

ANALYSIS

August 2019

Prepared by

Katrina Ell
Katrina.Ell@moodys.com
Assistant Director/ Economist

Steven G. Cochrane
Steve.Cochrane@moodys.com
Chief APAC Economist

Contact Us

Email
help@economy.com

U.S./Canada
+1.866.275.3266

EMEA
+44.20.7772.5454 (London)
+420.224.222.929 (Prague)

Asia/Pacific
+852.3551.3077

All Others
+1.610.235.5299

Web
www.economy.com
www.moodysanalytics.com

Asia Economic Outlook: Navigating Uncertainty

Introduction

The global economy is navigating troubled waters. The unresolved and significant geopolitical risks plaguing the global economy are exacerbating the slowdown in demand. We forecast global GDP growth at 2.7% in 2019 and 2.8% in 2020, down from the 3% expansion in 2018. Potential global GDP growth is estimated at 3%. Most regions are forecast to slow over the next year.

Asia Outlook: Navigating Uncertainty

BY KATRINA ELL AND STEVEN G. COCHRANE

The global economy is navigating troubled waters. The unresolved and significant geopolitical risks plaguing the global economy are exacerbating the slowdown in demand. We forecast global GDP growth at 2.7% in 2019 and 2.8% in 2020, down from the 3% expansion in 2018. Potential global GDP growth is estimated at 3%. Most regions are forecast to slow over the next year.

Asia has been swept up in the slower conditions. China's economy is forecast to grow 6.3% in 2019 and 6% in 2020 after the 6.6% expansion in 2018. Beijing is navigating a slowdown in domestic demand and sustained weakness in manufacturing and exports. The sustained trade war with the U.S. has been an added and significant hit. Pro-growth policies will be measured compared with prior downturns, keeping a rebound off the cards. Japan's important export engine has lost momentum in 2019. Domestic demand is unable to sufficiently pick up the slack, and the pace of labour market tightening has slowed.

Central banks in Southeast Asia have overwhelmingly shifted gear to an easing bias to shore up domestic demand amidst the backdrop of overwhelmingly weaker manufacturing and export performances this year compared with 2018 (see Table 1).

China's halcyon days are over

China's economy is in the midst of a cyclical and structural slowdown that shows no signs of abating. GDP growth cooled to 6.2% y/y in the June quarter, its weakest pace since records began 27 years ago. It follows the 6.4% expansion in the March quarter and 6.6% full-year expansion in 2018. The June quarter's growth rate is within the accepted range, as Beijing is targeting GDP growth of 6% to 6.5% in 2019, down from the around 6.5% target in 2018. In the first half of the year, GDP growth was 6.3% (see Chart 1).

The enduring trade war with the U.S. has hurt manufacturing and exports and steepened the entrenched structural decline in broad economic conditions. Evidence is rising of the disruption to manufacturing production lines from the trade dispute, and forward indicators, including new export orders, suggest weakness into 2020. Inflation in China has been a background issue this past year. But the outbreak of African swine flu has created a pork shortage, which has contributed to higher inflation in recent months, a situation that is unlikely to resolve quickly.

Deleveraging campaign

China's stimulus this cycle has been measured and piecemeal, with the longer-term goal of achieving higher-quality growth in mind. The government has avoided the large-scale stimulus of prior downturns, and this has resulted in a gradual improvement of some conditions, namely via infrastructure spending, tax cuts, and easing credit conditions in some sectors. Further stimulus

Table 1: Real GDP, % change yr ago

	2016	2017	2018	2019	2020
East Asia					
China	6.7	6.9	6.6	6.3	6.0
Japan	0.6	1.9	0.8	0.7	0.1
South Korea	2.9	3.2	2.7	2.0	2.5
Taiwan	1.5	3.1	2.6	2.2	2.0
Hong Kong	2.2	3.8	3.0	1.1	2.8
South Asia					
India	8.7	6.9	7.4	6.7	7.2
Southeast Asia					
Indonesia	5.0	5.1	5.2	5.0	5.1
Philippines	6.9	6.7	6.2	5.8	6.9
Thailand	3.4	4.0	4.1	3.4	3.9
Singapore	3.0	3.7	3.2	0.9	3.1
Malaysia	4.4	5.7	4.7	4.5	4.1
Vietnam	6.2	6.8	7.2	6.5	6.7

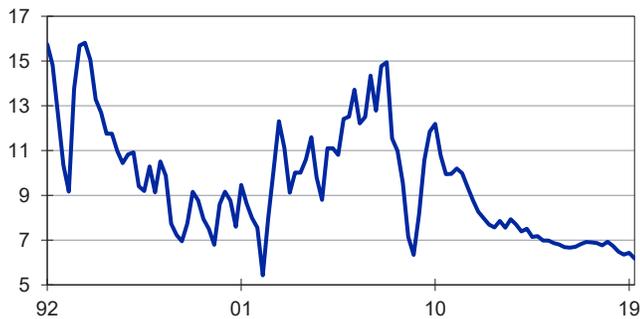
Source: Moody's Analytics

is expected through 2020. The monetary stimulus will continue focusing on smaller, private firms (see Chart 2).

At the heart of the deleveraging campaign—and consequent targeted stimulus approach—is the government's quest to move away from shadow banking. Regulators' persistence has yielded success, and growth in shadow banking in the year to May was down 10% y/y. This is in stark contrast to the credit-fuelled debt binge used in the aftermath of the financial crisis in 2009, when growth of shadow banking averaged 91% in 2010.

Chart 1: GDP Growth at Record Low

China GDP, % change yr ago



Sources: National Bureau of Statistics, Moody's Analytics

The trade war with the U.S. is complicating matters for Beijing given the disruption to supply chains in China and direct pain being inflicted on demand for manufactured goods caught up in the tariffs. A further layer of difficulty comes from the uncertainty of the trade dispute, with business sentiment souring and denting future activity.

Bank of Japan pledges support

The Bank of Japan has signaled that it is ready and willing to increase monetary stimulus if necessary. Governor Haruhiko Kuroda said that the bank could combine bigger asset purchases with interest rate cuts if the downside risks to global growth materialized and further hurt Japan's weakened economy.

The BoJ is not forecast to hit its elusive 2% inflation target in the foreseeable future and has constantly fallen short (see Chart 3). Although the planned increase in the consumption tax rate from 8% to 10% in October will trigger inflation expectations and

temporarily raise prices, the medium-term impact will be to depress domestic demand and further slow inflation.

Will BoJ walk the talk?

Soft inflation, a trade dispute with South Korea, slowing global demand, the U.S.-China trade war, and the October consumption tax hike could be the perfect storm that forces the BoJ to up the stimulus ante.

Prime Minister Shinzo Abe has confirmed that the planned October sales tax hike will go ahead despite growing speculation it would be delayed given the weakness at home and abroad. With this, we expect to see a temporary rise in spending in the third quarter that will then collapse through the fourth quarter after the tax implementation, a situation that has occurred with Japan's other tax hikes.

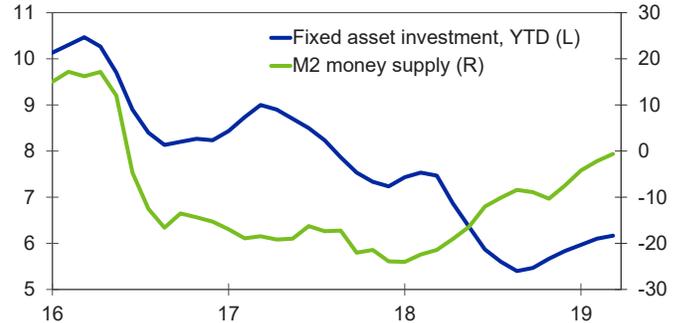
Japan's important export sector is struggling. Exports fell in June for a seventh straight month, with particular weakness

in semiconductors and auto parts bound for China (see Chart 4). The Tankan survey shows that business conditions in Japan hit a three-year low in the June quarter. Business sentiment has been deteriorating since late 2017, coinciding with the trade war escalation. This is denting capital investment plans and hiring intentions and will be a further drag on domestic demand heading into 2020.

For Japan, adding monetary stimulus is less straightforward, not least because negative interest rates have undesirable consequences on profitability for commercial banks. But the problem is that the BoJ needs to at least signal its willingness to loosen policy further, given the yen would likely suffer as major central banks offshore turn dovish. If the easing bias in the U.S. and Europe continues, it will put upward pressure on the yen. Our baseline is that the central bank will keep policy settings steady.

Chart 2: Stimulus Bearing Fruit

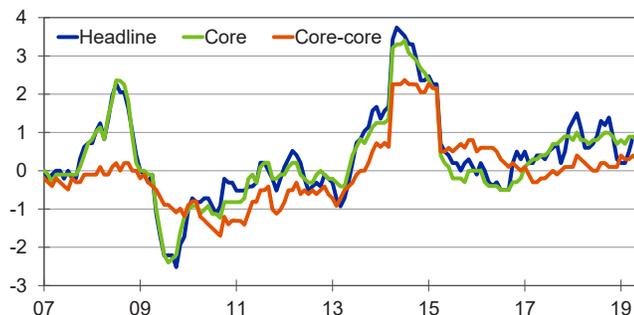
China's fixed asset investment, % change yr ago YTD, 3-mo MA



Sources: National Bureau of Statistics, Moody's Analytics

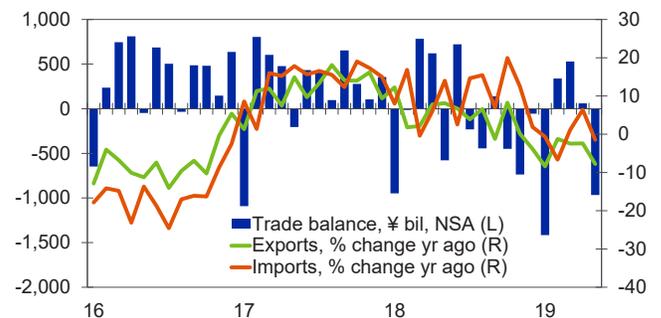
Chart 3: BoJ's Elusive 2% Inflation Target

% change yr ago



Sources: Japan Statistics Bureau, Moody's Analytics

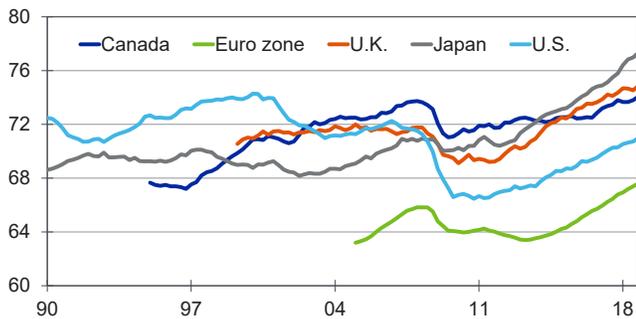
Chart 4: Japan's Exports Under Pressure



Sources: Japan Customs and Tariff Bureau, Moody's Analytics

Chart 5: Japan's Impressive Labour Market

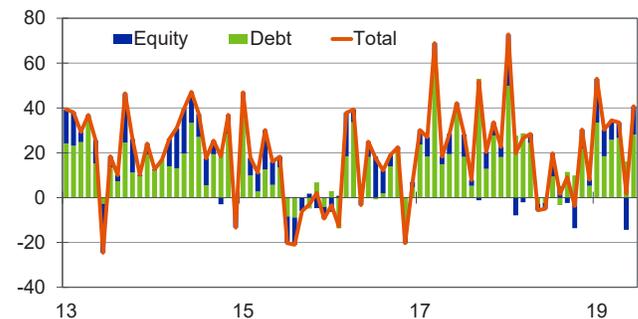
Employment rate for 15- to 64-yr-olds by country, %



Sources: OECD, Moody's Analytics

Chart 6: EMs Faring Better in 2019

Total portfolio flows into emerging markets, \$ bil



Sources: Institute of International Finance, Moody's Analytics

The bright spot in Japan's economy is the labour market (see Chart 5). The job-to-applicant ratio was 1.61 in June, not far from its highest level on record. There is a reasonable correlation between Japan's vacancy rate and wages. The extent of tightening in Japan's labour market is even more impressive when put in context of other developed markets. Less remarkable is the weak pass-through to higher wage growth.

Breathing space for EMs

Major central banks have responded to the cyclical downswing and heightened downside risks with an easing pivot. Nonwidening interest rate differentials with developed economies and expected depreciation of the U.S. dollar have so far kept external pressure off emerging markets compared with last year (see Chart 6). Cumulative net nonresident portfolio flows have been relatively upbeat so far in 2019, according to the Institute of International Finance.

Central banks in Asia have overwhelmingly boarded the easing bandwagon this year, taking the opportunity to undo some of the tightening that took place in 2018 to stabilize their external positions. The tally of central banks in Asia that have cut their policy rates this year has risen quickly. Thailand, Indonesia and South Korea have come off the sidelines most recently, joining India, Malaysia, the Philippines, New Zealand and Australia. For most, further easing is on the cards heading into 2020.

Economies in Asia tend to flourish when global demand is buoyant, and operate below potential when it is not. The latter situ-

ation is happening. Exports and manufacturing are struggling in most economies across the region, justifying the need to shore up domestic demand (see Chart 7).

Also driving the easing stance is that the global outlook is plagued with downside risk. The trade war between the U.S. and China is unresolved, while Brexit uncertainty continues alongside a flare-up in tensions in the Middle East. Our baseline is that no deal between the U.S. and China is made through President Donald Trump's first term.

Uncertainty limits policy potency

Expectations of further easing of monetary policy do not change the narrative that below-potential expansions will proceed into 2020. The potency of further expansionary monetary policy is limited by the unfavourable backdrop. Additional rate cuts make credit creation more attractive, but the global environment of heightened geopolitical risks is not one where firms want to invest. The Moody's Analytics weekly business confidence survey confirms that businesses across the globe remain anxious, and sentiment is well down from a year ago. Also, lending rates are already very low in most economies. Concerns about policy space to insulate against a sudden, exogenous shock will remain relevant.

Singapore's weakness sounds alarm

Singapore's economy has had a tough 2019. Second-quarter GDP growth slumped amid a broad-based decline in activity. GDP growth is forecast at 0.9% in 2019, down from 3.2% in 2018. Singapore's economic

performance is seen as a decent barometer of Asia's broader economic performance, as the production cycles tend to mirror each other.

Nonoil domestic exports shed 17.3% y/y in June, the fourth straight month of contraction and steepest monthly fall since February 2013. Electronics remain a major source of weakness. Nonelectronics have occasionally provided relief to the headline, but not of late. Tech shipments have been on a downswing for around two years, but weakness in the nontech sector did not materialize until 2019.

With the export-oriented sectors of the economy weak through 2019, much of the impetus for growth is coming from Singapore's service sector thanks to the finance and insurance, information and communication, and business service sectors. Construction, which has lagged in recent years, has shown some improvement.

BoK responds to headwinds

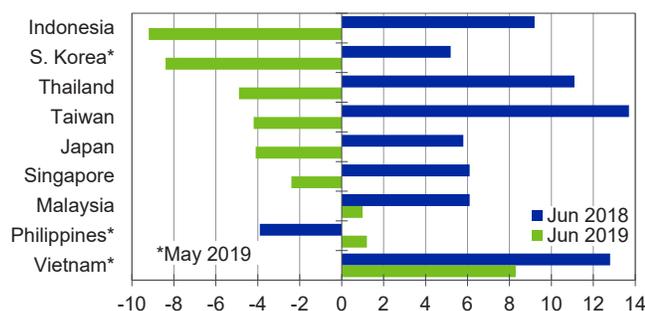
Similar to Singapore, South Korea is a bellwether in Asia and the underlying trend is weak. GDP growth is forecast at 2% in 2019 following the 2.7% growth in 2018.

The latest headwind comes from the dispute between South Korea and Japan. The dispute began when a South Korean court ruled that South Koreans who were forced labourers for Japanese firms during WWII can sue for compensation today. Japan's occupation of the Korean Peninsula from 1910-1945 remains a deeply sensitive issue.

Japan's cabinet approved a proposal to take South Korea off its "white list" of

Chart 7: Faltering Exports

Total exports, 3-mo MA, % change yr ago



Sources: National statistical agencies, Moody's Analytics

trusted export destinations. This removes South Korea from a list of 27 trading partners for which export approvals are fast-tracked. There is hope that cooler heads will prevail, as South Korea's removal from Japan's white list will not take effect until 28 August. Japan and Korea are adding to the list of countries that are using trade weapons in fighting other battles. This is a damaging strategy and comes at a fragile time for the global economy. Japan has already restricted access to three critical components used in Korean tech manufacturing. Alternate sources are scarce and could have significant ripple effects on global tech supply chains.

The Bank of Korea responded to domestic and offshore weakness with a cut in its key policy rate to 1.5% from 1.75% in July. Drivers for easier monetary settings included weak external demand due to the U.S.-China trade war, the slowdown in global growth, a downturn in the tech cycle, lacklustre employment growth domestically, and concerns over consecutive sizeable hikes in the minimum wage in recent years. The fragile state of consumer sentiment is a good barometer of how households are feeling the heat. The consumer sentiment index for July dropped to 95.9, its weakest since November. Sentiment has been below the neutral 100 mark since May.

The strong baht is problematic

The outlook for Thailand's economy has dimmed with weaker external conditions. Thailand's economy is forecast to grow by 3.4% in 2019 and 3.9% in 2020 following the 4.1% lift in 2018. In addition

to weaker export conditions, sluggish growth in rural incomes alongside impediments to public investment are hurting the growth picture.

The Bank of Thailand joined the easing bandwagon earlier than expected. The Monetary Policy

Committee in August voted 5-2 to cut rates. The strength of the baht appeared to be the primary driver. The BoT had only recently stated that easing policy would not do much for the baht given that real interest rates were already low, but with so many central banks in Asia and farther abroad turning even more dovish, the BoT apparently felt backed into a corner.

Easier monetary settings do not address the underlying reasons for the strong baht, including the rising current account surplus and hefty foreign reserves, both attractive to investors in the jittery global environment. Taiwan and South Korea also run current account surpluses, but their currencies have not had the same strength given their perceived greater adverse exposure to the trade war, particularly as any sort of near-term resolution seems remote.

Malaysia's export weakness

Malaysia's GDP growth is on a similar slowing trajectory. GDP growth is forecast to hit 4.5% in 2019 after 4.7% in 2018 and 5.7% in 2017. Malaysia's export sector has struggled amid weakness in the global tech cycle and commodity prices. The outlook for oil prices does not suggest meaningful relief, as Malaysia is a net oil exporter. Moody's Analytics forecasts West Texas Intermediate crude oil to hold broadly steady around its current levels, keeping pressure on government revenues.

In 2018, the government abandoned its earlier fiscal deficit target of 2.8% of GDP, later targeting a deficit of 3.7% for the year. The government hopes to lower the deficit

to 3.4% in 2019, which could prove a challenge given the narrower sales and services tax. Strained public finances are likely to undermine public investment, which is expected to remain on the weak side in 2019.

Private consumption was a key driver of GDP growth in 2018 thanks to continued wage and employment growth. Moody's Analytics expects private consumption to remain solid into 2020. An additional lift to domestic demand is coming from the government restarting a number of projects related to China's Belt and Road Initiative after reportedly negotiating more favourable terms. This will help lift fixed investment through 2020, with positive spillovers to the broader economy.

The Philippines was bruised in 2018

The Philippines emerged from 2018 bruised. GDP growth hit 6.2% in 2018, its weakest pace in three years. A number of factors conspired to weaken economic activity in 2018. Although, President Rodrigo Duterte's Build Build Build program promises to improve infrastructure, which has long undermined the country's growth potential. Duterte aims to lift infrastructure spending to 7.4% of GDP by 2022 from less than 3% under prior administrations. As of November, 44 out of 75 major infrastructure projects were being implemented, with 11 in the construction phase. By 2022, 31 projects worth about US\$9.8 billion are expected to be completed.

GDP growth in the Philippines was damaged through the first half of 2019 by delays to the passing of the 2019 budget, which caused hefty disruption to public construction. Agriculture has also been weak as poor growing conditions related to El Niño have hurt the planting season. These impediments have now eased, but the government's goal of 6% to 7% growth in 2019 is optimistic and the Moody's Analytics forecast sits at 5.8%.

Increased support to consumption, which has held up relatively well this year, will come from the Bangko Sentral ng Pilipinas easing monetary policy. An earlier hurdle to the BSP easing policy this year was inflation, but that has now abated. Inflation has been

broadly cooling since its 6.6% peak in October and is now within the central bank's 2% to 4% target range (see Chart 8).

We expect the central bank to continue reversing some of the 175 basis points of hikes implemented in 2018, with a cumulative 75 basis points of interest rate reductions in the baseline. Easier monetary settings will help ensure the Philippines remains one of Asia's fastest-growing economies this year, with a 5.8% expansion forecast.

Bank Indonesia treading carefully

Although Indonesia's economic outlook is also less favourable now due to the heightened global uncertainty, growth prospects remain positive thanks to strength in domestic demand. GDP growth is forecast to slow to 5% in 2019 from 5.2% in 2018. Continued infrastructure spending should help sustain fixed investment growth, as will partially reversing earlier monetary tightening.

There was a sizeable jump in government spending in the June quarter compared with a year earlier. This was on the back of a jump in the number of civil servants as well as higher procurement spending due to the April general elections, the world's largest one-day elections, whereby 190 million Indonesians headed to the polls across the archipelago. The election boost also showed up in a spike of nonprofit institutions serving households, which was up 15.3% y/y in the June quarter.

President Joko Widodo has optimistic plans for his second five-year term, including liberalising the labour market and stepping up infrastructure spending, the latter of which was seen as a primary disappointment

in his prior term. Though there was improvement, it fell short of expectations. Given that various impediments to improved infrastructure remain, including land acquisition and local government regulatory requirements, Moody's Analytics does not forecast a material improvement in potential growth, especially to the elusive 7% goal that Widodo set at the beginning of his first term in 2014.

Indonesia is less integrated in Asia's supply chain, so it has not been as hurt by the disruption resulting from the trade war, but it has been far from immune. In particular, its exports slumped 1.8% y/y in the June quarter, with a key drag being oil and gas shipments, which fell 31% y/y. This is a consequence of the cyclical downswing in global demand that has been exacerbated by the trade war. It has also damaged Indonesia's external position, particularly given the slump in prices for key commodities, including palm oil, which have been weak for months.

BI reduced its policy rate by 25 basis points to 5.75% at its July meeting. The bank had flagged in the lead-up to the meeting that easing was on the cards, but it was looking for the right time given its preoccupation with maintaining external stability, a credible endeavor.

BI was amongst the most active emerging market central banks in 2018 in trying to stem capital outflows, and an important lever was lifting the policy rate by 175 basis points. Its aggressiveness was warranted, since Indonesia was one of the hardest-hit in Asia by emerging market assets falling out of favour due to several vulnerabilities. In particular, foreigners account for almost 40% of Indonesian government bonds, so when emerging markets were

less attractive as central banks in major developed markets looked to continue normalising policy, foreigners exited Indonesia with a vengeance, causing bond yields to surge and the rupiah to slump at times to its lowest level in 20 years. The adverse swing in sentiment that caused the exchange rate slump also widened the current account deficit, further exacerbating Indonesia's vulnerability to adverse swings in investor appetite (see Chart 9).

Case study: Trade war and Vietnam

The trade war between the U.S. and China has led to a reordering of global supply chains as manufacturers work to circumvent tariffs. More than two-thirds of world trade occurs via global supply chains, according to the World Bank, and the disruption to the status quo from the world's two largest economies lobbying tariffs at one another has been significant.

The trend of Chinese manufacturers moving parts of their operations to Southeast Asia has accelerated since the trade war began. First, these economies are not subject to U.S. tariffs. Second, the structural features of the economies are appealing. Business environments are generally becoming more favourable and operating costs are lower, especially for labour. For instance, Thailand and Malaysia have seen an increase in auto production in the past year, while Vietnam has seen an increase in rubber, electronics and textiles production. The ASEAN-China trade agreement, which came into force for goods in 2005 and for services in 2007, facilitates this transition, as does the agreement with the EU, which came into effect in 2007.

Chart 8: The Philippines' Cooling Inflation

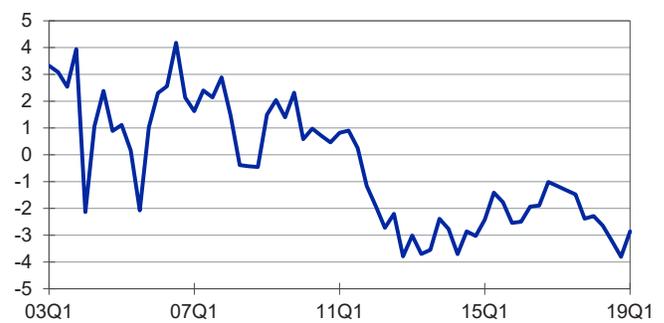
CPI, % change yr ago



Sources: Philippine Statistics Authority, Moody's Analytics

Chart 9: Indonesia's CAD Is a Vulnerability

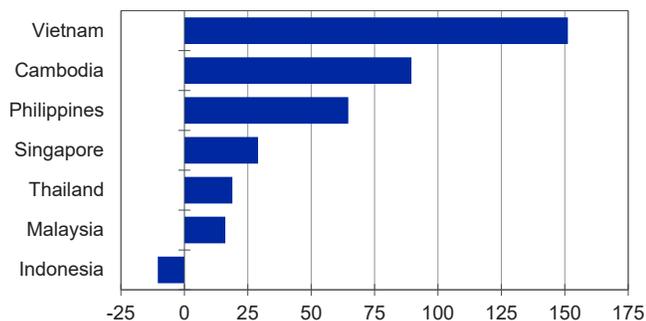
Current account deficit to GDP, %



Sources: Statistics Indonesia, Moody's Analytics

Chart 10: Tariffs Hasten Supply-Chain Shift

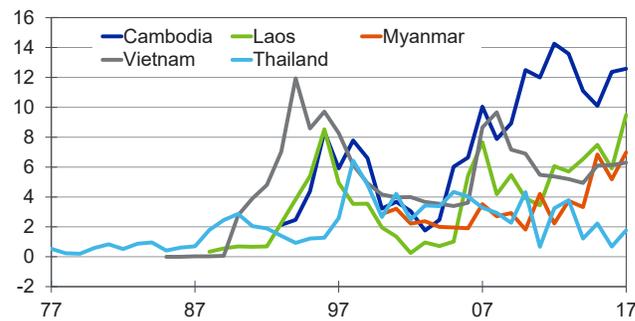
Import content of Chinese exports, % change, 2010 to 2015



Sources: OECD, Moody's Analytics

Chart 11: Southeast Asia Attractive for FDI

Foreign direct investment, net inflows as % of GDP



Sources: World Bank, Moody's Analytics

The agreement extends beyond eliminating tariffs and seeks to address barriers that are behind the scenes to facilitate the flow of goods and services.

Prior to the trade war, Vietnam was already closely tied to China. China is a key trading partner and large source of foreign direct investment. A growing proportion of Vietnam's exports are initially from intermediate goods imports from China (see Chart 10).

Vietnam is attractive due to its relatively low-cost, young and large working-age population. It has been able to slowly move up the value chain, helped by its increasingly well-educated workforce. The government has been proactive in creating price stability (after a history of high inflation) and improving its external position to maintain its attractiveness to offshore firms. Few restrictions on foreign investment and ongoing foreign ownership are noteworthy. Although there are caps on foreign investment in local banks, the government can waive caps on a

case-by-case basis. Investors can be considered for tax holidays and reductions. Ease of doing business has improved in recent years, according to the World Bank.

Vietnam's FDI in context

Vietnam's relative attractiveness spills over to solid foreign direct investment. As a proportion of GDP, foreign direct investment was at 6% in 2017, the World Bank's latest datapoint (see Chart 11). Foreign direct investment pledges for new projects, increased capital, and stake acquisitions (a gauge of future foreign direct investment) were up almost 70% y/y over the same period. The manufacturing and processing industry is the largest single recipient, representing almost 72% of total pledges.

Cambodia's foreign direct investment as a proportion of GDP has been larger than Vietnam's in recent years, according to the World Bank. Compared with Vietnam, foreign direct investment into Cambodia is in lower-value-added manufacturing, with garment manufacturing and agriculture being large recipients.

The service industry, including tourism, is a growing market. Sources of foreign direct investment are typically from within Asia, including China, Malaysia and Thailand.

Apart from Cambodia's low operating costs, other key incentives for foreign

direct investment include few restrictions on foreign ownership of companies and tax incentives such as a corporate tax holiday of up to eight years, a 20% corporate tax rate after the incentive period ends, and duty-free imports of capital goods. Cambodia's attractiveness (particularly to China) during the trade war is increased by the U.S.-Cambodia free trade agreement, effective from 2006. The agreement allows favourable terms with the U.S., including having its exports to the U.S. exempt from tariffs.

Limits looming

Vietnam's attractiveness as an alternate manufacturing destination has a limit. Vietnam's labour costs are rising, although they remain relatively low compared with those of others, including China, Malaysia and Thailand (see Chart 12). Also, rising land costs are constraining Vietnam's ability to continue absorbing foreign investment.

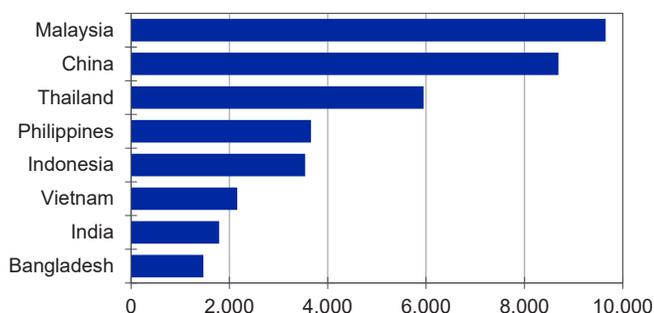
Meanwhile, pressure on Vietnam's infrastructure is rising with increased bottlenecks. This has included increased travel times due to congestion and energy constraints, including for electricity. The government cannot keep pace to increase capacity for ports, transport links and power plants.

Fortunes could sour in a tweet

Vietnam has been an attractive alternate destination for manufacturers in China given it is not subject to U.S. tariffs. This could all change in a tweet from President Donald Trump, who has announced other key foreign trade moves on that platform. There is a risk that the U.S. could take action against Vietnam

Chart 12: Relatively Low Labour Costs

Avg annual income, \$



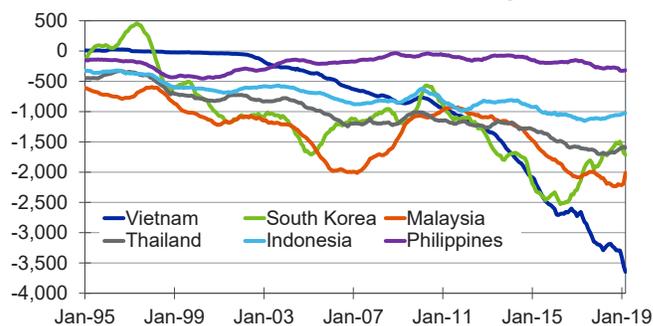
Sources: WorldData.info, Moody's Analytics

as well. The merchandise trade deficit that the U.S. runs with China has been a particular focus of the Trump administration and the trade deficit with Vietnam has steadily increased, making Vietnam vulnerable to accusations of a one-sided relationship (see Chart 13).

There could also be closer scrutiny around the rules of origin, which allow importers to stamp goods as being from a particular country if they are "substantially transformed." In practice this has proven to be problematic. Anecdotes suggest there is much room for standardization and clarity.

Chart 13: Vietnam's Rising Trade Surplus

U.S. trade balance w/select economies, \$ mil, rolling 12-mo sum



Sources: Census Bureau, Moody's Analytics

About the Authors

Katrina Ell is an assistant director and economist in the Sydney office of Moody's Analytics. Katrina manages the Asia-Pacific edition of Economy.com and is responsible for the research and analysis of economies throughout the Asia-Pacific region. Katrina is regularly quoted by international media such as CNBC, Bloomberg, The Wall Street Journal, Financial Times and Sky News. She previously worked as an analyst at the Australian Prudential Regulation Authority. Katrina received her bachelor's degree in economics (honours) from Macquarie University.

Steven C. Cochrane is chief APAC economist with Moody's Analytics. He leads the Asia economic analysis and forecasting activities of the Moody's Analytics research team, as well as the continual expansion of the company's international, national and subnational forecast models. In addition, Steve directs consulting projects for clients to help them understand the effects of regional economic developments on their business under baseline forecasts and alternative scenarios. Steve's expertise lies in providing clear insights into an area's or region's strengths, weaknesses and comparative advantages relative to macro or global economic trends. A highly regarded speaker, Dr. Cochrane has provided economic insights at hundreds of engagements over the past 20 years and has been featured on Wall Street Radio, the PBS News Hour, C-SPAN and CNBC. Through his research and presentations, Steve dissects how various components of the macro and regional economies shape patterns of growth. Steve holds a PhD from the University of Pennsylvania and is a Penn Institute for Urban Research Scholar. He also holds a master's degree from the University of Colorado at Denver and a bachelor's degree from the University of California at Davis. Dr. Cochrane is based out of the Moody's Analytics Singapore office.

About Moody's Analytics

Moody's Analytics provides financial intelligence and analytical tools supporting our clients' growth, efficiency and risk management objectives. The combination of our unparalleled expertise in risk, expansive information resources, and innovative application of technology helps today's business leaders confidently navigate an evolving marketplace. We are recognized for our industry-leading solutions, comprising research, data, software and professional services, assembled to deliver a seamless customer experience. Thousands of organizations worldwide have made us their trusted partner because of our uncompromising commitment to quality, client service, and integrity.

Concise and timely economic research by Moody's Analytics supports firms and policymakers in strategic planning, product and sales forecasting, credit risk and sensitivity management, and investment research. Our economic research publications provide in-depth analysis of the global economy, including the U.S. and all of its state and metropolitan areas, all European countries and their subnational areas, Asia, and the Americas. We track and forecast economic growth and cover specialized topics such as labor markets, housing, consumer spending and credit, output and income, mortgage activity, demographics, central bank behavior, and prices. We also provide real-time monitoring of macroeconomic indicators and analysis on timely topics such as monetary policy and sovereign risk. Our clients include multinational corporations, governments at all levels, central banks, financial regulators, retailers, mutual funds, financial institutions, utilities, residential and commercial real estate firms, insurance companies, and professional investors.

Moody's Analytics added the economic forecasting firm Economy.com to its portfolio in 2005. This unit is based in West Chester PA, a suburb of Philadelphia, with offices in London, Prague and Sydney. More information is available at www.economy.com.

Moody's Analytics is a subsidiary of Moody's Corporation (NYSE: MCO). Further information is available at www.moodyanalytics.com.

DISCLAIMER: Moody's Analytics, a unit of Moody's Corporation, provides economic analysis, credit risk data and insight, as well as risk management solutions. Research authored by Moody's Analytics does not reflect the opinions of Moody's Investors Service, the credit rating agency. To avoid confusion, please use the full company name "Moody's Analytics", when citing views from Moody's Analytics.

About Moody's Corporation

Moody's Analytics is a subsidiary of Moody's Corporation (NYSE: MCO). MCO reported revenue of \$4.4 billion in 2018, employs approximately 13,100 people worldwide and maintains a presence in 42 countries. Further information about Moody's Analytics is available at www.moodyanalytics.com.

© 2019 Moody's Corporation, Moody's Investors Service, Inc., Moody's Analytics, Inc. and/or their licensors and affiliates (collectively, "MOODY'S"). All rights reserved.

CREDIT RATINGS ISSUED BY MOODY'S INVESTORS SERVICE, INC. AND ITS RATINGS AFFILIATES ("MIS") ARE MOODY'S CURRENT OPINIONS OF THE RELATIVE FUTURE CREDIT RISK OF ENTITIES, CREDIT COMMITMENTS, OR DEBT OR DEBT-LIKE SECURITIES, AND MOODY'S PUBLICATIONS MAY INCLUDE MOODY'S CURRENT OPINIONS OF THE RELATIVE FUTURE CREDIT RISK OF ENTITIES, CREDIT COMMITMENTS, OR DEBT OR DEBT-LIKE SECURITIES. MOODY'S DEFINES CREDIT RISK AS THE RISK THAT AN ENTITY MAY NOT MEET ITS CONTRACTUAL, FINANCIAL OBLIGATIONS AS THEY COME DUE AND ANY ESTIMATED FINANCIAL LOSS IN THE EVENT OF DEFAULT. CREDIT RATINGS DO NOT ADDRESS ANY OTHER RISK, INCLUDING BUT NOT LIMITED TO: LIQUIDITY RISK, MARKET VALUE RISK, OR PRICE VOLATILITY. CREDIT RATINGS AND MOODY'S OPINIONS INCLUDED IN MOODY'S PUBLICATIONS ARE NOT STATEMENTS OF CURRENT OR HISTORICAL FACT. MOODY'S PUBLICATIONS MAY ALSO INCLUDE QUANTITATIVE MODEL-BASED ESTIMATES OF CREDIT RISK AND RELATED OPINIONS OR COMMENTARY PUBLISHED BY MOODY'S ANALYTICS, INC. CREDIT RATINGS AND MOODY'S PUBLICATIONS DO NOT CONSTITUTE OR PROVIDE INVESTMENT OR FINANCIAL ADVICE, AND CREDIT RATINGS AND MOODY'S PUBLICATIONS ARE NOT AND DO NOT PROVIDE RECOMMENDATIONS TO PURCHASE, SELL, OR HOLD PARTICULAR SECURITIES. NEITHER CREDIT RATINGS NOR MOODY'S PUBLICATIONS COMMENT ON THE SUITABILITY OF AN INVESTMENT FOR ANY PARTICULAR INVESTOR. MOODY'S ISSUES ITS CREDIT RATINGS AND PUBLISHES MOODY'S PUBLICATIONS WITH THE EXPECTATION AND UNDERSTANDING THAT EACH INVESTOR WILL, WITH DUE CARE, MAKE ITS OWN STUDY AND EVALUATION OF EACH SECURITY THAT IS UNDER CONSIDERATION FOR PURCHASE, HOLDING, OR SALE.

MOODY'S CREDIT RATINGS AND MOODY'S PUBLICATIONS ARE NOT INTENDED FOR USE BY RETAIL INVESTORS AND IT WOULD BE RECKLESS AND INAPPROPRIATE FOR RETAIL INVESTORS TO USE MOODY'S CREDIT RATINGS OR MOODY'S PUBLICATIONS WHEN MAKING AN INVESTMENT DECISION. IF IN DOUBT YOU SHOULD CONTACT YOUR FINANCIAL OR OTHER PROFESSIONAL ADVISER.

ALL INFORMATION CONTAINED HEREIN IS PROTECTED BY LAW, INCLUDING BUT NOT LIMITED TO, COPYRIGHT LAW, AND NONE OF SUCH INFORMATION MAY BE COPIED OR OTHERWISE REPRODUCED, REPACKAGED, FURTHER TRANSMITTED, TRANSFERRED, DISSEMINATED, REDISTRIBUTED OR RESOLD, OR STORED FOR SUBSEQUENT USE FOR ANY SUCH PURPOSE, IN WHOLE OR IN PART, IN ANY FORM OR MANNER OR BY ANY MEANS WHATSOEVER, BY ANY PERSON WITHOUT MOODY'S PRIOR WRITTEN CONSENT.

All information contained herein is obtained by MOODY'S from sources believed by it to be accurate and reliable. Because of the possibility of human or mechanical error as well as other factors, however, all information contained herein is provided "AS IS" without warranty of any kind. MOODY'S adopts all necessary measures so that the information it uses in assigning a credit rating is of sufficient quality and from sources MOODY'S considers to be reliable including, when appropriate, independent third-party sources. However, MOODY'S is not an auditor and cannot in every instance independently verify or validate information received in the rating process or in preparing the Moody's publications.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability to any person or entity for any indirect, special, consequential, or incidental losses or damages whatsoever arising from or in connection with the information contained herein or the use of or inability to use any such information, even if MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers is advised in advance of the possibility of such losses or damages, including but not limited to: (a) any loss of present or prospective profits or (b) any loss or damage arising where the relevant financial instrument is not the subject of a particular credit rating assigned by MOODY'S.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability for any direct or compensatory losses or damages caused to any person or entity, including but not limited to by any negligence (but excluding fraud, willful misconduct or any other type of liability that, for the avoidance of doubt, by law cannot be excluded) on the part of, or any contingency within or beyond the control of, MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers, arising from or in connection with the information contained herein or the use of or inability to use any such information.

NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, TIMELINESS, COMPLETENESS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OF ANY SUCH RATING OR OTHER OPINION OR INFORMATION IS GIVEN OR MADE BY MOODY'S IN ANY FORM OR MANNER WHATSOEVER.

Moody's Investors Service, Inc., a wholly-owned credit rating agency subsidiary of Moody's Corporation ("MCO"), hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by Moody's Investors Service, Inc. have, prior to assignment of any rating, agreed to pay to Moody's Investors Service, Inc. for appraisal and rating services rendered by it fees ranging from \$1,500 to approximately \$2,500,000. MCO and MIS also maintain policies and procedures to address the independence of MIS's ratings and rating processes. Information regarding certain affiliations that may exist between directors of MCO and rated entities, and between entities who hold ratings from MIS and have also publicly reported to the SEC an ownership interest in MCO of more than 5%, is posted annually at www.moody's.com under the heading "Investor Relations — Corporate Governance — Director and Shareholder Affiliation Policy."

Additional terms for Australia only: Any publication into Australia of this document is pursuant to the Australian Financial Services License of MOODY'S affiliate, Moody's Investors Service Pty Limited ABN 61 003 399 657AFSL 336969 and/or Moody's Analytics Australia Pty Ltd ABN 94 105 136 972 AFSL 383569 (as applicable). This document is intended to be provided only to "wholesale clients" within the meaning of section 761G of the Corporations Act 2001. By continuing to access this document from within Australia, you represent to MOODY'S that you are, or are accessing the document as a representative of, a "wholesale client" and that neither you nor the entity you represent will directly or indirectly disseminate this document or its contents to "retail clients" within the meaning of section 761G of the Corporations Act 2001. MOODY'S credit rating is an opinion as to the creditworthiness of a debt obligation of the issuer, not on the equity securities of the issuer or any form of security that is available to retail investors. It would be reckless and inappropriate for retail investors to use MOODY'S credit ratings or publications when making an investment decision. If in doubt you should contact your financial or other professional adviser.

Additional terms for Japan only: Moody's Japan K.K. ("MJKK") is a wholly-owned credit rating agency subsidiary of Moody's Group Japan G.K., which is wholly-owned by Moody's Overseas Holdings Inc., a wholly-owned subsidiary of MCO. Moody's SF Japan K.K. ("MSFJ") is a wholly-owned credit rating agency subsidiary of MJKK. MSFJ is not a Nationally Recognized Statistical Rating Organization ("NRSRO"). Therefore, credit ratings assigned by MSFJ are Non-NRSRO Credit Ratings. Non-NRSRO Credit Ratings are assigned by an entity that is not a NRSRO and, consequently, the rated obligation will not qualify for certain types of treatment under U.S. laws. MJKK and MSFJ are credit rating agencies registered with the Japan Financial Services Agency and their registration numbers are FSA Commissioner (Ratings) No. 2 and 3 respectively.

MJKK or MSFJ (as applicable) hereby disclose that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by MJKK or MSFJ (as applicable) have, prior to assignment of any rating, agreed to pay to MJKK or MSFJ (as applicable) for appraisal and rating services rendered by it fees ranging from JPY200,000 to approximately JPY350,000,000.

MJKK and MSFJ also maintain policies and procedures to address Japanese regulatory requirements.