

Retired Investor

Invest Wisely...Get an Impartial Second Opinion.

This Month's Feature Articles: Key Points

Our first article this month introduces a new occasional feature in our U.S. dollar edition: "Ask the Financial Adviser." This month, Rick Miller from Sensible Financial Planning takes an in-depth look at different college savings options. With more grandparents helping to pay for college today, we thought our readers would appreciate a good background piece on this subject. Our second article takes a closer look at one particular option: Section 529 Plans. We first look at the trade-off between using actively managed versus index funds in a 529 Plan, and find the latter offer significant benefits. We then look at the factors which drive the minimum compound annual real return a 529 investor needs to earn. These include (1) Whether the beneficiary of your 529 Plan will attend a private or a public college or university; (2) The annual real growth rate in the cost of tuition, room, and board at private and public colleges; (3) The number of years left before your 529 Plan beneficiary will start college; (4) The percent of the total cost of college you would like the funds accumulated in the 529 Plan to cover; and (5) The amount you intend to contribute to the 529 Plan each year. We provide detailed tables that show how these interact to determine different target returns.

We then move on to the asset allocations that will maximize the probability of achieving these returns, using as an example the asset classes that are offered within Vanguard's 529 Plan. We finish by showing how different asset allocation methodologies produce different recommendations, and why we believe our simulation optimization approach is superior to the others.

This Month's Letter to the Editor

What is your opinion of the asset allocation calculators available on many other websites?

You raise an interesting question. Based on our previous research, we would have said "pretty low." Now, having looked at them again, we'd like to amend that to "very low." I'll start with a few examples from the sites we researched (the names of which we will withhold, to protect the guilty). Site #1 makes some interesting claims: "Your age is by far the most important aspect of asset allocation." "People with large portfolios...and people who save more each year...can invest more aggressively." "The better your outlook for the economy, the more aggressive you can be with your investments." This site produced its asset allocation recommendations based on our answers to seven questions, including our age, current savings, expected future savings per year, income requirement (expressed as a percentage of the portfolio), tax rate, risk tolerance (expressed by moving a slider from "low" to "high") and our "economic outlook" (for which we could move a slider from "poor" to "good"). Its asset allocation solution divided a portfolio between the following "asset classes": "Large Cap" (we presume this means large capitalization U.S. equities), "Mid Cap", "Small Cap", Foreign Stock, Bonds (presumably some type of U.S. bonds); "Municipals" (tax advantaged U.S. state and local bonds), and cash.

Site #2's calculator used a similar set of questions and sliders to collect our input data, but limited its recommended allocation to just five asset classes: "Large Caps", "Small Caps", International Equity, Bonds and Cash.

Site #3 asked us only four questions: "when do you need the money?", "how much risk can you handle?", "how much wiggle room do you have?" (one possible answer to this question was "if I miss my goal by a year or two I'll still be okay"), and "as the bear market intensified, did you do nothing, see an opportunity to buy more stocks, or sell?". On the basis of our answers, it produced a suggested asset allocation, divided between Large Cap, Small Cap, Foreign Equity, and Bonds. Oh, yes, and it also conveniently provided lists of suggested funds for each asset class. Said suggestions

contained a wide variety of actively managed funds, and, at least in the cast of Large Cap and Small Cap equity, two index funds.

Site #4 is run by a mutual fund company. It asked us eight questions to start with, including one about how much time we had to achieve our primary financial goal (the longest time frame available was "more than ten years."). After this, it divided our portfolio between just three asset classes: Stocks, Bonds, and Cash.

To its great credit, Site #5 based its asset allocation calculations on the rate of return sought by the investor, and noted that its goal was to produce the mix of asset classes most likely to achieve this return with minimum risk. Once we input our desired rate of return, it produced an asset allocation divided between Cash, Bonds, Large Cap Equity, Small Cap Equity, and International Equity. Based on a target return of 8% (which we presume was nominal, but the site didn't specify nominal or real), the site calculator told us that there was a 68% chance that the return in any year would fall between 5.66% and 10.34%. However, as this implies a portfolio standard deviation of 2.34%, we were confused by the next statement, which noted that "it is possible that in any given year you may earn only .06%." Eight percent less three standard deviations of 2.34% (which gives you the 99% probability range) would give you a minimum return of .98%, not .06%. Finally, this site also provided "helpful" links to "high performing stocks and funds that fit in the asset classes in your recommended portfolio."

We could go on with similar examples, but we won't; frequent readers are already in enough pain. Needless to say, we have a number of problems with the methodology which underlies these and similar asset allocation calculators. First, they confuse tilts within asset classes (e.g., large and small cap companies) with the asset classes themselves (e.g., U.S. equity). Moreover, they present no arguments on the potential advantages and disadvantages of taking such tilts. Second, they generally employ too few asset classes in their solutions, and thereby forego potential diversification benefits. Third, their recommendations are typically based (site #5 being the exception) on the results of some type of "risk capacity" survey. In other words, their logic proceeds from determining the maximum risk a person is comfortable with, to the translation of this into a maximum portfolio standard deviation (the statistical measure of the dispersion of an

asset or portfolio's returns around its mean), to the calculation of an asset allocation that maximizes expected returns subject to this risk constraint.

In our experience, the real world doesn't work like this. The majority of people we know start with a set of financial goals they'd like to achieve within a certain time period, along with their current and expected future savings. They then use these starting points to "back into" the minimum compound rate of return they need to earn on their portfolio to achieve their goals. The asset allocation challenge then becomes how to maximize the probability of achieving this rate of return, at the lowest possible risk. Moreover, if an investor isn't comfortable with the risk implied by the asset allocation solution, he or she must confront some realistic alternatives: reduce his or her goals, stretch out the time period for achieving them, or increase annual savings. Unfortunately, as they are currently structured most online asset allocation calculators skip these practical realities.

Fourth, in our survey of different sites, it was never clear what underlying assumptions were being used in the asset allocation calculations. How were the asset classes defined? Were the assumed future asset class returns, standard deviations, and correlations based on historical averages? If so, over what period? Or were they based on the outputs of a forward-looking asset pricing model? If so, how does that model work? Or were they based on the combination of these two approaches (theoretically the most defensible solution)? The bottom line is that when you use online calculators you don't know the answers to these critically important questions, and therefore have no way of either judging the quality of the result or comparing the results produced by different calculators.

Fifth, we have a very strong suspicion that in many cases, the underlying methodology used by these calculators to produce their asset allocation recommendations is mean/variance optimization (a straightforward application of linear programming). The basic problem we have is that MVO is a technique designed to produce optimal solutions to problems involving one year holding periods. Its use for longer period problems -- which characterize the ones faced by many users of these calculators -- is much more difficult to theoretically justify (see our blue button "Asset Allocation Methodology Summary" for a much longer discussion of this).

Finally, as we repeatedly point out in our writing on the subject, all asset allocation methodologies are subject to some very important limitations, including non-normal (in the statistical sense!) historical returns for most asset classes, and non-stationary (i.e., changing) underlying returns generating economic processes. Unfortunately, none of the online asset allocation calculators we examined disclosed this to potential users. This violates one of our fundamental principles: you should never use an analytical tool unless you also make clear the potential limitations of the results it produces. Sometimes, knowing what you don't know is as important as knowing what you do. In sum, we found all the online calculators we examined had serious limitations.

Global Asset Class Returns

YTD 30Apr04	In USD	In AUD	In CAD	In EURO	In JPY	In GBP
US Bonds	0.00%	4.04%	5.50%	4.75%	2.85%	0.44%
US Prop.	-4.50%	-0.46%	1.00%	0.25%	-1.65%	-4.06%
US Equity	-0.30%	3.74%	5.20%	4.45%	2.55%	0.14%
AUS Bonds	-7.20%	-3.16%	-1.70%	-2.45%	-4.36%	-6.76%
AUS Prop.	5.10%	9.14%	10.60%	9.86%	7.95%	5.55%
AUS Equity	-2.60%	1.44%	2.90%	2.15%	0.25%	-2.16%
CAN Bonds	-4.36%	-0.32%	1.14%	0.39%	-1.51%	-3.92%
CAN Prop.	-16.70%	-12.66%	-11.21%	-11.95%	-13.86%	-16.26%
CAN Equity	-6.20%	-2.16%	-0.70%	-1.45%	-3.35%	-5.76%
Euro Bonds	-3.16%	0.88%	2.34%	1.59%	-0.31%	-2.72%
Euro Prop.	4.50%	8.54%	9.99%	9.25%	7.34%	4.94%
Euro Equity	-3.30%	0.74%	2.20%	1.45%	-0.45%	-2.86%
Japan Bonds	-3.17%	0.87%	2.33%	1.58%	-0.32%	-2.73%
Japan Prop.	25.75%	29.79%	31.25%	30.50%	28.59%	26.19%
Japan Equity	5.20%	9.24%	10.70%	9.95%	8.05%	5.64%
UK Bonds	-0.48%	3.56%	5.02%	4.27%	2.37%	-0.04%
UK Prop.	21.80%	25.84%	27.30%	26.55%	24.65%	22.24%
UK Equity	0.10%	4.14%	5.60%	4.85%	2.95%	0.54%
World Bonds	-1.60%	2.44%	3.90%	3.15%	1.25%	-1.16%
World Prop.	2.10%	6.14%	7.60%	6.85%	4.95%	2.54%
World Equity	0.50%	4.54%	6.00%	5.25%	3.35%	0.94%
Commodities	9.40%	13.44%	14.90%	14.15%	12.25%	9.84%
Hedge Funds	1.42%	5.46%	6.92%	6.17%	4.27%	1.86%
A\$	-4.04%	0.00%	1.46%	0.72%	-1.19%	-3.60%
C\$	-5.50%	-1.46%	0.00%	-0.74%	-2.65%	-5.05%
Euro	-4.75%	-0.72%	0.74%	0.00%	-1.91%	-4.31%
Yen	-2.85%	1.19%	2.65%	1.91%	0.00%	-2.40%
UK£	-0.44%	3.60%	5.05%	4.31%	2.40%	0.00%
US\$	0.00%	4.04%	5.50%	4.75%	2.85%	0.44%

Equity and Bond Market Valuation Update

Our equity market valuation analysis rests on two fundamental assumptions. The first is that the long term real equity risk premium is 4.0% per year. The second is the average rate of productivity growth an economy will achieve in the future. As described in more detail on our website (see the green button labeled “domestic equity”), we use both high and a low productivity growth scenarios for each region. Given these assumptions, here is our updated market valuation analysis at the end of last month:

Country	Real Risk Free Rate Plus	Equity Risk Premium Equals	Required Real Return on Equities	Expected Real Growth Rate* plus	Dividend Yield Equals	Expected Real Equity Return**
Australia	3.29%	4.00%	7.29%	4.90%	3.67%	8.57%
Canada	2.42%	4.00%	6.42%	2.10%	1.95%	4.05%
Eurozone	1.43%	4.00%	5.43%	2.50%	2.61%	5.11%
Japan	1.13%	4.00%	5.13%	2.70%	0.88%	3.68%
U.K.	1.88%	4.00%	5.88%	2.50%	3.22%	5.72%
U.S.A.	2.54%	4.00%	6.54%	4.50%	1.69%	6.19%

*High Productivity Growth Scenario. See our website (green button, “domestic equity”), for assumptions used in both productivity growth scenarios for each region.

** When required real equity return is greater than expected real equity return, theoretical index value will be less than actual index value – i.e., the market will appear to be overvalued.

Country	Implied Index Value*	Current Index Value	(Under) or Overvaluation in High Growth Scenario	(Under) or Overvaluation in Low Growth Scenario
Australia	153.56	100.00	-54%	-8%
Canada	45.14	100.00	55%	63%
Eurozone	89.08	100.00	11%	41%
Japan	37.77	100.00	62%	74%
U.K.	95.27	100.00	5%	34%
U.S.A.	82.84	100.00	17%	44%

*High productivity growth scenario.

At the suggestion of a number of readers, this month we are also expanding our equity market valuation analysis. As we have described, our estimate of over or undervaluation is based on the relationship between the returns an equity market is expected to supply, and those investors are likely to demand. We define the former as the current dividend yield plus the expected rate of real long-term economic growth. To be sure, changes in the market price/dividend (or price/earnings) ratio also affect the returns supplied. However, we view these as being essentially driven by psychological factors which we have no basis for predicting. Hence, we do not include future price/dividend ratio changes in our analysis.

We define the future demand for equity market returns to be equal to the current yield on long term real return bonds, plus a four percent long term equity market risk premium. As you can see, the good news is that two of the factors in our model -- current dividend yields and the real bond return -- are easily obtained from the daily paper. The bad news is that the other two -- the expected rate of dividend growth and the "correct" equity market risk premium -- are two of the most contentious issues in finance. However, as a number of readers have pointed out, by assuming one of these, you can derive an estimate of the market's current expectation for the other. Specifically, the market's current implied rate of future dividend growth equals the current real bond yield plus the four percent equity market risk premium less the current dividend yield. Similarly, the market's current implied equity market risk premium equals the current dividend yield plus our estimated future growth rate less the current real bond yield. To further help our readers assess the relative valuation of different equity markets, we will be presenting this information each month, as shown in the following table:

	Current Dividend Yield	Current Real Bond Yield	Implied Future Real Growth Rate, Assuming 4% ERP	Implied ERP, Assuming Low Future Growth Scenario	Implied ERP, Assuming High Future Growth Scenario
Australia	3.67%	3.29%	3.62%	4.28%	5.28%
Canada	1.95%	2.42%	4.47%	0.63%	1.63%
Eurozone	2.61%	1.43%	2.82%	2.18%	3.68%
Japan	0.88%	1.13%	4.25%	1.55%	2.55%
United Kingdom	3.22%	1.88%	2.66%	2.34%	3.84%
United States	1.69%	2.54%	4.85%	2.65%	3.65%

This month we are also adding a new bond market valuation update. It is based on the same supply and demand methodology we use for our equity market valuation update. In this case, the supply of future fixed income returns is equal to the current nominal yield on ten year government bonds. The demand for future returns is equal to the current real bond yield plus the historical average inflation premium (the difference between nominal and real bond yields) between 1989 and 2003. To estimate of the degree of over or undervaluation for a bond market, we use the rate of return supplied and the rate of return demanded to calculate the present values of a ten year zero coupon government bond, and then compare them. If the rate supplied is higher than the rate demanded, the market will appear to be undervalued. This information is contained in the following table:

	Current Real Rate	Average Inflation Premium (89-03)	Required Nominal Return	Nominal Return Supplied (10 year Govt)	Rate Gap	Asset Class Over or (Under) Valuation, based on 10 year zero
Australia	3.29%	2.96%	6.25%	5.95%	-0.30%	2.87%
Canada	2.42%	2.40%	4.82%	4.62%	-0.20%	1.93%
Eurozone	1.43%	2.37%	3.80%	4.21%	0.41%	-3.87%
Japan	1.13%	0.77%	1.90%	1.54%	-0.36%	3.60%
UK	1.88%	3.17%	5.05%	4.98%	-0.07%	0.67%
USA	2.54%	2.93%	5.47%	4.50%	-0.97%	9.68%

It is important to note that this analysis looks only at government bonds. The relative valuation of non-government bond markets is also affected by the extent to which their respective credit spreads (that is, the difference in yield between an investment grade or high yield corporate bond and the yield on a government bond of comparable maturity) are above or below their historical averages (with below average credit spreads indicating potential overvaluation).

Finally, for an investor contemplating the purchase of foreign bonds or equities, the expected future annual percentage change in the exchange rate is also important. Study after study has shown that there is no reliable way to forecast this. At best, you can make an estimate that is justified in theory, knowing that in practice it will not turn out to be accurate. That is what we have chosen to do here. Specifically, we have taken the difference between the yields on ten- year government bonds as our estimate of the likely future annual change in exchange rates between two regions. This information is summarized in the following table:

	To A\$	To C\$	To EU	To YEN	To GBP	To US\$
From						
A\$	0.00%	-1.33%	-1.74%	-4.41%	-0.97%	-1.45%
C\$	1.33%	0.00%	-0.41%	-3.08%	0.36%	-0.12%
EU	1.74%	0.41%	0.00%	-2.67%	0.77%	0.29%
YEN	4.41%	3.08%	2.67%	0.00%	3.44%	2.96%
GBP	0.97%	-0.36%	-0.77%	-3.44%	0.00%	-0.48%
US\$	1.45%	0.12%	-0.29%	-2.96%	0.48%	0.00%

For example, ten-year Eurozone government bonds currently have a nominal yield of 3.96%. Assume their purchase is being considered by an investor whose functional currency is A\$. Given the estimated annual change in the A\$/Euro exchange rate of 1.74% (that is, the A\$ is expected to depreciate versus the Euro), the estimated A\$ return on the Eurozone bond is $3.96\% + 1.74\% = 5.70\%$. Note that this assumes that the foreign exchange risk is not hedged (since, in an efficient market, the cost of that hedge would be equal to slightly more than the expected change in the exchange rate, and would therefore approximately equalize the domestic and foreign government bond yields).

Ask The Financial Adviser: How Should I Save for College?

This month we are adding a new feature to the U.S. Dollar edition of The Index Investor: an occasional column by a Registered Investment Adviser who will address more technical issues that are of particular interest to our U.S. readers. The adviser is Rick Miller, the founder of Sensible Financial Planning, Inc. (www.sensiblefinancial.com), a fee-based, index-oriented firm located in Cambridge, Massachusetts. Full disclosure: Rick is related to our publisher. However, before anybody complains about that, we should also mention that he has a PhD. in Economics from the University of Chicago and a Masters in Mathematics from the same university. We have always enjoyed reading his material, and thought our readers would benefit if we shared them more widely. But you are the judge: please feel free to email us to let us know what you think of this new feature, and what other subjects you'd like Rick to cover in his future columns.

Introduction

Saving for college is a very significant financial planning issue for most families, second only to retirement saving. This article addresses two key elements of college financing – paying for college with savings and financial aid, and college savings plans. We'll compare the most popular types of college savings plans, including 529 plans (still a relative newcomer), Coverdell Educational Savings Accounts (ESAs), Series I bonds, and Uniform Transfer to Minors Act (UTMA) accounts, and plain old savings accounts. Each has its own charms, but for most people, there is a clear winner. We'll also consider retirement savings accounts as vehicles for college savings.

College Finance – The Very Basics

The very first thing to understand about paying for college is that **the price isn't the same for everyone**. Colleges, with the active support of the Federal government, vary their prices based on (among other things) a family's financial resources. Colleges offer

financial aid (a lower price) to families with lower incomes and assets. With Federal support, colleges also offer subsidized (below market price) loans to those families.

Secondly, many **families can affect the price that they pay**. Colleges evaluate each family's financial resources using the Federal Methodology (FM), or the Institutional Methodology (IM) which assume that some types of assets and income are more available to pay for college than others depending upon:

- Income source
- How families hold their assets

To a certain extent, families can obtain more financial aid (a lower price) by moving income from children to parents, and by carefully selecting how to hold their assets. The FM treats home equity as unavailable for college. See the following table:

Type of asset or income	Federal Methodology (FM)	
	Excluded amount	Annual college contribution (above excluded amount)
Children's assets	\$0	35%
Home equity	Unlimited	0%
Retirement accounts	Unlimited	0%
Other parents' assets	\$45,000 (figure varies with parent age)	6%
Parents' incomes	\$20,000 (incomes up to \$40,000 get a limited exclusion)	47%
Children's incomes	\$0	50%

The IM is in fact a collection of methodologies. Each school using an IM seems to have its own approach. They all seem to agree that home equity is an asset that can be drawn on. Beyond that, there is variation. For example, some schools treat retirement assets as an asset that can support a contribution. The wide range of policies suggests that building a saving or investing strategy around the IM is a waste of time. More selective schools

tend to use an IM, but all schools must use the FM for allocating Federal funds among students. The rest of this discussion focuses on the impact of the FM.

For some families, both methodologies simply mean they can hope for full support, or no support. Both the FM and the IM assume no contribution from the families with levels of assets and income below the excluded amount, and both assume that families with very large resources will foot the entire bill. In these cases the saving allocation decision has no impact.

For families in the middle, however, increases in expected contribution mean decreases in financial aid. These reductions constitute an implicit “tax” on incremental resources. For example, each \$1 that a “middle” family shifted from home equity to “college” assets (such as a 529 or ESA) would cost about \$.23 in financial aid. **For these families, the decision about how to save for college can be especially complex.**

Who are these “middle” families? And, more to the point, is **your** family a middle family? The simple answer (if not the clear answer you’d like) is, you could be. You are more likely to be such a family if:

- Your income is lower (62% of families earning between \$40,000 and \$70,000 received some aid, as did 37% of those earning from \$70,000 to \$100,000 and even 22% of those earning over \$100,000);
- You have more children in college simultaneously;
- Your child is likely to select a (more expensive) private college.

And, it’s even more complex, because some schools use the FM, which distinguishes sharply between home equity and college saving assets, and others use the IM, which does not. For schools using the IM, the saving allocation decision has no impact, while for schools using the FM, savings toward home equity don’t reduce financial aid, while savings toward uncommitted assets do.

To cut through all of the complexity, Sensible Financial recommends:

- If you are a potential “middle” family (say, income of \$150,000 or less), and wish to improve your children’s chances of receiving financial aid, you should:
 - **First**, plan to maximize your holdings of “committed” assets, especially retirement accounts and home equity. Colleges following the FM currently do not count them when assessing a family’s expected contribution.
 - **Then**, contribute to either a 529 or an ESA or both.
- If you are a high income family (say income of \$150,000 or more), contribute to either a 529 or an ESA or both.

In this way, you’ll be sure that if there is any chance of qualifying for financial aid, you will qualify. At the same time, you will be saving toward your two most important financial goals – a comfortable retirement and college education for your children. If your child’s college happens to follow the IM, and expects you to contribute based on your home equity, you can take a second mortgage at that time, and you’ll be in nearly the same situation as you would have been had you “officially” saved for college, using 529s and ESAs.

Please note that we said “plan to pay off your mortgage.” If you are on schedule to accomplish this goal by the time your first child enters college, there is no need to accelerate your payments. With the current low level of mortgage rates, even a relatively conservative investment in a college savings account will return more than paying off your mortgage. And, the longer your savings have to appreciate, the more assets you’ll have available to spend on college, when the time comes.

Consider: each dollar of reduction in your mortgage balance saves you the after-tax interest rate you are paying. For example, with a mortgage rate of 6%, in the 25% tax bracket, your after-tax interest rate is 4.5%. In a 529 plan or ESA, your returns are **tax-free** if the distributions are used to pay for college. So, if you expect to earn 5% in that account, your after-tax return is ... 5%. The appropriate comparison is the pre-tax rate in

a 529 or ESA with the after-tax rate on your mortgage. So, in our example, paying the next dollar to your mortgage company earns 4.5% after tax, depositing it in a 529 or ESA earns 5%.

College Savings Plan Options

College savings accounts have two fundamental objectives – savings discipline and tax reduction. Even if you don't need the discipline, increasing lifetime spending power by paying less in lifetime taxes is always a good idea (In a newsletter we have to make general statements. It's always a good idea to consult your advisor directly to see how unique elements of your situation influence the selection of the best solution for you).

529 Savings Plans – offered by every state, these accounts are invested in a small number of investment alternatives, many of which reduce risk and return as the date of college enrollment approaches. Assets accumulate tax free, and investment returns spent for qualified expenses (post-secondary education) are not taxed. In this sense, these plans are very similar to Roth IRAs, but contribution limits are much higher, at 401(k) levels. In some states, contributions are state income tax-deductible for in-state residents, offering even better after-tax return. Families in one state are free to choose a plan offered by another state – but any state income tax deductibility is available only to in-state residents.

Even if this tax break is allowed to expire in 2010 as current law envisions, the returns are still taxable at your child's rate – lower than yours, quite likely. The only potential drawback is a 10% tax penalty on earnings not used for post-secondary education, in addition to the taxes you pay on those earnings at ordinary income rates. Scholarship recipients avoid the tax penalty, but still must pay taxes on the earnings.

Each state has made a deal with one or more investment managers to manage the portfolios – choose carefully, as investment management expenses vary widely.

529 Prepaid Plans – again offered by most states, these plans are effectively *advance purchase plans* for participating colleges. TIAA-CREF now sponsors an independent pre-paid 529 plan that covers over 200 private colleges in many states. These plans offer the opportunity to “lock in” tuition prices – an attractive feature given recent high rates of tuition inflation.

In Massachusetts, for example, approximately 80 colleges agree to accept your account as follows:

- If your deposit in the plan this year equals 100% of this year’s tuition at a participating college, then that institution will give you credit for 100% of tuition whenever your child matriculates. If your deposit equals 50% of this year’s tuition, they give credit for 50%, and so on. A deposit can be used at any of the 80 colleges when your child is ready.
- If your child picks one of these schools, you can be assured of keeping pace with the rapidly rising price of college.
- However, if your child *doesn’t* choose one of those 80 schools, your account may be worth a good deal less than if you had invested in the 529 Savings Plan – earning only bond returns, or perhaps even less. The TIAA-CREF plan has the same drawback.

Coverdell Educational Savings Accounts – are available through brokers and mutual fund companies, and do not vary by state. These could be thought of as the Roth IRA of education (in fact, they used to be called education IRAs). They have relatively low contribution limits (\$2,000 per year) but investment returns are never taxed if used for a qualified purpose. And these plans are more flexible than 529 plans – secondary education is also a qualified use. These plans also have a 10% penalty on earnings not used for educational purposes. Unfortunately, these plans are fully available only to families with incomes less than \$190,000 per year, and are not available at all to families with incomes over \$220,000.

Series I Bonds – tax advantaged Federal government bonds. These bonds are protected against inflation, and may have a role in your portfolio even if not for financing education. Earnings are state and local income tax free, and federal income tax deferred. For qualified taxpayers (income less than \$114,000), earnings are fully or partially excludable from federal income tax, if used for qualified higher education expenses (tuition and fees). Up to \$30,000 per year can be invested. Most families should find this sufficient to finance the full amount of college costs.

UGMA and UTMA (officially, Uniform Gift to Minors Act and Uniform Transfer to Minors Act, but pronounced as they look – Ugh-ma and Uht-ma) – the old standbys. These accounts have no tax advantages related to education. They do allow the transfer of assets to your children, and your children's incomes (up to \$1500) are taxed at their rates, which are probably lower than yours.

Simple savings accounts, either in a bank or in a mutual fund or brokerage account – these accounts can provide savings discipline, but offer no tax advantages.

The dark horses - qualified retirement plans (deductible IRAs, Roth IRAs, 401(k)s, etc.) – All of these plans offer the ability to defer taxes. Assets may be drawn from regular IRAs for college expenses without penalty. Roth IRAs are more restrictive – a 10% penalty applies unless the parent is 59½. Withdrawals from 401(k)s to finance college education are also subject to significant restrictions:

- withdrawals are treated as loans, which must be repaid;
- only tuition and fees (not room and board) can be financed without tax penalties; and
- “only” \$50,000 can be withdrawn, limiting the size of the balance that can be accumulated for college.

Further, unless you do not need all of your retirement savings capacity to support your retirement, these assets and their tax deferral should be preserved for retirement, and

other accounts should be used for college finance. Thus, you should save for college using retirement savings vehicles only after thinking this approach all the way through.

Types of college savings accounts – pros & cons

In evaluating the alternatives, you'll want to consider several issues:

- **How attractive are after-tax investment returns?** Do you have access to a full range of investment options, or are there some restrictions? Are there tax advantages, or not?
- **How big a balance can you build?** That is, can you save the full balance you need in one kind of account, or will you have to establish multiple kinds of accounts to do so?
- **Are the funds transferable?** Can they be used at any college? If not, and you choose a college where they can't be used, what happens then?
- **What else can be done with the money?** What happens if you save more than your child needs for college? Your child may choose an inexpensive school after you've saved enough for an expensive one, or earn a full scholarship. What then? Or, your child may decide not to go to college at all. What can you do with the money in the event that a portion or all of the money is unused?
- **Whose money is it?** This influences whether the money will be used as you intend or not. Money belonging to your child might be used to buy a Lamborghini instead of a college education. Money belonging to you won't be (unless you choose to address a mid-life crisis with a really fast car).
- **How do savings dollars count toward assessing financial aid?** There is another advantage to accounts that are owned by the parents (or treated that way for the purposes of assessing financial aid) – a smaller fraction of them need be contributed toward college costs in any year than dollars from accounts owned by the children.

And the best deal is ... 529 Savings Plans. They are best if you can be sure you will spend the accumulated assets entirely on post-secondary education. The only drawback is the tax penalty on excess funds. The Prepaid 529 plan offers excellent returns so long as it is used at one of the sponsoring institutions. If you can be sure which school your child will attend, in advance, these are worth considering. A Coverdell ESA plan offers similar after-tax return potential, and offers the flexibility of including secondary education as a qualified use. It shares the tax penalty on excess funds. The fly in the ointment? The restriction on annual contributions may limit your accumulation, especially if you are late in starting to save. However, there is nothing to stop you from having both – the Coverdell offers the flexibility of allowing you to save for secondary school costs, if that is something you are considering. Fund an ESA first, and then a 529. The following table summarizes all of these points. The "Grand Summary Table" at the end of this article provides more detail.

	529 Savings	529 Prepaid	Coverdell ESA	UGMA / UTMA	Series I Bonds	Simple Savings	IRA	401 (k)
After Tax Returns	1	1,2	1	2	2	2,3	1	3
Big Balance	1	1	3	1	1	1	2	2
Transferable	1	3	1	1	1	1	1	1
Other Uses	3	3	2	1	1	1	1	1
Ownership	1	1	2	3	1	1	1	1
Financial Aid	1	3	1	3	1	1	1	1
Overall	1	3	1,2	3	1,2	1,2	2	3
Comments	Just don't overfund	Only if you're sure which college/state	Fund first for flexibility; biggest disadvantage - balance limit	No education specific tax advantage, reduces financial aid	No equity exposure	No tax advantage, but great flexibility	Returns attractive, use only if not needed for retirement	Tax penalty makes this a non-starter

1 Most Attractive
 2 Moderately Attractive
 3 Least Attractive

Each state offers its own 529 program, with its own suite of investments, managed by one or more asset managers. For an index investor, the best plans are managed either by index leader Vanguard (Nevada, Utah, Iowa) or low cost semi-active manager TIAA-CREF (California, Connecticut, Georgia, Idaho, Kentucky, Michigan, Minnesota, Mississippi, Missouri, Oklahoma, Tennessee, Vermont). Other states offer plans managed by no-load managers, or in many cases, by load fund managers. Many states offer both no-load and broker-sold, loaded options. If your home state offers an income tax deduction for contributions, it's probably best to select your state's program if a no-load option is available – it's hard for slightly lower fees to overcome the contribution tax benefit. If your state doesn't allow contribution tax deductibility, then one of the Vanguard plans is probably your best bet. Do check to be sure that your state allows distributions for education to be tax free for out-of-state plans – some states don't so as to “encourage” their citizens to patronize their own state's more expensive program.

529 plans are due to expire in 2010, along with the recent changes to estate taxes. We do no political “handicapping.” It is fair to say, however, that if the Congress does eliminate these tax advantaged accounts at that time, there will be many families affected, and we can at least hope that families will be able to retain at least some of the tax deferral they will already have realized by that time.

Series I bonds are an excellent low risk investment. Risk averse families need look no further. These inflation-adjusted bonds allow you to lock in a real return until college expenses are due. The \$30,000 per person (and \$30,000 per person additional if purchased on-line) purchase limit is likely to constrain only those parents who wait to begin their saving program until college starts. However, the returns on these securities are relatively low, reflecting their resistance to inflation and the reliability of the issuer (the US government). In addition, the tax benefits of these securities are available only to families with incomes under \$117,000. Those with higher incomes enjoy only the inflation protection.

UTMAs and UGMAs offer lower average tax rates for all investments, and these benefits are even greater once your children reach 14. Younger children pay tax at their parents' rates after the first \$1500 of unearned income, while those over 14 can be treated as independent tax-payers. Consult your own tax advisor for the net tax benefit. The major drawbacks of these accounts are that once children reach 18, the money is theirs. They can decide that the funds should be spent on something "more important" than college. In addition, colleges treat these assets as belonging to the child, and will assess them as being directly available for the expected family contribution – no aid will be available unless exhausting these assets over the student's college career is insufficient to cover their college costs.

A simple mutual fund account allows significant tax deferral for assets invested in equities. An index investor buying and holding equity index funds will pay minimal tax until the securities are sold to pay college tuition. Bond funds in these accounts provide minimal tax deferral, and offer the lowest rate of return of all the possibilities considered.

IRAs and 401(k)s are available as college savings vehicles only to those families which do not require their entire capacity for retirement savings. In other words, families who "max out" their IRA and 401(k) contributions, and who will need all of those savings for retirement, can't use them for college savings, too. The following discussion applies only to those who have "room" in these retirement savings vehicles for college savings, too. For these families, the net return after financial aid to college savings in IRAs and 401(k)s is likely to be higher than for savings in college specific vehicles like 529s and ESAs. This is because savings in retirement vehicles are "committed" assets, not available to increase the expected family contribution for the purposes of the FM.

IRA assets can be withdrawn without tax penalty to pay higher education expenses. Taxes must be paid on the accrued income at ordinary income tax rates. The after-tax rate of return will be the same, on average, as for a 529 or ESA.

Finally, here is the financial bottom line. We've simulated the returns you might expect under the following assumptions:

- 60% of your saved assets are invested in equities, 40% in bonds
- Equities earn 8%, bonds 4% (I-Bonds, too)
- Investment made when your child is 5, 13 years before college starts
- 25% tax bracket for taxable accounts, 6% state tax rate
- The "small" UTMA is one which does not generate more than \$1,500 income, thus keeping the earnings in the child's tax bracket.

The following table shows the assets available to finance college produced by a \$1,000 after-tax investment. Note that for tax-deductible accounts (the IRA and the deductible 529) that the initial account balance is greater than \$1,000.

	Deductible 529	Non-deductible 529	Coverdell	IRA	I Bond	Small UTMA	Large UTMA	"Savings Account"
Initial (After Tax Investment)	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Initial Account Balance	1,064	1,000	1,000	1,449	1,000	1,000	1,000	1,000
Acct Bal pre-Distribution	2,383	2,240	2,240	3,246	1,665	2,162	1,982	1,929
No grant reduction Acct Val After Distrib.	2,383	2,240	2,240	2,240	1,665	2,162	1,982	1,929
Return on AT Investment (no EFC increase)	6.9%	6.4%	6.4%	6.4%				5.2%
Grant Reduction Grant Reduction - EFC increase	534	502	502	-	373	2,162	1,982	432
"middle" families Net Available for College Tuition	1,849	1,738	1,738	2,240	1,292	-	-	1,497
Return on after-tax investment	4.8%	4.3%	4.3%	6.4%	2.0%	-	-	3.2%
						100.0%	100.0%	

- If you do not expect to receive a significant grant, the best choice is the deductible 529, which yields \$2,383 for your \$1,000 after-tax contribution. The IRA, Non-deductible 529 and Coverdell all come close with \$2,240. The taxable accounts bring up the rear. A “small” UTMA, comes close at \$2,162, but the large UTMA and the savings account are significantly lower.
- If you are a middle family and expect to receive a significant college grant, the best choice is your IRA [so long as you do not need its entire capacity for retirement savings]. \$1,000 in after-tax savings yields \$2,240 in net college funds in our example. Next most attractive is the deductible 529 with \$1,849, then the regular 529 and ESA with \$1,738. Note that the UTMA is least attractive – as a student asset, it increases the EFC dollar for dollar over 4 years, and has a minus 100% return.
- Note: in our example, 529 plans offer about 1.1% to 1.2% per year better returns than a simple savings account. A fee disadvantage that large or greater completely wipes

out the tax advantage. Deductible 529 plans offer 1.6% greater returns or so, and can support slightly larger extra fees. However, a very low cost plan (.5% or more lower in cost) can overcome the advantage of tax-deductibility.

- The I-Bond produces lower returns, but at much lower risk (remember that the other accounts are assumed to invest 60% in stocks). The returns we've shown assume that stocks and bonds produce their returns steadily, but inveterate readers of this site will know that volatility is guaranteed.
- We'll re-emphasize the risk point here. This analysis illustrates the likely **relative** performance of the alternative vehicles. Stock and bond market returns will certainly vary from that used for the illustration.

College saving can seem very complex. However, the key point to take away is that the college savings vehicles – 529 plans and ESAs, offer significant advantages over simple savings accounts.

If you are a few years away from college, you have a pretty good sense of your situation – the kind of school your child will select, your financial resources, etc. You can make a pretty fair assessment of whether you are likely to affect your aid by using one of those vehicles.

If you are further away, the uncertainty is greater. Do the best you can – keep up your mortgage payments, and save as much as you can for retirement. If you can save more, use an ESA, and if you can save still more, use a 529.

Good luck, and we'll see you at graduation!

If you would like more information on college savings options, you can visit www.sensiblefinancial.com or call Rick Miller at 617-444-8677.

College Savings Options: Grand Summary Table

	529 Plans	529 Prepaid Plans	Coverdell ESA	Series I Bonds	UGMAs and UTMAs	Ordinary savings	IRA	401(k)
How large a balance can you build?	Maximum annual contribution <ul style="list-style-type: none"> • \$11k per parent • \$55k per parent can be contributed in 1 year (uses up maximum from 5 years at once) Each plan has balance maximum (usually over \$100k) above which further contributions are precluded		Maximum annual contribution \$2,000	Maximum annual purchase \$30,000	No limit to contributions, but gifts over \$11k per year per parent may be subject to gift tax	No limit	\$3,000 per year (\$3,500 for those over 50)	\$12,000 per year (\$14,000 for those over 50)
How else can balances be used?	Must be used for higher education expenses, or tax penalties apply. Withdrawals can match scholarships received without tax penalty. Beneficiary can be changed.			Must hold for five years to avoid redemption penalty. No use restrictions	Can be used for any purpose		Can be used for any purpose, ordinary income tax owed at withdrawal	
			Elementary or secondary education				Penalty-free withdrawals to fund higher education	10% tax penalty for withdrawals before age 59_
How large are after-tax returns?	Contributions income tax deductible in some states. Withdrawals used for higher education free from Federal and state tax (otherwise penalties apply) [some states impose income tax on residents investing out-of-state].		Fully available only to families with income less than \$190,000 (phased out for incomes \$190,000 - \$220,000). Earnings income-tax-free if used for higher education (otherwise penalties apply)	Returns limited – intermediate term bond, inflation-indexed Earnings state tax free, federal tax deferred [federal tax free if used for higher education expenses (for family incomes <\$117k)]	Small tax advantage (only income over \$1500 taxed at parents' rate) until children are 14. Once children reach 14, income taxed at their rate	Earnings taxed at relevant ordinary income or capital gains rates	Contributions tax-deductible, earnings tax-deferred, withdrawals taxed as ordinary income	
		If used outside the state where established, returns significantly reduced					Penalty-free early withdrawal to finance higher education	Up to \$50,000 can be borrowed from these accounts

	529 Plans	529 Prepaid Plans	Coverdell ESA	Series I Bonds	UGMAs and UTMAs	Ordinary savings	IRA	401(k)
Whose money?	Donor's (can withdraw the money) Donor can change beneficiaries at will		Owned by child. Parent can't withdraw the money, can change beneficiaries	Owned by parents	Owned by child once age 21 is reached Used only for child's benefit	Owned by parents		
Financial aid impact?	Parents' asset	Parents' asset – but counts as tuition payment	Student's asset	Parents' asset	Student's asset	Parents' asset	Parents' asset – FM does not consider for purposes of awarding financial aid	

529 Plan Asset Allocation Issues

This article assumes that you have decided to use a Section 529 College Savings Plan. We will now confront two issues you face: (1) Should you invest in actively managed or index funds within your 529 Plan? And (2), how should you divide your 529 Plan investments between different asset classes?

Active vs. Passive 529 Investments

At the end of 2002, Financial Research Corporation estimated that, in aggregate, all Section 529 plans held \$19,766 million in assets. The Rhode Island College Bound Fund was the largest 529 plan in the country, with estimated assets of \$2,661 million, up 74 percent from the previous year. Between 2000 and 2003 the Rhode Island plan increased from 1,700 accounts and \$8.6 million in assets to 400,548 accounts and \$3.9 billion in assets. The Rhode Island College Bound Fund is managed by Alliance Capital, and exclusively uses actively managed funds.

What accounts for Rhode Island's number one ranking, and astounding rate of growth over the last three years?

The answer isn't hard to figure out. According to Cerulli Associates of Boston, and Financial Research Corporation, about two thirds of the nation's 529 assets are in plans that were established with the assistance of a financial adviser (e.g., a stockbroker, financial planner, etc.). And Rhode Island's CollegeBound Fund richly rewards them for their marketing efforts.

Consider this comparison. If you are not a resident of Rhode Island, when you invest in Rhode Island's plan through a broker, you pay a sales load of 4.25% (based on the online prospectus, dated August, 2002 at www.collegeboundfund.org). This assumes that you buy the "A" class of fund shares. If you do this, you also pay a further .25% per year (of the 529's asset value) in sales charge. If you are a Rhode Island resident, the initial sales load is waived

if you invest through a financial advisor, but the annual sales charge is not. To eliminate the latter, you have to invest directly, not through a financial advisor.

The net funds you contribute to the plan (that is your initial investment less 4.25%) are invested in a mix of actively managed mutual funds managed by Alliance Capital. The average annual expenses on these funds range from .45% to 1.63% per year. The specific mix of funds can be set in three different ways. First there is a set of pre-determined fund mixes that changes based on the age of the beneficiary (becoming more conservative as the time the funds will be needed approaches). Second, there is a set of predetermined mixes that do not change over time. Finally, you can simply choose your own mix (or have your advisor do this) from the mix of the CollegeBound Fund's underlying mutual funds. We have calculated the weighted annual expense charge for the three core allocation portfolios whose fund mix does not change over time. For both the aggressive growth and growth portfolios, the average annual expense charge is 1.11% of the 529 account's assets. For the balanced portfolio, it is .92%.

On the other hand, if you invest in Iowa's 529 plan (which uses Vanguard index funds, as does a similar plan in Nevada, and soon Ohio too), you pay no initial sales load or ongoing sales charge. Moreover, your funds have annual expenses of only .65% (high by index fund standards, but apparently necessary to cover the higher costs of running a 529 Plan).

Finally, there is one more hidden cost difference. Because actively managed funds try to "beat the market" (that is, earn a higher rate of return than the index fund, which simply earns the market average, before expenses), they tend to trade more frequently. This imposes further costs on the actively managed fund, compared to the index fund (e.g., trading commissions, and adverse price moves while the trade is being executed). These have been conservatively estimated at .50% per year.

What does all this mean in practice? Here's an example: let's compare two investors, who both put \$10,000 into a section 529 plan and leave it there for ten years. The first invests in the Rhode Island Plan, while the second invests in the Iowa Plan. Let's further assume that each

year the two plans earn the same 8 percent annual rate of return on these funds (before expenses). Assuming an investment in Rhode Island's "balanced core allocation portfolio", and no trading cost impact, after ten years the Iowa investor ends up with 9.6% more money to spend on education. Assuming an investment in Rhode Island's "aggressive growth core allocation portfolio" leaves the Iowa investor with 11.6% more money after ten years. Finally, if we assume an investment in the aggressive growth RI portfolio, and take active funds' higher trading costs into account, the Iowa investor ends up with 17.0% (\$2,949) more money at the end of ten years. And remember, this analysis also assumes that active and index fund managers earn the same returns over ten years. In point of fact, the great majority of active managers underperform index funds over long periods, so the actual benefits to investing in index-based 529 plans are probably significantly greater than our 17.0% estimate.

So, in answer to our first question -- should you invest in actively managed or index funds within a 529 Plan -- we squarely come down on the side of indexing.

Asset Allocation in 529 Plans

The objective of your 529 Plan asset allocation policy is to maximize the probability of achieving your minimum target rate of return while staying within whatever risk limits you set. The minimum required rate of return results from the interaction of five variables: (1) Whether the beneficiary of your 529 Plan will attend a private or a public college or university; (2) The annual real growth rate in the cost of tuition, room, and board at private and public colleges; (3) The number of years left before your 529 Plan beneficiary will start college; (4) The percent of the total cost of college you would like the funds accumulated in the 529 Plan to cover; and (5) The amount you intend to contribute to the 529 Plan each year. The following table shows the impact each of these variables has on the (compound annual) target rate of return your 529 investments must earn in order to achieve your goals:

Variable	Impact on Target Return
Private University	Increases target return compared to public university.
Real growth in annual cost for tuition, room, and board	Increase in real growth rate increases target rate.
Number of years left before beneficiary starts college	Longer time remaining lowers target rate of return.
Percent of total college costs covered by accumulated 529 funds.	Higher percentage raises target rate of return.
Amount contributed to 529 Plan each year.	Contributing more each year lowers target rate of return.

In the following tables, we have assumed possible values for each of these variables, and calculated the minimum target rates of return needed to achieve a given set of goals. Please note that in the interest of conservatism, we have used the following assumptions:

- We assume that an investor wants to have reached his or her 529 savings goal (covering the cost of all four years of college) by the end of the year before his or her beneficiary begins college. For example, if your son is currently eight years old, he or she would start college in September, 2014, and you would want to have reached your savings goal by December, 2013 (after which the funds would be placed in low risk, short term investments).
- We assume that contributions are made to the 529 Plan on December 31st of each year. To continue with our previous example, this means that our model assumes only nine contributions, at the ends of years 2004 through 2012.
- Finally, we assume that the current annual cost of room, board, and tuition at a four year, private college or university is \$26,854, and \$10,636 at a public college or university. These data are from the College Board. We have also used the past 28 years of data (in real terms) on these costs to estimate how quickly they will increase in the future. For private school costs, we used a real annual rate of increase of 2.92% (the average over the

1976-2003 period; the standard deviation was 2.60%); for public school costs we used 2.14% (standard deviation of 3.01%).

We stress that these assumptions yield conservative minimum target real rates of return; relaxing any of them (e.g., assuming lower annual rates of increase in real costs) would reduce our target real rates of return. That being said, when it comes to paying for college, we thought it better to err on the side of conservatism.

The following three tables show target real rates of return for private colleges and universities. The first table is based on a goal of funding 100% of the cost of this education; the second table 75%, and the third table 50%. Each table also shows our assumption for annual growth in the real cost of tuition, room, and board, the number of year remaining before you want to have achieved your accumulation goal, and the amount contributed each year to a beneficiary's 529 Plan (our highest figure of \$22,000 assumes two spouses each contributing the maximum of \$11,000 per year). The cells in the center of the table show the minimum compound real annual rate of return that must be earned on your 529 portfolio over your target time horizon to achieve your accumulation goal. Assuming that the highest feasible annual portfolio real rate of return one should use for planning purposes is 7% (and, as we shall soon discuss, even that carries with it a high probability of falling short), you can see that some combinations of annual savings, time horizon, and percent of cost financed are unrealistic. You will also see negative numbers in these tables. They imply overfunding of the plan, given its time horizon and percent of cost financed, because they show how much a plan could lose each year while still reaching its target. In sum, the region of realistic solutions is the shaded one with positive real target returns of between 2% and 7%.

Private College	Annual Cost Growth =		2.92%	% Financed = 100%	
Goal =	\$ 124,020	\$ 131,359	\$ 143,190	\$ 151,664	\$ 165,234
Annual Savings	5 year horizon	7	10	12	15
\$ 1,000	202.8%	101.6%	55.1%	41.5%	29.9%
\$ 2,000	148.3%	75.5%	40.8%	30.5%	21.8%
\$ 3,000	120.4%	61.4%	32.7%	24.2%	17.0%
\$ 4,000	102.0%	51.7%	27.0%	19.7%	13.6%
\$ 5,000	88.6%	44.4%	22.7%	16.3%	10.9%
\$ 6,000	78.1%	38.6%	19.1%	13.4%	8.6%
\$ 7,000	69.6%	33.8%	16.1%	11.0%	6.7%
\$ 8,000	62.4%	29.7%	13.5%	8.8%	5.1%
\$ 9,000	56.3%	26.1%	11.2%	7.0%	3.6%
\$ 10,000	50.9%	22.9%	9.2%	5.3%	2.2%
\$ 11,000	46.1%	20.1%	7.3%	3.7%	0.9%
\$ 12,000	41.9%	17.5%	5.6%	2.3%	-0.2%
\$ 13,000	38.0%	15.1%	4.0%	1.0%	-1.3%
\$ 14,000	34.5%	12.9%	2.5%	-0.3%	-2.3%
\$ 15,000	31.3%	10.9%	1.2%	-1.4%	-3.3%
\$ 16,000	28.3%	9.0%	-0.1%	-2.5%	-4.2%
\$ 17,000	25.5%	7.3%	-1.3%	-3.5%	-5.0%
\$ 18,000	23.0%	5.6%	-2.5%	-4.5%	-5.8%
\$ 19,000	20.6%	4.1%	-3.6%	-5.5%	-6.6%
\$ 20,000	18.3%	2.6%	-4.6%	-6.3%	-7.4%
\$ 21,000	16.2%	1.2%	-5.6%	-7.2%	-8.1%
\$ 22,000	14.2%	-0.1%	-6.6%	-8.0%	-8.8%

Private	Annual Cost Growth =		2.92%	% Financed = 75%	
Goal =	\$ 93,015	\$ 98,519	\$ 107,393	\$ 113,748	\$ 123,993
	5	7	10	12	15
\$ 1,000	179.1%	90.5%	49.1%	36.9%	26.5%
\$ 2,000	128.2%	65.4%	35.0%	26.0%	18.4%
\$ 3,000	102.0%	51.7%	27.0%	19.7%	13.6%
\$ 4,000	84.8%	42.4%	21.4%	15.2%	10.1%
\$ 5,000	72.2%	35.3%	17.1%	11.7%	7.3%
\$ 6,000	62.4%	29.7%	13.5%	8.8%	5.1%
\$ 7,000	54.4%	25.0%	10.5%	6.4%	3.1%
\$ 8,000	47.6%	21.0%	7.9%	4.2%	1.3%
\$ 9,000	41.9%	17.5%	5.6%	2.3%	-0.2%
\$ 10,000	36.8%	14.4%	3.5%	0.6%	-1.6%
\$ 11,000	32.3%	11.6%	1.6%	-1.0%	-2.9%
\$ 12,000	28.3%	9.0%	-0.1%	-2.5%	-4.2%
\$ 13,000	24.7%	6.7%	-1.7%	-3.9%	-5.3%
\$ 14,000	21.4%	4.6%	-3.2%	-5.1%	-6.4%
\$ 15,000	18.3%	2.6%	-4.6%	-6.3%	-7.4%
\$ 16,000	15.5%	0.7%	-5.9%	-7.5%	-8.3%
\$ 17,000	12.9%	-1.0%	-7.2%	-8.6%	-9.2%
\$ 18,000	10.5%	-2.6%	-8.4%	-9.6%	-10.1%
\$ 19,000	8.2%	-4.2%	-9.5%	-10.6%	-11.0%
\$ 20,000	6.1%	-5.6%	-10.6%	-11.5%	-11.8%
\$ 21,000	4.1%	-7.0%	-11.6%	-12.4%	-12.5%
\$ 22,000	2.2%	-8.3%	-12.6%	-13.3%	-13.3%

Private	Annual Cost Growth =		2.92%	% Financed = 50%	
Goal =	\$ 62,010	\$ 65,680	\$ 71,595	\$ 75,832	\$ 82,662
	5	7	10	12	15
\$ 1,000	148.3%	75.5%	40.8%	30.5%	21.8%
\$ 2,000	102.0%	51.7%	27.0%	19.7%	13.6%
\$ 3,000	78.1%	38.6%	19.1%	13.4%	8.6%
\$ 4,000	62.4%	29.7%	13.5%	8.8%	5.1%
\$ 5,000	50.9%	22.9%	9.2%	5.3%	2.2%
\$ 6,000	41.9%	17.5%	5.6%	2.3%	-0.2%
\$ 7,000	34.5%	12.9%	2.5%	-0.3%	-2.3%
\$ 8,000	28.3%	9.0%	-0.1%	-2.5%	-4.2%
\$ 9,000	23.0%	5.6%	-2.5%	-4.5%	-5.8%
\$ 10,000	18.3%	2.6%	-4.6%	-6.3%	-7.4%
\$ 11,000	14.2%	-0.1%	-6.6%	-8.0%	-8.8%
\$ 12,000	10.5%	-2.6%	-8.4%	-9.6%	-10.1%
\$ 13,000	7.2%	-4.9%	-10.0%	-11.0%	-11.4%
\$ 14,000	4.1%	-7.0%	-11.6%	-12.4%	-12.5%
\$ 15,000	1.3%	-8.9%	-13.0%	-13.7%	-13.7%
\$ 16,000	-1.3%	-10.8%	-14.4%	-14.9%	-14.7%
\$ 17,000	-3.7%	-12.5%	-15.7%	-16.1%	-15.8%
\$ 18,000	-5.9%	-14.1%	-17.0%	-17.2%	-16.7%
\$ 19,000	-8.0%	-15.6%	-18.1%	-18.3%	-17.7%
\$ 20,000	-9.9%	-17.0%	-19.3%	-19.3%	-18.6%
\$ 21,000	-11.8%	-18.4%	-20.3%	-20.3%	-19.5%
\$ 22,000	-13.5%	-19.7%	-21.4%	-21.2%	-20.3%

The next three tables present the same information, but assume the 529 Plan beneficiary will attend a public college or university.

Public	Annual Cost Growth =		2.14%	% Financed = 100%	
Goal =	\$ 47,305	\$ 49,356	\$ 52,600	\$ 54,880	\$ 58,487
	5	7	10	12	15
\$ 1,000	129.4%	65.5%	34.6%	25.5%	17.7%
\$ 2,000	85.8%	42.4%	21.0%	14.7%	9.4%
\$ 3,000	63.3%	29.8%	13.1%	8.3%	4.3%
\$ 4,000	48.5%	21.0%	7.5%	3.6%	0.6%
\$ 5,000	37.6%	14.4%	3.1%	0.0%	-2.4%
\$ 6,000	29.1%	9.1%	-0.5%	-3.1%	-5.0%
\$ 7,000	22.1%	4.6%	-3.6%	-5.8%	-7.2%
\$ 8,000	16.3%	0.8%	-6.4%	-8.1%	-9.2%
\$ 9,000	11.2%	-2.6%	-8.8%	-10.2%	-11.0%
\$ 10,000	6.8%	-5.6%	-11.0%	-12.2%	-12.7%
\$ 11,000	2.9%	-8.3%	-13.0%	-13.9%	-14.3%
\$ 12,000	-0.6%	-10.7%	-14.9%	-15.6%	-15.7%
\$ 13,000	-3.7%	-13.0%	-16.6%	-17.1%	-17.1%
\$ 14,000	-6.6%	-15.0%	-18.2%	-18.6%	-18.4%
\$ 15,000	-9.3%	-17.0%	-19.7%	-20.0%	-19.6%
\$ 16,000	-11.7%	-18.8%	-21.2%	-21.3%	-20.8%
\$ 17,000	-14.0%	-20.5%	-22.5%	-22.5%	-22.0%
\$ 18,000	-16.1%	-22.1%	-23.8%	-23.7%	-23.1%
\$ 19,000	-18.1%	-23.6%	-25.1%	-24.9%	-24.1%
\$ 20,000	-19.9%	-25.0%	-26.2%	-26.0%	-25.2%
\$ 21,000	-21.7%	-26.3%	-27.4%	-27.0%	-26.1%
\$ 22,000	-23.3%	-27.6%	-28.5%	-28.1%	-27.1%

Public	Annual Cost Growth =		2.14%	% Financed = 75%	
Goal =	\$ 35,479	\$ 37,017	\$ 39,450	\$ 41,160	\$ 43,865
	5	7	10	12	15
\$ 1,000	110.5%	55.7%	28.9%	21.0%	14.3%
\$ 2,000	69.6%	33.4%	15.4%	10.2%	5.8%
\$ 3,000	48.5%	21.0%	7.5%	3.6%	0.6%
\$ 4,000	34.6%	12.5%	1.8%	-1.1%	-3.3%
\$ 5,000	24.3%	6.0%	-2.6%	-4.9%	-6.5%
\$ 6,000	16.3%	0.8%	-6.4%	-8.1%	-9.2%
\$ 7,000	9.7%	-3.6%	-9.5%	-10.9%	-11.6%
\$ 8,000	4.2%	-7.4%	-12.3%	-13.4%	-13.7%
\$ 9,000	-0.6%	-10.7%	-14.9%	-15.6%	-15.7%
\$ 10,000	-4.7%	-13.7%	-17.1%	-17.6%	-17.5%
\$ 11,000	-8.4%	-16.3%	-19.2%	-19.5%	-19.2%
\$ 12,000	-11.7%	-18.8%	-21.2%	-21.3%	-20.8%
\$ 13,000	-14.7%	-21.0%	-23.0%	-23.0%	-22.3%
\$ 14,000	-17.4%	-23.1%	-24.6%	-24.5%	-23.8%
\$ 15,000	-19.9%	-25.0%	-26.2%	-26.0%	-25.2%
\$ 16,000	-22.2%	-26.8%	-27.7%	-27.4%	-26.5%
\$ 17,000	-24.4%	-28.5%	-29.2%	-28.7%	-27.7%
\$ 18,000	-26.4%	-30.0%	-30.5%	-30.0%	-28.9%
\$ 19,000	-28.2%	-31.5%	-31.8%	-31.2%	-30.1%
\$ 20,000	-30.0%	-32.9%	-33.0%	-32.4%	-31.2%
\$ 21,000	-31.6%	-34.3%	-34.2%	-33.5%	-32.3%
\$ 22,000	-33.2%	-35.6%	-35.3%	-34.6%	-33.3%

Public	Annual Cost Growth =		2.14%	% Financed = 50%	
Goal =	\$ 23,653	\$ 24,678	\$ 26,300	\$ 27,440	\$ 29,243
	5	7	10	12	15
\$ 1,000	85.8%	42.4%	21.0%	14.7%	9.4%
\$ 2,000	48.5%	21.0%	7.5%	3.6%	0.6%
\$ 3,000	29.1%	9.1%	-0.5%	-3.1%	-5.0%
\$ 4,000	16.3%	0.8%	-6.4%	-8.1%	-9.2%
\$ 5,000	6.8%	-5.6%	-11.0%	-12.2%	-12.7%
\$ 6,000	-0.6%	-10.7%	-14.9%	-15.6%	-15.7%
\$ 7,000	-6.6%	-15.0%	-18.2%	-18.6%	-18.4%
\$ 8,000	-11.7%	-18.8%	-21.2%	-21.3%	-20.8%
\$ 9,000	-16.1%	-22.1%	-23.8%	-23.7%	-23.1%
\$ 10,000	-19.9%	-25.0%	-26.2%	-26.0%	-25.2%
\$ 11,000	-23.3%	-27.6%	-28.5%	-28.1%	-27.1%
\$ 12,000	-26.4%	-30.0%	-30.5%	-30.0%	-28.9%
\$ 13,000	-29.1%	-32.2%	-32.4%	-31.8%	-30.6%
\$ 14,000	-31.6%	-34.3%	-34.2%	-33.5%	-32.3%
\$ 15,000	-33.9%	-36.2%	-35.9%	-35.1%	-33.8%
\$ 16,000	-36.0%	-37.9%	-37.5%	-36.7%	-35.3%
\$ 17,000	-38.0%	-39.6%	-39.0%	-38.1%	-36.7%
\$ 18,000	-39.8%	-41.1%	-40.4%	-39.5%	-38.1%
\$ 19,000	-41.5%	-42.6%	-41.8%	-40.8%	-39.4%
\$ 20,000	-43.1%	-44.0%	-43.0%	-42.1%	-40.6%
\$ 21,000	-44.6%	-45.3%	-44.3%	-43.3%	-41.8%
\$ 22,000	-46.0%	-46.5%	-45.4%	-44.5%	-42.9%

Having determined the target rate of compound annual real return you need to earn over your 529 investment horizon, the next challenge is deciding on your Plan's asset allocation. A key issue here is the limited number of asset classes offered by most 529 Plans. Consider, for example, the Vanguard 529 Plan offered by the State of Nevada. Based on our definition of an asset class, it offers only four: real return bonds, domestic bonds, domestic equity and foreign developed market equity (though it also offers a large number of tilts within these, which we'll shortly discuss). Unfortunately, it does not offer three asset classes that, in our asset allocation studies, we have found to provide substantial diversification benefits: foreign currency bonds, commercial property, and commodities, as well as emerging markets equity, which can be used to increase a portfolio's expected return.

The impact of this lack of diversification opportunities is significant. For example, we used our simulation optimization model to develop a model portfolio that maximized the probability of achieving a compound annual real growth rate of six percent after ten years, subject to the requirement that 95% of the time the actual compound rate of return produced would be greater than zero. We first included only the four asset classes available in the Vanguard 529 Plan (for the full list of assumptions we used, see below). We found that the probability of meeting the target is 41%. When we added foreign currency bonds, commercial property, commodities, and emerging markets equity to the mix (with the first limited to a maximum weight of 35%, and the last three to a maximum weight of 20% each), the probability of achieving the target return rose to 68%.

We should also note the range of optimization solutions produced by different asset allocation methodologies. A traditional mean/variance optimization model either minimizes risk (defined as standard deviation) for a given level of expected return, or maximizes return for given level of risk. For a target return of 6%, it produces an allocation of 30% to domestic bonds, 65% to domestic equities, and 5% to foreign equities. The probability that this asset mix would achieve the compound real return target in year ten was 44 percent. The probability that it would produce a compound real return of zero or greater in year ten was 93 percent. Over 10,000 different simulations, the lowest compound annual ten year return it produced was (7.7%). A variation of the traditional mean/variance approach maximizes the ratio of portfolio return less target return to the portfolio standard deviation of returns (this is also known as the "safety first model").

This methodology results in a 100% allocation to domestic equities. The probability that this asset mix would achieve the compound real return target in year ten was 48 percent. The probability that it would produce a compound real return of zero or greater in year ten was 87 percent. Over 10,000 different simulations, the lowest compound annual ten year return it produced was (16.5%). Finally, our simulation optimization approach (for details, see the blue button labeled "methodology summary" on our home page) produces an allocation of 5% to real return bonds, 30% to domestic bonds, 50% to domestic equities, and 15% to foreign equities. The probability that this asset mix would achieve the compound real return target in

year ten was 41 percent. The probability that it would produce a compound real return of zero or greater in year ten was 95 percent. Over 10,000 different simulations, the lowest compound annual ten year return it produced was (5.8%).

For now, however, investors in the Vanguard 529 Plan are limited to four asset classes, so that is what we've used to develop our model 529 portfolios. Each of these portfolios is intended to maximize the probability of achieving the specified target real compound annual return over an investment horizon of ten years. We further assume that the investor setting up a 529 Plan wants to be 95% confident that the actual compound annual real rate of return over ten years will be at least 0% (i.e., he or she wants to be 95% confident they won't lose the money they have contributed, except for fees charged by the Plan's manager). We used the four asset classes available in the Vanguard 529 Plan: real return bonds, domestic investment grade bonds, domestic equity and foreign developed market equity. We limited the latter to a maximum of 35% of the model portfolio. Our expected real returns for each asset class were a weighted combination of 67% times the average historical return between 1971 and 2002, and 33% times our estimate of future returns (for more on these assumptions see our May through August, 2003 issues). We also used historical standard deviations (again for 1971-2002), and return correlations from 1994 to 2003. To calculate our model portfolios' asset allocations, we used our simulation optimization model. Possible asset allocations were adjusted in 5% increments to reduce the time required to run the optimization. More details about this approach can be found by clicking the blue button on our home page labeled "Methodology Summary."

The table below shows the target real rate of return each model 529 portfolio is designed to achieve, the weights given to each asset class, the expected annual return and standard deviation (note that, where standard deviation is greater than zero, the expected annual return is always greater than the compound annual return over a longer period), and the estimated probability of achieving the target compound annual real return in year ten. Over shorter periods, this probability will be lower, while over longer periods it will be higher.

	2% Target	3% Target	4% Target	5% Target	6% Target	7% Target
Real Return Bonds	35%	5%	0%	10%	5%	0%
Domestic Bonds	45%	65%	55%	30%	30%	30%
Domestic Equity	20%	20%	35%	50%	50%	40%
Foreign Equity	0%	10%	10%	10%	15%	30%
Total	100%	100%	100%	100%	100%	100%
Expected Annual Return	3.96%	4.67%	5.21%	5.52%	5.73%	5.89%
Expected Standard Deviation	4.15%	5.68%	7.53%	9.57%	10.31%	11.04%
Return per unit of risk (Std. Dev.)	.95	.82	.69	.58	.56	.53
Probability of Achieving Target in Year 10	92%	81%	66%	51%	41%	32%

As with all our other model portfolios, those shown in the table are also subject to the limitations that beset all quantitative approaches to asset allocation. For example, the inputs used in asset allocation processes are themselves only statistical estimates of the "true" values for these variables. As important, the underlying economic processes that generate the return distributions are not stable (or, as they say in statistics, it isn't "stationary"). This is why every mutual fund prospectus notes (though too often in the small print) that "past results are no guarantee of future results." In sum, asset allocation is at best an imperfect science, if not an art. Despite the apparent precision of the models that are used, they can only increase the

probability of achieving your goals -- they cannot guarantee it. When it comes to investing, a certain degree of uncertainty is inescapable.

In addition to index funds covering broad asset classes, the Vanguard 529 Plan offers a number of index funds that allow an investor to take tilts within them. These include tilts toward growth, value, midcap and small cap within domestic equities, and long versus short term maturity in domestic bonds. Should one take these tilts? The answer to this question depends on your view of market efficiency. Broadly speaking, there are two schools of thought. The first believes that markets are generally efficient, and that one takes tilts to gain exposure to a different mix of risk factors than that contained in the broad market index. In a reasonably efficient market, these tilts are logically expected to produce either higher returns than the broad index, but with higher risk, or lower returns with lower risk. The second school of thought believes that the presence of irrational investors, uneven flows of information, and obstacles to immediate arbitrage together creates long term market inefficiencies, which logically lead to the possibility of a tilt delivering higher returns with lower risk than the broad asset class index.

Of course, this view also requires that the opposite also be possible: that there exists a group of investors on the other side of these trades, who will be stuck with lower returns and higher risk than the broad index. In our writing in *The Index Investor*, we have repeatedly examined this issue; on balance, we come down on the side of generally efficient markets, and believe that the most logical basis for taking a tilt is to achieve either higher returns than the broad asset class index with higher risk, or lower returns with lower risk. Hence, based on historical results, a tilt toward value, midcap, or small cap equities should produce somewhat higher returns than the broad index, though with a higher degree of risk, while a tilt toward growth should have the opposite effect.

With respect to bond funds, the tilts on offer are towards longer and shorter maturities than the broad market index fund, which has an intermediate average maturity. Unlike the case of equities, taking these tilts only makes sense if you are confident in your ability to time changes in interest rates. Logically, you would shift to the long maturity fund when you

expected rates to fall, and to the short maturity fund when you expected them to rise. As a general principle, we believe that most investors lack the skills to succeed at market timing over the long term. That being said, we aren't ideologues on the issue; we also believe that there are some situations where it makes sense. With nominal U.S. interest rates currently at their lowest levels in decades, it would be a brave investor indeed who decided today to put a substantial portion of his or her portfolio into a long maturity bond fund. Then again, if you expected a sharp all in the price level (that is, rising deflation), then this would be a smart move. As we said, market timing is a very, very difficult game to play well, and most people would be better advised to avoid it, and invest in the broad bond market index fund.

Finally, what about those 529 funds which are based on the beneficiary's year of birth? The key selling point of these funds is their promise to automatically adjust their underlying asset allocation (to make it more conservative) as the start of college grows closer. How do they compare with the asset allocations in our model 529 target return portfolios? That is a subject we'll address in next month's issue. Stay tuned...

Model Portfolios Year-to-Date Nominal Returns

We offer over 2,000 model portfolio solutions for subscribers whose functional currencies (that is, the currency in which their target income and bequest/savings are denominated) include Australian, Canadian, and U.S. Dollars, Euro, Yen, and Pounds-Sterling. In addition to currency, each solution is based on input values for three other variables:

- The target annual income an investor wants her or his portfolio to produce, expressed as a percentage of the starting capital. There are eight options for this input, ranging from 3 to 10 percent.
- The investor's desired savings and/or bequest goal. This is defined as the multiple of starting capital that one wants to end up with at the end of the chosen expected life. There are five options for this input, ranging from zero (effectively equivalent to converting one's starting capital into a self-managed annuity) to two.
- The investor's expected remaining years of life. There are nine possible values for this input, ranging from 10 to 50 years.

We use a simulation optimization process to produce our model portfolio solutions. A detailed explanation of this methodology can be found on our website. To briefly summarize its key points, in order to limit the impact of estimation error, our assumptions about future asset class rates of return, risk, and correlation are based on a combination of historical data (from 1971 to 2002) and the outputs of a forward looking asset pricing model. For the same reason, we also constrain the maximum weight that can be given to certain asset classes in a portfolio. These maximums include 20% for foreign bonds and foreign equities, and 10% each for commercial property, commodities, and emerging markets equities. There are no limits on the weight that can be given to real return and domestic bonds, and to domestic equities.

Each model portfolio solution includes the following information: (a) The minimum real (after inflation) compound annual rate of return the portfolio must earn in order to achieve the specified income and savings/bequest objectives over the specified expected lifetime. (b) The long-term asset allocation strategy that will maximize the probability of achieving this return,

given our assumptions and constraints. (c) The recommended rebalancing strategy for the portfolio. And (d) The probability that the solution will achieve the specified income and savings/bequest goals over the specified time frame.

The following table shows how asset allocations with different target compound annual rate of return objectives have performed year-to-date:

	YTD 30Apr04	Weight	Weighted Return
	In US\$		In US\$
7% Target Real Return	<i>YTD Returns are Nominal</i>		
<u>Asset Classes</u>			
Real Return Bonds	0.1%	0%	0.0%
U.S. Bonds	0.0%	0%	0.0%
Non-U.S. Bonds	-3.2%	20%	-0.6%
Commercial Property	-4.5%	10%	-0.5%
Commodities	9.4%	10%	0.9%
U.S. Equity	-0.3%	50%	-0.2%
Foreign Equity (EAFE)	1.5%	0%	0.0%
Emerging Mkt. Equity	-0.7%	10%	-0.1%
		<i>100%</i>	-0.4%

±

	YTD 30Apr04	Weight	Weighted Return
	In US\$		In US\$
6% Target Real Return	<i>YTD Returns are Nominal</i>		
<u>Asset Classes</u>			
Real Return Bonds	0.1%	0%	0.0%
U.S. Bonds	0.0%	0%	0.0%
Non-U.S. Bonds	-3.2%	20%	-0.6%
Commercial Property	-4.5%	10%	-0.5%
Commodities	9.4%	10%	0.9%
U.S. Equity	-0.3%	45%	-0.1%
Foreign Equity (EAFE)	1.5%	5%	0.1%
Emerging Mkt. Equity	-0.7%	10%	-0.1%
		<i>100%</i>	-0.3%

±

	YTD 30Apr04	Weight	Weighted Return
	In US\$		In US\$
5% Target Real Return	<i>YTD Returns are Nominal</i>		
<u>Asset Classes</u>			
Real Return Bonds	0.1%	0%	0.0%
U.S. Bonds	0.0%	0%	0.0%
Non-U.S. Bonds	-3.2%	20%	-0.6%
Commercial Property	-4.5%	10%	-0.5%
Commodities	9.4%	10%	0.9%
U.S. Equity	-0.3%	30%	-0.1%
Foreign Equity (EAFE)	1.5%	20%	0.3%
Emerging Mkt. Equity	-0.7%	10%	-0.1%
		<i>100%</i>	0.0%

±

	YTD 30Apr04	Weight	Weighted Return
	In US\$		In US\$
4% Target Real Return	<i>YTD Returns are Nominal</i>		
<u>Asset Classes</u>			
Real Return Bonds	0.1%	5%	0.0%
U.S. Bonds	0.0%	35%	0.0%
Non-U.S. Bonds	-3.2%	20%	-0.6%
Commercial Property	-4.5%	10%	-0.5%
Commodities	9.4%	10%	0.9%
U.S. Equity	-0.3%	5%	0.0%
Foreign Equity (EAFE)	1.5%	10%	0.2%
Emerging Mkt. Equity	-0.7%	5%	0.0%
		<i>100%</i>	0.0%

±

	YTD 30Apr04	Weight	Weighted Return
	In US\$		In US\$
3% Target Real Return	<i>YTD Returns are Nominal</i>		
<u>Asset Classes</u>			
Real Return Bonds	0.1%	75%	0.1%
U.S. Bonds	0.0%	0%	0.0%
Non-U.S. Bonds	-3.2%	10%	-0.3%
Commercial Property	-4.5%	10%	-0.5%
Commodities	9.4%	5%	0.5%
U.S. Equity	-0.3%	0%	0.0%
Foreign Equity (EAFE)	1.5%	0%	0.0%
Emerging Mkt. Equity	-0.7%	0%	0.0%
		100%	-0.2%

±

	YTD 30Apr04	Weight	Weighted Return
	In US\$		In US\$
2% Target Real Return	<i>YTD Returns are Nominal</i>		
<u>Asset Classes</u>			
Real Return Bonds	0.1%	85%	0.1%
U.S. Bonds	0.0%	0%	0.0%
Non-U.S. Bonds	-3.2%	10%	-0.3%
Commercial Property	-4.5%	5%	-0.2%
Commodities	9.4%	0%	0.0%
U.S. Equity	-0.3%	0%	0.0%
Foreign Equity (EAFE)	1.5%	0%	0.0%
Emerging Mkt. Equity	-0.7%	0%	0.0%
		100%	-0.5%