The U.S. Federal Reserve’s plan to reduce monthly bond purchases is exposing the deep-seated fragility of India’s economy, unnerving investors and underscoring the risks to emerging markets at a time of rising global interest rates.

India’s stock market tumbled 1.6% Monday, adding to a 4% decline Friday, and the rupee hit a fresh low against the dollar. Government-bond prices slumped, sending yields sharply higher.

The malaise in India is the latest global ripple effect from a shift being considered at the U.S. central bank, following nearly five years of exceptional policy support for the American economy and financial markets.

During the era of low rates that followed the global recession, developing nations such as India, Indonesia and Thailand had no trouble attracting capital to boost growth. Imports soared as Asian consumers ran up debt to fuel purchases.

But as their export engines have sputtered, because of China’s slowing growth and uneven demand in the U.S. and Europe, these economies have started to run large current-account deficits, which occur when imports outweigh exports. As investors begin demanding higher returns for taking on risk, nations with large economic imbalances are getting punished.

"These economies definitely look suddenly a lot less impressive," said Frederic Neumann, an economist with HSBC in Hong Kong. "Investors have woken up to the fact the Fed is serious about tapering," or reducing bond purchases.

The flight from emerging markets hasn’t hurt stocks in richer economies. In the U.S., the Dow Jones Industrial Average remains just 4.1% below its all-time high even as market interest rates rise. On Monday, the yield on 10-year benchmark U.S. Treasury notes hit a two-year high of 2.884%, while the Dow fell moderately, dropping 70.73 points to 15010.74.

The selloff in Indian assets began in May, as Fed officials started discussing plans to pull back from the $85 billion of monthly bond purchases designed to bolster uneven U.S. economic growth. Seeing interest rates rise in rich-country markets such as the U.S., investors who had sought investments in faster-growing emerging markets pulled their funds.

The selloff has since spread to other developing nations, such as Indonesia and Thailand, which like India are exposed to rising global interest rates, thanks to budget and current-account deficits that mean they must borrow to finance daily spending.

The Indonesian rupiah fell to its lowest level in four years Monday. Shares slid 5.6% in Indonesia and 3.3% in Thailand. Asian shares fell further in early trading Tuesday. Indexes in Japan and Australia were both down 0.7%, and Indonesia's main index dropped 3%.

Few analysts expect the current clouds over the region to presage a full-blown crisis, like the one that slammed
Asia in 1997-98. That is because governments and companies there have much lower external debt burdens than back then, and nations have ample stocks of foreign currency reserves.

But pressure on these economies is unlikely to abate anytime soon, economists and investors say.

India is particularly vulnerable to shifts in investor sentiment, because it needs foreign capital to finance a huge current-account deficit. The country, unlike some regional rivals such as Indonesia, also has built up considerable government debt.

India’s situation is particularly precarious, because it relies on huge energy imports to fuel its economy. Investment has ground to a halt because of the government’s failure to push through clear rules meant to open up sectors like retail and aviation to foreigners.

Analysts say Indian markets are caught in a vicious cycle where losses in one asset are undermining confidence in the others, and spurring further selling.

"The single biggest factor making investors nervous on India is the currency," said Jyotivardhan Jaipuria, a research analyst with Bank of America Merrill Lynch in Mumbai.

As the rupee falls, it has negative implications for several aspects of the Indian economy. For instance, an eroding currency pushes up the cost of oil and other imported goods, like electronics, and stokes inflation, which is already about 10% for consumers. It also increases the government’s spending on fuel subsidies, potentially widening the fiscal deficit.

Analysts now expect the Reserve Bank of India to keep interest rates high in a bid to defend the rupee, but higher interest rates would hurt India’s economic growth, in turn making India less attractive to foreign investors.

In June, the Reserve Bank of India stopped a cycle of interest-rate cuts. In July, it effectively reversed course, making it more expensive for banks to borrow, forcing rates up in an effort to boost the rupee.

But that tighter liquidity also makes it much harder for companies to borrow to expand their businesses and repay their debt, adding to headwinds facing the already-slowing economy.

After a growth spurt from 2006 to 2011, when gross domestic product rose by an average of about 8% a year and raised hopes of India becoming a new Asian tiger, the country lapsed back into a plodding pace as economic reforms lost steam.

Economists have recently cut their target for India’s growth to as low as 5% for the year ending March 31, 2014, versus an expectation of 6.5% earlier this year.

In an effort to spark a comeback, officials last fall pledged fiscal rectitude and a more open economy. The government slashed fuel subsidies, helping shrink its budget gap to 4.9% of GDP in the year that ended March 31, from a projected 5.2%.

Last fall, India also moved to allow foreign companies such as Wal-Mart Stores Inc. to invest in Indian supermarkets for the first time, with a maximum stake of 51%. So far, investments have been limited by a lack of clarity on policies such as how much of a company’s products would have to be sourced locally.

Kaushik Basu, chief economist for the World Bank, said Monday that he expects India’s growth to fall further in the near term.

Investors also have become jittery because of a string of measures India has taken to stem the rupee’s decline.

India’s government, in an effort to narrow the current-account gap, has tried to curb gold imports and announced a plan to buy more of the country’s oil from Iran through what is effectively a barter mechanism. On Wednesday, the country reduced the amount of money residents and companies can send abroad, sparking fears of more-draconian measures.

The government says these moves aren’t a prelude to capital controls and that it doesn’t plan to impose restrictions on companies repatriating profits.

Write to Tom Wright at tom.wright@wsj.com, I Made Sentana at i-made.sentana@dowjones.com and Shefali Anand at shefali.anand@wsj.com
A version of this article appeared August 20, 2013, on page A1 in the U.S. edition of The Wall Street Journal, with the headline: Fear of Fed Retreat Roils India.