



**Figure 22.4** The binomial process for the dollar/yen exchange rate ( $x$ ) and the Nikkei ( $Q$ ). The last two columns contains the value of the currency-translated Nikkei and the risk-neutral probability of each node, computed using equations (22.35) and (22.37).

**Example 22.9** Using Figure 22.4 we can compute forward prices for the yen, the dollar-translated Nikkei, and the quanto Nikkei. The risk-neutral probability of an up move in the yen is .4750. The yen forward price is

$$F_{0,1}(x) = .4750 \times .011503 + (1 - .4750) \times .009418 = .010408$$

The forward price for the currency-translated Nikkei is

$$F_{0,1}(xQ) = 0.2170 \times 280.14 + 0.2581 \times 208.79 + 0.2398 \times 216.00 + 0.2852 \times 160.99 = 212.367$$

Finally, the quanto forward price is

$$F_{0,1}(Q) = 0.2170 \times \frac{280.14}{.011503} + 0.2581 \times \frac{208.79}{.011503} + 0.2398 \times \frac{216.00}{.009418} + 0.2852 \times \frac{160.99}{.009418} = 20,342.91$$

All of the prices computed from the tree match those in Example 22.8.