

Agustín Carstens: DALÍ – Mexico’s award-winning securities settlement system

Remarks by Mr Agustín Carstens, Governor of the Bank of Mexico, at the Franz Edelman Prize Award, granted to the Mexican central securities depositor, S.D. Indeval, for developing with the Bank of Mexico and the Instituto Tecnológico Autónomo de México (ITAM) the DALÍ securities settlement system, Mexico City, 12 January 2011.

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- Susan Albin, President of Informs (Institute for Operation Research and the Management Sciences).
- Luis Téllez Kuenzler, Chairman of BMV Group, stakeholder of S.D. Indeval.
- Arturo Fernández, Chancellor of the Instituto Tecnológico Autónomo de México (ITAM).
- Highly respected DALÍ developing team from S.D. Indeval, ITAM and Banco de México, to whom this renowned award has been granted.

Dear guests, ladies and gentlemen:

Good afternoon.

I am very pleased that the Institute for Operations Research and the Management Sciences granted the Franz Edelman Award to Indeval for the excellent job done in developing DALÍ. This recognition is very good news for the Mexican financial system.

The securities settlement system is key for Banco de México:

- We are responsible for promoting the sound development of the financial system, of which the securities settlement system is crucial.
- One of our objectives as a central bank is to foster the smooth operation of the payment systems. The securities settlement system is not only the largest payment system in Mexico, but also an essential component of our liquidity provision mechanism for other payment systems.
- Finally, the securities settlement system is used to compensate and liquidate the monetary policy operations that help us achieve our price stability goal.

Given the relevance of all payment systems, Banco de México is constantly striving to adapt the best practices available. In this spirit, we worked together with Indeval in the design, construction, and implementation of DALÍ.

When we were defining the operating rules for the system, financial intermediaries and Indeval wanted a multilateral netting scheme since this would allow them to use the available liquidity, in terms of cash and securities, efficiently. The central bank knew well the advantages of this scheme for a developing market, but also its downsides: if any depositor lacked enough money or securities, it could take hours and complex procedures to redo the multilateral netting process. From Banco de México’s perspective, this was not acceptable. Apart from the benefits of a multilateral netting scheme, we also needed a real time settlement system, for its superior characteristics in terms of risk control and simplicity, and because it would be very useful for our liquidity provision mechanisms.

In order to perform simultaneously multilateral netting and settlement in near real time, Banco de México developed and proposed a methodology based on mathematical models and operations research techniques.

Specifically, we created a linear programming model that linked a *network flow* problem for money with many network flow problems for securities. In other words, we proposed a model where money and securities constitute a flow through a network of participants. The solution we were looking for could be obtained by maximizing these flows quickly and applying the results immediately to the participants' balances.

Since there are specialized algorithms that solve linear programming problems very fast, we had, in principle, a method to choose a set of transactions with maximum value that could be settled with the available resources.

This methodology, however, would, in some cases, settle transactions only partially – for example, instead of settling the 1,000 CETES that were intended in a transaction, only 990 would be settled – a practice unheard at the time. We broke the mold when we realized that it was feasible to offer participants a simple choice: to operate on the basis of an efficient multilateral netting scheme that would partially settle some operations, or to operate on a gross basis. The intermediaries went for the most efficient solution.

And so, thanks to the use of operations research techniques, a new methodology to settle securities in the Mexican market was born.

With this solution in hand, Banco de México felt Indeval had the capability to develop a system that would:

1. **Settle under a delivery versus payment scheme.** That is, having an unbreakable link between the settlement of a securities transfer and the corresponding payment.
2. **Settle operations frequently.** Participants would be able to know, almost in real time, which transactions were settled.
3. **Make efficient use of the liquidity available for settlement, both in terms of securities and money.**

We knew from the models developed by Banco de México that it was possible to implement a system with such characteristics and, more importantly, that this would yield a first class securities settlement system.

After intensive analysis, testing and calibration, and with the valuable assistance of the Instituto Tecnológico Autónomo de México (ITAM), Indeval decided to use the model proposed by Banco de México for its new, ground breaking system, DALÍ. Today, we are very fortunate to have the first securities settlement system that offers multilateral netting and near real time settlement, with significant advantages for our financial market.

We now have an outstanding securities settlement system that offers excellent services to investors, issuers and intermediaries, and generates trust in our financial system. We believe that the effort we all put into the design, development, and testing of DALÍ was well spent.

I congratulate Indeval, and the staff from ITAM and Banco de México who participated in this project.

Thank you very much for your attention.