Under the intermediate assumptions, estimated total scheduled benefits paid from the OASI Trust Fund with respect to disabled beneficiaries will increase from $14,514 million in calendar year 2023 to $21,996 million in calendar year 2032.

In calendar year 2022, benefit payments (including payments for vocational rehabilitation services) with respect to disabled persons from the OASI Trust Fund and from the DI Trust Fund (including payments from the DI fund to all children and spouses of disabled-worker beneficiaries) totaled $156,861 million. Of this amount, $13,266 million, or 8.5 percent, represented payments from the OASI Trust Fund. Table VI.H2 contains these and similar figures for selected calendar years during 1960 through 2022 and estimates for calendar years 2023 through 2032.

Table VI.H2.—Scheduled Benefit Payments[a] Under the OASDI Program With Respect to Disabled Beneficiaries
[Amounts in millions]

Calendar year	Total[b]	DI Trust Fund[c]	OASI Trust Fund	
			Amount[d]	Percentage of total
Historical data:				
1960	$627	$568	$59	9.4
1965	1,707	1,573	134	7.9
1970	3,386	3,085	301	8.9
1975	9,169	8,505	664	7.2
1980	16,738	15,515	1,223	7.3
1985	20,908	18,836	2,072	9.9
1990	27,717	24,835	2,882	10.4
1995	45,140	40,937	4,202	9.3
2000	60,204	55,001	5,203	8.6
2005	91,835	85,386	6,449	7.0
2010	132,916	124,245	8,671	6.5
2015	154,028	143,388	10,640	6.9
2016	153,709	142,800	10,909	7.1
2017	154,048	142,826	11,222	7.3
2018	155,526	143,760	11,767	7.6
2019	157,289	145,141	12,148	7.7
2020	155,933	143,582	12,351	7.9
2021	152,538	140,085	12,453	8.2
2022	156,861	143,595	13,266	8.5
Estimates under the intermediate assumptions:				
2023	162,584	148,070	14,514	8.9
2024	170,786	155,521	15,265	8.9
2025	181,291	165,353	15,939	8.8
2026	192,051	175,345	16,706	8.7
2027	201,292	183,777	17,515	8.7
2028	209,539	191,196	18,343	8.8
2029	216,103	196,899	19,204	8.9
2030	222,804	202,723	20,081	9.0
2031	230,957	209,952	21,006	9.1
2032	240,239	218,243	21,996	9.2

[a] Amounts for 2020 and 2021 are adjusted to include in 2021 operations those benefit payments regularly scheduled in the law to be paid on January 3, 2021, which were actually paid on December 31, 2020 as required by the statutory provision for early benefit payments when the normal delivery date is on a weekend or holiday. Such shifts in payments across calendar years have occurred in the past, including in 2016, and will occur periodically in the future whenever January 3rd falls on a Sunday. In order to provide a consistent perspective on trust fund operations over time, all trust fund operations in each year reflect the 12 months of benefits that are regularly scheduled for payment in that year.

[b] Beginning in 1966, includes payments for vocational rehabilitation services.

[c] Scheduled benefits for disabled workers and their children and spouses.

[d] Scheduled benefits for disabled children aged 18 and over, for certain mothers and fathers (see text), and for disabled widows and widowers (see footnote e, table VI.H1).

Note: Components may not sum to totals because of rounding.

I. GLOSSARY

Actuarial balance. The difference between the summarized income rate and the summarized cost rate as a percentage of taxable payroll over a given valuation period.

Actuarial deficit. A negative actuarial balance.

Administrative expenses. Expenses incurred by the Social Security Administration and the Department of the Treasury in administering the OASDI program and the provisions of the Internal Revenue Code relating to the collection of contributions. Such administrative expenses are paid from the OASI and DI Trust Funds.

Advance tax transfers. Amounts representing the estimated total OASDI tax contributions for a given month. From May 1983 through November 1990, such amounts were credited to the OASI and DI Trust Funds at the beginning of each month. The trust funds reimbursed the General Fund of the Treasury for the associated loss of interest. Advance tax transfers are no longer made unless needed in order to pay benefits.

Alternatives I, II, or III. See "Assumptions."

Annual balance. The difference between the income rate and the cost rate for a given year.

Asset reserves. See "Trust fund reserves".

Assumptions. Values related to future trends in key factors that affect the trust funds. Demographic assumptions include fertility, mortality, net immigration, marriage, and divorce. Economic assumptions include unemployment rates, average earnings, inflation, interest rates, and productivity. Program-specific assumptions include retirement patterns, and disability incidence and termination rates. This report presents three sets of demographic, economic, and program-specific assumptions:

- Alternative II is the intermediate set of assumptions, and represents the Trustees' best estimates of likely future demographic, economic, and program-specific conditions.
- Alternative I is a low-cost set of assumptions—it assumes relatively rapid economic growth, high inflation, and favorable (from the standpoint of program financing) demographic and program-specific conditions.
- Alternative III is a high-cost set of assumptions—it assumes relatively slow economic growth, low inflation, and unfavorable (from the standpoint of program financing) demographic and program-specific conditions.

See tables V.A2, V.B1, and V.B2.

Automatic cost-of-living benefit increase. The annual increase in benefits, effective for December, reflecting the increase, if any, in the cost of living. A

benefit increase is applicable only after a beneficiary becomes eligible for benefits. In general, the benefit increase equals the percentage increase in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) measured from the third quarter of the last year for which there was an increase to the third quarter of the current year. If there is no increase in the CPI-W, there is no cost-of-living benefit increase. See table V.C1.

Auxiliary benefits. Monthly benefits payable to a spouse or child of a retired or disabled worker, or to a survivor of a deceased worker.

Average indexed monthly earnings—AIME. The measure of lifetime earnings used in determining the primary insurance amount (PIA) for most workers who attain age 62, become disabled, or die after 1978. A worker's actual past earnings are adjusted by changes in the average wage index, in order to bring them up to their approximately equivalent value at the time of retirement or other eligibility for benefits.

Average wage index—AWI. A series that generally increases with the average amount of total wages per worker with any wages for each year after 1950, including wages in noncovered employment and wages in covered employment in excess of the OASDI contribution and benefit base. (See Title 20, Chapter III, section 404.211(c) of the Code of Federal Regulations for a more precise definition.) The average wage index is used to index the taxable earnings of most workers first becoming eligible for benefits in 1979 or later, and for automatic adjustments in the contribution and benefit base, bend points, earnings test exempt amounts, and other wage-indexed amounts. See tables V.C1 and VI.G6.

Award. An administrative determination that an individual is entitled to receive a specified type of OASDI benefit. Awards can represent not only new entrants to the benefit rolls but also persons already on the rolls who become entitled to a different type of benefit. Awards usually result in the immediate payment of benefits, although payments may be deferred or withheld depending on the individual's particular circumstances.

Baby boom. The period from the end of World War II (1946) through 1965 marked by unusually high birth rates.

Bend points. The dollar amounts defining the AIME or PIA brackets in the benefit formulas. For the bend points for years 1979 and later, see table V.C2.

Beneficiary. A person who has been awarded benefits on the basis of his or her own or another's earnings record. The benefits may be either in current-payment status or withheld.

Benefit award. See "Award."

Benefit conversion. See "Disability conversion."

Benefit payments. The amounts disbursed for OASI and DI benefits by the Department of the Treasury.

Benefit termination. See "Termination."

Best estimate assumptions. See "Assumptions."

Board. See "Board of Trustees."

Board of Trustees. A Board established by the Social Security Act to oversee the financial operations of the Federal Old-Age and Survivors Insurance Trust Fund and the Federal Disability Insurance Trust Fund. The Board is composed of six members. Four members serve by virtue of their positions in the Federal Government: the Secretary of the Treasury, who is the Managing Trustee; the Secretary of Labor; the Secretary of Health and Human Services; and the Commissioner of Social Security. The President appoints and the Senate confirms the other two members to serve as public representatives. Also referred to as the "Board" or the "Trustees."

Cash flow. Actual or projected revenue (other than interest paid to the trust funds) and costs reflecting the levels of payroll tax contribution rates and benefits scheduled in the law. Net cash flow is the difference between noninterest income and cost.

Consumer Price Index—CPI. An official measure of inflation in consumer prices. In this report, CPI refers to the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). The Bureau of Labor Statistics, Department of Labor, publishes historical values for the CPI-W.

Contribution and benefit base. Annual dollar amount above which earnings in employment covered under the OASDI program are neither taxable nor creditable for benefit-computation purposes. (Also referred to as maximum contribution and benefit base, annual creditable maximum, taxable maximum, and maximum taxable.) See tables V.C1 and V.C6. See "Hospital Insurance (HI) contribution base."

Contributions. See "Payroll tax contributions."

Conversion. See "Disability conversion."

Cost. The cost shown for a year includes benefits scheduled for payment in the year (without regard to the ability to make the payments in full), administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries.

Cost-of-living adjustment. See "Automatic cost-of-living benefit increase."

Cost rate. The cost rate for a year is the ratio of the cost of the program to the taxable payroll for the year.

Covered earnings. Wages or earnings from self-employment covered by the OASDI program.

Covered employment. All employment for which earnings are creditable for Social Security purposes. The program covers almost all employment. Some exceptions are:

- State and local government employees whose employer has not elected to be covered under Social Security and who are participating in an employer-provided pension plan.
- Current Federal civilian workers hired before 1984 who have not elected to be covered.
- Self-employed workers earning less than $400 in a calendar year.

Covered worker. A person who has earnings creditable for Social Security purposes based on services for wages in covered employment or income from covered self-employment.

CPI-indexed dollars. Amounts adjusted by the CPI to the value of the dollar in a particular year.

Creditable earnings. Wages or self-employment earnings posted to a worker's earnings record. Such earnings determine eligibility for benefits and the amount of benefits on that worker's record. The contribution and benefit base is the maximum amount of creditable earnings for each worker in a calendar year.

Current-cost financing. See "Pay-as-you-go financing."

Current dollars. Amounts expressed in nominal dollars with no adjustment for inflation.

Currently insured status. A worker is currently insured when he or she has accumulated six quarters of coverage during the 13-quarter period ending with the current quarter.

Current-payment status. Status of a beneficiary to whom a benefit is being paid for a given month (with or without deductions, provided the deductions add to less than a full month's benefit).

Deemed filing. Under certain circumstances, a person applying for or receiving either an aged-spouse benefit or a retired-worker benefit is required to also file for the other of these two types of benefits. For those first eligible for benefits before 2016, this requirement applies to any person under normal retirement age who is eligible for the other benefit as of the starting month for the first benefit. For those first eligible for benefits in 2016 and later, this requirement applies whenever the person is eligible for the other benefit. This can occur at any age, and in months after the starting month of the first benefit.

Deemed wage credit. See "Military service wage credits."

Delayed retirement credits. Increases in the benefit amount for certain individuals who did not receive benefits for months after attaining normal retirement age but before age 70. Delayed retirement credits apply to benefits for

January of the year following the year they are earned or for the month of attainment of age 70, whichever comes first. See table V.C3.

Demographic assumptions. See "Assumptions."

Disability. For Social Security purposes, the inability to engage in any substantial gainful activity (see "Substantial gainful activity—SGA") by reason of any medically determinable physical or mental impairment that can be expected to result in death or to last for a continuous period of not less than 12 months. Special rules apply for workers at ages 55 and over whose disability is based on blindness.

The law generally requires that a person be disabled continuously for 5 months before he or she can qualify for a disabled-worker benefit.

Disability conversion ratio. For a given year, the ratio of the number of disability conversions to the average number of disabled-worker beneficiaries at all ages during the year.

Disability conversion. Upon attainment of normal retirement age, a disabled-worker beneficiary is automatically converted to retired-worker status.

Disability incidence rate. The proportion of workers in a given year, insured for but not receiving disability benefits, who apply for and are awarded disability benefits.

Disability Insurance (DI) Trust Fund. See "Trust fund."

Disability insured status. A worker is disability insured if he or she is: (1) a fully insured worker who has accumulated 20 quarters of coverage during the 40-quarter period ending with the current quarter, (2) a fully insured worker aged 24-30 who has accumulated quarters of coverage during one-half of the quarters elapsed after the quarter of attainment of age 21 and up to and including the current quarter, or (3) a fully insured worker under age 24 who has accumulated six quarters of coverage during the 12-quarter period ending with the current quarter.

Disability prevalence rate. The proportion of persons insured for disability benefits who are disabled-worker beneficiaries in current-payment status.

Disability termination rate. The proportion of disabled-worker beneficiaries in a given year whose disability benefits terminate as a result of their recovery or death.

Disabled-worker benefit. A monthly benefit payable to a disabled worker under normal retirement age and insured for disability. Before November 1960, disability benefits were limited to disabled workers aged 50-64.

Dual entitlement. A person may be entitled to more than one benefit at the same time. For example, a person may be entitled as a retired worker on his or her own record and as a spouse on another record. However, a person's benefit amount can never exceed the highest single benefit to which that per-

son is entitled. Some benefits are calculated independently with the larger benefit being paid or the smaller benefit being paid plus the excess amount of the larger one.

Earnings. Unless otherwise qualified, all wages from employment and net earnings from self-employment, whether or not they are taxable or covered.

Earnings test. The provision requiring the withholding of benefits if beneficiaries under normal retirement age have earnings in excess of certain exempt amounts. See table V.C1.

Economic assumptions. See "Assumptions."

Effective interest rate. See "Interest rate."

Excess wages. Wages in excess of the contribution and benefit base on which a worker initially makes payroll tax contributions, usually as a result of working for more than one employer during a year. Employee payroll taxes on excess wages are refundable to affected employees, while the employer taxes are not refundable.

Expenditures. Actual payments made or expected to be made under current law, including benefits paid or payable, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries. Includes only the portion of cost that is payable with the financing provisions in current law.

Exposed population. For any event (such as being awarded a benefit, or dying), the group that is exposed to the possibility of experiencing the event. For example, the exposed population for disabled worker awards (incidence) is the disability insured population less those already receiving benefits.

Federal Insurance Contributions Act—FICA. Provision authorizing payroll taxes on the wages of employed persons to provide for Old-Age, Survivors, and Disability Insurance, and for Hospital Insurance. Workers and their employers generally pay the tax in equal amounts.

Financial interchange. Provisions of the Railroad Retirement Act providing for transfers between the trust funds and the Social Security Equivalent Benefit Account of the Railroad Retirement program in order to place each trust fund in the same financial position it would have been had railroad employment always been covered under Social Security.

Fiscal year. The accounting year of the United States Government. Starting in 1976, a fiscal year is the 12-month period ending September 30. For example, fiscal year 2023 began October 1, 2022, and will end September 30, 2023.

Full advance funding. A financing method in which contributions are established to match the full cost of future benefits as these costs are incurred through current service. Such financing methods also provide for amortization over a fixed period of any financial obligation that is incurred at the

beginning of the program (or subsequent modification) as a result of granting credit for past service.

Fully insured status. A worker is fully insured when his or her total number of quarters of coverage is greater than or equal to the number of years elapsed after the year of attainment of age 21 (but not less than six). Once a worker has accumulated 40 quarters of coverage, he or she remains permanently fully insured.

General Fund of the Treasury. Funds held by the Treasury of the United States, other than income collected for a specific purpose (such as Social Security), and maintained in a separate account for that purpose.

General Fund reimbursements. Payments from the General Fund of the Treasury to the trust funds for specific items defined in the law, including:

- The cost of noncontributory wage credits for military service before 1957, and periodic adjustments of previous determinations.
- The cost in 1971-82 of deemed wage credits for military service performed after 1956.
- The cost of benefits to certain uninsured persons who attained age 72 before 1968.
- The cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21.
- The cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246.
- Payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.
- A portion of proceeds from repayments of loans authorized under Public Law 116-136.

The General Fund also reimburses the trust funds for various other items, including interest on checks which are not negotiated 6 months after the month of issue and costs incurred in performing certain legislatively mandated activities not directly related to administering the OASI and DI programs.

Gross domestic product—GDP. The total dollar value of all goods and services produced by labor and property located in the United States, regardless of who supplies the labor or property.

Hospital Insurance (HI) contribution base. Annual dollar amount above which earnings in employment covered under the HI program are not taxable. (Also referred to as maximum contribution base, taxable maximum, and maximum taxable.) Beginning in 1994, the HI contribution base was eliminated.

High-cost assumptions. See "Assumptions."

Hospital Insurance (HI) Trust Fund. See "Trust fund."

Immigration. See "Lawful permanent resident (LPR) immigration" and "Other-than-LPR immigration."

Income. Income for a given year is the sum of tax revenue on a cash basis (payroll tax contributions and income from the taxation of scheduled benefits), reimbursements from the General Fund of the Treasury, if any, and interest credited to the trust funds.

Income rate. Ratio of non-interest income to the OASDI taxable payroll for the year.

Infinite horizon. The period extending indefinitely into the future.

Inflation. An increase in the general price level of goods and services.

Insured status. The state or condition of having sufficient quarters of coverage to meet the eligibility requirements for retired-worker or disabled-worker benefits, or to permit the worker's spouse and children or survivors to establish eligibility for benefits in the event of his or her disability, retirement, or death. See "Quarter of coverage."

Interest. A payment in exchange for the use of money during a specified period.

Interest rate. Interest rates on new public-debt obligations issuable to Federal trust funds (see "Special public-debt obligation") are determined monthly. Such rates are equal to the average market yield on all outstanding marketable U.S. securities not due or callable until after 4 years from the date the rate is determined. See table V.B2 for historical and assumed future interest rates on new special-issue securities. The effective interest rate for a trust fund is the ratio of the interest earned by the fund over a given period of time to the average level of asset reserves held by the fund during the period. The effective rate of interest thus represents a measure of the overall average interest earnings on the fund's portfolio of investments. See table VI.G6 for projected compound new-issue interest factors and compound effective trust-fund interest factors.

Interfund borrowing. The borrowing of asset reserves by a trust fund (OASI, DI, or HI) from another trust fund when the first fund is in danger of depletion. The Social Security Act permitted interfund borrowing only during 1982 through 1987, and required all amounts borrowed to be repaid prior to the end of 1989. The only exercise of this authority occurred in 1982, when the OASI Trust Fund borrowed from the DI and HI Trust Funds. The final repayment of borrowed amounts occurred in 1986.

Intermediate assumptions. See "Assumptions."

Lawful permanent resident (LPR) immigration. Persons who enter the Social Security area population and are granted LPR status, or who are already in the Social Security area population and adjust their status to become LPRs. Persons who enter the country with legal visas but without

LPR status, such as temporary foreign workers and students, are not included in the "LPR immigration" category.

Legal emigration. Lawful permanent residents and citizens who leave the Social Security area population.

Life expectancy. Average remaining number of years expected prior to death. Period life expectancy is calculated for a given year using the actual or expected death rates at each age for that year. Cohort life expectancy, sometimes referred to as generational life expectancy, is calculated for individuals at a specific age in a given year using actual or expected death rates from the years in which the individuals would actually reach each succeeding age if they survive.

Long-range. The first 75 projection years. The Trustees make long-range actuarial estimates for this period because it covers approximately the maximum remaining lifetime for virtually all current Social Security participants.

Low-cost assumptions. See "Assumptions."

Lump-sum death payment. A lump sum, generally $255, payable on the death of a fully or currently insured worker. The lump sum is payable to the surviving spouse of the worker, under most circumstances, or to the worker's children.

Maximum family benefit. The maximum monthly amount that can be paid on a worker's earnings record. Whenever the total of the individual monthly benefits payable to all the beneficiaries entitled on one earnings record exceeds the maximum, each dependent's or survivor's benefit is proportionately reduced. Benefits payable to divorced spouses or surviving divorced spouses are not reduced under the family maximum provision.

Medicare. A nationwide, Federally administered health insurance program authorized in 1965 under Title XVIII of the Social Security Act to cover the cost of hospitalization, medical care, and some related services for most persons age 65 and over. In 1972, lawmakers extended coverage to persons receiving Social Security Disability Insurance payments for 2 years and persons with End-Stage Renal Disease. (For beneficiaries whose primary or secondary diagnosis is Amyotrophic Lateral Sclerosis, the 2-year waiting period is waived.) In 2010, persons exposed to environmental health hazards within areas under a corresponding emergency declaration became Medicare-eligible. In 2006, prescription drug coverage was added as well. Medicare consists of two separate but coordinated trust funds—Hospital Insurance (HI, Part A) and Supplementary Medical Insurance (SMI). The SMI Trust Fund is composed of two separate accounts—the Part B account and the Part D account. Almost all persons who are aged 65 and over or disabled and who are entitled to HI are eligible to enroll in Part B and Part D on a voluntary basis by paying monthly premiums.

Military service wage credits. Credits toward OASDI earnings records for benefit computation purposes, recognizing that military personnel receive non-wage compensation (such as food and shelter) in addition to their basic pay and other cash payments. Military personnel do not pay payroll taxes on these credits. Noncontributory wage credits of $160 were provided for each month of active military service from September 16, 1940, through December 31, 1956. For years after 1956, the basic pay of military personnel is covered under the Social Security program on a contributory basis. In addition to the contributory credits for basic pay, noncontributory wage credits of $300 were granted for each calendar quarter, from January 1957 through December 1977, in which a person received pay for military service. Noncontributory wage credits of $100 were granted for each $300 of military wages, up to a maximum credit of $1,200 per calendar year, from January 1978 through December 2001.

National average wage index—AWI. See "Average wage index—AWI."

Non-interest income. Non-interest income for a given year is the sum of tax revenue on a cash basis (payroll tax contributions and income from the taxation of scheduled benefits) and reimbursements from the General Fund of the Treasury, if any.

Nonresident alien beneficiary. An OASDI beneficiary who is not a U.S. citizen and who is living abroad while receiving benefits.

Normal retirement age—NRA. The age at which a person may first become entitled to retirement benefits without reduction based on age. For persons reaching age 62 before 2000, the normal retirement age is 65. It increases gradually to 67 for persons reaching age 62 in 2022 or later, beginning with an increase to 65 years and 2 months for persons reaching age 62 in 2000. See table V.C3.

Old-Age and Survivors Insurance (OASI) Trust Fund. See "Trust fund."

Old-law base. Amount the contribution and benefit base would have been if the 1977 amendments had not provided for ad hoc increases. The Social Security Amendments of 1972 provided for automatic annual indexing of the contribution and benefit base. The Social Security Amendments of 1977 specified ad hoc bases for 1978-81, with subsequent bases updated in accordance with the normal indexing procedure. See table V.C2.

Open-group unfunded obligation. See "Unfunded obligation."

Other-than-LPR emigration. Other-than-LPR immigrants who leave the Social Security area population or who adjust their status to become LPRs.

Other-than-LPR immigration. Persons who enter the Social Security area population and stay to the end of the year without being granted LPR status, such as undocumented immigrants, and foreign workers and students entering with temporary visas.

Par value. The value printed on the face of a bond. For special issues held by the trust funds, par value is the redemption value at any time up to maturity.

Partial advance funding. A financing method in which contribution levels are established to provide a substantial accumulation of trust fund asset reserves, thereby generating interest income to the trust funds and reducing the need for contribution increases or cost reductions in periods when costs are relatively high or income is relatively low. The trust fund buildup under partial advance funding is smaller than it would be with full advance funding.

Pay-as-you-go financing. A financing method in which contribution levels are established with the intent to produce annual income levels required to pay current benefits, with trust fund asset reserves built up only to the extent needed to prevent immediate depletion of the fund reserves by random fluctuations.

Payroll tax contributions. The amount based on a percent of earnings, up to an annual maximum, that must be paid by:

- employers and employees on wages from employment under the Federal Insurance Contributions Act,
- the self-employed on net earnings from self-employment under the Self-Employment Contributions Act, and
- States on the wages paid in 1986 and earlier to State and local government employees covered under the Social Security Act through voluntary agreements under section 218 of the act.

Also referred to as payroll taxes.

Population in the Social Security area. See "Social Security area population."

Potential GDP. Sustainable trend level of GDP (see "Gross domestic product—GDP"). That is, the hypothetical level of GDP that would be achieved at full sustainable employment and use of capital. For the purposes of this report, potential GDP is estimated consistent with long-range ultimate assumptions for the unemployment rate and other economic variables and can be interpreted as the hypothetical level of GDP in the absence of business cycles and other short-term fluctuations.

Present value. The equivalent value, at the present time, of a stream of values (either income or cost, past or future). Present value is used widely in calculations involving financial transactions over long periods of time to account for the time value of money, by discounting or accumulating these transactions at the rate of interest. Present-value calculations for this report use the effective yield on combined OASI and DI Trust Fund asset reserves.

Primary insurance amount—PIA. The monthly amount payable to a retired worker who begins to receive benefits at normal retirement age or, generally, to a disabled worker. This amount, which is typically related to the worker's average monthly wage or average indexed monthly earnings, is also used as a base for computing all types of benefits payable on an individual's earnings record.

Primary-insurance-amount formula. The mathematical formula relating the PIA to the AIME for workers who attain age 62, become disabled, or die after 1978. The PIA is equal to the sum of 90 percent of AIME up to the first bend point, plus 32 percent of AIME above the first bend point up to the second bend point, plus 15 percent of AIME in excess of the second bend point. Automatic benefit increases are applied beginning with the year of eligibility. See table V.C2 for historical and assumed future bend points and table V.C1 for historical and assumed future benefit increases.

Quarter of coverage. Basic unit of measurement for determining insured status. For 1978, a worker earned one quarter of coverage, up to four, for each $250 of that worker's annual covered earnings. After 1978, the $250 amount increases automatically with increases in the national average wage index. See table V.C2.

Railroad Retirement. A Federal insurance program, similar to Social Security, designed for workers in the railroad industry. The provisions of the Railroad Retirement Act provide for a system of coordination and financial interchange between the Railroad Retirement program and the Social Security program.

Reallocation of payroll tax rates. An increase in the payroll tax rate for either the OASI or DI Trust Fund, with a corresponding reduction in the rate for the other fund, so that the total OASDI payroll tax rate is not changed.

Real wage differential. The difference between the percentage increases in: (1) the average annual wage in covered employment and (2) the average annual Consumer Price Index. See section V.B.

Recession. A period of adverse economic conditions, generally defined as two or more successive calendar quarters of negative real growth in gross domestic product.

Reserves. See "Trust fund reserves."

Retired-worker benefit. A monthly benefit payable to a fully insured retired worker aged 62 or older or to a person entitled under the transitionally insured status provision in the law.

Retirement earnings test. See "Earnings test."

Retirement eligibility age. The age, currently age 62, at which a fully insured individual first becomes eligible to receive retired-worker benefits.

Scheduled benefits. The level of benefits specified under current law.

Scenario-based model. A model with specified assumptions for and relationships among variables. Under such a model, any specified set of assumptions determines a single outcome directly reflecting the specifications.

Self-employment. Operation of a trade or business by an individual or by a partnership in which an individual is a member.

Self-Employment Contributions Act–SECA. Provision authorizing Social Security payroll taxes on the net earnings of most self-employed persons.

Short-range. The first 10 projection years. The Social Security Act requires estimates for 5 years; the Trustees prepare estimates for an additional 5 years to help clarify trends that are only starting to develop in the mandated first 5-year period.

Social Security Act. Provisions of the law governing most operations of the Social Security program. The original Social Security Act is Public Law 74-271, enacted August 14, 1935. With subsequent amendments, the Social Security Act consists of 21 titles, of which three have been repealed. Title II of the Social Security Act authorizes the Old-Age, Survivors, and Disability Insurance program.

Social Security area population. The population composed of: (1) residents of the 50 States and the District of Columbia (adjusted for net census undercount); (2) civilian residents of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Northern Mariana Islands; (3) Federal civilian employees and persons in the U.S. Armed Forces abroad and their dependents; (4) non-citizens living abroad who are insured for Social Security benefits; and (5) all other U.S. citizens abroad.

Solvency. A program is solvent at a point in time if it is able to pay scheduled benefits when due with scheduled financing. For example, the OASDI program is solvent over any period for which the trust funds maintain a positive level of asset reserves.

Special public-debt obligation. Securities of the United States Government issued exclusively to the OASI, DI, HI, and SMI Trust Funds and other Federal trust funds. Section 201(d) of the Social Security Act provides that the public-debt obligations issued for purchase by the OASI and DI Trust Funds shall have maturities fixed with due regard for the needs of the funds. The usual practice has been to spread the holdings of special issues, as of each June 30, so that the amounts maturing in each of the next 15 years are approximately equal. Special public-debt obligations are redeemable at par value at any time and carry interest rates determined by law (see "Interest rate"). See tables VI.A4 and VI.A5 for a listing of the obligations held by the OASI and DI Trust Funds, respectively.

Stochastic model. A model used for projecting a probability distribution of potential outcomes. Such models allow for random variation in one or more variables through time. The random variation is generally based on fluctuations observed in historical data for a selected period. A large number of sim-

ulations, each of which reflects random variation in the variable(s), produce a distribution of potential outcomes.

Substantial gainful activity—SGA. The level of work activity used to establish disability. A finding of disability requires that a person be unable to engage in substantial gainful activity. A person who earns more than a certain monthly amount (net of impairment-related work expenses) is ordinarily considered to be engaging in SGA. The amount of monthly earnings considered as SGA depends on the nature of a person's disability. The Social Security Act specifies a higher SGA amount for statutorily blind individuals; Federal regulations specify a lower SGA amount for non-blind individuals. Both SGA amounts increase with increases in the national average wage index.

Summarized balance. The difference between the summarized income rate and the summarized cost rate, expressed as a percentage of GDP. The difference between the summarized income rate and cost rate as a percentage of taxable payroll is referred to as the actuarial balance.

Summarized cost rate. The ratio of the present value of cost to the present value of the taxable payroll (or GDP) for the years in a given period, expressed as a percentage. To evaluate the financial adequacy of the program, the summarized cost rate is adjusted to include the cost of reaching and maintaining a target trust fund level. A trust fund level of about 1 year's cost is considered to be an adequate reserve for unforeseen contingencies; therefore, the targeted trust fund ratio is 100 percent of annual cost. Accordingly, the adjusted summarized cost rate is equal to the ratio of: (1) the sum of the present value of the cost during the period plus the present value of the targeted ending trust fund level to (2) the present value of the taxable payroll (or GDP) during the projection period.

Summarized income rate. The ratio of the present value of scheduled noninterest income to the present value of taxable payroll (or GDP) for the years in a given period, expressed as a percentage. To evaluate the financial adequacy of the program, the summarized income rate is adjusted to include asset reserves on hand at the beginning of the period. Accordingly, the adjusted summarized income rate equals the ratio of: (1) the sum of the trust fund reserve at the beginning of the period plus the present value of noninterest income during the period to (2) the present value of the taxable payroll (or GDP) for the years in the period.

Supplemental Security Income—SSI. A Federally administered program (often with State supplementation) of cash assistance for needy aged, blind, or disabled persons. The General Fund of the Treasury funds Federal expenditures for the SSI program. The Social Security Administration administers it.

Supplementary Medical Insurance (SMI) Trust Fund. See "Trust fund."

Survivor benefit. Benefit payable to a survivor of a deceased worker.

Sustainable solvency. Sustainable solvency for the financing of the program under a specified set of assumptions is achieved when the projected trust fund ratio is positive throughout the 75-year projection period and is either stable or rising at the end of the period.

Taxable earnings. Wages or self-employment income, in employment covered by the OASDI or HI programs, that is under the applicable annual maximum taxable limit. For 1994 and later, no maximum taxable limit applies to the HI program.

Taxable payroll. A weighted sum of taxable wages and taxable self-employment income. When multiplied by the combined employee-employer payroll tax rate, taxable payroll yields the total amount of payroll taxes incurred by employees, employers, and the self-employed for work during the period.

Taxable self-employment income. The maximum amount of net earnings from self-employment by an earner which, when added to any taxable wages, does not exceed the contribution and benefit base. For HI beginning in 1994, all net earnings from self-employment.

Taxable wages. See "Taxable earnings."

Taxation of benefits. Beginning in 1984, Federal law subjected up to 50 percent of an individual's or a couple's OASDI benefits to Federal income taxation under certain circumstances. Treasury allocates the revenue derived from this provision to the OASI and DI Trust Funds on the basis of the income taxes paid on the benefits from each fund. Beginning in 1994, the law increased the maximum percentage from 50 percent to 85 percent. The HI Trust Fund receives the additional tax revenue resulting from the increase to 85 percent.

Taxes. See "Payroll tax contributions" and "Taxation of benefits."

Termination. Cessation of payment because the beneficiary is no longer entitled to receive a specific type of benefit. For example, benefits might terminate as a result of the death of the beneficiary, the recovery of a disabled beneficiary, or the attainment of age 18 by a child beneficiary. In some cases, an individual may cease one benefit and this is not a termination because they become immediately entitled to another type of benefit, such as the conversion of a disabled-worker beneficiary at normal retirement age to a retired-worker beneficiary.

Test of long-range close actuarial balance. The conditions required to meet this test are:

- The trust fund satisfies the test of short-range financial adequacy; and
- The trust fund ratio stays above zero throughout the 75-year projection period, such that benefits would be payable in a timely manner throughout the period.

The Trustees apply the test to OASI, DI, and the combined OASDI program based on the intermediate set of assumptions.

Test of short-range financial adequacy. The conditions required to meet this test are:

- If the trust fund ratio is at least 100 percent at the beginning of the 10-year projection period, then it must remain at or above 100 percent throughout the entire projection period;
- If the ratio is initially less than 100 percent, then it must reach at least 100 percent within 5 years (without reserve depletion at any time during this period) and then remain at or above 100 percent throughout the remainder of the 10-year period.

The Trustees apply the test to OASI, DI, and the combined OASDI program based on the intermediate set of assumptions.

Total-economy productivity. The ratio of real GDP to hours worked by all workers. Also referred to as "labor productivity."

Total fertility rate. The sum of the single-year-of-age birth rates for girls and women aged 14 through 49, where the rate for age 14 includes births to girls aged 14 and under, and the rate for age 49 includes births to women aged 49 and over. The total fertility rate may be interpreted as the average number of children that would be born to a woman if she were to experience, at each age of her life, the birth rate observed in, or assumed for, a specified year, and if she were to survive the entire childbearing period.

Trust fund. Separate accounts in the United States Treasury which hold the payroll taxes received under the Federal Insurance Contributions Act and the Self-Employment Contributions Act; payroll taxes resulting from coverage of State and local government employees; any sums received under the financial interchange with the railroad retirement account; voluntary hospital and medical insurance premiums; and reimbursements or payments from the General Fund of the Treasury. As required by law, the Department of the Treasury invests funds not required to meet current expenditures in interest-bearing securities backed by the full faith and credit of the U.S. Government. The interest earned is also deposited in the trust funds.

- **Old-Age and Survivors Insurance (OASI).** The trust fund used for paying monthly benefits to retired-worker (old-age) beneficiaries, their spouses and children, and to survivors of deceased insured workers.
- **Disability Insurance (DI).** The trust fund used for paying monthly benefits to disabled-worker beneficiaries, their spouses and children, and for providing rehabilitation services to the disabled.

- **Hospital Insurance (HI).** The Medicare trust fund that covers specified inpatient hospital services, posthospital skilled nursing care, home health services, and hospice care for aged and disabled individuals who meet the eligibility requirements. Also known as Medicare Part A.
- **Supplementary Medical Insurance (SMI).** The Medicare trust fund composed of the Part B Account, the Part D Account, and the Transitional Assistance Account. The Part B Account pays for a portion of the costs of physicians' services, outpatient hospital services, and other related medical and health services for voluntarily enrolled aged and disabled individuals. The Part D Account pays private plans to provide prescription drug coverage, beginning in 2006. The Transitional Assistance Account paid for transitional assistance under the prescription drug card program in 2004 and 2005.

The trust funds are distinct legal entities which operate independently. Fund operations are sometimes combined on a hypothetical basis.

Trust fund ratio. A measure of trust fund adequacy. The asset reserves at the beginning of a year (equal to the reserves at the end of the prior year), which do not include advance tax transfers, expressed as a percentage of the cost for the year. The trust fund ratio represents the proportion of a year's cost which could be paid solely with the reserves at the beginning of the year.

Trust fund reserve depletion. The point at which reserves in a trust fund are insufficient to pay scheduled benefits in full and on time.

Trust fund reserves. The cumulative excess of trust fund income over trust fund cost over all years to date. These reserves are held by the trust funds in the form of Treasury notes and bonds, other securities guaranteed by the Federal Government, certain Federally sponsored agency obligations, and cash.

Trustees. See "Board of Trustees."

Undisbursed balances. In general, refers to the cumulative differences between the actual cash payments for a month compared to security redemptions from the trust fund reserves made on a preliminary basis to cover such cash payments during the same month. On a monthly basis, the Social Security Administration (SSA) pays benefits and makes payments for other programmatic expenses associated with the trust funds. During each month, SSA draws cash from the trust funds on a preliminary basis, which results in Treasury redeeming invested securities to cover such payments. This monthly difference can be either positive or negative depending on net monthly activity, and is added to the balance at the end of the prior month.

A net positive undisbursed balance represents a situation where cumulative redemptions from the trust fund's securities are more than was needed to cover actual program cash payments through the end of the month. A net negative balance represents a situation where cumulative program cash pay-

ments exceeded the amount redeemed from the invested securities. A negative value requires future redemption of additional invested securities.

In addition, about every seven years, when January 3 falls on a Sunday, benefit payments scheduled to be paid on January 3rd are actually paid on December 31 of the preceding year, as required by the statutory provision included in the 1977 Social Security Amendments for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. Consistent with practice in prior reports and for comparability with other historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment in each year. Therefore, such advance payments are included as positive values in the undisbursed balance at the end of the calendar years in which the advance payments are made.

Unfunded obligation. A measure of the shortfall of trust fund income to fully cover program cost through a specified date after depletion of trust fund asset reserves. This measure can be expressed in present value dollars, discounted to the beginning of the valuation period, by computing the excess of the present value of the projected cost of the program through a specified date over the sum of: (1) the value of trust fund reserves at the beginning of the valuation period; and (2) the present value of the projected non-interest income of the program through a specified date, assuming scheduled tax rates and benefit levels. This measure can apply for all participants through a specified date, i.e., the open group, or be limited to a specified subgroup of participants.

Unfunded obligation ratio. The unfunded obligation accumulated through the beginning of a year expressed as a percentage of the cost for the year.

Unnegotiated check. A check which has not been cashed 6 months after the end of the month in which the check was issued. When a check has been outstanding for a year, the Department of the Treasury administratively cancels the check and reimburses the issuing trust fund separately for the amount of the check and interest for the period the check was outstanding. The appropriate trust fund also receives an interest adjustment for the time the check was outstanding if it is cashed 6 to 12 months after the month of issue. If a check is presented for payment after it has been administratively canceled, a replacement check is issued.

Valuation period. A period of years which is considered as a unit for purposes of calculating the financial status of a trust fund.

Vocational rehabilitation (VR). Services provided to disabled persons to help them to return to gainful employment. VR services are designed to provide an individual with the training or other services that are needed to return to work, to begin working, or to enter a new line of work. The trust funds, and the General Fund in the case of individuals also receiving Supplemental

Security Income disability benefits, reimburse the providers of such services only in those cases where the services contributed to the successful rehabilitation of the beneficiaries.

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STATEMENT OF ACTUARIAL OPINION

It is my opinion that: (1) the techniques and methodology used herein to evaluate the actuarial status of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds are based upon sound principles of actuarial practice and are generally accepted within the actuarial profession; and (2) the assumptions used and the resulting actuarial estimates are, individually and in the aggregate, reasonable for the purpose of evaluating the actuarial status of the trust funds, taking into consideration the past experience and future expectations for the population, the economy, and the program. I am a member of the American Academy of Actuaries and I meet the Qualification Standards of the American Academy of Actuaries to render this actuarial opinion.

Stephen C. Goss

Associate, Society of Actuaries
Member, American Academy of Actuaries
Chief Actuary, Social Security Administration

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https://cressetcapital.com/post/understanding-wage-inflations-role-and-outlook/

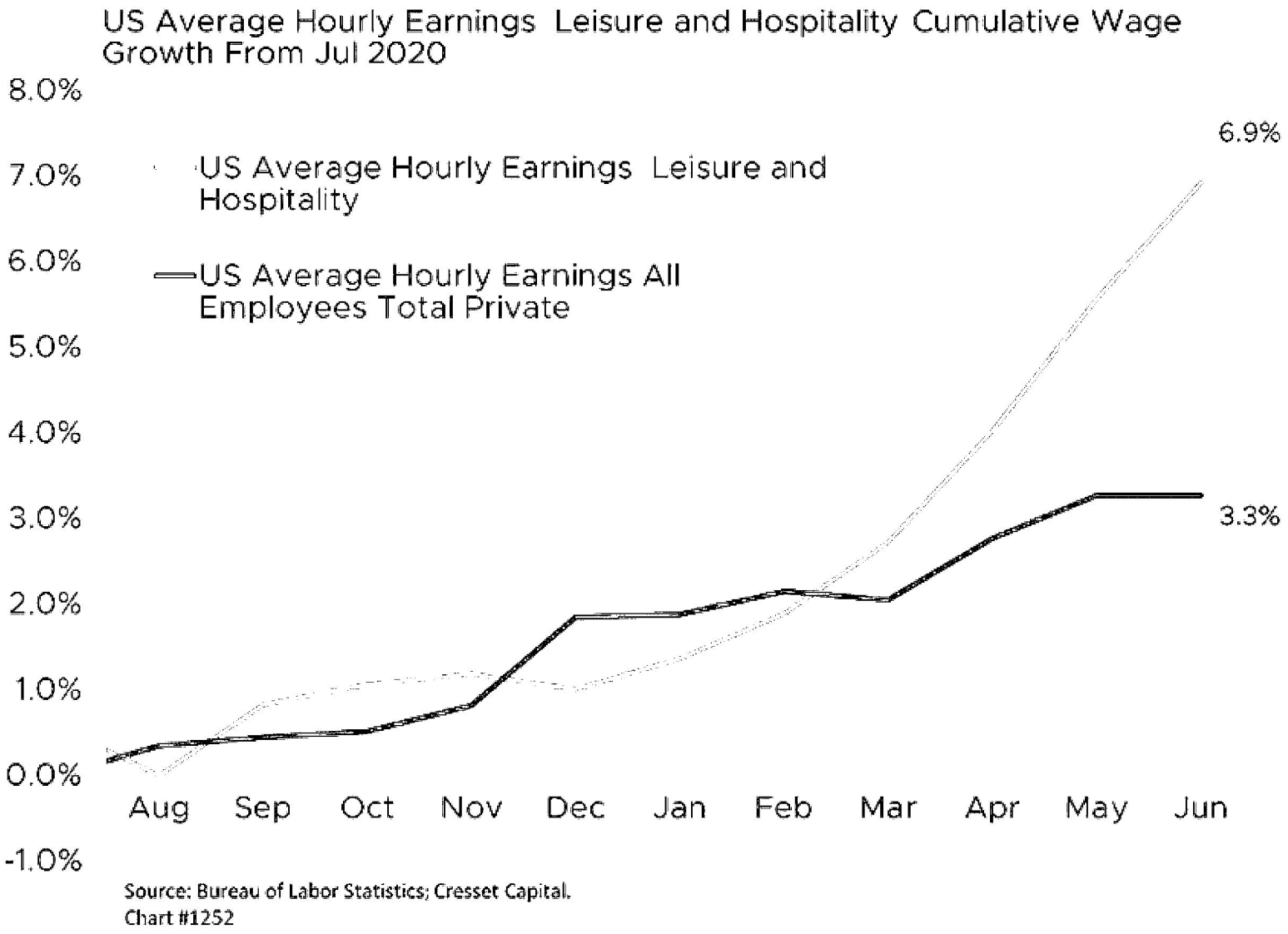
UNDERSTANDING WAGE INFLATION'S ROLE AND OUTLOOK

MARKET COMMENTARY | JACK ABLIN | 6/23/21

Fed governors flinched last week by accelerating their rate hike timetable. Federal Open Market Committee (FOMC) members, surprised by this spring's inflation spike, are penciling in the possibility of persistently elevated pricing. Many of the recent price hike offenders appear to be transitory, like used cars and hotel rooms. If history is a guide, sustained inflation cannot occur without a wage spiral. That's why understanding the labor market is the key to determining the future path of prices.

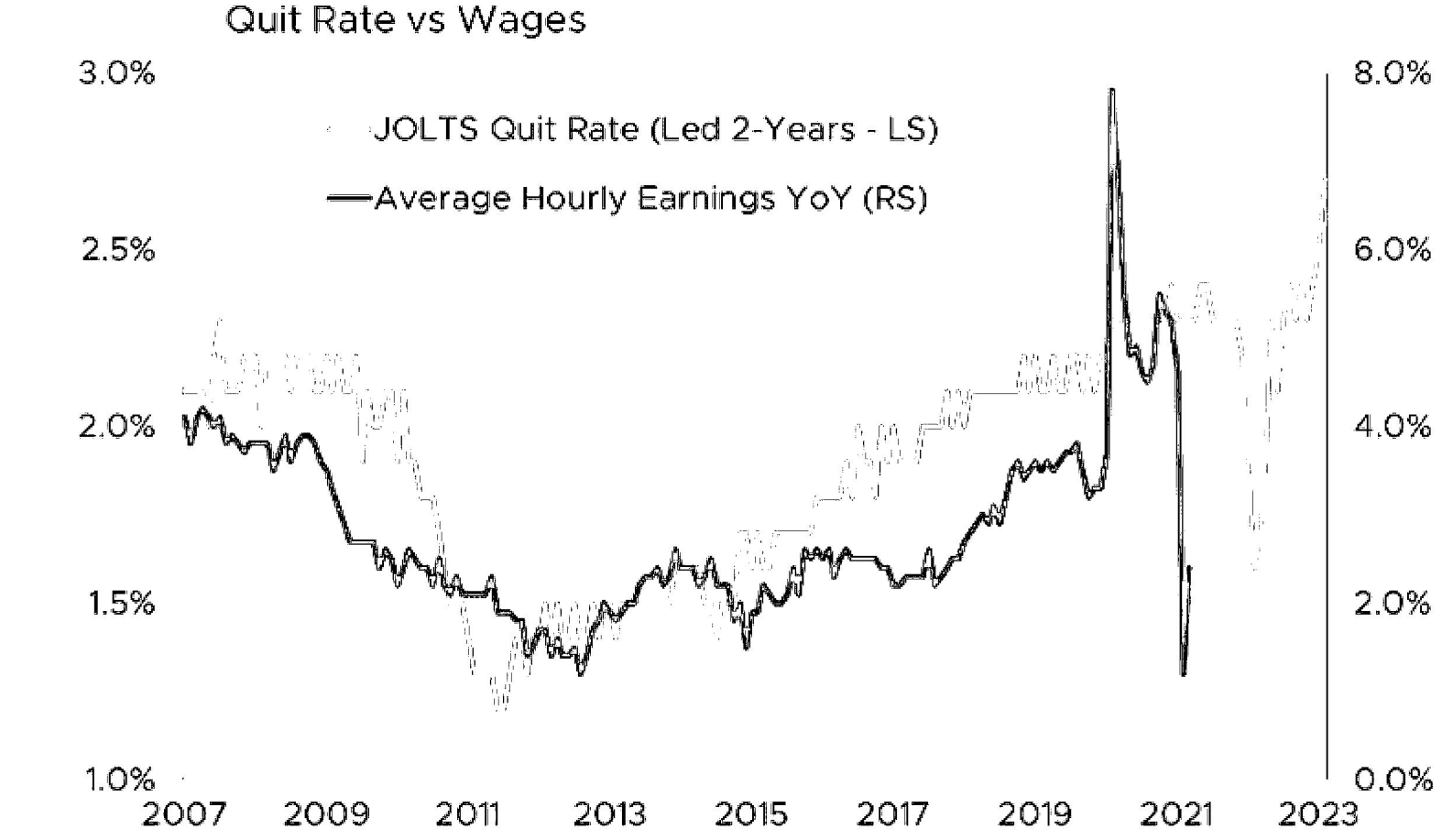
FOMC officials believe that maximum employment is a critical condition for raising short-term interest rates. That's a higher bar than full employment, their previous objective. While current labor market conditions suggest inflation could be lifting off, we need to keep in mind that there are still more than 8.8 million unemployed Americans. We are watching several factors in today's labor market that could help determine what happens to prices and the monetary policy response.

Prompted by tight labor market conditions, Americans are voluntarily leaving their jobs at a rate not seen in decades. This is a very interesting trend to watch. The "quit rate", at 2.7 per cent, is at its highest level in over 20 years, as emboldened workers rethink their professional lives. Low-wage workers, particularly those in the leisure and hospitality industries, are resisting low pay and long hours in sectors that required them to commute and mingle with potentially infectious customers. As a result, employers are being compelled to up the ante. Wages among leisure and hospitality employees, which include restaurant workers, have risen nearly 7 per cent since last July, according to the Labor Department. That dwarfs the 3.3 per cent wage gain among private sector workers in general. McDonalds and other restaurant giants are offering signing bonuses to would-be workers.



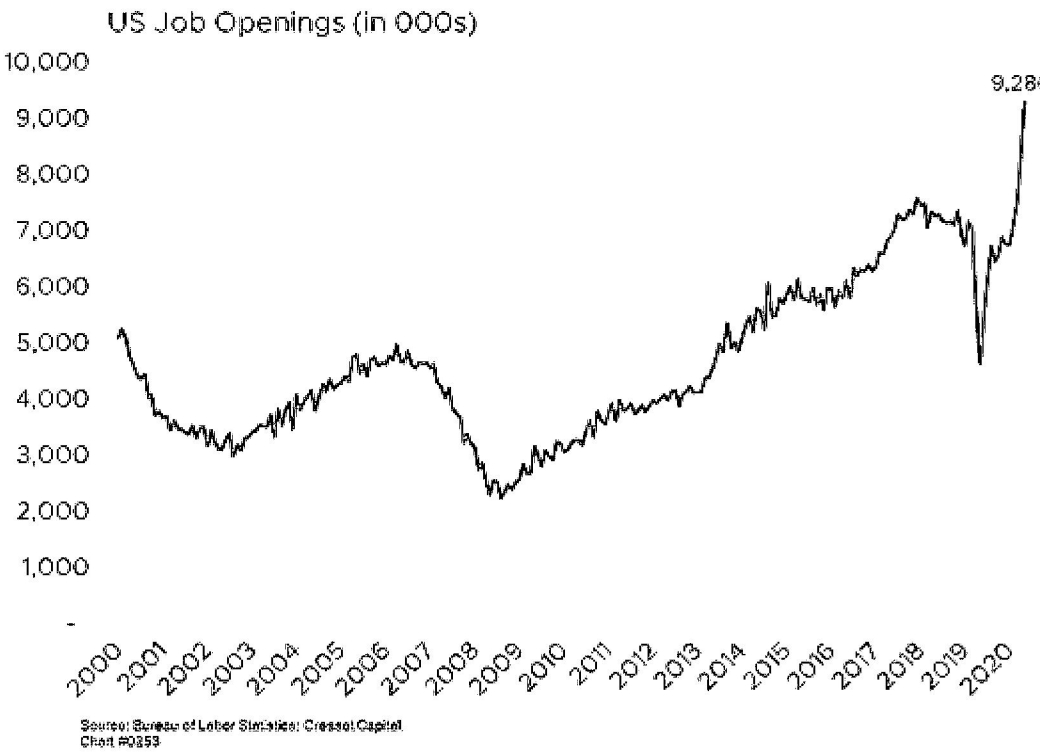
Source: Bureau of Labor Statistics; Cresset Capital.
Chart #1252

The idea of working from home is appealing to the low-wage service workers who often toil in hot kitchens or tidy up after messy hotel guests. Professional services and technology companies are using remote work as a recruiting tool, an attractive alternative to long commutes or living in cramped apartments in downtown business districts. Most of those positions, however, require a higher skill level than leisure sector work. Historical data show the quit rate tends to lead hourly wage growth by about two years. It should also be noted that the quit rate tends to ebb and flow with current labor market conditions and could easily slip if job opportunities become less abundant.

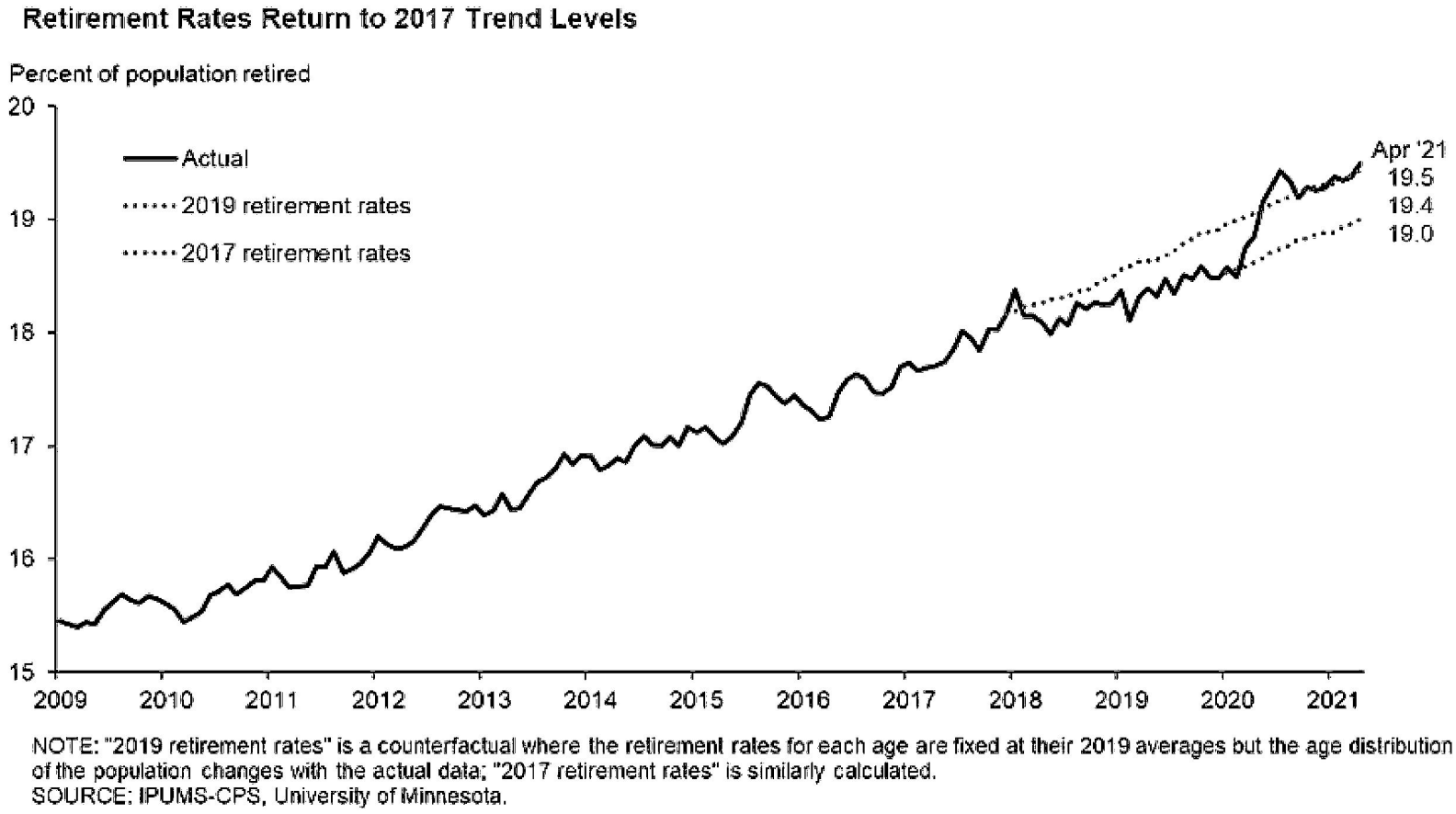


Source: BLS Job Openings and Labor Turnover (JOLT), Cresset Capital.
File #1648.2

Another factor influencing the direction of the labor market is the availability of work. As of April there are more than 9 million job openings – an increase of more than 3 million open positions from pre-pandemic levels in February 2020 and the highest number of job openings on record. More than 1.5 million jobs are available in leisure, 1.4 million in education, 1.5 million in professional and business services and 1.6 million jobs in trade, transportation and utilities. Putting it another way, there is currently one job opening for every out-of-work American. Because of the skills mismatch between sidelined workers and current job requirements, the unemployment rate will never reach zero. Job openings are generally cyclical, suggesting a reversal will occur as business conditions slow. However, it should be noted that, with the exception of 2020, job openings have been consistently expanding for most of the last decade.



The pandemic pushed many older Americans into retirement, shrinking the availability of experienced labor. According to a recent study by the Dallas Fed, the hot labor market in 2018 and 2019 likely prompted many older workers to delay retirement, causing the share of the population in retirement to increase more slowly than the rate of aging would have implied. During 2020 and early 2021, the rate of retirement returned to its 2017 trend. Since the pandemic, about 2.6 million Americans reported that they retired, and an additional 1.3 million left the workforce to be caregivers (individuals whose primary activity is taking care of a household or family). It's unlikely to expect the those 2.6 million to return to the workforce. The share of the population in retirement increased from 18.5 per cent in February 2020 to 19.5 per cent in April 2021.



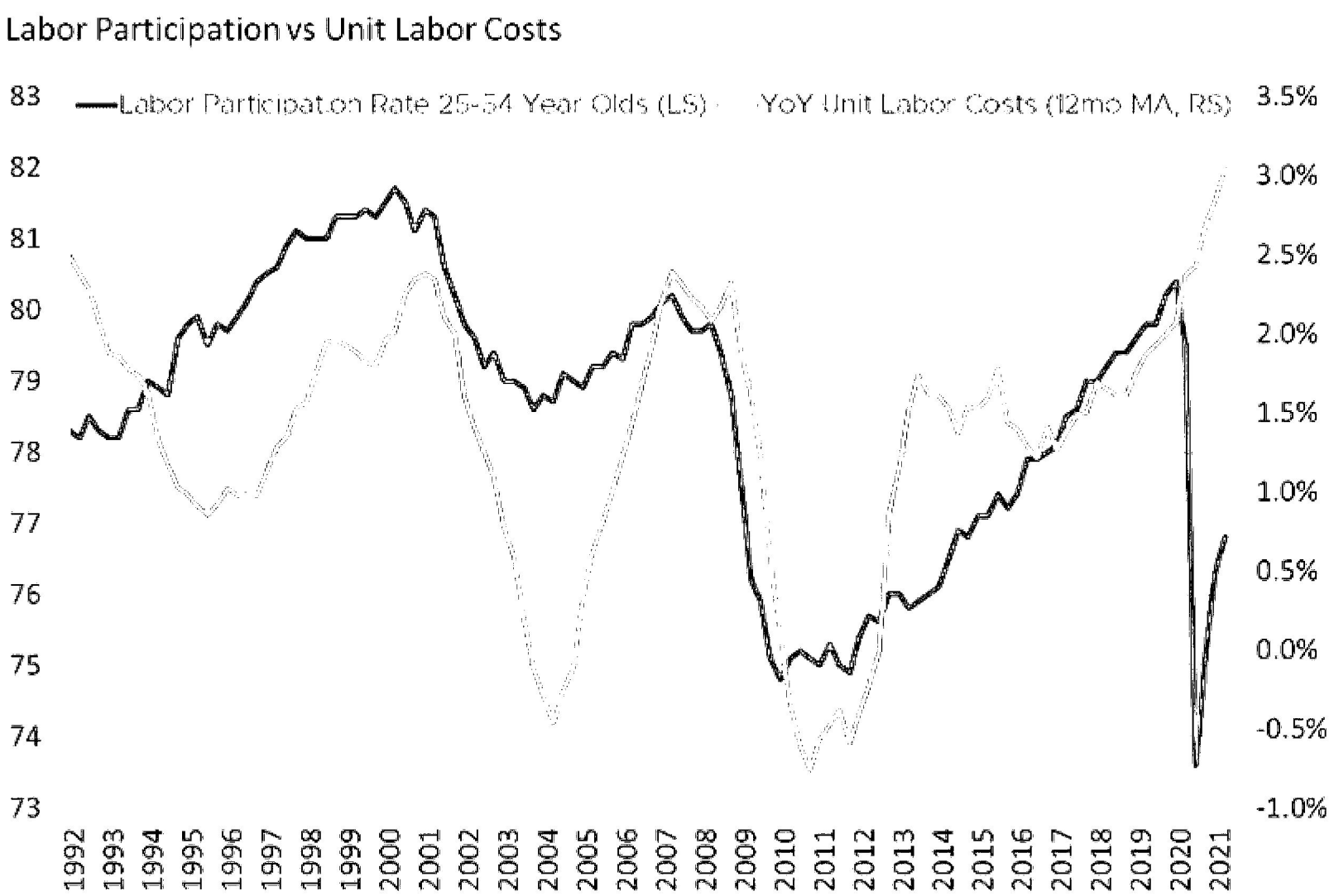
In our view, it's unlikely rising consumer prices will spill over into persistent wage acceleration. Several secular factors weigh in favor of a cyclical wage blip. First is the long-term trend downtrend in organized labor. Labor unions have historically boosted worker compensation, yet union membership, particularly in the private sector, has steadily declined. As of 2019, 5 per cent of the private sector workforce was unionized, down from nearly 12 per cent in 1983. Last year, Amazon fulfillment center workers in Bessemer, Alabama rejected unionization in favor of the company's pay and benefits package. Workers at large employers of unskilled labor, like McDonalds and Walmart, have also failed to organize. It's unlikely unskilled wages will morph into persistent inflation if union participation is declining. CPI escalator clauses built into union wage contracts were probably the key ingredient that transformed the one-time price shock of the 1973 OPEC oil embargo into persistent double-digit inflation that lasted through the end of that decade.

Second, the intransigence among sidelined workers is likely attributable to federal unemployment benefits that were granted as part of the January relief package. State unemployment benefits typically last up to 26 weeks, and amounts vary by state. The US average is $347/week, according to January data from the Labor Department. Under the Pandemic Unemployment Assistance Program, the federal

data from the Labor Department. Under the Pandemic Unemployment Assistance Program, the federal government kicked in an additional $300/week to those who qualify. Unemployment benefits, which are

contributing to would-be workers staying home, are set to run out and will likely prod people back into the job market. Nearly 15 million workers claimed unemployment benefits in May, up from about 2 million before the pandemic, according to *The Wall Street Journal*. It's argued that the combination of state and federal unemployment benefits gives workers more than they would likely earn by having a job. Enhanced unemployment benefits are set to expire in September.

Third, productivity gains driven by investments in technology and innovation have tended to offset wage growth historically. Employers facing higher labor costs have made capital investments in cost-saving technology, like software and capital equipment, to raise output per employee. Thanks to technological advances, employers no longer rely on receptionists, stenographers or elevator operators. The Internet has supplanted middlemen, as many producers now sell directly to consumers. The unit labor cost metric is one way the Bureau of Labor Statistics gauges the impact of productivity on labor costs. Unit labor costs, which adjust wage gains by productivity, grew 3 per cent over the last 12 months as wage growth outpaced productivity gains. Unit labor costs tend to respond to labor market conditions, as costs rise in tandem with the labor participation rate. Tight labor markets tend to push labor costs higher, and vice versa. Nowadays, unit labor costs are rising even though labor participation has been slack. Under normal conditions that would be disturbing, but the sudden fall and rebound in labor activity could be distorting the numbers.



Source: Bureau of Labor Statistics; Cresset Capital.
Chart #1011

Wages are one of the three critical factors of goods and service production, along with commodity prices and capital. We have observed that these three factors tend to offset one another. Much like the air in a balloon, if one input (like interest rates) is pushed or held below fair value, the other two costs (like labor and commodities), have room to expand. We expect financing costs will rise as interest rates trend back to fair value – between 2.8-3.8 per cent – and will crowd out wage growth and commodity prices. However, as long as interest rates remain below fair value, wages have room to rise.

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2023 Edition

Long-Term Asset Class Assumptions

AIMCo

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Joint CIO and CFMO Message

Dr. Marlene Puffer
Chief Investment Officer

Amit Prakash
Chief Fiduciary Management Officer

Last year was challenging for global financial markets. The persistent rise in inflation caught many central banks off guard, forcing them to undertake the most aggressive interest rate hiking cycle seen in decades. This resulted in a significant repricing of risk, which saw bond yields rise and global equity values fall. The silver lining is that valuations across many public market asset classes have become more attractive.

These starting points are important drivers that feed into our forward-looking expectations for financial market performance and are reflected in our 2023 Long-Term Asset Class Assumptions, which we are pleased to present in this report. This year we have again included a forecasted range of outcomes to complement our baseline estimates. Considering a range of expectations is always a prudent practice and reflects the fact that the path ahead remains highly uncertain. We must consider the possibility that the world may be

facing a regime shift away from what we've become accustomed to over the past ten years: lengthy economic cycles, minimal geopolitical risk and low inflation that contributed to an environment of easy monetary policy and muted volatility. For instance, an environment where both inflation and interest rates are somewhat higher versus history may also be contemplated. For each asset class, we have decomposed our return forecast into the building blocks that have proven to be reliable estimates of forward-looking risk and return.

In 2022, higher discount rates and greater economic uncertainty caused global equity prices to experience their largest annual decline since the Global Financial Crisis (GFC). As the threat of stagflation and recession continues to cloud global growth outlooks in the short term, the compression in valuation multiples makes for a more favourable outlook over the longer term. Yet there is still some disparity across markets. Valuations in the United States for example, continue to be priced at a premium relative to Europe, Canada, and Emerging Markets. Emerging markets are also expected to benefit from higher nominal growth relative to developed markets over the next decade.

Interest rates across most of the world are significantly higher than they were at the end of 2021, which has improved future return expectations for fixed income investments. As we enter 2023, nominal rates may be near a cyclical peak as most major central banks have signalled that they are nearing a pause in their rate hiking cycle, but interest rates and inflation may remain higher than we have been accustomed to over the past decade, at least in the medium term. Against this backdrop, the expected income that can be generated throughout the life of a bond has increased, which now accounts for the bulk of fixed income returns over the forecast horizon.

We're pleased to present a more in-depth examination of the outlook for short-term interest rates, which is our spotlight topic this year. As always, we look forward to continuing the dialogue around this forecast and exploring how we can further enhance our clients' portfolios as a result.

AIMCo 2023 Long-Term Assumptions

The long-term capital markets assumptions have become a staple deliverable for our clients at the beginning of each calendar year. At its heart, it provides long-term return and risk forecasts for 17 asset classes, broadly split into fixed income, public equities and illiquid assets. By forecasting various macroeconomic variables and economic scenarios along with modelling different components or building blocks, we arrive at reasonable risk and return expectations over a 10-year time horizon.

While we broadly follow the same proven process every year, we are constantly evolving our processes and methodologies to improve our forecasting ability. Introduced in last year's forecast, and presented again this year, we have included a range of forecasted returns for each asset class to supply our readers with a more robust picture of return expectations. These values can be found in the Long-Term Forecasted Return Ranges.

Return Assumptions

Our 2023 forecast is based, similar to last year, on expectations of a challenging global macroeconomic backdrop as we enter a period of materially slower growth in the near term. In 2023, we expect many countries to experience above-target inflation and tight monetary policy from central banks. We anticipate inflation decline this year, albeit potentially remaining higher than levels witnessed prior to the pandemic. Government bond yields, over the forecast horizon, are expected to remain relatively high, at levels closer to the ones seen before the Global Financial Crisis.

Given market developments over 2022, the outlook is more attractive for public equities over the next decade in comparison to last year's forecast. On the valuation side, price-to-earnings (P/E) ratios have improved from last year, more in line with their long-term average, if not lower in some cases (i.e. there is room for multiple expansion). Earnings growth is expected to remain healthy due to a combination of increased support from the inflation pass-through and robust demand globally.

Illiquid assets continue to exhibit high return-to-risk ratios. Overall, current private asset valuations are less expensive in comparison to last year, resulting in a reduced drag on returns. Illiquid real assets can be significantly impacted by macroeconomic factors such as inflation and real yields. However, they can also provide a degree of protection against inflation as these investments can pass through a portion of inflation to end-users.

Risk Assumptions

The risk forecast is based on the same methodology (VAR-GARCH-DCC[1] statistical model) we have utilized in previous years. The model allows us to forecast asset class volatilities and correlations simultaneously to provide consistent, forward-looking estimates. This forecast incorporates a more accurate market return distribution to capture the so-called "fat tails". Additional details can be found in the Risk Assumptions Methodology section.

[1] Vector Autoregressive - Generalized Autoregressive Conditional Heteroscedasticity - Dynamic Conditional Correlation.

Overview

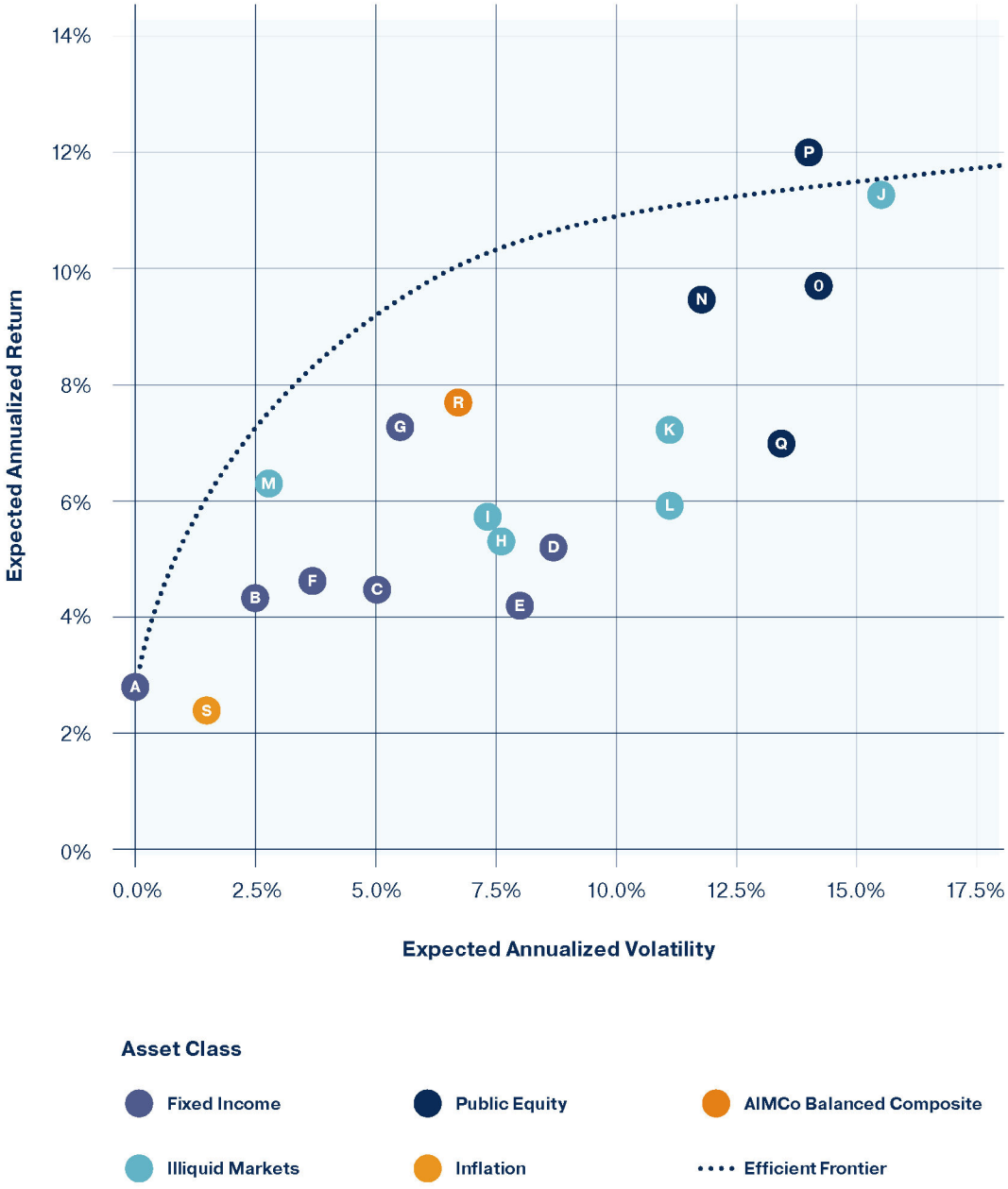
By taking into account both long-term return and risk expectations, we can envision an efficient frontier that incorporates all our forecasts. Putting it all together, a balanced portfolio (represented by AIMCo's aggregate balanced fund), is expected to achieve a 7.7%[2] annualized return over the next decade.

Table 1: Forecasted Return and Risk 2023-2032

Asset Class	Benchmark	Expected Return	Expected Volatility
Fixed Income			
A Money Markets	FTSE Canada 30-Day T-Bill Index	2.8%	0.1%
B Short-Term Bonds	FTSE Canada Short-Term All Government Bond Total Return Index	4.3%	2.5%
C Universe Bonds	FTSE Canada Universe Bond Total Return Index	4.5%	5.0%
D Long Bonds	FTSE Canada Long-Term All Government Bond Total Return Index	5.2%	8.7%
E Real Return Bonds	FTSE Canada Real Return Bond Total Return Index	4.2%	8.0%
F Private Mortgages	60% FTSE Short-Term Overall Bond Index and 40% FTSE Canada Mid-Term Overall Bond Index + 50 bps	4.6%	3.7%
G Private Debt & Loan	40% S&P/LSTA Leveraged Loan Index + 40% S&P European Leveraged Loan Index + 90bps	7.3%	5.5%
Illiquid Markets			
H Canadian Real Estate	REALpac/IPD Canadian All Property Index – Large Institutional Subset	5.3%	7.6%
I Foreign Real Estate	MSCI Global Region Property Index	5.7%	7.4%
J Private Equity	Total CPI 1 Month Lagged + 650 bps (5-year rolling average)	11.3%	15.5%
K Infrastructure	Total CPI 1 Month Lagged + 450 bps (5-year rolling average)	7.2%	11.1%
L Renewable Resources	Total CPI 1 Month Lagged + 450 bps (5-year rolling average)	5.9%	11.1%
M Absolute Return	Money Markets + 350 bps	6.3%	2.8%
Public Equity			
N Global Equities	MSCI World Net Total Return Index	9.5%	11.8%
O Canadian Equities	S&P/TSX Composite Total Return Index	9.7%	14.2%
P Emerging Markets Equities	MSCI Emerging Markets Net Total Return Index	12.0%	14.0%
Q Global Small Cap Equities	MSCI World Small Cap Total Return Index	7.0%	13.4%
R AIMCo Balanced Composite	AIMCo Composite: 38% Equity, 26% Fixed Income, 36% Illiquid Assets	7.7%	6.7%
S Inflation	Canadian Consumer Price Index	2.4%	1.5%

[2] This AIMCo balanced composite representation aggregates the asset class weights of our balanced fund clients. As such, it constitutes an illustrative return as it encompasses clients who may have very different portfolio objectives. This explains why such a weighted average of differing portfolios does not sit on the efficient frontier found in Chart 1.

Chart 1: Efficient Frontier and Asset Class Forecast[2]



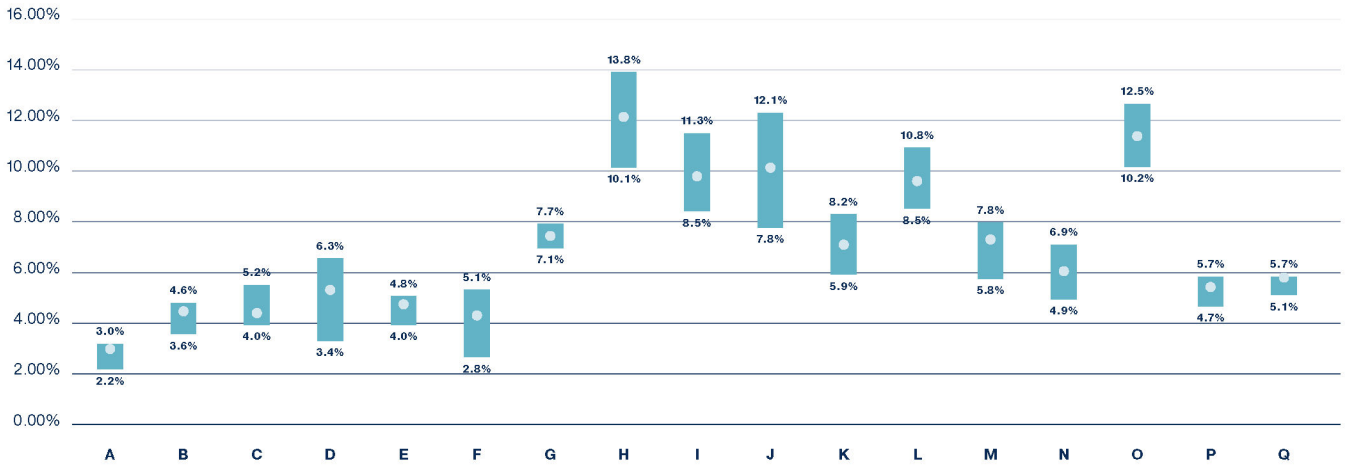
[2] This AIMCo balanced composite representation aggregates the asset class weights of our balanced fund clients. As such, it constitutes an illustrative return as it encompasses clients who may have very different portfolio objectives. This explains why such a weighted average of differing portfolios does not sit on the efficient frontier found in Chart 1.

Long-Term Forecasted Return Ranges

Range Forecast

In last year's edition, we introduced forecast ranges to provide readers with a better understanding of the embedded variation within our central forecasts. We are pleased to present the analysis again this year. We have simulated scenarios around the major economic inputs to the various asset classes' building blocks to derive ranges for the expected returns.

Chart 2: Forecasted Return Ranges



A Money Markets
B Short-Term Bonds
C Universe Bonds
D Long Bonds
E Private Mortgages
F Real Return Bonds
G Private Debt and Loan
H Emerging Market Equities
I Canadian Equities
J Chinese Equities
K Global Small Cap Equities
L Global Equities
M Infrastructure
N Renewable Resources
O Private Equity
P Canadian Real Estate
Q Foreign Real Estate

Expected Return

Global Economic Scenario

U.S.

The U.S. enters 2023 with, generally, positive albeit waning cyclical momentum as outlook surveys such as PMIs and ISM point to declining economic activity. The ratio of job openings to unemployed people, or labour market tightness, stands high in historical terms but appears to be plateauing. This suggests that unemployment could rise this year alongside wage growth stalling. Private spending will continue to be boosted by a mix of excess savings and falling unemployment. Inflation is expected to continue moderating as base effects and lower housing inflation start having more significant effects. However, inflation is likely to remain uncomfortably above the Federal Reserve's 2% target. Overall, we project 2023 U.S. economic growth between 0% and 1% but downside risks to that scenario exist.

In the long term, as in past years, themes contributing to lower U.S. potential growth remain such as weaker demographics and Baby Boomers retiring leading to a shrinking working-age population, deglobalization, increased regulation and the plight of elevated public debt. However, more immigration-friendly policies introduced by the current U.S. administration may cause a rise in labour force growth and productivity. Monetary policy is expected to be kept less accommodative than before the pandemic, with benchmark policy interest rates remaining around current levels over time. Overall, we forecast the U.S. economy to grow around the 2% level on an annual basis for most of the next decade.

Canada

Canada's economy is expected to stall in 2023, as higher interest rates and a global slowdown flow through domestically. Consumer spending may ebb downward as excess accumulated savings during the pandemic wear off and the housing market decelerates further. This could lead to growth around 0% in 2023. Canadian inflation for 2023 will average, between 4% and 4.5%, with inflation from the services sector driving much of the elevated price pressures. This set of assumptions is also subject to downside risk.

Canadian structural potential growth could increase in the long term. It remains to be seen whether prospects for strong immigration gains could offset the aging population impact of reducing labour force growth. However, global opportunities related to the energy transition theme and reshoring may lead to a demand increase for Canadian goods and services over the long haul. In summary, Canada's growth is forecasted to average slightly above 2%, annually, in the next 10 years. In addition, we believe that various factors could lead to inflation sustainably above the 2% Bank of Canada's target (see "Topic of the Year" section for more) and, as such, interest rates could remain close to current levels over the forecast horizon.

China

We forecast China to grow at a faster pace in 2023 due to the reopening of its domestic economy. Growth could be in the range of 4% to 5% this year. China's continued property sector woes constitute a risk to the outlook.

In the long term, China's adoption of the "common prosperity" policy to reach a high-income status nation by 2025 and targeted industries for investment should support potential growth. Economic growth is expected to hover between 3.5% and 4.5% per year in the next decade as an ageing population crimps labour force growth. Monetary policy should continue to target measures to contain economy-wide imbalances.

Eurozone

The euro area is facing challenging conditions in 2023. Relatively high energy costs should continue to impact businesses and consumers, albeit not as dramatically forecasted in the fall of 2022. But a global economic slowdown may cause a more protracted decline in economic activity given the region's sensitivity to global trade dynamics. Lastly, with higher wage agreements taking hold by the second half of this year, inflation could be persistently above the 2% target of the European Central Bank.

Since the eurozone is the world's most trade-oriented economic block, it stands to be the most affected by the process of reshoring the global manufacturing capacity. Labour costs are elevated in that region. Furthermore, the Eurozone ranks second only to Japan in terms of risk of lower trend growth due to its shrinking working-age population. On the positive side, the region's focus on green economic policies and building a resilient energy infrastructure would involve material investments in the related sectors, in support of growth.

Japan

Japan recently experienced green shoots domestically as the country reopened in earnest post-pandemic. In 2023, domestic demand is expected to drive growth compared to external trade. Inflation is anticipated to continue being in line with the Bank of Japan's medium-term targets thanks to higher wage agreements.

In the long term, however, its potential growth remains hampered by an aging population. Conversely, Japan's industries could benefit from secular trends such as an increase in local manufacturing capacity, a rise in its share of the global electric vehicle market and industry automation product needs. Overall, growth is forecasted to be relatively sluggish and inflation to endure at the lower end of the central bank's expectations.

Emerging Markets

Emerging market (EM) countries, excluding China, are slated to enjoy a moderate return to a positive economic growth differential in comparison to developed countries in 2023. Leading economic indicators point to relative outperformance of their manufacturing sector despite the projected global slowdown as China's reopening has positive implications for the EM world. Consumer inflation has likely peaked across emerging markets and most central banks have reached terminal policy rates.

From a structural perspective, emerging markets continue to be less reliant on capital inflows and they continue to benefit from positive demographics and urbanization tailwinds which are supportive long term.

Climate Change

Climate change remains an important subject for AIMCo and our clients. We strive to identify and integrate environmental drivers into our long-term forecasting. Climate change was first introduced in our 2021 long-term asset class forecast and the baseline economic scenario in our 2023 forecast continues to incorporate an assumption of one additional degree of warming to 2050, globally, from levels observed at year-end 2019, in line with a current assessment of credible stated policies, policies susceptible to be implemented over this long horizon.

Topic of the Year

The "Natural" Short-Term Interest Rate

The price of money is one of the primary drivers of our capitalist societies. Interest rates represent the cost of money or the future cost of capital. As long-term investors, calibrating our strategies concerning this hurdle rate and its various impacts is of critical importance. For instance, should interest rates structurally shift higher versus recent history, certain fixed income assets would then become more attractive from a yield-generating standpoint whilst a potentially higher discount rate for cashflows may negatively impact the valuation of riskier assets. Furthermore, a higher cost of capital for most companies would change how they access capital, select capital expenditures and the nature of their cashflow streams. Finally, such an outcome may modify the level of attractiveness for certain investment strategies which, to some degree, use leverage to generate returns in the long term.

Central banks are deemed to lead the way in establishing the basic cost of capital our modern economies are facing via the conduct of monetary policy. They represent the central channel for the price of money. For monetary policy to be successful, central banks need to balance their various mandates which typically encompass aiming for stable prices and maximum employment. The key tool at their disposal in that pursuit is calibrating the interest rate they influence to balance inflation and jobs. Too low interest rates in the economy can discourage savings. Low rates may also lead to wealth inequality as only

wealthier households may be able to save for retirement. Lower interest rates can keep unprofitable companies afloat, resulting in unproductive growth and can foster speculation and financial market bubbles. Conversely, too high interest rates can lead to balance sheet stress both for indebted households and corporations, restrictive credit growth, lower trend economic growth and potential market freezes.

The pricing of nominal interest rates has been trending downward since the Global Financial Crisis — hitting not only the zero lower bound but even threading into negative territory for certain jurisdictions up until the COVID crisis. Before the pandemic, extremely low or even negative nominal interest rates were deemed to be in line with the subdued global growth environment we have been experiencing since the early 2010s. The concept to explain such an occurrence is called secular stagnation. It posited that weak productivity and demographic growth would lead countries to be mired in a deflationary environment for an extended period.

The experience of the recent years suggests that we may have begun evading deflation fears for some time. Indeed, in 2022, the combination of pandemic-era spending and lingering supply chain challenges resulting from the coronavirus pandemic drove consumer prices to 40-year highs. In addition, the economic impact of the Russian invasion of Ukraine also led to significant price pressures. Global central banks responded by using their toolset to reduce aggregate demand and inflation via significantly increasing policy interest rates. However, inflation is still well above target at the time of writing.

Whether an economy would remain in a state of secular stagnation or able to reach the escape velocity status in the medium- to long-term could entail a significant impact on the final station in a central bank's interest rate normalization journey. That final monetary policy station is known as the neutral or natural short-term interest rate (R*). In essence, R* represents the "neutral" interest rate that is consistent with stable, non-inflationary growth in the longer term[3]. In other words, it is the interest rate that balances supply and demand when inflation is equal to expected inflation. A recent Bank of England report[4] confirmed that since the 1950s globally, slowing productivity growth and increasing longevity had been the two major factors driving trends in the real neutral rate across the 31 countries studied. Global inflation-adjusted R* rose from the mid-1950s (from 1.25%) to the mid-1970s (to 2.75%), declining since then (reaching -0.25% by 2015).

Are we then heading towards a renewed bout of secular stagnation, reverting to much lower interest rates in the long term once inflation declines in the next year, or is it the opposite situation and the hurdle rate for any financial investment has inched up structurally?

First, other than factors that structurally influence the supply of goods and services such as productivity growth and demographics (the latter for the supply of labour), various studies have highlighted other types of factors explaining the fall of R* through time. They can further be categorized under factors that influence the demand for goods and services (e.g. fiscal policy, too high savings rates resulting in low levels of investment, etc.) and the sensitivity of demand for goods and services to the real interest rate.

Secondly, based on the above findings, there are various arguments in favour of believing that the decline in R* will be persistent versus arguments favouring the view that headwinds are slated to fade. We have summarized such arguments in the table below (in no particular order):

Exhibit A

R* Decline To Remain Persistent	R* To Rise
Population aging leads to a smaller workforce and lower consumption and output growth.	A fall in the global household savings rate as the middle class ranks swell in emerging countries triggering a consumption and output boom.
A slowdown in productivity and output growth is caused by a decline in the pace of technological progress, chronic underinvestment, etc.	Productivity growth could increase over the next decade, perhaps by an incremental 0.5 to 1% versus current trends (1.1% y/y in the 10 years before the pandemic). Robots and investments in new technologies such as artificial intelligence could boost productivity gains.
The risk of too-aggressive tightening, much lower credit growth and expensive government debt forces central banks to remain accommodative at the risk of "zombification" of the economy and lower potential growth.	Inflation expectations could rise boosted by structural public deficits due to income redistribution policies by governments, higher prices for the commodities required for the energy transition or deglobalization.

Source: "The U.S. Economic Outlook and the Implications for Monetary Policy", Bill Dudley, New York Fed (July 31, 2016), "Three Remarks on the US Treasury Yield Curve", Olivier Blanchard, Peterson Institute for International Economics (June 22, 2016), M. Saunders, "Why neutral rates have risen and why it matters", Oxford Economics (January 2023), AIMCo Investment Strategy Research.

[3] According to the Swedish economist Knut Wicksell, the natural rate is the real short-term interest rate consistent with economic output equaling its natural rate (potential) and constant inflation to which it will converge over time. It can help to measure the stance of monetary policy, with policy expansionary (contractionary) if the short-term real interest rate lies below (above) the natural rate. In other words, close to the natural rate of unemployment while inflation is at the central bank target.

[4] Decomposing the drivers of Global R*, BoE (Cesa-Bianchi, Harrison and Sajedi), July 2022.

Overall, we acknowledge the population aging trend as a significant secular force potentially driving a low R* in the long term. That being said, we believe that on balance, the inflation expectations channel might overwhelm the impact of weak demographics as the world becomes more driven by inflationary trends such as policies centred on income redistribution, and deglobalization (or reshoring) alongside the cost of transitioning to a lower carbon economy.

While R* is unobservable, various academic models attempt to measure R* in the U.S., in particular[5]. Such forecasts embed a material degree of uncertainty; however, the Lubik-Matthes model estimated the median U.S. R* at 1.3% as of the end of the third quarter of 2022, for example. To conclude on the prospective range of outcomes for both Canadian and U.S. terminal short-term nominal rates (in nominal not real terms), we compare central bank research forecasts of R* versus estimates based on AIMCo's long-term baseline scenario in the table below:

Exhibit B

	Canada	U.S.
Range of terminal nominal short-rate based on Bank of Canada and Lubik-Matthes for the U.S.	2.0% to 3.0%	1.5% to 5.3%
AIMCo Baseline View vs Central Bank Estimates (as of January 2023)		
AIMCo range of terminal nominal short-rate forecast (2032)	Between 2.0% and 2.5%	Between 2.0% and 2.5%

AIMCo views are similar for both Canada and the U.S. and stand above the zero-lower bound for nominal short-term rates observed in the past, a sign that we are optimistic in averting a return to a so-called secular stagnation era. Moreover, our nominal R* range estimation is in line with the Bank of Canada's equivalent forecast. We note that our upper bound could move higher should Canada's immigration policy target become a reality alongside appropriate measures to provide more housing supply, which could further boost potential growth domestically. In summary, we anticipate Canada's terminal station for short-term rates to sit somewhat higher than what we have grown accustomed to in the last decade. Whether the Bank of Canada sets its base policy rate above or below the nominal R* will dictate if monetary policy is accommodative or restrictive. More importantly, our view implies that the cost of capital for our domestic economy may potentially have increased structurally from the zero-lower bound alongside the real long-term discount rate in risky markets and the hurdle rate for various client investment strategies. A new world?

[5] See Laubach, Thomas and John C Williams (2016): "Measuring the natural rate of interest redux," Business Economics, 51(2), 57-67 for a seminal version.
[6] Faucher et. al., "Potential output and the neutral rate in Canada: 2022 reassessment", Bank of Canada Staff Analytical Note 2022-3.
[7] Thomas A. Lubik and Christian Matthes, "Calculating the Natural Rate of Interest: A Comparison of Two Alternative Approaches," Federal Reserve Bank of Richmond Economic Brief 15-10, October 2015. Assumes the Federal Reserve is successful to bring core PCE inflation to the 2% target. Extracted on January 31, 2023 at www.richmondfed.org/research/national_economy/natural_rate_interest

Forecast by Asset Class

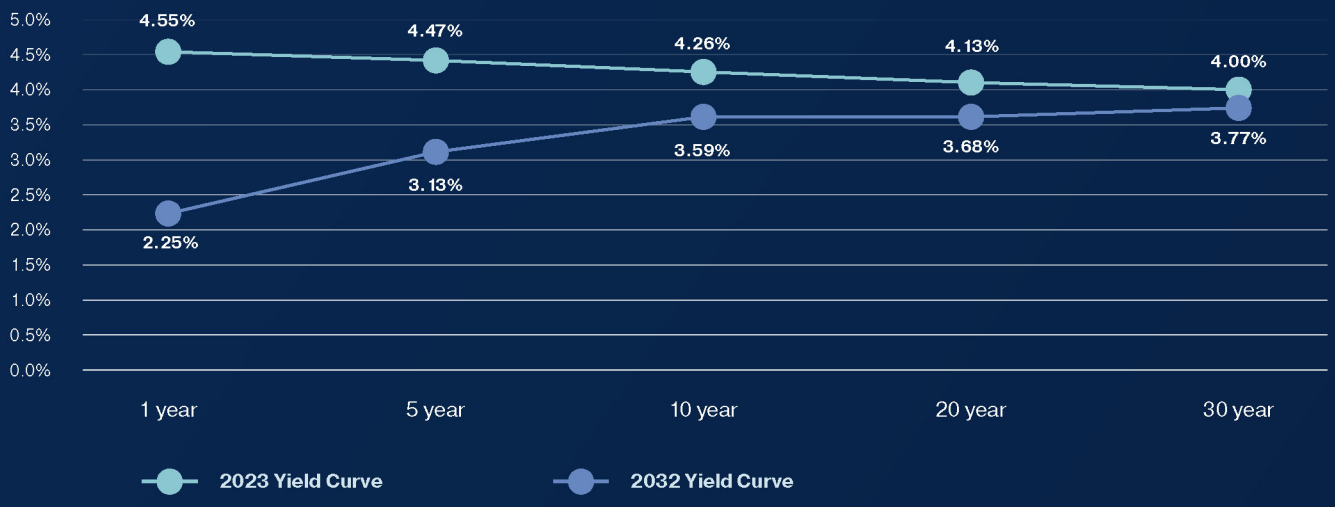
Fixed Income

Overview

Globally, central banks spent the past year aggressively raising rates to fight multi-decade inflation highs. The Bank of Canada (BoC) raised its overnight lending rate by 400 basis points in 2022, the largest and fastest rate hike cycle on record. As rate increases gathered momentum during the year, fixed-income markets grew weary of economic growth prospects leading to inverted yield curves in major economies. While the BoC's policy intends to slow growth, expected fixed income returns will benefit from higher starting yields. As such, our forecast this year highlights materially higher fixed income returns. Over the forecast horizon, we expect Canada's yield curve to moderate and steepen to levels that reflect a more normalized growth and inflation environment. In the short term, while the economic effects of higher rates are only beginning to transmit through the economy, we believe given the BoC's recent rate hike in January 2023, the central bank will now take a wait-and-see approach for most of this year.

Despite increasing chatter of a potential recession in 2023, credit spreads have remained resilient. Our economic growth forecast implies credit spreads will be supported and trade within the lower end of their historical range over the next 10 years. Alternative credit asset classes, namely Private Debt and Loan and Private Mortgages provide opportunities for AIMCo to selectively underwrite unique credit opportunities and are expected to generate a premium over their public market comparables.

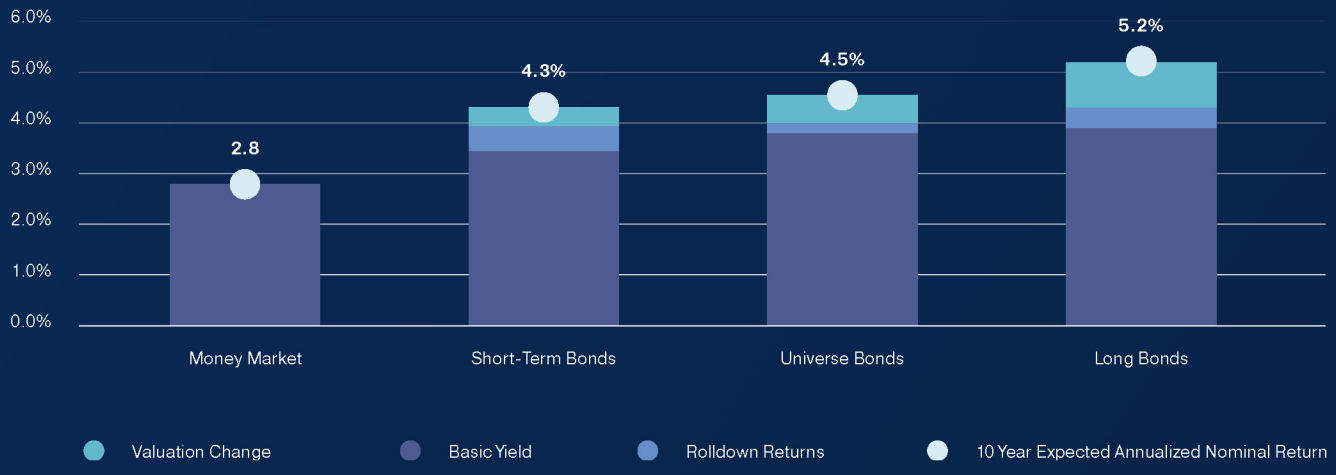
Chart 3: Canadian Sovereign Yield Curves 2023 Economic View



Building Blocks

AIMCo's fixed income capital market assumptions are based on interest rate forecasts, term premiums, roll returns and credit spreads/expected default loss. These underlying components are consistent with our global, long term economic scenario.

Chart 4: Building Blocks for Fixed Income Assets



Sub Asset Classes

Money Market

Fighting inflation has been the focal point of central banks this past year and that will continue in the near term. Inflation-focused rate hikes by the Bank of Canada have created more uncertainty in the magnitude and length of the rate hiking cycle which will continue throughout 2023.

Over the short term, there is increased concern about a deeper slowdown in the general economy as opposed to a mild downturn. That, in combination with the supply-side adjustments, geopolitical concerns and uncertainty over inflation volatility, may create higher uncertainty of rate adjustments. In the mid-to-longer term, the expectation is that inflation will subside and with the combination of mentioned economic pressure, short term rates should moderate from their near-term highs.

Short Term Bonds

Returns for this sector can be expected to be strongly correlated to movements in the overnight rate of the Bank of Canada. After a period of aggressive rate hikes, short-term bonds are coming off a year of negative performance. With the overnight rate ending last year in restrictive territory, the likelihood of short bonds prospectively having a negative year of performance is low.

Our forecast suggests that the returns for short bonds going forward should track the more recent and higher level of central bank rates. Accordingly, the current level of yields in the short-maturity sector is a reasonable expectation of future returns.

Universe Bonds

Following a significant move higher in yields during 2022, the long-term return profile of Universe Bonds is expected to be more stable. At the start of this year, index yields are two times higher than at the same point a year ago. That means the positive asymmetry of bond portfolio returns is a much more tangible benefit going forward. Universe bond yields are expected to fluctuate in a range around current levels as we navigate through the business cycle during the forecast horizon. A return to yield levels prevailing during periods of ultra-accommodative monetary policy is not expected. With a significantly inverted yield curve, there is the possibility that inflation does not return to target in the time frame anticipated by the market in the short term. If elevated inflation becomes persistent, yields at the long end of the bond market are likely to increase from current levels therefore negatively impacting returns.

Long Bonds

After a poor year in 2022, the prospective return for long bonds is more favourable in the years ahead. Long-term Canadian bond yields now reflect a level consistent with a moderate term premium and the implied long-term neutral policy rate of the Bank of Canada. Going forward the return profile for long bonds should be more correlated to the market's assessment of long-term growth and inflation rather than being tethered to moves in the overnight rate of the central bank, which was prevalent for a large part of last year.

Our return forecast for long bonds reflects an extended period of fluctuation around current yields which would be a new era that does not anticipate another drop to pandemic-era levels. The current level of yields depicts a stronger income narrative from a returns perspective while also putting the sector in a better place to act as a total portfolio diversifier going forward when compared to levels from a year ago. A major risk to our forecast is the possibility that economies do not realize the moderation of inflation currently priced by financial markets resulting in longer-dated yields reflecting a less benign long-term inflationary environment.

Real Return Bonds

Despite the emergence of unexpected inflation throughout 2022, the significant rise in real yields resulted in a year of poor absolute returns. As is the case with nominal bonds, the starting yield levels for real return bonds for long-term prospective returns are more favourable compared to last year. Real yields have returned to positive levels, and break-even yields reflect a return to central bank inflation targets from current elevated levels. Accordingly, forecasted returns project a regime consistent with current market conditions and not returning to an ultra-accommodative monetary policy environment. Relative to nominal bonds, real return bonds hold the upside return potential of actual inflation realizing higher than expected inflation. As with nominal bonds, another upward shock in real yields would be a significant headwind to long-term returns.

Private Debt & Loan (PDL)

The shift in monetary policy in 2022 that led central banks to increase interest rates was positive for the long and short-term returns of Private Debt assets. Last year, the positive dynamic of higher rates, given the portfolio's focus on floating rates, was offset by the widening of spreads in response to heightened recessionary fears and decreased market liquidity. Heading into 2023 and beyond, both factors higher rates and wider spreads, will benefit the asset class. While the near-term economic outlook is challenging is challenging, potentially leading to increased defaults. The asset class has historically experienced high recovery rates due to PDL's focus on senior, secured loans. Thus, the high interest rates earned on these assets are expected to absorb the impact of increased defaults in a highly diversified portfolio.

Over the longer term, an environment of higher interest rates and tighter monetary policy will benefit the returns of the asset class, enabling lenders to charge higher rates for borrowing. As borrowing costs have increased, so has the quality of companies looking to secure financing. Thus, investors are benefiting from both higher returns and higher credit quality. The lower-quality borrowers will struggle to receive financing and will have to turn to higher cost means of financing such as equity.

Overall, we expect private debt & loan to show resilience and generate contractual income with stable returns over the long term.

Mortgages

Following years of historically low borrowing costs, commercial mortgage rates more than doubled last year as a result of rising government bond yields and commercial mortgage spreads. The rapid rise in yields during 2022 put downward pressure on mortgage returns in the existing portfolio.

Many Canadian lenders continue to have an appetite for high-quality industrial, logistics and multifamily properties, although, liquidity in the commercial lending market has decreased compared to previous years. Looking ahead, prospective all-in rates for new commercial mortgages are attractive compared to recent years. That's due to higher government bond yields and elevated commercial mortgage spreads, with the latter currently sitting above the long-term average. Although the pace of interest rate hikes is expected to slow, persistently high inflation could lead to further rate increases that are above market expectations. This could negatively impact short-term returns, and at the same time increase long term return expectations.

Forecast by Asset Class

Illiquid Assets

Overview

Illiquid assets are crucial in constructing a well-diversified portfolio, and 2022 was a prime example of that. These asset classes exhibit low correlations to traditional fixed income and public equity markets. Investment opportunities in private asset markets are unique, even within the same asset class category, which helps diversify the risk across the portfolio. One commonality between these asset classes is the longer investment lifespan, which is suitable for long term investors. Furthermore, the illiquid nature of these investments generally means a higher premium and therefore a higher expected return. Over time, investors' appetites for illiquid assets have increased, and our clients continue to allocate more to illiquid asset classes to take advantage of the attractive return-risk characteristics.

Our 2023 forecast paints a favourable picture for all private assets with strong cashflow growth potential. Currently, on behalf of our clients, AIMCo invests in private Canadian real estate domestically and foreign real estate, private equity, infrastructure and renewable resources globally. The building blocks, explaining the sources of return for each private asset class are discussed in their respective sections.

Real Estate

Building Blocks

For real estate, we use forecasts from the Oxford Economics model for Canadian and foreign Real Estate. In this model, income yield, rental income growth and valuation change are the main building blocks. These building blocks are forecasted using the path of macroeconomic variables such as inflation, bond yields along with inputs on market rents, construction activity and relevant demand drivers.

Values for Canadian and Foreign real estate building blocks are shown in the following exhibits. We continue to expect foreign real estate to provide a higher return environment for investments compared to the Canadian market. In both cases, the expected income drives the respective assumptions.

Chart 5: Canadian Real Estate

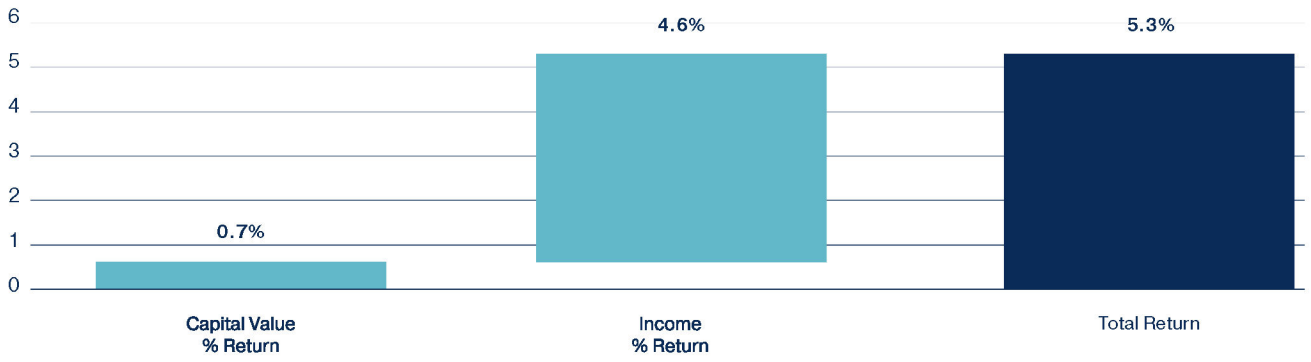
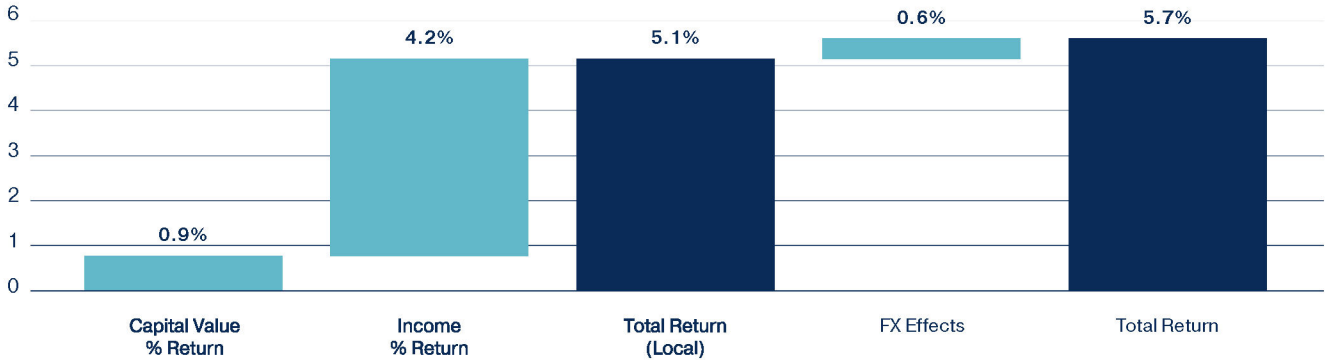


Chart 6: Foreign Real Estate



Market Comments

The overall Real Estate market hit a tipping point in 2022. Equity drawdowns, high inflation, and interest rate hikes began to have an impact on Real Estate pricing, volumes, and debt availability. Cap rates rose across nearly all sectors and geographies, driving up the Canadian national average cap rate figure to its highest level since before the pandemic. Furthermore, investment activity slowed in 2022 as more investors began taking a more cautious approach to capital allocation. However, not all sectors are equal. Namely, industrial, multi-family, and necessity-based retail are continuing to garner interest. Valuations are trending downwards for office properties, particularly in the U.S. and Europe. In addition, cap rates will need to adjust to find an equilibrium when compared with risk-free rates.

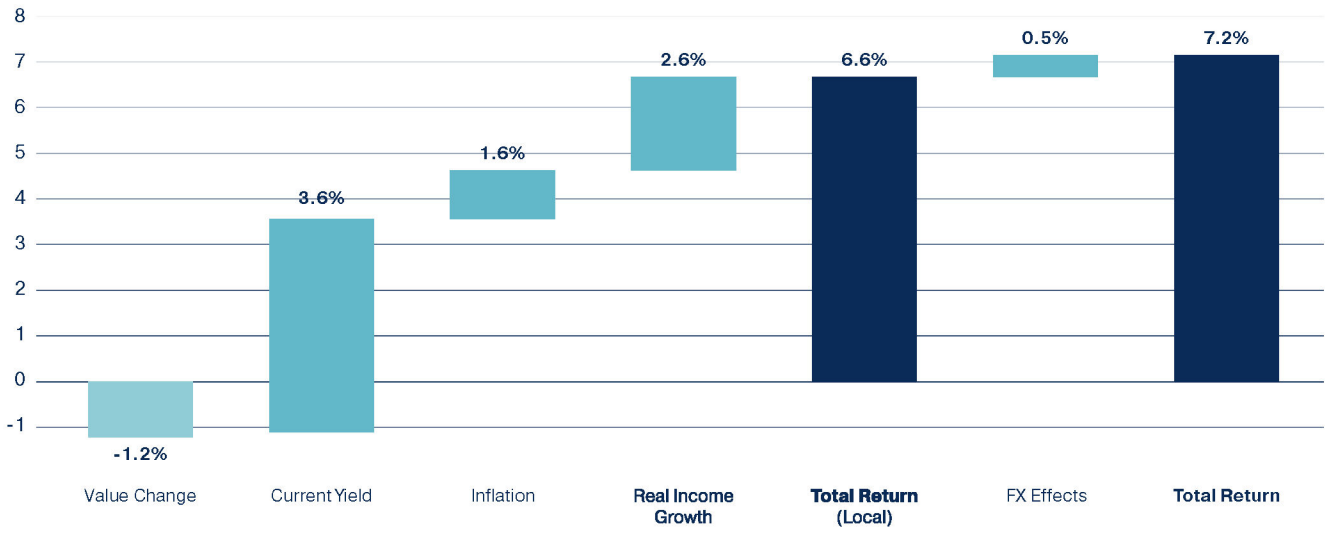
A flight to quality is beginning to take hold within capital markets and spatial markets. Office tenants are prioritizing quality and wellness in their leasing decisions. There is a renewed focus on Core/Stabilized properties as a better risk-adjusted investment opportunity. Long-term forward-looking returns will benefit from income gains as a result of expanding capitalization rates last year. We also expect a modest gain from valuation changes as rates markets level off over the forecast horizon.

Infrastructure

Building Blocks

Many real assets, including infrastructure, provide both inflation protection and an income stream to investors. While the degree to which a pass-through inflation rate impacts infrastructure return can vary based on specific investments, overall, we expect infrastructure as an asset class will benefit from the higher expected inflation rate over the forecast horizon in this year's economic forecast. The detailed building block values contributing to our return forecast are shown in the following exhibit.

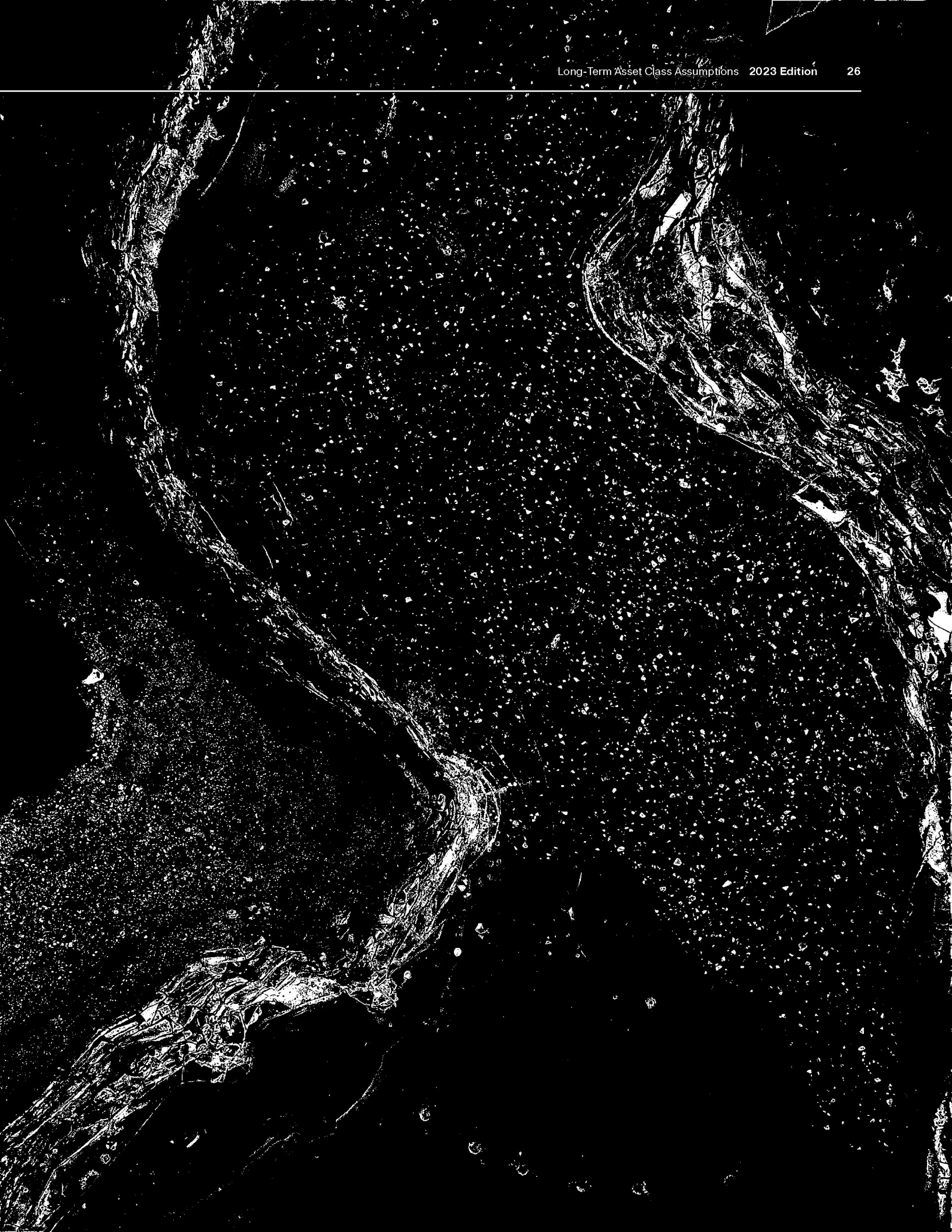
Chart 7: Building Blocks of Infrastructure



Market Comments

Infrastructure sectors performed well in 2022 relative to broader public equities. Underlying business dynamics remained largely resilient and benefitted from demand normalization post-pandemic. While there are still some lingering effects from the pandemic in certain sub-sectors (for example, transport), the shift back to a normalized demand environment continued in 2022 for most countries. Private investment in infrastructure is largely back to pre-pandemic levels and expected to increase on a longer-term basis, benefitting from some key trend drivers such as decarbonization and digitalization. Many government policies in various countries are also expected to be near-term supportive factors for further investment into infrastructure areas that drive decarbonization goals and the reshoring of various supply chains.

Forward-looking long-term returns have largely stayed close to the same levels as last year, with some impacts from valuation multiples reverting to longer-term normalized levels. In addition, the amount of undeployed capital seeking exposure in the space is expected to be a headwind for the asset class. Inflation is expected to be supportive of long-term returns, given the inflation-linked nature of many of the infrastructure sub-sector businesses. While the outlook has improved for several other asset classes, real assets will continue to play an important role as a diversified source of returns.



Renewable Resources

Building Blocks

Renewable resources is another asset class which provides a degree of inflation protection for AIMCo clients. We utilized a similar model to last year, incorporating both income generation capacity and valuation growth for this asset class. Our building blocks are highlighted in the following exhibit.

Chart 8: Building Blocks for Renewable Resources

Market Comments

The medium-to-long-term prospects for both timberland and farmland remain positive. The growing global middle class will intensify the demand for forest and agricultural products. At the same time, the supply of arable land to grow trees and crops is finite and decreasing due to competing land uses and climate change.

The demand for timberland and agriculture investments has increased as investors seek low correlations to conventional asset classes, inflation protection, and positive sustainability attributes. Underlying land values are generally correlated with inflation, whereas the income component of returns depends on the extent to which inflation impacts commodity prices/ revenues and costs. The impact of inflation on key inputs such as fertilizer has put pressure on farm incomes in 2022, but generally, the increase in costs has been offset by relatively strong commodity prices. Competition has continued to drive valuations higher and compressed expected returns, especially in core timberland regions. Investors continue to seek timberland and agriculture investments due to their positive environmental, social, governance (ESG) characteristics and expected return sources for the asset classes have evolved beyond traditional income with more value being placed on carbon sequestration, conservation, and biodiversity.

Key risks to our Renewable Resources forecasts include sustained high interest rates which could put pressure on timberland and farmland valuations, pressure on farm income due to high input costs, decreased production due to natural disasters or climate change, labour availability, and lower commodity prices.

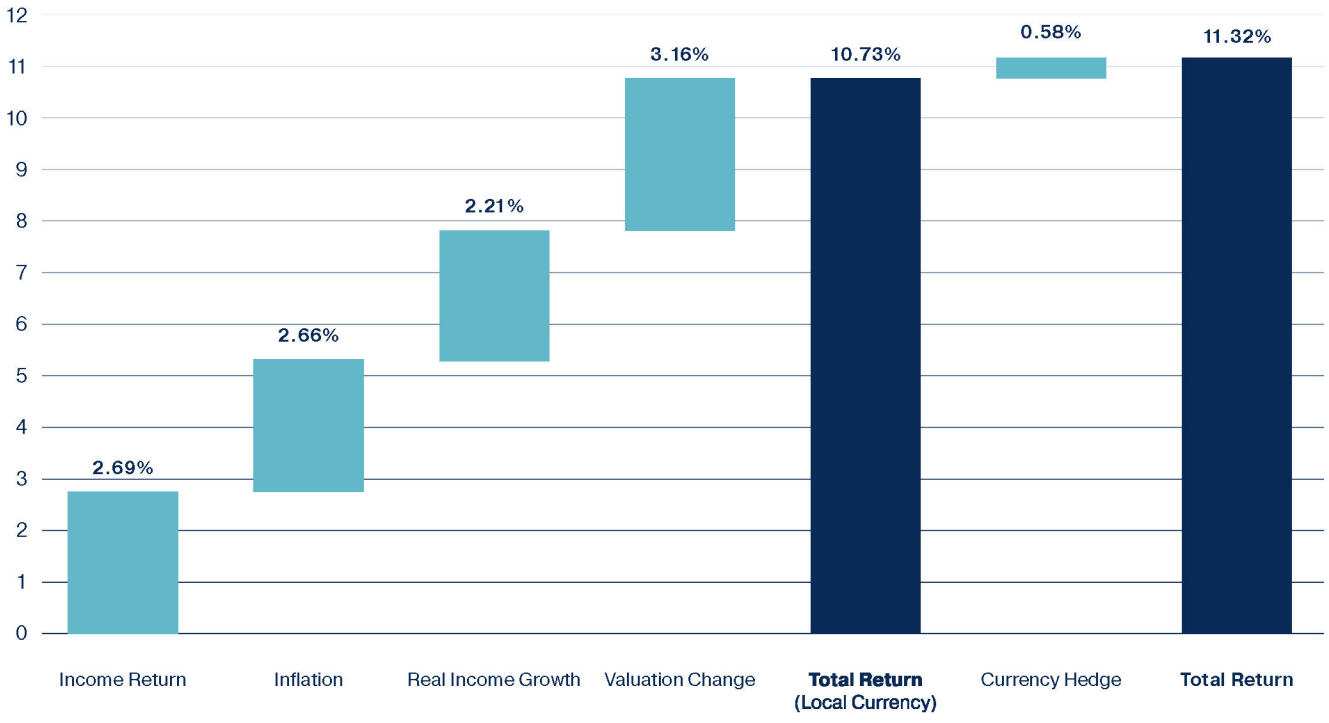
Private Equity

Building Blocks

Our private equity model, based on an AQR paper[8] we introduced in previous editions of our forecast, has similarities to the building blocks we use for public equities. Unlike public equities where we separately attribute income return to dividends and buybacks, for private equity, income return is forecasted using an estimated earnings yield. Our modelling framework uses a public equity comparable, namely MSCI World Index, to estimate the starting earnings yield and its long-term average, translating to an expected earnings yield of 2.7%. Based on our global GDP growth estimate, we assume real growth to be 2.2% for the decade.

Similarly, global inflation is expected to land at 2.7% over the next 10 years, boosting total returns. Valuation is the most challenging parameter to estimate over the long term. We use two metrics from data provider Preqin, "weighted net multiple" and "residual value to paid-in" ratio. By combining the effect of the convergence of the metrics from their current value to their long-term average, we expect a return from valuation gains to be 3.1%. The aggregate effect of all factors including currency translation produces an expected return of 11.3% over the coming decade.

Chart 9: Building Blocks for Private Equity



[8] Source: Demystifying Illiquid Assets: Expected Returns for Private Equity, AQR Whitepaper 1Q19, by Antti Ilmanen, Swati Chandra, Nicholas McQuinn."

Market Comments

Private equity will continue to be an attractive asset class in the long term and play an important role in portfolio diversification. The benefits of having a long-term approach, employing value-creation strategies and attracting best-in-class well-aligned management teams will continue to support attractive risk-adjusted returns. In the short term, valuations and performance have weakened in line with global macro factors including high inflation, supply chain disruption, slowing economic growth and widened bid-ask spreads as private market pricing has lagged depressed public valuations. This dynamic, compounded by a recent slowdown in exits, has led to the "denominator effect" being experienced by many public pension plans that have now reached or exceeded target allocations to the asset class. This, in turn, has contributed to a pullback in fundraising activity, which in aggregate has declined 14% year-over-year as of early December 2022. Nonetheless, there is still a large balance of dry powder already committed to private equity funds ready to invest, estimated to be approximately USD 1.3 trillion.

Private equity deal activity slowed in the second half of 2022 with volumes declining by 22% year over year. Turbulent leveraged financing markets have contributed to this dynamic, effectively limiting the size of deals that firms are currently able to execute. Meanwhile, higher interest rates and global economic uncertainty are also beginning to lower valuations, which had become frothy in recent years. As we enter an environment where leverage is increasingly expensive and valuation multiples may contract, operational value creation will likely drive an increasing share of private equity returns.

Two sectors that could see relative outperformance in this environment are healthcare and enterprise technology. Long-term global secular trends are providing strong tailwinds for the healthcare sector, including (i) demographics—an aging population, higher incidence of chronic diseases, growing middle class seeking better quality, and individualized healthcare; (ii) increased spending—pressure to find affordable products and services, increased spend by government, and fast-track processes for drug development; and (iii) transition towards greater personalization of treatment. The deal environment for the technology sector as well is likely to remain favourable—particularly in an environment with more palatable valuations—given long-term trends of (i) increased digitalization; (ii) greater adoption of recurring revenue models that should help insulate earnings through periods of economic volatility; and (iii) accelerating technological innovation. Rapidly evolving consumer behaviours and demands on businesses are similarly providing emerging opportunities within the consumer products and business services markets as well. Diversity, equity, and inclusion or "DEI" is an ancillary strategy traversing all sectors and represents an additional emerging yet undercapitalized opportunity for private equity investors. Historical performance of firms committed to DEI has proven to be at least comparable to that of nondiverse counterparts and, in certain cases, superior.

As traditional exits via sponsor-to-sponsor sales or IPOs stall in the near term, the continued rise of the secondaries market has helped enhance liquidity optionality in private markets. General Partners (GP) have increasingly embraced the market as a way to monetize stakes in companies that they do not want to exit completely even as they try to satisfy investor commitments. A GP-led secondary via a continuation vehicle creates a way to return capital to existing LPs while enabling the fund to maximize the value of the assets by extending the holding period, which is a trend we may see an increase over the coming years.

Forecast by Asset Class

Public Equities

Overview

Our forecast this year has forward-looking public equity returns increasing compared to a year ago. Lower starting valuations are the main driver of the increase in expected returns, given the retreat of price-to-earnings ratios experienced during 2022. Earnings growth is expected to be bound at the upper end by our GDP forecasts for each market. Rising input prices and cost of debt may manifest as a double-headed risk, should inflation persist over the coming years. Equity markets are, however, real assets and their cash flows are expected to keep pace with inflation over the longer term.

Dividends are reliable sources of return in equity markets. Our models assume dividends will persist based on current trends. In all markets, we expect valuations will help develop a positive contribution to equity returns over the next 10 years. Trailing 12-month Price-to-Earnings (P/E) ratios have dropped since our last forecast, as markets reset to a higher rate environment. We assume valuations will revert to the mean over the forecast horizon.

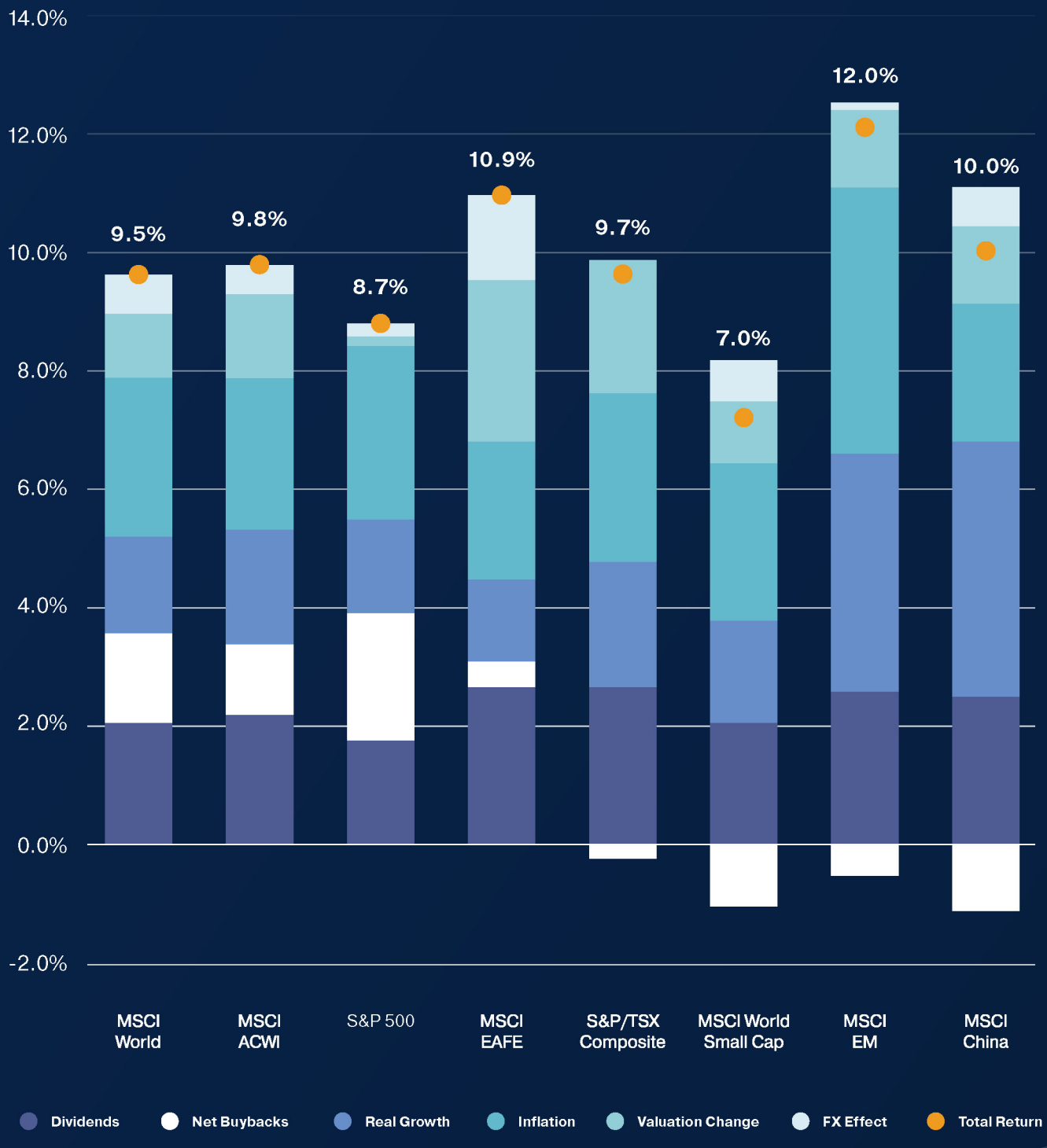
Building Blocks

AIMCo's public equity capital market assumptions are based on forecasts in inflation, real earning growth, dividend yield, buyback yield, net dilution and valuations for the respective index. AIMCo incorporates a currency view through conversion to the Canadian dollar.

For public equity benchmarks, we define the expected return as being the combination of total yield (dividend yield and net buyback yield), expected trend growth (g) in earnings per share EPS, and expected change in valuations (Δv). That is: $E(r) \approx DY+g+\Delta v$

Expected trend growth in EPS is proxied by real GDP growth rates.

Chart 10: Building Blocks for Public Equity Assets



Global Equities

In the past year, Global Equity investors were forced to manage the simultaneous challenges of rising and persistent inflation, central bank hawkishness, and significant geopolitical headwinds. With few exceptions, developed markets all closed out 2022 in the red, with the US technology-heavy NASDAQ among the worst performers. With widespread interest rate hikes globally in 2022, long-duration equities were particularly punished after more than a decade of market leadership. Elsewhere, as global energy security came to the fore, investors in global developed markets are now confronted with the most perplexing set of economic headwinds seen in decades.

Our view is that delayed action by global central banks in response to inflationary pressures has ushered in a new and potentially extended period of monetary tightness. Broadly speaking, 2022 was a year of valuation multiple compression. Indeed, the cost of capital for corporates has seen its biggest 12-month move in four decades. The possibility of a more moderate-to-low economic growth environment in the years to come suggests earnings revisions ahead. As valuations could continue to reset in the short term, we expect corporations to take advantage of this via accelerated shareholder returns in the form of dividends and share repurchases. Nonetheless, the economic backdrop for global equities is now quite distinct from that of the past 40 years and will require rigour, agility, and patience.

Canadian Equities

The strength in Canadian earnings continued in 2022, carrying on the incredible growth and recovery of the prior year. It was inevitable that earnings growth would slow given the higher base, but the broad strength across the economy translated into high profitability for the Canadian market. Return on equity for Canada approached the mid-teens, which are levels not seen since before the great financial crisis. Corporations developed a greater appreciation for capital efficiency and increasingly returned capital to shareholders via increased dividends and share buybacks. This behaviour change was particularly notable in the energy sector where high commodity prices were met with production discipline, which translated into tremendous free cash flow for the industry.

Similar to many parts of the developed world, much of the economic growth of the past two years can be attributed to the lingering effects of the various forms of stimulus introduced during the pandemic. The stimulative effects of these policies highlighted some of the constraints and underinvestment in the world as rising demand for many products and services remains unmet, resulting in significantly higher prices. The Bank of Canada is attempting to cool demand and inflationary pressures through higher interest rates, resulting in 400 bps of tightening in 2022. This has pushed bond yields and discount rates higher. The lower valuation combined with an outlook for a slowing economy have been the primary reasons for the decline in the Canadian equity market this past year.

As has been the case for many years, the Canadian equity market continues to trade at a discount relative to the U.S. due to the country's greater cyclicality and persistently lower profitability. As markets begin to anticipate a pause in central bank tightening, and perhaps some easing in the latter half of 2023, Canadian equities may benefit from Canada's economy pro-cyclical nature alongside less rich valuations than the U.S.

Emerging Market Equities

Last year was another challenging year in emerging markets, driven by rising global interest rates, higher inflation, a stronger U.S. dollar, economic headwinds in China and the largest military conflict in Europe since World War II. These events contributed to lower Emerging Markets' valuation measures, which has made them a more attractive investment opportunity over the longer term. Attractive valuations are supported by expectations for stronger corporate earnings growth as Emerging Market companies benefit from being in the faster-growing parts of the global economy. In 2023, we expect Emerging Markets to deliver stronger growth as China reopens its economy, the outlook for the U.S. dollar weakens, and commodity suppliers continue to perform well. Longer-term geopolitical concerns temper somewhat our enthusiasm for the asset class.

Global Small-Cap Equities

Global small caps performed very much in line with their larger cap peers this past year as the entire market declined. Small-cap earnings growth slowed materially and faced lower valuations as higher interest rates and the prospects for slower, or perhaps even contracting growth presented headwinds to the overall market. With the underperformance of small-cap equities back in 2021, valuations between the two segments of the market have returned to levels more in line with longer-term averages. As the prospect of a shift in central bank policy becomes more apparent and markets begin to anticipate a pause in the tightening cycle, opportunities will present themselves for small-cap markets.

Chinese Equities

China's equity markets have endured a difficult three years of rolling pandemic-related lockdowns, a precipitous property market slump, and most recently, rising geopolitical tensions resulting from Russia's invasion of Ukraine. Yet following the People's Party Congress in the fall of 2022, signals point to a substantial easing in China's COVID restrictions, which could soon unlock China's economic potential. With a backdrop of lower commodity prices, an economic reopening, and an effective put from the Chinese government to property developers, we expect earnings and investor sentiment to significantly improve. If the North American experience is any guide, the relaxation of mobility restrictions should positively impact consumption in China, with goods consumption expected to see an earlier resurgence than that of services. On valuations, although they have been lower relative to history, many domestically oriented sectors in China are near cyclical troughs. Our forecast also acknowledges that foreign investors have been substantially underweighting China equities during the pandemic (and compounded by U.S.-China tensions), and we expect a portfolio normalization over time.

Risk Assumptions Methodology

The AIMCo 2023 long-term risk forecasts are volatility estimates, which are useful for building portfolios based on a mean-variance optimization analysis. However, investors should also consider the broader concept of risk, including tail risks, which can be measured by Value at Risk (VaR) and Expected Tail Loss (ETL). In addition, some assets (e.g. real return bonds) may exhibit high volatility, but they help diminish inflation risk, which is important to investors sensitive to inflation. Although we will not cover the details of alternative risk measures, we would like to highlight the importance of understanding these dynamics, which can become particularly relevant in investment decisions.

Similar to last year, we have incorporated the results of a collaboration with our partner AlphaLayer, to enhance the robustness of our risk forecast. AlphaLayer, a collaboration between AIMCo and AltaML, applies deep understanding and experience in machine learning techniques to deliver solutions specific to the investment management industry. Illiquid asset classes are valued infrequently and may not be marketable securities. As a result, illiquid assets can suffer from various biases and are difficult to compare to higher frequency data available for publicly-traded assets. Adjusting the data for these shortcomings can improve the statistical nature of the dataset and produce more robust and realistic estimates of risk. A few of the specific adjustments made were:

1. Seasonal effects of time series data were removed; for example, accounting effects that are noticeable at year-end.
2. Monthly data were imputed based on the adjusted quarterly data using machine learning techniques. The imputation considered not only an individual asset's return time series but also the appropriate statistical relationship with other assets.

AIMCo has implemented a VAR-GARCH-DCC[9] statistical model for risk forecasting. This model was proposed by Nobel laureate Robert Engle and Kevin Sheppard to estimate time-varying covariance matrices through the concept of Dynamic Conditional Correlation (DCC) estimators in 2001. The DCC estimators are combined with a multivariate VAR-GARCH in a parsimonious manner to estimate correlation matrices. The following considerations are given during the modelling process:

1. We employed a multivariate time series model, which is a suitable choice when both volatility and correlation vary over time. The use of time series with varying volatilities across time to model asset return data is also supported by extensive academic literature.
2. We used an asymmetric Student's t-distribution to incorporate skewness and kurtosis exhibited by most asset class historical statistical distributions.
3. We ensured the benchmarks would be provided at a high frequency with the requirement of trying to capture the true, underlying volatility properties of the respective asset classes.
4. We made use of long enough benchmark historical data for modelling purposes.
5. We selected the risk benchmarks either following the AIMCo official asset class benchmarks or researched representative benchmarks for the underlying asset class.

The long-term expected risks and correlations have also been reviewed by AIMCo's Chief Investment Officer and the Risk Management group.

[9] Vector Autoregressive - Generalized Autoregressive Conditional Heteroscedasticity - Dynamic Conditional Correlation.

Currency Assumptions Methodology

To convert non-Canadian market returns to Canadian dollar terms, we adjust the expected return using the exchange rate such that purchasing power is maintained between other economies and Canada. Absolute PPP holds that exchange rates are in equilibrium when the value of a national basket of goods and services are the same between two countries.

Disclaimer

Return assumptions and risk estimates were developed by Alberta Investment Management Corporation and are for general information only. This information is not intended to provide specific advice to any individual. We make no representations or warranties with respect o the timeliness, accuracy, or completeness, and bear no liability for any loss arising from its use. All forward-looking information and forecasts contained herein, unless otherwise noted, are the opinion of Alberta Investment Management Corporation, and future market movements may differ significantly from our expectations. Index performance or any index related data is given for illustrative purposes only and is not indicative of the performance of any particular portfolio. Any performance data shown herein represents returns and is no guarantee of future results. Investment returns will fluctuate such that the value of holdings may be worth more or less than their original cost.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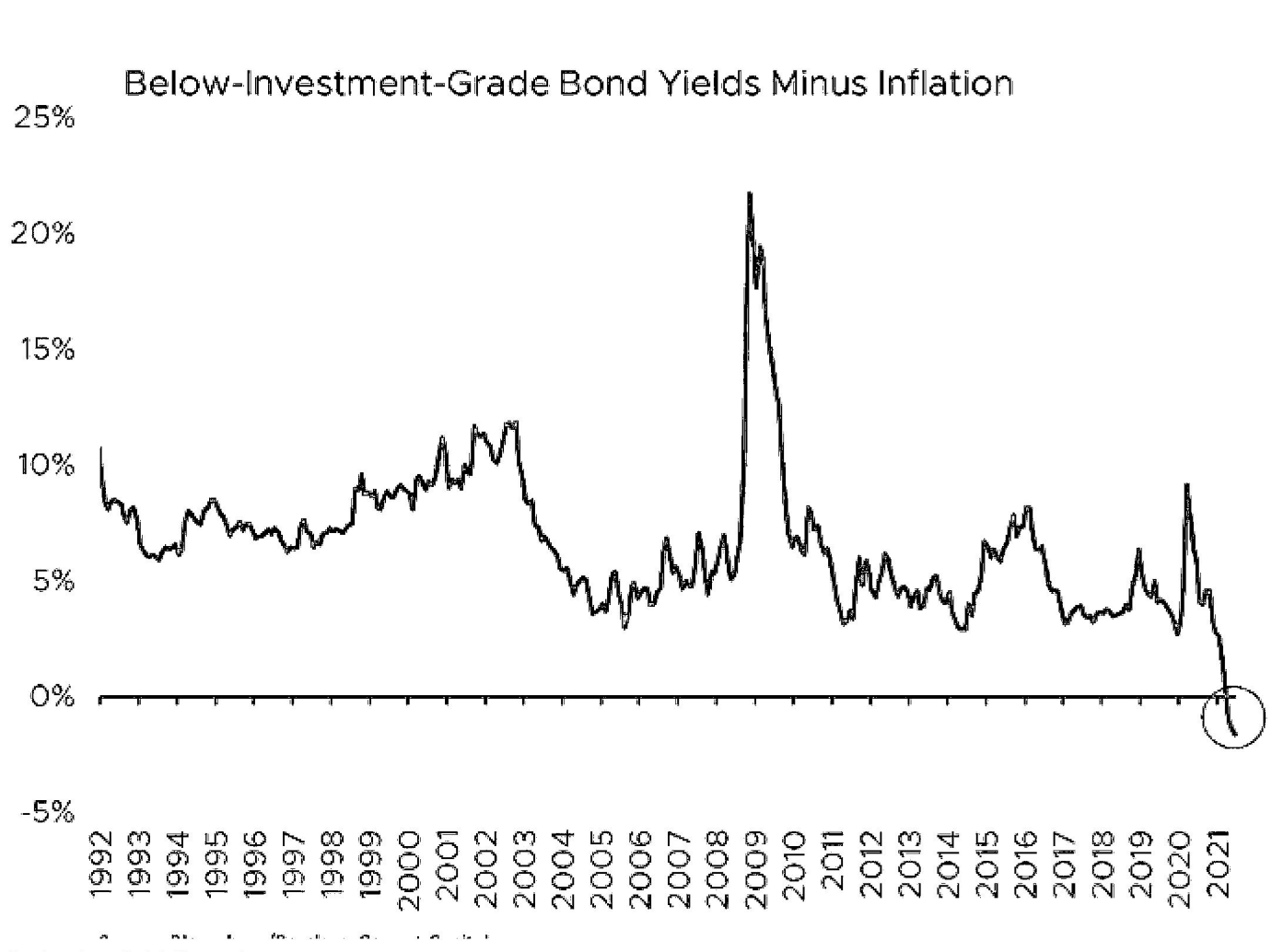
https://cressetcapital.com/post/what-is-the-bond-market-telling-us/

WHAT IS THE BOND MARKET TELLING US?

MARKET COMMENTARY | JACK ABLIN | 7/22/21

The benchmark 10-year yield slid nearly .60 per cent since the end of March against a backdrop of robust economic growth and the highest inflation readings in years. At 1.2 per cent, the 10-year is back to levels we haven't seen since February. With year-over-year inflation running at 5.4 per cent, the "real" rate – the 10-year yield adjusted for inflation – is -4.2 per cent, more than one percentage point more negative than any of our developed market counterparts. The 10-year "junk" bond yield is negative also, for the first time in history. Same for the real earnings yield of the S&P 500, which has never before been negative. Bond holders, unable to earn a yield higher than the inflation rate, are effectively locking in a lower standard of living as the potential growth of their investment trail the cost of living. While negative real rates have occurred historically, they are generally associated with extraordinary events, like an inflation shock or emergency monetary policy, not a recovering economy.



Source: Bloomberg/Barclays; Cresset Capital.
Chart #1254

Bond investors tend to see the glass half empty, since bad news is usually good news for fixed-income investors. But several issues are keeping today's bond holders awake at night. The Delta variant is gaining strength, particularly among the unvaccinated. While the US leads much of the world in vaccinations, we're falling behind projections made earlier this year. President Biden had to walk back his pledge that 70 per cent of US adults would be fully vaccinated by July 4. Credit market investors worry that inadequate vaccination rates could stall reopening efforts in parts of the US where vaccinations trail and in many parts of the developed world. Vaccination rates in Japan, Mexico and South Korea remain at or below 20 per cent of their populations.

Fixed-income investors also worry about waning fiscal support. President Biden's $2 trillion COVID-19 relief package went a long way to support households and unemployed Americans beset with the ravages of the pandemic. Relief in the form of stimulus checks and unemployment benefits are set to expire this fall, leaving a hole in disposable income. Bond investors worry that demand will fall without government support. The economy is expected to have expanded 9 per cent last quarter, fueled in part by government stimulus checks. While economists anticipate growth to continue, it would be at a slower pace. Longer term, growth is expected to trend back to a 2.5 per cent annualized rate.

Federal Reserve governors are tasked with balancing full employment with price stability. Prices are rising even though millions of Americans remain without work. Bond investors worry that the Federal Open Market Committee will tighten monetary policy too soon, quashing the incipient recovery. Bond yields reversed in June, when the Fed updated its “dot plot,” signaling an acceleration of its rate-tightening program. Bond investors now expect the Fed to commence raising its overnight rate next year. That stands in contrast to Chairman Powell’s pledge earlier this year of no rate hikes through 2022.

From a growth perspective, bond investors are concerned today’s growth is situated on the North Pole, where any step taken must be south. They believe we are experiencing peak growth in economic activity, corporate profits and inflation, as the reopening and recovery converge. Inflation is currently running at over 5 per cent year over year, but it’s largely a reflection of pandemic pricing last year, particularly for used car and hotel rooms. Investors expect pricing pressure to retreat, with 5-year inflation expected to average 2.5 per cent and 10-year inflation to average 2.1 per cent. That implies the 5-year rate five years from now is expected to be 1.8 per cent, below the Fed’s 2 per cent inflation target. It remains to be seen if today’s pricing pressure is temporary or longer lasting. A lot depends on what happens to wages and housing costs. Higher wages are needed to fuel demand at higher prices while housing costs, which typically don’t retreat, comprise nearly half of the government’s CPI calculation.

Bond investors worry that profit growth is also peaking. S&P 500 investors are expected to harvest 60+ per cent profit growth this quarter, representing the strongest year-over-year gain since Q4/09, when companies rebounded from the financial crisis. Wary investors understand current profit trends won't last indefinitely. Next quarter, for example, S&P profits are expected to grow 24 per cent from a year earlier, leveling to 14 per cent toward the middle of next year. While mid-teens profit growth is respectable by historical standards, glass-half-empty investors look at growth trends, and see them slowing.

Investment implications

The bond market is sending strong but inconsistent signals. Harried investors should be justifiably worried about the escalation of the Delta variant, especially given the low vaccination rates in certain

parts of the world. However, the yield differential between short-term and intermediate-term maturities, albeit narrower, still implies growth. The yield differential touched zero in H2/19 but remains over one per cent today. Financial conditions – an index comprising a combination of credit spreads (the premium lenders require to extend credit to lower-quality borrowers) and market volatility – remain favorable for risk takers as well. Notwithstanding the pullback in growth expectations, lenders have not pulled in their horns.

Putting the pieces together suggests the evolving view of the bond market should not be interpreted as a threat to long-term equity investors. It remains to be seen whether equity investors were justified in driving the S&P 500 to more than 30 all-time highs this year, but in our view a downgrade in growth estimates shouldn't prompt anything worse than a correction. An extended, flatter recovery still leaves bond yields that carry negative real interest rates too low for projected, stable-state conditions. That means that a physical asset, like gold, would do a better job than financial assets in helping short-term bond investors maintain their purchasing power. Persistently negative real rates also mean that equity investors can no longer rely on valuation expansion to help fuel future market returns, a benefit that drove most of the market gains over the last 10 years. Instead, equity investors must rely on organic earnings growth and dividends for returns. From that perspective, cheaper, value-oriented sectors with higher earnings yields, like health care, industrials and materials, will likely be a more important source of investment returns over the coming years.

About Cresset

Cresset specializes in Intelligent Wealth Management™ for CEO Founders, entrepreneurs, PE Partners and high-net-worth families. Our Family Office goal is to simplify and elevate your life so you have more time to spend on what matters to you most.

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CHAPTER 18

The Valuation of Common Stocks

In Chapter 17 it was noted that one purpose of financial analysis is to identify mispriced securities. Fundamental analysis was mentioned as one approach for conducting a search for such securities. With this approach the security analyst makes estimates of such things as the firm's future earnings and dividends. If these estimates are substantially different from the average estimates of other analysts but are felt to be more accurate, then from the viewpoint of the security analyst, a mispriced security will have been identified. If it is also felt that the market price of the security will adjust to reflect these more accurate estimates, then the security will be expected to have an abnormal rate of return. Accordingly, the analyst will issue either a buy or sell recommendation, depending on the direction of the anticipated price adjustment. Based on the capitalization of income method of valuation, dividend discount models have been frequently used by fundamental analysts as a means of identifying mispriced stocks. This chapter will discuss dividend discount models and how they can be related to models based on price-earnings ratios.

18.1 CAPITALIZATION OF INCOME METHOD OF VALUATION

There are many ways to implement the fundamental analysis approach to identifying mispriced securities. A number of them are either directly or indirectly related to what is sometimes referred to as the **capitalization of income method of valuation.**[1] This method states that the "true" or "intrinsic" value of any asset is based on the cash flows that the investor expects to receive in the future from owning the asset. Because these cash flows are expected in the future, they are

adjusted by a **discount rate** to reflect not only the time value of money but also the riskiness of the cash flows.

Algebraically, the intrinsic value of the asset V is equal to the sum of the present values of the expected cash flows:

$$V = \frac{C_1}{(1+k)^1} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} + \cdots$$
$$= \sum_{t=1}^{\infty} \frac{C_t}{(1+k)^t} \tag{18.1}$$

where C_t denotes the expected cash flow associated with the asset at time t and k is the appropriate discount rate for cash flows of this degree of risk. In this equation the discount rate is assumed to be the same for all periods. Because the symbol ∞ above the summation sign in the equation denotes infinity, all expected cash flows, from immediately after making the investment until infinity, will be discounted at the same rate in determining V.[2]

18.1.1 Net Present Value

For the sake of convenience, let the current moment in time be denoted as zero, or $t = 0$. If the cost of purchasing an asset at $t = 0$ is P, then its **net present value** (NPV) is equal to the difference between its intrinsic value and cost, or:

$$\text{NPV} = V - P$$
$$= \left[\sum_{t=1}^{\infty} \frac{C_t}{(1+k)^t}\right] - P. \tag{18.2}$$

The NPV calculation shown here is conceptually the same as the NPV calculation made for capital budgeting decisions that has long been advocated in introductory finance textbooks. Capital budgeting decisions involve deciding whether or not a given investment project should be undertaken. (For example, should a new machine be purchased?) In making this decision, the focal point is the NPV of the project. Specifically, an investment project is viewed favorably if its NPV is positive, and unfavorably if its NPV is negative. For a simple project involving a cash outflow now (at $t = 0$) and expected cash inflows in the future, a positive NPV means that the present value of all the expected cash inflows is greater than the cost of making the investment. Conversely, a negative NPV means that the present value of all the expected cash inflows is less than the cost of making the investment.

The same views about NPV apply when financial assets (such as a share of common stock), instead of real assets (such as a new machine), are being considered for purchase. That is, a financial asset is viewed favorably and said to be underpriced (or undervalued) if NPV > 0. Conversely, a financial asset is viewed unfavorably and said to be overpriced or (overvalued) if NPV < 0. From Equation (18.2), this is equivalent to stating that a financial asset is underpriced if $V > P$:

$$\sum_{t=1}^{\infty} \frac{C_t}{(1+k)^t} > P. \tag{18.3}$$

Conversely, the asset is overvalued if $V < P$:

$$\sum_{t=1}^{\infty} \frac{C_t}{(1 + k)^t} < P.$$

18.1.2 Internal Rate of Return

Another way of making capital budgeting decisions in a manner that is similar to the NPV method involves calculating the **internal rate of return** (IRR) associated with the investment project. With IRR, NPV in Equation (18.2) is set equal to zero and the discount rate becomes the unknown that must be calculated. That is, the IRR for a given investment is the discount rate that makes the NPV of the investment equal to zero. Algebraically, the procedure involves solving the following equation for the internal rate of return k^*:

$$0 = \sum_{t=1}^{\infty} \frac{C_t}{(1 + k^*)^t} - P. \tag{18.5}$$

Equivalently, Equation (18.5) can be rewritten as:

$$P = \sum_{t=1}^{\infty} \frac{C_t}{(1 + k^*)^t}. \tag{18.6}$$

The decision rule for IRR involves comparing the project's IRR (denoted by k^*) with the required rate of return for an investment of similar risk (denoted by k). Specifically, the investment is viewed favorably if $k^* > k$, and unfavorably if $k^* < k$. As with NPV, the same decision rule applies if either a real asset or a financial asset is being considered for possible investment.[3]

18.1.3 Application to Common Stocks

This chapter is concerned with using the capitalization of income method to determine the intrinsic value of common stocks. Because the cash flows associated with an investment in any particular common stock are the dividends that are expected to be paid throughout the future on the shares purchased, the models suggested by this method of valuation are often known as **dividend discount models** (DDMs).[4] Accordingly, D_t will be used instead of C_t to denote the expected cash flow in period t associated with a particular common stock, resulting in the following restatement of Equation (18.1):

$$\begin{aligned} V &= \frac{D_1}{(1 + k)^1} + \frac{D_2}{(1 + k)^2} + \frac{D_3}{(1 + k)^3} + \cdots \\ &= \sum_{t=1}^{\infty} \frac{D_t}{(1 + k)^t} \end{aligned} \tag{18.7}$$

Usually the focus of DDMs is on determining the "true" or "intrinsic" value of one share of a particular company's common stock, even if larger size purchases are being contemplated. This is because it is usually assumed that larger

size purchases can be made at a cost that is a simple multiple of the cost of one share. (For example, the cost of 1,000 shares is usually assumed to be 1,000 times the cost of one share.) Thus the numerator in DDMs is the cash dividends per share that are expected in the future.

However, there is a complication in using Equation (18.7) to determine the intrinsic value of a share of common stock. In particular, in order to use this equation the investor must forecast *all* future dividends. Because a common stock does not have a fixed lifetime, this suggests that an infinitely long stream of dividends must be forecast. Although this may seem to be an impossible task, with the addition of certain assumptions, the equation can be made tractable (that is, usable).

These assumptions center on dividend growth rates. That is, the dividend per share at any time t can be viewed as being equal to the dividend per share at time $t - 1$ times a dividend growth rate of g_t,

$$D_t = D_{t-1}(1 + g_t) \tag{18.8}$$

or, equivalently:

$$\frac{D_t - D_{t-1}}{D_{t-1}} = g_t. \tag{18.9}$$

For example, if the dividend per share expected at $t = 2$ is \$4 and the dividend per share expected at $t = 3$ is \$4.20, then $g_3 = (\$4.20 - \$4)/\$4 = 5\%$.

The different types of tractable DDMs reflect different sets of assumptions about dividend growth rates, and are presented next. The discussion begins with the simplest case, the zero-growth model.

18.2 THE ZERO-GROWTH MODEL

One assumption that could be made about future dividends is that they will remain at a fixed dollar amount. That is, the dollar amount of dividends per share that were paid over the past year D_0 will also be paid over the next year D_1, and the year after that D_2, and the year after that D_3, and so on—that is,

$$D_0 = D_1 = D_2 = D_3 = \cdots = D_\infty.$$

This is equivalent to assuming that all the dividend growth rates are zero, because if $g_t = 0$, then $D_t = D_{t-1}$ in Equation (18.8). Accordingly, this model is often referred to as the **zero-growth** (or no-growth) **model.**

18.2.1 Net Present Value

The impact of this assumption on Equation (18.7) can be analyzed by noting what happens when D_t is replaced by D_0 in the numerator:

$$V = \sum_{t=1}^{\infty} \frac{D_0}{(1 + k)^t}. \tag{18.10}$$

Fortunately, Equation (18.10) can be simplified by noting that D_0 is a fi
lar amount, which means that it can be written outside the summation sig

$$V = D_0\left[\sum_{t=1}^{\infty} \frac{1}{(1+k)^t}\right]. \qquad (1$$

The next step involves using a property of infinite series from mathem
If $k > 0$, then it can be shown that:

$$\sum_{t=1}^{\infty} \frac{1}{(1+k)^t} = \frac{1}{k}. \qquad (18.$$

Applying this property to Equation (18.11) results in the following formula f
the zero-growth model:

$$V = \frac{D_0}{k_0}. \qquad (18.13)$$

Because $D_0 = D_1$, Equation (18.13) is written sometimes as:

$$V = \frac{D_1}{k}. \qquad (18.14)$$

Example

As an example of how this DDM can be used, assume that the Zinc Company is expected to pay cash dividends amounting to \$8 per share into the indefinite future and has a required rate of return of 10%. Using either Equation (18.13) or Equation (18.14), it can be seen that the value of a share of Zinc stock is equal to \$80 (= \$8/.10). With a current stock price of \$65 per share, Equation (18.2) would suggest that the NPV per share is \$15 (= \$80 − \$65). Equivalently, as V = \$80 > P = \$65, the stock is underpriced by \$15 per share and would be a candidate for purchase.

18.2.2 Internal Rate of Return

Equation (18.13) can be reformulated to solve for the IRR on an investment in a zero-growth security. First, the security's current price P is substituted for V, and second, k^* is substituted for k. These changes result in:

$$P = \frac{D_0}{k^*}$$

which can be rewritten as:

$$k^* = \frac{D_0}{P} \qquad (18.15a)$$

$$= \frac{D_1}{P}. \qquad (18.15b)$$

Example

Applying this formula to the stock of Zinc indicates that $k^* = 12.3\%$ (= \$8/\$65). Because the IRR from an investment in Zinc exceeds the required rate of return on Zinc (12.3% > 10%), this method also indicates that Zinc is underpriced.[5]

18.2.3 Application

The zero-growth model may seem quite restrictive. After all, it seems unreasonable to assume that a given stock will pay a fixed dollar-size dividend forever. Although such a criticism has validity for common stock valuation, there is one particular situation where this model is quite useful.

Specifically, whenever the intrinsic value of a share of high-grade preferred stock is to be determined, the zero-growth DDM will often be appropriate. This is because most preferred stock is nonparticipating, meaning that it pays a fixed dollar-size dividend that will not change as earnings per share change. Furthermore, for high-grade preferred stock these dividends are expected to be paid regularly into the foreseeable future. Why? Because preferred stock does not have a fixed lifetime, and, by restricting the application of the zero growth model to high-grade preferred stocks, the chance of a suspension of dividends is remote.[6]

18.3 THE CONSTANT-GROWTH MODEL

The next type of DDM to be considered is one that assumes that dividends will grow from period to period at the same rate forever, and is therefore known as the **constant growth model.**[7] Specifically, the dividends per share that were paid over the previous year D_0 are expected to grow at a given rate g, so that the dividends expected over the next year D_1 are expected to be equal to $D_0(1 + g)$. Dividends the year after that are again expected to grow by the same rate g, meaning that $D_2 = D_1(1 + g)$. Because $D_1 = D_0(1 + g)$, this is equivalent to assuming that $D_2 = D_0(1 + g)^2$ and, in general:

$$D_t = D_{t-1}(1 + g) \tag{18.16a}$$

$$= D_0(1 + g)^t. \tag{18.16b}$$

18.3.1 Net Present Value

The impact of this assumption on Equation (18.7) can be analyzed by noting what happens when D_t is replaced by $D_0(1 + g)^t$ in the numerator:

$$V = \sum_{t=1}^{\infty} \frac{D_0(1 + g)^t}{(1 + k)^t}. \tag{18.17}$$

Fortunately, Equation (18.17) can be simplified by noting that D_0 is a [illegible] lar amount, which means that it can be written outside the summation [illegible]

$$V = D_0\left[\sum_{t=1}^{\infty}\frac{(1+g)^t}{(1+k)^t}\right]. \quad (1[illegible]$$

The next step involves using a property of infinite series from mathem[illegible] If $k > g$, then it can be shown that:

$$\sum_{t=1}^{\infty}\frac{(1+g)^t}{(1+k)^t} = \frac{1+g}{k-g}. \quad (18.[illegible]$$

Substituting Equation (18.19) into Equation (18.18) results in the valuation [illegible] mula for the constant-growth model:

$$V = D_0\left(\frac{1+g}{k-g}\right). \quad (18.20)$$

Sometimes Equation (18.20) is rewritten as:

$$V = \frac{D_1}{k-g} \quad (18.21)$$

because $D_1 = D_0(1+g)$.

Example

As an example of how this DDM can be used, assume that during the past year the Copper Company paid dividends amounting to \$1.80 per share. The forecast is that dividends on Copper stock will increase by 5% per year into the indefinite future. Thus dividends over the next year are expected to equal \$1.89 [= \$1.80 × (1 + .05)]. Using Equation (18.20) and assuming a required rate of return k of 11%, it can be seen that the value of a share of Copper stock is equal to \$31.50 [= \$1.80 × (1 + .05)/(.11 − .05) = \$1.89/(.11 − .05)]. With a current stock price of \$40 per share, Equation (18.2) would suggest that the NPV per share is −\$8.50 (= \$31.50 − \$40). Equivalently, as V = \$31.50 < P = \$40, the stock is overpriced by \$8.50 per share and would be a candidate for sale if currently owned.

18.3.2 Internal Rate of Return

Equation (18.20) can be reformulated to solve for the IRR on an investment in a constant-growth security. First, the current price of the security P is substituted for V and then k^* is substituted for k. These changes result in:

$$P = D_0\left(\frac{1+g}{k^*-g}\right). \quad (18.22)$$

which can be rewritten as:

$$k^* = \frac{D_0(1 + g)}{P} + g \tag{18.23a}$$

$$= \frac{D_1}{P} + g. \tag{18.23b}$$

Example

Applying this formula to the stock of Copper indicates that $k^* = 9.72\%$ {$= [\$1.80 \times (1 + .05)/\$40] + .05 = (\$1.89/\$40) + .05$}. Because the required rate of return on Copper exceeds the IRR from an investment in Copper ($11\% > 9.72\%$), this method also indicates that Copper is overpriced.

18.3.3 Relationship to the Zero-Growth Model

The zero-growth model of the previous section can be shown to be a special case of the constant-growth model. In particular, if the growth rate g is assumed to be equal to zero, then dividends will be a fixed dollar amount forever, which is the same as saying that there will be zero growth. Letting $g = 0$ in Equations (18.20) and (18.23a) results in two equations that are identical to Equations (18.13) and (18.15a), respectively.

Even though the assumption of constant dividend growth may seem less restrictive than the assumption of zero dividend growth, it may still be viewed as unrealistic in many cases. However, as will be shown next, the constant-growth model is important because it is embedded in the multiple-growth model.

18.4 THE MULTIPLE-GROWTH MODEL

A more general DDM for valuing common stocks is the **multiple-growth model.** With this model, the focus is on a time in the future (denoted by T) after which dividends are expected to grow at a constant rate g. Although the investor is still concerned with forecasting dividends, these dividends do not need to have any specific pattern until this time, after which they will be assumed to have the specific pattern of constant growth. The dividends up until T (D_1, D_2, D_3, . . ., D_T) will be forecast individually by the investor. (The investor also forecasts when this time T will occur.) Thereafter dividends are assumed to grow by a constant rate g and the investor must also forecast, meaning that:

$$D_{T+1} = D_T(1 + g)$$
$$D_{T+2} = D_{T+1}(1 + g) = D_T(1 + g)^2$$
$$D_{T+3} = D_{T+2}(1 + g) = D_T(1 + g)^3$$

Illustration. Figure 18.1 presents a time line of dividends and growth rates associated with the multiple-growth model.

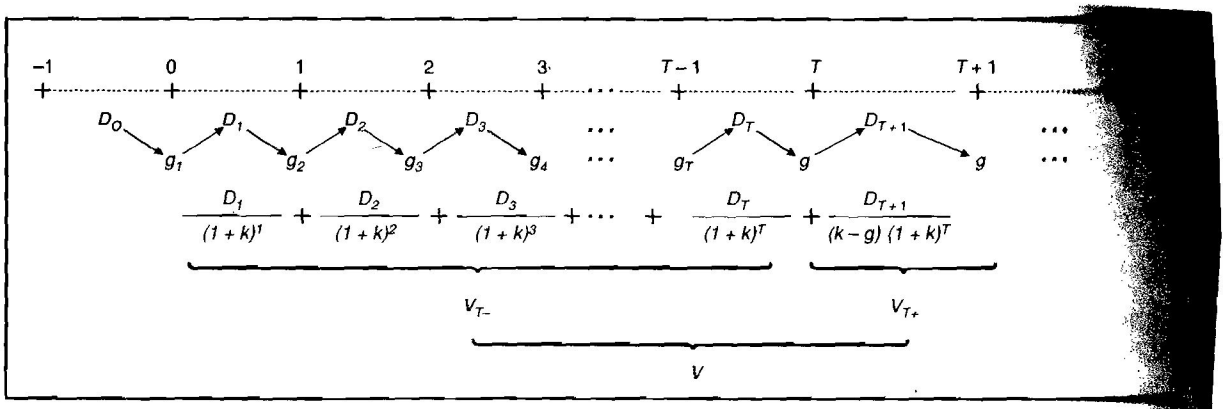

Figure 18.1
Time Line for Multiple-Growth Model

18.4.1 Net Present Value

In determining the value of a share of common stock with the multiple-growth model, the present value of the forecast stream of dividends must be determined. This can be done by dividing the stream into two parts, finding the present value of each part, and then adding these two present values together.

The first part consists of finding the present value of all the forecast dividends that will be paid up to and including time T. Denoting this present value by V_{T-}, it is equal to:

$$V_{T-} = \sum_{t=1}^{T} \frac{D_t}{(1+k)^t}. \tag{18.24}$$

The second part consists of finding the present value of all the forecast dividends that will be paid after time T, and involves the application of the constant-growth model. The application begins by imagining that the investor is not at time zero but is at time T, and has not changed his or her forecast of dividends for the stock. This means that the next period's dividend D_{T+1} and all those thereafter are expected to grow at the rate g. Thus the investor would be viewing the stock as having a constant growth rate, and its value at time T, V_T, could be determined with the constant-growth model of Equation (18.21):

$$V_T = D_{T+1}\left(\frac{1}{k-g}\right). \tag{18.25}$$

One way to view V_T is that it represents a lump sum that is just as desirable as the stream of dividends after T. That is, an investor would find a lump sum of cash equal to V_T, to be received at time T, to be equally desirable as the stream of dividends D_{T+1}, D_{T+2}, D_{T+3}, and so on. Now given that the investor is at time

zero, not at time T, the present value at $t = 0$ of the lump sum V_T must be determined. This is done simply by discounting it for T periods at the rate k, resulting in the following formula for finding the present value at time zero for all dividends after T, denoted V_{T+}:

$$V_{T+} = V_T\left[\frac{1}{(1 + k)^T}\right] \tag{18.26}$$

$$= \frac{D_{T+1}}{(k - g)(1 + k)^T}.$$

Having found the present value of all dividends up to and including time T with Equation (18.24), and the present value of all dividends after time T with Equation (18.26), the value of the stock can be determined by summing up these two amounts:

$$V = V_{T-} + V_{T+}$$

$$= \sum_{t=1}^{T} \frac{D_t}{(1 + k)^t} + \frac{D_{T+1}}{(k - g)(1 + k)^T}. \tag{18.27}$$

Figure 18.1 illustrates the valuation procedure for the multiple-growth DDM that is given in Equation (18.27).

Example

As an example of how this DDM can be used, assume that during the past year the Magnesium Company paid dividends amounting to \$.75 per share. Over the next year, Magnesium is expected to pay dividends of \$2 per share. Then $g_1 = (D_1 - D_0)/D_0 = (\$2 - \$.75)/\$.75 = 167\%$. The year after that, dividends are expected to amount to \$3 per share, indicating that $g_2 = (D_2 - D_1)/D_1 = (\$3 - \$2)/\$2 = 50\%$. At this time, the forecast is that dividends will grow by 10% per year indefinitely, indicating that $T = 2$ and $g = 10\%$. Consequently, $D_{T+1} = D_3 = \$3(1 + .10) = \$3.30$. Given a required rate of return on Magnesium shares of 15%, the values of V_{T-} and V_{T+} can be calculated as follows:

$$V_{T-} = \frac{\$2}{(1 + .15)^1} + \frac{\$3}{(1 + .15)^2}$$

$$= \$4.01$$

$$V_{T+} = \frac{\$3.30}{(.15 - .10)(1 + .15)^2}$$

$$= \$49.91.$$

Using V_{T-} and V_{T+} results in a value for V of \$4.01 + \$49.91 = \$53.92. With current stock price of \$55 per share, Magnesium appears to be fairly priced. Thus, Magnesium is not significantly mispriced because V and P are nearly of equal size.

18.4.2 Internal Rate of Return

The zero-growth and constant-growth models have equations for V that [illegible] reformulated in order to solve for the IRR on an investment in a stock. U[illegible] nately, a convenient expression similar to Equations (18.15a), (18.15b), (1[illegible] and (18.23b) is not available for the multiple-growth model. This can be s[illegible] noting that the expression for IRR is derived by substituting P for V, and k^* [illegible] in Equation (18.27):

$$P = \sum_{t=1}^{T} \frac{D_t}{(1 + k^*)^t} + \frac{D_{T+1}}{(k^* - g)(1 + k^*)^T}. \qquad (18.[illegible])$$

This equation cannot be rewritten with k^* isolated on the left-hand side, mean[illegible] ing that a closed-form expression for IRR does not exist for the multiple-growth model.

However, all is not lost. It is still possible to calculate the IRR for an invest[illegible] ment in a stock conforming to the multiple-growth model by using an "educat[illegible] ed" trial-and-error method. The basis for this method is in the observation that the right-hand side of Equation (18.28) is simply equal to the present value of the dividend stream, where k^* is used as the discount rate. Hence the larger the value of k^*, the smaller the value of the right-hand side of Equation (18.28). The trial-and-error method proceeds by initially using an estimate for k^*. If the resulting value on the right-hand side of Equation (18.28) is larger than P, then a larger estimate of k^* is tried. Conversely, if the resulting value is smaller than P, then a smaller estimate of k^* is tried. Continuing this search process, the investor can hone in on the value of k^* that makes the right-hand side equal P on the left-hand side. Fortunately, it is a relatively simple matter to program a computer to conduct the search for k^* in Equation (18.28). Most spreadsheets include a function that does so automatically.

Example

Applying Equation (18.28) to the Magnesium Company results in:

$$\$55 = \frac{\$2}{(1 + k^*)^1} + \frac{\$3}{(1 + k^*)^2} + \frac{\$3.30}{(k^* - .10)(1 + k^*)^2}. \qquad (18.29)$$

Initially a rate of 14% is used in attempting to solve this equation for k^*. Inserting 14% for k^* in the right-hand side of Equation (18.29) results in a value of \$67.54. Earlier 15% was used in determining V and resulted in a value of \$53.92. This means that k^* must have a value between 14% and 15%, since \$55 is between \$67.54 and \$53.92. If 14.5% is tried next, the resulting value is \$59.97, suggesting that a higher rate should be tried. If 14.8% and 14.9% are subsequently tried, the respective resulting values are \$56.18 and \$55.03. As \$55.03 is the closest to P, the IRR associated with an investment in Magnesium is 14.9%. Given a required return of 15% and an IRR of approximately that amount, the stock of Magnesium appears to be fairly priced.