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Maximizing Predictability in the Stock and Bond Markets

Investors and academics have been searching for predictability in the stock and bond markets since the advent of organized trading. One reason is obvious: anyone who could accurately predict how asset values will react to economic news would become rich. But there are several other reasons. First, such knowledge would provide insights into how aggregate fluctuations in the economy are transmitted to and from the financial markets. Also, understanding predictability would help in the design of optimal consumption and investment policies. Finally, it would further the study of the markets' efficiency.

In **Maximizing Predictability in the Stock and Bond Markets** (*NBER Working Paper No. 5027*), **Andrew Lo** and **Craig MacKinlay** show that there are indeed predictable components in the stock market, and that sophisticated forecasting models based on measures of economic conditions do have predictive power.

Much of the recent research on asset predictability has involved the construction of models incorporating explanatory economic factors, and then analyzing the predictability of these factors. Lo and MacKinlay instead begin by explicitly constructing portfolios of assets that are the most predictable, incorporating market data from 1947 to 1993. They then study the characteristics and performance of these "maximally predictable portfolios" (MPPs). The economic factors selected to test predictability include the dividend yield, the spreads between bonds of different maturities and investment quality, and trends in stock returns and interest rates.

Lo and MacKinlay find that the predictability of a portfolio can be increased considerably by selection of portfolio and time horizon. In one example, they look at the 11 portfolios formed by industry or sector classification according to SIC codes, with a monthly return horizon. The MPP formed from this universe is "long"—betting prices will rise—in the shares of companies producing nondurable goods, but "short" (betting that prices will fall) in the durables sector. At a semiannual return horizon, however, the MPP is long in basic industries and short in construction. These findings suggest that there are distinct forecasting horizons for various sector assets; this may signal important differences in how such groups of securities respond to economic events.

Lo and MacKinlay also demonstrate how an investor might have fared using a simple active asset-allocation strategy in conjunction with the MPP. The strategy: whenever the next month's predicted return for the MPP is expected to exceed the return from risk-free Treasury bills, then the entire portfolio is invested in the MPP that month. Otherwise, the entire portfolio is invested in Treasury bills.

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From 1967 to 1993, $1 invested in a passive MPP grew to $46.73. The corresponding active strategy yields a return of $99.38. These and other results, the authors conclude, show that there is predictability in the MPP that is genuine, and both statistically and economically significant. RN

High School Employment Pays Off

In a recent study for the NBER, **Christopher Ruhm** finds that "light to moderate job commitments" during high school have no detrimental effect on economic attainment six to nine years after the normal age of graduation. In fact, working during one's senior year is correlated positively with future earnings and fringe benefits, and occupational status.

Previous studies have found both pros and cons of working during high school. But those studies have two fundamental shortcomings, Ruhm suggests: they ignore the selection process that determines which students work and how much, and they focus only on achievements during high school and employment shortly after graduation, not further into the future. In **Is High School Employment Consumption or Investment?** (*NBER Working Paper No. 5030*), Ruhm corrects for these limitations by using several strategies to account for differences between student workers and nonworkers; he also considers the *long-term* effects of student jobs on economic outcomes.

"High school students who work generally have higher levels of future economic attainment than those who do not," Ruhm finds. This holds true for a variety of measures of success, but is strongest in terms of annual earnings. For example, sophomores working more than 20 hours in a sample week earn 9 percent more than their nonworking counterparts six to nine years later—the differentials for juniors and seniors are 31 percent and 35 percent, respectively. For seniors, working ten hours during a sample week raises future earnings by around 15 percent, Ruhm predicts.

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In fact, it seems to be work during the senior year that is most important for future earnings. After controlling for a wide variety of individual household and labor market characteristics, Ruhm finds that "there is no evidence of statistically significant effects for sophomores and juniors, once senior work hours are held constant." This may be because the advantages of working depreciate rapidly if not acted upon quickly. Or, some seniors may continue to work for the same company after leaving high school, and thus do better than their peers. Alternatively, working seniors may have an easier transition from school to work than their counterparts who do not hold jobs.

In any case, Ruhm finds that the benefits of working during a sample week of the senior year are roughly twice as large for students not going on to college as for those who do attend. Working ten hours is predicted to raise future annual earnings by 21 percent for the former group, versus a statistically insignificant 9 percent for the latter. Similarly, "ten hours of work in the senior grade raises expected future hourly wages by 8 percent overall and by 11 percent for individuals not attending college, versus just 4 percent for those who do go to university."

Ruhm's data come from the National Longitudinal Survey of Youth, a sample of persons aged 14 through 21 on January 1, 1979. Respondents are interviewed annually, and he uses information through the 1991 interview. He considers annual earnings, and three additional measures of economic attainment: occupational status, and whether group health insurance and retirement benefits are provided by the current or most recent employer. In Ruhm's sample, 28 percent of sophomores are employed in the "interview week," compared to 43 percent of juniors and 51 percent of seniors. Average weekly work commitments rise from three hours for sophomores to ten hours for seniors. Approximately two-thirds of juniors and three-quarters of seniors hold jobs at some point during the academic year, and whites and males work more than nonwhites and females.

Disability Insurance Denials Raised Work Effort of Older Men

The Social Security Disability Insurance (DI) program is designed to provide income support to workers who no longer can work because of a physical or mental disability. In 1993, more than 5 million individuals received benefits from this program at a total cost of more than $36 billion. The program has grown rapidly since its inception in the 1950s; between 1960 and 1977, the number of disa-

bility recipients rose from 455,000 to 2.8 million, while total payments grew twenty-fold. Since there was not a commensurate decline in the health of working Americans, many observers attributed this rapid rise in the size of the program to increased application for DI benefits by healthy workers who wanted to retire early from their jobs. In part because of this view, and in part because of a crisis in the funding of DI, many states dramatically increased the stringency of the screening process for qualifying for DI in 1977 to 1980. On average, the rate of denial of DI applications rose by 30 percent over this period.

According to an NBER study by **Jonathan Gruber** and **Jeffrey Kubik,** this increase in DI denial rates led to a substantial rise in the work effort of older men (aged 45–64). The proportion of men *not* participating in the labor force declined by 1.4 percentage points, or 8.1 percent. About one-half of this effect occurred because some of those denied DI benefits returned to work after applying for the program. But the remainder was because men were discouraged from leaving their jobs to apply for DI benefits since it was harder to qualify for the program.

In **Disability Insurance Rejection Rates and the Labor Supply of Older Workers** (*NBER Working Paper No. 4941*), Gruber and Kubik also find that the increase in the incentive to work (via denial of insurance) appears to have been targeted efficiently to the more able portion of the older male population. To make this assessment, the authors use data from the National Health Interview Survey, in which a nationally representative sample of persons is asked questions about labor force participation, health, height, and weight. Gruber and Kubik compute a measure of health that is a function of height and weight: workers who are either very heavy or very light (relative to their height) on average are in much worse health relative to others in the population. They estimate that the 30 percent jump in the denial rate for disability insurance resulted in an 11 percent reduction in the rate of nonparticipation in the labor force for those who were not truly disabled, according to their height/weight measure. The increased denial rate had no effect on the labor force participation of truly disabled workers, though. DRF

"[T]he increase in the incentive to work (via denial of insurance) appears to have been targeted efficiently to the more able portion of the older male population."

School Choice Improves Student Performance and Lowers Cost

In most industries, competition improves product quality and forces firms to keep costs low. In a new NBER study, **Does Competition Among Public Schools Benefit Students and Taxpayers?** (*NBER Working Paper No. 4979*), **Caroline Hoxby** finds that competition among public schools analogously improves student performance and limits the cost of education.

The more school districts there are in a city, the more options parents have, and therefore the greater is the competition among school districts. Also, parents have more flexibility when enrollment is distributed relatively equally across districts. For instance, a city with two equal-sized districts provides more options and more competition than a city with two districts where one of them enrolls 90 percent of the students. Therefore, Hoxby uses as her measure of competition the degree to which enrollment is concentrated in a few school districts. (Concentration increases as the number of districts shrinks and as enrollment is concentrated in fewer of the existing districts.) Higher concentration thus means less competition.

Using data from 1982, Hoxby finds that a higher concentration of school districts leads to higher costs. Specifically, an increase in concentration equivalent to collapsing ten equal-sized school districts down to two leads to a $219 increase in per-pupil spending (in 1982 dollars). Thus, by Hoxby's measure, competition limits costs.

To determine the effect of an increase in concentration on student performance, Hoxby uses two different measures of performance. She finds that the highest grade completed, her first measure, falls by 0.3 years for the same increase in concentration. Her second measure of performance, students' test results on the Armed Forces Qualification Test (AFQT)—which measures arithmetic reasoning, word knowledge, paragraph comprehension, and numerical operations—also declines as concentration increases. An increase in concentration equivalent to collapsing ten equal-sized

districts down to two also reduces the probability that a student will score in the top quarter of those taking the AFQT by 2 percent.

portion of students attending private school. Indeed, Hoxby finds that the same increase in concentration causes a 2 percentage point

"[R]elatively disadvantaged students benefit disproportionately from the increased sorting brought about by greater competition."

When firms in one segment of an industry become less competitive, some customers will stop buying from those firms and take their business elsewhere. Similarly, cities with less competition among public schools may have a higher pro-

increase in the fraction of students attending private school. Although this may sound small, Hoxby points out, 2 percentage points amounts to a 20 percent increase in the "market share" of private schools in the average U.S. city.

Hoxby also finds that competition does cause sorting of students into districts by ability, but she finds no evidence that this sorting harms the relatively disadvantaged students. On the contrary, using high school graduation as the measure of student performance, Hoxby concludes that relatively disadvantaged students benefit disproportionately from the increased sorting brought about by greater competition.

Finally, using school years completed as the measure of performance, Hoxby finds that shifting students from public to private schools is twice as effective as creating a new public school district for some students to attend. DRH

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