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2017 economic and market outlook: Stabilisation, not stagnation

- By late 2016, market sentiment had quickly shifted from an overly pessimistic outlook of cyclically weak stagnation toward an overly optimistic expectation of a growth acceleration. Both views are incorrect.

- Global growth should stabilise, not stagnate. Ever-tightening labor markets should place modest upward pressure on otherwise low inflation. And further monetary stimulus (i.e., negative interest rates) will prove unproductive in spurring unlevered growth. Global bond yields are unlikely to rise materially higher until the major economies address structural impediments to higher productivity growth. The risks to the consensus outlook vary notably across markets.

- Vanguard's outlook for portfolio returns is modest compared with the heady returns experienced since the depths of the Global Financial Crisis. This guarded, but not bearish, outlook is unlikely to change until we see a combination of higher short-term rates and more favorable valuation metrics. In some ways, the investment environment for the next five years may prove more challenging than the previous five, underscoring the need for discipline, reasonable expectations, and low-cost strategies.

Lead authors

Joseph Davis, Ph.D.
Global Chief Economist

Roger A. Aliaga-Díaz, Ph.D.
Chief Economist, Americas

Peter Westaway, Ph.D.
Chief Economist, Europe

Qian Wang, Ph.D.
Chief Economist, Asia-Pacific

Andrew J. Patterson, CFA
Senior Economist

Harshdeep Ahluwalia, M.Sc.
Senior Investment Strategist

Editorial note

This publication is an update of Vanguard's annual *Economic and Investment Outlook*. We present our economic and market perspectives for 2017 for key economies around the globe. Aided by Vanguard Capital Markets Model® simulations and other research, we also forecast future performance for a broad array of fixed income and equity asset classes.

Acknowledgements

Vanguard Investment Strategy Group

Vanguard Global Economics Team

Joseph Davis, Ph.D.
Global Chief Economist

Americas

Roger A. Aliaga-Díaz, Ph.D.
Chief Economist, Americas

Jonathan Lemco, Ph.D.

Harshdeep Ahluwalia, M.Sc.

Joshua M. Hirt

Vytautas Maciulis, CFA

Zoe B. Odenwalder

David Pakula, CFA

Andrew J. Patterson, CFA

Christos Tasopoulos, M.Sc.

Ravi Tolani

Matthew C. Tufano

Europe

Peter Westaway, Ph.D.
Chief Economist, Europe

Alexis Gray, M.Sc.

Asia-Pacific

Qian Wang, Ph.D.
Chief Economist, Asia-Pacific

Jessica Mengqi Wu, M.Sc., CFA

Beatrice Yeo

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Notes on asset-return distributions

The asset-return distributions shown here represent Vanguard's view on the potential range of risk premiums that may occur over the next ten years; such long-term projections are not intended to be extrapolated into a short-term view. These potential outcomes for long-term investment returns are generated by the Vanguard Capital Markets Model® (VCMM—see also the description in the Appendix) and reflect the collective perspective of our Investment Strategy Group. The expected risk premiums—and the uncertainty surrounding those expectations—are among a number of qualitative and quantitative inputs used in Vanguard's investment methodology and portfolio construction process.

IMPORTANT: The projections or other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from the VCMM, derived from 10,000 simulations for each modeled asset class. Simulations as of September 30, 2016. Results from the model may vary with each use and over time. For more information, see the Appendix.

Vanguard's distinct approach to forecasting

To treat the future with the deference it deserves, Vanguard believes that market forecasts are best viewed in a probabilistic framework. This publication's primary objectives are to describe the projected long-term return distributions that contribute to strategic asset allocation decisions and to present the rationale for the ranges and probabilities of potential outcomes. This analysis discusses our global outlook from the perspective of an Australian investor with a dollar-denominated portfolio.

Global outlook summary

Global economy: *Stabilisation, not stagnation*

Since the end of the Global Financial Crisis, economic growth has fallen short of historical averages and consistently disappointed policymakers. Deflationary shocks have roiled the markets, and much of the world's bond market offers negative yields. Some analysts still believe the world is headed for Japanese-style secular stagnation. And yet the modest global recovery—at times frustratingly weak—has endured, proving the most ardent pessimists wrong.

With forecasters having downgraded global growth outlooks for at least five consecutive years, we believe that the risks to the consensus outlook of 3% are more balanced this year. We anticipate "sustained fragility" for global trade and manufacturing, given China's ongoing rebalancing and the need for structural business-model adjustments across emerging-market economies. We do not anticipate a Chinese hard landing in 2017, but we are more bearish than consensus on China's medium-run growth prospects.

Our growth outlook for developed markets remains modest but steady. Increasingly sound economic fundamentals supported by U.S. and European policy should help offset weakness in the United Kingdom and Japan. For the United States, 3% GDP growth is possible in 2017, even as job growth cools. Our long-held estimate of 2% U.S. trend growth is neither "new" nor "subpar" when accounting for lower population growth and exclusion of the consumer-debt-fueled boost to growth between 1980 and the Global Financial Crisis.

In Australia, prior headwinds to the growth outlook – falling commodity prices and the ongoing decline in mining capex – appear to have eased over 2016. While this provides an extra boost going into 2017, a full cyclical economic recovery, in our view, is likely to be limited by the peak in dwelling investment. Our base case is, therefore, for growth to center around its trend growth of 2.5-3%.

Inflation: *Global disinflationary forces waning for now*

Many developed economies will struggle to consistently achieve 2% core inflation due to a combination of depressed inflation expectations, excess capacity and structural falls in some prices associated with digital technology and excess commodity capacity in China and elsewhere. That said, some of the most pernicious deflationary forces are cyclically moderating.

U.S. core inflation should modestly "overshoot" 2% in 2017, prompting the U.S. Federal Reserve to raise rates. U.K. inflation is also set to overshoot following the post-Brexit depreciation of sterling. By contrast, euro area inflation will only return to target levels gradually. Similarly, core inflation in Australia will remain subdued, as disinflationary pressures from the labor market continue to dampen wage growth.

Monetary policy and interest rates: *Central banks grapple with their limits*

The U.S. Federal Reserve is likely to pursue a "dovish tightening," raising rates to 1.5% in 2017 while leaving the federal funds rate below 2% through at least 2018.

Elsewhere, further monetary stimulus seems possible, but its benefits may be waning and, in the case of negative interest rates, potentially harmful to the very same credit-transmission channel that monetary policy attempts to stimulate. Even so, the European Central Bank (ECB) and Bank of Japan (BoJ) could yet add to the quantitative easing implemented in 2016.

Domestically, the Reserve Bank of Australia (RBA) is expected to adopt a neutral stance. However, we are hesitant to call the bottom of the easing cycle, given the risks associated with inflation, the peak in construction activity and rising global trade frictions.

Chinese policymakers have the most difficult task of engineering a "soft landing" by lowering real borrowing costs and the real exchange rate without accelerating capital outflows. The margin of error is slim, and policymakers should continue to provide fiscal stimulus to the economy this year to avert a hard landing. The most important policy measure we are monitoring is the pace of reforms for China's state-owned enterprises, which are currently key sources of overinvestment and deflationary excess capacity.

Investment outlook: *Muted, but positive given low-rate reality*

Vanguard's outlook for global stocks and bonds remains the most guarded in ten years, given fairly high equity valuations and the low-interest-rate environment. We don't expect global bond yields to increase materially from year-end 2016 levels.

Bonds. The return outlook for fixed income remains positive, yet muted. The expected long-run median return of the broad taxable fixed income market is centered in the 1%-3% range. It is important to note that we expect the diversification benefits of investment-grade fixed income in a balanced portfolio to persist under most scenarios. As we stated in 2015, even in a rising-rate environment, short duration tilts are not without risks, given global inflation dynamics and our expectations for monetary policy.

Stocks. After several years of suggesting that low economic growth need not equate with poor equity returns, our medium-run outlook for global equities remains guarded in the 6%–9% range. That said, our long-term outlook is not bearish and can even be viewed as a positive when adjusted for the low-rate environment.

Asset allocation. Vanguard's outlook for portfolio returns is modest across all asset allocations when compared with the heady returns experienced since the depths of the Global Financial Crisis. This guarded but not bearish outlook is unlikely to change until we see a combination of higher short-term rates and more favorable valuation metrics. The investment environment for the next five years may prove more challenging than the previous five, underscoring the need for discipline, reasonable return expectations, and low-cost strategies.

Indexes used in our historical calculations

The long-term returns for our hypothetical portfolios are based on data for the appropriate market indexes through September 2016. We chose these benchmarks to provide the best history possible, and we split the global allocations to align with Vanguard's guidance in constructing diversified portfolios.

Australian bonds: Bloomberg Ausbond Composite Index from 1989 through 2004, and Barclays Australian Aggregate Bond Index thereafter.

Global ex-Australia bonds: Standard & Poor's High Grade Corporate Index from 1958 through 1968, Citigroup High Grade Index from 1969 through 1972, Lehman Brothers U.S. Long Credit AA Index from 1973 through 1975, and Barclays U.S. Aggregate Bond Index from 1975 through 1989, Barclays Global Aggregate from 1990 through 2001 and Barclays Global Aggregate Ex AUD Index thereafter.

Global bonds: 50% Australian bonds and 50% Global Ex-Australian bonds.

Australian equities: ASX All Ordinaries Index from 1958 through 1969; MSCI Australia Index thereafter.

Global ex-Australia equities: S&P 500 Index from 1958 through 1969; MSCI World Ex Australia Index from 1970 through 1987; MSCI ACWI Ex Australia Index thereafter.

Global equities: 50% Australian equities and 50% Global Ex-Australian equities.

I. Global economic perspectives

## Global economic outlook: Low growth, not stagnation

Since the end of the Global Financial Crisis, economic growth rates have fallen short of historical norms (see **Figure I-1a**), and interest rates have hovered at historical lows (**Figure I-1b**) despite increasingly high levels of debt (**Figure I-1c**). A significant share of the world's government bonds have negative yields. With 80% of the world economy at full employment, wages have nevertheless continued to stagnate, and income inequality has reached new highs in developed markets (**Figure I-1d**).

Policymakers' aggressive efforts to boost growth and counteract deflationary shocks have become exercises in disappointment. Stubbornly low growth has raised
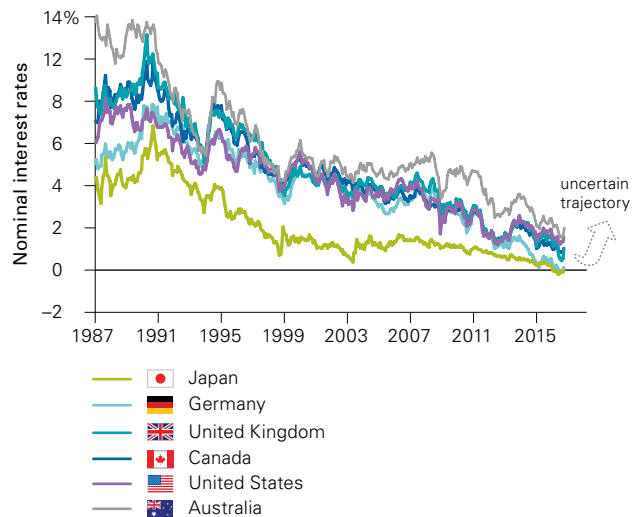
Figure I-1. The global economic backdrop
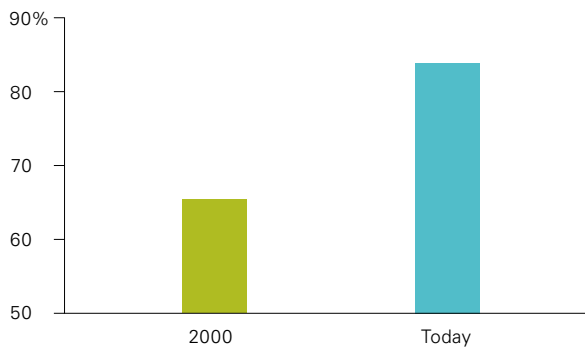
a. Low growth persists across the globe
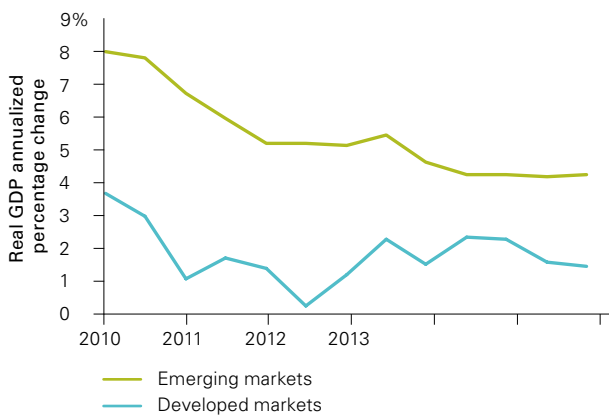
Source: Vanguard calculations based on data from the International Monetary Fund (IMF) *World Economic Outlook* (2016).

b. Interest rates remain low, but may have bottomed

Source: Vanguard calculations based on data from Bloomberg.

c. Debt levels have risen

Source: Vanguard calculations based on data from the IMF *World Economic Outlook* (2016).

d. Income inequality in developed markets continues to climb
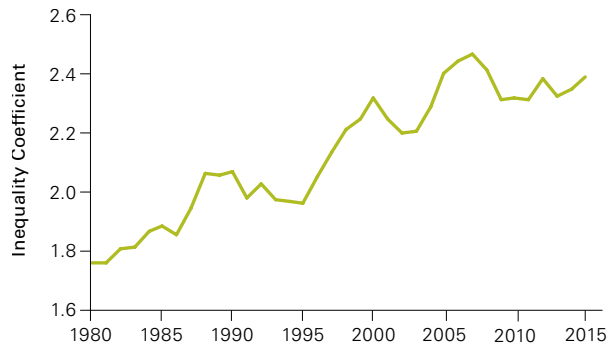
Notes: Income inequality is measured by the inverted Pareto Lorenz coefficient of the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States).

Source: Vanguard calculations based on data from The World Wealth and Income Database and the IMF *World Economic Outlook* (2016).

concerns that the global economy is settling into a Japanese-style secular stagnation. We believe these concerns reflect a misunderstanding of the structural forces that have shaped growth, inflation, and interest rates and will continue to do so in the years ahead.

As in past versions of Vanguard's Economic and Investment Outlook (see the 2015 and 2016 editions), we maintain that depressed growth and interest rates reflect deeper structural trends that have been shaping the global economy for at least four decades (see Figure I-2):
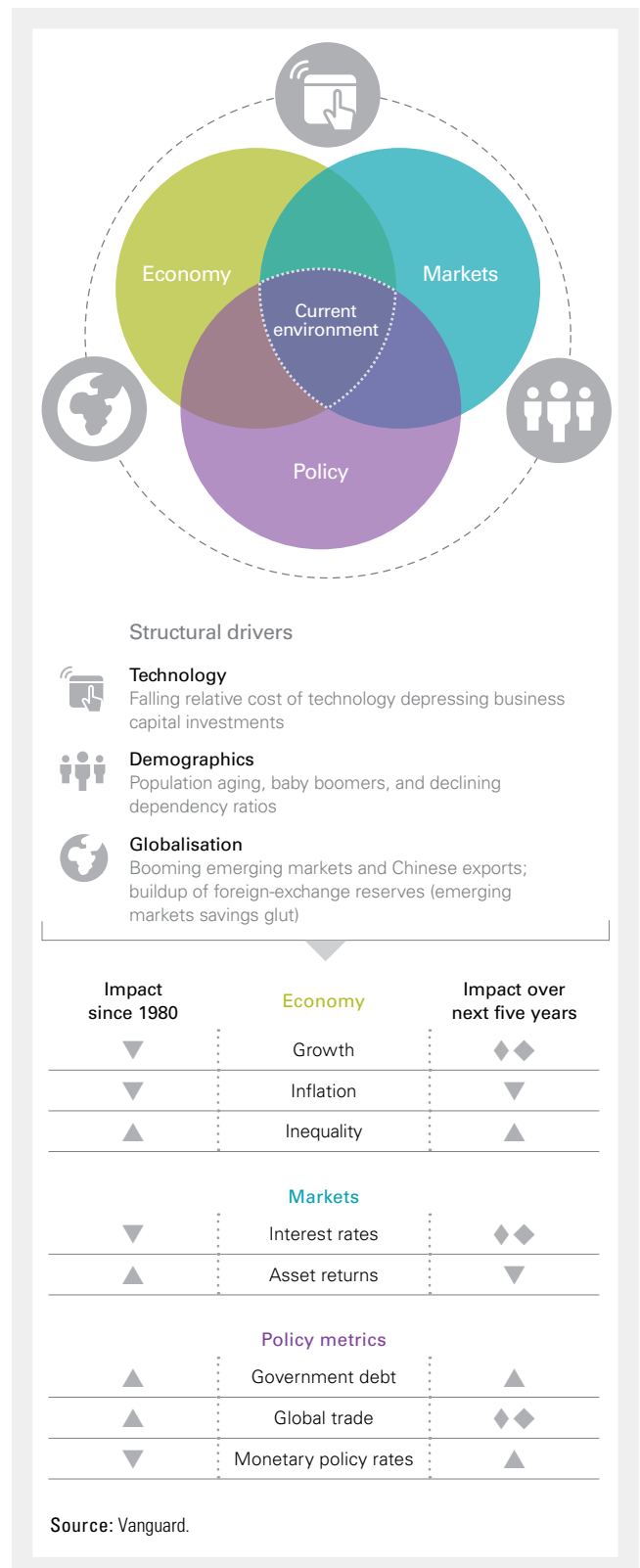
- unfavorable demographics,

- expanding globalisation, and

- the waves of technological disruption and challenges of a burgeoning digital economy.

Not only do these structural forces provide a coherent explanation of pre-crisis growth trends and world interest rates, but they also can reconcile currently low growth rates with full employment in most developed markets. And, although a secular stagnation view hinges on global demand weakness and thus calls for more monetary or fiscal policy stimulus, a structural view provides an intuitive explanation for the increasing ineffectiveness of such policies.[1]

In the near term, those structural drivers will continue to restrain global growth. Although the deleveraging cycles in the developed economies—including the United States, Japan, and Europe—are largely or halfway done, the story is different in emerging markets. Many emerging markets have accumulated significant debt over the past decades and have barely started the deleveraging process. Meanwhile, the influence of unfavorable demographics and weaker productivity growth is unlikely to be reversed soon.

Central banks across the globe have reached a critical stage. They're bumping up against the limits of monetary policy, which is generating diminishing benefits and increasing risks (see *Vanguard Global Macro Matters— Monetary Policy Is (Barely) Carrying the World*, 2016). As policymakers recognise that strategies such as negative interest rates are an insufficient response to forces that are neither cyclical nor a reflection of weak demand, they will withdraw the exceptional stimulus, nudging interest rates higher.

Figure I-2. Long-term structural forces intersect to shape growth, policy, and interest rates

Structural drivers

Technology
Falling relative cost of technology depressing business capital investments

Demographics
Population aging, baby boomers, and declining dependency ratios

Globalisation
Booming emerging markets and Chinese exports; buildup of foreign-exchange reserves (emerging markets savings glut)

Impact since 1980	Economy	Impact over next five years
▼	Growth	◆◆
▼	Inflation	▼
▲	Inequality	▲
	Markets	
▼	Interest rates	◆◆
▲	Asset returns	▼
	Policy metrics	
▲	Government debt	▲
▲	Global trade	◆◆
▼	Monetary policy rates	▲

Source: Vanguard.

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1 Infrastructure spending is an exception, as public investment in infrastructure would be recommended under either view. Under a secular stagnation view, infrastructure spending could provide a short-term demand-side boost no different from any other expansionary fiscal policy. Under our structural view, infrastructure spending could increase the long-term productive capacity of the economy and raise potential labor productivity growth, as well as potential GDP.

The process will unfold at different times in different regions. In the United States, the right course for the Federal Reserve is to continue its "dovish tightening" by raising short-term rates deliberately to 1.5% in 2017 and reducing its long-term rate projections toward 2.5%, a level more consistent with an unlevered-growth world.

In Australia, the Reserve Bank of Australia (RBA) is expected to shift back to the sidelines for an extended period, as a rising terms of trade and concerns over financial stability act as important counterweights to subdued inflation and the forthcoming peak in residential construction.
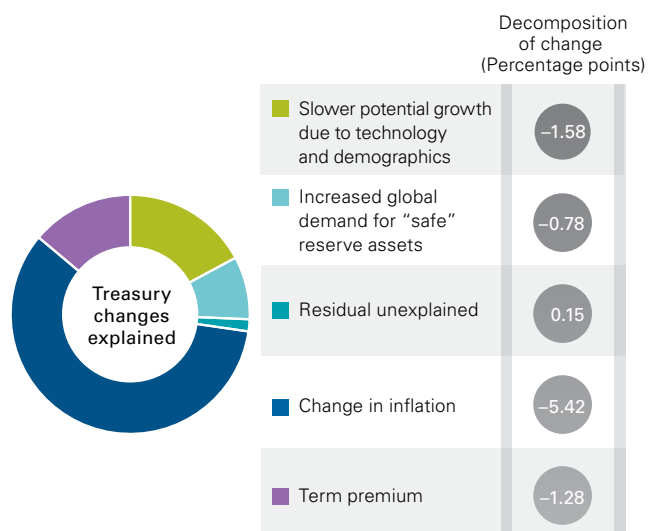
In Japan, where unemployment is already low, the extensive use of aggressive cyclical policies has done little to spur growth or inflation. It may be time to put these policies away and focus on structural issues such as a bifurcated labor market (see *Vanguard Global Macro Matters—Japan: The Long Road Back to Inflation*, 2015). In Europe, by contrast, high unemployment and low capacity utilisation suggest there may still be opportunities for aggressive stimulus to awaken the economy from its cyclical slumber.

However, our outlook for long-term interest rates depends more on the direction of these structural forces than on the next move in central bank policy rates (see **Figure I-3**). When we evaluate the forces' longer-term paths, we see that although they will most likely keep interest rates considerably lower than in the past three decades, these drivers are unlikely to stagnate and remain unchanged. Thus, assuming that long-term yields will remain at their current lows could prove too pessimistic for long-term investors.

We believe that potential global growth could pick up modestly over time. Our expectation is based on the potential for a rebound in productivity growth as new digital technologies are better utilised and a slight recovery in the labor force as the baby boom generation finishes transitioning to retirement. Meanwhile, the combination of an aging population entering the spend-down phase of its investment life cycle (see **Figure I-4a**), the secular slowdown in emerging markets resulting in lower trade surpluses and less accumulation of U.S. Treasury reserves (**Figure I-4b**), and a continued increase in global debt levels (**Figure I-4c**) could put upward pressure on rates. At the same time, the ever-falling cost of technology could serve to anchor both inflation and yields in the long term (**Figure I-4d**).

Figure I-3. Structural forces driving interest rates since 1980s

Percentage of 10-year US Treasury yield change explained by each factor, 1982-2016

Decomposition of change (Percentage points)

Factor	Value
Slower potential growth due to technology and demographics	−1.58
Increased global demand for "safe" reserve assets	−0.78
Residual unexplained	0.15
Change in inflation	−5.42
Term premium	−1.28

Treasury changes explained

Notes: Decomposition of real equilibrium interest rates based on sequential application of three models. First, Williams et al (2016) model used for the two major components of rates: potential GDP growth and Other Real determinants. Second, CBO (2016) estimates to break potential GDP growth effects into its two key elements, potential labor force and potential labor productivity growth. Third, an OLS regression estimate of Other Real Determinants from Williams et al (2016) on various structural drivers listed in Appendix Table A (income inequality, EM savings glut, world demand for USD assets, Dependency ratios, Life expectancy, Effective retirement age, and Developed Markets Government debt).
Source: Vanguard based on Williams et al (2016) and Congressional Budget Office (2016).
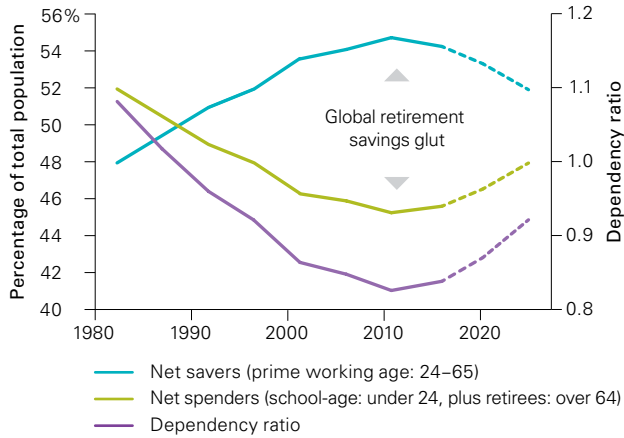
The central tendency of our projections does not include a significant departure from past norms, but world real interest rates somewhere near the 115-year historical range of 0.6%–1.4% are entirely possible in years to come.[2] Despite potentially heightened volatility during the transition from today's extreme levels of policy rates toward modestly higher rates, we remain cautiously optimistic about the long term. An equilibrium interest rate that is positive in inflation-adjusted terms means that investors should be reasonably compensated for saving and investing, justifying our modest, yet positive, long-term real return outlook for cash and bonds.

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2 The 0.6%–1.4% range corresponds to the interdecile range around the historical median estimate of 1%, based on Dimson Marsh Staunton data for real cash rate for the 115-year period 1900–2015.

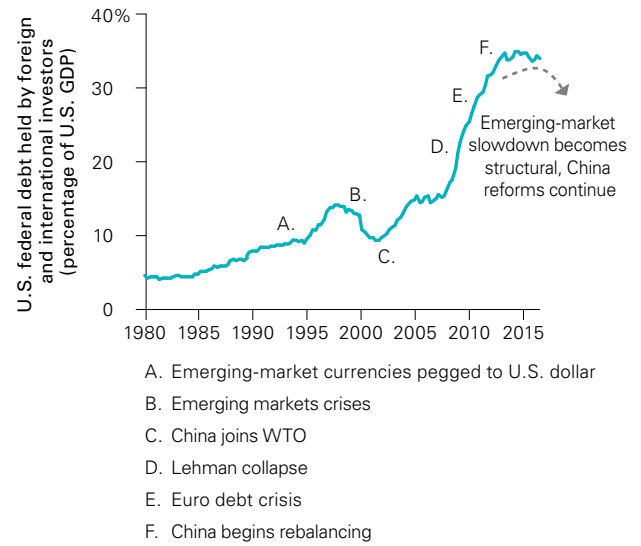# Figure I-4. Structural drivers could nudge interest rates higher

a. Global baby boomers begin to spend net savings

Global retirement savings glut

- Net savers (prime working age: 24–65)
- Net spenders (school-age: under 24, plus retirees: over 64)
- Dependency ratio

Bond yields impact: Next 3 years ♦♦   Subsequent decade ▲

Source: Vanguard calculations based on data from the U.S. Census Bureau.

b. Emerging markets' structural reforms may alleviate global imbalances

Emerging-market slowdown becomes structural, China reforms continue

- A. Emerging-market currencies pegged to U.S. dollar
- B. Emerging markets crises
- C. China joins WTO
- D. Lehman collapse
- E. Euro debt crisis
- F. China begins rebalancing

Bond yields impact: Next 3 years ♦♦   Subsequent decade ▲

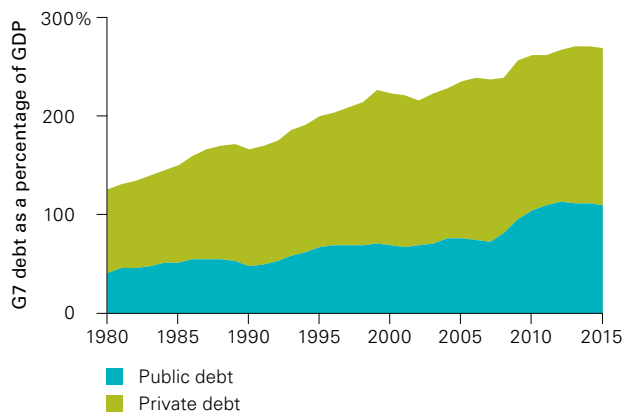Source: Vanguard calculations and U.S. Department of the Treasury.

c. Cheaper technology lowers investment cost
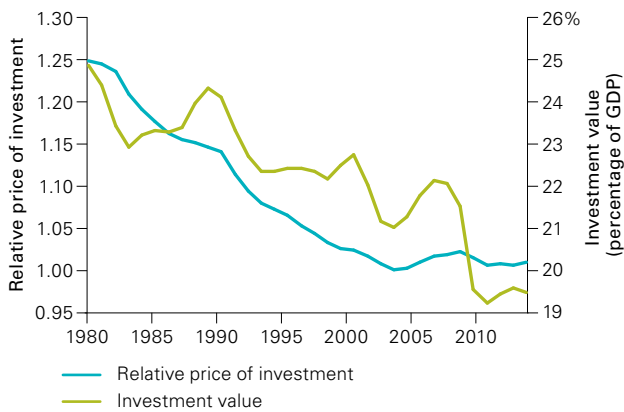
- Relative price of investment
- Investment value

Bond yields impact: Next 3 years ▼   Subsequent decade ▼

Source: Vanguard calculations based on data from the Bureau of Economic Analysis and the IMF.

d. A large debt overhang persists

- Public debt
- Private debt

Bond yields impact: Next 3 years ▲   Subsequent decade ▲

Source: Vanguard calculations based on data from the IMF *World Economic Outlook* (2016) and The World Bank World Development Indicators database.

Global growth outlook: Policy risks on the rise

We expect the global economy to continue growing around its recent trend of about 3%–4% amid geopolitical uncertainties and long-term structural challenges such as slowing productivity growth and demographic headwinds in many advanced economies. Our proprietary global leading indicators dashboard is a statistical model based on over 1,000 economic indicators from 24 countries covering 80% of the world's GDP. As **Figure I-5a** shows, it points to continued modest growth.

Geopolitical and policy uncertainty in developed markets could weigh on sentiment and investment. We expect advanced economies to continue their low-growth trend in 2017. We expect lower but more stable growth to persist in emerging markets. Loose monetary policy, combined with expansionary fiscal policy, should support growth in emerging Asian economies. Growth in
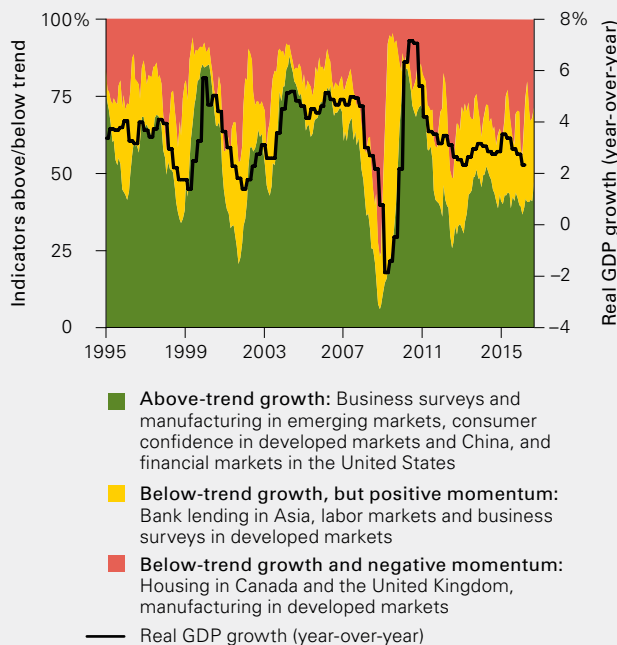
emerging European economies should improve, as Russia may emerge from recession, while Latin American economies may have found a bottom in 2016.

We use our proprietary indicators to estimate a distribution of potential scenarios for global growth in 2017, as shown in **Figure I-5b**. The central tendency falls a bit below the International Monetary Fund (IMF) forecast of 3.4%. The odds of growth falling below the central tendency are higher than the odds of a sustained rebound above 4%.
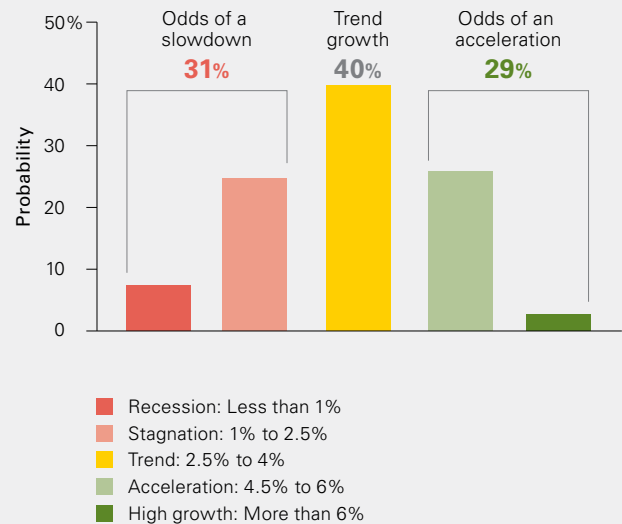
Key tail risks to watch for are policy-related events in developed markets (European elections, Brexit negotiations, and the rollout of a U.S. trade renegotiation agenda) and the geopolitical environment in emerging markets (for instance, unpredictable policies in the Philippines, Russia's foreign policy adventures, political uncertainty in South Africa, and ongoing political and economic uncertainty in Venezuela).

Figure I-5. Vanguard's proprietary economic indicators dashboard implies global growth slightly below consensus

a. Global economic indicators point to modest growth

b. Global growth estimate is slightly below broad expectations

Above-trend growth: Business surveys and manufacturing in emerging markets, consumer confidence in developed markets and China, and financial markets in the United States

Below-trend growth, but positive momentum: Bank lending in Asia, labor markets and business surveys in developed markets

Below-trend growth and negative momentum: Housing in Canada and the United Kingdom, manufacturing in developed markets

— Real GDP growth (year-over-year)

Recession: Less than 1%
Stagnation: 1% to 2.5%
Trend: 2.5% to 4%
Acceleration: 4.5% to 6%
High growth: More than 6%

Note: The distribution of growth outcomes was generated by bootstrapping the residuals from a regression based on a proprietary set of leading economic indicators and historical data estimated from 1990 to 2015 and adjusting for the time-varying trend growth rate.

**Source:** Vanguard calculations based on data from the IMF and Thomson Reuters Datastream.

Australia: Resilient but vulnerable

Over the course of 2016, the Australian economy continued to expand at a moderate pace, as transition drivers, particularly strong growth in dwelling investment, helped offset declines in mining investment (**Figure I-6**).

While none of the growth factors, individually or concurrently, suggests that we are on the cusp of a return to the type of growth rates seen before 2008, they do suggest that the economy continues to rebalance from the downswing in the commodities boom. In particular, we estimate that mining investment is approximately half way down its peak of 8% of GDP and should reach pre-boom levels of 1.5% of GDP by late 2018. Consistently, while mining investment is still expected to subtract from growth over the near term, we estimate that the trajectory after 2017 should be no steeper than what we have been accustomed to in recent years.

Against this backdrop, the Australian economy is expected to center around its current long-term potential of 2.7%[3] in 2017. As **Figure I-7a** illustrates, our
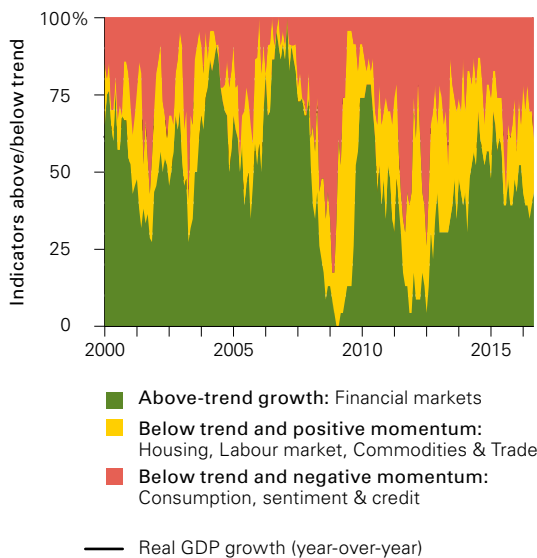
Figure I-6. Dwelling Investment has supported the transition away from mining
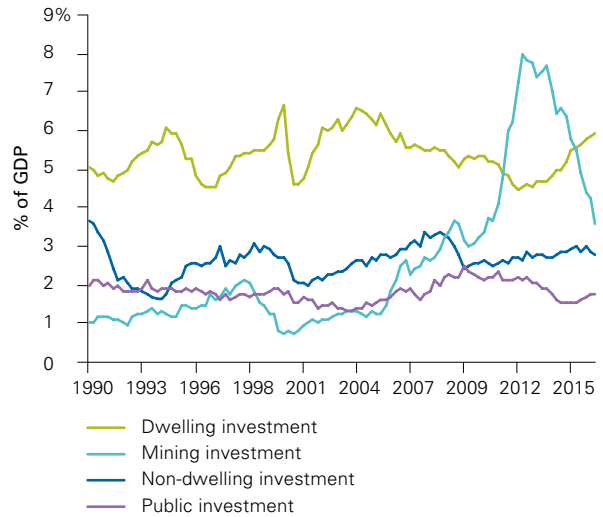
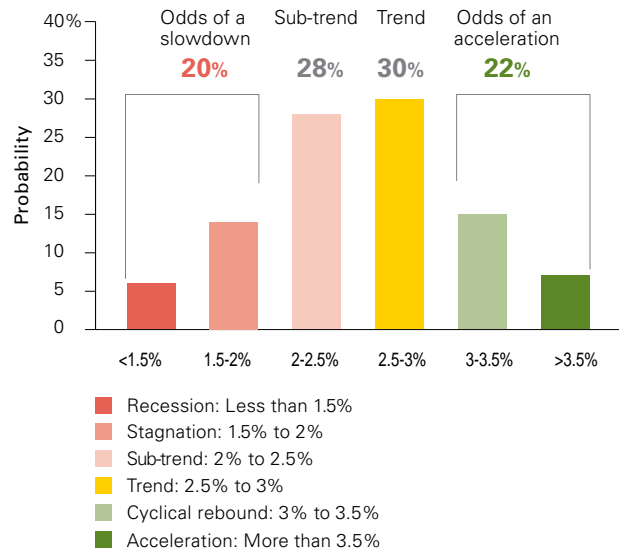Source: Thomson Reuters Datastream and ABS

Figure I-7a. Vanguard's dashboard of leading economic indicators

a. Percentage of leading indicators

Figure I-7b. Vanguard's 2017 Australian economic outlook

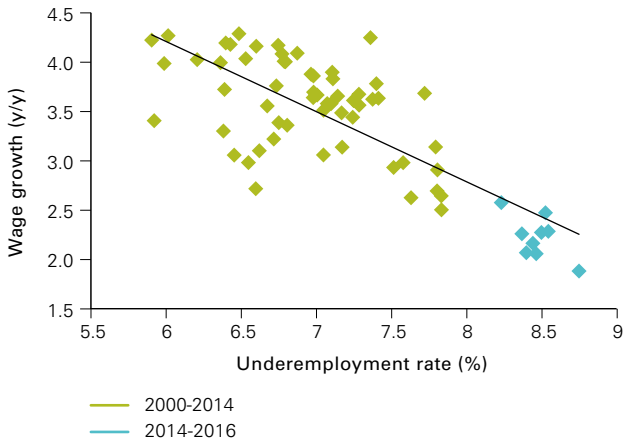b. Estimated distribution of growth outcomes, 2017

Note: Distribution of growth outcomes generated by bootstrapping the residuals from a regression based on a proprietary set of leading economic indicators and historical data, estimated from 1960 to 2016 and adjusting for the time-varying trend growth rate.
Source: Vanguard calculations, based on data from Thomson Reuters Datastream, CEIC, ABS, and the RBA.

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3 Trend growth was estimated using a Cobb-Douglas production function with constant returns to scale. Output was measured by real GDP, labor supply was measured as full-time equivalent employment, and capital stock as real net capital stock for the private and public sectors.

Figure I-8. Wage growth and underemployment

2000-2014
2014-2016

Figure I-9. Mark-up model of inflation

Coefficient of each variable against underlying inflation

Notes: Inflation is determined by current and lagged growth in unit labor costs and import prices, output gap, and bond market inflation expectations. Where multiple lags are included, coefficients shown are the sum of the lags. Sample period is 1993 to 2016.
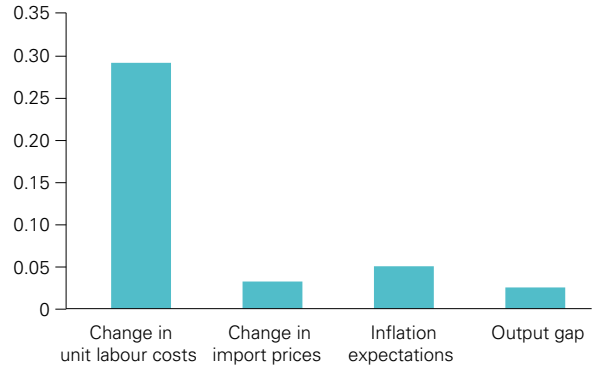
proprietary leading indicators dashboard points toward a stable outlook with moderate downside risks. The most positive leading indicators, the "green signals", are those associated with financial markets. The "yellow signals" derive from the commodity, housing and labor markets as discussed below. The more negative indicators are associated with consumption, sentiment levels and credit, largely reflecting a somewhat subdued outlook for wage growth and a more uncertain economic environment globally.

Using a regression analysis, we mapped our proprietary indicators to a distribution of potential scenarios for Australian economic growth in 2017 (**Figure I-7b**). The odds of a slowdown (20%) are roughly the same as that of the potential for it to accelerate (22%). Our base case is for the economy to center around trend, although moderation to sub-trend growth (2-2.5%) remains a key downside risk (28%) as large resource-related projects progressively get completed and as the residential construction cycle peaks.

In the commodity market, the rise in bulk commodity prices since the beginning of 2016 has been reflected in the increase in the terms of trade following 4 years of significant declines. Although recent spikes in spot prices are expected to partially unwind as temporary disruptions to supply ease, the magnitude of the bulk commodity

price rally, and their combined 55% weighting in the Australia export basket still implies an improved outlook for the terms of trade going forward.

Beyond the trade sector, the recent price dynamics could also have a positive impact on the Federal Budget position. Specifically, the FY2016 Budget revealed that a permanent 10% increase in bulk commodity prices would lift revenues by AUD 2.1 billion in the current fiscal year and by AUD 5.4 billion over the next 2 years. The higher budget outcomes could potentially reduce pressure to achieve near-term fiscal consolidation and lessens the risk that fiscal policy will drag on growth in the near-term.

In the labour market, the unemployment rate has declined a little further over recent months. While this suggests that labor market conditions have continued to improve, broader measures of labor market utilization have indicated otherwise. In particular, following strong growth in late 2015, employment growth has slowed to a more modest pace and the increase in employment since then has been heavily skewed towards part-time jobs, reflecting the rebalancing of activity towards the services sector. Indeed, approximately 45% of employment in household services[4] is part-time while the share for business[5] services is 25%. This compares with a share of just 3% in the mining sector. In line with this compositional change, the underemployment rate has remained elevated over the past year and helps to

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[4] The household services sector includes the accomodation & food, arts & recreation, education and healthcare industries.

[5] The business services sector includes the administration & support, financial & insurance, media & telecommunications, professional, scientific & technical, and real estate industries.

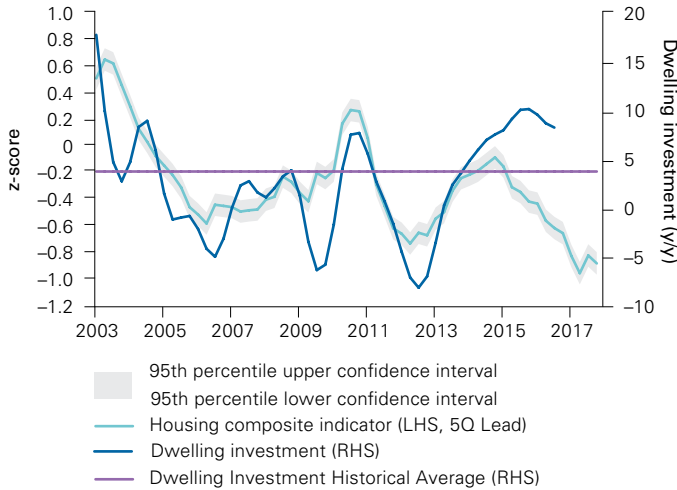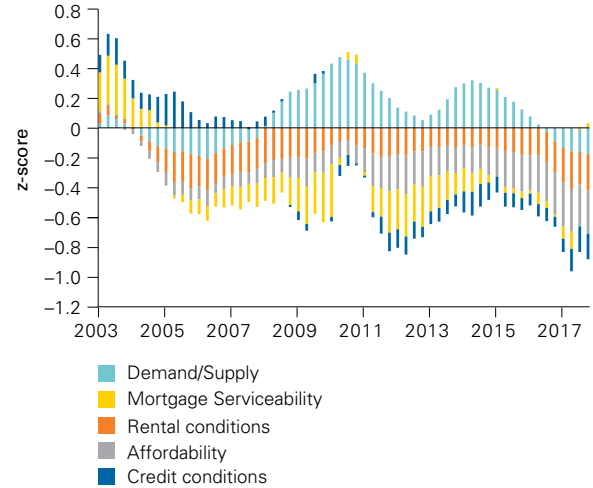Figure I-10a. Percentage of leading indicators

Figure I-10b. Estimated distribution of growth outcomes, 2017

Notes: The housing composite indicator is a z-statistic based composite measure of a number of quarterly variables that proxy the housing market state of play. The variables used include dwelling completions and population growth for the demand & supply factor; family income to average loan repayments for the mortgage serviceability factor; percentage of new loans with a LVR>80 and >90%, percentage of new loans that are interest-only, growth in investor lending for the credit conditions factor; dwelling price to income ratio for the affordability factor and rental yields for the rental conditions factor. Each variable is equally weighted in the indicator. Analysis is done over the period 1991 to 2016.

Sources: Vanguard calculations, based on data from the RBA, ABS and APRA.

explain much of the recent weakness in wage growth (**Figure I-8**). According to our estimate of the mark-up model, which models inflation as a function of import prices, unit labor costs, the output gap and inflation expectations, labor costs are the ultimate determinant of inflation in Australia (**Figure I-9**). Consequently, the weakness in wage growth could imply that underlying inflation will remain below target for some time.

In the housing market, dwelling investment, particularly the construction of higher-density dwellings, continues to grow at an above-average rate (**Figure I-10a**). While the pipeline of residential work is expected to support a high level of dwelling investment for some time, the rate of growth in dwelling investment is expected to moderate over the next two years. In particular, our housing z-score composite indicator, which aggregates five key underlying drivers (Demand/Supply dynamics; credit conditions; mortgage serviceability; affordability; rental conditions) of housing activity foreshadows the downside risk to the outlook for dwelling investment, which correlates highly with prices, over the next 5 quarters[6] (**Figure I-10a**).

As illustrated in **Figure I-10b**, the demand/supply factor has historically supported housing activity, as population growth has typically outpaced dwelling completions. This trend seems to have reversed over the past year, and the imbalance can be seen most clearly in cities with larger

Figure I-11. Housing market state of play

	City			
	Sydney	Melbourne	Brisbane	Perth
House prices (2 year % change)	26%	10%	5%	-2%
Demand/Supply				
Rental conditions				
Mortgage Serviceabilty				
Affordability				

■ > 1 standard deviation deterioration from long run averages
■ < 1 standard deviation deterioration from long run averages
■ Improvement from long run averages

Sources: Vanguard calculations based on data from REIA and the ABS.

6 After running regressions across various quarterly leads, we found that the z-score indicator had the best explanatory power over a 5-quarter lead time period.

exposures to the mining sector. In Perth, for example, the combination of slower population growth following the end of the mining investment boom and high level of dwelling completions in recent years have resulted in a marked deterioration in the demand/supply balance (**Figure I-11**). Consequently, rental vacancy rates have risen sharply and rental yields in Perth have deteriorated by more than 1 standard deviation from its long run average of 4.7% (**Figure I-11**).

Similar concerns have been raised in the apartment markets of Melbourne and Sydney, although the risk is more manageable in our view, as local and foreign[7] demand is still relatively strong, and the sizeable amount of work in the pipeline will likely see house price appreciation moderate from double digit levels to more sustainable growth levels. Instead, we see the near-term risk of a mild correction in apartment prices from increased supply to be the most prominent in inner-city Brisbane, as the more modest price growth suggests that the demand and supply dynamics are already broadly in balance (**Figure I-11**). The increase in the pace of apartment completions could potentially throw out this balance overtime.

Importantly, the transmission effect of low interest rates on housing demand has been limited by the tightening credit conditions imposed by the Australian Prudential Regulation Authority (APRA) (**Figure I-10b**). Meanwhile, the deterioration in affordability, which extent varies across the major capital cities, has also served to ease housing activity (**Figure I-10b**).

Consistent with the moderation in these key leading indicators, we expect housing construction to slow over the next year. However, given the pipeline of work in the apartment sector, growth in dwelling investment is still likely to support overall economic activity, albeit at a gradually declining pace.

From a monetary policy perspective, we expect the Reserve Bank of Australia (RBA) to remain data dependent as they gauge the impact of the two rate cuts delivered in 2016. While a tenuous labour market raises the probability of a rate cut, we think that the Bank's flexible monetary policy framework will allow greater tolerance for the slightly lower inflation outlook for the time being. This is especially so given that our Taylor Rule estimate shows that the current nominal policy rate of 1.5% is accommodative enough (**Figure I-12**).

Figure I-12. Taylor Rule of monetary policy

Actual RBA cash rate versus that indicated by the Taylor rule
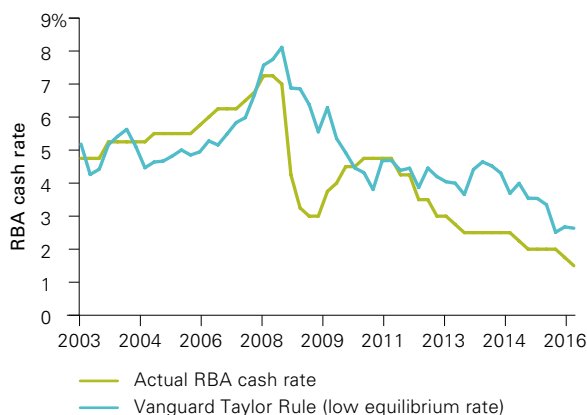
Notes: We specify r* (equilibrium real rate) as a function of the potential growth rate and the world neutral real rate, which we approximated using the real Fed funds rate.
Sources: Vanguard calculations based on data from the ABS and RBA.

Furthermore, concerns over financial stability have increasingly been an important counterweight to subdued inflation under the helm of Governor Lowe. Admittedly, the heat in the housing market has largely been confined to Sydney and Melbourne, but the record high household gearing levels still counts strongly against the RBA providing further cuts until they feel more confident in their judgments around the housing and labor market.

We note that it would also be unusual for the RBA to ease into a positive terms of trade, as the easing cycle has historically bottomed following an upturn in the terms of trade trajectory. At the same time, the downside risk to growth via the peak in dwelling investment makes their decision subject to more than the usual uncertainty. After all, weaker construction activity has historically triggered a new easing cycle (e.g. from 1994-96; 2000-01; 2011-12) unless there are strong offsetting factors, such as in 2004 to 2006, where the RBA continued its tightening cycle despite a slower pace of dwelling investment, as the terms of trade picked up strongly. On balance, we expect these conflicting forces to shift the RBA's stance from its earlier dovish outlook to one that is more cautiously balanced.

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[7] Data from the Foreign Investment Review Board highlights that foreign buyer activity is most concentrated in VIC (44% of foreign residential real estate approvals) followed by NSW (33%).

China: Balancing the risks of its rebalancing

On the back of the aggressive credit extension and infrastructure spending in 2016, economic growth in China has stabilised somewhat, led by a modest recovery of the "old economy" such as metals and real estate (**Figure I-13**). Nonetheless, the protracted slowing trend of recent years is unlikely to be reversed any time soon, given secular and structural drags including industrial overcapacity, unfavorable demographics, and falling productivity growth. Thus, we expect real GDP growth to fall further in 2017, especially as the authorities restrain China's credit growth amid property market restrictions.

Although the official growth target is likely to hover around 6%–7%, underlying indicators are pointing to a 5% "real-feel" growth. The slower pace is also healthier, as the economy would continue to rebalance away from investment and manufacturing toward the "new economy," a consumption and service-driven growth model.

Although market concerns about China's weak growth outlook and elevated debt level could re-emerge, we believe the likelihood of a hard landing is relatively low in the near term, as the debts are largely domestically owned and China has a strong policy buffer to mitigate the downside risk (**Figure I-14**). The policy agenda remains in a "fighting retreat" mode. Recognising the secular and

structural nature of the slowdown, Chinese policymakers are more amenable to a lower but gradual growth trajectory. They would remain vigilant and ready to fight when downside risk emerges, but they would hold off or even withdraw some stimulus when the growth picture stabilises. As such, macroeconomic volatility would stay low in the near term.

The true risk lies in the medium to long term. Policymakers' ammunition could gradually be exhausted, and they have arguably the most difficult task of engineering a soft landing by lowering real borrowing costs and the real exchange rate without accelerating capital outflows.

So far, China has chosen to tighten control on capital outflows. However, this does not offer a permanent solution, and capital account liberalisation remains a crucial part of China's structural reforms. Indeed, without effective market-oriented reforms to ensure that investment spending flows toward the most productive uses of capital, avoiding misallocation and overinvestment in certain sectors, higher financial risk will be pushed into the future.

We believe that China has approached a crossroad in its transition, as it must balance near-term economic and social stability against long-term growth sustainability

Figure I-13. The Chinese economy is experiencing a protracted slowdown and a gradual rebalancing

- Vanguard nowcast
- New economy
- Old economy
- Official real GDP
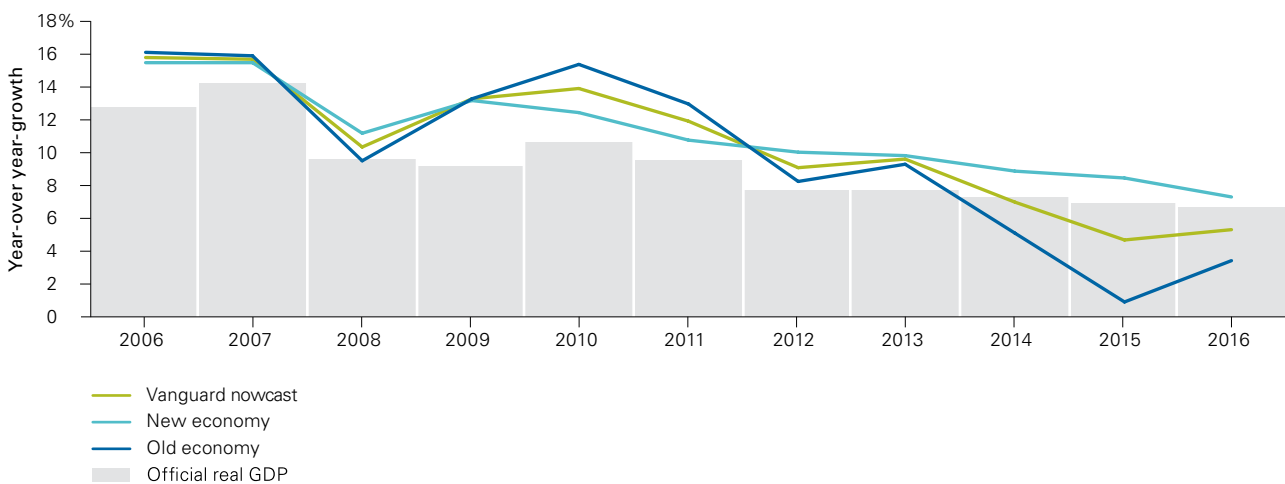
Notes: *New economy* refers to sectors that require higher skill levels and are more private-led and less capital-intensive. *Old economy* refers to sectors that require relatively low skill levels and are more state-led and more capital-intensive. *Vanguard real-feel growth* is the average of the new and old economy indexes, assuming equal weight to the aggregate economy. Data for 2016 represent the simple average from January to September 2016.
Sources: Thomson Reuters Datastream, CEIC Data, Bloomberg, and National Bureau of Statistics of China.

Figure I-14. Most of China's debt is held domestically and has a sufficient near-term policy cushion

	External vulnerability				Domestic policy cushion			
	External debt (% of GDP)	Total reserves (% of GDP)	Current account balance (% of GDP)	Currency peg	Nominal policy rate (%)	Inflation (%)	Fiscal balance (% of GDP)	Government debt (% of GDP)
Average during past emerging markets crises	42.8	7.7	−2.5	Y	27.5	20.6	−1.8	57.8
Worst 25th percentile	52.0	4.0	−3.7	Y	16.0	16.9	−4.1	71.2
China today	15.9	29.6	2.1	N	1.5	1.8	−2.3	43.5

Notes: Emerging markets crises and years are: Brazil in 2002, Hungary, Malaysia, South Africa, Turkey, Indonesia, and South Korea in 1997, Mexico in 1994, Argentina in 2001, and Russia in 1998. Fiscal balance data for Turkey are for 1998. Malaysia central government debt data are for 1995. China nominal policy rate is one-year deposit rate. China fiscal deficit is central government fiscal deficit.
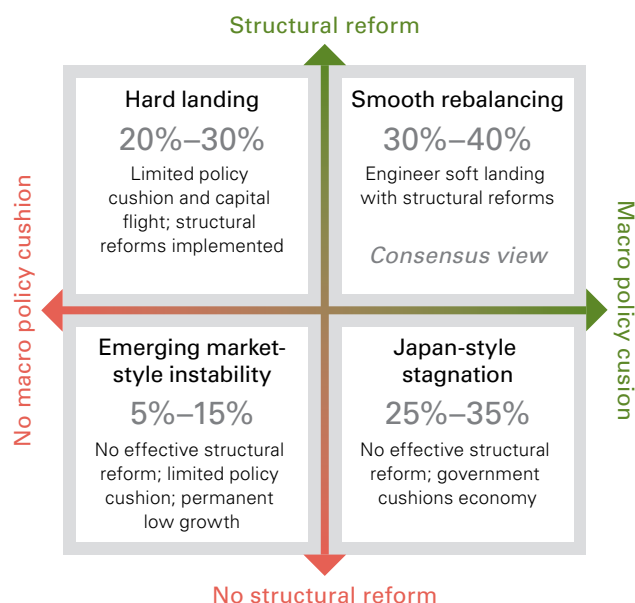
Sources: World Bank, national central banks, national government websites, and Vanguard.

while keeping financial risk at bay. The tension between the short-term policy cushion and the long-term necessity for structural reforms can easily tip China from one scenario to another, including U, V, L, and M. (Each letter represents the shape of a trend line for economic growth. In the U scenario, for example, growth falls, remains low for a period, and then climbs; see **Figure I-15**).

We see an above 50% chance that China will be able to avert a hard landing or a systematic financial crisis down the road, and an above 50% probability that the government will successfully push for structural reforms in a timely manner. Although we are cautiously optimistic about China's future in the long term, the outlook for its economy will be a consequence of many complex, deep-rooted factors both domestic and external that will continue to become clearer with time. Thus, close monitoring of China's development on the economic, financial, policy, and social fronts down the road is warranted.

Although any large-scale stimulus plan appears unlikely in 2017, Chinese authorities are likely to provide some monetary and fiscal support, in a bid to cushion against the downside risks and avert a hard landing. The government could continue to focus on the fiscal side, especially on infrastructure investment through various funding channels, including public-private partnership and policy bank lending, to offset part of the weakness in business spending.

Figure I-15. Four scenarios and probabilities for China's medium-term growth outlook

Structural reform

Hard landing	Smooth rebalancing
20%–30%	30%–40%
Limited policy cushion and capital flight; structural reforms implemented	Engineer soft landing with structural reforms
	Consensus view

No macro policy cushion / **Macro policy cusion**

Emerging market-style instability	Japan-style stagnation
5%–15%	25%–35%
No effective structural reform; limited policy cushion; permanent low growth	No effective structural reform; government cushions economy

No structural reform

Source: Vanguard.

Despite modest RMB depreciation against the USD, the authorities would be more prudent on the monetary front. In particular, the room for further interest rate and required reserve ratio cuts is limited, given higher commodity prices, a housing market rally, an expected U.S. Fed rate hike, and persistent capital outflow pressure. Meanwhile, China's 19th National Party Congress will be held in the second half of 2017; it

concludes the current round of leadership turnover at both the central and local government levels. Hopefully, this could enable the government to lean toward addressing long-term issues rather than focusing on maintaining short-term stability.

Japan: Fighting against looming policy limits

Nearly four years into its bid to reflate the Japanese economy, Abenomics has reached a critical stage as the overreliance on monetary policy has generated diminishing benefits and increasing risks. Despite further asset purchases and the introduction of negative interest rate policy (NIRP) this year, USD/JPY has gained significantly, economic growth remains sluggish and deflation risk is on the rise again (**Figure 16a**).

As authorities remain committed to revive economic growth and inflation, we expect continued monetary easing and fiscal stimulus in 2017. However, those stimulus are likely to remain modest given limited room for policy maneuvering (**Figure 16b**), and their cost effectiveness will be questionable. We expect the economy to grow 0.7% in 2017, slightly above its long-term 0.4% trend, and inflation could recover gradually towards 1%. But any rebound is unlikely to be significant,

Figure I-16. Japan's policymakers are in a dilemma

a. Japan economic fundamentals remain weak…

b. …and further policy easing room is limited

	Real economy							Monetary			Fiscal			
	Real GDP growth	Potential growth	Core Inflation	Inflation expectation	Capital stock per capita	Labor productivity growth	Labor force growth	Central bank asset	CB holding of govt bond	Policy rate	Fiscal balance	Primary balance	Gross public debt	Net public debt
Japan	0.6	0.4	0.2	0.8	158.0	-0.1	1.1	91.6	35.2	-0.1	-5.6	-3.7	249	138
G4 ex JP	1.6	1.6	1.3	1.6	139.7	0.0	1.3	25.2	21.9	0.3	-2.9	-1.1	85.9	80.3

Note: Capital stock per capita for the Eurozone is the data for Germany. Central bank asset as % of GDP for Japan is 2015 data, while for U.S., U.K. and EU, the data is up to Q2 2016. Central bank holding as % of total outstanding data for Japan is up to Q2 2016, for U.S., U.K. and EU is up to September 2016. Primary deficit, gross and net public debt data are 2015 data. Core inflation for Japan, U.S. and U.K. are data in August 2016 while for EU is in September 2016. Inflation expectation is from inflation swaps. Capital stock per capita is in USD thousand based on 2015 price. Labor productivity growth data are from Q2 2016. Labor force growth data for Japan is from August 2016, for U.S. is from September 2016, for U.K. and EU is from Q2 2016. Real GDP growth, policy rate and fiscal deficit as % of GDP are economists' consensus forecasts from the Bloomberg.

The z-score is calculated using the mean and standard deviation of G4 countries. Then the signs are adjusted to match the direction of policy displayed in the above charts. For the real economy bucket, we think higher GDP growth, potential growth rate, core inflation, inflation expectation, labor productivity and labor force growth indicate stronger economic fundamentals and potential. Higher capital stock per capita indicates lower growth potential. For the monetary and fiscal policy buckets, we think higher central bank assets, central bank holding of government bonds, gross and net public debt indicate lower room for further policy easing. But higher policy rate, fiscal and primary balance indicate more policy easing room.

Source: CEIC, Haver, UBS and Vanguard.

given the persistently strong structural headwinds, including a declining and aging population, excessive labor market duality, weak productivity growth and high debt levels. In the absent of meaningful progress on structural reforms, we expect the potential growth to fall further in coming years.

Despite market concerns about a potential BoJ tapering, we expect further easing with an expansion of risky asset purchase such as ETF and J-Reits in 2017. Failing to respond to falling inflation expectation would entail the risk that the BoJ would lose its credibility and eventually its battle against deflation. However, as the BoJ is quickly approaching the limit of its monetary easing, it has to strike a balance between seemingly conflicting goals-- to achieve its 2% inflation target as soon as possible by easing aggressively and to ensure policy sustainability by minimising financial stability side effects. The lack of aggressive moves in 2016, together with the introduction of a new policy framework of "QQE with yield curve control", seems to suggest that the BoJ is leaning towards the latter and ready to fight a long drawn-out battle. As such, the BoJ could take a more gradual and flexible approach in 2017, staying vigilant against potential risks to both inflation outlook and financial stability.

The limited room for monetary easing and its fading effectiveness have tilted the policy focus towards the fiscal side despite the elevated public debt level. After three years of fiscal consolidation, the fiscal stimulus package announced in August 2016 came with an impressive headline number of 28 trillion yen. But only 7.5 trillion represented new spending and will be distributed over the next 3-5 years. Thus, immediate impact on real economic growth in 2017 is likely to remain moderate. In fact, a closer look at Japan's fiscal stimulus programs since early 1990's reveals that they have been increasingly reliant on public consumption rather than investment, with little impact on private investment growth (**Figure I-17**). While public consumption only provides a short-term boost to the economy, research found that the marginal productivity of capital and hence fiscal multipliers for public investment have declined over time in Japan, given the over-investment and the relatively large pre-existing public capital stock.

Figure I-17. Japanese fiscal policy is unlikely to provide a strong boost to private demand
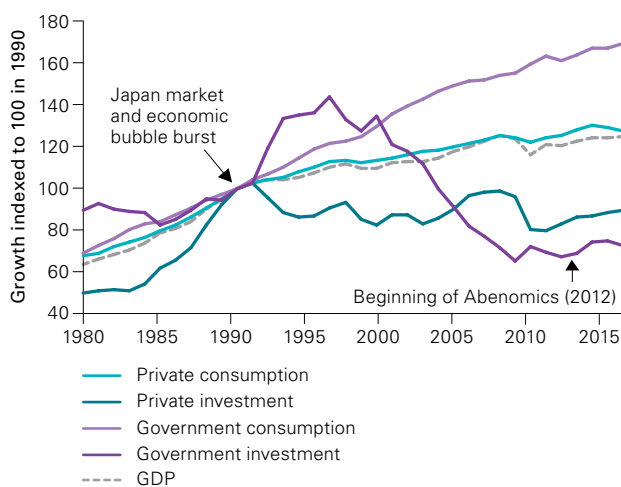
Sources: CEIC Data, Vanguard.

The more radical policy strategy of helicopter money is still on the table and could more effectively change inflation expectations. We view the probability of this occurring as small in the near term because it would entail unpredictable economic risks, legal and political pressure and significant damage to central bank independence and long-term fiscal discipline. The bottom line is, cyclical policies, either on the monetary or fiscal front, are unlikely to offer the right solution to Japan's deeply-rooted problems. More structural reforms, by raising the medium-term growth and inflation expectations, could improve the effectiveness of fiscal and monetary policies. Thus, a better coordination of fiscal, monetary and structural policies is necessary to reflate and revitalise the economy in a sustainable manner. However, near term progress are likely to remain gradual, given concerns for financial stability, elevated government debt levels, objections from vested interest groups and the high level of complacency among the general public. Unless there is a breakthrough on structural reforms, we don't expect to see a significant boost to the growth outlook over the medium term.

United States: Resiliency in the midst of global weakness

In spite of a rocky start to 2016, and even recession fears, the U.S. economy remains firmly on a long-term growth path of about 2% a year. We maintain our longheld view of resiliency for the U.S. economy.

We continue to believe it is important to disentangle the structurally lower trend growth of 2% (compared with 3.25% average growth since 1950) from the shortterm cyclical concerns of a weak economic recovery and the need for more policy responses. As previously mentioned, cyclical policy responses, such as monetary policy, are not well-equipped to influence the economy's structural forces in a meaningful way.

Lower-than-historical growth in the United States is our base case for 2017 and beyond. Such growth, however, should be viewed as fundamentally sound rather than abnormally low after accounting for structurally lower population growth and excluding the consumer debtfueled boost to growth between 1980 and the Global Financial Crisis (see Figure I-6).

With the United States already at full employment, we expect the unemployment rate and other broader measures of labor market slack to remain tight in 2017 (see Figure I-7 on page 12), while the pace of employment growth (currently averaging 180,000 jobs a month) continues to moderate to a level closer to the net flow of entrants to the labor force (80,000–100,000, based on population growth and labor force participation trends).

A slowdown in job growth through 2017 may raise some recession concerns, but a decrease in job growth is expected at this stage of the U.S. business cycle. Under this view, a job-growth slowdown would be offset by a much-needed increase in labor productivity growth, resulting in stable GDP growth in 2017. As productivity increases, workers may continue to experience modest gains in terms of inflation-adjusted wage growth. Core inflation should rise to 2% and wage growth to 3% this year (see Figure I-8a on page 12).

Figure I-18. Debt distorts: Without leverage 2% growth is normal
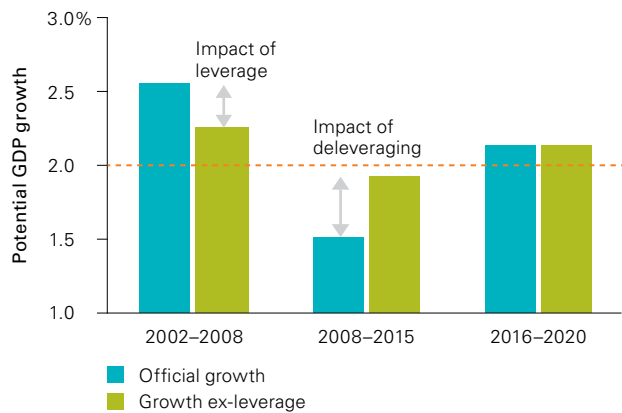

Notes: The official potential GDP growth estimate reflects U.S. Congressional Budget Office data. The potential GDP growth ex-leverage estimate factors in the estimated effects of consumer debt on private domestic demand components of the GDP.
Source: Vanguard calculations based on data from the U.S. Congressional Budget Office and the U.S. Bureau of Economic Analysis.

Our tame inflation outlook derives also from weighing the effect of the long-term structural forces of technology and globalisation on consumer prices. In the short term, inflation drags from oil prices and a stronger dollar continue to abate. However, long-term structural trends reflected in falling prices for technology and imports, particularly tradable goods, continue to restrain overall core inflation metrics. As Figure I-8b shows, the impacts of technology and globalisation have been in play since well before the Global Financial Crisis and are not expected to abate any time soon.

Figure I-19. The tight labor market should remain, slight slowdown in jobs is to be expected
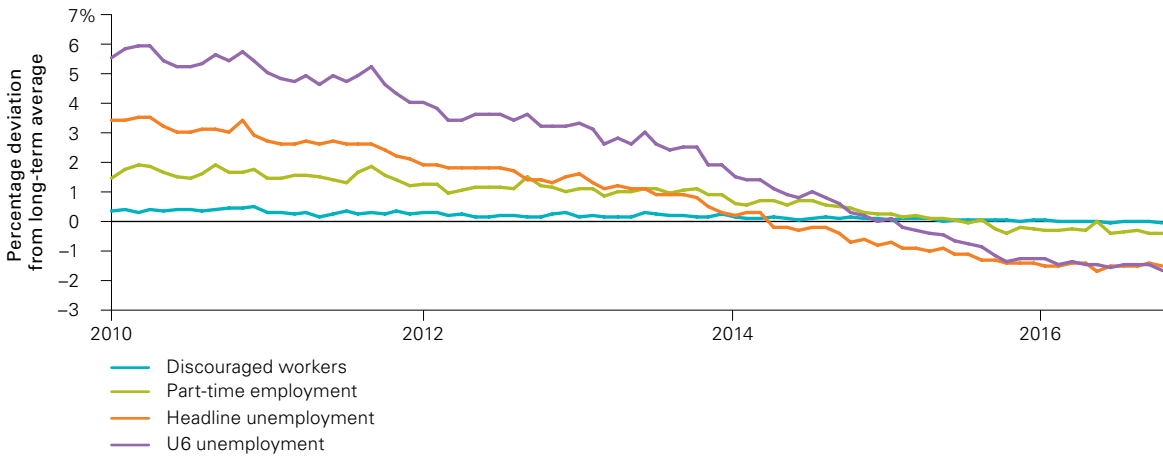
Note: The long-term average for discouraged workers represents the period from January 31,1994, through October 31, 2016; for all other categories, the period begins January 31,1980.
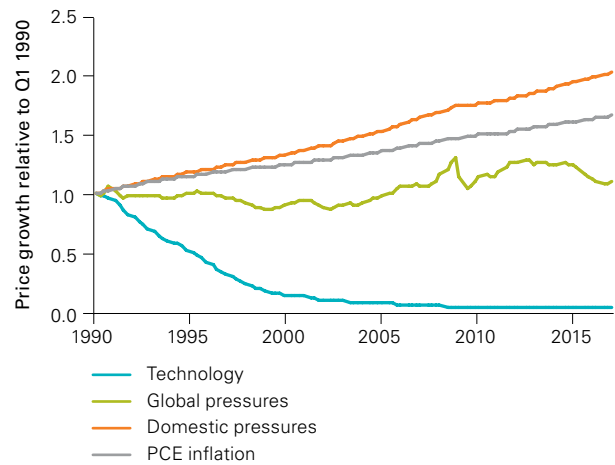**Source:** Vanguard calculations based on data from the U.S. Bureau of Labor Statistics and Moody's Analytics.

Figure I-20. Inflation heating up, but not too hot

a. Real wage gains and inflation are closing in on long-term trend
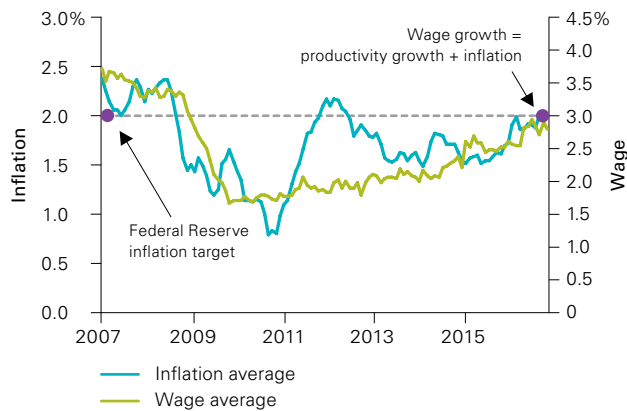
b. Structural drags resulting from technology and globalisation will persist

Notes: The wage average represents the monthly mean of year-on-year percentage changes in total private hourly earnings, Atlanta Federal Reserve Bank wage tracker, and the Employment cost index: wage and salaries index. The inflation average is the monthly mean of year-on-year percentage changes in core CPI and core PCE. The axes are aligned according to estimates of the inflationary level of wage growth. The productivity growth and inflation target represents a 2% inflation target plus a hypothetical 1% growth in productivity.
Source: Vanguard calculations based on data from the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, the U.S. Bureau of Economic Analysis, the Federal Reserve Bank of Atlanta, and Moody's Analytics.

These forces, along with the Fed's hard-won credibility for anchoring inflation expectations, have resulted in the U.S. economy spending most of the time below the 2% inflation target since the 1990s (in 64% of the core personal consumption expenditure monthly inflation readouts since January 1990). This fact should not be overlooked when evaluating adequate timing for the Fed's rate normalisation.

The appropriate course for the Fed is to further its pursuit of a "dovish tightening" by raising short-term rates deliberately to 1.5% in 2017, while also lowering its long-term "dots" closer to 2.5%.[3] This approach should shortcircuit the negative feedback loop of the prospects for an even-stronger U.S. dollar undercutting growth and rattling global financial markets.

A gradual increase in the federal funds rate would not be a real tightening but rather would be a removal of monetary accommodation. As illustrated in Figure I-9, monetary policy will remain expansionary even as rates increase. Meanwhile, the easing of fiscal policies, either tax cuts or infrastructure spending, may help support the transition over the medium term.

Our 2017 U.S. outlook is not without tail risks (see Figure I-22). Although the U.S. economy is unlikely to accelerate materially above 3%, the short-term risks to both inflation and growth are tilted toward the upside, given the fading effects of weaker commodity prices, inventory overhang, the stronger dollar, and the prospects for fiscal stimulus.

Figure I-21. Time to pass the baton of policy support
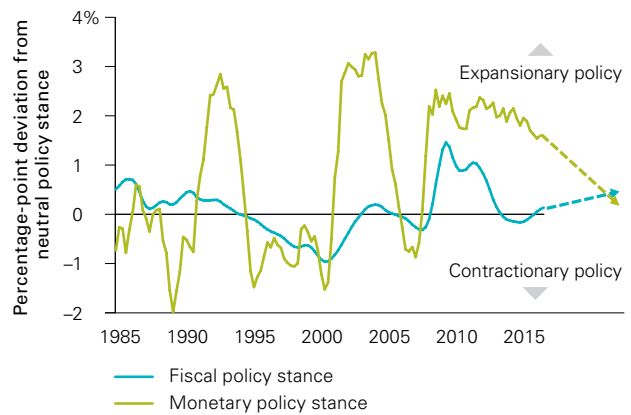
Notes: Monetary policy stance is measured by the percentage-point difference between the neutral real short rate and the real effective federal funds rate. Fiscal policy stance is based on the standardized budget deficit (excluding automatic stabilizers). Fiscal policy stance is measured as the percentage-point deviation of this deficit from its historical average.

Source: Vanguard Investment Strategy Group calculations based on data from Holston, Laubach, and Williams (2016), the Board of Governors of the Federal Reserve System, and the U.S. Congressional Budget Office.

At the same time, the odds of a recessionary scenario are not negligible, particularly as the U.S. economy enters its eighth year of expansion since the cycle trough in the summer of 2009. Although "expansions don't die of old age," markets will remain highly sensitive to unexpected shocks that could bring about recessionary fears. (See the text box "What could trigger the next U.S. recession?")

Figure I-22. A probabilistic view of the U.S. outlook: Tail risks have increased

Scenarios	Cyclical acceleration	Status quo	Recession	Stagflation
Probabilities	35%	35%	20%	10%
Growth	~3.0%	2.0%	Less than 0%	~1.0%
Core inflation	2%–2.5%	1.5%–2%	Less than 1%	3% or more
Federal funds rate (year-end 2017)	>1.5%	1.5%	Back to 0%	1.5%

Source: Vanguard.

3 "Dots" refers to charts published by the Federal Open Market Committee (FOMC) in the Fed's Summary of Economic Projections, showing points where FOMC participants, who are kept anonymous, believe the federal funds rate should be over the next few years, in the absence of economic shocks.

What could trigger the next U.S. recession?

The U.S. economy has been expanding for seven years, more than doubling the average length of an expansion (38 months).

However, as the saying goes, "expansions don't die of old age," meaning that recessions are more than just statistical regularities of a predetermined business cycle. In reality, recessions are brought about by shocks that amplify the dislocations and excesses that build up over time during the expansion. In some instances, it takes just a relatively small shock to prick the bubble and kick-start the unwinding of such misallocations in one sector of the economy; this in turn typically spills over into broader demand weakness and pessimistic business sentiment, affecting hiring and investment decisions across the economy.

But what could be some economic triggers? Here are three possibilities, in no particular order:

The collapse of global trade
Causes could be a sharp move toward trade protectionism in the United States and a trade war; gridlock and the breakdown of Brexit negotiations within the European Union; and uncertainty surrounding anti-EU movements in euro-area countries, particularly the French and German elections.

Aggressive monetary policy
A sharp acceleration of rate hikes through 2017 could be triggered by an unforeseen flare-up in inflationary pressures and a rise in long-term rates due to expansionary fiscal policy (extensive infrastructure spending and tax cuts). This in turn could cause dislocation in asset markets and affect investor sentiment and confidence.

A U.S. stagflation scenario
Depending on the extent and timing of U.S. immigration and antitrade policies, a supply-side negative shock with higher labor costs and higher imported input costs could lead to cost-push inflation. Adding cost-push inflation to the potential demand-pull inflation from expansionary fiscal policies and rising budget deficits could result in rising inflation and long-term interest rates.
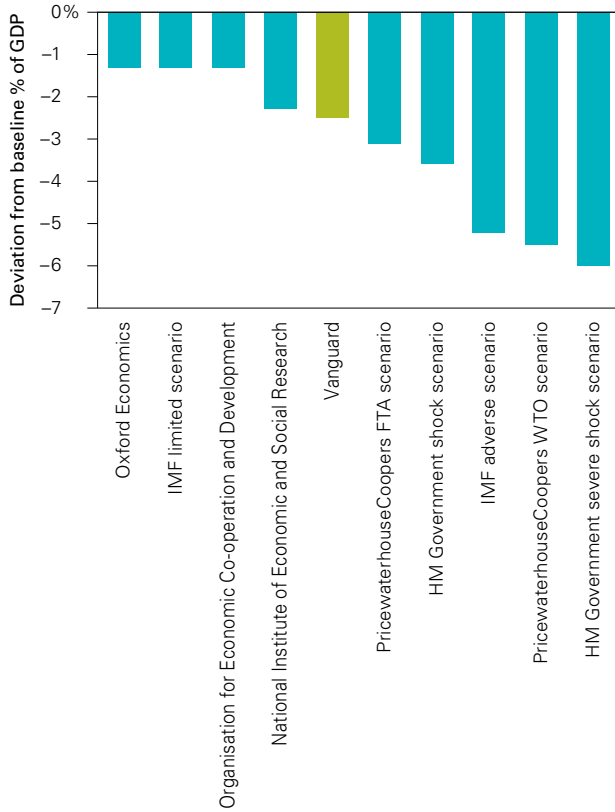
China "hard landing " and systemic financial crisis
Capital outflows intensify in spite of capital controls, leading to a collapse in the yuan and affecting key sectors of the Chinese economy, such as real estate, local government finances, and the stock market. Global spillovers affect emerging markets via trade linkages and developed markets via financial volatility and increased risk aversion.
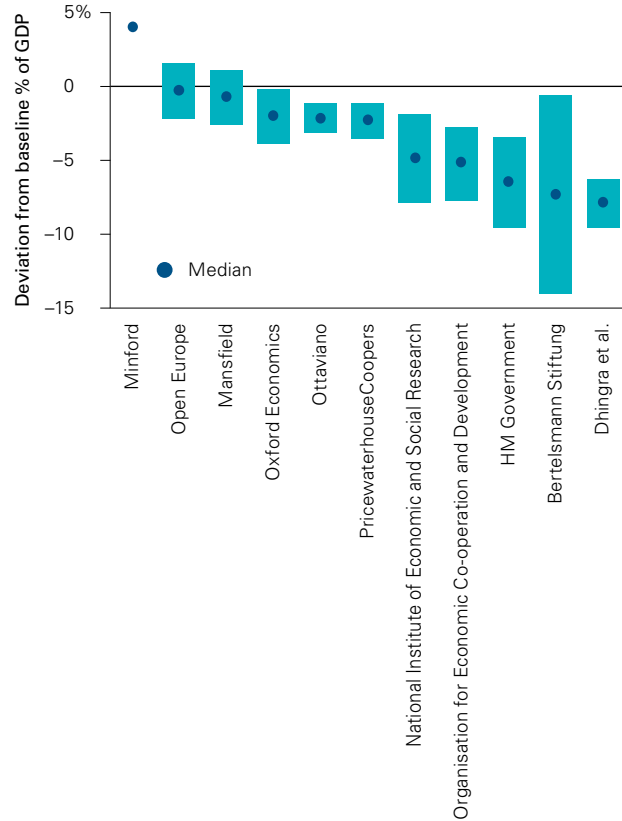
Figure I-23. Negative implications of Brexit may play out over the long term

a. Short-run estimated effects on GDP

(Bar chart. Y-axis: "Deviation from baseline % of GDP", ranging from 0% to −7%. Categories left to right: Oxford Economics; IMF limited scenario; Organisation for Economic Co-operation and Development; National Institute of Economic and Social Research; Vanguard; PricewaterhouseCoopers FTA scenario; HM Government shock scenario; IMF adverse scenario; PricewaterhouseCoopers WTO scenario; HM Government severe shock scenario.)

b. Long-run estimated effects on GDP

(Range chart with median markers. Y-axis: "Deviation from baseline % of GDP", ranging from 5% to −15%. Categories left to right: Minford; Open Europe; Mansfield; Oxford Economics; Ottaviano; PricewaterhouseCoopers; National Institute of Economic and Social Research; Organisation for Economic Co-operation and Development; HM Government; Bertelsmann Stiftung; Dhingra et al. Legend: Median.)

Notes: All values in Figure I-15a are for 2018, except HM Government scenarios, which are for fiscal year 2017–18, and PricewaterhouseCoopers scenarios, which are for 2020. Figure I-15a shows the total impact on GDP by year-end 2018, relative to a no-Brexit scenario. Figure I-15b shows the total impact on GDP by year-end 2030, relative to a no-Brexit scenario.

Source: International Monetary Fund (2016); Kierzenkowski et al. (2016); HM Treasury (2016b); PricewaterhouseCoopers (2016); Baker et al. (2016).

Europe: Year 1 A.B. (After Brexit)

Britain's decision to leave the European Union will have a significant influence on the U.K. economy. The long-run impact on U.K. living standards is likely to be significantly negative, according to a majority of economists' estimates. But there is considerable uncertainty about the terms of the United Kingdom's departure. A "soft" Brexit, with the country remaining a member of the EU single market, would probably be less costly; a "hard" Brexit, more likely at this stage, would be worse, with immigration controls leading to restrictions on the ability of U.K. firms to sell products and services into the EU. This more severe scenario would most likely lead to an eventual drop in GDP of 5% or more (see **Figure I-23a**).

The immediate short-run effects of the Brexit vote are also negative, as the uncertainty may lead firms and households to delay spending plans. We expect continuing weakness in spending, with an overall effect of about 2%–3% of GDP—at the lower end of expectations made in advance of the vote (**Figure I-23b**). This more muted effect is partly due to the marked depreciation of sterling, which should stimulate exports, as well as the robust past and anticipated monetary policy response by the Bank of England and the expected fiscal loosening from the government.

The euro-area economy will certainly be affected as well. We have accordingly marked down our growth forecast for the euro area by about 0.2 percentage points in 2017, to 1.5%. The more important consequences for the euro

area are political if other countries should decide to follow suit and break away from the EU. General elections in France and Germany in 2017 will more definitively indicate how serious this risk is. The euro area's slow and incomplete recovery from the sovereign debt crisis would be enhanced by more integration, not less, but such developments will most likely be side-lined while political attention is diverted by Brexit.

The burden of policy stimulus in the euro area is currently being borne almost exclusively by the ECB, whose quantitative easing program is providing a weak but positive stimulus to euro-area growth. Even so, headline inflation still remains below 1%, while core inflation is not expected to return to the 2% inflation target until beyond the ECB's three-year forecast horizon. As a consequence, the ECB is expected to extend its asset purchases of €80 billion a month past March 2017.

There is no doubt that policy outcomes would be improved if fiscal policy played a more supportive role. After earlier years of acting as a strong drag, the net impetus from fiscal policy has been positive in 2016, although the chances of significant additional stimulus in the years ahead are relatively low.

II. Global capital markets outlook

Vanguard's outlook for global stocks and bonds remains the most guarded since 2006, given the low-interest-rate and low-earnings-yield environment. We continue to view the global low-rate environment as secular, not cyclical. Although low rates are the anchor for the asset class forecasts, our outlook also includes simulations of portfolio performance in alternative interest-rate regimes. We encourage investors to evaluate the role of all asset classes from a perspective of balance and diversification rather than outright return.

Global fixed income markets: Positive but muted

As in past outlooks, the return forecast for fixed income is positive but muted. As displayed in **Figure II-1**, the expected ten-year median return of the global fixed income market is centered in the 1.0% to 3.0% range. This is lower than our return outlook one year ago, and is notably lower than our ten-year projections from June 2010, where the median was centered in the range 5.0 to 7.0%[8].

The current projection is near current benchmark yields and thus most closely resembles the historical bond returns of the 1950s and 1960s. Despite this outlook, we encourage investors to evaluate the role of fixed income from a perspective of balance and diversification rather than outright return. High-grade or investment-grade bonds act as ballast in a portfolio, buffering losses from riskier assets such as equities. Several segments of the Australian bond market, such as credit and government bonds have 10-year median expected returns centered in the 2.5 to 3.5%, and 1.5 to 2.5% range respectively (**Figure II-2**).

Inflation: Below historical average, but in-line with expectations

Our VCMM 10-year inflation projections are centered in the 1% to 3% range (**Figure II-2**) which is broadly in-line with the target of the Reserve Bank of Australia. Notably, our central tendency is well below the long term

Figure II-1: Global fixed income outlook: Muted returns projected relative to the past
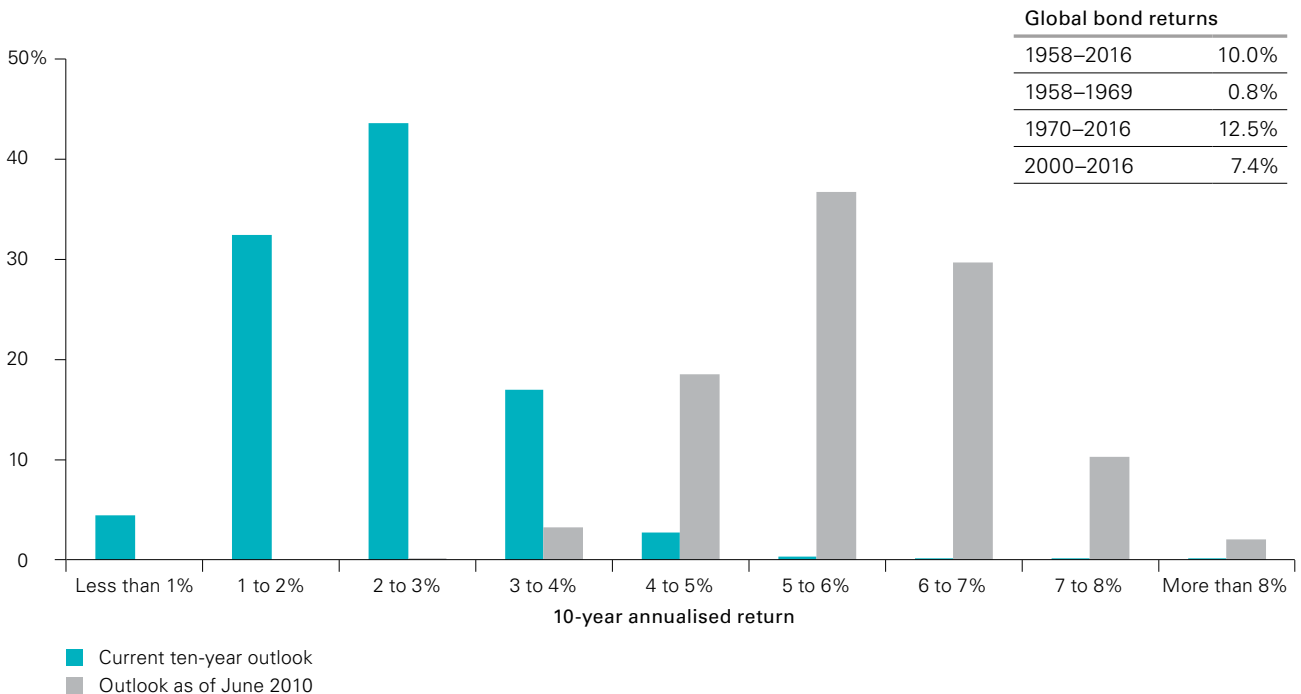

Global bond returns	
1958–2016	10.0%
1958–1969	0.8%
1970–2016	12.5%
2000–2016	7.4%

Legend: Current ten-year outlook; Outlook as of June 2010

X-axis: 10-year annualised return (Less than 1%, 1 to 2%, 2 to 3%, 3 to 4%, 4 to 5%, 5 to 6%, 6 to 7%, 7 to 8%, More than 8%)

Notes: Figure displays projected range of returns for a portfolio of 40% Australian bonds and 60% ex-Australia bonds, rebalanced quarterly from 10,000 simulations from VCMM as of September 2016 in AUD. Benchmarks used for historical returns are defined on page 4. See appendix section titled "Index simulations" for further details on the asset classes shown above.
Source: Vanguard.

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8 Indeed, over the past six years a 40% Australia/60% Global ex Australia bond portfolio has provided annualised total nominal returns of 7.2% in AUD.

Figure II-2: Bond market ten-year return outlook: Setting reasonable expectations
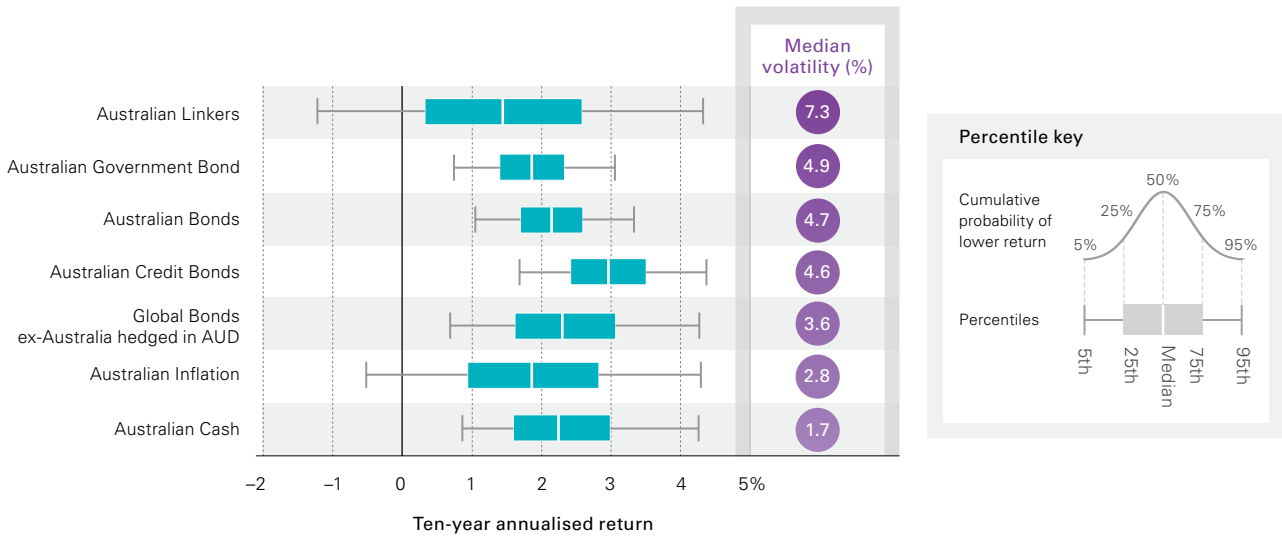
Note: Forecast corresponds to distribution of 10,000 simulations from VCMM for the 10 year annualised returns as of September 2016 in AUD for asset classes shown above. See appendix section titled "Index simulations" for further details on the asset classes shown above.

Source: Vanguard.

Figure II-3: Rates unlikely to rebound to post 70s average
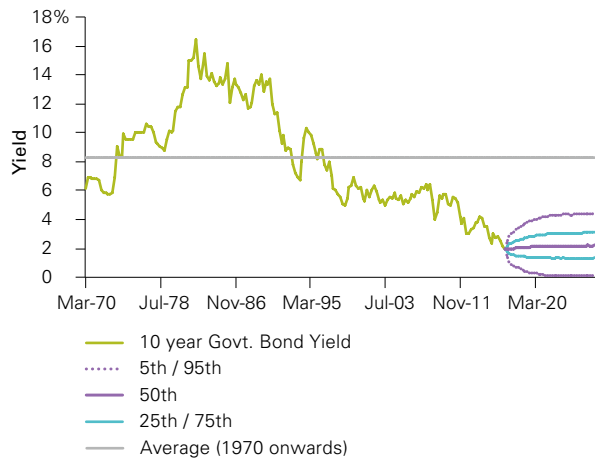
Note: 10-year Govt. bond yield projections based on 10,000 simulations from VCMM as of September 2016

Source: Vanguard calculations, based on data from Thomson Reuters Datastream and the Reserve Bank of Australia.

historical average annualised inflation of 5.1% (since 1950). Realising the historical average of 5.1% or higher is a possible future event even in our VCMM projections, but it comes with a reduced probability of less than 5%.

Australian Interest Rates: Unlikely to rebound to post 1970s average

Compared with Vanguard's 2016 outlook, our projections for the 10-year government bond yield have fallen, with the current macroeconomic environment justifying a 10-year yield in the range of 2%–3% (**Figure II-3**). As discussed in previous sections, long-term structural forces are behind this lowered expectation for longer-term rates. As the markets price in the lower trend growth and inflation, the terminal level for the RBA cash rate gets revised downward, and with it all other rates across the maturity spectrum. This is because fair-value estimates of long-term government bond yields are determined by the expected average short-term-rate over the maturity of the bond (plus a term premium).

Based on the VCMM projections, the 10-year government bond yield is projected to rise slowly over the next few years. The central tendency of our forecast

for the 10-year yield in five years is around 2.5% which is well below the long term average (since 1970) of 8.2% and the recent average (2000 onwards) of 4.9%.

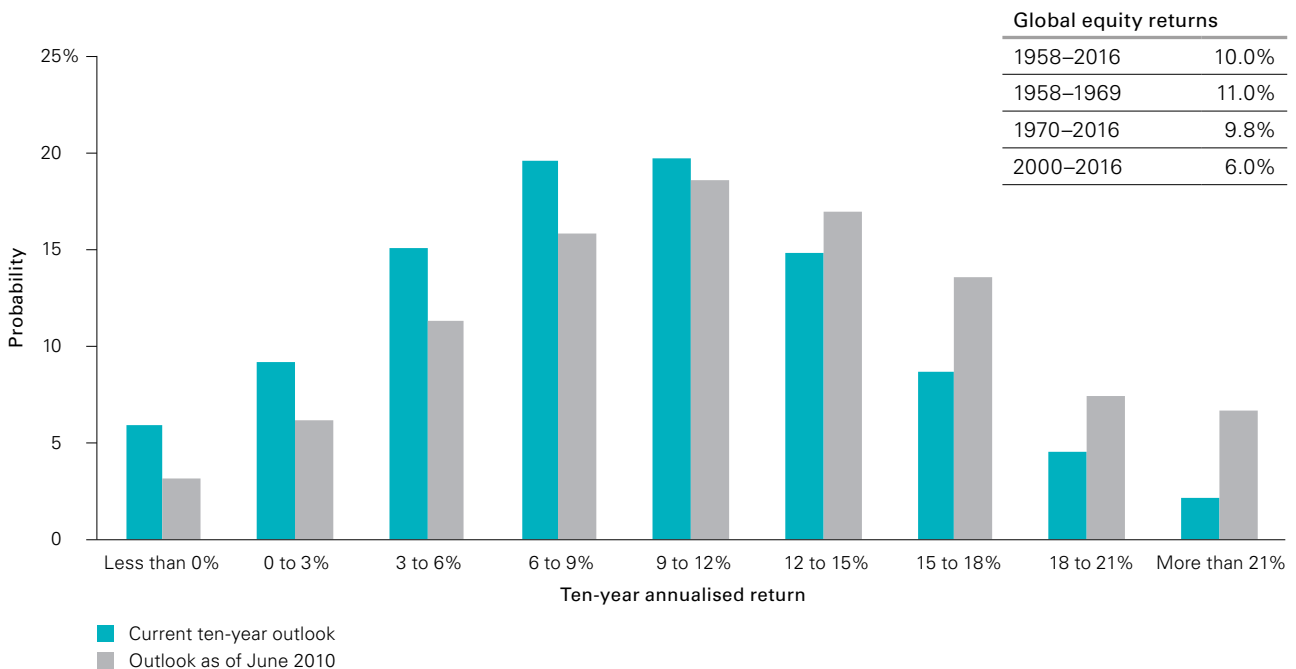## Cash and Government bonds: Duration tilts are not without risks

Our VCMM simulations show the 10-year return distribution of cash and the government bond index in **Figure II-2**, where the medians look very similar with the median volatility projection of cash being lower than that of the government bond index. This might make the return outlook for cash appear more attractive than the treasury index on a risk adjusted basis, however, it is important to highlight that bonds provide stronger diversification properties. During times of equity market stress, high quality bonds act as a ballast buffering losses from riskier assets. In addition, the dispersion of potential returns for cash is greater than for bonds, so the return outlook is more uncertain. Finally, we caution investors against trying to time allocations to cash and fixed income, for example, by going short-duration. In general,

a short-duration strategy entails substantial forgone income. Focusing solely on avoiding capital losses on long-term bonds ignores the fact that an upward sloping yield curve produces significant income differences among duration strategies.

Credit bonds: Risk premium still comes with equity correlation

The central tendency for the Australian credit bond index is in the 2.5 – 3.5% range which is slightly higher than that of the government bond index. This reflects the accumulation of credit and default risk premia that accompanies the higher risk of credit bonds. The credit spread for the Barclays Australian Aggregate Corporate Bond Index (as of October 2016) have tightened in recent months and are slightly below the historical median of 1.35%. However, one must keep in mind that credit spreads tend to widen in times of equity market stress, thereby reducing diversification benefits relative to government bonds.

Figure II-4: Global equity outlook: Muted returns projected relative to the past

Global equity returns	
1958–2016	10.0%
1958–1969	11.0%
1970–2016	9.8%
2000–2016	6.0%

- Current ten-year outlook
- Outlook as of June 2010

Notes: Figure displays the projected range of returns for a 50% Australia equity, 50% ex-Australia equity portfolio in AUD, rebalanced quarterly from 10,000 simulations from VCMM as of September 2016. Benchmarks used for historical returns are defined on page 4. See appendix section titled "Index simulations" for further details on the asset classes shown above.

Source: Vanguard.

Inflation-Linked Bonds: Insurance continues to come at a cost

In the inflation-linked segment of the bond market, the distribution in our VCMM scenarios of inflation-linked bond returns is wider than that of nominal government bonds. The expected median long-term return on an Australian inflation-linked bond portfolio is lower than that of a similar-duration nominal government bond portfolio by a modest amount that represents the estimated inflation-risk premium that is earned by nominal bonds. As expected, inflation-linked bonds generally outperform nominal Treasuries in scenarios featuring inflation scares or higher-than-expected inflation rates over a ten-year outlook.

The current break even inflation rate (BEI) is near its lowest historical level of about 1.8% and is similar to our ten year inflation expectation, while the historical median BEI is at 2.6%, which reflects potentially cheap inflation protection. On a more cautionary note, inflation-linked bonds have displayed a higher probability of negative returns over shorter investment horizons because of their sensitivity to a rise in real rates. Balancing these considerations, investors should continue to evaluate the role of inflation-linked bonds in their portfolios by balancing their inflation-risk protection quality against the inflation- risk premium "given up" relative to nominal bonds.

Aggregate fixed income markets:

Domestic versus international: Benefits of diversification remain

The central tendency of expected returns for global ex-Australia bonds appears to be similar to Australian composite bonds (**Figure II-2**). We expect the diversification benefits of global fixed income in a balanced portfolio to persist under most scenarios. Yields in most developed markets are at historically low levels, particularly in Europe and Japan, yet the diversification through exposure to hedged international bonds should help offset some risk specific to the Australian fixed income market. Less-than-perfect correlation between two of the main drivers of bond returns—interest rates and inflation—is expected between the U.S. Federal Reserve, which we expect to raise rates gradually, and the RBA, which may remain data-dependent but inclined to be on hold.

Global equity markets: Guarded, but not bearish

VCMM simulations for ten-year returns of a global equity portfolio are centered between the 6% to 9% range (**Figure II-5**). This outlook is based on a 50% Australian equity/50% unhedged developed markets ex Australia equity portfolio. Australian equity returns are expected to be broadly in line with historical returns when adjusted for inflation. This can be attributed to the fact that current valuations, a key driver of forward looking equity returns[9], are close to their historical medians (**Figure II-6**) in Australia and in-line with current levels of interest rates

Figure II-5: Widely dispersed potential returns necessitate setting reasonable expectations
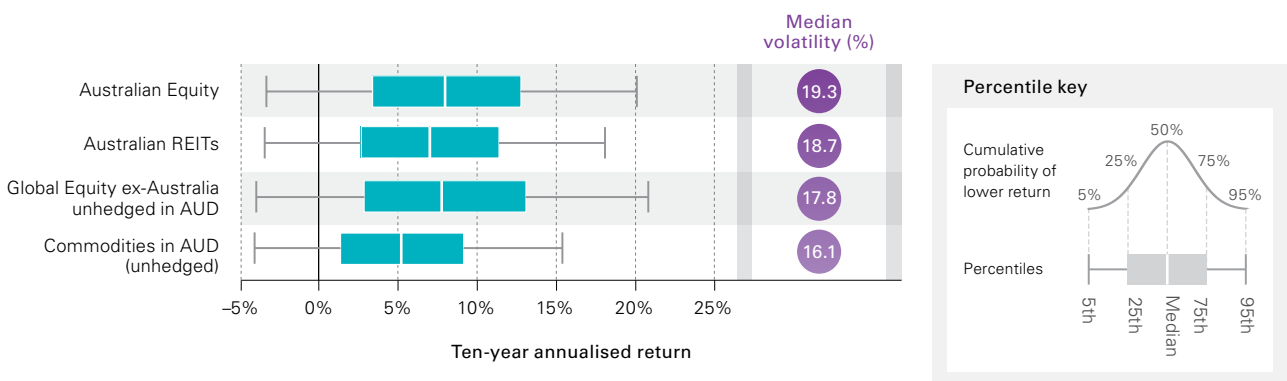
Notes: Forecast corresponds to distribution of 10,000 simulations from VCMM for the 10 year annualised returns as of September 2016 in AUD for asset classes shown above. See appendix section titled "Index simulations" for further details on the asset classes shown above.
Source: Vanguard.

9 See Davis et al 2012

and inflation. Valuations in developed markets ex Australia are slightly higher, implying a lower return outlook over the next 10 years if currency is ignored. The currency impact is expected to be positive, based on the principal of uncovered interest rate parity. That is to say, there is a positive interest rate differential between Australian and US interest rates which is expected to close over time, pushing the value of the Australia/US dollar exchange rate down, and thus boosting the value of foreign assets. Therefore the return outlook for Australian and unhedged developed markets ex Australia equities are broadly similar.

The current outlook appears slightly muted when compared to the central tendency of 9% to 12% for global equity as of June 2010 (**Figure II-5**) when valuations were at lower levels[10]. When returns are adjusted for future inflation, we estimate a 40% likelihood that a global equity portfolio will fail to produce a 5% average real return over the decade 2016–2026.

Equity valuations

Vanguard's proprietary 'fair-value' CAPE looks beyond historical averages

Our equity outlook for the stock market is based primarily on market valuations, such as price/earnings (P/E) ratios. Some may wonder why our outlook for the Australia is not more bullish given the current P/E ratio (**Figure II-6**). After all, widely followed market valuation metrics such as the Shiller (2000) cyclically adjusted price/earnings, or "CAPE" are lower than historical levels. When adjusted for low interest rates, and low inflation, however, we would expect a slightly lower fair value CAPE level. This lower level is the right benchmark for determining whether the market is over- or undervalued.

Figure II-6 compares Shiller's (2000) CAPE multiple (for the MSCI Australia index) with Vanguard's proprietary fair-value CAPE estimate, which is based on the fundamental drivers of equity-market earnings yields, namely, interest rates, inflation expectations equity and

Figure II-6: Equity Market is fairly valued, not undervalued

Shiller CAPE versus estimated fair-value CAPE

Valuation difference is explained by current levels of inflation, interest rates and equity / bond volatility

- CAPE (MSCI Australia Index)
- Fair Value CAPE (MSCI Australia Index)
- Historical Average 1980 onwards
- Fair-value CAPE +/– 1 standard error range
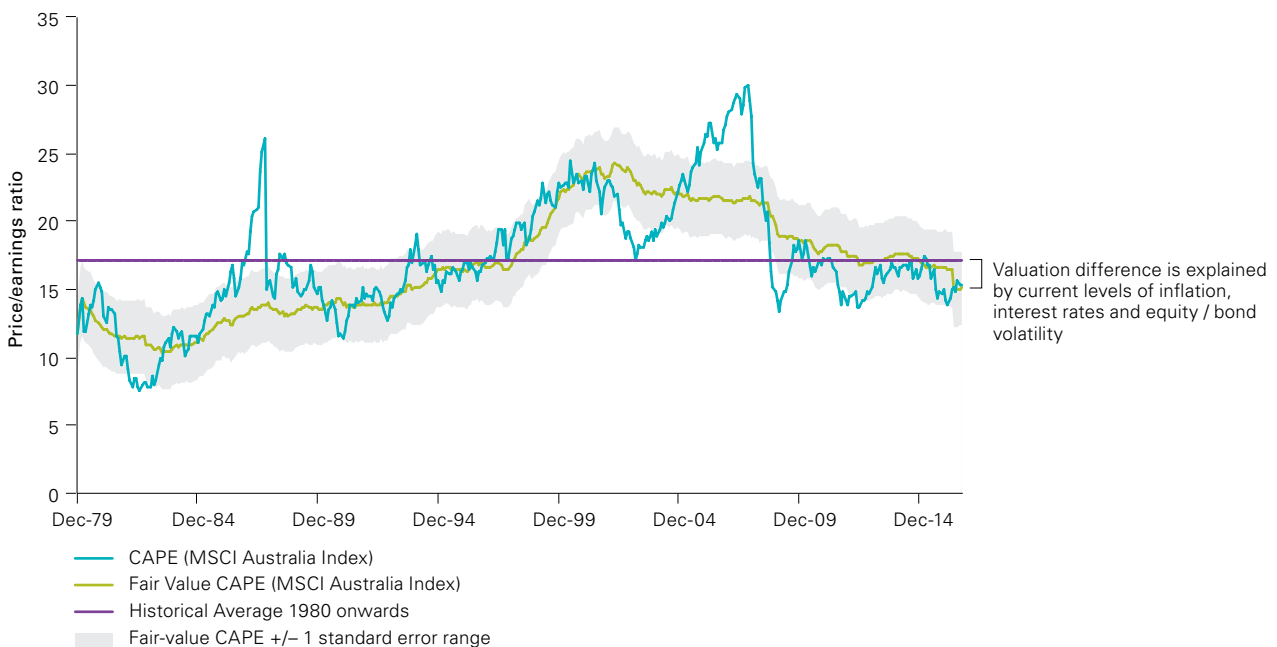
Notes: "Fair-value CAPE" is based on statistical model that corrects CAPE measures for the level of inflation expectations and for interest rates. The statistical model specification is a five-variable vector error correction (VEC), including equity earnings-yield (MSCI Australia index), Australian ten-year trailing inflation, ten-year Govt. bond yield, 10 year trailing equity and bond volatility estimated over the period January 1970 – September 2016.
Source: Vanguard calculations, based on data from Thomson Reuters Datastream, the Reserve Bank of Australia and Factset.

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10 Indeed, over the past five years a 50/50 Australia/developed market ex Australia unhedged equity portfolio has provided annualised returns of 11.0%.

bond volatility. Unlike what the model indicated during the Global Financial Crisis in 2008 and 2009, we find that current CAPE levels are accounted for by current levels of bond yields and inflation, equity and bond volatility (i.e., our fair-value estimate is within one standard deviation of Shiller's CAPE).

## Global equities: Diversification benefits and attractive valuations

A closer look at the long-term median expected return for Australian equity versus global ex- Australia equity in **Figure II-5** suggests that the expected Australian equity market return may slightly overshoot the expected global ex- Australia equity return. This result is in spite of our modest growth outlook for Australia. As explained in Davis et al. (2012a, 2013), low economic growth expectations do not always translate into low equity return expectations.

However, for the purposes of asset allocation, investors should be cautious when considering tactical tilts or strategic portfolios based on just the median expected return—that is, ignoring the entire distribution of outcomes and their correlations. We urge caution for the following reasons:

- A large portion of the return distribution is overlapping (which could negate the intended outperformance with significant odds).

- The projected distributions of long-term returns shown in **Figure II-4** and **Figure II-5** display wide and fat tails. As discussed in Davis, Aliaga-Díaz, and Thomas (2012b), although valuations are useful in predicting stock returns over the long term, they still leave more than half the volatility of long-run returns unexplained.

- An international equity allocation of 50% of the total equity allocation for an Australian investor has typically provided reasonable diversification benefits,

Figure II-7. Emerging market valuations lower than developed markets, but not yet "cheap"

Prices over 12-month trailing earnings for selected equity indexes

Australia
Developed Markets ex Australia
Emerging Markets
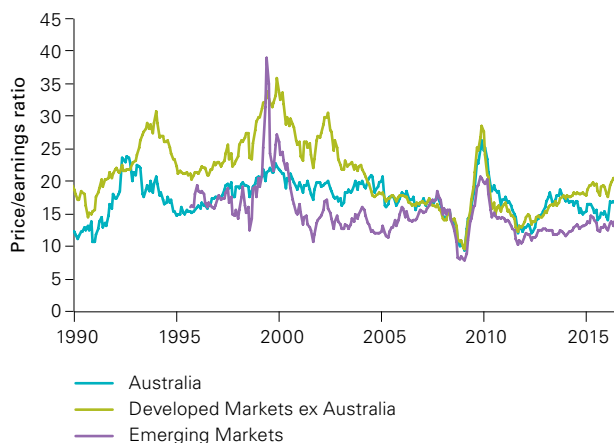
Notes: Figure displays price/earnings ratio with 12-month trailing average earnings. Australian equities represented by MSCI Australia Index, "Developed Markets ex Australia" represented by MSCI World ex Australia Index and "Emerging markets" represented by MSCI Emerging Markets Index.
Sources: Vanguard calculations based on data from Thomson Reuters Datastream.

considering factors such as home country bias, although our "ex-ante" optimal recommendation remains market- cap proportional

As such, equity portfolios with a high degree of home bias can always take advantage of global diversification benefits by rebalancing toward non-Australian exposures.

Emerging markets equity valuations

Emerging market valuations are low relative to developed markets, but this phenomenon is typical of riskier markets as illustrated in **Figure II-7**. Thus, we caution investors against characterising emerging market equities as "cheap." This is reflected in emerging-market valuations at close to "normal" levels (**Figure II-7**, suggesting that risk-adjusted returns for emerging markets may not differ much from those of other global equities). Thus, the case for emerging markets in long-term portfolios should be based not on any projected return outperformance but, rather, on the diversification benefits of emerging markets.

Australian REITS

For Australian REITS, our long-term return simulations indicate that the median return expectation is broadly in line with that of the broad Australian equity market, based on similar valuations and volatility. REITS are a subsector of the equity market, so all of REITs' potential diversification benefits should be already captured in a broad-market portfolio.

Commodity futures

Figure II-5 also includes simulations for commodity futures returns. The simulated returns show a wide distribution, with lower median returns and slightly lower median volatility than equities. Because commodity futures markets are forward looking, futures contracts are already pricing in the market's outlook for spot commodity prices. Thus, even if investors believe commodity prices may rise or fall further, this expectation may already be reflected in current pricing.

From a portfolio construction viewpoint, commodities are a good diversifier of Australian equity risk only in the presence of supply-side shocks such as adverse weather for agricultural commodities, or geopolitical events affecting world oil production. When commodity returns are driven by global demand considerations (such as a global economic slowdown), correlations to equity markets tend to increase (in some cases, sharply), and the diversification value may be very low. For these reasons, we caution investors to keep in mind that correlations vary over time as they decide on an adequate exposure to commodities.

Implications for balanced portfolios and asset allocation: Expect modest real returns

To examine the potential portfolio construction implications of Vanguard's range of expected long-run returns, **Figure II-8** (right-hand side) presents simulated real (inflation-adjusted) return distributions for 2016–2026 for three hypothetical portfolios ranging from more conservative to more aggressive: 30% equities/70% bonds; 50% equities/50% bonds; and 70% equities/30% bonds. The historical performance of these portfolios is shown on the left-hand side of the figure. The results have several important implications for strategic asset allocation, as discussed next.

Figure II-8. Real return analytics for balanced portfolios

a. Projected real returns moderately below long-run historical averages

Ten-year annualised return

● History 1958-2016
● History 2000-2016
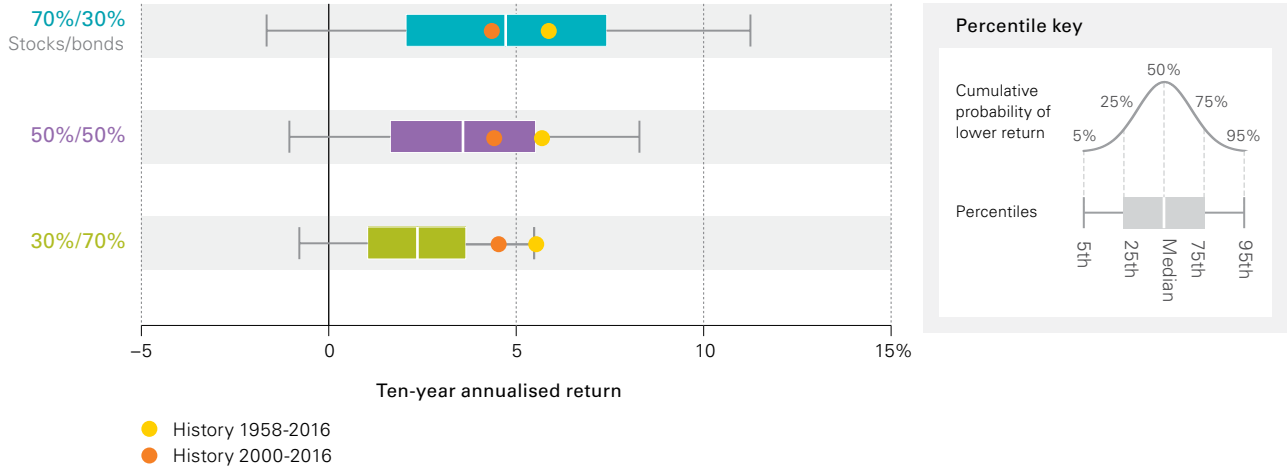
b. Projected ten-year real return outlook for balanced portfolios

	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	History 1958-2016	History 2000-2016
70%/30%	−1.7%	2.1%	4.7%	7.4%	11.3%	5.7%	4.2%
50%/50%	−1.0%	1.6%	3.6%	5.5%	8.3%	5.6%	4.3%
30%/70%	−0.8%	1.1%	2.4%	3.7%	5.5%	5.4%	4.4%

Notes: The forecast displays 5th/25th/50th/75th/95th percentile ranges of 10,000 VCMM simulations for projected ten-year annualised real returns as of September 2016 in U.S. dollars. Historical returns are computed using indexes defined in "Indexes used in our historical calculations" on page 5. The equity portfolio is 60% U.S. equity and 40% global ex-U.S. equity. The bond portfolio is 70% U.S. bonds and 30% global ex-U.S. bonds.

Source: Vanguard.

Figure II-8. *(Continued).* **Real return analytics for balanced portfolios**

c. The higher the real return objective, the lower the probability of success
Probability of meeting real return objectives (10-year horizon)
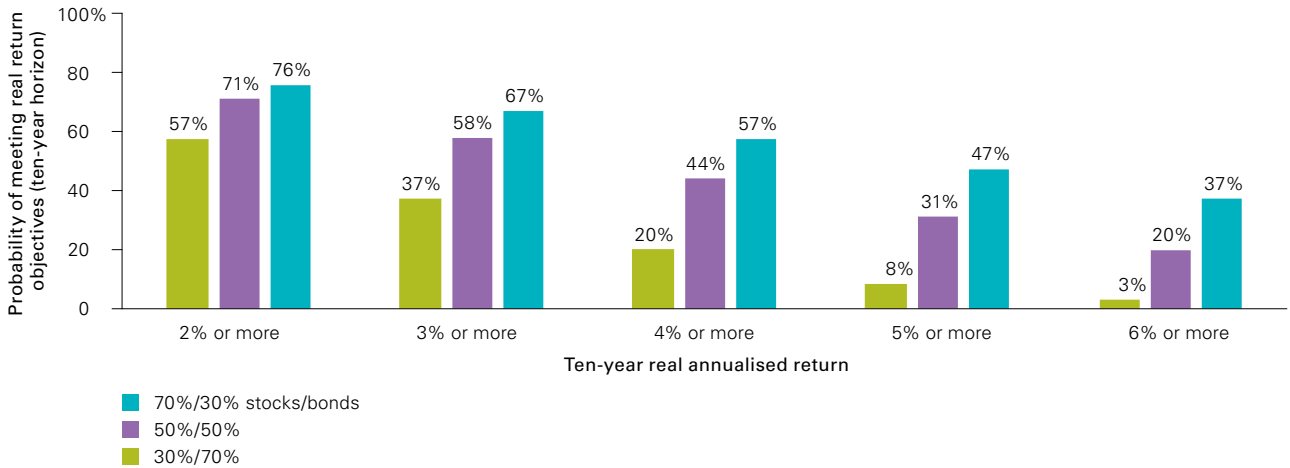
d. Risky portfolios require risk tolerance
Probability of negative real returns in any given year
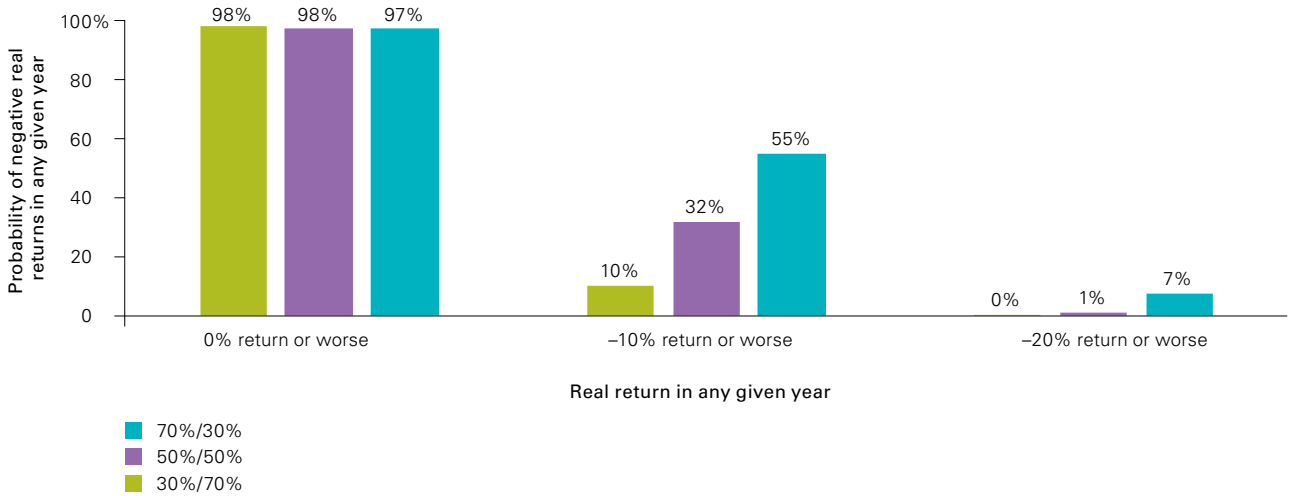
Note: Forecast displays the 5th/25th/75th/95th percentile range of 10,000 simulations from VCMM for projected real returns for balanced portfolios in AUD as of September 2016. Historical returns are computed using the indexes defined on page 4. The equity portfolio is 50% Australian equity and 50% global Ex-Australia equity. The bond portfolio is 40% Australian bonds and 60% global Ex-Australia bonds. See appendix section titled "Index simulations" for further details on the asset classes shown above. Hedged returns from June 1969 until 1990 based on availability of 3-month yields for the US and Australia, and use the forward rate based on interest rate differentials. After 1990, returns are hedged using Barclays methodology.

Source: Vanguard calculations using data from Thomson Reuters Datastream, Bloomberg, Barclays Live, OECD via Federal Reserve, and Moody's Analytics Databuffet.

Modest outlook for long-run returns

Amid widespread concern over the current low level of long-term Australian government bond yields, **Figure II-8**'s real long-run return profile for balanced portfolios may seem modest relative to history. However, Vanguard believes it's important for investors to consider real-return expectations when constructing portfolios, because today's low government bond yields are, in part, associated with lower expected inflation than was the case 20 or 30 years ago.

Figure II-8 does show that the inflation-adjusted returns of a balanced portfolio for the decade ending 2026 are likely to be moderately below long-run historical averages (indicated by the small boxes for 1958–September 2016). But the likelihood of achieving real returns in excess of those since 2000 for only aggressive portfolios is higher.

Specifically, our VCMM simulations indicate that the average annualised returns of a 50% equity/50% bond portfolio for the decade ending 2026 are expected to center in the 2.5%–4.5% real-return range, below the actual average real return of 5.6% for the same portfolio since 1958. Viewed from another angle, the likelihood that our portfolio would achieve at least the 1958–2015 average real return is estimated at approximately 25%, while the odds of attaining a higher real return than that achieved since 2000 (4.3%) are near 35%.

Economic scenario based portfolio construction strategies

In relation to the global economic perspective expressed earlier in this paper, we examine three yield-curve scenarios (low, moderate and high), occurring over the next 5 years in **Figure II-9a**. Using our VCMM simulations, we are able to not only illustrate the effectiveness of various portfolio strategies designed for specific scenarios, but also demonstrate the risks of these strategies when the scenario does not occur.

In a low-yield scenario, a suitable portfolio strategy would be to have a long-duration tilt or additional term premium (Australian long-term Treasury Index) as a drop in long-term rates would result in significant capital gains for the long-duration component of the portfolio. Conversely, a short-duration strategy with a degree of inflation protection would be a suitable strategy for a high-yield

scenario, given a sharp rise in interest rates. If rates rise as expected, a diversified portfolio would be a prudent investment strategy.

Figure II-9b shows the allocation of optimal portfolios for each of the scenarios and confirms the portfolio strategy discussed above. The optimal portfolios vary exposure to the following four factors or risk premia: 1) equity risk premium, 2) term premium, 3) credit premium and 4) inflation risk premium. The portfolio outcomes relative to an efficient frontier are illustrated in **Figures II-9c** and **Figure II-9d** summarises the analysis.

Our VCMM simulations help in assessing the expected performance of the above mentioned portfolio strategies relative to the efficient frontier (**Figure II-9c**). This exercise can be a useful one for investors considering strategic allocation tilts and can assist in assessing risk-return trade-offs among the strategies, especially if an expected scenario does not occur. The following conclusions can be drawn from our analysis:

1. **Portfolios designed for extreme scenarios involve important tradeoffs. The risks are asymmetric.**

- If a low-yield scenario is realised, the short-duration portfolio under performs the long-duration portfolio by 2.5 percentage points/ year, because of forgone income due to short duration.

- Conversely, the long-duration portfolio under performs the short-duration portfolio by 1.6 percentage points/ year in a high-yield scenario due to capital losses incurred by long duration fixed income portfolios. The under-performance of the long-duration portfolio can be attributed to capital losses incurred in a high-yield scenario.

2. **The diversified portfolio works best for investors who do not have strong conviction on the future state of the economy.** Interestingly, across all three scenarios, the diversified portfolio is either on the frontier or a close second. In other words, the diversified portfolio exhibits better downside outcomes relative to long or short duration portfolio strategies.

Portfolio construction strategies: Time-tested principles apply

Contrary to suggestions that an environment of structural deceleration, subdued inflation pressures, and permanently lower interest rates warrants some radically new investment strategy, **Figure II-8** reveals that the simulated ranges of portfolio returns are upward sloping on risk. Simply put, higher risk accompanies higher (expected) return. Our analysis of equity valuations in **Figure II-6** showed that the Australian equity risk premium endures, when one adjusts for the muted expectations for global inflation and interest rates. Thus, according to our VCMM simulations, the forward-looking equity risk premium expectation over bonds may not be meaningfully lower than it has been in the past.

Nevertheless, although risk–return trade-offs and equity risk premiums may not be different, portfolio return expectations themselves need to be lowered based on the prospects of lower global trend growth and central banks' lifting of policy rates very gradually over time. In this environment, we expect asset yields to be lower relative to historical norms across the board, both for equities and fixed income. Investment objectives based either on fixed spending requirements or on fixed portfolio return targets may require investors to consciously assess whether the extra risk needed to reach those goals is within reasonable risk-tolerance levels. A balanced approach may also include calibrating investment objectives against reasonable portfolio return expectations and adjusting investment behavior, such as savings and portfolio contributions.

We encourage investors to evaluate carefully the trade-offs involved in any shifts toward risky asset classes—that is, tilting a bond portfolio toward corporate and high-yield investments or making a wholesale move from bonds into equities. The crosscurrents of valuations, structural deceleration, and divergent monetary policies imply that the investment environment is likely to be more challenging and volatile in the years ahead. Both a realistic expectation of the extra return to be gained in such an environment and an understanding of the implications for holistic portfolio risk are crucial to maintaining the discipline needed for long-term investment success.
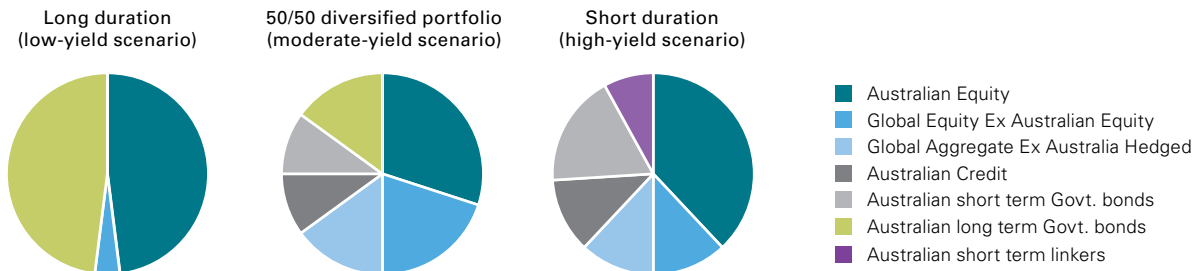
Ultimately, our global market outlook suggests a somewhat more challenging and volatile environment ahead, yet one in which investors with an appropriate level of discipline, diversification, and patience are likely to be rewarded over the next decade with fair inflation-adjusted returns.

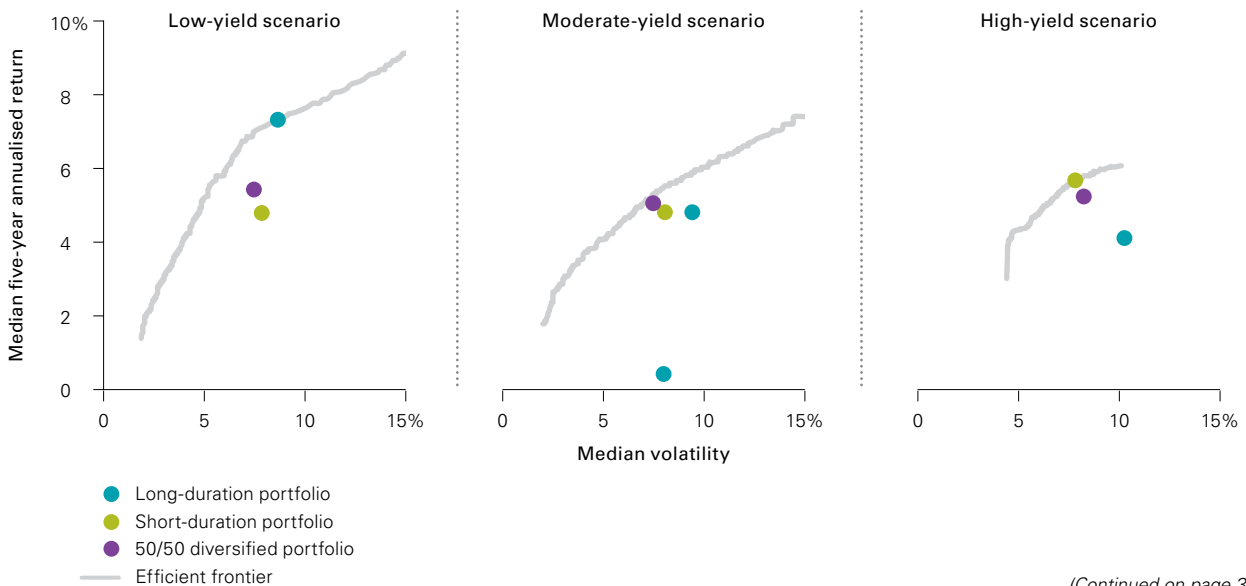## Figure II-9. A five-year look at three economic scenarios

a. Portfolio strategies based on yield-curve scenarios
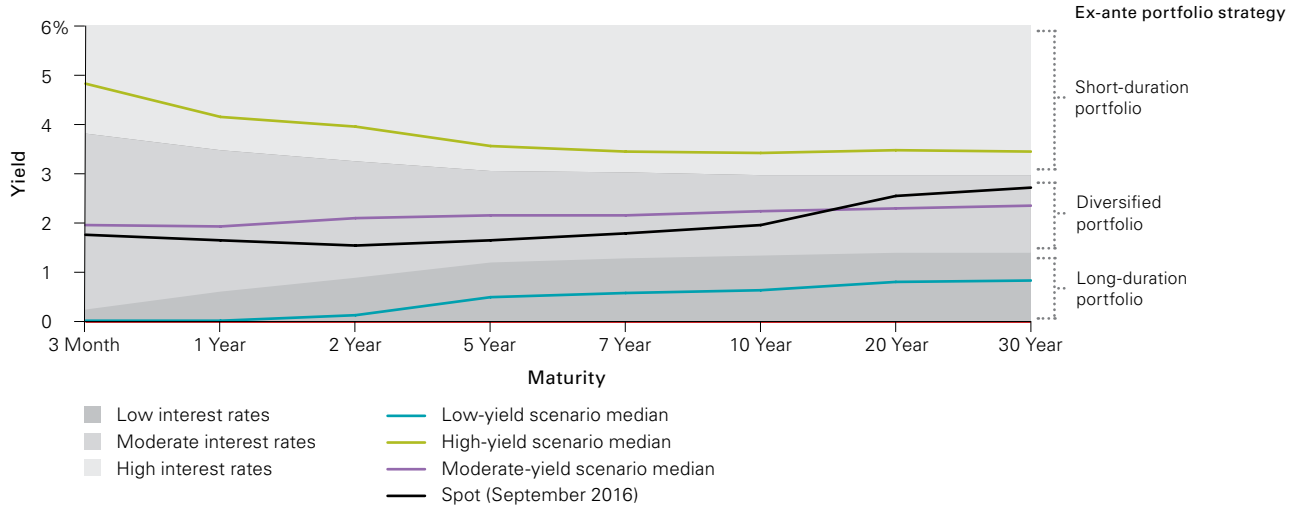
b. Mean-variance-optimal portfolios for each interest rate scenario

Long duration
(low-yield scenario)

50/50 diversified portfolio
(moderate-yield scenario)

Short duration
(high-yield scenario)

- Australian Equity
- Global Equity Ex Australian Equity
- Global Aggregate Ex Australia Hedged
- Australian Credit
- Australian short term Govt. bonds
- Australian long term Govt. bonds
- Australian short term linkers

c. Not always the best, but the diversified portfolio is never the worst

- Long-duration portfolio
- Short-duration portfolio
- 50/50 diversified portfolio
- Efficient frontier

Figure II-9. *(Continued).* A five-year look at three scenarios

d. Portfolios designed for a single scenario can be risky

	Stagnation/recession (low-yield scenario)	Status quo (moderate-yield scenario)	Inflation returns (high-yield scenario)
Best-performing portfolio	●	●	●
2nd-best-performing portfolio	●	●	●
Worst-performing portfolio	●	●	●
Strategy upside relative to balanced portfolio	1.9% higher annualised return with slightly higher volatility in a low-yield scenario		0.4% higher annualised return with lower volatility in a high-yield scenario
Strategy downside relative to balanced portfolio	1.2% lower annualised return with higher volatility in a high-yield scenario		0.6% lower annualised return in a low-yield scenario

● Long-duration portfolio   ● Short-duration portfolio   ● 50/50 diversified portfolio

Notes: Performance is relative to the efficient frontier. Forecast displays simulation of five-year annulaized returns of asset classes shown as of September 2016. Scenarios are based on sorting the VCMM simulations based on the 3-month and 30-year Gyields at the end of every year. The three scenarios are a subset of the 10,000 VCMM simulations. See appendix section titled "Index simulations", for further details on asset classes shown here.

Source: Vanguard.

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III. Appendix: VCMM and index simulations

About the Vanguard Capital Markets Model

IMPORTANT: The projections or other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The Vanguard Capital Markets Model is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include Australian and international equity markets, several maturities of the Australian Treasury and corporate fixed income markets, international fixed income markets,

Figure III-1. Nominal return analytics for balanced portfolios

a. Nominal returns are likely to be significantly below the long-run historical average

- ● History 1958-2016
- ● History 2000-2016

b. Projected ten-year nominal return outlook for balanced portfolios

	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	History 1958-2016	History 2000-2016
30%/70%	1.3%	3.1%	4.3%	5.5%	7.2%	10.0%	7.1%
50%/50%	0.8%	3.6%	5.5%	7.4%	10.3%	10.2%	7.0%
70%/30%	0.1%	4.0%	6.6%	9.4%	13.4%	10.4%	6.9%

Notes: The forecast displays 5th/25th/50th/75th/95th percentile ranges of 10,000 VCMM simulations for projected ten-year annualised nominal returns as of September 2016 in U.S. dollars. Historical returns are computed using indexes defined in "Indexes used in our historical calculations" on page 5. The equity portfolio is 60% U.S. equity and 40% global ex-U.S. equity. The bond portfolio is 70% U.S. bonds and 30% global ex-U.S. bonds.

Source: Vanguard.

Figure III-1. *(Continued).* Nominal return analytics for balanced portfolios

c. The higher the nominal return objective, the lower the probability of success
Probability of meeting nominal return objectives (10-year horizon)
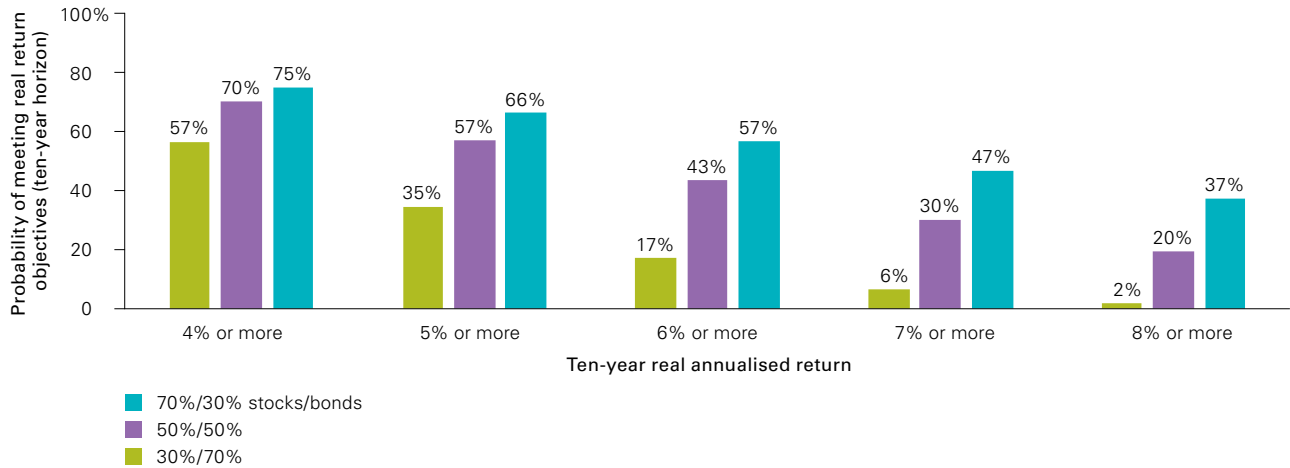
d. Risky portfolios require risk tolerance
Probability of negative real returns in any given year
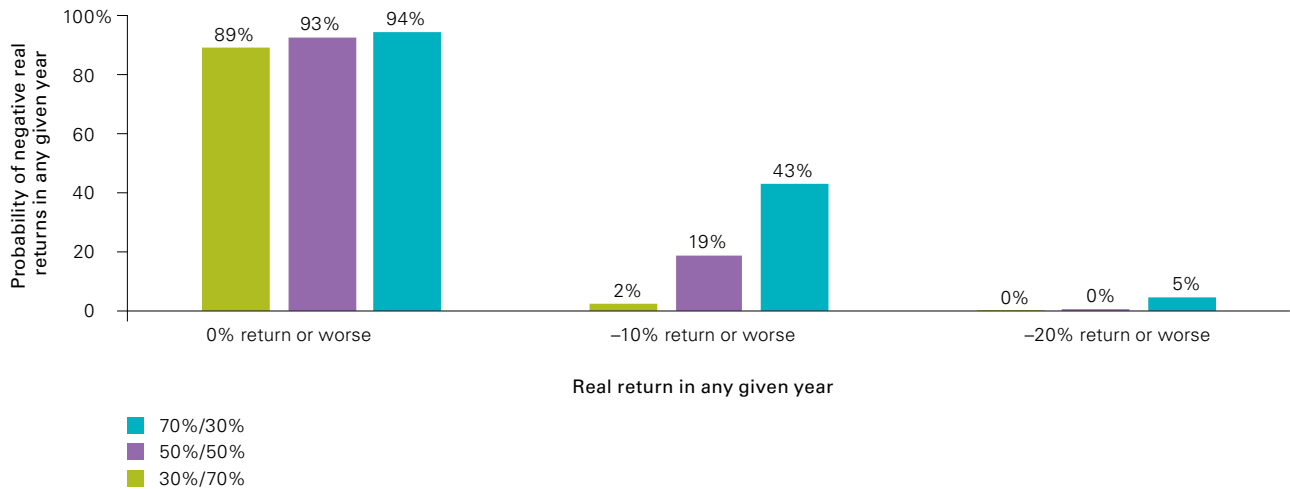
Note: Forecast displays the 5th/25th/75th/95th percentile range of 10,000 simulations from VCMM for projected nominal returns for balanced portfolios in AUD as of September 2016. Historical returns are computed using the indexes defined on page 4. The equity portfolio is 50% Australian equity and 50% global Ex-Australia equity. The bond portfolio is 40% Australian bonds and 60% global Ex-Australia bonds. See appendix section titled "Index simulations" for further details on the asset classes shown above. Hedged returns from June 1969 until 1990 based on availability of 3-month yields for the US and Australia, and use the forward rate based on interest rate differentials. After 1990, returns are hedged using Barclays methodology.

Source: Vanguard calculations using data from Thomson Reuters Datastream, Bloomberg, Barclays Live, OECD via Federal Reserve, and Moody's Analytics Databuffet.

money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data from as early as 1960. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The primary value of the VCMM is in its application to analysing potential client portfolios. VCMM asset-class forecasts—comprising distributions of expected returns, volatilities, and correlations—are key to the evaluation of potential downside risks, various risk–return trade-offs, and diversification benefits of various asset classes. Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered, such as the data presented in this paper, is the most effective way to use VCMM output.

The VCMM seeks to represent the uncertainty in the forecast by generating a wide range of potential outcomes. It is important to recognise that the VCMM does not impose "normality" on the return distributions, but rather is influenced by the so-called fat tails and skewness in the empirical distribution of modelled asset-class returns. Within the range of outcomes, individual experiences can be quite different, underscoring the varied nature of potential future paths. Indeed, this is a key reason why we approach asset-return outlooks in a distributional framework, as shown in Figure III-1, which highlights balanced portfolio returns before adjusting for inflation.

Figure III-2: VCMM simulation output for broad Australian stock market (10,000 simulations)
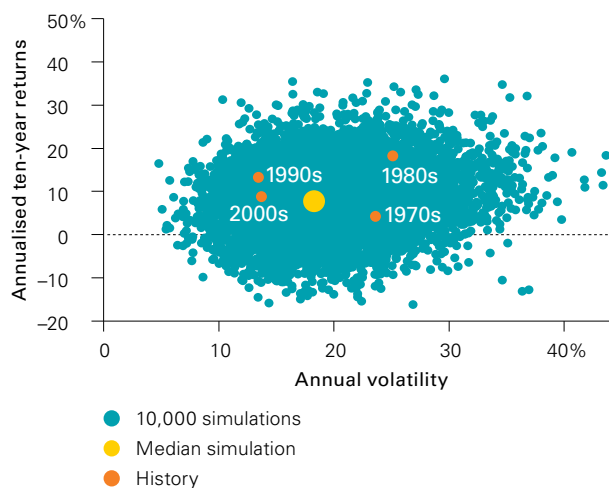
Notes: Historical returns are computed using indexes defined in "Indexes used in our historical calculations" on page 5.
Source: Vanguard.

Figure III-2 further illustrates this point by showing the full range of scenarios created by the model. The scatter plot displays 10,000 geometric average ten-year returns and standard deviations for Australian equities. The dispersion in returns and volatilities is wide enough to encompass historical market performance for various decades.

Index simulations

The long-term returns of our hypothetical portfolios are based on data for the appropriate market indexes through September 2016. We chose these benchmarks to provide the most complete history possible, and we apportioned the global allocations to align with Vanguard's guidance in constructing diversified portfolios. Asset classes and their representative forecast indexes are as follows:

- **Australian equities:** MSCI Australia Index.

- **Global ex-Australia equities:** MSCI All Country World ex-Australia Index.

- **Australian REITs:** FTSE EPRA/NAREIT Australian Index.

- **Commodity futures:** Bloomberg Commodity Index in AUD (unhedged).

- **Australian cash:** Australian 1-Month Government Bond.

- **Australian Government Bonds / Treasury Index:** Barclays Australian Aggregate Treasury Bond Index.

- **Australian credit bonds:** Barclays Australian Credit Index.

- **Australian bonds:** Barclays Australian Aggregate Bond Index.

- **Global ex-Australia bonds:** Barclays Global Aggregate ex-AUS Bond Index.

- **Australian Linkers:** Barclays Australia Inflation Linked Treasury Index.

- **Short-term Treasury index:** Barclays Australian Aggregate Treasury 1-5 Year Bond Index.

- **Long-term Treasury index:** Barclays Australian Aggregate Treasury 10+ Year Bond Index.

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