APPENDIX

Bolsa or NYSE: Price Discovery for Mexican Shares

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Trading Costs, ADR/ADS Arbitrage with Mexican Shares, and Exchange-Rate Data

(1) Trading Costs for Mexican and U.S. Shares Compared

With an average price of stock traded in USD of $39.78 on the NYSE and $2.34 on the BMV, total estimated trading costs in Q4-2000 were 53.40BP in Mexico and 28.39BP in the United States (NYSE). These data were obtained from the Elkins/McSherry Global Universe analysis of trading costs for 150 large global institutions. The breakdown by average commissions, fees, and market impact that yields the average cost to trade in relation to the average of high, low, open, and close price was 29.98BP, 1.34BP, and 22.08BP for Mexico and 13.45BP, 0.50BP, and 14.44BP for the United States. (BP = basis points.) Source: Standard & Poor’s, Emerging Stock Markets Fact Book 2001, New York: McGraw Hill, 2001, p. 418.

One ADR represents 20 ordinary shares. Trading commissions for the Mexican shares underlying one ADR valued at around $40 may be 53.40BP or 21 cents per 20 Mexican shares for free-standing institutional investors like some life insurance companies and pension funds. They are as little as 15.5 cents for more integrated financial institutions or conglomerates that operate in such a way that two-thirds of the cost of market impact itemized above can be avoided. In the latter case, transaction costs for ADRs in the U.S. market amount to 7.5 cents per ADR, which is less than half as much as for the underlying ordinaries in Mexico.

(2) Arbitrage Between ADRs Sold and the Underlying Mexican Ordinaries Bought

Because the settlement period in Mexico is one day shorter (T+2) than in the United States (T+3), an arbitrage operation that involves selling an ADR on the NYSE and simultaneously buying the underlying ordinaries on the BMV requires one-day financing to bridge the gap. Under U.S. Federal Reserve Board Regulation T or its equivalent in other countries, financing provided by the clearing broker is limited to 50% of the value of the underlying securities, so that buyer’s own funds would have to be put up for the other half. In any event, interest on a one-day USD loan, starting at T+2 and repaid with the proceeds from the sale of the ADR when it settles on T+3 could represent
the cost of bridge funds. Then the MXP funds required for the Mexican share purchase at T+2 are obtained (at the forward rate quoted for T+2 at time T) from the sale of the borrowed dollars paid out at T+2. Thus, to bridge the gap to T+3 settlement in New York, a one-day financing cost arises.

The choice of an appropriate interest rate is complicated because it depends on the circumstances and market access of the borrower. The cost of funds from banks for broker-dealers may be as low as 10 basis points above the federal funds rate, but 25 basis points is a reasonable figure on industry average. Margin credit may be available at between 100 and 300 basis points above the broker-dealer’s own cost of funds depending on the volume and frequency of margin borrowing and the trading volume generated by a client. On a $40 ADR, 1-day financing at, say, 5% annual interest adds about half of one cent ($40(0.05/360)=0.00556) per share of ADR.

Since the pricing of arbitrage operations requires going through a set of transactions ending with re-establishment of the original position, the ordinaries purchased in Mexico are used to reconstitute the ADR on the NYSE. {The entire operation may thus be viewed as logically, but not practically (in view of various short-sale requirements and restrictions), equivalent to a short sale of the ADR collateralized by a purchase of the underlying ordinaries, with delivery of the ordinaries for reconstitution of an ADR covering the short sale.} The cost of the entire financing package per $40 ADR may then be estimated as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tr>
<td>(1) Sell ADR on NYSE</td>
<td>7.5 (cents)</td>
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<tr>
<td>(2) Purchase the 20 underlying ordinaries on the BMV</td>
<td>15.5</td>
</tr>
<tr>
<td>(3) Bridge financing</td>
<td>0.5</td>
</tr>
<tr>
<td>(4) Delivery of ordinaries from custodian of their seller via the SIDV to U.S. depositary bank’s custodian in Mexico</td>
<td>2.0</td>
</tr>
<tr>
<td>(5) Issuance of the ADR and delivery to original seller of ADR via the Depository Trust Company (DTC)</td>
<td>5.0</td>
</tr>
<tr>
<td>Total:</td>
<td>30.5 cents or 0.7625% per $40 ADR</td>
</tr>
</tbody>
</table>

To help explain the last entries above, there is a 5 cent charge per share of ADR imposed by its issuing agent, and SIDV is the Mexican securities transfer system, Sistema Interactivo para el Depósito de Valores. In arriving at the total transactions cost estimate for the entire package we have assumed that a charge for the bank money wire of the funds obtained from the sale of USD for MXP at T+2 from New York to Mexico City (of about $25 per wire or 2.5 cents per share for 1,000 shares) does not arise or can be ignored for instance because the same broker clears both the U.S. and the Mexican trade. We have also ignored the transaction and margin costs of buying peso for dollars two days forward to lock in the exchange rate at time T+2 when dollars need to be converted to pesos needed for settlement. Furthermore, all the costs itemized above may vary depending on the continuity and quality of the business relationship between the parties, including the clearing firm.

Because purchase and sale of shares in different markets and the forward foreign-exchange contract can not in fact be executed with complete price certainty exactly at the same moment in time, appreciably higher exchange-converted price differences would
have to be observed to trigger arbitrage operations. Assuming a required risk cushion of at least 5 cents a share would bring the minimum total exchange-converted price discrepancy, that could trigger arbitrage, up to 35.5 cents, or 0.8875 percent in relation to the price of one ADR share trading at around $40.

(3) Arbitrage Between ADRs Bought and the Underlying Mexican Ordinary Shares Sold

An arbitrage operation to take advantage of the reverse price discrepancy by buying an ADR on the NYSE and selling the underlying ordinaries on the BMV would involve canceling the ADR just purchased to release the underlying ordinaries at the final stage. This would reconstitute the starting position, this time in ordinaries in Mexico. Delivery of the underlying ordinaries generally is possible in 24 hours (next-day delivery) but same-day delivery may be obtained if the ADR is presented for cancellation early in the trading day and/or with prior notice. Assuming that the costs of buying and selling shares as well as the costs of ADR issuance and cancellation are the same, the costs itemized in (2) above apply equally on the reverse package of transactions. The only difference is that the sale of the underlying ordinaries in Mexico may deliver funds one day before their dollar equivalent (obtained from the exercise of the forward contract) is needed to settle the purchase of the ADR in New York. This would create an element of market asymmetry in the arbitrage operation as total costs would fall from 35.5 cents per share of ADR in (2) to about 34.5 cents per share of ADR in (3) as one-day’s interest payments would be turned into one day’s interest earnings. For arbitrage to be triggered on this side of the market hence would require, at a minimum, a 0.8625 percent excess of the exchange-converted Mexican over the ADR price if that price is around $40.

Information in sections (2) and (3) of this appendix is based on guidance kindly provided over the phone in February/March 2002 and again in February 2003 by Director Irving J. Klubeck, State Street Corporation, 225 Franklin Street, Boston, MA 02110 but the first author is responsible for any remaining errors. For detailed background information on how to bridge the difference in settlement periods between the two markets see also Chakravorti (1998).

(4) Exchange Rate Quotes: Snapshots of MXP/USD at NYSE and BMV Open and Close

All data are based on quotations since there is no central agency which records transactions in the foreign exchange market and transactions are recorded only in private records of the participating market makers. Snapshot quotes identified by a specific time stamp are obtained by linear interpolation from the nearest temporally surrounding quotes except if a quote happens to fall directly on the time (specified to 1/100 of a second) requested. If quotes on the Mexican peso per dollar (MXP/USD) rate were equally distributed over a 10 hour day, getting 120 daily quotes would imply an average interpolation span of 5 minutes. In fact, the total number of quotes registered by the data source for this rate has risen from about 160 quotes per day in 1996 to 700 in 2000 and quotes tend to be bunched near the open and close. It is unclear to what extent the increase in quote activity represents real growth of the market rather than background
growth of computer technology and networking that makes frequent quoting easier. Staleness parameter limits can be specified that identify all those interpolations involving longer time spans as yielding “NaN,” or missing, data at the time stamp. During data gaps in the source, not a single quote was received for this exchange rate, in a few cases for an entire day, due to communication or recording problems and not because of market breakdown.

When a major market maker, such as an international bank, posts bid and ask prices for size, usually in excess of 1 million, the quotes picked up by the source are not binding in the foreign exchange market. However, it is believed that the reputation of the market maker would be tarnished if quotes are repeatedly not honored for phone calls received within a reasonable human reaction time (say of 3 minutes). It is also possible that some market makers may be serious only about one side of the quote. No change in price (tick) is needed for a new quote to be generated. For MXP/USD, quotes generally are specified with up to two places of decimals. Among the institutions posting quotes that are picked up by the source are BASX, BCMX, BICC, BIXM, BMNO, BNML, BNMX, CINZ, COFY, CYMX, DBEM, EUMX, LAMP, MBCB, MEXI, MUCC, MXFX, PROX, SERM, SERY, and VDCC.

This summary is based directly on information kindly provided by Dr. Rakhal Dave, CEO, Olsen Data, Seefeldstrasse 233, CH-8008 Zurich, Switzerland.