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Emerging Markets Strategy Highlight

Argentine GDP Warrants: Lagging the Rest of EM

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■ The warrants have been lagging the rest of the market lately

We attempt to analyze the relationship between overall EM spreads and the discount vs. theoretical value of the Argentine GDP linked warrants. As one would expect the correlation appears to be high, but recently the warrants have underperformed the overall market. As a result the warrants are in our view somewhat cheap relative to overall EM valuations.

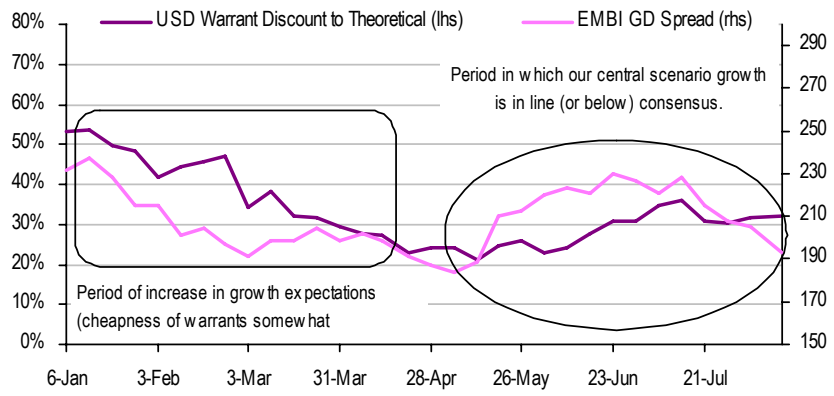
■ Risk factors

The Argentine GDP-linked warrants are complex securities that expose to several sources of risks. Some of these risks are unhedgeable, hence justifying that the warrants should trade at a discount to their theoretical value. We review the various sources of risk as well as the variables that investors should carefully consider when attempting to value the warrants.

■ Terms of the warrants

In a separate appendix we have summarized the key terms of the Argentine GDP-linked warrants.

Chart 1: Argentine GDP warrants have been lagging the rest of EM



Source: Bloomberg, UBS

All charts and analysis in this publication are based on the following indicative valuations as of August 14: USD Warrant: 9.42; EUR Warrant: 9.32; ARS Warrant (quoted in USD): 2.65; USD Warrant (issued under domestic law): 8.42.

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Theoretical values and market discount to theoretical

In the table below we present our central scenario theoretical values and compare them to current market prices. Market prices are considerably lower than theoretical prices, and particularly so for the non-ARS warrants. The main reason for a discount vs. the theoretical value is the complexity of these securities, and the fact that they require many assumptions, as the market itself provides little input – and hedges – for the valuation of these securities (more details on the challenges of valuing these warrants later).

Table 1: Current valuations vs. theoretical values

Warrant	Mid price	Theoretical value	Discount to theoretical value
ARS (in USD)	2.65%	3.4%	-21%
USD	9.43%	13.9%	-32%
EUR	9.33%	13.5%	-31%
USD domestic	8.33%	12.3%	-32%

Source: UBS

Evolution of the discount vs. theoretical value: GDP warrants have lagged and look somewhat cheap relative to overall EM valuations

We thought it was interesting to assess how the discount of market prices vs. theoretical values has evolved over time. We have calculated this discount for the USD warrant and the results of our exercise are in the chart on the front page, where we have also plotted the EMBI GD spread vs. Treasuries (weekly). Not surprisingly, the two series seem highly correlated[1]. However, it seems that in the recent strong EM rally (which also coincides with the period in which we feel that our discount to theoretical value calculations are more accurate, because the market consensus for near-term GDP growth has move to levels equal or higher than our GDP forecast) the GDP warrants have lagged, as the discount to theoretical value has remained stable while the EMBI GD spread has decreased by approx. 35 bps. In our view this makes the warrants somewhat cheap when compared to prevailing EM valuations. It is interesting to see the discount flat to increasing in the last few sessions when EMBI GD spreads have been decreasing steadily.

Little relative value among the warrants, except for the ARS one, which looks less attractive

As the table above shows, all the non-ARS warrants are trading at a very similar discount to theoretical of about 32%. Again, we think this is quite high a discount compared to current EM spreads. The same cannot be said for the ARS warrant, which trades at a discount of only 21%.

Long-term inflation expectations the likely cause for the ARS warrant expensiveness

In our view the reason for the expensiveness of the ARS warrant is the market implied long-term Argentine inflation expectations vs. our central scenario. We will discuss the importance and impact of inflation on this warrant later, but, in summary, if one used a long-term inflation expectation of 6% for the years 2012-35 (which is our central scenario), the ARS warrants would be only 21%

[1] In this exercise we have not changed over time the central GDP growth scenario. We have changed the discount curve (to be in line with bonds) and also the market value of the warrant has changed over time. As a result it is important to indicate when we believe the consensus 2006 GDP forecast has reached (or started exceeding) our central scenario (and we have indicated the relevant periods in the chart itself), as for the periods in which expectations were below our scenario, the discount to theoretical value that we have calculated overstimates the cheapness of the warrant at that time. However such change in expectations only affects the next 1-2 years of payout, as long-term growth expectations have not changed, in our view.

cheap to theoretical, which we believe is unattractive. We have calculated that the long-term inflation rate would have to be approx. 3.7% for the ARS warrant to trade at the same discount as the USD and EUR warrants, which we believe as an inflation scenario is too low.

ARS warrant could provide interesting Argentine inflation hedge, but at this level it is not attractive

In our view the expensiveness of the ARS warrant takes away one of the most interesting aspects of these securities. In a domestic ARS fixed income market dominated by inflation-linked bonds, and with inflation appearing to slow down also thanks to price agreements between the government and various sectors of the economy, the market overall is exposed to a larger than expected reduction in the inflation rate. In theory, being long the ARS warrant and short the USD warrant would provide a hedge against a reduction in inflation. But with the warrant already pricing in a low implied inflation rate (3.7% in our estimates) the hedge does not seem that helpful.

Valuation Model and Risk Factors

When valuing the warrants we use a Monte Carlo process that requires taking into account several variables and their interactions. The most important of these variables are:

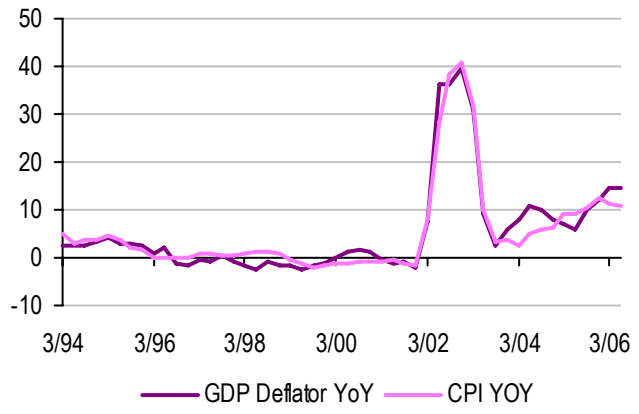
(1) **Future GDP growth**. This is the most important parameter, as the payout of the warrant is directly linked to the real GDP performance. Our central scenario for growth is to use our economic forecasts for 2006 and 2007 (7.3% and 4.2%) with growth slowing to our central 3% scenario by 2010. We have assumed a standard deviation of 3% for GDP growth.

(2) **The exchange rate.** The payout of the warrant is determined in Argentine pesos and translated into other currencies (USD and EUR) at the average FX rate prevailing in the last two weeks of the reference year. As a result, the performance of the peso vs. the USD and EUR – <u>and particularly during those two key weeks</u> – will have direct impact on the valuation of the USD- and EUR-denominated warrants. Given that the model requires us to analyze very long-term FX rates as well as Argentine inflation (see below), we have opted to analyze the ARS in real terms vs. the dollar. In our base-case scenario we have assumed a 22.5% real appreciation vs. the USD over the next five years, while the EUR moves in line with the forwards.

(3) **Argentine inflation.** This parameter is particularly important for the ARS-denominated warrant. While the warrants payout is driven by *real* GDP, the fact that the maximum payout is capped at 48% of notional introduces a *nominal* constraint. In our view a very high ARS inflation would not materially increase the value of the USD and EUR warrant cap, because in such case, given our central RER scenario, the ARS would depreciate vs. USD and EUR, hence making the payments in USD and EUR smaller (and the value of the cap roughly unchanged). However, in case of the ARS warrant, inflation, if associated with

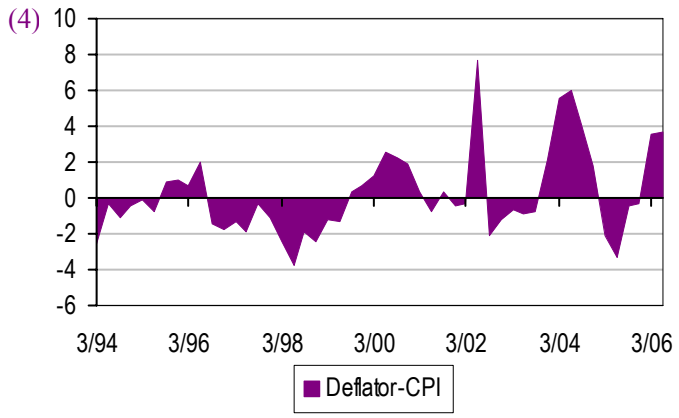
enough GDP growth, would make the peso payments very high and the value of the cap substantially higher. We also point out that the measure of inflation used to translate the "excess GDP" (see appendix) into an actual peso payment is the GDP deflator (and not the CPI). While over the long-run these measures of inflation tend to be very close, in the short-run large deviations may occur. Currently, the GDP deflator is considerably higher than CPI (see charts below).

Chart 2: GDP deflator and CPI similar on average over the long-run . . .



Source: Bloomberg

Chart 3: . . but deflator currently considerably higher than CPI



Source: Bloomberg, UBS

(5) **Discounting rates.** These are the rates at which we discount future expected payments. We estimate these rates based on the existing Argentine bonds. We estimate a par curve that is in line with liquid Argentine bonds (we have used a curve calibrated to USD Discounts and EUR Discounts for the USD and EUR warrants; for the domestic USD warrant we have used a par curve in line with Boden 12s; for the ARS warrant we have used the domestic inflation-linked curve and our inflation scenario to determine the ARS nominal curve). The higher the discount rates, the lower the theoretical value of the warrant.

(6) **The cap.** As mentioned earlier the warrant payout is capped at 48% of notional. This cap is quite valuable, and particularly so for the ARS warrants.

Central Scenario and Sensitivities to Key Parameters

Below we discuss the inputs we have used for our basic model, which are a mix of the UBS economics forecasts for 2006-07, followed by a short transition period of 2-3 years towards long-term assumptions that we believe are reasonable. In order to determine the EURARS rate we have used the EUR FX forwards and the USDARS rate shown in the table.

Table 2: Assumptions for the central scenario

	Real GDP growth	GDP deflator	US CPI	ARS RER vs. USD (% appreciation)	USDARS
2006	7.30	15.80	3.60	5.94	3.10
2007	4.20	14.50	2.60	4.81	3.25
2008	3.75	13.00	2.57	4.70	3.37
2009	3.36	9.00	2.53	4.70	3.41
2010	3.00	5.75	2.50	4.70	3.39
2011	3.00	5.00	2.50	0.00	3.50
2012-35	3.00	6.00	2.50	0.00	As implied by RER, GDP deflator, and US CPI

Source: UBS

Simple vs. complex model. We have used two models in order to assess the importance of the various parameters: A simple model – which follows the above central scenario, and which runs the Monte Carlo process only for GDP (using a 3% standard deviation) – and a more complex model in which also the RER, the GDP deflator, and the EURUSD exchange rates are subject to volatility and are correlated among themselves. We have found that, in terms of theoretical valuations, the two models return similar values as long as we keep some key common assumptions (such as the path of the RER in 2006-10). If we remove those key assumptions (which give the model a bias) we find that the complex model would return theoretical values that are approx. 10% lower than the simple model.

- **Sensitivity to GDP growth and discount curves.** Below we show grids for the sensitivity of each warrant to changes in the long-term GDP growth rate and in the discounting curve. The tables clearly show how material the long-term GDP growth assumption is for the valuation of the warrants. Moving the assumed growth rate to 2.5% removes a very large part of the central scenario theoretical value (which would then become only marginally higher than current market values).

Chart 4: Sensitivities to long-term GDP growth assumption and discount factor

USD Warrant Theoretical Value

Long-term GDP	Shift in Discount curve 1.0%	0.5%	0.0%	-0.5%	-1.0%
2.0%	6.91%	7.10%	7.31%	7.53%	7.77%
2.5%	9.40%	9.77%	10.16%	10.58%	11.02%
3.0%	12.67%	13.25%	13.87%	14.54%	15.27%
3.5%	15.54%	16.27%	17.05%	17.90%	18.80%
4.0%	17.72%	18.52%	19.38%	20.29%	21.26%

EUR Warrant Theoretical Value

Long-term GDP	Shift in Discount curve 1.0%	0.5%	0.0%	-0.5%	-1.0%
2.0%	6.69%	6.87%	7.07%	7.27%	7.49%
2.5%	9.03%	9.38%	9.74%	10.14%	10.56%
3.0%	12.28%	12.85%	13.46%	14.11%	14.82%
3.5%	15.30%	16.05%	16.84%	17.70%	18.62%
4.0%	17.66%	18.49%	19.37%	20.32%	21.33%

USD Domestic Warrant Theoretical Value

Long-term GDP	Shift in Discount curve 1.0%	0.5%	0.0%	-0.5%	-1.0%
2.0%	6.49%	6.66%	6.84%	7.03%	7.23%
2.5%	8.57%	8.88%	9.20%	9.55%	9.92%
3.0%	11.31%	11.78%	12.29%	12.84%	13.43%
3.5%	13.80%	14.41%	15.06%	15.75%	16.49%
4.0%	15.81%	16.49%	17.21%	17.98%	18.79%

ARS Warrant Theoretical Value (in USD)

Long-term GDP	Shift in Discount curve 1.0%	0.5%	0.0%	-0.5%	-1.0%
2.0%	1.94%	1.99%	2.04%	2.09%	2.15%
2.5%	2.49%	2.57%	2.65%	2.74%	2.83%
3.0%	3.13%	3.24%	3.36%	3.49%	3.63%
3.5%	3.68%	3.82%	3.97%	4.12%	4.29%
4.0%	4.15%	4.30%	4.46%	4.63%	4.80%

Source: UBS

- **Durations**. From the above exercise we can also estimate the durations of the theoretical values, which are as follows:
  - USD warrant: 9.3
  - EUR warrant: 9.4
  - USD domestic warrant: 8.6
  - ARS warrant: 7.4
- **Sensitivity to the FX rate.** The non-ARS denominated warrants are exposed to FX risk, as their payout is based on an ARS variable (the performance of GDP) but converted in the currency of denomination at the market rate at the end of the year. We have estimated that a 1% depreciation (in nominal term) of the peso across all maturities (both spot and future) vs. the USD and the EUR – and keeping everything else constant – would cause a decrease in the value of the USD and EUR warrant of approx. 0.5% (not in absolute terms, but as a percentage of the central scenario theoretical value). If the payout of the warrant were uncapped, a certain change in FX would translate in the same percentage change in the warrant theoretical value. But the cap decreases the sensitivity to FX changes, and it also makes it non-linear.
- **Sensitivity to the GDP deflator.** In our simple version of the model, which assumes a constant US CPI and a given ARS RER vs. USD path, changes in the deflator do not have an impact on the USD and EUR warrants. However, they have a material impact on the ARS warrant. We have estimated that decreasing our long-term deflator scenario by 1% (from 6% to 5%) increases

the theoretical value of the ARS warrant by 8%. Again, this sensitivity is due to the 48% cap (which is "nominal", and not "real").

- **Value of the cap.** The table below shows our estimates for the central scenario theoretical value with and without the cap. As it can be seen, the cap detracts substantial value, and particularly so in the ARS warrant.

Table 3: Impact of the cap on warrants theoretical values

Warrant	Capped	Uncapped	Difference	% Difference
ARS (in USD)	3.36%	4.46%	1.09%	32%
USD	13.87%	16.77%	2.90%	21%
EUR	13.46%	15.24%	1.78%	13%
USD domestic	12.29%	14.34%	2.04%	17%

Source: UBS

Appendix: Terms of the Warrants

The Argentine GDP-linked warrants were issued as part of the 2005 external debt restructuring. Below we list some of the key details.

Amount outstanding. The GDP-linked securities have a notional amount equal to the corresponding defaulted debt tendered and accepted in the 2005 restructuring, converted to the corresponding currency using the exchange rate as of December 31, 2003. The amounts outstanding for each of the four main GDP-linked securities are:

- ARS 88,004 mm
- USD (external) 14,476 mm
- USD (domestic) 2,925 mm
- EUR 11,864 mm

Conditions for payment. The payments on the GDP-linked securities are contingent upon the performance of Argentina's GDP and take place only if the following three conditions are met:

(a) Actual real GDP exceeds the Base case GDP for each reference year

(b) Annual growth in actual real GDP is higher than the growth rate in the base case GDP

(c) Total payments made on the security do not exceed the payment cap of 48% of the notional amount during the life of the security.

where, the Base case GDP and its rate of growth for each year between 2005 and 2034 are defined as follows:

Year	GDP	Growth	Year	GDP	Growth	Year	GDP	Growth
2005	287.0	4.3%	2015	395.6	3.0%	2025	531.6	3.0%
2006	297.2	3.6%	2016	407.4	3.0%	2026	547.5	3.0%
2007	307.4	3.4%	2017	419.6	3.0%	2027	564.0	3.0%
2008	317.5	3.3%	2018	432.2	3.0%	2028	580.9	3.0%
2009	328.0	3.3%	2019	445.2	3.0%	2029	598.3	3.0%
2010	338.7	3.3%	2020	458.6	3.0%	2030	616.3	3.0%
2011	349.7	3.3%	2021	472.3	3.0%	2031	634.7	3.0%
2012	361.1	3.3%	2022	486.5	3.0%	2032	653.8	3.0%
2013	372.8	3.2%	2023	501.1	3.0%	2033	673.4	3.0%
2014	384.0	3.0%	2024	516.1	3.0%	2034	693.6	3.0%

Source: Prospectus Supplement dated January 10, 2005, Bloomberg, UBS

and Actual real GDP is the total gross domestic product in constant prices for each calendar year as published by the official statistical agency, INDEC.

Payment amount. On the payment date, holders of the securities are entitled to receive payments calculated as follows:

> Payment = 0.05 x Excess GDP x unit of currency coefficient x aggregate notional amount of securities held

where, Excess GDP is the amount by which actual real GDP converted into nominal GDP using the GDP deflator exceeds the base case nominal GDP and is expressed in billons, and the Unit of currency coefficient is defined as follows:

Currency	Unit of currency coefficient
U.S. Dollars	1/81.8 = 0.012225
Euro	1/81.8 x (1/0.7945) = 0.015387
Pesos	1/81.8 x (1/2.91750) = 0.004190

Source: Prospectus Supplement dated January 10, 2005

representing the proportion that each security with a notional amount of one unit of currency bears to the aggregate eligible amount outstanding as of the date of the prospectus (around US$81.8 billion), calculated using the exchange rates in effects as of December 31, 2003.

Payments in each currency. The payment will take place in the currency of denomination of the warrant, either US dollars, euro, or pesos, and will be converted using the average free market exchange rate during the 15 calendar days preceding December 31st of the reference year.

Payment dates. The payment amount will be calculated on November 1 of each year following the reference year and will take place on December 15 of the year following the reference year.

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* Europe - iBoxx NonSovereign € and NonGilt £ universe measured on a curve-adjusted, excess return basis

Source: UBS

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