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Economic Watch

Mexico

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Economic Analysis

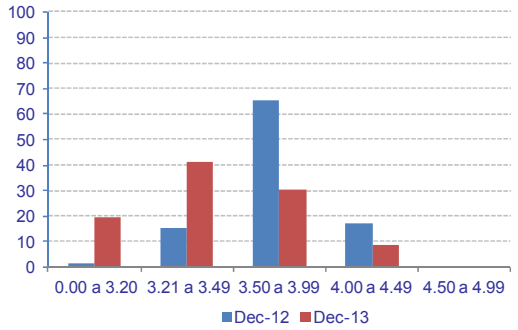
Arnoldo López Marmolejo
arnoldo.lopez@bbva.com

Pedro Uriz Borras
pedro.uriz2@bbva.com

Inflation with a 60% probability of coming in between 3.5 and 4.0% at the end of 2012

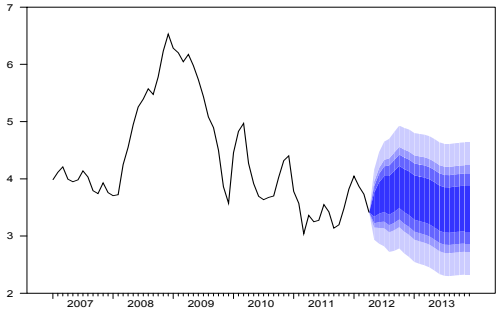
- Inflation expectations continue to slowly fall and remain below 4%.
- Market forecasts do not consider inflation will reach the Bank of Mexico target of 3% in 12 months, in line with the volatile cyclical nature of some determining factors. Nonetheless, the likelihood of coming in close to the target has increased.
- Inflation will most likely stay below 4% for the year. Taking into account BBVA Research's economic scenario, the probability of inflation coming in at the central bank's range target (3%+/-1%) at the end of 2012 is estimated at 80%. Meanwhile, there is a 20% likelihood of it coming in above 4%.
- For December 2013, the probability of inflation being below 4% is 90%. In this way, inflation is expected to maintain its path toward convergence with the central bank target.
- The probability of inflation coming in near 3% (between 2.9 and 3.2%) at the end of 2012 and 2013 is 2 and 20%, respectively, although there is a greater likelihood that it comes in higher rather than lower.

Chart a
Inflation range probability for December 2012 and 2013



Source: BBVA Research

Chart b
Annual inflation, fan chart (%)



Source: BBVA Research

Inflation expectations and uncertainty

In the last decade, Mexico has made notable advances in reducing inflation levels and volatility.[1] Despite this, several volatility factors have led to 12-month market forecasts for inflation[2] at times coming in both below and above the final level (chart 1), although with a common downward trend with less volatility between forecasts and recorded data. The performance of said forecasts suggests that the market continues to see an important uncertainty in future inflation performance and persistent low inflation levels.

Inflation forecasts, especially for 12 months ahead, have been persistent in recent years. Although in recent months they have come in slightly above the actual inflation level, just 3 years ago they increased slightly despite the fact that inflation saw a bounce to 6.5% for the year in December 2008. These differences are due to several factors with a highly volatile performance and which are difficult to predict for 12 months. This is linked to the intrinsic difficulty in mapping the intensity of the shocks in question on prices. These include the variation in the international prices for commodities, subject to climate or geopolitical factors, tax changes and an intense swing in the exchange rate.

The performance of said forecasts suggests that the market sees the outlook for inflation maintaining an important level of uncertainty. In order to quantify the uncertainty on price changes, the likelihood of different inflation ranges is estimated, i.e. uncertainty is limited in relation to the performance of certain determining factors on prices. These determining factors are identified in the inflation model set out in the Economic Watch "Inflation, influenced by slack in production factors". This analysis concludes that there seems to have been no recent structural change in the price setting process. Moreover, the exceptionally low performance of factors such as demand pressure is behind the moderate inflation rates.

An ordered *Probit* model to limit uncertainty

Once identified the relevant factors for the consumer price formation process in Mexico, an *ordered probit* model is identified and estimated. This qualitative option model assigns a probability that the dependent variable (inflation) falls within a specific range, in this case: from 0.00% to 3.20%, 3.21% to 3.49%, 3.50% to 3.99%, 4.00% to 4.49%, 4.50 to 4.99%, 5.00% to 6.00% and 6.01% and above.

The probability estimate is based on the BBVA Research economic scenario.[3] The results show that year-end inflation will remain between 3.5 and 4.0% with a 60% probability. Meanwhile, for December 2013, inflation could be between 3.0 and 3.5% with a very similar probability, albeit with a 30% bias of coming in between 3.5 and 4.0%. This is due to core inflation being between 3.2 and 3.5%, with a probability of around 70%. The bias for core inflation is balanced with 14% probability of coming in above 3.5% and below 3.2%.

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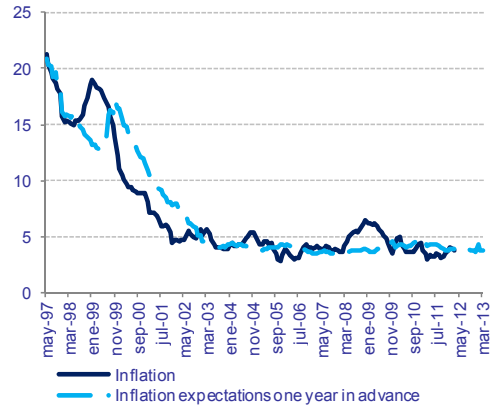
[1] For example, inflation went from 35% on average in 1996 to 3.4% on average in 2011, with a standard annual deviation going from 8.34 pp to 0.24 pp.

[2] The market forecast may be obtained from the survey on the expectations of economic specialists in the private sector, collected by Bank of Mexico.

[3] Commodity prices are taken to moderate slightly. In Mexico, the price of maize is especially important due to its weight in the consumer basket and the moderation comes in at 600 dollars per bushel, from 640 dollars where the price sat in February. The remainder of the economic scenario is as follows. GDP growth of 3.7% and 3.0% in 2012 and 2013, respectively, extended to salaries. Transport prices maintain a similar performance to the average recorded in 2009-2010 and the exchange rate strengthens gradually to hit 12.5 pesos per dollar in December 2013. In turn, the 12-month inflation forecast remains at the current level.

Chart 1

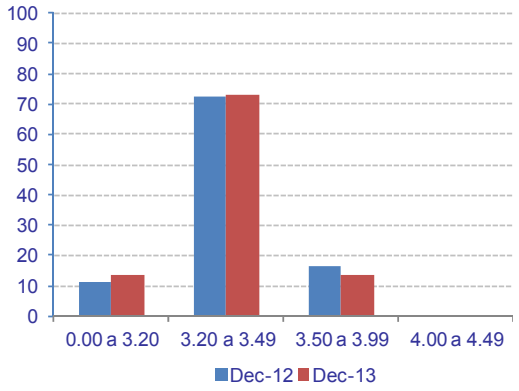
Recorded inflation and forecasts from 12 months previous (% change y/y)



Sources: BBVA Research and Banxico

Chart 2

Core inflation range probability for December 2012 and 2013



Source: BBVA Research.

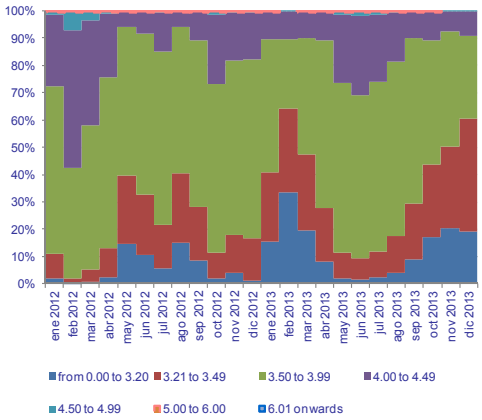
Chart 3 shows that as the months go by, the probability of inflation coming in between 3.0 and 3.5% increases, while the likelihood of it coming in between 3.5 and 4.0% decreases. Nevertheless, the possibility of hitting the latter range is not negligible with an average of 50% in 2013 and ending that year at 30%.

An alternative approach to forecast uncertainty

Given the BBVA Research economic scenario, the possible effects of forecast errors on inflation generated by volatile factors may also be seen in a fan chart. The estimate shows that inflation should spread to a moderate reduction, remaining between 3 and 4% in 2013; this last result, linked to the increased expected probability that inflation comes in between

Chart 3

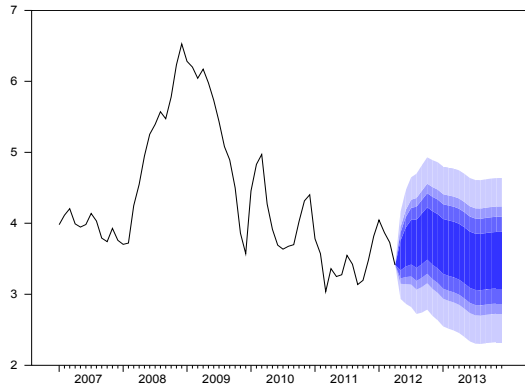
Inflation range probability by month for 2012 and 2013



Source: BBVA Research.

Chart 4

Annual inflation, fan chart (%)



Source: BBVA Research.

3.0 and 3.5% toward the end of 2013, suggest that inflation should see a trend toward convergence with the central bank's inflation target if moderate growth continues, there is a slight reduction in commodities prices, the exchange rate strengthens to the considered long-term level and there are stable inflation expectations. This performance is in line with stable monetary and

fiscal policy and more so in an especially uncertain global setting as at present. The fan chart is in line with probabilities estimated with the *probit* model. For example, both cases assign a probability above 50% to inflation in the 3.0 to 4.0% range in December 2013.

Appendix

The probability analysis in this document is based on an ordered probit model. The sample period comprises monthly data from January 1997 to February 2012. The equation is as follows:

$$PCPI_{,t} = \beta_1 \Delta\log(Salary_{,t}) + \beta_2 \Delta\log(Distribution\ prices_{,t}) + \beta_3 \Delta\log(Exchange\ rate_t) + \beta_4 \Delta\log(Maize\ price_t) + \beta_5 \Delta\log(Inflation\ expectation_t) + \beta_6 PCPI_{,t-1} + u_t$$

Where PCPI is a variable indicating the range where inflation in the period comes in, which is defined as:

$$PCPI_t = \begin{cases} 1 \text{ if } 3.20 \geq inflation_t \geq 0.00 \\ 2 \text{ if } 3.49 \geq inflation_t \geq 3.21 \\ 3 \text{ if } 3.99 \geq inflation_t \geq 3.50 \\ 4 \text{ if } 4.49 \geq inflation_t \geq 4.00 \\ 5 \text{ if } 4.99 \geq inflation_t \geq 4.50 \\ 6 \text{ if } 6.00 \geq inflation_t \geq 5.00 \\ 7 \text{ if } inflation_t \geq 6.01 \end{cases}$$

The determining factors used are those identified in Economic Watch "Inflation, influenced by slack in production factors" as the most relevant variables to explain Mexican inflation.

The estimate is made for differences of 12 months, as most of the series follow a unitary root process, and this transformation allows an estimate for a stationary process that yields consistent results. The multicollinearity test, called inflation variances factor, shows no problems of this kind between the explanatory variables. The same specification is applied to core inflation. The following table shows the results of the model's estimation for different specifications.

The estimates show that salaries, transport costs, the exchange rate and maize price are significant in aggregate inflation and have a positive sign. The maize price is significant for both total and core inflation. In addition, salary and the 12-month inflation forecast are important for core inflation. The high coefficient for the dependent variable lag shows that prices are highly persistent.

In order to assess the robustness of the results, the lag inflation level is used as an alternative to the variable lag which indicates the inflation range. The results are maintained with both specifications.

Table 1

Determining factors for total and core inflation ranges

	PCPI		Pcore	
Δ12log(Salary)	3.89	17.17*	36.27*	43.26*
	(8.53)	(5.41)	(18.07)	(10.91)
Δ12log(Exchange rate)	2.87*	2.77*	2.12	1.19
	(1.35)	(1.30)	(2.48)	(1.97)
Δ12log(Distribution prices)	12.39**	11.60*	-7.12	3.15
	(6.65)	(4.75)	(13.75)	(7.14)
Δ12log(12 months inflation expectations)	0.21	0.35	4.93*	4.59*
	(0.75)	(0.68)	(1.75)	(1.22)
Δ12log(Maize price)	0.93*	0.78**	2.34*	1.52*
	(0.43)	(0.42)	(0.79)	(0.69)
L.Δ12log(CPI)	313.70*			
	(29.99)			
L. PCPI		1.50*		
		(0.13)		
L.Δ12log(core)			1296.70*	
			(186.41)	
L. Pcore				3.51*
				(0.37)
Observations	179	200	179	200
R-squared	0.64	0.60	0.92	0.86

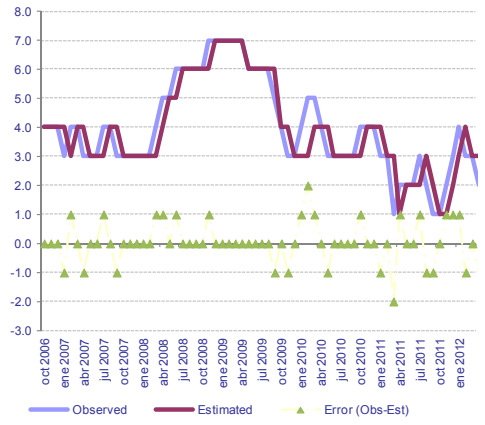
L. indicates a lag
Standard errors in parentheses
** p<0.10; * p<0.05
Sample: 1997:1-2012:2

Source: BBVA Research.

Charts 5 and 6 and table 2 show a good estimate adjustment. The charts show that when there are forecast errors, they are limited mostly to a single established inflation range level. Meanwhile, table 2 shows that the estimate correctly assigns the higher probability to the range where inflation actually came in 70% of the time.

Chart 5

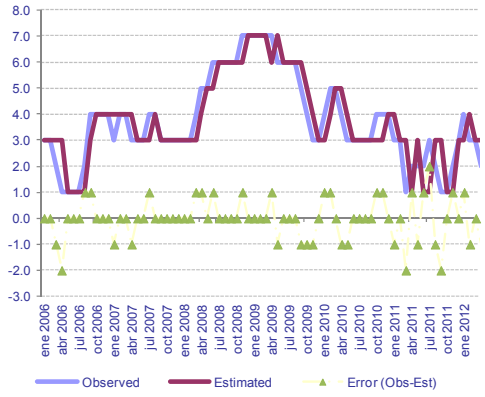
Model adjustment with qualitative variable lag and errors



Source: BBVA Research.

Chart 6

Model adjustment with annual inflation lag and errors



Source: BBVA Research.

Table 2
Comparison of Probit models accuracy

Range	Observations	Times inflation has come in at the highest probability range, %
from 0.00 to 3.20	9	56
3.21 to 3.49	8	0
3.50 to 3.99	30	68
4.00 to 4.49	31	58
4.5 to 4.99	19	39
5.01 to 6.00	25	76
6.01 onwards	49	95
Total	171	68

Source: BBVA Research.

References

López Marmolejo, Arnoldo and Uriz Borrás, Pedro (2011), "Inflation, influenced by slack in production factors", BBVA Research Economic Watch.

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