

Vilijam F. Šarp

Nobelova nagrada za 1990.



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TVORAC MODELA VREDNOVANJA KAPITALA

Rezime

Heri M. Markovic, Merton H. Miler i Vilijam F. Šarp nagrađeni su Nobelovom nagradom iz ekonomije 1990. godine za svoj pionirski rad u oblasti teorije finansijske ekonomije. Heri Markovic je dao najznačajniji doprinos u selekciji portfolija, Vilijam Šarp u postavljanju ravnotežne teorije vrednovanja kapitala (CAPM), a Merton Miler u korporativnim finansijama. Njihov rad je revolucionalizovao finansije uvođenjem i primenom kvantitativnih metoda u finansijskoj analizi. Šarp je rođen 1934. godine u Bostonu, Masačusets. Diplomirao je 1955. godine, magistrirao 1956, a doktorirao 1961. godine na Ekonomskom fakultetu Univerziteta CLA. U doktorskoj disertaciji istraživao je niz aspekata analize portfolija na osnovu modela koji je predložio Markovic. Svoj radni vek proveo je kao predavač i profesor aktivno učestvujući u brojnim istraživačkim projektima. Napisao je brojne stručne radove i knjige, dobitnik je više priznanja i član mnogih institucija. Svoju firmu za finansijski konsalting osnovao je 1989. godine.

Ključne reči: Nobelova nagrada, Vilijam F. Šarp, Heri M. Markovic, Merton H. Miler, Stenford univerzitet, teorija finansijske ekonomije, portfolio, CML, investicije, prinos, tržište, kamatna stopa, istraživanje

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article**William F. Sharpe**Nobel Prize for 1990*

CREATOR OF THE CAPITAL ASSET PRICING MODEL



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Summary

Harry M. Markowitz, Merton H. Miller and William F. Sharpe were awarded the Nobel Prize in Economic Sciences in 1990, for their pioneering work in the theory of financial economics. Harry Markowitz gave the most significant contribution in portfolio selection, William Sharpe in establishing the equilibrium theory of capital asset pricing (CAPM), and Merton Miller in corporate finance. Their work revolutionized finance through the introduction and implementation of quantitative methods in financial analysis. Sharpe was born in 1934 in Boston, Massachusetts. He received the Bachelor of Arts degree in 1955, the Master of Arts degree in 1956, and PhD degree in Economics in 1961 at the UCLA. In his doctoral dissertation he explored a series of aspects of portfolio analysis, based on a model proposed by Markowitz. He spent his working career as a lecturer and professor, taking active part in numerous research projects. He authored many scientific papers and books, having won several awards and being a member of many institutions. He established his own financial consulting firm in 1989.

Keywords: Nobel Prize, William F. Sharpe, Harry M. Markowitz, Merton H. Miller, Stanford University, theory of financial economics, portfolio, CML, investments, revenues, market, interest rate, research.

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Uznak sećanja na Alfreda Nobela Švedska kraljevska akademija odlučila je da nagradu Švedske centralne banke za 1990. godinu dodeli trojici američkih naučnika. Heri M. Markovic, Merton H. Miler i Vilijam F. Šarp nagrađeni su za svoj pionirski rad u oblasti teorije finansijske ekonomije.

Heri Markovic je dao najznačajniji doprinos u selekciji portfolija, Vilijam Šarp u postavljanju ravnotežne teorije vrednovanja kapitala (CAPM), a Merton Miler u korporativnim finansijama. Njihov rad je revolucionizovao finansije uvođenjem i primenom kvantitativnih metoda u finansijskoj analizi.

Biografija

Vilijam Šarp rođen je juna 1934. godine u Bostonu, Masačusets. Do fakulteta obrazovanje je sticao u javnim školama Kalifornije od profesora koji su znali da uspešno stimulišu rad učenika, pre svega dobrim i interesantnim programima nastave. Univerzitet Kalifornija u Berkliju Šarp je upisao 1951. godine, s namerom da ga glavni put kroz nauku vodi ka diplomu iz medicine. Međutim, više kurseva koje je pohađao na fakultetu uverili su ga da njegove mogućnosti leže u nekoj drugoj nauci. Zbog toga je prešao na Univerzitet Kalifornija u Los Angelesu. U izboru glavnih predmeta na osnovnim studijama opredelio se za računovodstvo i ekonomiju. Diplomirao je 1955. godine, a magistrirao 1956. U svojoj autobiografiji za Nobelovu fondaciju ističe da su dva profesora imala veliki uticaj na njegovu buduću karijeru. To su Armen Alhijan i J. Fred Veston. Kao asistent istraživač sarađivao je sa profesorom Vestonom na Poslovnoj školi i on ga je upoznao sa radom Herija Markovica. Alhijan je Šarpu bio predsednik komisije za odbranu doktorata. Svoje studente je učio da rad uvek počinju analizom, da se koncentrišu na njegove osnovne elemente i da se igraju „đavoljeg advokata“ kada je u pitanju procena sopstvenih ideja. Na njegovim časovima studenti su imali prilike da se upoznaju sa briljantnim načinom rada pri rešavanju problema tokom istraživanja. Takav način istraživačkog rada prihvatio je i Šarp i celog života ga oponašao.

Nakon vojske, Šarp od 1956. godine radi kao ekonomista u RAND korporaciji, idealnom

mestu za sve koji su zainteresovani za istraživački rad. U ovoj korporaciji Šarp je imao prilike da se obuča za rad na kompjuteru i računarsko programiranje, da se upozna sa teorijom igara, linearnim i dinamičkim programiranjem, kao i primenjenom ekonomijom.

Jedan član komisije predložio je Šarpu da uzme neku drugu temu, a ne onu koju je prvobitno izabrao za doktorsku disertaciju. Markovic mu je pomogao u izboru nove teme *Portfolio analiza zasnovana na pojednostavljenom modelu odnosa hartija od vrednosti*. Iako mu nije bio u komisiji, Markovic je u potpunosti ispunio ulogu savetnika-mentora i Šarp je to komentarisao na sledeći način: „Moj dug prema njemu je ogroman“. Doktorirao je 1961. godine na Ekonomskom fakultetu Univerziteta CLA. U doktorskoj disertaciji je istraživao niz aspekata analize portfolija na osnovu modela koji je predložio Markovic.

Iste godine kad je doktorirao preselio se u Sijetl da bi radio u biznis školi Vašingtonskog univerziteta. Ovde je proveo sedam izuzetno produktivnih godina. Potom se seli u Irvin na Kalifornijski univerzitet gde učestvuje u stvaranju škole društvenih nauka sa interdisciplinarnim programom. Ovaj eksperiment iz više razloga nije završen. Već 1970. godine prelazi na Fakultet za poslovne



In memory of Alfred Nobel, the Swedish Royal Academy in 1990 decided to award the Sveriges Riksbank Prize to three American scientists. Harry M. Markowitz, Merton H. Miller and William F. Sharpe were rewarded for their pioneering work in the theory of financial economics.

Harry Markowitz gave the most significant contribution in portfolio selection, William Sharpe in establishing the equilibrium theory of capital asset pricing (CAPM), and Merton Miller in corporate finance. Their work revolutionized finance through the introduction and implementation of quantitative methods in financial analysis.

Biography

William Sharpe was born in June 1934 in Boston, Massachusetts. The majority of his pre-college education was completed in the public schools of California, where he benefitted from teachers who knew how to stimulate their pupils' work, mostly through solid and challenging curricula. In 1951 he enrolled at the University of California at Berkeley, with a plan to major in science en route to a medical degree. However, several courses he attended at the University convinced him that his preferences lay elsewhere. Therefore, he transferred to the University of California at Los Angeles. During his undergraduate studies he majored in accounting and economics. He received the Bachelor of Arts degree in 1955, the Master of Arts degree in 1956. In his autobiography written for the Nobel Foundation, he underlined that two professors had a profound influence on his future career. Those are Armen Achian and J. Fred Weston. As a research assistant Sharpe cooperated with Professor Weston in the Business School, who introduced him to the work of Harry Markowitz. Alchian served as chairman of Sharpe's dissertation committee. He taught his students to always begin their work with an analysis, to concentrate on essential elements and to play devil's advocate with one's own ideas. In his classes the students were able to watch a brilliant method of work, used to solve different problems during research. Sharpe accepted that approach to research, and emulated it ever since.

After the Army, Sharpe joined the RAND Corporation in 1956 as an economist. RAND was an almost ideal place for anyone interested in performing research. In this Corporation Sharpe had a chance to train himself in computer science, game theory, linear programming, dynamic programming and applied economics.

A member of the faculty suggested to Sharpe to choose a different topic than the one he had originally selected for his doctoral dissertation. It was Markowitz who helped him settle on the new topic *Portfolio Analysis Based on a Simplified Model of the Relationships Among Securities*. Although Harry was not on his committee, Markowitz filled a role similar to that of dissertation advisor, which Sharpe commented upon by saying: "My debt to him is truly enormous." He gained his PhD degree in Economics in 1961 at the UCLA. In his doctoral dissertation he explored a series of aspects of portfolio analysis, based on a model proposed by Markowitz.

In 1961 he moved to Seattle to take a position at the School of Business at the University of Washington. He spent seven extremely productive years there. After that, he moved to the University of California at Irvine to participate in an experiment involving the creation of a School of Social Sciences with an interdisciplinary curriculum. For various reasons this experiment was never completed. Already in 1970 he went to the Stanford University Graduate School of Business, where he was a lecturer on doctoral seminars in a team with Alan Kraus and Bob Litzenberger. As underlined by Sharpe, the three of them shared not only the experience and knowledge but also an interest in sailing. In this period he achieved wonderful cooperation with his colleagues Alex Robichek and Paul Cootner, from whom he learned a lot.

In 1973 he was named the Timken Professor of Finance at Stanford. During this period he also served as a consultant in many reputable institutions, such as: Merrill Lynch, Pierce, Fenner and Smith, Wells Fargo Investment Advisors. Working as a consultant in these firms, he learned much about the real world of investment. In countless ways Sharpe successfully applied the acquired knowledge in his lectures and research.

studije na Stenford univerzitetu, gde je predavač na doktorskim seminarima u timu sa Alanom Krausom i Bobom Ucenbergerom. Kako ističe, Šarp njih troje nisu samo delili iskustva i znanja već i zajedničko interesovanje prema jedrenju. U ovom periodu ostvario je divnu saradnju sa kolegama Aleksom Robičekom i Polom Cutnerom i od njih je mnogo naučio.

Za profesora finansija na Stenford univerzitetu imenovan je 1973. godine. Bio je, takođe, i konsultant u mnogim renomiranim institucijama kao što su: *Merrill Lynch, Pierce, Fenner and Smith, Wells Fargo Investment Advisors*. Radeći kao konsultant u ovim firmama mnogo je naučio o stvarnom svetu investiranja. Na bezbroj načina Šarp je stečeno znanje uspešno koristio u nastavi i istraživanju.

Akademsku godinu 1976-77. proveo je u Nacionalnom birou za ekonomska istraživanja kao član tima koji je proučavao pitanja adekvatnosti kapitala banaka, pod rukovodstvom Šermana Mejzela. U njegovom fokusu bio je odnos između osiguranja depozita i rizika neizvršenja.

Vilijam Šarp izabran je 1980. godine za predsednika Američkog udruženja za finansije. Tokom osamdesetih godina nastavio je da radi na pitanjima u vezi sa investicionom politikom penzionih planova. Dvogodišnje odsustvo sa Stenforda uzeo je 1986. godine kako bi osnovao Šarpe-Rasel Istraživanja, firmu ovlašćenu da obavlja istraživanja i razvija procedure kako bi se penzioni fondovi, zadužbine i fondacije lakše odlučivali za alokaciju sredstava koja odgovara njihovim okolnostima i ciljevima.

Da bi imao više vremena za istraživanja i konsultantske aktivnosti nakon osnivanja sopstvene konsultantske firme 1989. godine Šarp postaje počasni profesor finansija na Stenford univerzitetu.

Tokom svog plodnog naučnog rada bio je član brojnih institucija i fondova, kao što su: Penzioni fond za zaposlene na univerzitetima, Fondacija za istraživanja pri Institutu ovlašćenih finansijskih analitičara, Institut za kvantitativna istraživanja u finansijama i Savet za edukaciju i istraživanja pri Institutu ovlašćenih finansijskih analitičara.

Dobitnik je priznanja Visoke škole za biznis i Federacije finansijskih analitičara. Napisao je brojne radove i izdao više knjiga. Svoju radnu

energiju i postignute rezultate objašnjava roditeljskim vaspitanjem: „Naučili su me na sopstvenom primeru kako je učenje radost, kao i osećaju zadovoljstva postignutim rezultatima tog učenja“. Inače Šarpovi roditelji su svoj radni vek završili sa položaja, otac kao predsednik koledža i majka kao direktorka škole.

Oženjen je ostvarenom slikarkom Ketrin koja je njegova velika podrška i ohrabrenje. Čerka Debora i sin Džonatan su fakultetski obrazovani i poseduju, takođe, ljubav prema učenju i prenošenju znanja drugima, što je očigledno nešto što se prenosi iz porodice generacijama.

Naučni rad

Kada je 1952. godine objavljena Markoviceva *Selekcija portfolija*, bilo je očigledno da je njegov model zahtevan sa aspekta baza podataka i obima izračunavanja. Izazov smanjivanja ove kompleksnosti inspirisala je Vilijama Šarpa da razvije model merenja rizika baziran na jednom faktoru koji i stoji u osnovi CAPM. Ovaj model dalje razvija Tobinovu teoriju separacije

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He spent the 1976-1977 academic year at the National Bureau of Economic Research as a member of a team studying issues of bank capital adequacy under the direction of Sherman Maisel. His focus was on the relationship between deposit insurance and default risk.

In 1980 William Sharpe was elected President of the American Finance Association. In the 1980s he continued to work on issues relating to pension plan investment policy. In 1986, he took a two-year leave from Stanford to found Sharpe-Russell Research, a firm chartered to perform research and to develop procedures to help pensions, endowments and foundations select asset allocations appropriate to their circumstances and objectives.

In order to devote more of his time to research and consulting activities, after establishing his own financial consulting firm in 1989, he chose to change status, becoming Timken Professor Emeritus of Finance at Stanford.

Throughout his fruitful scientific career, Sharpe served as a member of numerous institutions and funds, including: the College

Retirement Equities Fund, the Research Foundation of the Institute of Chartered Financial Analysts, the Institute of Quantitative Research in Finance, and the Council on Education and Research of the Institute of Chartered Financial Analysts.

Sharpe received the American Assembly of Collegiate Schools of Business Award and the Financial Analysts' Federation Award. He authored numerous papers and published several books. He explains his working energy and achieved results by referring to the way his parents raised him: "They taught me by example the joys associated with learning and with communicating the results of that learning to others." Sharpe's parents retired from high positions, his father as a college president, and his mother as an elementary school principal.

He is married to Kathryn, an accomplished painter, who has been his great support and encouragement. His daughter Deborah and son Jonathan have college education, and both share a love of learning and of communicating knowledge to others, which is obviously something to be transferred from generation to generation.

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Scientific Work

When in 1952 Markowitz published his Portfolio Selection, it was obvious that his model was rather demanding from the aspect of databases and calculation volume. The challenge of reducing this complexity inspired William Sharpe to develop a risk measurement model based on a factor which is in the basis of CAPM. This model further elaborates on Tobin's theory of separation, claiming that the investment process takes place in two stages: construction of an efficient portfolio according to Markowitz and combination of the efficient portfolio with risk-free assets.

The Capital Asset Pricing Model is based on a situation in which an efficient set is formed with the allowed purchase and sale of risk-free assets. It is then that a linear set of investment possibilities (Market Capital Line) is generated, which is the efficient set for the given situation.

The process of finding the optimal portfolio combination, given the unlimited availability of risk-free assets, substantially simplifies the

koja tvrdi da se investicioni proces odvija u dve faze: konstrukcija efikasnog portfolija po Markoviciu i kombinovanje efikasnog portfolija sa bezrizičnom aktivom.

Model vrednovanja kapitala zasniva se na situaciji u kojoj se formira efikasni set uz dozvoljenu kupovinu i prodaju bezrizične aktive. Tada nastaje linearni skup investicionih mogućnosti (Tržišna linija kapitala) koji za datu situaciju predstavlja efikasni set.

Iznalaženjem optimalne portfolio kombinacije, uz neograničenu raspoloživost bezrizične aktive, bitno se pojednostavljuje problem portfolio selekcije jer je investitor u poziciji samo da odluči koliko će da da ili da uzme u zajam bezrizične aktive. Isto tako, odluka o kupovini portfolia može se posmatrati kao investiciona, a odluka o davanju ili uzimanju u zajam bezrizične aktive kao finansijska odluka.

Šarp je zaključio da bi svi investitori bili u poziciji istog portfolija rizične aktive koji bi u ravnotežnom stanju predstavljao tržišni portfolio kao portfolio koji obuhvata sve raspoložive hartije od vrednosti na tržištu. Uslov za ovo je da postoji jedinstvena kamatna stopa po kojoj se neograničeno može uzimati i davati u zajam i da su investicioni horizonti investitora homogeni. Eventualni izostanak

neke od hartija iz tržišnog portfolija u koga ulažu svi investitori, doveo bi do pada cena i rasta očekivane stope prinosa dotične hartije do nivoa kada bi odnos njenog rizika i očekivanog prinosa bio takav da može biti uključena u portfolio. Zbog toga on predstavlja efikasni tržišni portfolio.

Rizik se po Šarpu može tretirati kao ukupni rizik i kao sistemski rizik. Totalni rizik predstavlja ukupni varijabilitet stopa prinosa posmatrane aktive i meren je standardnom devijacijom stope prinosa. Sistemski rizik meri se koeficijentom - relativnim indeksom osetljivosti posmatrane hartije od vrednosti ili portfolija na rizik tržišta - i to je rizik koji se ne može otkloniti diversifikacijom. Deo rizika koji predstavlja razliku između totalnog i sistematskog rizika naziva se nesistematski rizik. Kretanje cena po osnovu ovoga dela rizika je statistički atonomno i može se, različitom kombinacijom aktive, u proseku svesti na nulu.

Osnovni Šarpov zaključak je da su na efikasnom tržištu investitori kompenzirani samo za podnošenje sistemskog rizika koji se ne može otkloniti diversifikacijom, i da je očekivana stopa prinosa na hartiju u linearnoj zavisnosti sa njenim nivoom sistematskog rizika.

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problem of portfolio selection, because the investor is in the position to decide how much risk-free assets he will lend or borrow. Moreover, the decision on purchasing a portfolio can be viewed as an investment decision, whereas the decision on lending or borrowing risk-free assets can be viewed as a financial decision.

Sharpe reached the conclusion that all investors would be in the position of the same portfolio of risky assets, which would, in an equilibrium state, represent the market portfolio, as the portfolio containing all available securities on the market. The condition for this is that there is a uniform interest rate at which one can lend or borrow without any limitations, and that the investment horizons of the investors are homogenous.

A potential absence of a security from the

portfolio in which all investors have invested would cause a drop of prices, and a growth of expected rate of return on the concerned security, to the extent when the ratio between its risk and expected return is such as to allow it to be included in the portfolio. This is the reason why this represents an efficient market portfolio.

According to Sharpe, risk can be treated as total risk and systemic risk. Total risk refers to the overall variability of rates of return on the observed asset, measured by the standard deviation of the rate of return. Systemic risk is measured by means of a coefficient - relative index of the observed security's or portfolio's sensitivity to market risk - and this risk cannot be mitigated through diversification. A segment of risk representing the difference between the total and systemic risk is called non-systemic risk. Price movements in respect of this risk segment are statistically autonomous and, through different combinations of assets, can be reduced to zero on average.

The basic Sharpe's conclusion is that in an efficient market investors are compensated only for taking the systemic risk that cannot be mitigated through diversification, and that the expected rate of return on a security is linearly correlated to the systemic risk level it entails.