



**Inter-American Development Bank  
Office of the Chief Economist  
Working Paper Green Series #347**

**Capital Requirements for Latin American Banks in Relation to their Market Risks:  
The Relevance of the Basle 1996 Amendment to Latin America**

by

Andrew Powell and Verónica Balzarotti  
Central Bank of Argentina

Tel: 54-1-348-3612 Fax: 54-1-348-3662

email: [APOWELL@BCRA.GOV.AR](mailto:APOWELL@BCRA.GOV.AR)

This paper was largely written whilst the first author was a visitor in the Office of the Chief Economist, Inter-American Development Bank, Washington DC. The authors would like to thank all the staff of the IDB that gave assistance to this work. The first author would also like to acknowledge support from the UK Economic and Social Research Council's, Global Economic Institutions Research Initiative. The contents of the paper draw on work completed in the Central Bank of Argentina area of Economía y Finanzas. Special thanks are due to Gabriel Lopetegui for his work in this area. We would also like to thank Miguel Kiguel, Astrid Dick and Liliana Schumacher in particular for their valuable contributions. All mistakes however remain those of the authors. The views expressed in this paper are those of the authors and do not necessarily represent the views of the President nor the Directors of the Central Bank.

© 1997

Inter-American Development Bank  
1300 New York Avenue, N.W.  
Washington, D.C. 20577

The views and interpretations in this document are those of the authors and should not be attributed to the Inter-American Development Bank, or to any individual acting on its behalf.

## Summary

Banks' market or 'trading' risks have increased noticeably over the past years, largely as a result of the growth of liquid assets on banks' balance sheets and the increase in banks' off-balance sheet activities. Well-publicized bank failures and significant capital losses have focussed further attention on these developments. In January 1996, the Basle Committee recommended the imposition of capital charges related to banks' trading risks, and the European Community's Capital Adequacy Directive (CAD) came into force on January 1st, adopting, in part, the Basle Amendment. The G10 countries are committed to full implementation of these recommendations by the end of 1997.

This paper reviews the main features of the Basle Amendment, which allows banks a choice between a 'standardized methodology' and the use of their own internal models, subject to the authorization of the relevant supervisor and a set of parameter values. The relevance of this regulation for Latin America is analysed in the light of the region's characteristics. We suggest that these characteristics increase rather than diminish the importance of the implementation of market risk capital requirements in Latin America.

We advocate the use of a standardized approach in the region to avoid the complexities of the model-approval process and monitoring problems, and considering that the assumptions behind those models are more likely to be invalid in Latin America. We also suggest some adaptation to the Basle recommendations, including the use of time-varying risk weights instead of fixed weights, to take into account the changes in volatilities over time and the differences across Latin American countries. These weights may be calculated on the basis of a simple Value-at-Risk formula, while the determination of bands for offsetting as well as the extent of offsetting may be determined by means of simulation exercises. For derivatives, we suggest the use of the 'delta-plus' method (one of the possible methodologies allowed in Basle).

Besides the build-up of a safe capital cushion, this regulation will also provide incentives to improve banks' risk management systems. This may be particularly important in Latin America, where many banks will have to improve their information and risk management systems to ensure compliance. Further strong implications for Latin America are analysed, including the qualitative standards that banks should fulfil and the upgrading, on the part of supervisors, of their information systems and staff-skills. We suggest that supervisors should carefully consider the creation of separate specialized units of supervision for these regulations.

## 1. Introduction and Motivation

A bank's market risk is the risk of loss stemming from its positions, both on- and off-balance sheet, as a result of movements in market prices. Market risk has attracted much attention from bank regulators as it is generally agreed that banks' market or 'trading' risks have increased markedly over the past years. The two main factors leading to this increase are the growth of liquid assets on banks' balance sheets and the increase in banks' off-balance sheet activities. Moreover, widely publicized banks failures and significant capital losses over the past few years have provided further motivation for the representatives of the Basle countries to introduce capital charges on market risks in order to strengthen the soundness of banking systems.

In January 1996, the Basle Committee on Banking Supervision published an Amendment to the (1988 Basle) Capital Accord to Incorporate Market Risks in the capital requirements for banks<sup>1</sup>. The G10 group of countries are committed to implement these recommendations by the end of 1997. Furthermore, on January 1st 1996, the European Community's Capital Adequacy Directive (CAD) came into force. This specifically includes capital requirements for European banks in relation to their market or trading risks although it does not include all of the recommendations of the Basle Amendment. The US authorities are currently seeking comment on its proposed changes to the capital requirements regime also based on the Basle Amendment.

These recommendations and regulations have had a long and complex gestation period. Indeed, some claim that, in this area, regulations are particularly difficult to impose and to control. Nevertheless, they represent the culmination of a great deal of thought, both on the part of bank regulators and their regulatees in many countries and represent a significant step in the attempt to obtain a full picture of the true risks faced by banks and hence by their depositors, other creditors and any relevant insurance agencies.

In Latin America, many countries of the region have implemented the main recommendations of the Basle 1988 Accord. Bolivia, Brazil, Costa Rica, Guatemala, Honduras, Paraguay, Peru<sup>2</sup>, Uruguay and Venezuela have all adopted the 8% 'basic capital/assets at risk' requirement whereas Argentina, Colombia, Ecuador and El Salvador have adopted Basle-type regulations but with a higher requirement of up to 11.5% for Argentina (the maximum). Cuba, Chile, Panama and the Dominican Republic retain different rules. Indeed, there remains considerable debate whether the proposals set out in Basle by representatives of the G10 countries are appropriate for Latin America and if so whether they can be simply transferred wholesale or whether considerable adaptation is required to 'fit' local conditions<sup>3</sup>. This debate will probably be even more pronounced with respect to the 1996 Amendment on Market Risks. In the region, Argentina and Mexico have recently issued regulations for market risk capital requirements to be effective from September 1st 1996<sup>4</sup>.

### Adoption of Basle 1988 Accord in Latin America

- Countries with Alternative Rules:
  - Cuba
  - Dominican Republic
  - Panama
- Countries Adopting Basle 1988 Accord with Capital/Assets at Risk 8%
  - Brazil
  - Costa Rica
  - Guatemala
  - Honduras
  - Paraguay
  - Perú \*
  - Uruguay
  - Venezuela

---

1

See Basle (1996a, 1996b).

2

In Peru assets at risk are greater due to different asset classes.

3

See Kane (1994).

4

See BCRA (1996) and Secretaría de Hacienda y Crédito Público (1996).

- \* Assets at Risk greater due to different asset classes.
- Countries Adopting Basle 1988 Accord with Capital/Assets at Risk > 8%
  - Colombia
  - Ecuador
  - El Salvador

The object of this paper is then to review the main features of the Basle 1996 Amendment and to consider whether it is indeed relevant for Latin America. Our general conclusion is that these regulations are at least as important in Latin America as in G10 countries, albeit for somewhat different reasons. However, it is also our conclusion that considerable adaptation is required. In particular we suggest that, at least currently, the standardized approach, as adopted in the European CAD, may be more appropriate than the use of banks' own models for regulatory purposes, as admitted in Basle. Nevertheless, it is recognized that incentives should also be put in place to advance banks' own risk-management systems. However, even adopting the standardized approach requires considerable adaptation. In particular, Latin American bond and equity markets have quite different characteristics to those in G10 countries and this will in general call for alternative rules on the calculation of a safe capital cushion. How to mesh the general approach of Basle with the characteristics of Latin American risk is then the over-riding theme of the paper.

The paper is organized as follows. In section 2, we discuss the international approach to the assessment of capital requirements for banks in relation to their trading risks focusing on Basle and the European Capital Adequacy Directive. In section 3, we consider the characteristics of Latin American financial markets and Latin banks that might influence how these regulations may need to be adapted for the Latin American environment. Section 4 is devoted specifically to the topic of derivatives and other off-balance sheet items. The different approaches for these more complex instruments are outlined and the pros and cons of each approach are weighed-up, again with reference made to the Latin American context. In section 5, we make some preliminary observations on what these types of regulations imply for Latin American banks and their supervisors. Section 6 concludes.

## 2. The International Approach

### 2.1 Motivation

There are potentially several different ways to analyse a bank balance sheet. One useful categorization of assets and liabilities is based on whether they are traded in a liquid market and hence have a transparent market valuation or not. This categorization might also be thought of as splitting banks' assets and liabilities into those that are in a 'trading book' in contrast to those which are in the 'banking book' which contains the traditional, non-standardized and (hence) non-traded loan portfolio<sup>5</sup>. There is widespread agreement that, whatever the definition of banks' trading risks in G10 countries, these risks are both an important part of banks' total risks and that they have increased over recent years. The central motivation for the 1996 Amendment of the Basle Accord was then to attempt to gain a more accurate picture of the full spectrum of risks (including off-balance sheet risks) taken by banks by including the risks stemming from banks' trading operations<sup>6</sup>.

The perceived increase in banks' trading risks has occurred for at least two related reasons. First, the percentage of liquid assets on banks' balance sheets has grown. This is in part a result of the increase in 'securitization' as companies have found liquid liabilities, such as equities and bonds, more attractive forms for financing over traditional bank lending. Please refer to Table 1 to illustrate

---

5

However, this definition is not without its problems; it might be argued for example that liquid assets held for 'investment purposes' (i.e.: for a minimum time period or until maturity) and yet which have a liquid secondary market should be placed in the traditional banking book. Further complications arise with respect to off-balance sheet items. It might seem obvious that options, swaps and other derivatives, which have valuations contingent on the movement of transparent prices or indices, should be placed in the 'trading book' but if the motive for such contracts is to hedge, say, an interest rate exposure in the banking book then there is again an argument that these too should be placed in the banking book.

6

See Jackson (1995) for an overview.

this trend in the US and in the UK where this development is particularly, although not exclusively, apparent. The second reason is the increase in banks' activities in off-balance sheet instruments, especially derivative operations. In particular, the growth in the swaps market in both currencies and interest rate products has been very significant indeed in the last 10-15 years and many of the major players in these markets are banking institutions (Again see Table 1 for illustrative statistics).

**Table 1**

<b>U.S. Commercial Banks - Whole Industry</b>			
As a percentage of Gross Total Assets	1980	1990	1994
Assets in Trading Accounts	0.5	1.4	4.8
Derivatives*		199.5	392.3

<b>U.S. Commercial Banks - Organizations with greater than \$100bn in total assets</b>			
As a percentage of Gross Total Assets	1980	1990	1994
Assets in Trading Accounts	1.4	2.1	13.2
Derivatives*		595.0	1145.2

*Source:* Consolidated Report of Condition and Income for Banks

<b>OTC Derivatives - Active UK Banks</b>						
	1993		1994		1995	
	H1	H2	H1	H2	H1	H2
As a percentage of Total Assets						
Int. rate & FX related contracts*	380.0	450.4	551.3	570.7	620.5	609.7

*Source:* Bank of England Quarterly Bulletin

\* Notional values

## **2.2 The Standardized Approach Against Banks' Own Models**

Much of the discussion on the market risks amendment to Basle focussed on whether banks would be allowed to use their own internal models to assess their trading risks. An earlier proposal of the Amendment, in 1993, contemplated only the use of a standardized or so-called building block approach whereas the revised 1995 and 1996 versions incorporated the requests of banks to allow the use of their own internal risk-management models for regulatory purposes subject to authorization by the relevant regulator.

A set of influential banking institutions, mostly US-based and concentrated in the investment banking business, argued that they should be allowed to use their own internal models to assess their trading risks. Their argument might be put as follows; investment banks are expert in the field of investment banking including the trading in highly liquid assets and complex derivative trading and they have invested heavily in human capital, in hardware and software systems and in data, which hence allows them to estimate such risks accurately. Moreover, it must be the case that they themselves know best how such trades function and what risks are being run rather than a regulator with, perhaps, a less accurate methodology and with imperfect information on banks' real-time trading positions. Hence, the risk-managers of the banks

themselves are the natural controllers of the risk truly facing these firms and they should be able to use whatever advanced systems banks might employ to calculate a safe level of capital in relation to their trading operations.

On the other hand, at least until such times when these firms are not covered by deposit- insurance schemes nor expect to gain access to the relevant authority's discount window nor present any dangers to financial systems more generally, it is to be expected that regulators will wish to remain comfortable that they also understand the nature of risks faced by such banks and that these banks maintain a safe cushion of capital in the case of any negative shocks arising. Given the existence of these, or other externalities, there will tend to be incentives for banks to take on more risks, relative to their capital base, than regulators may wish, and hence regulations will remain desirable in this area and will require monitoring.

This trade-off is reflected in the international approach by allowing banks a choice. They may either comply with the so-called standardized methodology or they may employ their own internal models but subject to an authorization procedure and a set of parameter values<sup>7</sup>. Note that to date, even in the European regulations (CAD 1996), the use of internal models is not admitted and that therefore no bank has yet had its full internal model authorized for regulatory purposes.

We argue below (section 3), that the trade-off in Latin America is different and that in particular there is less to be gained (and perhaps more to be lost), by regulators allowing the use of internal models currently. Hence our focus in this section will be on the standardized approach.

### **2.3 The Standardized Approach**

The standardized approach attempts to provide a reasonable and, it might be argued, over-conservative estimate of banks' general market risks by assessing the risk in four categories of assets in the trading book separately (interest rate, equity, commodity and currency risks) and then summing with no offsetting of positions of opposite sign<sup>8</sup>. Moreover, the resultant capital charge for general market risk is subsequently added to the so-called specific risk charge (which is analogous to the counterparty charge in the Basle 1988 Accord) to yield an overall capital requirement. The reason that this might well result in an over-conservative capital charge is that it does not take into account the possibility of low correlations between these different types of risks.

Broadly speaking, the Basle proposals advocate the use of a methodology of risk analysis that has been largely adopted by banks in their in-house models, namely Value-at-Risk (VaR) analysis. This type of calculation computes the possible loss on a portfolio over a specified time period, with a given level of risk tolerance and according to the volatility of the corresponding asset(s) (we expand on VaR analysis in section 3 below). In the case of internal own models, the authorization procedure mentioned above demands a specified set of standards within a framework of daily Value-at-Risk computation. The standardized approach is a simplified methodology (based on the application of pre-set weights), but whose starting point is also based on Value-at-Risk analysis.

We now consider the international approach for each of the asset classes mentioned.

#### **2.3.1 Interest Rate Risk**

The Basle 1996 Amendment splits interest rate risk into general market risk and specific risk. The specific risk component is designed to protect against an adverse price movement due to factors related to an individual issuer. It is analogous to the standard Basle

---

7

The most important parameter in the own models approach is the so-called multiplication factor. The current recommendation is that this should be set at 3 which, roughly speaking, implies that banks must maintain a capital cushion three times greater than that given by their own daily Value-at-Risk calculation. See below for a definition of Value-at-Risk.

8

These four categories are in turn divided according to currency or market (US dollar bonds, bonds in Japanese yen, equities in Germany, equities in France, etc.) and, again, no offsetting is allowed among these groups.

counterparty/credit risk charge in the 1988 Accord. It is graduated into five categories from 0% for government bonds to 8% for non-qualifying bonds (typically non-investment grade corporate traded debt)<sup>9</sup>.

For general interest rate risk there are two alternatives within the standardized approach, (i) the maturity method and (ii) the duration method where the former is in some sense a simpler version of the latter. In the former method, positions in interest rate sensitive instruments are slotted into a maturity ladder comprising 13 time bands. Each time band within the ladder has an associated risk weight depending on the maturity and the coupon of each debt instrument (the longer the maturity and the lower the coupon then the higher the value of the risk weight). For floating bonds the recommendation is that the relevant maturity is the time to the next repricing date.

The capital requirement calculation consists of a number of steps. First, the overall net weighted position attracts a capital charge of 100%. Second, the sum of all the weighted long positions and the sum of all the weighted short positions in each time-band is calculated and a capital charge of 10% is levied on the smaller of each of the offsetting positions in each time-band irrespective of whether it is short or long. This is an attempt to protect against basis risk between different assets within each time-band and is known as the 'vertical disallowance'. In addition banks are able to offset positions in different time-bands. For example, if a bank has a long position in a 12 month bond and a short position in a 2 year bond these can also be offset. This is referred to as a 'horizontal offset' but again the offsetting allowed is not 100% but subject to a 'horizontal disallowance'. Indeed, banks will be allowed to undertake two rounds of horizontal offsetting (between adjacent zones and between non-adjacent zones) with different scales of 'horizontal disallowances'.

Under the duration method, banks may calculate a more accurate measure of the price risk of each of their interest rate sensitive assets. This involves multiplying an assumed change in yield (set in the recommendations for each duration band) by a calculated duration for each instrument held. In each time band the long and short positions are then calculated and subjected to a 5% 'vertical disallowance'. Then horizontal offsetting is allowed in similar fashion to the maturity method as described above subject to a similar set of disallowances.

Interest rate derivatives such as futures, forwards, forward rate agreements and swaps can also be treated in the maturity or duration method. The idea here is that these derivatives can be converted into positions in the relevant underlying assets. Hence a swap position can be converted into long and short positions in the relevant fixed and floating bonds etc. The equivalent underlying assets can then be slotted into the maturity or duration approaches as described above and a capital charge calculated. Options on interest rate derivatives are rather more complex and there are a variety of different potential treatments contemplated within the Basle Amendment. We come back to options in section 4 below. In general derivatives are also subject to the same types of specific risk charges as for their underlying instruments. For example, a derivative on a government bond will not in general have a specific risk charge although a derivative on a corporate bond would have a specific risk charge. However, a derivative on a government bond might have a counterparty charge based on the risk of the writer of the option.

### **2.3.2 Equities**

The recommendations regarding capital requirements for equity risk are simpler than the interest rate risk rules in the 1996 Basle Amendment. In similar vein to interest rate risk, there is a specific risk charge and a general risk charge for market risks for equities. The basic specific charge recommended in Basle is 8% of the position in each stock unless the portfolio is both liquid and diversified. In this case, the charge may be reduced to 4%. Again, the specific risk charge can be thought of as analogous to the counterparty/credit risk charge in the Basle 1988 Accord. National authorities will have the power to decide what constitutes a liquid and diversified portfolio. The general market risk charge corresponds to the overall net position and must be calculated by market, i.e.: equities traded in the US, those traded in the UK, equities

---

9

Note that national authorities may apply a specific risk weight to securities issued by certain foreign governments.

traded in Japan, etc., and then summed. In other words the total net position in, say, equities traded in the US will attract an 8% capital requirement.

Positions in equity derivatives such as forwards, futures and straight swaps should be converted into notional positions in the underlying equities and capital charges levied as for those underlying positions as detailed above. There is an additional 2% capital charge for positions in an equity index (e.g.: a position in a futures contract on an index). The idea here is that the 2% charge should cover factors such as execution risk or basis risk if the bank is pursuing an arbitrage strategy of a long (short) position in the index (or index futures) and an opposing position in a basket of stocks. Equity options are considered in section 4. below.

### **2.3.3 Foreign Currency Risk**

The Basle Amendment for market risks on foreign currency exposure covers not only the so-called trading book of the bank but also the traditional 'banking book'. In other words interest on foreign currency loans that are subject to foreign currency risk (with respect to the banks home currency) are included as well as liquid assets in foreign currencies. Gold is also treated as a foreign currency for market risk purposes: the argument being that gold volatility is more similar to currency volatility than other commodities.

The exposure in each currency should be calculated (including the spot position and forward/futures positions) and then banks will have a choice as to whether to adopt a 'standardized' approach to deal with this set of currency risks or use an 'internal model'. The 'standardized' approach, sometimes also referred to as the 'shorthand' method, considers the sum of all of the long positions in different currencies and the sum of all the short positions in different currencies and then applies a capital charge of 8% to whichever is the larger. So, if there are long positions in Yen and French Francs to a total of 300 units of the home currency and short positions in Pounds sterling and German DM's for 200 units of the home currency, then the capital charge is 8% of 300. In addition, an 8% capital charge is made on the position in gold whatever the sign.

Note that, a bank which does not do excessive foreign currency business (where the greater of the sum of all the short positions and the sum of all the long positions does not exceed 100% of eligible capital and where its overall net open position in foreign currency does not exceed 2% of its eligible capital) may be exempted from these capital requirements.

### **2.3.4 Commodity Risk**

In this paper we will not deal in detail with commodity risk in banks' portfolios, suffice to say that the main standardized approach employs a maturity ladder in similar vein to that for interest-rate risk. Commodity positions are slotted into the maturity ladder depending on the maturity of the commodity position. Positions are then netted out along the maturity ladder with a capital charge applied to each net position at each stage. In addition to this maturity approach, banks may also elect to use their own internal models subject to authorization. There is also a simplified approach. The simplified approach states that the capital charge should be 15% of the net position in each commodity irrespective of the maturity of the positions (for example position in the physical commodity can be netted out with a position in a 1 year futures etc.). Note that, as for foreign currency risk, commodity risk applies throughout the banks' balance sheet not just for the 'trading book'.

## **3. Latin American Characteristics**

The relevance of Basle type capital requirements to Latin American must be analysed in relation to the stage of development of the region's capital markets. Latin American markets are characterized by higher volatilities, a reduced menu of products and, in some countries, restrictions on trading activities (regulations, taxes, etc.). In addition, not all markets are deep nor liquid. Nevertheless, we believe that these characteristics imply that the implementation of market risk capital requirements is more important and not less. Indeed, because volatility is higher and there have been many cases of banking problems, this kind of regulation should be welcomed by regulators and regulatees. On the other hand, economic and financial reform in many Latin American countries in the past few years have led firstly to stabilization and consequently to a surge in the region's debt and equity markets (in section 4. we expand on these and on the development of derivative markets). In addition, liberalization, privatization and internationalization have attracted a larger number of foreign investors to operate in Latin

American markets. Altogether, there are strong reasons to believe that the development of these markets will continue. Furthermore, as for the discussed regulation, we believe that the implementation of market risk capital charges may help reduce the perceived risk of regional financial systems. However, these rules cannot be transferred as they stand to Latin America but rather the pros and cons of the different approaches should be analysed in the light of Latin American characteristics.

In the above we have made reference to the debate between the standardized approach and the use of banks' own internal models. In the international approach, banks are presented with the two alternatives, this choice reflecting a compromise solution of the representatives of the regulatory authorities of the G10 group and the wishes of their constituents: the banks in the different G10 countries.

The advantage of a fully-fledged, internal model is that, provided its underlying assumptions are valid, it is capable of yielding more accurate measures of a banks' required, safe capital-cushion. The disadvantages of an internal model include the possibility that the assumptions may be invalid with a consequent loss of accuracy and, from the regulators' standpoint, the fact that once an internal model is authorized (a potentially difficult process in itself), it is extremely difficult to monitor and control.

Our hypothesis here is that this trade-off is different in Latin America than in the G10 countries. First, the typical assumptions that lie behind internal models are more likely to be invalid in the region (for example, the statistical assumptions on the distributions of returns). This implies that the benefit from increased accuracy may be severely curtailed. Secondly, given the likely constraints on human capital in the relevant regulatory authorities in Latin America, the difficulties in authorization, monitoring and control are likely to be even more pronounced. For these reasons it is our opinion that the benefits from allowing banks to use fully-fledged internal models for regulatory purposes is probably outweighed by the dangers and potential costs, and that, as in Europe, if Latin American countries wish to introduce capital requirements for market risks, and we think that they should, a standardized approach is the best option. In this section we concentrate on developing a standardized approach for Latin America.

### **3.1 General Comments on a Standardized Approach for Latin America**

There are two important characteristics of the parameters in this 'standardized view' (i) the parameters are constant across countries and (ii) the parameters are constant over time.

An advantage of a single set of rules across nations is that countries cannot seek enhanced competitiveness by relaxing regulatory requirements and hence allowing banks to expand their activities with a lower capital base sacrificing safety for competition. A disadvantage is that the rules may not 'fit' exactly each country's characteristics. As an example, consider the value of the risk weights in the standardized approach for interest rate risk. These risk weights are common across bonds in all the G10 countries even though the volatility of bond prices in the US may be very different to that in Japan or Italy.

Secondly, the parameters are constant across time. A disadvantage with this is that it is clear that volatilities and to some extent correlations are not constant across time and hence at 'risky' moments the capital cushion may be too low whereas at 'safe' times the regulated minimum capital cushion may be too high. However, although theoretically feasible, it would add considerable complexity to the regulations to have weights constant across countries but variable over time.

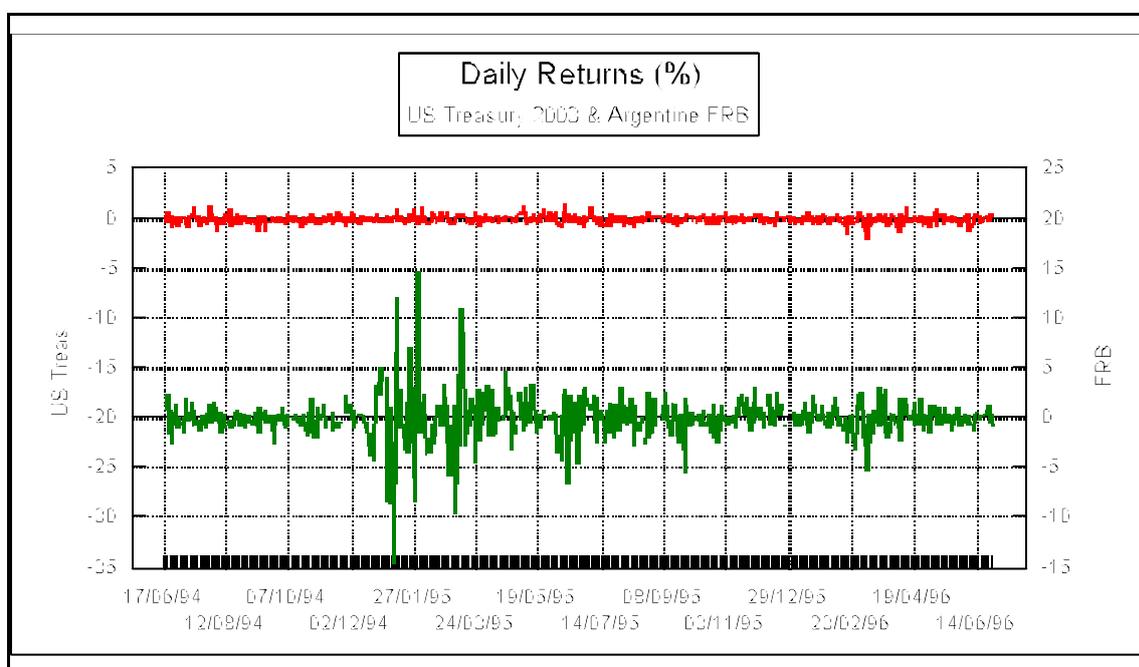
The defence of the standardized approach in the G10 countries is then that the importance of a standard set of rules across countries outweighs the disadvantage of the lack of 'fit' perhaps because it is felt that the differences between G10 countries are not too large in practice. The defence of having constant parameters across time is that the simplicity of this approach outweighs the cost in terms of a lack of accuracy regarding the necessary capital cushion. Again, there may be a view in G10 countries that changes in volatilities are not that large so the costs of inaccuracy are reduced. Nevertheless, it is clear that these concerns have been part of the debate in allowing banks to use their own internal models which naturally take these factors into account.

A number of questions then arise for Latin America. First, if Latin America adopts a standardized approach, should countries of the region adopt the Basle Amendment risk weights? We would suggest that the response to this question should be 'no' given the differences in the level of volatility between Latin American and G10 asset prices. As an illustration, Figure 1

plots daily returns for the Argentine FRB against daily price changes for the US 2003 Treasury Bond. In many countries in Latin America, a view was taken that the standard 8% requirement in Basle was not appropriate given perceived higher levels of counterparty risks and hence, as noted above, many countries adopted stricter standards. We would argue that a similar approach is also necessary for Market Risks.

If countries of the region do not adopt the Basle weights then a possible alternative would be to adopt a standardized Latin American system of risk weights. However, we would again suggest that, although there might be additional merit in this suggestion, especially if substantial cross-border banking relations exist, it would probably be best at the current time for Latin American countries not to standardize in this way. The justification here is that, even between countries in the region, differences in volatilities and differences in the structure of financial markets currently imply that standardization across the region would be difficult to impose and might not be very beneficial. Again, the trade-off in Latin America currently is different to that, say, in Europe. In Europe,

**Figure 1**



financial markets are considerably more integrated and of a more standard form and inter-country banking relations are substantially more developed. However, this is something that should be kept in mind, in particular as regional groups within Latin America (e.g.: Mercosur and the Andean Pact) become stronger.

A third question is whether the risk-weight parameters should be time-varying. Here, we suggest that the simplicity-insurance, trade-off may also be different for Latin America but in this case a more complex regulation may be justified for the region. In the G10 countries, volatility changes are not as severe as in Latin America and hence a simpler regulation might be justified. In Latin America, we would argue that the extra benefit from time-varying parameters justifies the added complexity. Again, Figure 1 illustrates just how severe changes in volatility can be for Latin American instruments versus their US counterparts. The period in the first half of the graph is the so-called Tequila period after the Mexican devaluation of December 1994.

### 3.2 Calculating Time-Varying Risk Weights

In this section we introduce a methodology which might provide a standardized approach for calculating time-varying risk-weights. This methodology relies on the theory which underlies the Basle Amendment and indeed which also underlies many of the internal models employed by banks. This theory is often referred to as the theory of Value-at-Risk (VaR).

The Value-at-Risk (VaR) of a position in an asset is defined as the maximum loss that might be suffered within a specified confidence limit over a given time period. In other words, if the VaR, with a 99% confidence limit, of an equity position is \$2 then this means that in only 1% of cases would you expect to lose more than \$2 from holding that risky position (or alternatively that there is only a 1% chance of losing more than \$2).

If we assume that an asset-price follows a random walk, then it is well-known that the distribution of the log of the price at any point in time will be normal and that the conditional variance of the asset price at time T given today's price,  $V(p_T | p_0)$ , increases in linear fashion over time. Indeed  $V(p_T | p_0) = T\sigma^2$  where  $\sigma^2$  is the daily variance of the asset price. It follows therefore that the Value-at-Risk of a position in a risky asset, expressed in terms of each dollar of the position, is given by:

$$\text{VaR} = K * T^{1/2} * \sigma$$

where K is a constant which depends on the statistical confidence limit, T is the holding period (in days) and  $\sigma$  is the daily price volatility<sup>10</sup>. This basic formula provides one method to develop time-varying risk-weights.

Note that if a 99% confidence limit is employed this implies that  $K=2.32$  (for normal distributions) and if  $T=10$  days (as suggested in the Basle approach if banks use their own internal models), then this implies that:

$$\text{VaR} = 7.336 * \sigma$$

The VaR then gives a capital charge such that the capital base would only be eroded 1% of times (assuming a 10 day holding period).

This methodology gives one way of calculating risk-weights which vary over time and which reflect changes in the volatility of the underlying asset. It is also a rule which might be adopted by different countries of the region. In other words, for standardization across the region, a country might adopt the standard statistical tolerance measure, K, and the holding period, T, rather than a fixed weight. Capital charges for market risk would then vary across countries to reflect differences in the volatility of the relevant asset prices but the methodology would be standardized.

This methodology requires an estimate of volatility for each asset price. An issue here is whether banks should calculate their own volatility estimates, perhaps based on a prescribed formula, or whether volatility estimates will be supplied by the authority. Argentina has adopted a mixed approach, with the Central Bank supplying volatilities for major Argentine assets and the banks calculating volatilities elsewhere.

### 3.3 Latin American Interest Rate Risks

We now turn to analyse the nature of Latin American interest-rate and equity risk (next sub-section) and how market risk regulations for Latin American banks might then be calculated on the basis of time varying risk-weights derived above. To understand the nature of the risk in holding a portfolio of Latin interest-rate sensitive assets, it is fundamental to understand the nature of Latin American yield curves and how they move over time. Unfortunately, Latin American yield curves tend to be more complex to analyse than, say, their US counterpart, which in turn, as is well known is not simple in itself.

As an illustration consider Figures 2 and 3, which illustrate the US yield curve and the Argentine "yield curve". Note that the US yield curve is relatively well-defined, in part because the instruments are relatively homogenous. However, the Argentine yield curve consists of a set of rather heterogeneous assets and as such does not appear particularly well-defined. One of the interesting characteristics about Latin yield curves, and Argentina is no exception, is that Government paper is not considered homogenous with respect to credit risks. In other words there is a clear view as to the seniority of the claims on Government resources, either implicit or explicit, and this appears to make a considerable difference to the pricing in the market. For example, in Argentina, the Bonex issues (Bonex 87, 89, Global 1 and Global 2) appear to have a higher seniority than the Brady Bonds (FRB, Par and Discount) and hence the Bonex issues trade at much lower yields.

In terms of the risk in a bond portfolio, this heterogeneity is also very important. It implies that the bonds may not trade as closely together as a set of homogenous bonds might be expected to do and the usual references made to parallel shifts and changes in the slope of the yield curve may not be as relevant as

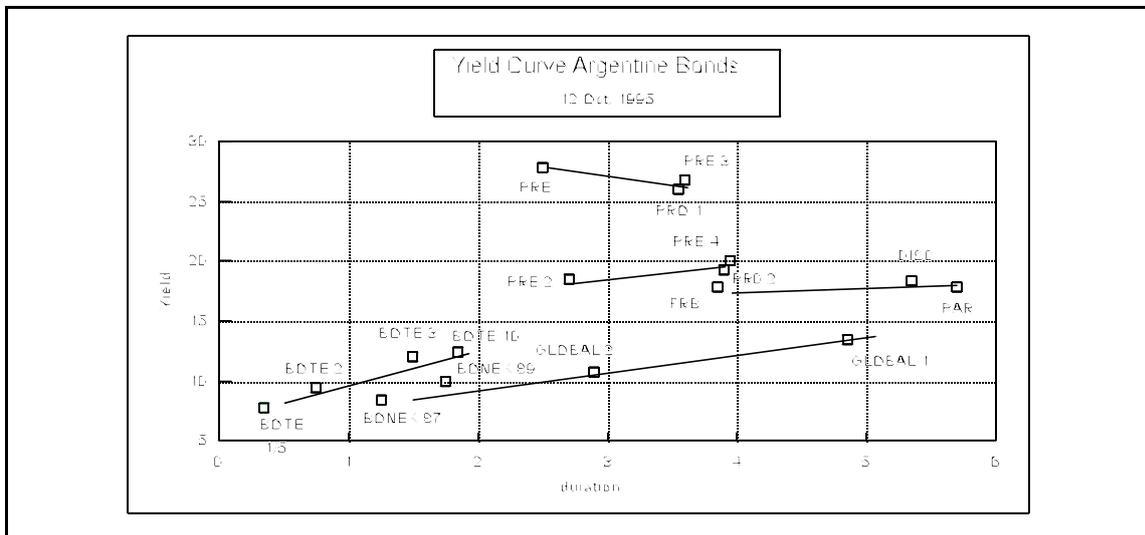
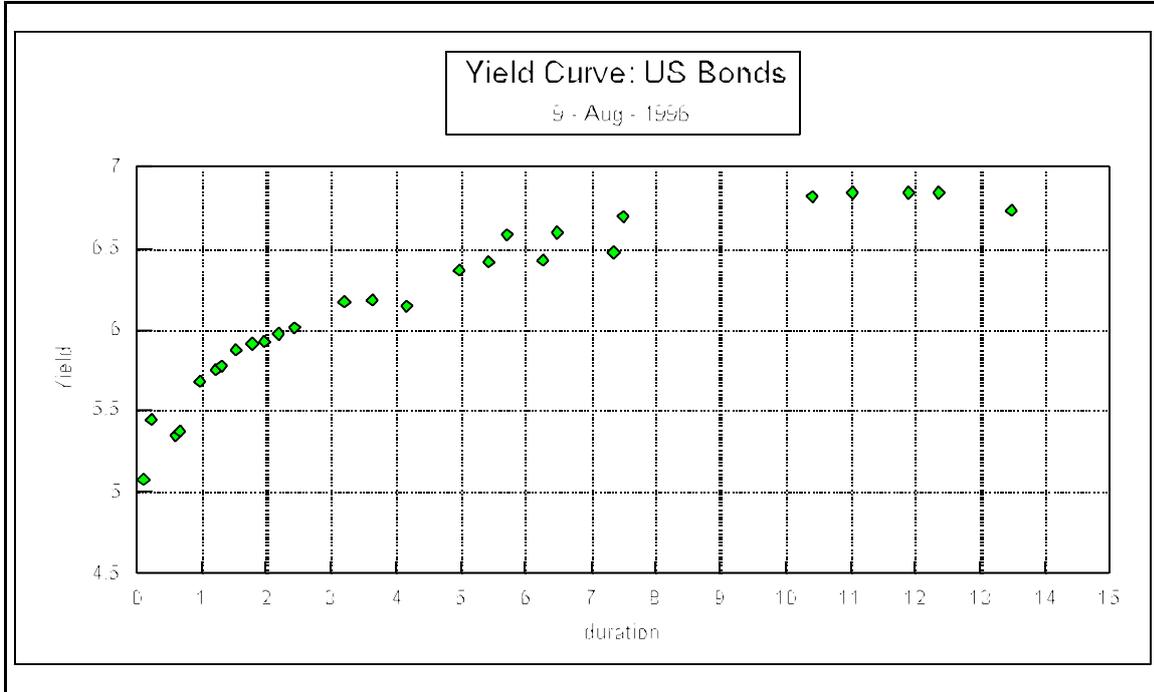
---

10

Alternatively  $\sigma$  may be expressed in annualized terms in which case T must be measured in years.

understanding why bonds of similar durations might trade at dissimilar yields. The heterogeneity does not imply that a Latin American bond portfolio is necessarily more risky. Indeed, it may imply that there is more possibility for diversification. However, it does suggest that attaching a single risk-weight to a particular maturity or duration band may be an inappropriate methodology.

**Figure 2**



**Figure 3**

A second important characteristic is that many of the Government bonds in Latin America are floating rate bonds. In Argentina, for example only the PAR bonds and the Bonex Global issues are fixed rate bonds. All other Government bonds are floaters. The rules in Basle suggest that a floating rate bond should be slotted into the maturity/duration ladder according to the next repricing date. This would imply that many bonds in Argentina would be of a very short maturity in the Basle standardized approach and would therefore attract a very low risk weight.



Table 3 illustrates the value of the parameter  $\alpha$  that must be fixed such that capital is lost only 1% of periods over a two year history of offsetting positions in Argentine bonds. Again, the bonds are arranged according to currency and secondly by modified duration. Once again, it appears that two zones in the dollar segment naturally present themselves. This is not very surprising as there is a close relationship between the correlations between the bonds (Table 2) and the required disallowance.

On the basis of these, and other simulations not reported here, the Argentine regulations have been set by defining the zones for interest rate risk as above and below 2.5 years in modified duration and with offsetting allowed in each zone subject to a disallowance parameter,  $\alpha$ , equal to 1.0. The view taken in Argentina is that no offsetting is to be allowed across the different zones.

**Table 3**

(4+ = more than 4)

Disallowance Coefficients so that 1% of the times capital loss > capital cushion														
long	Br3	Br1	Br2	Br10	Ex39	Pr2	Pr3	Pr4	Pr7	Pr1	Us1	Pr1	Pr3	Pr1
short	Br3	Br1	Br2	Br10	Ex39	Pr2	Pr3	Pr4	Pr7	Pr1	Us1	Pr1	Pr3	Pr1
Br3	...	0.3	1.2	1.3	1.2	1.3	1.1	1.4	1.2	0.9	1.2	1.0	0.4	0.9
Br1	0.3	...	1.1	1.0	1.0	1.4	0.9	1.2	1.2	0.9	0.7	1.2	0.3	0.9
Br2	0.9	1.1	...	0.9	1.1	0.9	0.7	0.7	0.8	0.6	0.6	1.0	0.4	1.0
Br10	1.1	1.0	0.7	...	1.2	0.8	0.8	0.8	0.7	0.6	0.5	0.9	0.6	0.9
Ex39	1.0	1.0	1.0	0.9	...	1.0	0.8	1.1	1.1	0.9	0.8	0.7	0.2	0.7
Pr2	1.4	1.4	0.9	0.7	1.0	...	0.4	0.7	0.7	0.9	0.9	0.9	0.7	0.9
Pr3	1.3	1.4	1.0	0.5	0.8	0.3	...	0.7	0.6	0.7	0.8	1.0	0.4	0.8
Pr4	0.8	0.8	0.4	0.4	1.1	0.4	0.4	...	0.3	0.4	0.4	0.9	0.6	0.9
Pr7	2.2	2.3	1.7	1.0	2.0	0.7	0.9	0.9	...	1.1	1.2	0.8	0.8	0.9
Pr1	0.7	0.3	0.3	0.6	0.3	0.7	0.8	0.8	0.8	...	0.3	0.3	0.3	0.7
Us1	0.4	0.4	0.0	0.3	0.3	0.3	0.4	0.4	0.3	0.4	...	0.8	0.3	0.9
Pr1	3.8	4+	3.2	1.9	2.8	1.7	0.9	1.4	0.7	1.3	1.7	...	0.3	1.0
Pr3	4+	4+	4+	2.8	4+	1.3	1.2	1.8	0.9	1.9	1.9	0.7	...	0.7
Pr1	4+	4+	4+	2.7	2.8	1.7	1.3	1.8	1.2	2.0	2.0	1.2	0.3	...

Naturally, the regulations for other countries in the region should reflect the specific nature of their respective bond markets and rules might be set on the basis of similar simulations<sup>11</sup>.

### 3.4 Latin American Equities Risk

As noted above, equity risk is conceptually somewhat simpler than interest rate risk. In part, this is due to the fact that equities are perpetuities and hence the time dimension is constant<sup>12</sup>. As in the international approach, countries of the region may wish to subdivide equity-risks into, ‘general market’ and ‘specific risk’ in similar vein to interest-rate risks. Specific risk is analogous to counterparty risk and in Basle is set at 8%. However, in Latin America, some countries may wish to adopt a higher equity specific risk charge in line with their higher ‘counterparty’ risk charges in the banking book. Argentina for example retains an 11.5% basic counterparty charge on equities which is analogous to the ‘specific risk’ charge in Basle.

With respect to ‘general market risk’, similar arguments apply for equity risk in Latin America as regards interest rate risk. First, price volatilities are significantly higher (implying that Basle weights may not be relevant) and second, price volatilities vary significantly across country and, (third) across time (implying that the same weights may not be relevant for say Chile and Venezuela and that weights should be time-varying).

The suggestion made here is that the time-varying weights as developed in Section 3.2 might also be adopted for equity risk. In other words, the Value-at-Risk of an equity position can be obtained simply by multiplying the appropriate fixed factors (the statistical tolerance value, K, and the square root of the holding period, T) by a relevant volatility measure.

A similar simulation analysis can then also be performed for equities as for bonds to consider what level of offsetting might be adopted. On the basis of simulations, not reported here, for major Argentine equities the required ‘disallowance’ factor was also set at 1, as in the case of interest-rate sensitive assets. Hence, the formula to calculate the Value-at-Risk of an equity position in Argentina is as follows:

$$VaR_e = ABS (VaR_L - VaR_S) + 1 * MIN (VaR_L; VaR_S)$$

As in Basle, it was decided for Argentina, that the Value-at-Risk of equities traded in each national market should be calculated separately and no offsetting should be permitted for long and short positions in different national markets. However, as cross-listings become more common (e.g.: Latin American ADR’s traded in the US) and as Latin American derivative contracts become more commonly employed (see next section), there may be an argument for considering the inclusion of offsetting between markets for similar stocks traded in different countries or between, say, a stock portfolio in a country of the region and a futures on a stock-market index bought in Chicago or other centre.

11

See Jackson et al (1995) for a further defence of simulation methodologies.

12

Distinctions between ‘growth’ stocks and ‘income’ stocks are not addressed in what follows.

A further important topic with respect to equities in Latin America is the liquidity of the markets. The Basle rules allow for some reduction in the capital charge for a diversified portfolio of liquid stocks. However, Latin American stocks do not have the liquidity of their G10 counterparts and, furthermore, the correlations between stocks tend to be somewhat higher in Latin American exchanges than in the major stock markets of the world. This implies that this particular Basle rule may not be appropriate for Latin America. Moreover, the lack of liquidity in Latin American stock markets is also suggestive that the, across the board, assumption of, say, a 10 day holding period may be problematic. To relax this rule, however, and make the holding period dependent on the liquidity of the stock in question (and also perhaps on position held) would introduce a great deal of complexity and make these regulations extremely difficult to monitor. On balance the recommendation here is to maintain the 10 day holding period but to recommend this as a minimum. If certain stocks held are judged, by the bank, to lack sufficient liquidity then a longer holding period should be applied.

Some countries of the region may find this approach too lenient. For example, Argentina has defined only those stocks that constitute the relatively narrow Merval Index as liquid stocks. There is then simply an overall limit on the quantity of stocks other than those defined as liquid, which a bank can maintain on its balance sheet. This is one way of limiting market risks. An alternative would be to increase the holding period for those stocks not defined as 'liquid'.

#### 4. The Treatment of Derivatives

The discussion above has made little reference to derivative contracts. However, in the introduction we have already noted the extraordinary growth in the volumes of these contracts employed in G10 countries. The Table below further illustrates the importance of the world-wide derivatives business.

**Table 4**

<b>Markets for selected financial derivative instruments</b>						
Instruments	Notional amounts outstanding					
	1990	1991	1992	1993	1994	1995
	in billions of US dollars					
Exchange-traded instruments	2290.4	3519.3	4634.4	7771.1	8862.5	9185.3
Interest rate futures	1454.5	5126.7	2913.0	4958.7	5777.6	5863.4
Interest rate calls & puts	599.5	1072.6	1385.4	2362.4	2623.6	2741.7
Currency futures	17.0	18.3	26.5	34.7	40.1	37.9
Currency calls & puts	56.5	62.9	71.1	75.6	55.6	43.2
Stock market index futures	69.1	76.0	79.8	110.0	127.3	172.2
Stock market index options	93.7	132.8	158.6	229.7	238.3	326.9
Over-the-counter instruments	3450.3	4449.4	5345.7	8474.6	11303.2	17990.0
Interest rate swaps	2311.5	3065.1	3850.8	6177.3	8815.6	
Currency swaps	577.5	807.2	860.4	899.6	914.8	
Other swap-related derivatives	561.3	577.2	634.5	1397.6	1572.8	

*Source:* Bank for International Settlements 66th Annual Report

Whilst the Latin American derivatives industry has not, to date, experienced the same explosive growth rates, derivative contracts are traded in Latin America and Latin American banks do use derivative contracts.

Latin America's exchange-traded derivatives are currently limited mostly to Brazil, although there is some activity in several other countries. Trading in Latin America-based derivatives is concentrated on the

OTC markets, but it is very difficult to estimate volumes as data are not systematically collected. Offshore, most exchange-traded derivatives based on Latin American securities are concentrated on the Chicago exchanges. These and other developed offshore markets are developing derivatives on Latin American securities, some of them on Brady bonds. Private estimates put the nominal value of emerging market debt trading at around \$ 4 trillion in 1995, of which Argentina, Brazil, Mexico and Venezuela accounted for 79% and Brady bonds represented nearly 50%. As shown in Table 5, many exchanges in Latin America have introduced (or plan to introduce) one or more futures or options products on the large volume of underlying Latin debt.

**Table 5**

<b>Exchange-traded new LA derivative products</b>		
<b>Country</b>	<b>Exchange</b>	<b>Instruments</b>
Argentina	Bolsa de Comercio de Buenos Aires	Futures and options on short-term interest rates, currency futures and equity index products.
Chile	Bolsa de Comercio de Santiago	Dollar futures, IPSA stock index, puts and calls on Endesa and CTC
Colombia	Bolsa de Bogotá	Stock index futures, interest rate futures
Costa Rica	Bolsa Nacional de Costa Rica	Interest rate futures, dollar future
Guatemala	Bolsa Nacional de Guatemala	Three-month quetzal/dollar futures, short-term quetzal interest rate option, Central America currency market
Mexico	Bolsa Mexicana de Valores	Peso/dollar futures, futures and options on IPC stock index, interest rate future on 90-day Cete
Peru	Bolsa de Valores de Lima	Stock index futures
US	Chicago Board of Trade	Futures and options on futures on Latin American Brady bond index, Argentine Brady bond index, Brazilian Brady bond index, Mexican Brady bond index
	Finex	Futures and options index on par Brady bonds, derivatives on floating-rate bonds
	Chicago Mercantile Exchange	Futures and options on futures on Mexican, Argentine and Brazilian Brady bonds
Uruguay	Bolsa de Valores de Montevideo	Dollar futures, live cattle futures
Venezuela	Private group	Need for futures and options exchange being evaluated

*Source:* Latin American Derivatives magazine, April 1996.

Contracts such as forwards and futures and simple swaps do not present large problems. For example, forwards can be thought of, for the purposes of this regulation, as a position in the underlying asset itself and a swap contract can be thought of as a portfolio of forwards. For interest rate contracts, however, a problem emerges where the derivative is expressed in terms of a reference interest rate and where the regulation adopted uses bond price volatility, rather than interest rate volatility, as the underlying source of risk. However, as noted earlier the conversion between the two is simply a matter of multiplying the interest rate volatility by a relevant duration measure.

More serious problems emerge with option-like derivatives. The fundamental problem with option-like derivative contracts is the non-linear relationship between their value and the price of the underlying. Here, the international approach is to suggest a number of alternative methods. These may be referred to as (i) a simplified approach, (ii) a scenario method, (iii) the delta-plus method and (iv) the use of a full internal model. There is then some discretion for choice by the national regulatory authority, and potentially some choice for the banks, to select which method to apply.

In the **simplified approach**, options' positions attract separately calculated capital charges for specific and general market risk. In other words, options positions are not aggregated with other positions in the underlying or in similar assets. This approach is designed for those banks that only purchase options, but that do not write option-like contracts.

The **scenario approach** uses a simulation technique to calculate the changes in the value of an options portfolios given assumed changes in the prices and/or the volatilities of the underlying assets. An option pricing model is required to calculate the value of the position in each of the scenarios. A set of scenarios is developed, which may depend on the history of the asset in question, or on its measured volatility. For example, if the volatility of the underlying is say 20% then a set of scenarios may be developed such that, given this volatility, there is a 99% chance that the price of the underlying asset will turn-out to be within the bounds of the scenarios suggested. The Value-at-Risk is determined by the greatest loss across the scenarios considered.

The **delta-plus method** employs a little more option pricing theory. The delta of an option is the amount by which the value of an option changes given a one unit change in the price of the underlying asset. Given an option pricing formula, it is normally fairly straightforward to calculate the delta of the option. Formally, the delta is the first derivative of the option value with respect to the price of the underlying asset. The delta then gives a measure of the sensitivity of the option value to the underlying source of risk. However, as noted above, the problem with options is that in fact this is a non-linear relationship. The **gamma** of the option attempts to correct for the change in the option's delta. Formally, the gamma is the second derivative of the option value with respect to the price of the underlying asset. In other words, the gamma measures how much the delta of the option changes given a one unit change in the price of the underlying asset. Finally, a third Greek letter is considered in the delta-plus method; namely the vega. This is necessary because option values, not only depend on the price of the underlying asset, but also on the volatility of the asset price. The **vega** of an option is then a measure of the sensitivity of the value of an option to changes in the volatility of the price of the underlying asset. Formally, the vega is then the first derivative of the option value with respect to the volatility of the price of the underlying asset. Again, given an option pricing formula, it is relatively easy to calculate the gamma and the vega of the option in question.

The Basle recommended, delta-plus method, suggests that the delta-risks of the option may be incorporated into the standardized approach. In other words, the option position is converted into a position in the underlying asset by multiplying by the delta of the option. Then, the same offsetting rules may be applied as for those in the underlying asset. By itself, this would be like assuming a linear relationship between the option value and the price of the underlying asset. However, in addition, Basle recommends calculating separately, the other 'Greek risks'. In other words, the gamma and vega risk should be calculated and a separate capital charge be levied on the net gamma and net vega position in each underlying asset. No offsetting is permitted for the gamma and vega risks of different assets.

The final approach is the use of a full internal model. As noted above, even in some G10 countries, the process of full-model development and authorization is still not in a very advanced stage. As we have generally argued against Latin America adopting this approach currently, we will not describe in detail the model development nor testing procedure. The interested reader is referred to the Basle 1996 Amendment itself for further details.

Our general argument in this paper is that the adoption of appropriate regulations for Latin America is a decision based on a set of trade-offs. A simple regulation may be less accurate but may also be easier to standardize and to monitor. In some cases we have opted for simplicity (i.e.: against internal models) and in some cases for added complexity (i.e.: time varying weights). This trade-off is also apparent in designing regulatory rules for the calculation of safe capital cushions for options' positions. However, there is also an issue of providing incentives for Latin American banks to improve their own knowledge and their risk management systems. In part for this reason we would suggest that Latin American regulators consider closely the adoption of the delta-plus method for calculating safe capital cushions. The delta-plus method has the following advantages.

First, there is some evidence that it is reasonably accurate even when considered against the other 'intermediate' method that might be adopted (i.e.: the scenario approach)<sup>13</sup>. Second, it is more elegant in the sense that the delta-converted option positions can be treated simply as positions in the underlying and hence subject to the same offsetting rules etc. Third, adopting this method will provide incentives for Latin Banks

who use options to more fully understand the risks involved and to improve their risk management systems. It is principally for these reasons that Argentina has asked banks to adopt the delta-plus method for the calculation of the Value-at-Risk of options positions.

A further important point to note with respect to derivatives is that it is sometimes not obvious whether a derivative should be placed in the trading book or in the banking book, which includes the traditional bank lending activity. For example, if an option (or other derivative) is bought to hedge an interest rate risk which stems from the risk in the banking book then there is an argument that the derivative should also be placed in the banking book. At least, the derivative should not then be subject to the market risk regulation and indeed, if the country has any regulations on marking to market assets in the banking book then the value of the derivative contract should be taken into account. This might then give banks the appropriate incentives to hedge risks stemming from the banking book. Argentina has adopted a system where a bank can request the Superintendent of Banking to accept that a particular transaction has been entered into for hedging purposes. If that is deemed to be the case, then the derivative may not be subject to market risk capital requirements.

Finally, we have not discussed counterparty risks with respect to derivative contracts.

## **5. Implications for Latin Banks and Latin Supervisors**

In this section, we consider various, selected topics where we feel there are major implications for Latin banks and their supervisors in order to ensure the effectiveness of the regulations.

### **5.1 Information Requirements and Capital Compliance**

The international standard for compliance with the capital requirement for market risks is 'at all times', however, this is normally interpreted as 'on a daily basis'. We believe that this requirement should also be applied in Latin American, in which case Latin banks should calculate the Value-at-Risk of their trading book daily. Note also that these regulations are normally to be applied on a consolidated basis across the whole bank (i.e.: including off-shore and stock-broker subsidiaries etc.).

Our view is that consolidation is also appropriate in the case of Latin America. One of the major challenges for many banks in the region will then be simply to ensure that accurate information on the trading positions of the consolidated bank can be amassed in one central location on a daily or even on a real-time basis. For some institutions this may imply a significant investment in new information systems, depending on the size of the organization and the extent of the trading activity conducted.

Although the international standard calls for capital to exceed requirements at all times, this does not imply that reporting needs to be on a daily basis. Indeed, in many of the G10 countries, including those in Europe, reporting is on a quarterly basis. Furthermore, banks in some countries (e.g.: the UK) need only report their end of quarter trading risks. Although, regulators retain the right to question banks further concerning their day to day risk positions.

The timing encapsulated within the reporting regime may be thought of, once again, as a trade-off. Daily reporting of daily positions might make for, potentially, more accurate knowledge on the part of supervisors but naturally costs to banks will be higher and there is a danger that supervisors will become swamped with information. Latin American supervisors in particular will probably be severely resource-constrained and may simply lack the necessary resources to analyse the quantity of information received. However, on the other hand, with quarterly reporting of quarterly positions, there is a danger that Latin banks will not feel sufficient incentives to invest in the information systems required to provide daily risk measures, even for internal use.

One possibility is for Latin supervisors to ask for monthly reporting of daily Value-at-Risk and daily capital requirement alongside their actual daily capital. Argentina has, for example, adopted monthly reporting but where banks must report daily figures. Monthly reporting comprises of summary figures of the capital requirement and of the compliance, while more detailed files of positions and requirement calculations must be kept in the banks at the supervisors' disposition.

### **5.2 Management of the Risk Management Function**

A set of recent reports on risk management refer to, not only the technical and quantitative side of risk management (information systems and Value-at-Risk type calculations) but also to the qualitative side, including the 'management' part of risk management. The focus here is on the internal reporting lines and internal controls.

For example, the Basle Amendment states that banks should have an independent risk control unit that is responsible for the banks' risk management system. This unit should produce daily reports on the banks' risks and evaluate quantitative controls (trading limits, etc.). This unit should be independent from the trading

units (also a key recommendation of the UK report on the Baring's collapse<sup>14</sup>) and should report directly to the senior management of the bank. In addition, the risk management unit should conduct an independent review of the risk measurement system to be carried out regularly in the bank's own internal auditing processes. The review should include, at least, the following:

- (a) the adequacy of documentation
- (b) the organization of the risk control unit and reporting lines
- (c) the integrity of the management information system
- (d) the accuracy and completeness of position data
- (e) the verification of the consistency, timeliness and reliability of data sources

Basle further recommends: "directors and senior management should be involved in the risk control process and should regard risk control as an essential part of the business and to which significant resources need to be devoted".

Again, these recommendations, which we believe are highly relevant for Latin America, may have strong implications for the organization of Latin banks currently. Those banks that have significant trading operations and have not yet developed risk control units along the above lines will find Supervisors increasingly concerned and focussing on the risks in their trading activities.

### **5.3 On the Implications for Supervisors**

The implementation of these recommendations in the region has strong implications for Latin Supervisors as well. First, Latin Supervisors may also have to improve their information and risk analysis systems in order to process the potentially large quantity of data received from the banks on their Value-at-Risk calculations.

Second, given the human resource constraint, in particular in assessing the accuracy of reported risk positions, qualitative standards may be particularly helpful to yield a prior rating for institutions. In our view, a standard comprehensive evaluation of qualitative features should be set out, which should consider all of the items given above in the previous section - (a) to (e). According to the results of this evaluation, together with the analysis of the summary monthly information, banks might be classified into those deserving further inspection and those where further supervision may receive a secondary priority. Those banks falling into the first category may then receive further information requests (e.g.: for daily positions and Value-at-Risk calculations) or indeed may receive on-site inspection to ensure adequate compliance with the regulation.

Third, we would also recommend that Supervisors consider very carefully the possibility of setting up a special unit to supervise these regulations. In part, this recommendation stems from the likely severe human resource constraints for adequately trained staff to analyse Value-at-Risk type calculations (off-site) and also the potential complexity of analysing a large banks' trading activities (on-site). A special team might focus on analysing the data received and determining the overall trading risks in the banking sector as well as comparisons between different institutions. Ordinary bank inspectors may need a lower degree of specialized knowledge in this area, perhaps focussing on the qualitative features of the risk management function, and, for an on-site inspection, would be able to draw on the assistance of a member of the special risk analysis supervisory unit.

## **6. Conclusions**

Our primary conclusion is that the January 1996 Amendment of the Basle Accord, agreed by the representatives of the G10 countries to set standards for a safe level of capital cushion in relation to banks' trading activities is highly relevant for Latin America and Latin American supervisors should study its contents closely. Indeed, although Latin American financial markets differ from their G10 counterparts in a variety of ways, we believe that Latin markets' characteristics increase, rather than diminish the importance of these recommendations.

We suggest that the so-called 'standardized approach', as adopted by the European group of countries, may be more suitable for the region than the 'internal model' approach at the current time. Principally our argument is that the choice between the two, as given in the Amendment, represents a trade-off between the potential, increased accuracy of an internal model and, on the other hand, the complexities of the authorization and monitoring processes and the fact that the assumptions behind the model may be invalid. In Latin America, we suggest that the difficulties in supervision of the model approach plus the increased likelihood that the assumptions behind such models are invalid tilt the balance in favour of the 'standardized approach'.

However, it is argued that, principally due to high volatilities, the weights as suggested by the Amendment are too lenient for the region and moreover, due to differences in volatilities between countries, a standardized set of weights for Latin America may also be inappropriate. Indeed, our suggestion is that as

---

14

See Bank of England (1995).

volatilities also vary substantially over time, then one approach for the region would be to adopt a system of time-varying weights calculated on the basis of a simple Value-at-Risk formula. This method could then be standardized within Latin America by the adoption of the same standards on statistical tolerance limits (a factor K) and the holding period (a constant T). This would imply differences in weights between different countries but only depending on differences in volatilities in national markets.

With respect to interest rate risk, we advocate a close analysis of countries' yield curves to ascertain an appropriate methodology for interest rate sensitive assets. The lack of homogeneity in the yield curves in some countries suggests that the use of bond price volatilities directly rather than the use of 'maturity' bands may be more appropriate. In Argentina, for example, the 'yield curve' is not well-defined with bonds of similar durations offering quite different yields, perhaps due to the (implicit) seniority of certain claims, and furthermore, spreads between these bonds being quite variable.

We advocate the use of simulation exercises to (i) establish the relevant bands for offsetting for interest rate sensitive assets and (ii) establish the offsetting (or 'disallowance') parameters for both bonds and equities. In Argentina, only two bands have been defined for dollar and for peso instruments respectively with a 'disallowance' factor of 1 for both bonds in the same bands and for equities. No offsetting is permitted between the different bands for bonds nor between bonds of different currencies nor between different types of assets.

For derivatives we suggest the use of the 'delta-plus' method. This provides relatively accurate measures of the risk in derivative positions and also gives banks incentives to become more knowledgeable, and to manage more carefully, the non-linear risks and the volatility risks inherent in derivative positions. This method also fits well together with the standardized approach as the 'delta' adjusted positions in the underlying assets stemming from derivatives can be assessed, together with actual positions in the underlying, and the same rules for calculating Value-at-Risk, including offsetting, can be applied. As recommended in Basle, we would suggest that the non-linear (gamma) and volatility (vega) risks should be calculated separately for positions in each asset and no offsetting be permitted between assets.

Besides demanding a safe capital cushion for banks in relation to their trading risks, these regulations provide incentives for banks to improve their information and risk management systems. One of the challenges for many institutions in the region will be simply to improve information systems such that consolidated trading positions across the whole bank can be amassed in a central location in real time or at least on a daily basis. Furthermore, once the information is obtained, appropriate systems will be required to produce the necessary risk calculations on a daily basis.

The Basle Amendment also makes recommendations for the 'management' part of 'risk management' which we also suggest are highly appropriate for Latin America. In particular, each institution should have a separate risk management unit with clear reporting lines separate from the trading activities of the bank. This unit should be charged with the production of the daily risk reports and, at least, the senior management of the bank should be involved with the risk management process.

There are also strong implications for Supervisors if Latin America is to adopt these recommendations. In particular, Supervisors must be able to process the, potentially large amount of information generated and also become more expert at analysing the riskiness of banks' trading portfolios. In turn this may require upgrading Supervisors information and risk analysis systems as well as training programs for staff as appropriate. Our recommendation is that Latin America Supervisors should carefully consider setting up a separate unit for the monitoring of these regulations.

Much has been written about the vulnerability of banking systems in Latin America and one of the sources of this vulnerability is the volatility of the value of traded assets on and off Latin American banks' balance sheets. This regulation should serve to strengthen the financial systems of the region by more closely matching the capital cushion of Latin banks with the risks that they are taking. In this way, the perceived vulnerability of Latin banks should be diminished and this should also feed through to greater stability, confidence and hence growth in banking systems in the region.

## References

- Banco Central de la República Argentina 1996. *Comunicación "A" 2435. Exigencia de Capital Mínimo para la Cobertura de los Riesgos de Mercado.*
- Bank of England, Board of Banking Supervision 1995. "Report of the Board of Banking supervision Inquiry into the Circumstances of the Collapse of Barings".
- Basle Committee on Banking Supervision 1994a. *Risk Management Guidelines for Derivatives.*
- \_\_\_\_\_ 1994b. *Prudential Supervision of Banks' Derivatives Activities.*
- \_\_\_\_\_ 1995. *Basle Capital Accord: Treatment of Potential Exposure for Off- Balance-Sheet Items.*
- \_\_\_\_\_ 1996a. *Overview of the Amendment to the Capital Accord to Incorporate Market Risks.*
- \_\_\_\_\_ 1996b. *Amendment to the Capital Accord to Incorporate Market Risks.*
- \_\_\_\_\_ 1996. *Supervisory Framework for the Use of 'Backtesting' in Conjunction with the Internal Models Approach to Market Risk Capital Requirements.*
- Estrella, A., D Hendricks, J. Kambhu, S. Shin and S. Walter 1994. "The Price Risk of Options Positions: Measurement and Capital Requirements". *Federal Reserve Bank of New York Quarterly Review.* Summer-Fall 1994.
- Jackson, P., D. Maude and W. Perraudin 1995. "Capital Requirements and Value-at-Risk Analysis"
- Jackson, P 1995. "Risk Measurement and Capital Requirements for Banks". *Bank of England Quarterly Bulletin.* May 1995.
- Kane, E. 1994. "Difficulties of Transferring Risk-Based Capital Requirements to Developing Countries". *World Bank Policy Research Working Paper 1244.*
- Secretaría de Hacienda y Crédito Público 1996. *Reglas para los Requerimientos de Capitalización de las Instituciones de Banca Múltiple.* México.