February 18, 2010

Adjustments to Mexican Pension Funds' Investment Rules

This brief note will present the main adjustments features of Mexican pension funds' investment regime, approved by CONSAR's Board on February 17th, 2010. The appointed regulatory changes refer to two topics:

A. Pension funds' risk control methodology adjustments.

- The regulator's board of Mexican pension funds (Afores) considers Value at Risk (VaR) as an adequate and necessary risk management tool for pension fund managers, since it gauges the investment portfolios' risk from an integral point of view and thus it helps to attain suitable processes of control and monitoring of portfolios' risks.
- However, some adjustments were approved in the VaR methodology in order to allow this tool to accommodate in an automatic, transparent, objective and timely way new episodes of high market volatility.
- This objective is reached by adapting the VaR confidence level according to market volatility. This means that VaR confidence level will be reduced when the general volatility increases and vice versa (equivalently, the number of scenarios allowed to exceed the VaR regulatory limit will increase as market volatility increases and vice versa). It is worth to point out that the VaR regulatory limits previously defined for each type of fund will remain intact.
- On one side, with the modifications on the VaR methodology, the pro-cyclic behavior that this tool could induce over Mexican pension funds and whose effects could exacerbate the market volatility is eliminated. On the other side, the approved adjustments will let the pension funds to preserve their investment strategies even though high volatility events may occur, strengthening the legal certainty with respect to operative possibilities that such funds could exercise under stressed market conditions. All other market participants are allowed to know in a transparent and timely way, the investment rules applicable to pension funds. Therefore, the adjustments on the VaR methodology recently approved should let the pension funds to continue acting as institutional investors which contribute to strengthen the market stability.

B. Investments in individual stocks listed on the Mexican stock market.

- The modifications of the investment rules recently approved by CONSAR'S Board include the possibility that pension funds invest a part of their assets under management in individual stocks listed on the Mexican Stock Market (Bolsa).
- Currently, the Siefores could invest in individual stocks of Mexican companies listed on the domestic stock market and whose size is small or medium and do not belong to any index authorized by investment regime.

- The aforementioned modifications expand the pension funds investment possibilities since now they are allowed to buy Mexican companies' individual stocks listed on Bolsa, whose capitalization and liquidity are classified as medium or large and consequently belong to some of the authorized Mexican equity indices. As an investment concentration limit, pension funds can finance eligible companies (as defined before) up to a percentage of the fund assets under management that is equivalent to the product of the weight assigned to the company in the *IPC Composite* index (such index is a general domestic market benchmark) and the equity investment limit applicable to the pension fund.
- It is expected that this investment regime modification help to foster the national corporate sector financing as well as a better price discovery and formation in the Mexican stock market; additionally, this investment regime modification should let pension funds, after having performed an integral analysis over the authorized investments possibilities, define better diversified portfolios that could increase the returns of retirement savings.

I. Adjustments to Mexican Pension Funds' Risk Control Methodology

I.1 Purpose of the Regulatory Change

- The regulator's board of Mexican pension funds (Afores) considers Value at Risk (VaR) as an adequate and necessary risk management tool for pension fund managers, since it gauges the investment portfolios' risk from an integral point of view and thus it helps to attain suitable processes of control and monitoring of portfolios' risks.

- Nevertheless, episodes of generalized market volatility might cause an increase in the portfolios' VaR which in turn could end up in a behavior of the Afores that may further exacerbate market volatility (Afores' reaction may amplify the cycle.)

  o This means that when VaR of Afores' investment portfolios increases as a result of a rise in market volatility, it is likely that this tool exceed the regulatory risk limits and as a consequence Afores' investment strategies be impaired or even fund managers be forced to engage in market transactions (short term purchases and sales) whose aim is to decrease portfolios' market risks. However, since all this is done in periods on which markets are disrupted, Afores' transactions may create a new source of pressure on the securities' liquidity and therefore negatively influence price formation. The latter in turn generates a second round of effects over the securities valuations and on the risk parameters, resulting in further market volatility.

- Given this, the board of CONSAR billed a change in the regulation regarding modifications on the VaR methodology with the purpose of letting the Afores to remain with their long term investment strategies had new high volatility episodes emerge. This change allows fund managers to maintain their strategies without
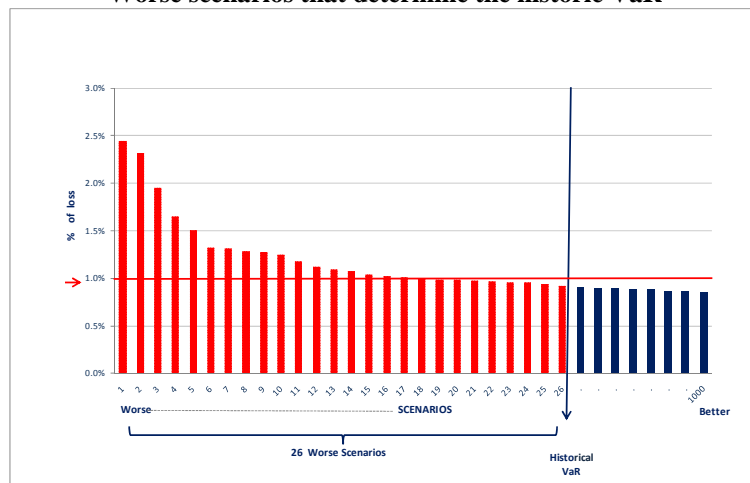
having to be granted an authorization for a special portfolio rebalancing program; thus eliminating the pro- cyclicality that the VaR may create, fostering normal market functioning even under stressed conditions and providing Afores and other market participants with transparent rules and thus strengthening the legal framework under which one of the most important institutional investors operate.

- The main objective of these adjustments is to procure a deeper protection to retirement savings by preventing pension funds from contributing to exert pressure on markets when atypical and transitory volatility events arise. The risk control methodology adjustments are done through a transparent, objective and replicable rule, based on a precise mathematical formulation. All of the previous contributes to fulfill the pension funds regulator's mandate. The following sections present the VaR methodology adjustments in detail.

I.2 Description of adjustments to VaR methodology

- In order to explain the changes in VaR methodology it is worth to remember that the VaR is calculated on a daily basis considering 1000 scenarios that reflect changes in the portfolios valuation. These scenarios are simulated with the risk factors of the securities that made up the investment portfolio. The portfolio's VaR is the 26th worse scenario and represents an interval at 95% confidence level (25*2 / 1000) (equivalently a one tail interval of 97.5% confidence level).

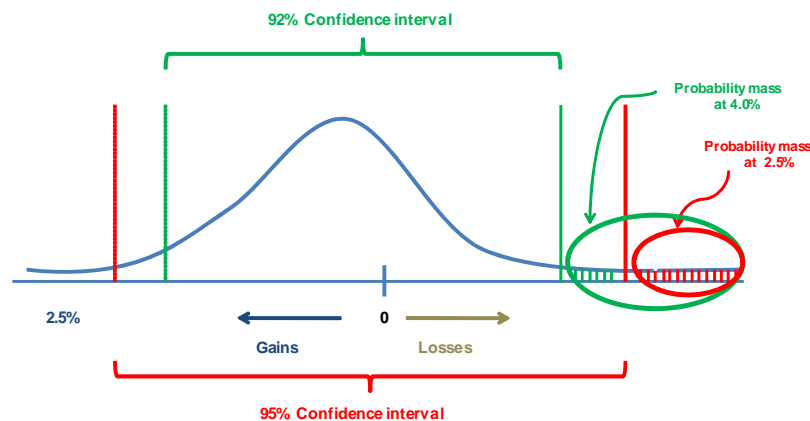**Worse scenarios that determine the historic VaR**

- The current regulatory VaR limit applied to each pension fund remains unchanged as it is shown below:

Current VaR limits for each Pension Fund (SB)

Limit/SB	SB1	SB2	SB3	SB4	SB5
VaR	0.60%	1.0%	1.3%	1.6%	2.0%

- In order to eliminate the pro-cyclical effects of the VaR (with respect to the volatility), some adjustments are made that seek to allow this tool to automatically accommodate future increases in aggregated market volatility.

- With that objective in mind, the authorities chose that the adjustment be done (automatically) to the VaR confidence level in line with observed variations on market volatility. In order to adjust the confidence level, the number of scenarios that are permitted to exceed the corresponding VaR limit (one limit for each type of fund) must be modified.

Relation between the confidence level and the number of scenarios permitted to exceed the regulatory VaR limit

- Thus, the VaR methodology adjustments are based on the following logic:

  o If a significant increase in the aggregated market volatility is observed then the VaR confidence level is reduced, and
  o If the market volatility decreases then the VaR confidence level will be allowed to return gradually to its original parameters. In other words, the VaR confidence level gradually returns to 95%, so the VaR would be again the 26th scenario.

- In order to determine when an increase or a decrease in the market volatility arises, a benchmark portfolio is defined for each type of pension fund. These benchmark portfolios are exogenous to the pension fund manager's strategies and are defined considering the investment regime of each type of pension fund. The sensitivity of these portfolios detects changes in the aggregated market volatility. It is important to point out that those portfolios do not imply in any form neither an investment guideline made by the authority nor optimal investments choices; the benchmark portfolios are indicators that help the authorities to objectively identify when the market volatility considerably increases and when returns to its normal level.

- Each benchmark is computed assuming that investments are made only in two asset classes: equity and fixed income. Specifically, it is assumed that the percentage of

the assets under management that each basic fund is allowed to invest in equity is fully exploited and that the rest of the portfolio is invested in Mexican government's fixed income securities. This is shown in the following table.

Benchmarks

Asset class	SB1 % AUM	SB2 % AUM	SB3 % AUM	SB4 % AUM	SB5 % AUM
Equity	0.00%	15.00%	20.00%	25.00%	30.00%
Fixed Income	100.00%	85.00%	80.00%	75.00%	70.00%

- Within each type of asset class, it is assumed, on one hand, that the share addressed for equity is completely invested in the Mexican Stock Exchange leading index, the IPC ("Índice de Precios y Cotizaciones"); on the other hand, the portfolio share addressed for fixed income investment is covered through a security basket made up of federal government notes and bonds, and whose weights are defined based on the value that the amount issued of each security represents with respect to the total amount outstanding of federal government notes and bonds. These benchmark portfolios will be made public and they will be posted on CONSAR web page (www.consar.gob.mx).

- When market volatility increases, the benchmarks' VaR will experience an increase (ceteris paribus) as well as the number of scenarios that are permitted to exceed the corresponding VaR regulatory limits. In this way, the number of scenarios generated with each benchmark that exceed the corresponding VaR limit works as a signal which helps to determine when an adjustment to the VaR confidence level has to take place.

- In order to have a robust signal employed to determine the adjustments to VaR confidence level, it is necessary also to take into account the maximum number of scenarios allowed to exceed the corresponding VaR limit (along with the number of scenarios generated with the benchmark that exceed the VaR limit.) Currently this number is 26.

- The adjustment to the VaR methodology consists in increasing the maximum number of scenarios allowed to exceed the corresponding VaR limit (equivalently, reduce the confidence level of the VaR) whenever the market volatility increases and conversely when it decreases, that is, reduce the maximum number scenarios permitted to exceed the corresponding VaR limit when market volatility recedes.

- The adjustment will be performed automatically whenever a significant and/or sudden increase in the market volatility takes place (measured objectively through the benchmark.)

- The changes described above seek to allow the VaR methodology to be able to accommodate future aggregated market volatility with the aim of reducing the

current pro-cyclicality of the VaR and allow Afores to maintain their long term investment decisions, thus preventing that in order to recompose their investment portfolios these investors be forced to engage in unnecessary market transaction under stressed conditions.

I.3 Detailed formulation of the new VaR methodology

- The adjustment to the VaR methodology is explained in detail in this section. For such purposes one must note that the adjustments that can be made to the VaR parameters arise from monitoring market volatility which is measured through the benchmark defined for each type of basic fund:

  - On date t a 1000 valuation scenarios (P&L) generated with the corresponding benchmark are calculated (one benchmark is defined for each type of basic fund). The calculations are made by applying the historic VaR procedure described in the regulation (see Appendix G of the Circular CONSAR 15-19.)

  - A variable called "slack" is defined as the difference between the maximum number of scenarios that are allowed to exceed the regulatory VaR limit minus the benchmark's number of scenarios that exceed the corresponding regulatory VaR limit. For portfolios that abide by the VaR regulatory limits the slack is positive and is negative otherwise.

  - The VaR adjustments consists of 3 rules described next:

    a) If the benchmark's slack is small and during a short time span several scenarios (generated with the benchmark) that exceed the regulatory VaR limit have been added, then the maximum number of scenarios permitted to exceed the regulatory VaR limit is increased. (This is equivalent to reduce the VaR confidence level when the market conditions quickly worsen.) Specifically:

      > *On date t, the maximum number of scenarios permitted to exceed the regulatory VaR limit is increased in 5 if the following two conditions prevail:*
      > *i) The benchmark's slack is less than 5.*
      > *ii) Within the 1000 scenarios generated with the benchmark at date t, 5 or more of them exceed the regulatory VaR limit and correspond to dates within the 30 most recent days.*

Also, if the benchmark's slack is less than 3, then the number of scenarios permitted to exceed the regulatory VaR is increased, with disregard of the speed with which the scenarios enter to the worse cases. This part of the policy deals with situations where market conditions may get worse gradually but persistently. Succinctly,

> *On date t, the maximum number scenarios permitted to exceed the regulatory VaR limit is increased in 5 if the benchmark's slack is less than 3.*

b) The maximum number of scenarios permitted to exceed the regulatory VaR limit is decreased when stable market conditions prevail. This will be evident when the benchmark's slack increases and when the number of scenarios that exceeds the regulatory VaR limit is low (this rule provides a soft mechanism to reduce the number of scenarios that are permitted to exceed the regulatory VaR limit and grants smoothness in the policy). Succinctly,

> *On date t, the maximum number scenarios permitted to exceed the regulatory VaR limit is decreased in 5 if the following two conditions prevail:*
> i)   *The benchmark's slack is higher than 15.*
> ii) *Within the 1000 scenarios generated with the benchmark at date t, less than 5 of them exceed the regulatory VaR limit and correspond to dates within the 60 most recent days.*

It should be mentioned that the number of scenarios permitted to exceed the regulatory VaR limit will never be lower than 26, which is the current level. This implies that the policy will never be tighter than currently.

c) If none of the cases described above happens, then the maximum number of scenarios permitted to exceed the VaR remains unchanged.

o The VaR adjustments described above can be expressed mathematically as follows:

Let,

X_t: Within the 1000 scenarios generated at time t with the benchmark, this variable is the number of scenarios that exceeds the regulatory VaR limit.

X_t^{30}: Within the 1000 scenarios generated at time t with the benchmark, this variable is the number of scenarios that simultaneously satisfy the following two conditions:
        1) Exceed the regulatory VaR limit
        2) Correspond to dates between t and t-30.

X_t^{60}: Within the 1000 scenarios generated at time t with the benchmark, this variable is the number of scenarios that simultaneously satisfy the following conditions:
        1) Exceed the regulatory VaR limit
        2) Correspond to dates between t and t-60.

E_t: Is the maximum number of scenarios that at time t are permitted to exceed the regulatory VaR limit (there is one E_t for each type of fund each day.) This variable will never be less than 26 (current level). When the approved regulatory changes to the VaR methodology take place formally this variable takes the value $E_1 = 26$.

H_t: Is the slack at day t (there is one slack variable for each type of fund.) This variable is defined as the difference between the maximum number of scenarios that are permitted to exceed the regulatory VaR limit minus the number of scenarios generated with the corresponding benchmark that exceed the regulatory VaR limit (there is one benchmark for each type of fund.) That is, $H_t \equiv E_t - X_t$

Then, the value of E_t will be determined with the following formula:

$$E_1 = 26\,,$$
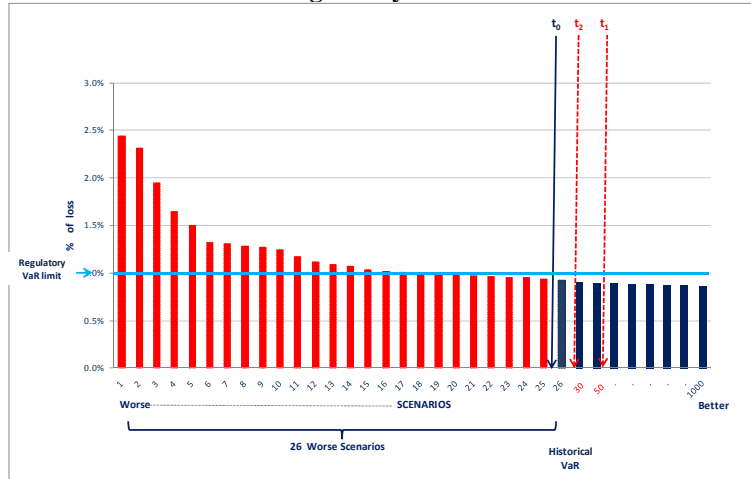$$H_t = E_t - X_t$$

$$E_{t+1} = \begin{cases} E_t + 5, & \text{If } H_t < 3 \quad \text{or} \quad H_t < 5 \text{ and } X_t^{30} > 5 \\ E_t - 5, & \text{If } E_t > 26 \quad \text{and} \quad H_t > 15 \text{ and } X_t^{60} < 5 \\ E_{t,} & \text{in other case} \end{cases}$$

- After having determined the value of E_t at date t, this parameter is used to calculate the VaR of the pension funds' investment portfolios.

- The following graph helps to summarize how the VaR adjustment works: When the number of scenarios that are permitted to exceed the regulatory VaR limit is adjusted, then the vertical line moves to the right or to the left according to an increase or a decrease in the market volatility, respectively.

Adjustment in the number of scenarios permitted to exceed the regulatory VaR limit

- For example, the current parameters determine that the number of scenarios that exceed the regulatory VaR limit be less than 26. The new VaR policy points out that in a period with high market volatility this threshold for the scenarios could increase sequentially from 26 to 31, 36, 41, and so on, depending on market conditions. The following table shows a hypothetical situation for the benchmark of basic fund 1 (SB1) where initially (as of Nov 11th, 2008) the maximum number of scenarios permitted to exceed the regulatory VaR limit be less than the 26th worse loss, which in the example happens to be lesser than the regulatory limit and therefore abides by the regulation; on the second day there is an increase in the market volatility and the 26th worse loss of the benchmark exceeds the regulatory VaR limit (the latter never changes from the value 0.60%). So, the new VaR methodology imposes that the scenario threshold be increased to the 31st worse loss so that the benchmark again complies with the regulatory VaR limit as seen on the third date.

	Nov,11,08	Nov,12,08	Nov,09,08
Scenario 14	2.28%	2.28%	2.28%
Scenario 15	1.28%	1.28%	1.28%
Scenario 16	1.16%	1.16%	1.16%
Scenario 17	1.00%	1.11%	1.11%
Scenario 18	0.82%	1.00%	1.00%
Scenario 19	0.79%	0.82%	0.85%
Scenario 20	0.75%	0.79%	0.82%
Scenario 21	0.70%	0.75%	0.79%
Scenario 22	0.70%	0.70%	0.75%
Scenario 23	0.70%	0.70%	0.70%
Scenario 24	0.62%	0.70%	0.70%
Scenario 25	0.61%	0.62%	0.70%
Scenario 26	0.57%	0.61%	0.62%
Scenario 27	0.53%	0.57%	0.61%
Scenario 28	0.49%	0.53%	0.57%
Scenario 29	0.47%	0.49%	0.53%
Scenario 30	0.45%	0.47%	0.49%
Scenario 31	0.45%	0.45%	0.47%
Scenario 32	0.43%	0.45%	0.45%
Scenario 33	0.41%	0.43%	0.45%

New scenarios

Confidence level at 95%

Confidence level at 94%

- Operationally, CONSAR will take the following actions: It shall notify the AFORES when, in accordance with the procedure outlined above, the maximum number of scenarios allowed to exceed the regulatory VaR changes. At date t the value that comes into effect at time t+1 will be notified.

- The Risk Analysis Committee (CAR), described in Article 45 of the SAR Law (integrated by CONSAR, CNBV, CNSF, SHCP and Banco de Mexico), could do adjustments to the parameters involved in the formulation with which the threshold scenario is determined as well as on the benchmarks if considered necessary. This will ensure that the pension funds' benchmarks remain representative of the investment opportunities. The Commission will post through its website detailed characteristics of the benchmarks, as well as current values of the scenarios threshold numbers applied to each type of basic fund.

II.   Investments in individual stocks listed on the Mexican stock market.

- The current investment regime (IR) allows the Afores to invest a percentage of the retirement savings in stocks of companies which are listed on recognized markets such as the Mexican Stock Market (Bolsa) or other international markets which are regulated and supervised by some of the most sophisticated and specialized financial authorities. The investments in stocks are commonly referred as equity instruments.

- For each type of fund managed by the Afores there exist a maximum limit applicable to equity instruments, defined according to the worker's age and to the time to his retirement. Such parameters are more restrictive for workers near to retirement and conversely. The current regulatory parameters for equity are shown in the following table:

Regulatory investment limits in Equity
(% of AUM)

SB1	SB2	SB3	SB4	SB5
0%	15%	20%	25%	30%

- Currently, the regulation allows that investment in equity be done through two mechanisms:

    o Replicating a basket of stocks that belongs an authorized equity index (listed on Annex H of Circular CONSAR 15-19.)

        ▪ In this case, it is allowed to buy stocks that belong to the replicating index through: a) buying or selling each individual stock, b) Exchange Traded Funds (ETFs) or c) financial derivatives. Besides, these investments may protect the capital.
        ▪ In order to fulfill with concentration limits set by the IR for this type of securities, these investments are considered within the authorized parameters for equity instruments (described in the table above).

    o Investment in individual stocks that belong to Mexican companies under the following assumptions:

        ▪ The company is sold on the Bolsa through an IPO.
        ▪ The company is listed on the Bolsa but does not belong to the basket of any authorized Mexican equity index.
        ▪ In order to fulfill with the concentration limit authorized by the IR for this type of securities, these investments are taken within the authorized parameters for structured products (along with other type of securities).

- The modifications on the IR recently passed by the CONSAR' Governing Body, complement the equity investment rules described above. These adjustments allow the Afores to invest directly in individual stocks of Mexican companies that are listed on Bolsa and that belong to any of the authorized Mexican equity indices, without the obligation to purchase a bundle of other stocks. Thus,

    o The pension funds can invest in individual stocks of eligible companies (as defined above) up to a limit equivalent to the percentage that the pension fund could currently do if it had exhausted its equity investment capacity in the *IPC Composite* index, which is the most general authorized reference for the domestic capital market.
    o The investment limit for each eligible firm is equal to the product of its weight on the *IPC Composite*, plus the current slack margin that apply to the index replication (4 percentage points) and the equity limit of the pension

fund. As a result of this, the percentages aforementioned will vary depending on the fund.

o In this way, for each Mexican company listed on Bolsa that belongs to any of the authorized Mexican equity indices, the individual limits are computed as shown in the following table.

Company name	IPC Composite weight	Maximum investment as a % of the authorize limit in equity instruments: weight+ 4 percentage points					Maximum investment as a % of AUM: (weight + 4 percentage points)*(Equity instruments limits)				
		SB1	SB2	SB3	SB4	SB5	SB1 (0%)	SB2 (15%)	SB3 (20%)	SB4 (25%)	SB5 (30%)
Company "X" belongs to IPC Composite index	2.76%	0%	Weight + 4% = 6.76%				0%	6.76% * 15% = 1.01%	6.76% * 20% = 1.35%	6.76% * 25% = 1.69%	6.76% * 30% = 2.03%
Company "Y" does not belong to IPC Composite index, but belongs to an authorize BMV index	0%	0%	Weight + 4% = 4.00%				0%	4.00% * 15% = 0.60%	4.00% * 20% = 0.80%	4.00% * 25% = 1.00%	4.00% * 30% = 1.20%

- It is expected that the aforementioned adjustments to the IR contribute to increase the returns for retirement savings and to improve the Mexican Stock Market operation. As a result the Afores could complement their investment strategies with companies' assets that have better performance which fosters diversification.