

APPENDIX B

Stock Price Synchronicity

Market capitalization as a percentage of gross domestic product (GDP) tends to be large in MENA. In many cases, however, it cloaks thin public floats that leave companies under family or state shareholder control. Trading on many MENA stock markets is extensive, but much of it seems to be driven by individuals and retail investor speculation rather than fundamental equity research and institutional investors. Even in terms of turnover, countries in the region rank high compared with other countries, but high turnover does not translate into effective price discovery.

Stock returns reflect new market-level and firm-level information. The extent to which stock returns move together therefore depends on the relative amounts of market- and firm-level information. Other factors being equal, markets that operate in an institutionally sound environment with proper investor protection and better accounting transparency produce more firm-specific information and therefore exhibit more asynchronous price movements.¹

Two measures of stock price synchronicity are used to assess the quality of price. The simplest conceptual measure is to count the number of stocks that move in the same direction during a given time period. This measure, which is calculated on a weekly basis and lies between 50 and 100 percent, is calculated as follows for country c at time t :

$$CO - MOVE_{c,t} = \frac{\max[\#UP_{c,t}, \#DOWN_{c,t}]}{\#UP_{c,t} + \#DOWN_{c,t}}$$

The second measure takes into account the portion of stock returns explained by the market (R^2). This synchronicity measure uses stock-level regression analysis by estimating the following model for each stock s in country c in period t :

$$r_{s,c,t} = \alpha + \beta r_{m,t} + \varepsilon_{s,c,t}$$

where $r_{s,c,t}$ represents the individual stock return and $r_{m,t}$ represents the market return. A high R^2 suggests a high degree of price synchronicity.

Table B.1 shows the correlations of measures of market liquidity, synchronicity, and size. The most important result is the high correlation (0.73) between the two price synchronicity measures. This result is expected, as these indicators conceptually represent the same phenomenon. The liquidity measures show moderate intercorrelations, indicating that the individual metrics capture different aspects of liquidity. Market capitalization and the number of firms are positively correlated. The correlation results also highlight that larger markets tend to be more liquid and exhibit less synchronicity. By construction, synchronicity measures exhibit some negative correlation with liquidity, as a high proportion of zero-trading days reduces price synchronicity. Also by construction, synchronicity measures are inherently linked to the number of firms.

Table B.2 shows the results of a regression analysis conducted to examine the drivers of stock price synchronicity, using the co-movement measure. As the measure is bounded between 0.5 and 1, a standard logistic transformation is applied. One of the main results from this analysis suggests that foreign participation contributes to improvements in price synchronicity. After controlling for foreign participation, the main variable is captured by the ratio of gross portfolio equity liabilities to GDP (defined simply as the portfolio of foreign liabilities to total GDP).

To correct for biases arising from market size, the regressions include the number of firms, but the variable is not significant in any

TABLE B.1**Correlations of Market Liquidity, Synchronicity, and Size**

Measure	Zero-return days	Value traded top 10	Turnover	Co-move	R^2	Number of firms
Liquidity						
Zero-return days	1.00					
Value traded top 10	0.42	1.00				
Turnover	-0.60	-0.53	1.00			
Synchronicity						
Co-move	-0.32	0.06	0.32	1.00		
R^2	-0.16	0.15	0.33	0.73	1.00	
Size						
Number of firms	-0.21	-0.68	0.31	-0.13	-0.25	1.00
Market cap	-0.31	-0.24	0.27	-0.10	-0.24	0.43

Source: World Bank staff calculations.

Note: Results are based on annual data from 2004 to 2009.

TABLE B.2

Determinants of Stock Price Synchronicity

Variable	(1) Logistic co-move	(2) Logistic co-move	(3) Logistic co-move	(4) Logistic co-move	(5) Logistic R^2
Number of firms	-9.63e-05 (-0.0578)	-0.0012 (-0.781)	0.0016 (0.870)	0.0005 (0.335)	0.0011 (0.512)
Gross portfolio equity liabilities/GDP	-0.0112* (-1.990)	-0.008** (-2.485)	-0.0118** (-2.733)	-0.009** (-3.167)	-0.0088 (-1.793)
Exchange rate (local currency units per \$)	0.645*** (5.330)	0.681*** (5.484)	0.658*** (4.012)	0.820*** (5.367)	0.428* (2.218)
Industry Herfindahl index			0.700 (1.097)	-0.208 (-0.421)	
Log GDP per capita			0.207 (1.563)	0.0527 (0.654)	
Stock market turnover		0.0038*** (6.440)		0.0039*** (4.472)	
Constant	-0.593** (-3.073)	-0.730*** (-3.556)	-2.803* (-2.072)	-1.281 (-1.575)	-1.105*** (-3.579)
Observations	53	50	41	38	53
R^2	0.408	0.589	0.581	0.710	0.098

Source: World Bank staff calculations.

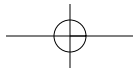
Note: Dependent variable is the logistic transformation of the co-movement measure $\ln((\text{Co-move} - 0.5)/(1 - \text{Co-move}))$ and the R^2 measure $\ln(R^2)/(1 - R^2)$. Regressions use pooled ordinary least squares on annual data for 2004–09. The Herfindahl index is defined as the sum of squared shares in annual GDP of the agriculture, industry, manufacturing, and service sectors. In all regressions, robust t -values clustered at the country level are given in parentheses.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

of the regressions, suggesting that larger markets do not exhibit greater synchronicity. However, the ratio of portfolio equity liabilities to GDP and the exchange rate, both measures of foreign stock market participation, are significant in all regressions except regression 5, which uses the R^2 measure of price synchronicity; foreign participation has a p -value of 0.104. Overall, the results suggest that more foreign participation and a weaker currency relative to the dollar induce greater synchronicity (lower values). These results persist even after controlling for stock market turnover (regression 2), industry composition and GDP per capita (regressions 3 and 4), and, albeit weakly, use of R^2 as a dependent variable (regression 5).

Note

1. The number of firms in the market or the level of diversification in the economy can also drive synchronicity (better-functioning markets may have more listings). Alternatively, by the law of large numbers, when many stocks co-move randomly, both the R^2 and the co-move measures will be biased toward



lower values. Follow-up regression analysis will attempt to control for this bias. See also Morck, Yeung, and Yu (2000).

Reference

Morck, R., B. Yeung, and W. Yu. 2000. "The Information Content of Stock Markets: Why Do Emerging Markets have Synchronous Stock Price Movements?" *Journal of Financial Economics* 58 (1-2): 215-60.

