the referred equation: $E_t(y_{t+n}(1)) = f_t^{(n \rightarrow n+1)} + K_3$, subtracting the short-term interest rate $y_t(1)$ on both sides of the equation, the following equation is obtained, where the inclusion of the interest rate within the conditional expectation is due to the fact that the referred interest rate is known in period t :

$$E_t(y_{t+n}(1) - y_t(1)) = f_t^{(n \rightarrow n+1)} - y_t(1) + K_3 \quad (5)$$

The intuition is that, if expectation hypothesis holds, the changes in the forward rate with respect to the short-term interest rate (right side of (5)) forecast the behavior of the changes of the short-term rate in the following periods (left side of (5)). Then, if the following regression is considered:

$$y_{t+n}(1) - y_t(1) = a + b (f_t^{(n \rightarrow n+1)} - y_t(1)) + e_{t+n}$$

⁵⁰ Formally, to reach this conclusion, the law of iterated expectations is used.

where e_{t+n} has a distribution with conditional zero mean in t . By taking the expectations on both sides, conditional on the information in time t , it is obtained:

$$E_t(y_{t+n}(1) - y_t(1)) = a + b (f_t^{(n \rightarrow n+1)} - y_t(1))$$

Therefore, the fact that b is statistically different from 1 is evidence against the expectation hypothesis. In this context, Table 7 shows the estimation results of the previous regressions for the case of the interest rates in the Mexican market.

Table 7
Estimation of Predictability Regression ^{1/}

$$y_{t+n}(1) - y_t(1) = a + b (f_t^{(n \rightarrow n+1)} - y_t(1)) + e_{t+n}$$

n	a	std.e.(a)	b	std.e.(b)	R ²
1	-0.16	0.06	0.64*	0.23	0.0600
4	-0.62	0.13	0.94	0.16	0.2334
8	-0.70	0.20	0.66*	0.21	0.0807
12	-1.11	0.28	0.77	0.22	0.0999
16	-1.78	0.33	0.93	0.18	0.2208
20	-2.41	0.36	0.95	0.15	0.3106
24	-3.21	0.37	1.07	0.13	0.4386

^{1/} R² is adjusted. **std.e.** are the standard errors. The time period is monthly. Estimates are carried out with ordinary least squares. * Statistically different from 1.

Considering the estimates in the referred table, the following observations stand out:

- a. There is evidence that the expectation hypothesis does not hold, specifically for $n=1$ and $n=8$, estimates for b are statistically different from 1, in line with the results of the previous section and other studies.⁵¹
- b. These results are similar to those presented for data on the U.S. market, with respect to the behavior of the estimates of coefficient b .⁵²

4. Stylized Facts

Once evidence has been found against the expectation hypothesis and it is established that, thus, the risk premia, which are assumed to be constant, are indeed time-varying, it is essential to learn about the relationship between the term structure of interest rates and different macroeconomic variables. This possibly reflects that the referred premia are a function of these variables. In this context, the analysis of stylized facts of the term structure of interest rates consists of two parts:

- a. The decomposition of the interest rates using the principal component analysis, in order to know the most common movements of the term structure of interest rates.
- b. The relation between the referred movements of the term structure of the interest rates and some macroeconomic variables relevant to the analysis of the monetary policy.

⁵¹ For example, see Castellanos and Camero (2002) and Cortés et al. (2009).

⁵² For example, see Cochrane (2005).

4.1. Principal Components

The decomposition of a data set using the principal component methodology is commonly used for the analysis of the variability of a large data set.⁵³ In particular, the referred methodology allows rewriting the term structure of interest rates of a given period as the sum of its average and different vectors to which a different importance is assigned according to the relative variability of each one of them. Nevertheless, these vectors do not have a direct interpretation, thus they are often related to observable variables.

If one considers the term structure of interest rates in period t , $\mathbf{y}_t = [y_{t,1m}, y_{t,3m}, \dots, y_{t,10a}]$, then, following the statistical technique of principal components, it is possible to obtain a set of vectors $\mathbf{v}_1, \mathbf{v}_2, \dots$ and \mathbf{v}_n and a set of numbers $\alpha_{t,1}, \alpha_{t,2}, \dots$ and $\alpha_{t,n}$, such that \mathbf{y}_t can be expressed by its expectation and the sum of the referred vectors weighted by the corresponding numbers:

$$\mathbf{y}_t = \mathbf{E}(y_t) + \alpha_{t,1}\mathbf{v}_1 + \alpha_{t,2}\mathbf{v}_2 + \dots + \alpha_{t,n}\mathbf{v}_n$$

Each number $\alpha_{t,i}$ assigns different importance to the respective vector \mathbf{v}_i . In particular, the numbers $\alpha_{t,1}, \alpha_{t,2}, \dots, \alpha_{t,n}$ have the property that the variability of $\alpha_{t,n}$ is greater than the variability of $\alpha_{t,n+1}$, for all n . Thus, the importance of the vectors $\mathbf{v}_1, \mathbf{v}_2, \dots$ and \mathbf{v}_n decreases with the index $i=1,2,3,\dots,n$. The vectors \mathbf{v}_i are known as eigenvectors, the numbers $\alpha_{t,i}$, as coefficients and the vectors $\alpha_{t,i}\mathbf{v}_i$, as the principal components.⁵⁴

Table 8 presents the percentage of variations in the term structure of interest rates explained by each component. The rate at which the variances decline naturally depends on the data.⁵⁵ A relevant fact in the case of the term structure of interest rates is that the explained variance decreases at such a rate that the first two principal components are sufficient to describe more than 98.9% of the total variance. Thus, it results that the approximation, using the first two principal components, $\mathbf{y}_t \approx \mathbf{E}(y_t) + \alpha_{t,1}\mathbf{v}_1 + \alpha_{t,2}\mathbf{v}_2$, to the referred term structure of interest rates is reasonable.

⁵³ For example, see Jackson (1988).

⁵⁴ In order to obtain the vectors $\mathbf{v}_1, \mathbf{v}_2, \dots$ and \mathbf{v}_n , the variance and covariance matrix of the interest rates is decomposed, $\text{Var}(y_t) = \Sigma = \mathbf{V}\mathbf{D}\mathbf{V}^T$, where the columns of \mathbf{V} , $\mathbf{v}_1, \mathbf{v}_2, \dots$ and \mathbf{v}_n , are the eigenvectors of Σ and the diagonal matrix \mathbf{D} has the eigenvalues of Σ as entries. Additionally, $\alpha_{t,i}$ is the magnitude of the projection of y_t in \mathbf{v}_i .

⁵⁵ The fact that the variances decrease is obtained from the principal components by construction.

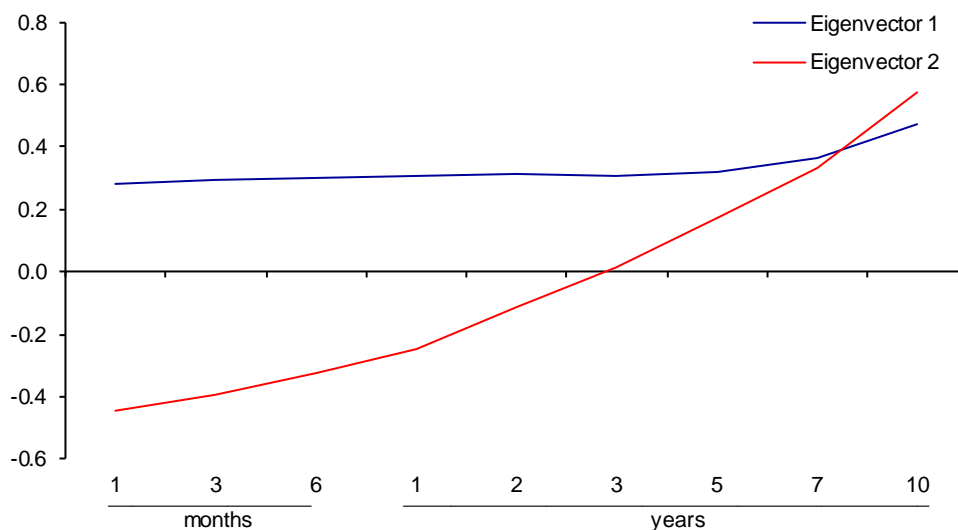
Table 8
Variance Explained by Principal Components ^{1/}
 Percent squared

Eigen-vector	Variance	Accumulated variance
1	0.8627	0.8627
2	0.1263	0.9890
3	0.0074	0.9964
4	0.0015	0.9979
5	0.0009	0.9988
6	0.0006	0.9994
7	0.0005	0.9999
8	0.0001	1.0000
9	0.0000	1.0000

Source: Estimates carried out with data from *Valor de Mercado* (Valmer).

In the particular case of the term structure of interest rates, the vectors, \mathbf{v}_1 and \mathbf{v}_2 are often interpreted in the literature as “level” and “slope”, respectively. This is due to the graphic form of the vector \mathbf{v}_1 , essentially a horizontal line, and the form of \mathbf{v}_2 , a line with a positive slope.⁵⁶ Both vectors are presented in Graph 47. In this context, remember that if \mathbf{v} is a vector: $\mathbf{v} = (\mathbf{v}_1, \dots, \mathbf{v}_n)^T$ and α a number, then, the multiplication of both elements is: $\alpha\mathbf{v} = (\alpha\mathbf{v}_1, \dots, \alpha\mathbf{v}_n)^T$. Thus, an increase in $\alpha_{t,1}$, leads to an increase in the level of the vector $\alpha_{t,1}\mathbf{v}_1$, which is reflected in \mathbf{y}_t since $\mathbf{y}_t \cong \mathbf{E}(\mathbf{y}_t) + \alpha_{t,1}\mathbf{v}_1 + \alpha_{t,2}\mathbf{v}_2$, resulting in an increase of similar magnitude of each rate in \mathbf{y}_t , given that \mathbf{v}_1 consists of positive elements with a similar magnitude for all time horizons. On the other hand, an increase in $\alpha_{t,2}$ leads to an increase in $\alpha_{t,2}\mathbf{v}_2$, which in turn affects \mathbf{y}_t due to the relation $\mathbf{y}_t \cong \mathbf{E}(\mathbf{y}_t) + \alpha_{t,1}\mathbf{v}_1 + \alpha_{t,2}\mathbf{v}_2$, reducing the short-term rates and increasing the long-term rates, which, in turn, increases the slope of the referred structure, since \mathbf{v}_2 consists of negative elements in the short terms and positive elements in the long terms.

Graph 47
Eigenvectors
 Percent



Source: Estimates carried out with data from *Valor de Mercado* (Valmer).

⁵⁶ For the case of the U.S., see Litterman and Scheinkman (1991).

Graph 48 confirms the interpretation of the principal components presenting the coefficients $\alpha_{t,1}$ and $\alpha_{t,2}$ with the level and slope directly obtained from the interest rates, respectively.⁵⁷

- The level can be measured by an average of the term structure of interest rates. An alternative used in literature is the average of the short-term and long-term interest rates, in this case, the 3-month and 10-year horizons, respectively:

$$(y_t(3) + y_t(120))/2 \quad (\text{level})$$

This level indicator and the first principal component ($\alpha_{t,1}$) have a correlation of 0.9919 during the study period (Graph 48a).

- The slope of the term structure of interest rates can be measured by the difference between the long-term and short-term interest rates, in this case, the 10-year and 3-month interest rates, respectively:

$$(y_t(120) - y_t(3)) \quad (\text{slope})$$

The slope and the second principal component ($\alpha_{t,2}$) have a correlation of 0.9024 (Graph 48b).

The aforementioned suggests that a great part of the variability of interest rate movements around their mean, $\mathbf{y}_t \approx \mathbf{E}(y_t) + \alpha_{t,1}\mathbf{v}_1 + \alpha_{t,2}\mathbf{v}_2$, is given by changes in the “level”, determined in t by $\alpha_{t,1}$ and by changes in the “slope”, whose influence is measured in t by $\alpha_{t,2}$. Intuitively, if only the movements in the “level” and in the “slope” of the term structure of interest rates are considered, the majority of changes in the referred structure would be described, a fact which is documented by the principal component analysis.⁵⁸ In sum, the movements of the term structure of interest rates are mainly explained by changes in the level around its mean. Furthermore, the rest of the variability in the term structure of interest rates is practically explained by changes in the slope, around its mean.

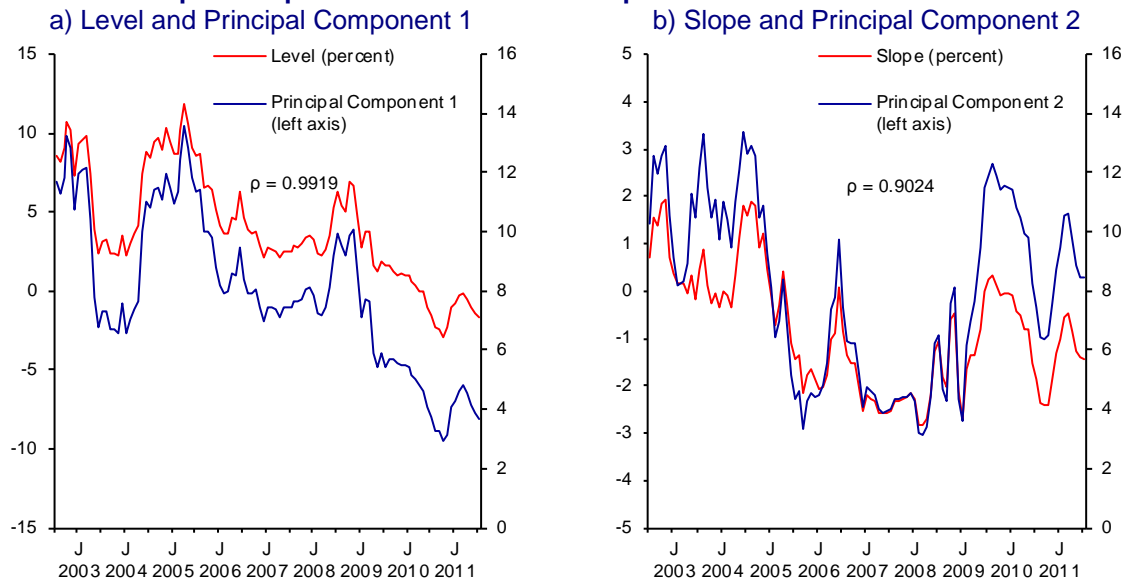
It is noteworthy that results regarding the decomposition of the interest rates using the principal component methodology are similar to the case of the interest rates in the U.S. market, as well as to other exercises carried out previously with interest rates of the Mexican market.⁵⁹ The characterization of movements provided by the decomposition using the principal component analysis is essentially statistical. Nevertheless, this decomposition is useful, since it simplifies the interpretation of the movements of the term structure of interest rates and facilitates the analysis of the relationship between these and other variables.

⁵⁷ The charts in Graph 48 have different scales in the vertical opposite axis, given that in the principal component analysis the means of the variables are subtracted previous to the analysis.

⁵⁸ An additional movement could be the change in the curvature of the term structure of interest rates which measures the concavity of this structure. Nevertheless, the reduced variability explained by a third component suggests that this movement is less important.

⁵⁹ See Litterman and Scheinkman (1991) for the case of the U.S. and Cortés et al. (2008) for the case of Mexico. This result could suggest a relation between the interest rates in Mexico and the U.S.

Graph 48
First Two Principal Components and Level and Slope of the Term Structure of Interest Rates



Source: Estimates carried out with data from *Valor de Mercado* (Valmer).

4.2. Term Structure of Government Interest Rates and its Relation with Different Macroeconomic Variables

The previous statistics suggest that there is possibly a relationship between the term structure of interest rates and some macroeconomic variables. It is desirable for these relationships to be backed up theoretically, thus they are typically more easily identified using low-frequency components of the macroeconomic variables. Due to the aforementioned, the series analyzed below are smoothed, estimating a 6-month moving average with a centered window, in order to extract its low-frequency components.⁶⁰ Following, the relationships among the two principal components, characterizing the movements of the term structure of the interest rates, and two macroeconomic variables, the 1-month interest rate and the output gap, using the monthly indicator IGAE, are analyzed.^{61,62}

First, for the monetary policy conduction it is relevant that the movements of the short-term interest rate are transferred to the long-term rates, given that these are the rates mainly influencing households' and firms' saving and consumption decisions. Hence, it would be desirable for the average level of all interest rates of the term structure of the rates to be strongly related with the short-term interest rates, which is the rate more immediately influenced by the monetary authority.⁶³ If this is the case, it would imply that the monetary policy

⁶⁰ The larger the moving average window, the lower is the frequency of the smoothed variable. Thus, the choice of 6 months aims at capturing the trend of the smoothed series without losing too much variability.

⁶¹ In the present exercise, the GDP is not used because its frequency is quarterly and that of the other data is monthly.

⁶² It is worth mentioning that the study of the relationship of the term structure of interest rates with other macroeconomic variables can be extended to other variables. Nevertheless, it is considered that the two variables used in this chapter are the ones which allow most easily the analysis of the relation between the term structure of interest rates and monetary policy.

⁶³ As mentioned before, Banco de México implements its monetary policy through the Overnight Interbank Interest Rate and this rate, in turn, is considerably related to the 1-month interest rates. In fact, the

actions adopted by the Central Bank do not dilute throughout the term structure of interest rates, but rather reach the desired effects by increasing or decreasing the different-term interest rates, as the case may be.

Specifically, longer-term interest rates consist of two components, the real one, which is determined by low-frequency movements (productivity) and which is not influenced by the monetary policy (neutrality of money in the long run), and the nominal component (inflation expectations plus inflationary risk premium). In this way, the component, which can be affected by the monetary policy is the nominal component of the long-term rates. As mentioned, the level of the term structure of interest rates can be measured as the average of the different-term interest rates. Thus, the fact that the short-term interest rate might be strongly correlated with the level of this structure could be interpreted as the evidence of anchored inflation expectations. On the contrary, if inflation expectations were not anchored, the short-term interest rate movements, determined by the monetary authority, would have a low correlation with the medium- and long-term rates, and, consequently, with their nominal component, which includes the inflation expected in the long term.

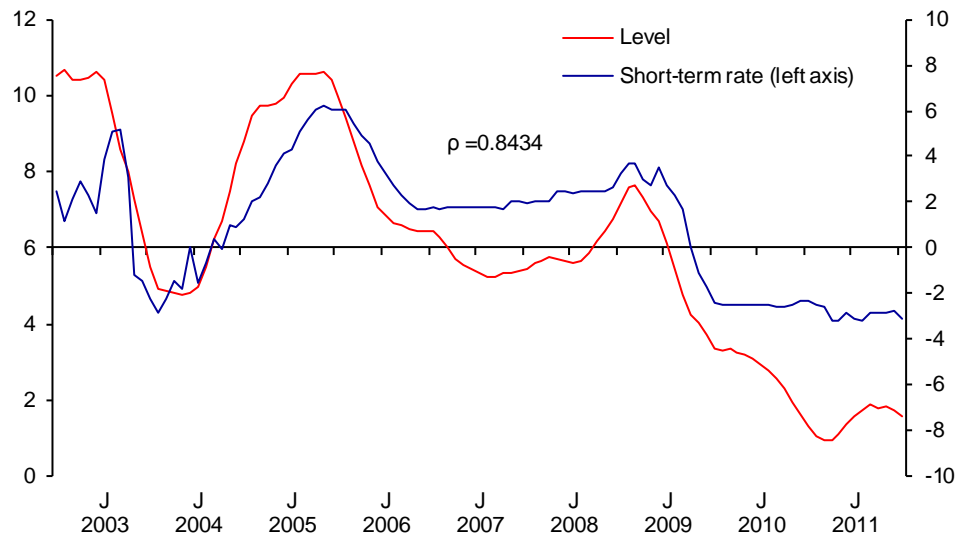
In this context, a correlation of 0.8434 between the short-term interest rate and the component associated with the level of the term structure of interest rates confirms a positive relation between these variables during the study period. To complement the previous data, consider the dynamic of the referred variables in Graph 49. Due to the argument described in the previous paragraph, this result provides evidence which seems to indicate that the inflation expectations are anchored. Additionally, Cortés et al. (2008) document a positive correlation (of 0.7) between the level of the term structure of interest rates and the 10-year break-even inflation. This is in line with the stability and the anchoring of long-term inflation expectations.

Another interesting exercise consists in analyzing the movements of the slope of the term structure of interest rates throughout the economic cycle. When the economy is emerging from a recession, i.e., if the output gap is negative but increasing and inflation and its expectations are at low levels, the short-term interest rate is expected to be at relatively low levels and the long-term interest rate at relatively high levels.⁶⁴ This means that the term structure of interest rates would have a positive slope.

correlation between the Overnight Interbank Interest Rate and the 28-day interest rate is 0.97 for the sample from July 2002 to July 2011.

⁶⁴ The adverb "relatively" refers to the fact that the concerned interest rate is high as compared to its average throughout the economic cycle.

Graph 49
Level Component and One-month Interest Rate ^{1/}
 Percent



^{1/} Variables smoothed with moving average.

Source: Estimations carried out with data from *Valor de Mercado* (Valmer) and Banco de México.

In this situation, the low short-term interest rate would be explained by a relatively more relaxed monetary policy induced by the monetary authority during the recession period, while the higher level of long-term interest rates would be the result of the increase of the real component of the referred rate, given that market participants would have better economic growth expectations in the near future with respect to the present. By trying to smooth consumption, they would take on longer-term credits. Nevertheless, since not everyone can do this, the real component of nominal interest rates would have to increase in order to clear the savings market. Due to the aforementioned, a negative output gap would be expected to be associated with a relatively low level of the short-term interest rate and a relatively high level of the long-term interest rate.

In the case of an economy completing an expansion phase (with a significantly positive, but declining, output gap, and inflation, in turn, registering widespread upward pressures), the short-term interest rate would be expected to be at higher levels with respect to other phases of the cycle, and, on the other hand, the long-term rate to be at relatively low levels. This means that the term structure of interest rates would be relatively flatter.

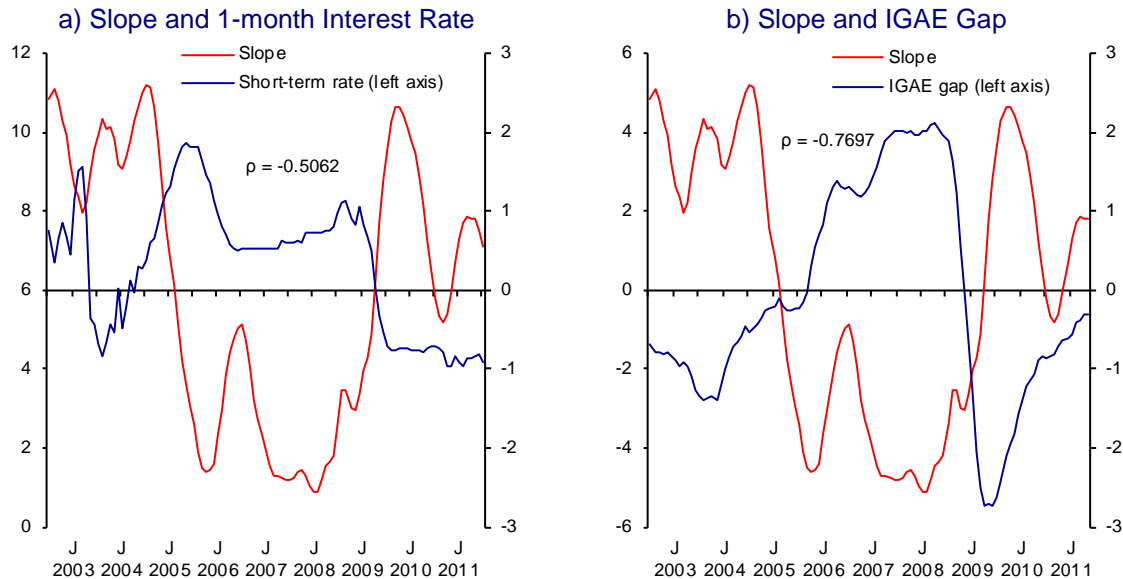
In this situation, the relatively high level of the short-term interest rate would reflect a restrictive monetary policy in the face of generalized inflation pressures in the expansive period. In turn, the relatively low level of the long-term interest rate would be associated with reduced economic growth outlook by the agents. This would lead most of them to prefer longer-term savings, which would cause a decline in the real component of the nominal long-term interest rates. Thus, a positive output gap would be expected to be associated with a relatively high level of the short-term interest rate, and a relatively low level of the long-term interest rate. This result can be found for the case of Mexico, where the following is observed:

- i. A negative correlation (of -0.5062) between the short-term interest rate and the slope of the term structure of interest rates (Graph 50a).

- ii. A negative correlation (of -0.7697) between the output gap (using IGAE) and the slope component of the term structure of interest rates (Graph 50b).

Thus, the variations in the slope of the term structure of interest rates would seem to be affected by changes in the monetary policy stance throughout the economic cycle. This result has also been documented for developed debt markets, for example, see Ang et al. (2005).

Graph 50
Slope Component, One-month Interest Rate and IGAE Gap ^{1/}
 Percent



^{1/} Variables smoothed with moving average.

Source: Estimations carried out with data from *Valor de Mercado* (Valmer) and Banco de México.

5. Final Remarks

This technical chapter provides a description of the development of the government bond market and analyzes the main properties of the term structure of interest rates in Mexico. In particular, the expectation hypothesis is proved not to hold for the Mexican case and the deviations of the term structure of interest rates with respect to the referred hypothesis are examined.

After showing that the expectation hypothesis does not hold, stylized facts about the movements of the term structure of interest rates throughout the economic cycle are documented. The presented evidence shows results similar to those found for other developed debt markets, which, indeed, is an element of strength of the Mexican economy. In particular, evidence is found which suggests that inflation expectations in Mexico are anchored and that changes in the monetary policy stance throughout the economic cycle are reflected in the slope of the term structure of interest rates.

Even if the results reported in this chapter are likely to be improved to the extent to which more information becomes available, they suggest that risk premia are time-varying and that these variations can be a function of the evolution of the macroeconomic environment. Deepening this analysis is a task

which would surely contribute to enriching the analysis of the monetary policy in Mexico.

6. Appendix

The present appendix describes the difference between the term structure of interest rates or zero-coupon curve and the yield curve (with coupon), which are the two ways of expressing the temporal value, which economic agents assign today to nominal payments, which, in principle, for the case of governments are credit risk-free, are carried out in the future for different time horizons. While the yield curve is widely used in practice, the term structure of interest rates is mainly used in academic papers because its handling is easier in the models from an analytical point of view.⁶⁵

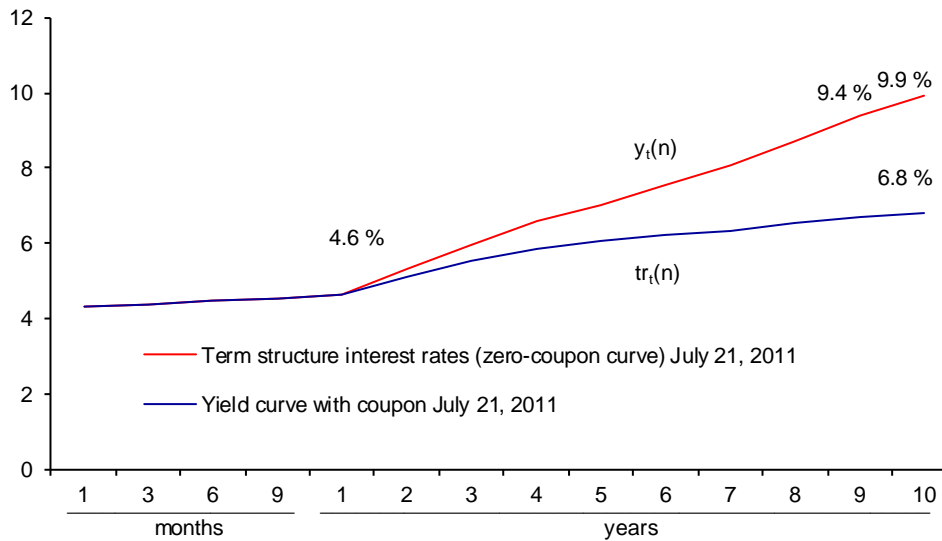
Graph 51 shows both curves for July 21, 2011. The interest rate, 9.9%, associated with the maturity horizon of 10 years reflects the return obtained from buying the associated bond after 10 years without receiving any coupon. On the other hand, the yield rate, 6.8%, associated with a 10-year maturity, reflects the return that would be obtained from buying the corresponding bond, having received the associated coupons, being able to invest them for the rest of the time horizon at the same rate and after 10 years having passed. In this context, the market price $P_t(n)$ of a bond paying coupons of amount C in the period 1, 2, 3, ... and $n-1$, with a face value V and which expires in n periods, can be expressed in two ways, by means of the interest rates ($y_t(n)$) or by means of the corresponding yield rate ($tr_t(n)$):

$$\underbrace{\frac{C}{(1+y_t(1))} + \frac{C}{(1+y_t(2))^2} + \dots + \frac{V}{(1+y_t(n))^n}}_{\text{Interest Rate (zero-coupon)}} = P_t(n) = \underbrace{\frac{C}{(1+tr_t(n))} + \frac{C}{(1+tr_t(n))^2} + \dots + \frac{V}{(1+tr_t(n))^n}}_{\text{Yield rate}}$$

where, for instance, if time to maturity n is 10 years, from Graph 51, the interest rates for discounting the flows on the left are $y_t(1) = 4.6\%$, ..., $y_t(9) = 9.4\%$, $y_t(10) = 9.9\%$, respectively, and the yield rate for discounting the flows on the right side is $tr_t(n) = 6.8\%$.

⁶⁵ In the literature, the names of the term structure of interest rates and the yield curve are not standardized and are at times exchanged.

Graph 51
Term Structure of Interest Rates and Coupon Yield Curve
 Percent



Source: Valor de Mercado (Valmer).

The following example is illustrative in order to explain the difference between the term structure of interest rates and the yield curve with coupon. Suppose there is a bond without coupons, with face value of 1 and a time to maturity of one year. Thus, the one-year interest rate, $y_t(1)$, is such that the market price of the bond equals its face value discounted by the referred interest rate: $P_t(1) = (1+y_t(1))^{-1}$. Additionally, there is a bond with a coupon of amount C paid in one year and a principal of one peso paid in two years. Thus the interest rate associated to a two-year maturity, $y_t(2)$, is such that the bond market price, $P_t(2)$, equals the amount of the coupon discounted by the one-year interest rate, $y_t(1)$, plus the face value of the referred bond, one peso, discounted by the two-year interest rate; i.e., $P_t(2) = C(1+y_t(1))^{-1} + (1+y_t(2))^{-2}$. It should be emphasized that the one-year interest rate was obtained from the valuation of the bond without a coupon and principal payment in one year. Thus, the only unknown variable in the previous equation is the two-year interest rate, $y_t(2)$, and, therefore, the numeric value of the referred variable can be obtained so that the equation is satisfied. In sum, $y_t(1)$, $y_t(2)$ are part of the *term structure of interest rates or zero-coupon curve*.

Considering the bonds described in the previous paragraph, first, it turns out that the one-year yield rate is the rate at which the discounted face value of the bond equals its market value $P_t(1) = (1+tr_t(1))^{-1}$; i.e, the one-year interest rate coincides with the one-year yield rate, $y_t(1) = tr_t(1)$. Nevertheless, the yield rate associated with the two-year bond, $tr_t(2)$, is such that the market price of the referred bond equals the amount of coupon, C , discounted by the yield rate, $tr_t(2)$, plus the face value discounted by the same rate, $tr_t(2)$.⁶⁶ Formally, the following equation is obtained: $P_t(2) = C(1+tr_t(2))^{-1} + (1+tr_t(2))^{-2}$ where C is the amount of the coupon paid in the first year. Note that it is the same rate used for discounting both flows. From the previous equation, the only unknown variable is, $tr_t(2)$, thus,

⁶⁶ In general, given a flow of payments c_1 and c_2 , in the first and second years, respectively, and the discount price P , the yield rate is defined as tr , so that the price $P = (1+tr)^{-1}c_1 + (1+tr)^{-2}c_2$. It is important to note that the two flows are discounted with the same rate. The estimation of this rate is similar to the estimation of the internal rate of return in the context of project valuations.

the numeric value of the referred rate can be obtained. In sum, the rates $tr_t(1)$, $tr_t(2)$ are part of the *yield curve*, also called *yield curve with coupon*. Additionally, note that the last equation can be rewritten as follows: $P_t(2) (1+tr_t(2))^2 = C(1+tr_t(2)) + 1$. This expression has, on its left side, the future value with the rate $tr_t(2)$ in two years of the market price of the bond, $P_t(2)$, and, on the right side, the future value with rate $tr_t(2)$, in one year, the coupon plus the face value of the referred bond. Thus, the possibility of reinvesting the amount of the coupon at the yield rate $tr_t(2)$, is one assumption with respect to the calculation of the yield rate. For more details, see, for example, Luenberger (1997).

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