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Bernstein Journal

PERSPECTIVES ON INVESTING AND WEALTH MANAGEMENT

AB
Bernstein
Global Wealth Management

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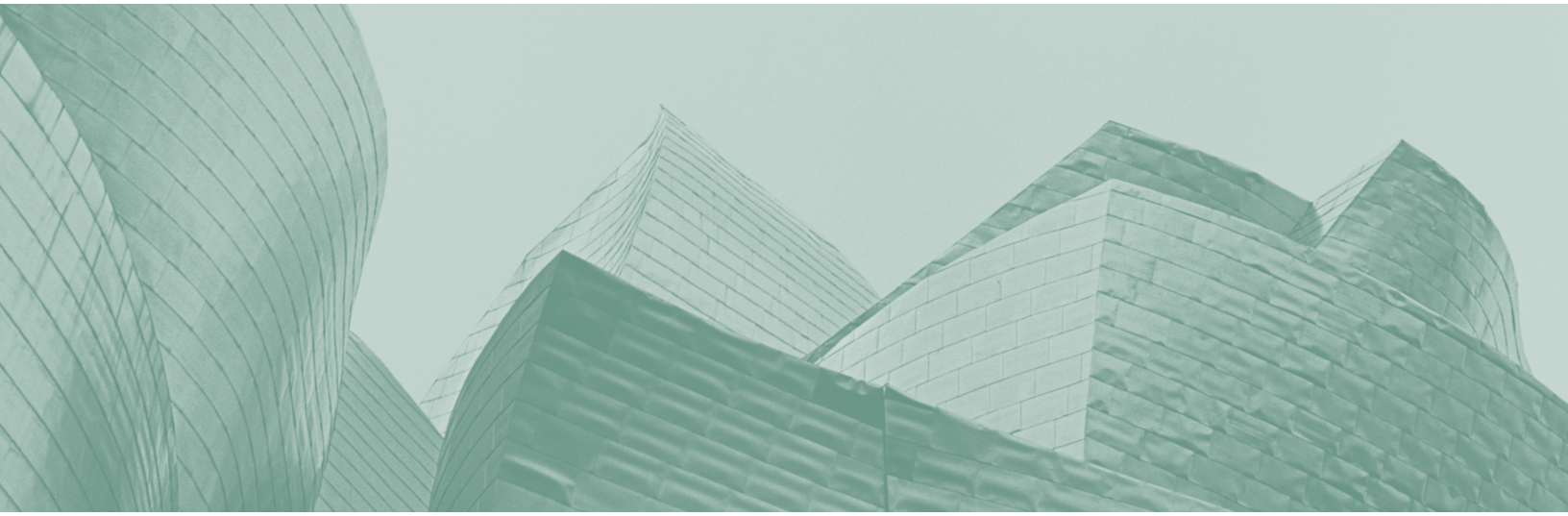


Research in Depth—and Breadth

IN THE *BERNSTEIN JOURNAL*, WE present our Firm's latest research aimed at helping us improve the investment outcomes for our clients. This issue is no different, yet the range of topics addressed may raise a few eyebrows.

Why would we be studying the physical environment, probing the efforts now getting under way to contend with global climate change? Or the laboratories of companies attempting to refine gene sequencing for health-care purposes? Because developments in both arenas have the potential to create significant investment opportunities down the road, and we want to ensure we are poised to capitalize on them.

Admittedly, our research into these areas represents developments that are distinctly longer-term in character. More immediately, this issue of the *Bernstein Journal* also highlights research we are using today in our planning discussions with clients and in their portfolios.

We present our findings on how to transfer wealth across multiple generations in the most tax-efficient way possible, using sophisticated quantitative modeling tools. We explore how we approach generating incremental return from an important, though often overlooked, source: currency management.

Far from the foreign exchange markets, but perhaps of no less relevance to investors, is our analysis of real estate. Does commercial property, whose yields stand at historical lows, still warrant a meaningful portfolio allocation? More broadly, what strategies can be employed to create appropriate exposure to real estate?

We hope you find this issue of the *Bernstein Journal* informative and thought provoking.

Managing Multigenerational Wealth

by Daniel J. Loewy, Director of Research—Wealth Management Group
and Francis W. Dubreuil, National Managing Director—Wealth Management Group

Often, families with substantial wealth require investment and wealth transfer strategies that span several generations. Advanced quantitative modeling tools can help identify the mix of strategies likely to strike the right balance between the financial and emotional objectives of all involved.

The Anxiety of Affluence

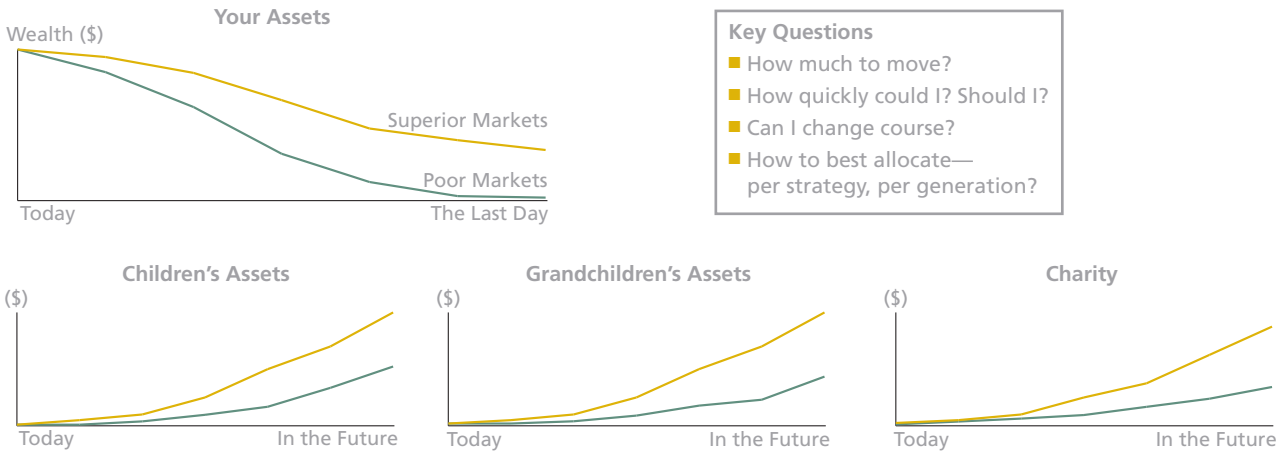
THERE'S AN OLD SAYING: "SMALL CHILDREN, small problems; big children, big problems." A variant of that can be applied to the notion of family wealth, though it isn't problems that multiply with net worth so much as planning complications—and opportunities. For example, as the wealth of a family grows, typically so do the number of:

- Investment opportunities at their disposal;
- Beneficiaries they're looking to satisfy;
- Estate planning strategies they should consider to minimize wealth transfer taxes;
- Professional advisors they'd benefit from consulting with; and last but not least…
- …Emotional issues that arise for donors and family members alike.

It's a litany of items, but most can be managed through a framework that boils down the complexity to a few simple questions (*Display 1*). First, how do you effectively reduce the taxable estate of the grantor and simultaneously build the wealth of the desired beneficiaries? Then, at a finer level of detail, *how much* should be kept and how much transferred to different generations or charity; *how quickly* could (or should) the transfer happen; and *how much flexibility*

Display 1

Multigenerational planning in a nutshell



Source: AllianceBernstein

Bernstein does not provide tax, legal, or accounting advice. In considering this material, you should discuss your individual circumstances with professionals in those areas before making any decisions.

should the donor retain to change course or halt the transfer altogether? And separate from the question of wealth transfer itself, how should the funds be *allocated* across the various strategies and generations of family members, each with his or her own risk tolerance and time horizon? These are all personal questions requiring highly customized solutions that address the specifics of how each individual's wealth will unfold. The real challenge for most families and their professional advisory teams is quantifying the costs and benefits associated with each of these variables in order to determine which route has the greatest chance of achieving a donor's objectives. Fortunately, we can help them navigate this terrain.

At Bernstein, we've developed an approach that can help each client identify a multigenerational asset allocation and wealth transfer plan that makes the most sense for him and his family. Key to this process is our recently enhanced Wealth Forecasting System, a model that can systematically "stress test" potential solutions and provide insights into the range of wealth outcomes for each family member, the trade-offs that a donor must make, and the overall tax savings that he can realize.[1] In this article, we'll highlight the enormous benefits that clients can capture by managing their wealth using such a multigenerational perspective. In fact, our research shows that with the help of just a few key strategies, families can build and preserve very large estates for their desired beneficiaries. Further, they can accomplish their goals without relinquishing substantial control and financial flexibility along the way.

Meet the Worths

Consider the example of a hypothetical family of 10 whom we'll call the Worths. The family is headed by successful entrepreneurs who recently sold their business and want help managing the proceeds.

Jim and Sue, both age 60, have $50 million in liquid assets. Over the years, they've been making annual exclusion gifts of interests in their closely held business to their children, their children's spouses, and trusts for their grandchildren. As a result, these younger generations already have small fortunes. The children, David and Bonnie, ages 30 and 35, respectively, have a total of $5 million in assets. Both are married and earning all they need to cover their current spending. Each of the four grandchildren (all under age 6) is a beneficiary of a separate trust. The total value of the four trusts' assets is about $1 million.

Jim and Sue's goals for their wealth are straightforward:

- To fund their lifestyle spending needs of $500,000 per year (grown with inflation).
- To hold at least $3 million in reserve for emergencies, or in case a new business or philanthropic opportunity arises.
- To preserve the lion's share of their good fortune for their children.
- To provide a legacy for their grandchildren, and perhaps more distant generations as well.
- To accomplish all of this with the least amount of tax possible.

So how can we best address the Worths' objectives across all the generations?

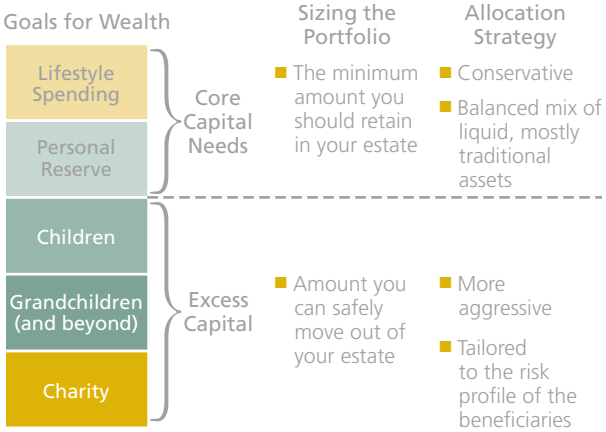
Defining and Segmenting the Wealth

The Worths can begin to craft a plan to address their goals and concerns by following a simple process that integrates their wealth transfer goals with a corresponding allocation strategy (*Display 2*). The starting point is always to care for their own needs first (the first generation, or G1) by setting aside enough

[1] Our Wealth Forecasting System (WFS) projects a range of future market returns and inflation rates in order to assess the impact of various spending rates and asset allocations on likely wealth outcomes. The Multigenerational WFS does the same across the generations, accounting for all transfer taxes and the plethora of planning vehicles currently available.

Display 2

Sizing, segmenting, and allocating the wealth



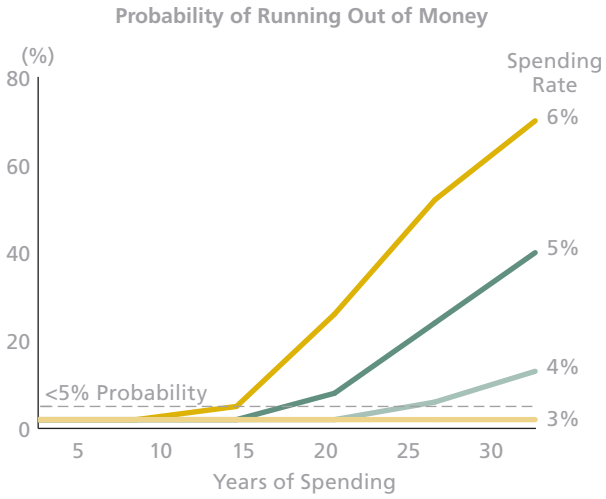
funds to meet their personal spending requirements for as long as they may live. Those assets represent the Worths' "core capital needs"—the minimum amount of wealth that they should retain in their estate. And because these funds are needed for the Worths' financial security, they should be invested in a conservative, balanced asset allocation.

Funds that are above and beyond the Worths' core capital are "excess capital." Once that amount is identified, it should be managed as if it belonged to the younger generations it is intended for (the second generation, or G2, and beyond). As a result, excess capital should be allocated more aggressively and the Worths should consider moving these funds out of their estate over time in order to ensure a tax-efficient wealth transfer.

Sizing the amount needed for the Worths' core capital boils down to determining their "safe" spending rate, given their expected time horizon and the uncertainties of the markets. Our research shows that an investor who spends 3% of his initial portfolio value (and then grows that dollar amount with inflation) can safely maintain his spending for more than three decades. Raise the initial spending rate to 4%, and the odds of running out remain very low for about 25 years. However, a spending rate in the 5–6% range is clearly dangerous for any investor with a long time horizon (*Display 3, left*).

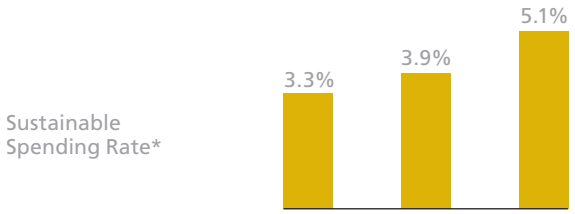
Display 3

Determining a safe spending rate…



…and the size of a core portfolio

Setting Core Capital Requirements



Spending Needs	$500K	$500K	$500K
÷ Spending Rate	3.3%	3.9%	5.1%
= Capital for Spending	$15.4 Mil.	$12.8 Mil.	$9.8 Mil.
+ Reserve/Cushion	$3.0	$3.0	$3.0
= G1's Core Capital Needs	$18.4 Mil.	$15.8 Mil.	$12.8 Mil.

*Spending is grown with inflation; spending rates that could be sustained at the 95% level of confidence

Based on Bernstein estimates of the range of returns for the applicable capital markets over the duration of the analysis. Data do not represent past performance and are not a promise of actual future results or a range of results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: Society of Actuaries RP-2000 mortality tables and AllianceBernstein

Since Jim and Sue are only 60 years old, we peg their safe spending rate at a conservative 3.3%. With that budget, they should be able to maintain their lifestyle and face only a very small chance (less than 5%) that they'll ever need to cut back. This assumes a globally diversified asset allocation comprising 60% in stocks and 40% in municipal bonds—our recommendation for the Worths' core capital.[2] To translate that spending rate into the amount of money the Worths need to retain, we divide their $500,000 annual budget by 3.3%. We then add their $3 million emergency fund and arrive at a total of $18.4 million (*Display 3, right, preceding page*).

As the Worths age, their safe spending rate should increase. That is, with fewer years ahead of them their core capital needs will decline, and as a result they'll be able to draw down a larger percentage of their portfolio. For example, at age 80, Jim and Sue need only $12.8 million on an inflation-adjusted basis.

Today, with $50 million in net worth and only $18.4 million of core capital needs, the Worths have substantial excess funds—almost $32 million. And that fact brings us to the next step in the process: managing the excess capital for the younger generations through an appropriate asset allocation strategy.

Finding a Mix That Fits

While the Worths' core capital is allocated 60/40, the right mix of stocks and bonds for the excess capital will depend on a number of factors, including the purpose of the funds and the timing and availability of external income to the various beneficiaries.

For example, since the needs of the children will arise sooner than those of the grandchildren, the excess wealth reserved for their purposes (say the Worths peg that at $27 million of their $32 million in excess capital) might be invested in an 80/20 stock/bond mix, while the remaining excess reserved for the grandchildren and younger generations ($5 million) might be invested 100% in stocks. If the Worths were to allocate in this "multigenerational" fashion (whereby the total asset allocation, combining the Worths' core capital and the excess capital, comes to about 75% stocks and 25% bonds), we'd expect their total family wealth to grow, in the median case, by an additional $8 million in inflation-adjusted dollars (*Display 4, top*). Plus, they'd benefit from a substantial upside if markets turn out great, with total family wealth increasing to almost $250 million over 30 years, versus a high of $204 million for the more conservative, single-generation allocation.[3]

However, the downside of this significant increase in total family wealth is the specter of an even larger estate-tax bill (*Display 4, bottom*). About $50 million of Jim and Sue's projected estate of $115 million will go to the federal government (assuming a 45% estate-tax rate and $4 million of combined estate-tax exemptions), unless they do systematic wealth transfer planning. So once the Worths decide to put in place a multigenerational allocation geared to building their total wealth, the next step in our approach is actually to reduce the part of it that remains in their estate.

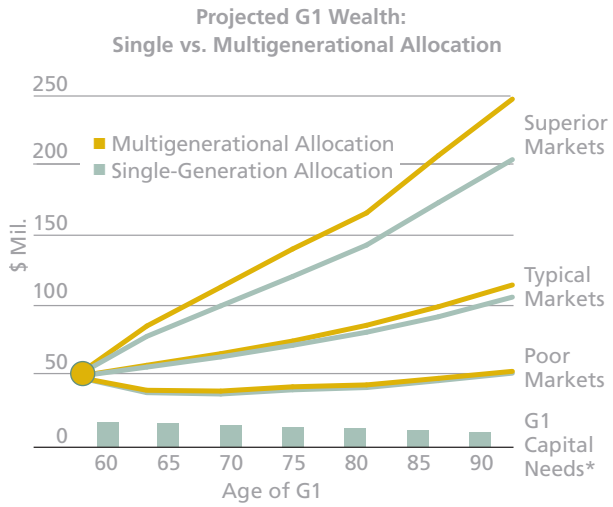
How Much to Transfer, and How Fast—A Spectrum of Strategies

While many wealth transfer strategies are available to the Worths, none allows them to move such a large amount of wealth in a tax-efficient manner all at once. But working closely with their tax and legal advisors, we can evaluate the impact of several potential plans, ranging from the conservative to the aggressive. Our goal is to help them get a clear

[2] If the Worths wanted a less volatile portfolio, we estimate they could sustain approximately the same spending rate with a 40% stock/60% bond portfolio. This allocation, however, would provide less growth potential for the family.
[3] "Superior markets" represent results at the 10% level of confidence in our Wealth Forecasting model; "poor markets" at the 90% level of confidence.

Display 4

Multigenerational allocation enhances wealth creation…

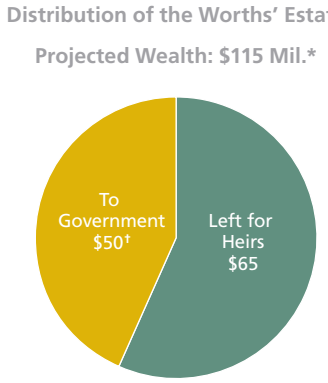


*Grown with inflation; amount needed to meet core needs and maintain a rainy-day fund at 95% level of confidence

Based on Bernstein estimates of the range of returns for the applicable capital markets over the duration of the analysis. "Superior markets" represent results at the 10% level of confidence in our Wealth Forecasting model, "poor markets" at the 90% level of confidence. Data do not represent past performance and are not a promise of actual future results or a range of results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: Society of Actuaries RP-2000 mortality tables and AllianceBernstein

…Making wealth preservation even more critical



*After spending, taxes, and inflation in typical markets; mortality-adjusted. Throughout this presentation, "typical markets" represent results at the 50% level of confidence.

†Estate tax is assumed to be levied at a 45% rate, with a $4 million combined exemption for a married couple (grown with inflation).

Based on Bernstein estimates of the range of returns for the applicable capital markets over the periods analyzed. Data do not represent any past performance and are not a promise of actual future results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: Society of Actuaries RP-2000 mortality tables and AllianceBernstein

sense of the amount they can transfer, how fast they can accomplish it, the savings the family would realize, and the amount of wealth that would accumulate for each generation.

Beginning with the Basics

Any of the plans would begin with the basic giving strategies that allow a donor to transfer wealth free of gift tax. These include:

- **Annual exclusion gifts:** Each donor can give $12,000 per donee per year to as many beneficiaries as desired. This way the Worths can move a total of $96,000 per year to the children and their spouses, and another $96,000 per year to the grandchildren.

- **A $1 million lifetime gift tax exclusion:** Each donor is allowed to gift up to $1 million during his lifetime, in addition to the annual exclusion gifts. Using this approach, Jim and Sue combined can gift an additional $2 million. These funds could be gifted into a trust for the children, or alternatively, given the Worths' multigenerational intent, used to create a generation skipping trust that could benefit third and younger generation family members.[4] By allocating a portion of their generation skipping transfer (GST) tax exemption to the gifts, the funds will grow in trust and can be distributed to beneficiaries without being subject to estate or GST tax.

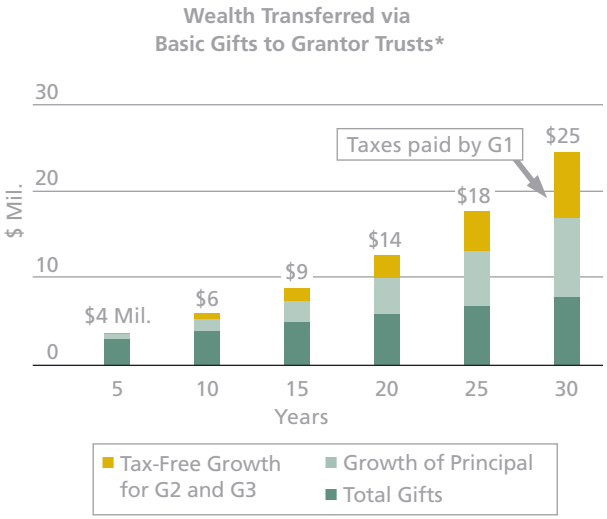
- **Grantor trusts:** We'd also emphasize the importance of further enhancing the annual exclusion and lifetime exemption gifts by placing them in "grantor trusts." The benefit of gifting the funds into a grantor trust is that such a trust may be *excluded* from the donor's estate for estate-tax purposes, but its income is *included* in the donor's income for income tax purposes. This allows the Worths to remove more money from their estates and increase the value of their gifts.

[4] A generation skipping trust can, and most often does, also include G2 beneficiaries eligible to receive discretionary distributions by the trustee.

Altogether, we estimate that in typical markets the combination of the gifts (the principal), the appreciation on the gifts (the growth of the principal), and the grantor trust benefit (whereby the donor pays the tax on the growth of principal) will enable the Worths to transfer $25 million, after inflation, over the next 30 years (*Display 5*).

Display 5

The basic strategies can be enhanced by grantor trusts



*In typical markets, after taxes and inflation

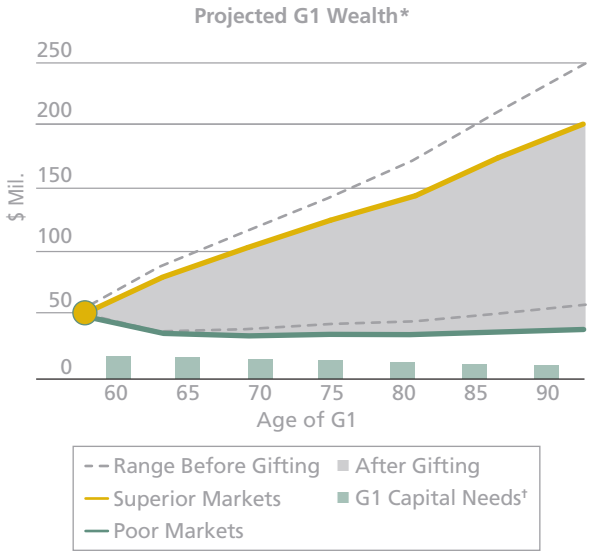
Based on Bernstein estimates of the range of returns for the applicable capital markets over the duration of the analysis. Data do not represent any past performance and are not a promise of actual future results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: AllianceBernstein

Now, $25 million sounds like a lot of money, and it is. But remember: We project that the Worths will have an estate of more than $115 million in typical markets after 30 years, far more than their core needs require. So while Jim and Sue would surely want to take maximum advantage of the basic gifts, they'll have to do more if they want to avoid saddling their children with an outsized estate-tax bill (*Display 6*).

Display 6

Basic strategies and grantor trusts reduce the estate—but not enough



*After spending, taxes, and inflation

†Grown with inflation; amount needed to meet core needs and maintain a rainy-day fund at 95% level of confidence

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Source: Society of Actuaries RP-2000 mortality tables and AllianceBernstein

Increasing the Size and Speed of Transfer

Here's where using a more specialized vehicle, a grantor-retained annuity trust—or GRAT—can be so effective, as it allows a donor to significantly increase the amount—and the pace—of wealth transfer. With a GRAT, a donor makes an irrevocable contribution to a trust, but retains the right to receive an annuity payment each year during the trust's term. The present value of the annuity payments is determined based on prevailing interest rates.[5] If that value is equal to the value of the property contributed to the GRAT, the donor will not have made any gift, according to IRS rules. However, if the GRAT assets produce a total return during the GRAT term in excess of the predetermined rate, the excess return can be moved free of gift tax to the beneficiaries specified in the GRAT.

[5] The rate is determined under Section 7520 of the Internal Revenue Code and is based on what is known as the "7520 rate," which is an interest rate published monthly by the IRS.

In the case of a single GRAT, there's no guarantee this will happen. But our research shows that the odds of success are extremely high if a grantor establishes a continuous series of short-term rolling GRATs, with the annuity from each one funding the next. The reason short-term GRATs are so powerful is because money can be transferred even if only one or two of the trusts beat the hurdle. A long-term trust has but a single chance at success: Either it beats the hurdle rate over its full term and can pass on a remainder, or it undershoots the goal and has no funds left to transfer.

How Low Can You Go?

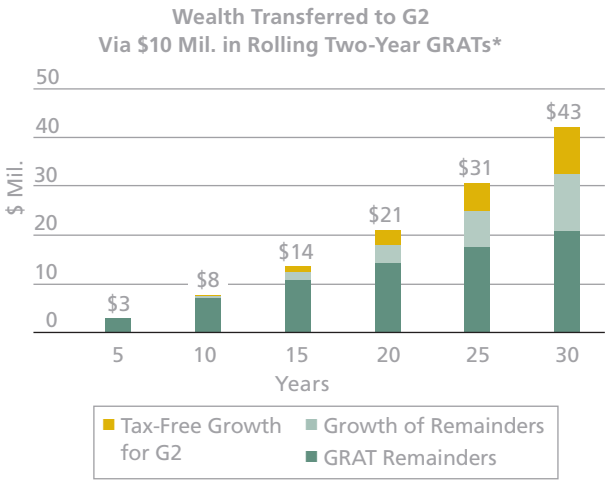
In the Worths' case, if Jim and Sue establish a series of rolling GRATs and the remaining assets in any successful GRAT pass to grantor trusts for the children, the Worths will create a simple but powerful wealth transfer tool. Let's assume that the Worths commit $10 million to the GRAT strategy, that successful GRAT assets are passed on to the grantor trusts for the children, and that the donor continues to pay the tax on the trusts' earnings. We estimate a transfer to the children in typical markets of $21 million after 20 years and $43 million after 30 years—and that's above and beyond the $25 million transferred via the basic strategies (*Display 7*).[6]

A Strategy both Scalable and Flexible

With $10 million in GRATs, the Worths can begin to significantly shrink the enormous gap remaining between their resources and their needs. But more remains to be done, and here's where the scalability of GRATs—the ability to simply increase or decrease the amounts contributed, as well as the speed of transfer—makes them such a compelling wealth transfer solution. Simply put, the amount that could be used to fund the strategy is unlimited, so the results can be scaled upward or downward depending on the wealth transfer goal. So if a $10 million contribution is expected to pass about $21 million in 20 years (2.1x the original amount), a $20 million GRAT should pass about $42 million over the same period.

Display 7

GRATs can complement the basic strategies, hiking legacy potential



*Typical markets, after taxes and inflation

Based on Bernstein estimates of the range of returns for the applicable capital markets over the duration of the analysis. Data do not represent any past performance and are not a promise of actual future results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: AllianceBernstein

With a $20 million contribution to rolling GRATs, we project that Jim and Sue will come much closer to reducing their estates to their "core capital" needs after 25 or 30 years (*Display 8, left, following page*). But what if time were an issue and 25 years seemed too long a stretch, exposing the family's wealth to potentially significant estate taxes? For larger and faster wealth transfer, the Worths might want to commit $40 million to GRATs and be virtually assured of reducing their estates to the level of their core needs within just 15 to 20 years (*Display 8, right, following page*).

[6] The GRATs won't be used for gifts to the grandchildren, because technical tax rules make it difficult to avoid an onerous GST tax.

Display 8

The bigger the investment in GRATs, the larger the estate reduction…

…and the faster it comes

*After spending, taxes, and inflation

†Grown with inflation; amount needed to meet core needs and maintain a rainy-day fund at 95% level of confidence

Based on Bernstein estimates of the range of returns for the applicable capital markets over the duration of the analysis. "Superior markets" represent results at the 10% level of confidence in our Wealth Forecasting model, "poor markets" at the 90% level of confidence. Data do not represent past performance and are not a promise of actual future results or a range of results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: Society of Actuaries RP-2000 mortality tables and AllianceBernstein

Here's where the flexibility of rolling GRATs as a wealth transfer strategy becomes important. That is, Jim and Sue can choose to cut back or stop the GRAT contributions at virtually any point they wish. They might choose to do this when they reach the magic core-needs number, or it may be earlier, for instance, if they begin to feel wary about handing over so much money to their children, or if they just decide they'd like to spend more, or give to charity. For the Worths, $40 million in GRATs seemed too aggressive an approach since they were still quite young. But if time *were* an issue—as it might be for older donors who delay their wealth transfer planning—this might be an interesting option.

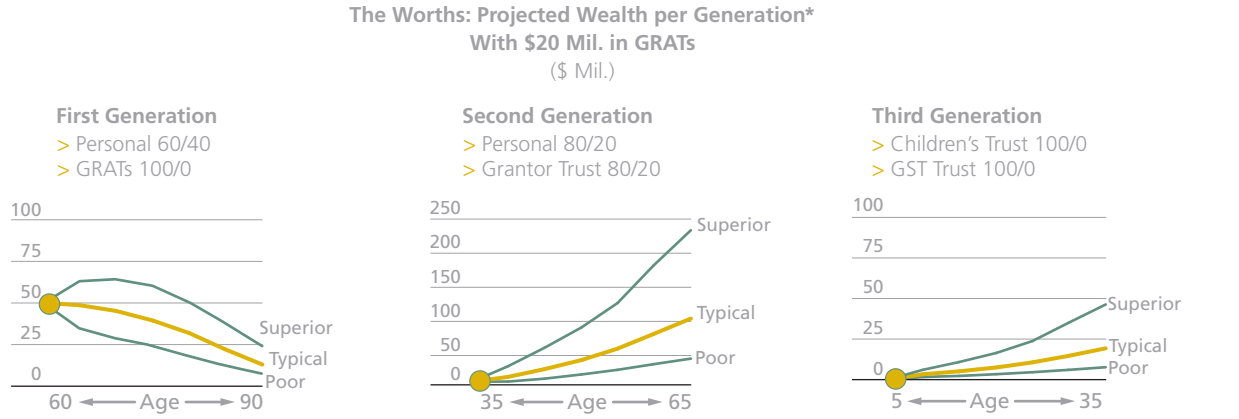
Summing Up Multigenerational Wealth

So let's assume that the Worths were intrigued by the strategy that included the basic gifts and the $20 million in GRATs. How could they assess the impact of the full plan on themselves, their children, and their grandchildren? *Display 9* sums up the implications of the Worths' chosen strategy for each of the generations. For Jim and Sue, their wealth declines progressively, dropping in line with the level of their core needs as they age. For the children, who continue to own their personal accounts and who benefit from the grantor trusts that house the basic gifts and the GRAT remainders, the wealth builds. In typical markets, we expect each of the two children to benefit from some $50 million of assets by the time they retire, assuming the funds are invested with an appropriately aggressive allocation. Meanwhile, the grandchildren benefit from the basic gifts in grantor trusts that take advantage of a portion of the Worths' GST exemptions, in addition to annual exclusion gifts. They should also have quite a healthy nest egg.

The Worths will want to study closely the size of this projected inheritance and make sure it's in line with their intent. For example,

Display 9

Meeting the goals for each generation



*After spending, taxes, and inflation

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Source: AllianceBernstein

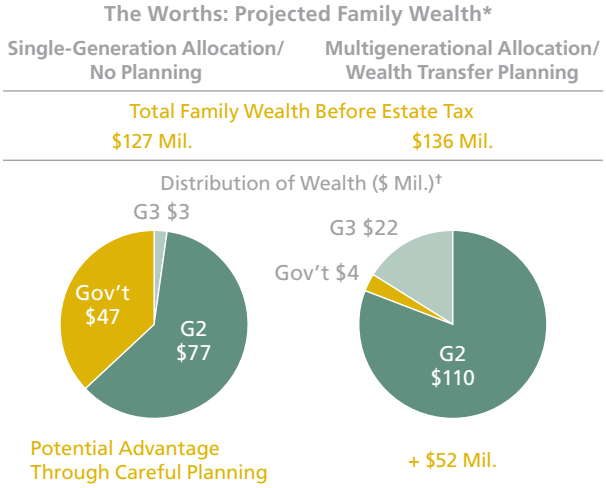
would it be enough for the children and the grandchildren? Would it put too much in the children's hands too soon? Would it leave room for potential philanthropic goals? And of course, all of this would be helpful to know ahead of time, as the Worths begin to think about all of their legacy goals, and certainly well before they finalize their planning.

And so, through a surprisingly straightforward plan with relatively few moving parts, Jim and Sue should be able to meet their goals for efficiently transferring wealth to their descendants while maintaining their lifestyle. To underscore what that means in dollars, consider one more set of numbers: the projected Worth-family wealth if they had done no planning versus the strategy they chose—enhancing the basic strategies with grantor trusts and a commitment of $20 million to GRATs (*Display 10*).

Originally we estimated that in typical markets and on a mortality-adjusted basis, the total family wealth before estate taxes—everything owned by Jim and Sue, their children, and the trusts for their children and grandchildren—would be about $127 million in inflation-adjusted dollars. Well, simply by employing a multigenerational approach to

Display 10

Effective planning can create outsized value



*In typical markets, after inflation; mortality-adjusted

†Estate tax is assumed to be levied at a 45% rate, with a $4 million combined exemption for a married couple (grown with inflation).

Based on Bernstein estimates of the range of returns for the applicable capital markets over the duration of the analysis. Data do not represent past performance and are not a promise of actual future results or a range of results. See Notes on Wealth Forecasting Analysis on page 13 for further details.

Source: Society of Actuaries RP-2000 mortality tables and AllianceBernstein

their asset allocation—fitting the mix of assets to the risk tolerance and time horizon of the beneficiaries—we've added about $9 million to the family's total wealth, for a total of $136 million.

But that benefit pales compared with the estate-tax savings the Worths will enjoy from a multigenerational wealth transfer plan. Assuming a 45% estate-tax rate and $4 million in combined estate-tax exemptions, we project that Jim and Sue will move nearly all the excess wealth out of their hands with $20 million in GRATs (along with grantor trusts). As a result, a $47 million estate-tax bill is trimmed to about $4 million—adding more than $50 million in real wealth to the Worth fortune. And the beauty of the strategy is that it can work for a client with wealth of any size; the contributions just need to be scaled up or down appropriately.

It's About More than Gifting

The Worths' wealth transfer plan is elegant in its simplicity and likely effectiveness. Moreover, they'll be able to accomplish their goals on a timetable that could change at essentially any point should their wishes or their circumstances change.

But while our example of the Worth family focused on intra-family gifting, multigenerational wealth transfer can encompass a broad range of issues: philanthropy, for example, or liquidity events and single-stock portfolios. All of these can ultimately affect not only the donor generation, but also the children and grandchildren, and raise questions about tax and estate planning best handled by a full team of professionals.

Finally, we note that research studies can never capture the complexity of real life, which is messy and often riddled with conflicts. However, the job of professional counselors is to offer planning tools robust enough to translate complex details into a clear, client-specific solution. ■

Notes on Wealth Forecasting Analysis

The Bernstein Wealth Forecasting Analysis℠ (WFA) is designed to assist investors in making a range of key decisions, including setting their long-term allocation of financial assets. The WFA consists of a four-step process: (1) Client Profile Input: the client's asset allocation, income, expenses, cash withdrawals, tax rate, risk-tolerance goals, and other factors; (2) Client Scenarios: in effect, questions the client would like our guidance on, which may touch on issues such as which vehicles are best for intergenerational and philanthropic giving, what his/her cash-flow stream is likely to be, whether his/her portfolio can beat inflation long term, when to retire, and how different asset allocations might impact his/her long-term security; (3) The Capital Markets Engine: our proprietary model that uses our research and historical data to create a vast range of market returns, taking into account the linkages within and among the capital markets (not Bernstein portfolios), as well as their unpredictability; and (4) A Probability Distribution of Outcomes: based on the assets invested pursuant to the stated asset allocation, 90% of the estimated returns and asset values the client could expect to experience, represented within a range established by the 5th and 95th percentiles of probability. However, outcomes outside this range are expected to occur 10% of the time; thus, the range does not establish the boundaries for all outcomes. Further, we often focus on the 10th, 50th, and 90th percentiles to represent the upside, median, and downside cases. Asset-class projections used in the article in this publication are derived from the following: US value stocks are represented by the S&P/Barra Value Index, with an assumed 50-year compounding rate of 8.0%, based on simulations from December 31, 2006, through December 31, 2007; US growth stocks by the S&P/Barra Growth Index (compounding rate of 7.9%); developed international stocks by the Morgan Stanley Capital International (MSCI) EAFE Index of major markets in Europe, Australasia, and the Far East, with countries weighted by market capitalization and currency positions unhedged (compounding rate of 7.7%); emerging markets stocks by the MSCI Emerging Markets Index (compounding rate of 6.4%); municipal bonds by diversified AA-rated securities with seven-year maturities (compounding rate of 4.4%); taxable bonds by diversified securities with seven-year maturities (compounding rate of 5.4%); and inflation by the Consumer Price Index (compounding rate of 2.4%). Expected market returns on bonds are derived taking into account yield and other criteria. An important assumption is that stocks will, over time, outperform long-term bonds by a reasonable amount, although this is by no means a certainty. Moreover, actual future results may not be consonant with Bernstein's estimates of the range of market returns, as these returns are subject to a variety of economic, market, and other variables. Accordingly, this analysis should not be construed as a promise of actual future results, the actual range of future results, or the actual probability that these results will be realized.

Mortality Assumptions: Mortality is modeled using our proprietary simulation model, which creates a range of death ages for a given age. The outcomes of the mortality simulation model are then combined with the outcomes of the Capital Markets Engine on a trial-by-trial basis to produce summarized mortality-adjusted results. Mortality simulations are based on the Society of Actuaries Retirement Plan Experience Committee Mortality Tables RP-2000.

Active Currency Management: The Unexploited Opportunity

by Giulio Martini, Chief Investment Officer—Currency Strategies

All over the world, investors are catching on to the benefits of global investing, yet few effectively exploit the opportunities related to currency exposure arising from cross-border portfolios. In most cases, currency exposure is treated as a necessary evil, an additional source of risk for which there is no compensation. Many investors seem to have concluded that the best they can do is either to neutralize foreign currency exposure through hedging or do nothing.

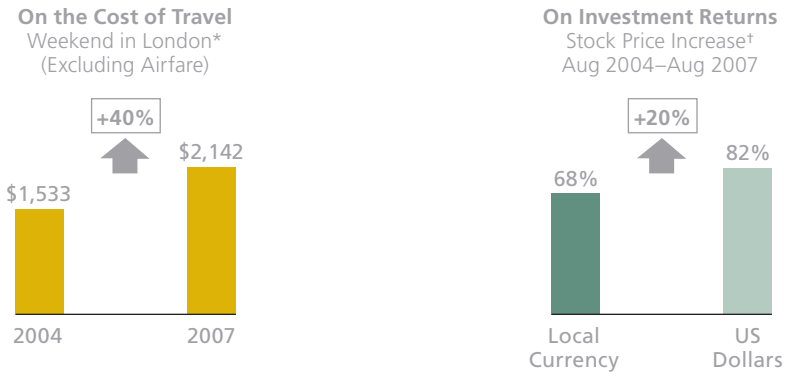
TODAY, A US CITIZEN WHO TAKES A QUICK jaunt to London must pack a great deal of fortitude to handle the jaw-dropping prices. Between 2004 and 2007, the price of a weekend trip has gone up 40% (*Display 1, left*). Memories of the good old days may be dredged up as menus are perused. Why has everything changed? Because the dollar has fallen versus the pound. Travelers feel the impact most immediately.

But in an increasingly global world, the effects of currency are unavoidable. Most US citizens view that as a negative, but the positive offset is that if you hold foreign assets in your investment portfolios, you receive a benefit from the weakening dollar: increased investment returns. Over the same 2004–2007 period, returns for US investors were 20% more than for non-US investors (*Display 1, right*).

Of course, seeing the positives and negatives from a US point of view is looking at it from just one side of the fun-house mirror—if you switch to the other side, things look very different. For investors in other base currencies investing in the US, the falling dollar has meant smaller investment returns. So the distortion depends on where you stand—it either helps you or hurts you.

Display 1

In a global economy, currency movements can have a huge impact



*Two nights at Claridge's Hotel London, dinner for two at Restaurant Gordon Ramsay, Royal Hospital Road, and theater tickets
†Represented by the Morgan Stanley Capital International (MSCI) Index of Europe, Australasia, and the Far East (EAFE)
Source: MSCI, TripAdvisor, World Press, and AllianceBernstein

But we believe currency exposure can be managed to deliver benefits to global portfolios. In fact, our research suggests that a reliable risk premium is embedded in the currency market and can be systematically exploited to add value. In addition, this risk premium is particularly attractive because it is almost entirely uncorrelated to the risk premiums of stocks and bonds. Active currency returns are therefore an effective complement to multiple investment strategies. We'll explore where currency returns come from, detail our approach to active currency management, and suggest how active currency management can be used to engineer solutions to a broad range of investment challenges—from boosting returns without adding significantly to risk to reducing risk without sacrificing returns.

Currency Returns: The Sum of Two Parts

In most people's minds, currency returns are defined by changes in exchange rates. Assuming no change in underlying asset values, if a foreign currency rises in value against the home country currency over a defined period, the returns from a foreign equity or bond investment will exceed those in the local market by the amount that the foreign currency appreciates. That's because the foreign currency will buy more of the domestic currency when it is translated back into the home currency. Conversely, if a foreign currency falls in value against the home currency over the investment period, returns from the foreign investment will be less than those realized in the local asset market.

But returns from investing in currency are not based solely on exchange-rate changes. When you invest in a currency, you sell one currency in order to buy another. In doing so, you give up the interest rate on the currency that you sold and receive the interest rate on the currency that you bought.

Since interest rates differ across countries, returns will depend on whether the interest-rate gap is positive or negative. Provided the exchange rate is constant, if foreign interest rates are higher than domestic rates, returns will exceed those in the domestic market by the amount of the interest-rate differential. But if foreign rates are lower than domestic rates, returns will fall short of those in the domestic market. Thus, currency returns comprise the sum of an interest-rate differential, which is known at the beginning of the investment period, and an exchange-rate change, which is inherently uncertain (*Display 2*).

Display 2

Currency returns have two elements

Currency Investing

> Borrow (go short) in one currency to lend (long) in the currency of another country. You pay the interest rate on what you borrow and earn the interest rate on what you lend.

Currency Return =

Interest-Rate Differential + Exchange-Rate Change

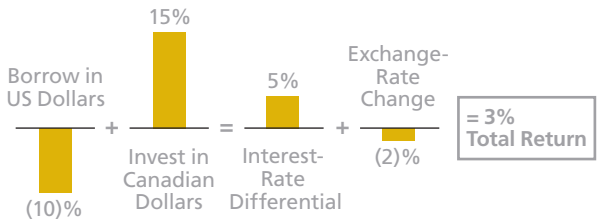
Efficient Market Theory Versus Market Reality

Returns on currency investments always reflect the interplay of exchange-rate movements and interest-rate differentials. In fact, one of the longest-standing theories of exchange-rate behavior—the theory of uncovered interest-rate parity—holds that in an efficient market, these two components of currency returns on average perfectly offset each other. According to this theory, the difference in the interest rates is compensation to investors for the expected change in exchange rates between the two currencies. Therefore, in theory, the expected return associated with a particular currency exposure should be zero, regardless of the interest-rate differential between the currencies.

For example, assume that the interest rate in the US is 10%, and the interest rate in Canada is 15%. According to uncovered interest-rate parity, the Canadian dollar is expected to depreciate against the US dollar by about 5%. Put another way, the higher Canadian interest rate compensates investors for what they expect to lose from a depreciation of the Canadian dollar versus the US dollar. However, if the Canadian dollar depreciated by less than 5% (or appreciated in value), there would be an opportunity to make a profit from borrowing in US dollars and simultaneously lending in Canadian dollars (*Display 3*).

Display 3

How the "carry trade" works



Source: AllianceBernstein

In reality, this is exactly what happens. Actual currency moves do not tend to fully offset the premium that investors earn by borrowing in low-interest-rate currencies to lend in high-interest-rate ones; in our example, the exchange rate depreciated by just 2%, providing a 3% return. This phenomenon, known as the forward premium puzzle, leads to the existence of profitable return opportunities that are widely exploited in the global financial markets. Thus, on Wall Street, in London, and in other financial centers around the globe, there are armies of investors, from the largest hedge funds to the smallest retail speculators, profiting from borrowing in low-yielding currencies and lending in high-yielding ones—so-called carry trades.

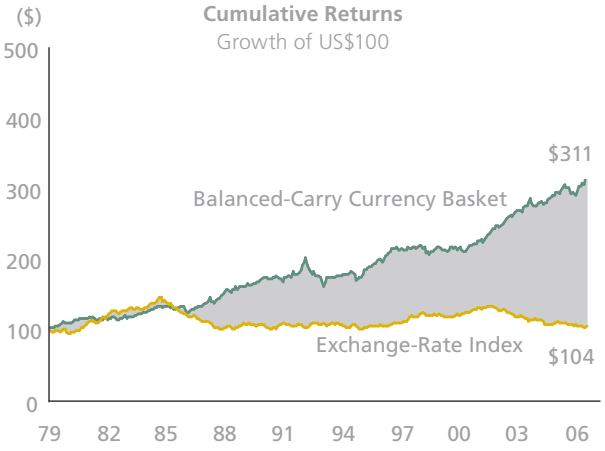
Why Do Carry-Trade Returns Persist?

The reason that currency investors are able to exploit interest-rate differentials is a subject of debate. Some experts argue that carry-based investment returns are a market anomaly. This contradicts the efficient market hypothesis, which holds that, at any given time, security prices fully reflect all available information. If it is an anomaly, however, it seems likely that the very existence of such a widely known irregularity would lead to more and more investors trying to exploit it to earn superior returns. Over time, one would expect the wall of money flowing into carry strategies to erode the return premium that they have historically commanded, in the same way that once-profitable convertible bond arbitrage trades have diminished now that so many investors have become wise to the strategy.

But that hasn't happened. *Display 4* shows returns to a portfolio that dynamically purchases the three highest-yielding global currencies and short-sells the three lowest-yielding

Display 4

Returns from a balanced-carry basket are positive



From July 1979 through December 2006

The balanced-carry strategy represents a portfolio that takes long positions in currencies with the top three positive interest-rate differentials and short positions in currencies with the bottom three negative interest-rate differentials, with net currency exposure kept at zero; the portfolio is rebalanced monthly, and volatility scaled to 5%. This is not intended to represent the performance of any AllianceBernstein managed portfolio.

Source: Bloomberg L.P., Datastream, JPMorgan Chase, and AllianceBernstein

(balanced-carry currency basket) versus the exchange-rate index. These returns vary over time, as would be true for equities and fixed income returns as well. However, there is no evidence to suggest that the return premium is being systematically eroded over time—i.e., no long-term downward trend in returns is evident—as we would expect to see if such a simple and well-known phenomenon was an anomaly that could be easily arbitraged away.

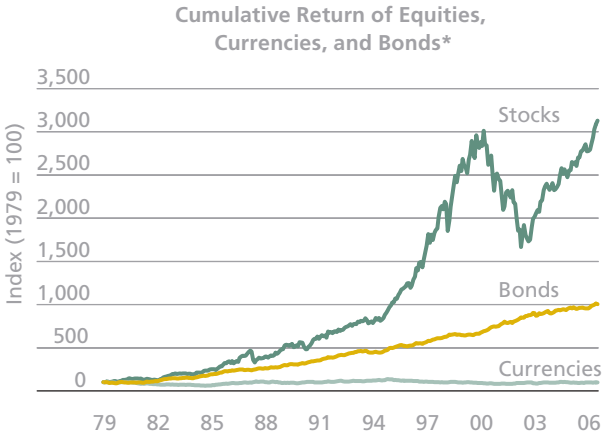
Why, then, do returns from carry trades persist? In our view, the most plausible explanation for this phenomenon is that embedded in the interest-rate differentials is extra compensation for investors who tolerate the extra risk of investing in a particular country. That risk premium varies over time and rewards investors for taking exposure to a country's inflation or cyclical economic risks or other risks more directly related to exchange rates, such as current account imbalances and misvaluations relative to purchasing power parity. Given the long lags between changes in interest rates and their impact on a country's real economy, the effectiveness and timing of the use of the interest-rate weapon is highly uncertain. But as with equity or bond risk premiums, the risk premium embedded in the currencies of countries is one that investors can exploit.

Extracting the Risk Premium from the Currency Market

Equity or fixed income managers extract their market risk premiums simply by being fully invested in stocks or bonds at all times. However, currency managers cannot invest in the same way because passive exposure to all currencies at all times tends to result in long-term returns close to zero. *Display 5* compares the returns from passive investment in baskets of stocks, bonds, and currencies.

Display 5

Returns from passive currency exposure are flat



Through December 31, 2006

*Stocks are represented by the S&P 500, bonds by the Lehman Brothers US Aggregate Index, and currencies by a basket that corresponds to the MSCI World ex-US.

Source: Datastream, International Monetary Fund, Lehman Brothers, MSCI, and AllianceBernstein

Unlike the clear upward trend for bonds and stocks, the profile for a passive basket of developed country currency returns is essentially flat, reflecting the fact that currencies tend to move in long cyclical swings with little overall direction. In practice, over time interest-rate differentials between economies with similar economic structures are small and are partially offset by exchange-rate changes.

The key word here, though, is *passive*. To build stock, bond, or even pure currency portfolios that capitalize on opportunities in currency returns based on interest-rate differentials and the factors known to predict exchange-rate changes, investors have to adopt an active approach to currency investing. Unlike the risk premium for a bond or stock, which is embedded in the price of the bond or stock, the currency risk premium is embedded in the relationship between different currencies. That relationship is dynamic, and, as such, currency positions need regular rebalancing to capture the risk premium.

Adding Value with Currency Management

Investors can earn additional return from currency in a number of ways. Value can be added by adopting simple carry-based strategies that capture a portion of the currency return available: For instance, an approach that invests in the euro versus the US dollar whenever interest rates in the Eurozone are above those in the US and sells short the euro versus the US dollar whenever they are lower results in consistently positive risk-adjusted returns. The same calculation is true for all the major and sub-major currencies. And while the risk-adjusted returns differ, they are positive for all base currencies, not just for the US dollar.

However, by incorporating other fundamental elements into the active currency exposure decision, we believe that it's possible to improve markedly on the returns from the simple carry-based approach. Mechanistically going long high-yielding currencies and short low-yielding currencies can be profitable, but using research to gain predictability over exchange-rate fundamentals can potentially achieve even more powerful results.

As we argued above, interest-rate differentials partly compensate investors for underlying macroeconomic and financial risk. Therefore, weighing these risks against the returns available in carry trades should enhance an investor's ability to identify pricing anomalies and enhance risk-adjusted returns. This is what our active currency strategies seek to do. *Display 6* shows the results of a simulation of our active strategy incorporating expected currency returns based on the econometric model that we have developed over the past 15 years and the currency risk model that we use to optimize those expected returns. The results show that this approach has produced a higher return than balanced-carry strategies have produced on their own.

Currency's Full Complement of Attractions

Other features also make currency investing enticing: It is extremely capital efficient, and because currencies are traded in the foreign exchange market, the world's most liquid financial market, transaction costs are very modest.

Approaches to Currency Management

Currency management comes in several styles.

Passive hedging strategies are usually targeted toward risk reduction, seeking to avoid losses that would be generated by adverse movements in exchange rates. An example would be a strategy that maintains a full hedge of the foreign currency exposure in a global bond portfolio. Passive hedges may also be partial, such as a half- or three-quarters-hedged target.

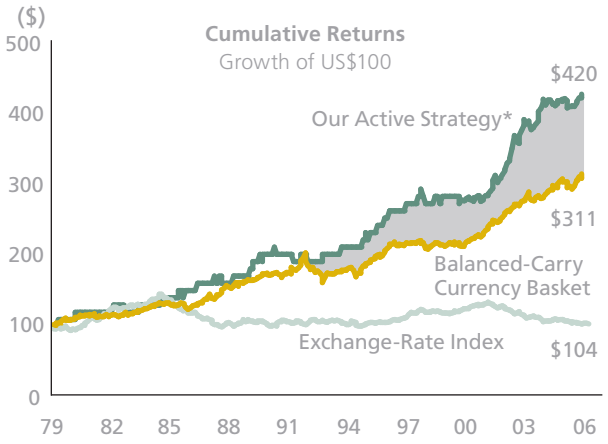
Defensive hedging strategies are used to maintain a variable exposure to currency—ranging from 0 to 100% of the non-US portion of the portfolio—depending on the opportunities or hazards the manager sees in the currency environment.

Active currency overlay strategies seek to manage the currency exposure that is derived from a portfolio that has exposure to international asset markets. For example, some global equity or fixed income mandates give the asset manager or a currency specialist the freedom to decrease or increase the foreign currency exposure stemming from the underlying assets—thereby earning currency returns outside of the portfolio.

Currency alpha investing involves taking long and short positions in various currencies in order to generate positive active returns. The manager need not have any exposures in global equities or bonds—the mandate is purely to extract alpha from currency positions. Leverage is often used in this approach, and shorting of specific currencies is permitted as well. ■

Display 6

Our active strategy earns additional return



From July 1979 through December 2006

*Our active strategy shows the results of a simulation incorporating expected currency returns based on our econometric model and the currency risk model we use to optimize those expected returns.

Source: Bloomberg L.P., Datastream, and AllianceBernstein

Display 7

Currency returns are uncorrelated to those of other asset classes

Equities	US	(0.03)
	EAFE	0.00
	Emerging Markets	(0.02)
Fixed Income	Global	0.22
	US Aggregate	(0.13)
Other	Commodities	0.02
	Passive Currency*	0.14

Simulation returns include the return on cash. Simulation period is July 1979–December 2006. Simulation developed using AllianceBernstein's proprietary currency model. Factors that influence our currency expected-return forecasts include, but are not limited to, autocorrelation, interest-rate differentials, current account, purchasing power parity, and state probability. Estimates involve a number of assumptions that may not prove valid and may be changed without notice. Simulation guidelines include limitations on individual currency weights. Please note that simulated results have certain inherent limitations. The optimal currency weights and performance results may not reflect the impact that certain material economic and market factors might have had on an investment advisor's actual decision making if they were reflective of a managed account. No representation is being made that any account will, or is likely to, achieve profits or incur losses similar to those described herein.

*Currency basket embedded in US dollar–based MSCI EAFE

Source: Goldman Sachs, Lehman Brothers, MSCI, Standard & Poor's, and AllianceBernstein

The limited capital requirements of currency investing stem from the fact that currency forward contracts, the main instrument used in active strategies, require cash only if the contract settles at a loss at the end of the term. In the interim, the cash reserved for the currency strategy can be held in another source of return.

Currency returns are a particularly attractive source of added value because returns are uncorrelated to those of other assets and volatility can be controlled simply by varying the amount of leverage employed in the strategy. *Display 7* shows the correlation of excess returns between various stock, bond, and commodity indexes and our currency portfolio simulation over a period of almost 30 years. If both move in the same direction at the same time to the same degree, they are perfectly correlated, with a measure of 1.0. If their movements show no relationship to one another, their correlation is 0.0. A perfect negative correlation of 1.0 indicates that the two values move in opposite directions to the same degree. Here we see that the correlation between the movement of our currency returns to stock and bond markets is relatively low. In most cases, the correlations are very close to zero, demonstrating that active currency strategies can be a very effective complement to exposure in other markets.

How Does the AllianceBernstein Model Work?

Our currency model produces expected returns for 10 developed market currencies by analyzing elements such as current account–to-GDP ratios, purchasing power parity, and short-term trends in currency movements (*Display 8, following page*). The most important factors in our model are the state probability factor, which estimates the probability that a currency is in a strong or a weak state versus the base currency—often for prolonged periods of time—and interest-rate differentials, which compensate investors for bearing macroeconomic risk. The probable strength or

weakness of a currency is determined by the sign of the interest-rate differential, which is a particularly powerful signal of future currency returns when it is close to zero.

We couple our expected-returns model with a quantitative approach to forecasting risk in currency returns. Our approach recognizes that there are two types of risk inherent in currency investing—fundamental risk and risk associated with forecasting errors in our returns model—and balances them carefully. In order to estimate fundamental risk, we combine estimates of correlations across currencies obtained through a statistical factor analysis of currency returns together with separate estimates of volatility. These are computed through a process that incorporates reversion to long-term means and the fact that deviations from these means tend to be somewhat persistent.

Throughout the process, we use a Bayesian approach to statistical analysis, which starts with a prior view (What do we think influences currency returns?), analyzes the data (What has influenced currency returns in the past?), and combines the two to come up with our expected return estimates (Based on our prior belief and what actually happened in the past, what do we think will influence currency returns in the future?). Our central prior belief is that markets are approximately efficient and that huge risk-adjusted returns are not likely. We are, therefore, conditioned to be skeptical of the data that our model analyzes. This cautious approach results in conservative estimates of currency market returns given the available information; this serves to produce portfolios that are more stable than if we had placed complete faith in the data.

Conclusion

As investors increase their strategic allocations to markets outside their home countries, they are beginning to focus more on the currency aspect of their portfolios. In addition, a greater familiarity with return opportunities in the currency market is attracting interest in active currency strategies. Like equities and bonds, currencies present an opportunity to generate both a market-like return from systematically deploying simple carry-trade strategies and alpha from balancing returns from carry trades against exchange-rate fundamentals. Therefore, we believe that active currency returns can be harnessed to great advantage in a variety of different strategies. Moreover, active currency strategies can be tailored to the specific needs of investors with very different risk tolerances and with any underlying base currency exposure defining their liabilities. ■

Display 8

Elements of the AllianceBernstein Currency Return Model

State Probability	An estimate of the probability that a currency is in its strong or weak state. The sign of the interest-rate differential is a key driver of the probability estimate.
Interest-Rate Differential	High-interest-rate currencies embed a risk premium and also attract short-term capital flows.
Current Account	Relative current account–to-GDP ratios capture an important component of countries' external debt dynamics, which influence exchange-rate movements over the long term.
Purchasing Power Parity	The deviation between market and PPP. PPP exchange rates reflect domestic pricing imbalances that trigger exchange-rate movements toward PPP in the long term.
Momentum (Trend)	Positive momentum in the short term may reflect positive surprises to economic fundamentals and other favorable market conditions that are not immediately captured by other factors in the model.

The Investment Implications of Climate Change

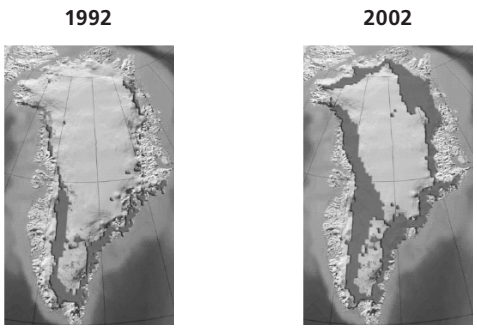
by Amy Raskin, Director—Research on Strategic Change

Regulations aimed at reducing the greenhouse gas emissions associated with climate change are likely to vastly increase spending on low-carbon electric power systems and energy efficiency, creating strong growth opportunities in a wide array of industries.

THE FABLED SNOWS OF KILIMANJARO ARE disappearing—along with snowcaps on mountains from Peru to Tibet. Greenland's summer Ice Sheet has narrowed visibly since 1992 (*Display 1*). And atmospheric carbon dioxide, or CO_2, levels have jumped from 284 parts per million (the high end of its normal range) prior to the Industrial Revolution to an unprecedented 380 today. Most scientists believe that the jump in atmospheric CO_2 is a result of the increased burning of fossil fuels that began with the Industrial Revolution some 200 years ago and intensified as fossil-fuel-fired electric plants have proliferated over the last 100 years.

Display 1

The Greenland Ice Sheet is shrinking

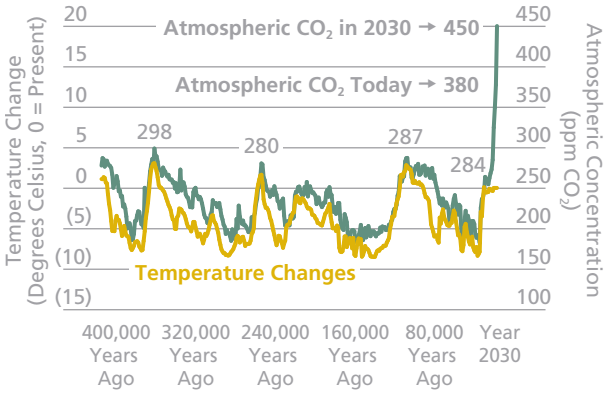


Arctic Climate Impact Assessment 2004
Source: Arctic Council and International Arctic Science Committee

Given the close correlation between global temperatures and the atmospheric concentration of carbon dioxide over the last 400,000 years (*Display 2*), most scientists agree that the shrinking mountain snowcaps and Greenland

Display 2

Temperature fluctuations have correlated with atmospheric CO_2



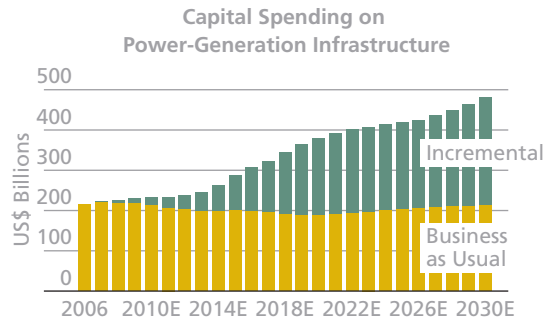
Source: Arctic and Antarctic Research Institute, Laboratoire de Glaciologie et Géophysique de l'Environnement, and Laboratoire des Sciences du Climat et de l'Environnement

Ice Sheet are signs of man-made global warming. They also predict that if atmospheric CO_2 continues its recent rise, in just two or three decades it could enter the 450–550-parts-per-million range, which could prove catastrophic in time. In just a few hundred years, dangerously higher temperatures could melt the polar ice caps, submerging coastal areas where hundreds of millions of people now live. Mountain snowcaps that supply river water to vast inland agricultural areas could disappear, resulting in famine. Warmer sea temperatures could foster more destructive hurricanes and other storms.

Our research suggests that these horrific potential consequences of climate change can be avoided. Regulations aimed at reducing the greenhouse gas emissions associated with

Display 3

Climate change concerns will result in a doubling of capital spending on power



Source: Energy Information Administration (EIA) and AllianceBernstein

climate change are being adopted in much of the world, and we expect these regulations to become stricter and more widespread. Existing and developing technologies will make a wide array of strategies possible.

The effort will be expensive: We expect annual capital spending in the power-generation sector alone to more than double to US$480 billion a year by 2030 (*Display 3*). Relative to total global capital spending of more than $10 trillion per year, however, the spending required to forestall climate change is manageable.

More directly relevant to us as investors, we see sweeping implications from this effort for a wide array of industries. Remarkably, we expect there will be many winners (*Display 4*) but very few big losers, although households and industry will face higher electric bills. In our view, the macroeconomic impact of the effort to reduce carbon emissions is, on balance, likely to be positive.

Display 4

Many industries will benefit from initiatives to reduce carbon emissions

	Near Term	Mid-Term	Long Term
Generating Equipment	++	+++	+++
Transmission Equipment	+	+++	++
Electric Utilities	+ / –	++ / – –	+++ / – –
Oil Field Services	+ / –	++ / – –	+++ / – –
Pipeline Operators	+	++	+++
Engineering and Construction Firms	+	+++	+++
Power Electronics	+++	+++	+++

Near term is defined as less than five years, mid-term as from five to eight years, and long term as more than eight years.
Source: AllianceBernstein

The Key Issues

To estimate the magnitude of the investment required to mitigate climate change, we focused on two central and related problems: CO_2 and electric power generation. We focused on CO_2 because it's the largest contributor to the problem, accounting for more than 70% of man-made greenhouse gas emissions; it also stays in the atmosphere longest. And we focused on electric power generation because this segment produces 36% of total CO_2 emissions, and many of the solutions applicable for electric power can also be used for industrial processes, which represent another 30% of emissions.

To conduct our analysis, we examined all the possible ways mankind could reduce CO_2 emissions. The first way is to do less in order to use less energy: Drive cars less, air-condition and light fewer and smaller buildings, and pull the plug on flat-screen televisions, refrigerators, and other energy-intensive consumer devices. Although this would be a fairly cheap solution, most likely no one would agree to it, so we crossed it off our list.

The second way is to increase the Earth's natural absorption of CO_2. People would not have to reduce their standard of living, but our research suggests it would be technologically very difficult (if not impossible) and exorbitantly expensive. We crossed off that option, too.

Three options remain that are feasible:

- **Generate electricity from sources that don't create carbon dioxide.** Nuclear power and renewable resources, such as wind and solar, are costly, but not prohibitively so, and the technologies are proven. There are political obstacles to nuclear energy, but opposition is waning in many regions.

- **Capture and sequester the CO_2 emissions produced by burning fossil fuels.** This, too, would have relatively little negative impact on users and would not be prohibitively expensive. The technology exists or is in development.

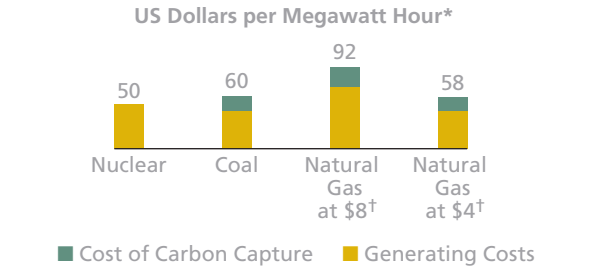
- **Use more energy-efficient technologies.** Requiring use of such technologies or encouraging their use by raising electricity prices (or both) allows people to do as much with less energy. It wouldn't cost much and there are few implementation obstacles, but the potential reduction in total carbon emissions is limited.

Electricity from Nonfossil Fuels

Over 400 nuclear reactors in operation around the world today have the capacity to generate about 367 gigawatts of electricity. We forecast that by 2030 there will be over 900 gigawatts of nuclear-generating capacity, based on our estimates of the economics of nuclear power: When the cost of curbing carbon emissions is taken into account, it is the cheapest way to generate electricity (*Display 5*).

Display 5

Nuclear power is cheapest if the cost of capturing CO_2 is factored in



*Excludes financing cost
†US dollars per million BTU
Source: Intergovernmental Panel on Climate Change and AllianceBernstein

If we are right, by 2030 the world will be spending more than $90 billion per year on nuclear equipment, versus less than $10 billion today; this figure does not include service-related spending. This would create a much bigger market opportunity for companies in the nuclear power industry such as Areva, Alstom, Cameco, GE, and Toshiba/Westinghouse.

Aside from hydroelectric power, renewable energy sources today generate a very small part of the global supply of electricity. Due to strong political support for renewable energy in many parts of the world, we expect much more renewable energy capacity to be added. We estimate that more than 2,200 gigawatts of generating capacity based on renewable sources will be in place by 2030, up from just over 1,000 today. Wind and solar power will account for most of the gains, but hydro will grow as well. In total, we forecast that spending on renewable resources will increase from about $60 billion per year today to $140 billion per year by 2030.

Our research shows, however, that increasing the use of nonfossil fuel energy sources won't be sufficient to meet growing global power requirements, in part due to low capacity utilization for renewables. While a nuclear reactor can operate virtually around the clock, a wind turbine generates electricity only when the wind is blowing, and solar power works only when the sun is shining.

To maintain global economic growth without curbing our lifestyles, CO_2 emissions from burning fossil fuels will have to be reduced.

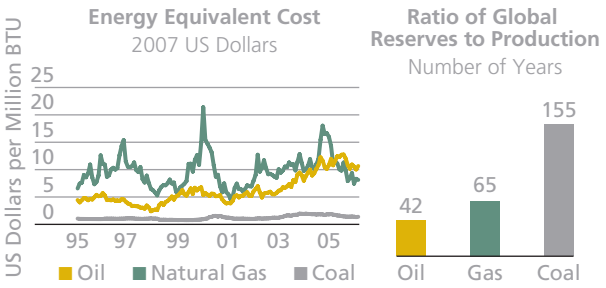
Fossil Fuel Choices

Three fossil fuels are now used for generating electricity: oil, coal, and natural gas. Oil is no longer a real option, given its scarcity and rising cost over the long term. There are almost no oil-burning electric plants being built today.

Coal has been much cheaper than either oil or natural gas for the last 10 years and is far more abundant (*Display 6*). Furthermore, coal reserves are located in key regions, such as rapidly growing China and India, as well as in many European countries and the US. But coal-burning plants emit far more CO_2 per unit of electricity generated than other types of electric plants (*Display 7*).

Display 6

Widely available, coal is consistently the cheapest fossil fuel



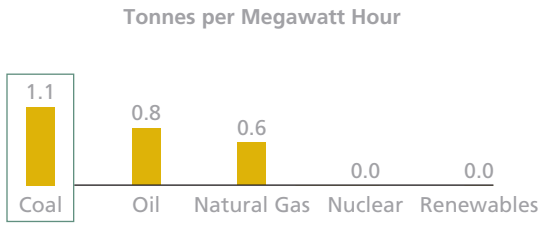
Source: Bloomberg L.P., BP Statistical Review of World Energy 2006, and AllianceBernstein

Today, much of the power-generation capacity being built in the US and Europe is based on natural gas, because natural gas plants emit fewer pollutants and are cheaper and quicker to build. If natural gas prices retreat from recent highs, the cost per megawatt hour of electricity generated could be lower for natural gas than for coal, if carbon emissions aren't subject to regulation.

But once CO_2 emissions are regulated, utilities will likely have to capture CO_2 from both natural gas and coal plants. With the cost of capturing CO_2 factored in, it costs about as much to generate electricity from natural gas as from coal, even when gas prices are low, as the display on the preceding page indicates.

Display 7

The problem with coal is high CO_2 emissions



Source: EIA and AllianceBernstein

We predict that future decisions on whether to build coal- or gas-fired electric plants will largely be a function of each company's cost of buying the commodities. Coal will likely be more cost-effective in many locales.

Cleaning Fossil Fuels

Existing coal-generating plants can be retrofitted to reduce emissions. A chemical process or a filter in the plant's chimney (or flue) can be used to separate the carbon dioxide from the rest of the gas discharged. This is difficult because CO_2 represents less than 15% of flue gas, and the technologies haven't been tested for scale operations. It is also expensive: Adding a chilled ammonia CO_2 scrubber (a promising option) would increase the cost of producing a kilowatt hour of electricity by about 4.5 cents (US). In the US, where the average retail electric price is 7.3 cents per kilowatt hour, this would likely increase electricity prices by more than half. Other chemical and filtration methodologies are even more expensive, although companies such as Alstom, American Electric Power, and McDermott are seeking to improve them and lower their costs.

A second retrofit option is to replace the air that goes into a traditional coal plant with pure oxygen, so the plant produces a more concentrated stream of CO_2 that is easier to capture. This process adds an estimated 3.5 cents to the cost per kilowatt hour of generating electricity.

Unless there's significant progress in the retrofit options, utilities building new plants will likely choose yet another alternative: integrated gasification combined cycle (IGCC) technology. Already deployed in chemical manufacturing but new to power generation, IGCC transforms coal into a synthetic gas and captures the CO_2 before combustion. While it is more expensive to build and operate an IGCC plant than a traditional coal-burning plant, it is cheaper than building and operating a new coal plant and retrofitting it to capture CO_2.

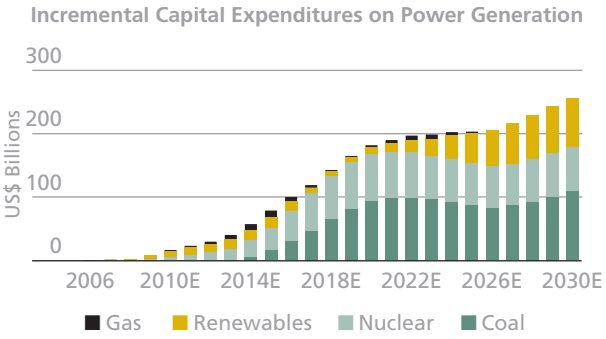
GE and Siemens, among other firms, are seeking to bring IGCC technology to the power-generation sector. Today, more than 30 coal gasification projects are under way in the chemical industry, and many more are on the drawing board, including a handful designed specifically for power generation.

Our research suggests that utilities will retrofit their largest and most efficient plants but replace smaller, inefficient facilities that do not justify the incremental expenditure.

With these costs in mind, we estimate that annual capital spending on coal power will increase from about $60 billion in 2006 to more than $210 billion in 2030. This would add meaningfully to the revenue and earnings growth of the industrial giants that produce this equipment.

Display 8

Coal, nuclear, and renewable energy will gain



Source: EIA and AllianceBernstein

Power Spending Overall

We forecast that incremental spending on power that is related to reducing CO_2 emissions will be greatest for coal. Uncertainty about the regulatory outlook and the long lead times required to build coal plants, however, means there will be little incremental spending growth until 2015 (*Display 8*). Growth in spending on nuclear energy will also be delayed for similar reasons. Increased spending on renewables will begin sooner; incremental spending for natural gas will be limited throughout our forecast period.

After all these new or improved plants are built, natural gas plants' share of total electricity generated globally will shrink from 20% to 13%, but nuclear energy's share will grow from 15% to 24%. Renewable energy sources will grow from 19% to only 21% of the total, despite significant growth in capacity, because of their much lower utilization rates.

Coal will retain its position as the world's largest fuel for power generation, with a 39% share of a total electricity market that will nearly double in annual output, from 18 trillion to 35 trillion kilowatt hours. As a result of clean-coal technology, however, total carbon emissions from coal-burning plants will be less than half the level today.

Carbon Transport and Storage

We also expect an entirely new market to emerge around transporting and sequestering the CO_2 captured. Most of the storage sites are likely to be oil fields, mines, saline aquifers, and other underground openings.

By 2030, mankind may be transporting more than 500 billion cubic feet of CO_2 per day, almost double the amount of natural gas transported today. Although CO_2 is likely to be transported over much shorter distances than natural gas, this massive new volume will likely require at least a doubling of the current global pipeline infrastructure.

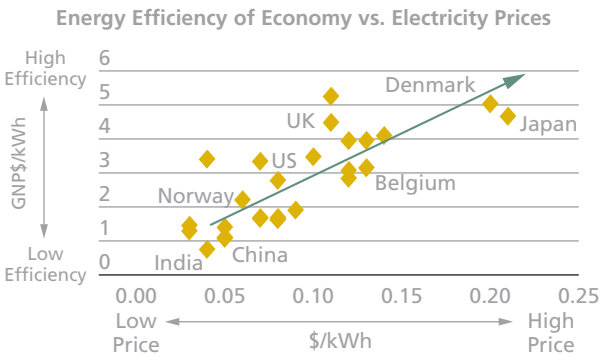
Once the CO_2 reaches the appropriate sites, it will have to be injected safely underground or deep in seabeds, thereby creating a new business for oil field service firms. The latter already inject CO_2 into the ground to raise the pressure in oil wells but have not yet used the process solely to sequester CO_2.

Enhancing Efficiency

The money to pay for new and retrofitted power plants, pipelines, and storage will most likely come from consumers, through higher electricity prices. This won't be popular, but there's no real alternative: Utilities can't pay for these massive investments without rate hikes or subsidies—and subsidies tend to encourage waste. Indeed, in countries where electricity is relatively cheap due to subsidies (China and India) or cheap hydropower (Norway), economic output per unit of electricity used is low (*Display 9*). In countries where electricity is expensive, usually due to steep taxation (Japan and Denmark), economic output per unit of electricity used is high. Thus, we expect efficiency improvements to be both the direct result of regulatory requirements and the indirect result of higher electricity prices.

Display 9

Price of electricity tends to drive efficiency



Data from 2000
Source: EIA, World Bank, and AllianceBernstein

Regulatory requirements are also effective at increasing energy efficiency. Since California adopted stringent energy efficiency standards two decades ago, its per-capita energy consumption has remained flat, while electricity consumption soared in the rest of the US—yet Californians have not curtailed their lifestyles. Many regions around the world are now considering much stricter energy standards than California's.

The two main ways to improve energy efficiency are to switch from mechanical to electrical systems and to improve the efficiency of electrical systems already in place.

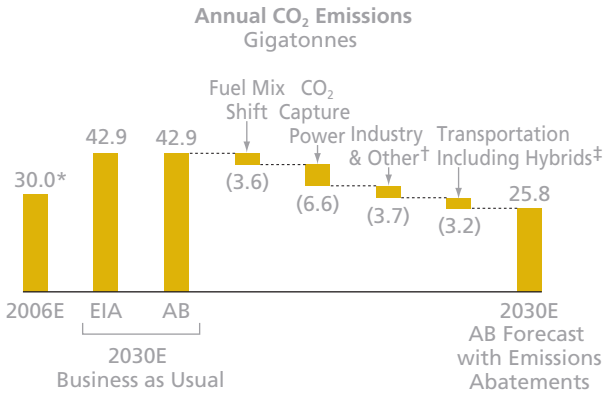
Although the switch to electrical systems is already well under way in most developed markets, most transportation is driven by mechanical systems. We expect the conversion of the global car fleet to hybrid vehicles to reduce energy consumption and CO_2 emissions, even with plug-in vehicles that draw power from the electric grid.

Enhancing the efficiency of the large motors that run industrial machinery, home appliances, and heat and air-conditioning systems can also improve overall energy efficiency

dramatically. Most motors produce the same amount of power without regard to power needed at a given time. Thus, we predict rapid sales growth for variable-speed motors that use sophisticated semiconductors to adjust the power generated to the power required.

Display 10

Emissions control efforts are likely to make a big difference



*Estimated from 2003 data
†Includes some CO_2 capture
‡Reflects decline in emissions from increased fuel economy only
Source: EIA, Oak Ridge National Laboratory, World Resources Institute, and AllianceBernstein

How Big Is the Benefit?

Our research shows that the vast sums spent on reducing carbon emissions from power generation and on improving energy efficiency will indeed help reduce CO_2 emissions. We project that by 2030, less than 26 gigatonnes of man-made CO_2 will be emitted worldwide, less than the 30 gigatonnes emitted last year and far less than the 43 gigatonnes that will be emitted if nothing is done to address the problem (*Display 10*).

Reducing CO_2 emissions to 26 gigatonnes per year by 2030 is unlikely to be sufficient to reverse the warming trend. It would, however, probably be enough to delay reaching the critical 450–550-parts-per-million range of atmospheric CO_2 that scientists say could be catastrophic. As these strategies achieve mass scale and demonstrate success, improvements and new technologies will emerge that will likely make it feasible for governments to tighten regulations even further over time. ■

New Technologies Spur the Race to Affordable Genome Sequencing

by Richard Troyer, Health-Care Analyst—Early-Stage Growth Research
and Jamie Kiggen, Director—Early-Stage Growth Research

Since scientists first sequenced the human genome in 2000, they have made great strides in understanding how genes affect our health—knowledge that could lead to better diagnosis of disease and safer, more effective treatments. Although gene sequencing is still too expensive for broad use, we believe that within the next decade new technologies will radically reduce the cost—which could create major new markets for the companies that develop them.

JUST 30 YEARS AGO, GENE SEQUENCING was a prohibitively cumbersome and expensive process. Using technology available at the time, it would have taken a single technician nearly 6,000 years and cost billions of dollars to sequence the entire human genome. Today, using the best technology on the market, it would take a single machine nearly 20 years to decode a genome at a cost of about $10 million, which is still much too expensive to be broadly incorporated into medical care. However, next-generation gene sequencing technologies have the potential to radically reduce the cost of decoding the genome—to as low as $1,000 within the next five to 10 years.

Greater insight into the human genome, the unique personal blueprint that contains a complete record of every person's hereditary traits, could lead to the proliferation of personalized medicine. We believe that new gene sequencing technologies will be key to enabling these comprehensive changes.

What Is Gene Sequencing?

DNA is made up of four basic building blocks, or nucleotides: adenine, cytosine, guanine, and thymine, abbreviated as A, C, G, and T. Gene sequencing is the process of reading each individual nucleotide in the genome (or in a

Human Genome Primer

- DNA is the largest known molecule in the world. The DNA in a single human cell is approximately six feet long.
- The human genome is made up of 3.2 billion DNA subunits, referred to as nucleotides or bases.
- The human genome is believed to contain approximately 25,000 genes.
- DNA provides the "recipe" for proteins, which are essential to the structure and function of all living cells and viruses.
- Variations in individual genomes are responsible for all inherited traits. These variations include single nucleotide polymorphisms (SNPs) and copy number variations (insertions and deletions).
- Genes determine physical characteristics like eye and hair color, as well as susceptibility to certain diseases and one's response to certain drugs.

section of the genome). As such, it is the most complete genetic information available. Other technologies, such as polymerase chain reaction (PCR) and microarrays, act as proxies for gene sequencing, but they are not as complete. Today, microarrays are able to read about one million data points in the human genome. However, the human genome contains about 3.2 billion nucleotides. PCR is used primarily to identify prespecified data points, a handful at a time.

Sequencing Shifts Toward the Commercial Market

Worldwide gene sequencing sales totaled approximately $1 billion in 2006. Although overall sales have declined modestly since the completion of the first draft of the human genome in 2000, they have recently returned to a growth trajectory. More significantly, the market for gene sequencing is beginning to shift from academic laboratories toward commercial applications.

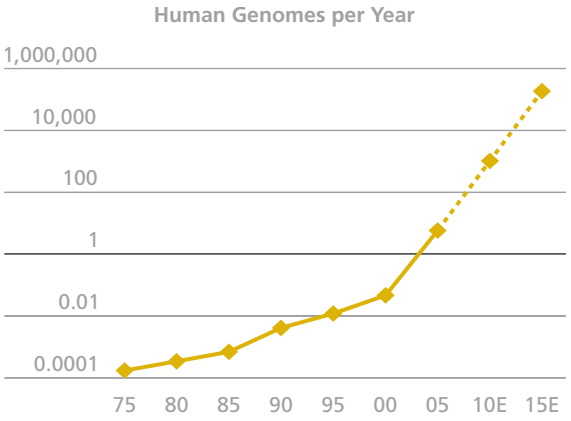
Currently, about half of all gene sequencing activity occurs in the basic research setting—this includes efforts to sequence additional human and nonhuman genomes and to link specific genetic variations to certain diseases. This market peaked around the time of the completion of the human genome and is likely to grow slowly over time. Commercial settings (e.g., diagnostics, forensics, and food safety) account for the remainder of sequencing. Within a few years, the growing commercial market will account for a majority of gene sequencing sales.

Technology Makes Sequencing Faster and Cheaper

Gene sequencing has undergone radical technological advances over the past several decades. In 1975, gene sequencing was a manual process, and a single technician was able to sequence only about 1,500 nucleotides per eight-hour day (*Display 1*). At that rate, it would have taken a single technician nearly 6,000 years to sequence the 3.2 billion

Display 1

Gene sequencing throughput is rapidly increasing



Source: Company data and AllianceBernstein estimates

nucleotides of the entire human genome. Just 10 years later, the daily output was quadrupled to 6,000 nucleotides per day when Applied Biosystems launched the first automated gene sequencing system in 1985; the company has dominated the industry ever since.

Applied Biosystems' products are considered the gold standard, but even today, the company's machines sequence only about 700,000 nucleotides per eight-hour day, which implies a theoretical 20 years to decode a human genome using a single machine. This market is becoming more competitive. In 2005, Roche and 454 Life Sciences launched a system with a throughput of about 50 million nucleotides per day, at costs that are theoretically severalfold below that of Applied Biosystems. Illumina has also recently launched a product that promises major speed and cost advantages.

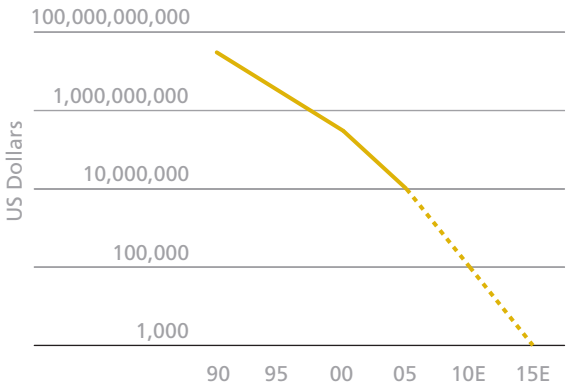
All of the emerging systems have unique strengths and weaknesses, but no new technologies have emerged that are clearly superior to the existing gold standard technology on all key measures. Still, the potentially disruptive nature of these new products has compelled Applied Biosystems to develop and acquire new technologies to keep up with advances in the field.

New systems that are poised to launch by the end of the decade could sequence more than 10 billion base pairs per day, and may ultimately sequence trillions of nucleotides per day once fully optimized. Although these systems are at very early stages, the implications are intriguing—at that rate, one machine could sequence more than 100,000 human genomes per year, even assuming each genome was sequenced 10 times to minimize errors.

While advances in sequencing speed are impressive, reductions in cost have the potential to transform the gene sequencing market (*Display 2*). The first draft of the human genome was completed in 2000 at a cost of about $300 million, an effort that took several years with hundreds of machines running around the clock. Today, it costs about $10 million to sequence a human genome using Applied Biosystems' gold standard capillary sequencing. Several new technologies on the market—or preparing to launch—could reduce costs by several orders of magnitude. Newer technologies may eventually cut the cost to approximately $1,000, although these efforts are at a much earlier stage of development. At such a low price point, gene sequencing has the potential to become a routine part of medical care.

Display 2

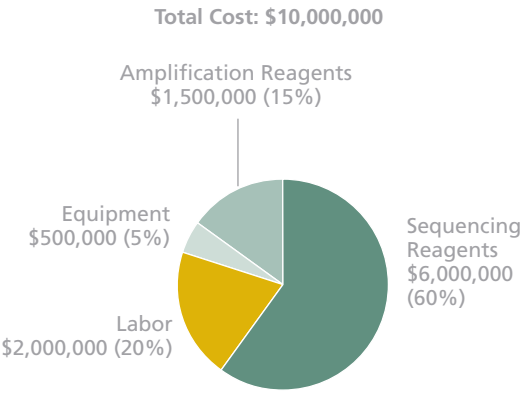
The cost of sequencing the human genome is declining



Source: Company data and AllianceBernstein estimates

Display 3

How the cost components of gene sequencing are sliced



Source: National Human Genome Research Institute and AllianceBernstein estimates

Getting to the $1,000 Genome

Even with the rapid decline in gene sequencing costs, getting to a $1,000 genome is not a certainty. However, we believe it will be a reality in the next five to 10 years, as new technologies will be much less dependent on the chemicals (reagents) that are the critical ingredients in conventional gene sequencing technology. These chemicals account for approximately 75% of current gene sequencing costs, or $7.5 million (*Display 3*). Some early-stage technologies could reduce the volume of sequencing reagents 100,000-fold and eliminate the use of amplification reagents altogether. In addition, sequencing today is an extremely labor-intensive process due to significant sample preparation and processing time. Labor and equipment costs should decline at a rate in line with that of processing speed, or as much as 25,000-fold within the next five to 10 years. Using these rates of improvement, total costs could theoretically decline to just a few hundred dollars.

COMPANY PROFILE: Pacific Biosciences

Most new gene sequencing technologies involve trade-offs in accuracy, speed, and costs. In general, newer technologies tend to offer improved speed and costs compared with the gold standard technology, but lower accuracy due to shorter DNA read lengths. Consequently, while we expect these new technologies to compete with established approaches in some markets, we expect most uses to be additive.

There are a few companies developing new technologies that could be superior to existing approaches on almost all key measures. One such company is Pacific Biosciences (PBI), based in Menlo Park, California. PBI is developing an ultrafast, ultra-low-cost gene sequencing platform that is based on work done at Cornell University. PBI's goal is to commercialize a gene sequencing technology that would replace the gold standard platform, and ultimately enable the sequencing of individual genomes as a part of routine medical care.

PBI's approach uses tiny pores, called zero-mode waveguides, to observe nucleotide incorporation in real time, much as it occurs in the human body. This is a radical departure from most other technologies, which require a high volume of reagents to artificially simulate the incorporation process—negatively affecting accuracy, speed, and costs. PBI's approach lends itself to high degrees of parallelism, resulting in very long read lengths and very high throughput. While this effort is in the early stages, it has the potential to offer superior accuracy and unprecedented speed, at a fraction of the cost of competing technologies. ■

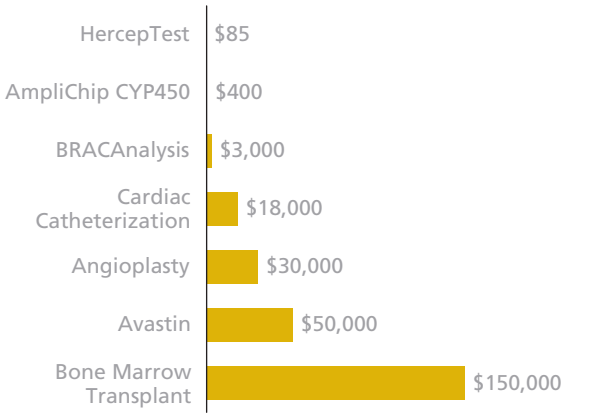
New Technologies Could Boost the Market

We believe that projections of slow but steady gene sequencing sales growth will prove to be conservative if new technologies succeed in radically reducing the cost of gene sequencing. At the $1,000 price level, gene sequencing would be on a par with chronic treatments such as Lipitor, and well below that of certain cancer drugs such as Avastin. It would also be far less expensive than other diagnostics products or procedures such as cardiac catheterization and BRACAnalysis, which assesses the risk of developing breast cancer (*Display 4*).

It is easy to envision a scenario in which annual sales of a $1,000 genome product would exceed $1 billion. For instance, if half of the four million infants born in the US every year had their genes sequenced, annual sales would reach $2 billion. Approximately three million insured patients are diagnosed with cancer or cardiovascular disease in the US each year—this would represent a $1.5 billion revenue opportunity if half of these patients had their genes sequenced during the course of therapy. Ultimately, even people in relatively good health might choose to have their genes sequenced in order to maintain their current level of health. Such a mass market would dwarf the existing gene sequencing market.

Display 4

The costs of selected medical procedures and products



Source: American Heart Association, company data, and analyst estimates

As has occurred in the past, we expect increased gene sequencing activity in the research sector to make up for declining costs. In fact, our conversations with major genome sequencing centers lead us to believe that volume growth will outpace price declines for the foreseeable future. One research setting that is generating considerable interest is metagenomics—this involves the analysis of all genomes contained within an environmental sample (e.g., soil, water, and air). Only about 1% of microorganisms can be grown in standard laboratory conditions. Scrutinizing environmental samples will radically increase the number of microorganisms available for testing. These organisms could eventually lead to new drugs as well as industrial and agricultural biotechnology products.

We believe that most of the market's growth will occur in the medical and commercial markets. Cancer is a particularly ripe area of study. The National Institutes of Health (NIH), a US government agency, recently announced the Cancer Genome Atlas program, which will sequence tumors to identify genetic mutations leading to their growth. Funding has not been finalized, but the project is expected to cost several hundred million dollars. This project will provide a source of near-term gene sequencing revenues. However, the long-term opportunities are even greater. In the future, it may make sense to sequence a portion of a newly diagnosed cancer patient's tumor in order to customize treatment. It may also be possible to use next-generation sequencing technologies to monitor patients' blood for cancer biomarkers long before a tumor has been identified. Recent studies have indicated that the genetic profile (genotype) of a tumor has a greater impact on treatment response than do the physical characteristics (phenotype). Given the serious nature of cancer and the high cost of treatment, it may make sense to sequence a patient's tumor even if the cost is well above $1,000.

This is just a small sample of potential applications that have been cited for next-generation sequencing technologies; many other applications will emerge as technologies advance.

Display 5

NHGRI next-generation sequencing grants

Near Term $100,000 Genome		Revolutionary $1,000 Genome	
Company	Grant Amount ($ Mil.)	Company	Grant Amount ($ Mil.)
454 Life Sciences	7.0	Pacific Biosciences*	6.6
Agencourt Personal Genomics	6.6	VisiGen Biotechnologies	4.2
Microchip Biotechnologies	6.1	Helicos BioSciences	2.0
Network Biosystems	4.5	General Electric Global Research	0.9
LI-COR	2.5		

*AllianceBernstein Venture I portfolio company

References to specific securities are presented to illustrate the application of our investment philosophy only and are not intended to be considered recommendations by AllianceBernstein. It should not be assumed that investments in the securities identified were or will be profitable.

Source: National Human Genome Research Institute

Many Companies Are Pursuing Next-Generation Sequencing Technologies

Emerging technologies are also receiving government support through the NIH. Since 2004, the NIH's National Human Genome Research Institute (NHGRI) has awarded $83 million in grants to develop "near term" $100,000 genome technologies and "revolutionary" $1,000 genome products (*Display 5*). The NHGRI expects a $1,000 genome product to "enable the sequencing of individual genomes as part of medical care," leading to "more individualized strategies for diagnosing, treating, and preventing disease." These grants account for just a fraction of these companies' development costs. Additional sources of funding include the public markets, venture capital, and corporate partners. In addition to those listed in the display, many other companies are working to develop next-generation sequencing technologies.

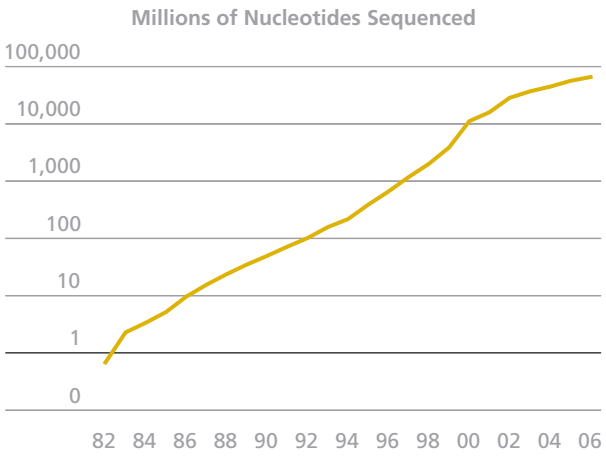
Sequencing Data Are Growing Exponentially

The NIH has also played an important role in collecting gene sequencing data since 1982. As sequencing costs have declined, the number of nucleotides that have been sequenced has grown exponentially. In 1983, the year after the NIH founded GenBank to catalog all publicly available gene sequences, the database contained just over two million nucleotides. This figure increased steadily to just over one billion nucleotides in 1997 and increased to 65 billion nucleotides as of August 2006 (*Display 6*). It is important to note that this database contains only data that have been submitted to the NIH, so it may significantly undercount recent totals, as genes sequenced for commercial purposes are less likely to be included in the GenBank. We expect the exponential growth in gene sequencing to continue as costs decline and commercial and medical sequencing accelerate—leading to significant growth in gene sequencing revenues.

Many technological hurdles remain, but we believe that gene sequencing costs will continue to decline radically over the next several years—ultimately reaching a cost of about $1,000 per human genome. Financial support from government agencies will continue to encourage the development of new gene sequencing technologies. However, we believe it will be the major commercial opportunities that will ultimately drive significant investment and innovation. New gene sequencing technologies will be disruptive to incumbent companies and have the potential to create major new markets as gene sequencing becomes faster and cheaper and is ultimately incorporated into routine medical care. ■

Display 6

Publicly available DNA sequences included in GenBank



Source: National Institutes of Health

Commercial Real Estate: New Paradigm or Old Story?

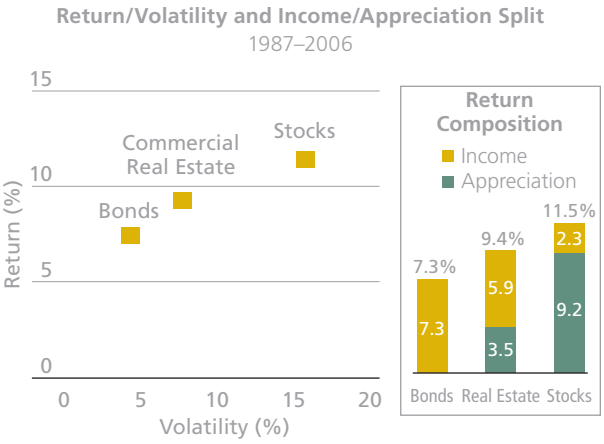
by Jon Ruff, Director—Wealth Management Group

Investors used to count on real estate for its rich yields and low risk, but today income yields from commercial property are at historical lows and prices at record highs. Have the established rules of owning commercial property changed?

SINCE THE START OF THE MILLENNIUM, everything seemed to go right for commercial property investors. Attracted by properties' juicy yields, income growth potential, and an attractive rate environment, they poured capital into the asset class, sending prices to all-time highs. But with valuations now at record levels and the credit environment worsening since the start of the summer, is the bloom coming off the rose? In light of the remarkable developments in the market and the growing prominence of real estate in investors' asset allocations, we embarked on an in-depth analysis, examining both the private and public markets. But more important, we have tried to dig beneath the primary investment approaches—direct ownership or securitized REITs (real estate investment trusts)—to understand the fundamental factors driving the asset class itself, and to determine whether the long-term case for commercial real estate investment remains intact.[1]

Display 1

Commercial real estate offers the best of both worlds—income and appreciation



Past performance is no guarantee of future results.

Source: Global Financial Data (GFD), Lehman Brothers, MIT Center for Real Estate (MIT CRE), National Council of Real Estate Investment Fiduciaries, and Standard & Poor's

Commercial Real Estate Historically: A Stock/Bond Hybrid

For all their familiarity as structures, office skyscrapers, apartment complexes, shopping malls, and other commercial properties have never been a core component of most investors' asset allocations. And it hasn't been performance that's gotten in their way. Over the past 20 years the returns for this asset class—almost 10%—are just a bit below those of stocks, but its volatility is much closer to that of bonds (*Display 1*).[2] What's more, performance has been well-balanced, with approximately two-thirds of returns coming from current income (cash generated by rents, net of operating and maintenance expenses) and the remainder being driven by property price appreciation. Commercial

[1] For the purposes of this study, and given the data limitations, we are defining the commercial real estate asset class as a fully diversified, unlevered national cross section of "core" income-producing properties, including office, retail, industrial, and residential apartment buildings.

[2] Understanding the data sources and data quality is critical in researching real estate valuations and returns. Where possible, we are using a transaction-based index to measure price changes in the private commercial property market (the MIT/NCREIF Index). This index, which includes data beginning in 1986, avoids the time lags and valuation subjectivity inherent in traditional appraisal-based price measures, and is more representative of the broad asset class than the securitized REIT index, which reflects leveraged returns and whose data prior to 1992 do not fully represent the underlying value of the real estate market.

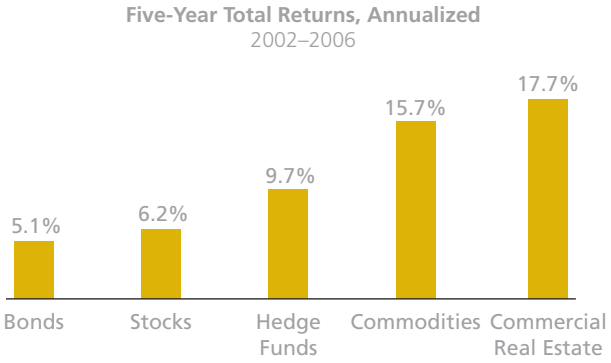
real estate's historical combination of strong income and growth characteristics makes it seem like an interesting stock/bond hybrid.

Commercial Real Estate Today: Prices Spike, Yields Shrink

More recently, the prominence of commercial real estate as an *investable asset class* has been cycling to a new high. Capital flows began to accelerate as the stock market bubble deflated from 2000 to 2002 and investors fled high-flying growth companies for stability in real estate, which offered tangible assets and positive cash flows. What could be more Old Economy, more brick-and-mortar, than property and the stable income its buildings generated? Commercial real estate then proceeded to outperform every other major investment category, including hedge funds (which saw record asset flows) and commodities (whose recent run-up reflects the bull market for raw materials over the last several years), as shown in *Display 2*.

Display 2

Property's high performance: Is it experiencing a cyclical peak, secular change, or both?



Past performance is no guarantee of future results.

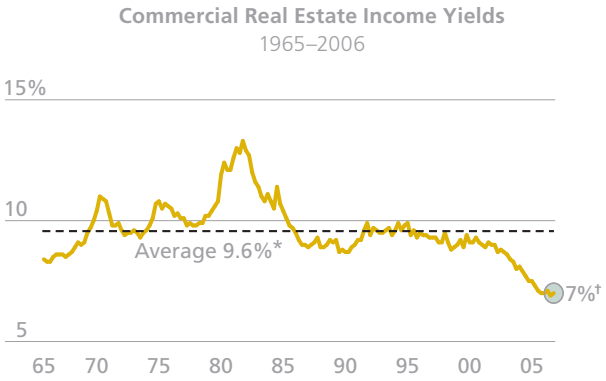
Bonds are represented by the Lehman Brothers US Aggregate Index, stocks by the S&P 500, hedge funds by the HFRI Fund Weighted Composite Index, commodities by the Reuters-CRB CCI Commodity Index, and unlevered real estate by the MIT CRE Transactions-Based Index.

Source: Hedge Fund Research, Inc. (HFRI), Lehman Brothers, MIT CRE, Reuters-CRB, and Standard & Poor's

But as real estate prices have moved higher and higher, the income that properties throw off has grown at a much more modest pace; as a result, the income yield has been shrinking. At year-end 2006, the yield offered by commercial properties—also known as the *capitalization rate*—stood at an all-time low of 7%, down nearly a third from its historical average (*Display 3*). After accounting for the investment needed for ongoing capital expenditures, we'd place an investor's actual income, or "cash" yield, at only 5%—a return on par with that of Treasuries![3]

Display 3

As prices peak, real estate cap rates hit 40-year low



*Average of four major property types, 1965–2006

†Capitalization rate = net operating income/value

Source: American Council of Life Insurers (ACLI) and Real Capital Analytics (RCA)

With yields this low, investors will become more dependent on continued price gains to earn their returns. Those price gains can be driven by two sources:

> **Future income growth:** If property income grows, real estate prices should increase at the same rate (assuming investors continue to place the same valuations on that income).

[3] It is important to distinguish between income yield (capitalization or "cap" rate) and cash yield, which is simply the cap rate minus the capital expenditures (capex) needed to maintain the properties. We have assumed throughout a capex estimate of 2% to derive our cash yield figure. Unless otherwise stated, the cap rates quoted here refer to an equal-weighted average of office, industrial, retail, and apartment property types. Running the analyses in this section for the individual property types would produce virtually identical results. The similarities between property type fundamentals and valuations far outweigh the differences.

- **Valuation changes:** Investors might be willing to pay higher prices for less income—as they have over the last several years (in real estate terms, *higher valuations* are represented by *lower income yields*).

But how much income growth can property investors reasonably expect? And can current valuations hold in the face of recent market headwinds, or are prices likely to move ever lower, sending the income yield on real estate back to its long-term average? Were that to happen, prices would fall by 25%! These are the critical questions for all property investors today—whether they hold REITs or own properties directly.

We've analyzed the drivers of real estate returns and the evolution of the asset class, and our research has led us to two main conclusions:

- **Returns will be lower:** While income growth rates can vary substantially over the short term, over the long term we'd expect growth not to exceed the rate of inflation. Combining current cash yields of 5% with inflation expectations of about 2.5%, we'd expect long-term returns in the 7–8% range.
- **Risk will be lower as well:** Investors should be willing to accept lower returns from real estate than they have in the past because investments have become easier to diversify, more liquid, and more transparent than they used to be. Plus, broader capital market forces, like lower interest rates and a general smoothing of the business cycle, have propped up prices across nearly all asset classes. For these reasons, we believe that in the long term, real estate valuations can remain somewhat higher than they have been historically.

In short, although real estate as an asset class has gotten pricier, some of its richness is justified by the decline in the risk of holding it. And while richer valuations do increase our concerns about short-term price volatility, some of which we've experienced firsthand in recent months, our analysis suggests that the long-term case for real estate investment remains intact.

The Building Blocks of Commercial Real Estate: A Valuation Analysis

We analyzed a number of forces at play in the property market. First, there is the question of real estate fundamentals—the supply of and demand for space. Can the demand for property outpace supply and thus cause income to grow faster than it has in the past, offsetting unusually low current yields and boosting total return? Second, in considering the possibility of a shift in valuation, we also need to look at capital market forces like interest rates and mortgage spreads. Real estate needs to be priced so that an investor can earn sufficiently more than these rates for an investment to make sense. Finally, we look at how the risk of property ownership itself has evolved, given the influence of securitization as well as a general reduction in business cycle volatility, and how that might influence valuations.

Real Estate Fundamentals: The Long and Short of Income Growth

There's good reason why investors historically have seen real estate as a safe, yield-bearing investment, similar to a fixed income asset. In the short term, real estate cash flows (from current leases) can be thought of as bonds with maturities equal to the lease term and credit quality that's dependent on the quality of the tenants. And while some leases automatically adjust upward for inflation, one should not expect significant income growth over the term of these "bonds."

Any opportunity for growth comes when current leases expire. At that point, landlords and tenants alike are exposed to the local real estate cycle of occupancy rates and new construction, and with it the current asking rents prevalent in the market. This can be a boon

or bane: A vibrant economy and an absence of new construction could cause demand to outstrip supply for space, pushing up rents; a recessionary malaise or an oversupply of space would reduce rents.

Today, commercial real estate occupancy and construction rates suggest that the market is pretty well in balance. As of this writing, vacancies stand at about their long-term average of 9% across all the major property types (*Display 4, left*). As for supply, it turns out commercial development has been restrained by two factors. Material costs have increased substantially due to the run-up in commodity prices globally. Meanwhile, residential developers' recent frenzy of overbuilding has bid up the price of land. As a result, the pace of new completions seems to have stagnated over the last few years, remaining below its long-term average of 1.5% (*Display 4, right*). The recent dearth of new building augurs well for near-term rent growth if the economy remains strong, but projections for full-year 2007 and beyond show a substantial pickup in supply on the horizon. In sum, there's no reason to believe that short-term income growth is at a cyclical low and set to move sharply higher.

Long-Term Income Growth

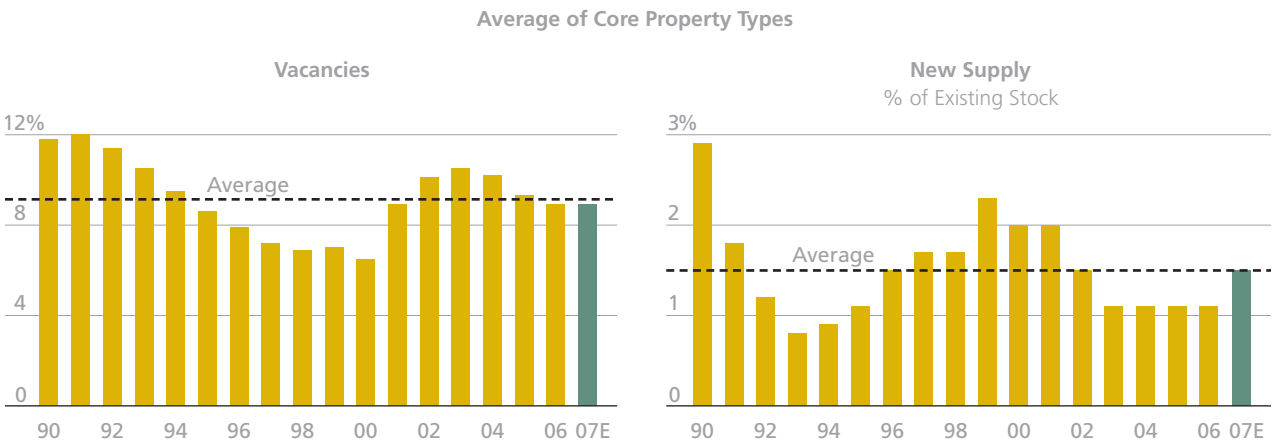
With the short-term growth outlook modest at best, we shift our attention to commercial real estate's long-term prospects. And over the long term we expect income growth to more or less track inflation. Here's why: Buildings, at base, are brick and mortar, land and labor. When finished, they produce a stream of cash flows for their owners. If the costs of developing a building increase, an investor will require greater cash flows to achieve an attractive enough return.

Conversely, if it costs less to build, supply will gradually come online, pushing rents lower. Throughout history, when rents and development costs get out of line, the market inevitably corrects itself. So over the long term, the cost to build or "replace" a structure should be the proxy that investors use to set income growth expectations for the asset class.

Replacement costs for commercial property consist of approximately one-third land and two-thirds building costs, or materials and labor.[4] It turns out all three items bear a close relationship to inflation. Labor typically

Display 4

With supply and demand currently in balance, prospects for long-term income growth seem modest



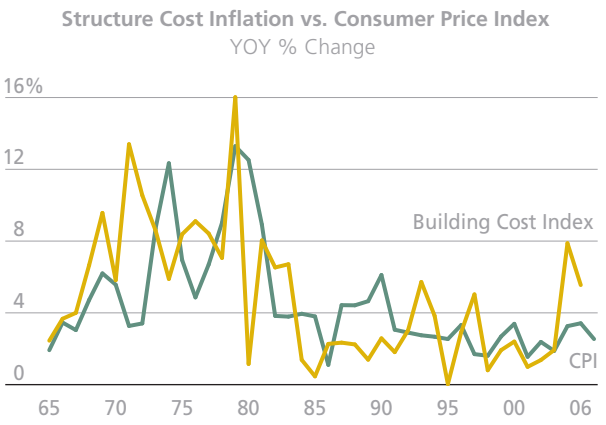
Source: Reis, Inc.

[4] This breakdown of replacement costs represents the long-term countrywide average. It could vary significantly by property type, location, and time period.

appreciates at a rate slightly higher than inflation, and materials at a slightly lower rate. Taken together, these factors suggest that building costs should grow at or about the pace of inflation, and, in fact, they have (*Display 5*).

Display 5

Structure costs tend to move in line with inflation



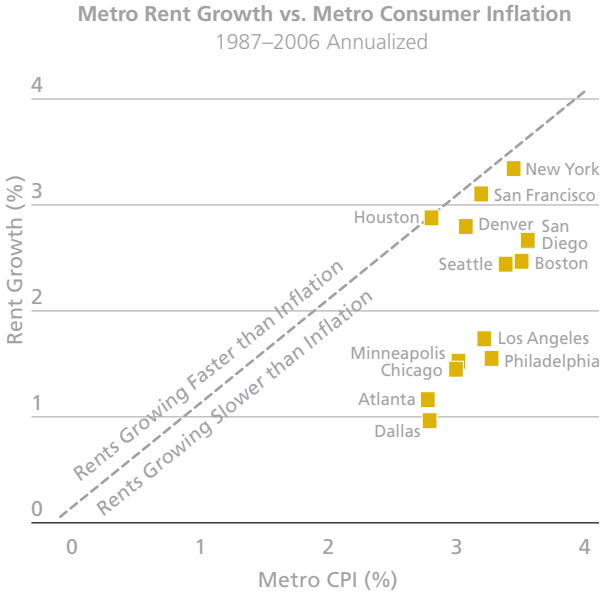
Source: Bureau of Labor Statistics and *Engineering News-Record*

The wild card then is land. Some feel that land's appreciation potential should be limitless, since at some point you simply run out—think of Manhattan, London, or Tokyo. But in reality, land will exhibit a growth rate above inflation only if it benefits from a step-up in value attributable to a change in usage: the rare transition from farmland to residential or from residential to commercial. Barring such a shift, uncommon in a core metropolitan area, the aggregate value of land should rise in line with general inflation over the long term.

While data on land price growth are limited, we can analyze rents from the central business districts of mature cities to get some clues. And remember, since building costs grow at a rate close to that of inflation, any large divergence in long-term rent growth should be explained by the cost of land. Over the past 20 years, rent growth in major US cities, on average, has

Display 6

Metro rents grow more slowly than inflation



Source: Bureau of Labor Statistics and National Real Estate Index

not even kept pace with local price measures—an indication that land has generated subpar growth (*Display 6*).

Today, market and consensus estimates for long-term inflation tend to hover in the 2–3% range, which is far lower than historical realized or expected inflation. If we add that rate of growth to real estate's income yield and subtract maintenance costs (to get to our "cash" yield of 5%), we have an estimate of what investors might reasonably expect from this asset class. We've used this methodology to create a historical series of real estate return estimates. The picture that emerges suggests that the prospective total return of 7.5% currently offered by real estate is in record-low territory.[5] In our view, therefore, it seems unlikely that growth expectations in the market today, in either the long or short term, can make up for the current low level of yields. That leaves changes in valuation as the remaining part of the equation.

[5] Unfortunately, historical market-based inflation expectations data do not exist. To look at this crucial component of expected returns, we estimated inflation expectations from 1965 through 1979 and used inflation expectations in the Survey of Professional Forecasters from 1980 on; the Philadelphia Federal Reserve took over the survey in 1990. Our research suggests that investors form expectations based on recent and longer-term history, in this case trailing 12-month and 10-year inflation.

The Valuation Quandary: Market Cycles, Secular Change, or Both?

Capital Markets Pressures: Rates Slide, Hurdle Drops

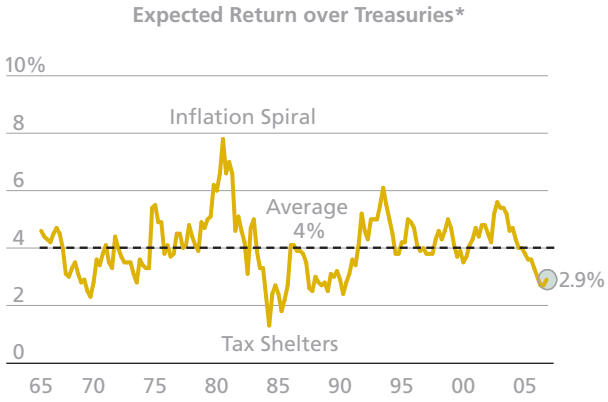
Thus far our analysis assumes that valuations remain intact. But is that likely? Even though current real estate valuations may seem rich, context is critical: Any investment needs to be judged relative to a number of factors, including the returns available from other investment alternatives, its funding costs, and the risk inherent in the opportunity. As it turns out, all three of these bases of comparison present lower hurdles for the real estate investor today than they have historically, even considering the recent turmoil in subprime mortgages and related credit markets. As long as these elements stay in place, we believe, valuations can remain richer than they have been historically. Let's first focus on Treasury yields, a key capital market force that has been affecting real estate values.

The 10-year Treasury yield is key because it represents the risk-free alternative to which many long-term investments are compared. The difference, or spread, between the 10-year Treasury yield and commercial real estate's income yield, or cap rate, is an indication of the extra yield real estate offers investors for bearing the risk of owning it. And just as real estate cap rates are well below their historical averages, the 10-year Treasury yield recently hovered nearly *300 basis points* below its historical average. Viewing the asset class through this lens explains at least some of the corresponding drop in commercial real estate's yields.

But comparing real estate's income yield to Treasuries does not go far enough, because real estate also offers growth potential. To truly understand the return environment, it's necessary to add the projections for income growth rates to real estate cash yields and compare that to Treasury rates. We can thereby gauge the additional return that real estate is priced to offer based on valuations at the time and the growth opportunity—it's a measure of the so-called "real estate risk premium." If the risk premium is high, real estate is being priced to offer significant additional return compensation for the risk of investing. If it's low, it may be that valuations would need to come down before the asset could better compensate investors for the risk (*Display 7*).

Display 7

Risk premium compression: Commercial real estate is now priced to return less than its historical average



*Data reflect historical inflation regressions from 1965 through 1979 and survey inflation from 1980 through 2006.
Source: ACLI, GFD, Lehman Brothers, and RCA

With this analysis, one can see that real estate was priced to offer a significant return premium over Treasuries in the late 1970s—the result of a conjunction of high income yields and expectations of strong income growth that came along with the spike in inflation of the time. Then, in the early 1980s, the risk premium fell to record lows as investors bid up the value of real estate assets, and tax loopholes emerged that made real estate investing more advantageous for wealthy private investors.[6]

[6] Changes to the tax code opened a tax loophole allowing wealthy individuals to use passive losses from real estate tax shelters to offset their other income, and a change in the depreciation rules for commercial real estate allowed investors to depreciate a building over 15 years rather than the prior standard of 40 years. The legislation that created some of these incentives was the Economic Recovery Tax Act, passed in 1981; the Tax Reform Act, which became law in 1986, helped to curtail them.

Due to the strong price appreciation of the last several years, the real estate risk premium has again dropped sharply and now stands at about 3% over Treasury yields, as the display on the preceding page shows. While not quite at historical lows, it is a full percentage point below its long-term average of 4%.

In analyzing these results, we would emphasize two points. First, while the return expected has dropped substantially, it fell from what looks to have been a cyclical peak in 2001, when the asset class was very attractively valued. Therefore, much of the recent performance has been simply a reversion to the mean. Second, although the return opportunity is below the long-term average, we believe there are at least two justifications for this. One is the increase in securitization—converting mortgage loans into tradable public securities—which we think has driven a sharp compression in commercial mortgage spreads, lowering the cost of financing for real estate investors. The other is the broader compression of return expectations across all asset classes, the result in part of a global decline in business cycle volatility.

The Role of Securitization: Evolution or Revolution in Mortgages?

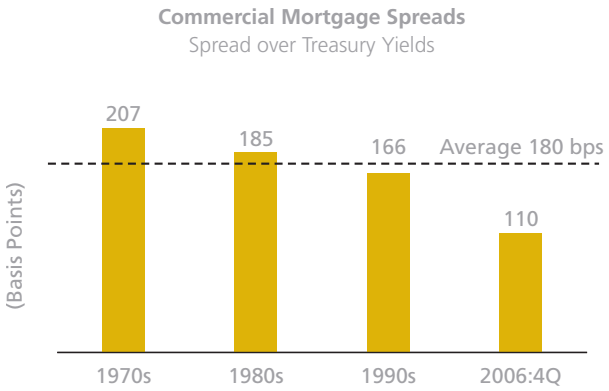
Real estate used to be privately financed by banks and insurance companies that made mortgage loans to investors and then carried all the credit risk on their balance sheets. Since the loans were concentrated and illiquid, the lender would demand a high interest rate and favorable terms on the loans.

Also, because these two industries provided basically all the financing, if they happened to encounter business headwinds, as they did in the early 1990s, access to mortgage funding could suddenly dry up, creating one of the greatest risks to levered investors: the inability to refinance their maturing balloon mortgages.

Securitization changes this equation, lowering the risk of diminished access to funding and the cost of that funding as well. It allows for the packaging of a pool of loans into a diversified, publicly traded security, which the lender can take off its balance sheet and sell to many new investors. This essentially creates another source of debt financing for real estate investors, reducing the risk of finding the lending market closed. Furthermore, freed from holding the burden of concentrated, illiquid loan portfolios, lenders can provide loans at lower rates.

Display 8

Cyclical or secular shift: Mortgage rates have dropped…

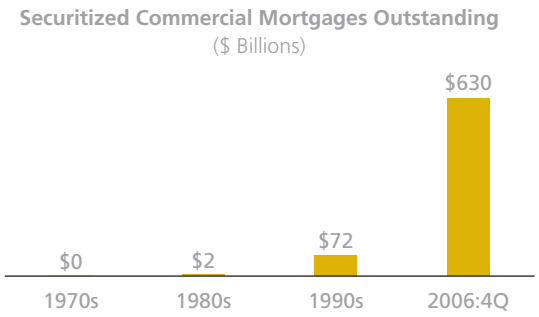


Source: ACLI and *Barron's*/John B. Levy & Co. National Mortgage Survey

And they have. As *Display 8* shows, the commercial mortgage rate spread to Treasuries has fallen pretty consistently over the last few decades. More remarkably, this spread seems to have collapsed of late; as of the fourth quarter of 2006, it stood 70 basis points below its long-term average. This collapse in mortgage spreads happened to coincide with a dramatic increase in securitization,

Display 9

...as private debt markets go public



Source: Federal Reserve Flow of Funds

$630 billion worth of it in the fourth quarter of 2006 (*Display 9*). To put that number in perspective, 15 years ago, less than 2% of commercial mortgages were held in commercial mortgage-backed security (CMBS) form; today more than 26% are.[7]

In our view, this accounts in large part for the recent precipitous drop in mortgage spreads, which has lowered the return hurdle levered real estate investors must surpass, helping explain much of real estate's current lower risk premium to Treasuries. Of course, spreads have widened of late as a result of the recent credit market turmoil, primarily due to the mispricing of risk in some more esoteric securitization structures. However, while the unwinding of these structures and repricing of risk will put pressure on spreads in the near term, we do not believe the longer-term trend of mortgage securitization will reverse.

But there's more, and with it more reason to believe that real estate's risk premium in the long term will be lower than its historical average. For along with an increase in the number of providers of debt capital, there has been an expansion in the number and type of equity investors in commercial real estate. For example, real estate investment trusts—REITs—are publicly traded, professionally managed vehicles that bring new levels of liquidity and transparency to the sector. In the US alone, REITs, which grew from less than $20 billion in market capitalization a decade ago to almost $400 billion by year-end 2006, have dramatically increased both the breadth of investor type and the depth of capital flowing into real estate markets.

The changes to the usual risks of holding real estate assets have been enormous:

- **Concentration**—Cheaper and easier diversification has reduced the "concentration premium" required for holding real estate assets.
- **Illiquidity**—Cheaper and easier public market transactions have reduced the "illiquidity premium" required to own real estate assets.
- **Lack of transparency**—Improved pricing of data, meanwhile, has reduced the "information premium" required to invest in opaque real estate markets.

As the conventional risks of real estate ownership have shrunk, investors require less return to hold it, and the risk premium has therefore fallen.

Business Cycle Volatility on the Wane: The Great Moderation

The decline in real estate risk is also tied to increased economic stability generally over the last 15 years, sometimes referred to as the great moderation. Take US GDP growth. Inventories, which are prone to wide swings, historically have represented about a quarter of GDP. But as the US has progressively exported

[7] Wall Street innovation in this area has continued with the morphing of commercial mortgage-backed securities structures into collateralized debt obligations (CDOs). The CDO market, which provides an outlet for higher-risk tranches of CMBS mortgage pools, increased in size in 2006 by more than 60% over its record volume in 2005, to reach nearly $35 billion. Concerns that the ample liquidity being generated by all this activity could be sowing the seeds of future problems were borne out this year as trouble in the subprime mortgage markets triggered market turbulence worldwide.

its manufacturing capabilities, inventories have shrunk and today constitute only 14% of GDP. Moreover, real-time inventory management has reduced the volatility of raw stock fluctuations.

Another example is a more predictable inflation rate. The decline in volatility in this key variable is due to a number of factors. For instance, an increase in imported goods as a share of consumption has had the effect of disciplining prices through a vast expansion in the quantity and diversity of the supply of goods. This doesn't mean that we are now immune to inflation problems, but rather that any such problems are likely to develop more gradually than in the past, with fewer good and bad surprises, and each of lesser magnitude. This has many positive implications, most notably the reduced likelihood of very wide "corrective" swings in monetary policy, and less attendant economic volatility. Moreover, these changes appear to be structural in nature, and, as such, their beneficial effects should prove lasting.

Conclusion: Stay Strategic

In our view, despite the recent turmoil in subprime mortgages and the credit markets generally, secular changes appear to be altering the long-term risk associated with real estate, and therefore lowering the returns investors will require from it (*Display 10*). But it's only in hindsight that one can safely determine whether something is a permanent feature or a cyclical shift. *While our analysis is long term in nature*, it does highlight some short-term factors we must still watch for: Rising interest rates, a continued widening of mortgage spreads, a drop in liquidity due to tightening credit markets, or a shift in the flow of equity capital could all move against the asset class, separately or simultaneously. This could hurt investors overexposed to commercial real estate, some of whom could suffer significant loss of equity. But these risks, of course, are not unique to commercial real estate.

So, with commercial real estate fully but perhaps not excessively valued, we think the asset class still warrants a long-term allocation. The key issue then becomes how to assess the level and sort of risks real estate portfolios present and the implications for investors' overall asset allocation. For a full discussion of this topic, please see our recent blackbook, *Commercial Real Estate: From the Ground Up.* ■

Display 10

The drivers of commercial real estate support today's rich valuations

The Elements	The Drivers	The Measures	Impact on Valuation*
Real Estate Fundamentals	Short-Term Income Growth	Market Supply/Demand	Neutral
	Long-Term Income Growth	Inflation Outlook	Lower
Capital Markets Forces	Risk-Free Rate	10-Year Treasury Yield	Higher
	Funding Costs	Mortgage Spreads	Higher
Secular Change in Risk	Diversification and Liquidity	Growth of Securitization	Higher
	Cash-Flow Stability	Business Cycle Volatility	Higher

*Relative to historical average
Source: AllianceBernstein

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