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NAGRAĐENI TEORETIČARI - NEUSPEŠNI PRAKTIČARI

*Robert Merton i
Majron Šouls*

Nobelova nagrada za 1997.

Rezime

Robert Merton, SAD i Majron Šouls, Kanada, dobitnici su Nobelove nagrade za ekonomiju u 1997. godini za razvoj novog metoda za vrednovanje finansijskih derivata.

Sredinom 1973. godine Blek i Šouls razvili su formulu vrednovanja opcija, a Merton generalizuje, razrađuje i dopunjuje osnovne ideje koje su prisutne u radu prethodna dva autora. Smatra se da je ekspanzija prve organizovane berzanske trgovine opcijama u Čikagu 1973. nastala zahvaljujući zaključcima i implikacijama u radovima Bleka, Šoulsa i Mertona. Vrednost formule omogućava brzo izračunavanje cene opcije - svi potrebni elementi su ili definisani ugovorom ili su poznati na tržištu.

Ključne reči: Nobelova nagrada za 1997, ekonomija, Robert Merton, Majron Šouls, F. Blek, novi metod, vrednovanje, finansijski derivati, fond Long-Term Capital Management (LTCM), bankrot, opcija, akcije, tržište, kamatna stopa

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*Robert C. Merton and
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Nobel Prize for 1997*

Summary

Robert Merton, USA and Myron Scholes, Canada, won the 1997 Nobel Prize in Economics for having developed a new method to determine the value of financial derivatives.

In mid 1973 Black and Scholes developed a formula for option pricing, and Merton generalized, amended and elaborated on the basic ideas presented in the paper by these two authors. The expansion of the first organized stock exchange trade in options in Chicago in 1973 is considered to have been enabled thanks to the conclusions and implications presented in the papers by Black, Scholes and Merton. The simplicity of the formula enables quick calculation of the option price - all required elements are either contractually defined or available at the market.

Key words: 1997 Nobel Prize, economics, Robert Merton, Myron Scholes, F. Black, new method, pricing, financial derivatives, Long-Term Capital Management (LTCM) Fund, bankruptcy, option, stock, market, interest rate

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**AWARDED
THEORETICIANS
- UNSUCCESSFUL
PRACTITIONERS**

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Nobelova nagrada za ekonomiju dodeljena je 1997. godine Amerikancu Robertu Mertonu i Kanađaninu Majronu Šoulsu za razvoj novog metoda za vrednovanje finansijskih derivata. Senka na sjaj ovih Nobelovih zvezda neoliberalne ekonomije pala je zbog osvedočene bespomoćnosti u rešavanju konkretnih ekonomskih problema. Naime, već 1998. godine propao je na berzi fond *Long-Term Capital Management (LTCM)*, u čijem bordu direktora su bili Merton i Šouls, čija je strategija bila zasnovana upravo na nagrađenim radovima. Poznato je da je za samo četiri meseca Fond izgubio 4,6 milijardi dolara i da je ubrzo bankrotirao.

Merton - profesor Univerziteta Harvard

Merton je rođen u Njujorku 1944. godine. Otac mu je bio profesor sociologije na univerzitetu Kolumbija iz porodice imigranata, a majka iz kvekerske porodice. U ranom detinjstvu je imao dve strasti: matematiku i bejzbol. Kasnije, strašno je zavoleo automobile i mislio je da će postati inženjer kojem će u poslu preokupacija biti automobili. Na letnjem raspustu u prve dve godine studija radio je u Fordu. Završio je osnovne i postdiplomske studije na univerzitetu Kolumbija. Nedelju dana po diplomiranju oženio je Džun Rouz, glumicu, od koje se razveo 1996. godine. Sa njom ima troje dece: Samantu, Roberta i Pola. Magistar u oblasti primenjene matematike postaje 1967. na Kalifornijskom

tehnološkom institutu. Upisuje doktorske studije na MIT univerzitetu i radi kao asistent profesora Pola Semjuelsona. Diplomom doktora ekonomskih nauka dobio je 1970. godine. Sledeće četiri godine vanredni je profesor na smeru finansija na ovom univerzitetu, a od 1974. redovni je profesor na Sloun fakultetu za menadžment MIT univerziteta. Na Harvard univerzitetu predaje od 1988. godine.

Njegova profesionalna angažovanja bila su i ostala brojna i nemoguće ih je sve nabrojati: Direktor, koosnivač i partner, *Long-Term Capital Management* (1993-), Saradnik istraživač, Nacionalni zavod za ekonomska istraživanja (1979-), Direktor, *Travelers Investment Management Company* (1987-1991), Direktor, *Nova Fund* (1980-1988), Direktor, Američka asocijacija za finansije (1982-84, 1987-88), Član, Ekonometrijsko udruženje (1983), Predsednik, Američko finansijsko udruženje (1986), Počasni član, Međunarodno udruženje finansijskih inženjera (1994), itd. Član je redakcija i odbora kao što su: Međunarodni odbor naučnih savetnika, Tinbergen Institut (1995),

Savetodavni odbor, *Brookings-Wharton* (1997-), Savetodavni odbor, *Međunarodni časopis za teorijske i primenjene finansije* (1997-), Savetodavni odbor, *Časopis za finansijsku edukaciju* (1995-), Savetodavni odbor, *Matematičke finansije* (1989-), Pomoćnik urednika, *Časopis za fiksne*

prihode (1991-), Pomoćnik urednika, *Časopis za bankarstvo i finansije* (1977-79, 1992-), i mnogih drugih.

Nije mali broj ni nagrada niti priznanja koje je do sada dobio. Nagrade: Međunarodnog udruženja finansijskih inženjera, Univerziteta u Čikagu, Instituta za kvantitativno istraživanje u oblasti finansija, *FORCE* - za finansijske inovacije Univerziteta Djuk, itd. Počasni je doktor: Univerziteta u Lozani, Univerziteta Pariz, Nacionalnog Sun-Jat-sen univerziteta, i dr.



In 1997 the Nobel Prize in Economics was awarded to Robert Merton, USA and Myron Scholes, Canada, for having developed a new method to determine the value of financial derivatives. However, a shadow was cast on the glory of these two Nobel stars of neo-liberal economy, due to the evident powerlessness to solve concrete economic problems. Namely, already in 1998 the Long-Term Capital Management (LTCM) Fund, in whose Board of Directors Merton and Scholes sat as members, collapsed in the stock exchange, having followed the strategy based on the awarded papers by these two authors. It is publicly known that in only four months the Fund lost USD 4.6 billion and soon afterwards went bankrupt.

Merton - Harvard University Professor

Merton was born in 1944. His father, the son of immigrant parents, was a professor of sociology at Columbia University, whereas his mother came from a Quaker family. In his early childhood he had two passions: mathematics and baseball. Later on, he came to like cars, and thought he would become an automobile engineer. While in college he spent two summers working for Ford. He completed his undergraduate and postgraduate studies at Columbia University. One week after his graduation he married June Rose, an actress, whom he divorced in 1996. They have three children: Samantha, Robert and Paul. He gained his master degree in applied mathematics in 1967 at the California Institute of Technology. He enrolled at his doctoral studies at MIT University and started working as an assistant to Professor Paul Samuelson. He became a doctor of economic sciences in 1970. The following four years he was a professor at the Department of Finance at the

same University, and since 1974 he has been a full-time professor at the Sloan School of Management at MIT University. He has taught at Harvard University since 1988.

His professional engagements have been and remained numerous, including the following: Principal, Co-founder, Limited Partner, Long-Term Capital Management (1993-), Research Associate, National Bureau of Economic Research (1979-), Director, Travelers Investment

Management Company (1987-1991), Director, Nova Fund (1980-1988), Director, American Finance Association (1982-84, 1987-88), Fellow, Econometric Society (1983), Fellow, American Finance Association

(1986), Vice President, The Society for Financial Engineers (1994), etc. He has also been a member of countless editorial boards, such as: International Board of Scientific Advisers, Tinbergen Institute (1995-), Advisory

Board Brookings-Wharton (1997-), Advisory Board, International Journal of Theoretical and Applied Finance (1997-), Advisory Board, European Finance Education (1995-), Advisory Board, Mathematical Finance (1989-), Associate Editor, Journal of Fixed Income (1991-), Associate Editor, Journal of Banking and Finance (1977-79, 1992-), and many others.

The number of awards and recognitions he has received so far is equally impressive. He received the awards of: the International Association of Financial Engineers, University





Laureati Nobelove nagrade za 1997. godinu
All 1997 Nobel Laureates

Plodan je pisac radova objavljenih u časopisima, zbornicima i knjigama. Knjige koje je objavio su: *Finansijske*, sa Cvi Boudi (1998), *Globalni finansijski sistem: funkcionalna perspektiva*, sa D. Krejn, K. Frut, S. Mejson, A. Perold, C. Boudi, E. Siri i P. Tufano (1995), *Slučajevi finansijskog inženjeringa: Primenjene studije finansijskih inovacija*, sa S. Mejson, A. F. Perold i P. Tufano (1995). Autor je i brojnih radova, kao što su: "O utvrđivanju cena potencijalnih potraživanja i teoremi Modiljani-Miler" (1977.), "Utvrđivanje cena opcija kada su prinosi osnovnih akcija nekontinuirani" (1976.), "Intertemporalni model utvrđivanja cena kapitalne aktive" (1973.), i dr.

Šoulsove ljubavi: kompjuteri i ekonomija

Šouls je rođen 1941. godine u Timinsu, Kanada. Bio je dobar đak u osnovnoj školi. U šesnaestoj godini umrla mu je majka, a posle tog bolnog šoka imao je i problema sa očima zbog trajnog oštećenja rožnjače. To ga je nateralo da kod sebe razvije apstraktno razmišljanje i potpunu koncentraciju, postavši dobar slušalac, što mu je veoma pomoglo

na studijima. U 26. godini transplantacija rožnjače u velikoj meri mu je poboljšala vid. Još je u mladosti bio zainteresovan za trgovinu, berzansko poslovanje i ekonomiju. Osnovne studije završio je na univerzitetu McMaster u Kanadi. Magistarske i doktorske (1968.) studije iz ekonomije stekao je na univerzitetu u Čikagu.

Prvo leto provedeno u Čikagu zauvek je promenilo pravac njegovog života. Odlučio je da neće raditi u firmi svog strica koja se bavila izdavačkom delatnošću, što je bila želja njegove majke. Zbog istraživačkih projekata počeo je da se interesuje za kompjutere i sledeća četiri i po meseca pohađao je kurs postavši "kompjuterski štreber" radeći na njima danju i noću. Do kraja tog leta, kako sam ističe, postao je kompjuterski mag, ovladavši svim potrebnim veštinama koje će potom razvijati i sledećih godina. I pored ove ljubavi, a i zbog nepostojanja adekvatne škole u Čikagu, nešto drugo odnelo je prevagu - ljubav prema ekonomiji i istraživanjima.

Predavač postaje 1968. na Sloun Fakultetu za menadžment MIT univerziteta gde sarađuje sa Mertonom. Šest godina kasnije vraća se na Univerzitet Čikago i tamo predaje sledećih sedam godina. Na univerzitetu Stenford predaje od 1981. godine, a od 1983. na Poslovnoj školi i

of Chicago, Institute for Qualitative Research in Finance, FORCE Award for Financial Innovation of Duke University, etc. He is the Honorary Doctor of: University of Lausanne, University of Paris, National Sun Yat-sen University, etc.

He is a fruitful author of many papers published in journals, anthologies and books. Among others, he has authored the following books: *Finance*, with Zvi Bodie (1998), *The Global Financial System: A Functional Perspective*, with D. Crane, K. Froot, S. Mason, A. Perold, Z. Bodie, E. Sirri and P. Tufano (1995), *Cases in Financial Engineering: Applied Studies of Financial Innovation*, with S. Mason, A. F. Perold and P. Tufano (1995). He has also written countless papers, such as: "On the Pricing of Contingent Claims and the Modigliani-Miller Theorem" (1977), "Option Pricing When Underlying Stock Returns Are Discontinuous" (1976), "An Intertemporal Capital Asset Pricing Model" (1973), etc.

Scholes' Passions: Computers and Economics

Scholes was born in 1941. in Timmins, Canada. He was a good student in primary school. When he was sixteen, his mother passed away, and after this painful shock

he developed scar tissue on his corneas that permanently impaired his eyesight. This made him learn to think abstractly and to develop full concentration. He also became a good listener, which quality greatly assisted him during his studies. At the age of 26 he underwent a successful cornea transplant which greatly improved his vision. Already in his youth, he developed an interest in trade, stock exchange operations and economics. He completed his undergraduate studies at McMaster University in Canada, and gained his master and doctoral degree (1968) in economics at the University of Chicago.

The first summer he spent in Chicago changed the direction of his life forever. He decided that he would not return to his uncle's publishing firm, which used to be his mother's wish. Through his research projects, he developed an interest in computers, spent the following four and a half months attending a computer course, and became a "computer nerd", working day and night. By the end of that summer, as he points out, he became a computer wizard, having acquired all the necessary skills that he would continue to develop over many years. Despite this passion of his, due to the lack of an adequate computer science school in



Ceremonija dodele Nobelove nagrade za 1997. godinu.
A view of the Nobel Prize Award Ceremony for 1997

na Pravnom fakultetu. Za sebe kaže da je srećan čovek jer ima dve divne ćerke: Anu i Saru. Iako zbog poslovnih angažovanja nema mnogo vremena, uživa u dva hobija: golfu i skijanju.

Šoulsovi istraživački radovi u poslednjih nekoliko godina fokusirani su na interakciju i evoluciju tržišta i finansijskih institucija. Postao je počasni doktor na tri univerziteta: Paris-Dauphine, Univerzitet McMaster i Katholieke Universiteit Leuven. Sa Markom Volfsonom autor je knjige *Porezi i poslovna strategija: planski pristup* (1991). Autor je i niza drugih publikacija kao što su: "Efekti prinosa od dividendi i politike dividendi na cene običnih akcija i prinos" sa F. Blekom (1974.), "Utvrđivanje cena opcija i korporativnih obaveza" sa F. Blekom (1973.), "Vrednovanje ugovora o opcijama i testiranje tržišne efikasnosti" sa F. Blekom (1972.), itd.

Merton i Šouls su autori dva rada koji su objavljeni 1978. i 1982. godine: "Dividende i porezi" i "Dividende i porezi: empirijski dokazi".

Doprinosi Mertona i Šoulsa ekonomskoj nauci

Uporedo sa akademskim radom, Merton i Šouls su intenzivno učestvovali kao konsultanti, direktori, osnivači i partneri u radu različitih finansijskih institucija. Još od 1972. godine su zajedno radili kao konsultanti u *Donaldson, Lufkin and Jenrette*. Najpoznatije angažovanje je nesumnjivo u investicionom fondu *Long-Term Capital Management (LTCM)*, u čijem su se nastanku 1994. godine Merton i Šouls pojavili kao suosnivači. Ubrzo je, međutim, ova kompanija prešla put od "grupe najprestižnijih finansijskih analitičara na svetu" (Merton) do potpunog kolapsa i bankrotstva u 1998. godini.

Sredinom 1973. godine objavljen je rad Bleka i Šoulsa "Utvrđivanje cena opcija i korporativnih obaveza". U ovom, možda i najcitiranijem, radu iz oblasti finansija razvijena je formula za vrednovanje opcija, poznata kao Blek-

Šoulsov model. Istovremeno, Merton objavljuje jednako priznat rad pod nazivom "Teorija racionalnog utvrđivanja cena opcija" u *Bell Journal of Economics and Management Science*, u kome generalizuje, razrađuje i dopunjuje osnovne ideje prisutne u radu Bleka i Šoulsa. Smatra se da je u velikoj meri ekspanzija prve organizovane berzanske trgovine opcijama u Čikagu 1973. godine nastala zahvaljujući zaključcima i implikacijama u radovima Bleka, Šoulsa i Mertona.

Blek-Šoulsov model pretpostavlja evropski tip (realizacija je moguća samo na dan dospeća opcije) kupovine opcije (kupac opcije ima pravo, ali ne i obavezu da kupi osnovnu hartiju od vrednosti), a osnovnu finansijsku aktivu u analizi čine akcije. Uz to, prisutne su i uobičajene pretpostavke za ravnotežne modele, koje, po pravilu, olakšavaju analizu, ali i umanjuju značaj rezultata za ekonomsku praksu: neisplaćivanje dividendi u periodu važenja opcionog ugovora, savršena efikasnost tržišta, nepostojanje transakcionih troškova, konstantnost kratkoročnih kamatnih stopa, mogućnost neograničenog uzimanja i davanja zajmova, lognormalna raspoređenost prinosa, predvidivo kretanje cena akcija i njihove blage promene. Raniji pokušaji utvrđivanja cene opcija su polazili od procene očekivane vrednosti opcije na dan njenog izvršenja (isteka ugovora), što je, po definiciji, pretpostavljalo diskontovanje buduće vrednosti na sadašnju. Nerešivi problem je bila procena riziko premije koja bi se koristila pri diskontovanju. Pošto

ona zavisi od kretanja cena akcija, ali i od sklonosti investitora ka riziku, njeno objektivno vrednovanje je bilo nemoguće. Blek i Šouls su problem elegantno rešili, jednostavno izostavljajući riziko premiju iz računice. To je značilo, ne da premija ne postoji, već da je ona već inkorporirana u cenu akcije.

Vrednost opcije je funkcija cene akcije, vremena dospeća i varijabli (koji su, shodno



Robert C. Merton

Chicago, something else prevailed - his love for economics and scientific research.

In 1968 he became an Assistant Professor at the Sloan School of Management at MIT University, where he started cooperating with Merton. Six years later he returned to the University of Chicago, where he spent the next seven years as a professor. In 1981 he started teaching at Stanford University and in 1983 in the Business School and the Law School. He is fortunate to have two wonderful daughters: Anne and Sara. Although due to his business engagements he does not have much free time, he does enjoy his two hobbies: golf and skiing.

Scholes' research papers in the last few years have focused on the interaction and evolution of markets and financial institutions. He has received honorary doctorate degrees from three universities: University of Paris-Dauphine, McMaster University and Katholieke Universiteit Leuven. Together with Mark Wolfson he wrote the book *Taxes and Business Strategy: A Planning Approach* (1991). He has also authored a series of other publications, such as: "The Effects of Dividend Yield and Dividend Policy on Common Stock Prices and Returns" with F. Black (1974), "The Pricing of Options and Corporate Liabilities" with F. Black (1973), "The Valuation of Option Contracts and a Test of Market Efficiency" with F. Black (1972), etc.

Merton and Scholes also jointly authored two papers published in 1978 and 1982: "Dividends and Taxes" and "Dividends and Taxes: Some Empirical Evidence".

Contributions of Merton and Scholes to Economic Science

In parallel with their academic work, Merton and Scholes intensely participated, as consultants, directors, founders and partners, in the activities of various financial institutions. Since 1972 they have worked together as

consultants in *Donaldson, Lufkin and Jenrette*. Their most famous engagement has certainly been the one concerning the investment fund *Long-Term Capital Management (LTCM)*, whose co-founders Merton and Scholes were back in 1994. This company, however, soon travelled the road from "a group of the most prestigious financial analysts in the world" (Merton) to the complete collapse and bankruptcy in 1998.

In mid 1973 Black and Scholes published their paper "The Pricing of Options and Corporate Liabilities". In this, probably most often quoted, paper in the field of finance, they developed a formula for option pricing, known as the Black-Scholes model. At the same time, Merton published his equally recognized paper titled "Theory of Rational Option Pricing" in *Bell Journal of Economics and Management Science*, where he generalized, amended and elaborated on the basic ideas presented in the paper by Black and Scholes. The expansion of the first organized stock exchange trade in options in Chicago in 1973 is considered to have been enabled thanks to the conclusions and implications presented in the papers by Black, Scholes and Merton.

The Black-Scholes model presents the European type (realization possible only on the option's maturity date) of put option (the buyer of the option has the right, but not the obligation to buy the underlying security), with shares being the underlying financial assets in the analysis. Moreover, the model incorporates the typical assumptions of balanced models,

which, as a rule, make the analysis easier, but also reduce the significance the results have in economic practice: no dividend pay-outs until the expiry of the option-related contract, perfect market efficiency, no transaction costs, stability of short-term interest rates, possibility of unlimited borrowing and lending, lognormal distribution of returns, predictable



pretpostavkama, konstantne). Ključna ideja u modelu je da je moguće formirati takav portfolio akcija i kupovnih opcija koji će u potpunosti neutralisati rizik promene cene osnovne hartije, odnosno koji neće zavisiti od cene akcije, već samo od vremena i konstanti (prinos će biti na nivou nerizične kratkoročne kamatne stope). Ukoliko se tokom vremena menja cena akcije, menja se i broj opcija koje je potrebno prodati/kupiti da bi se pokrila duga/kratka pozicija u akcijama. Kontinualnim prilagođavanjem broja akcija i opcija u potpunosti se eliminiše zavisnost prinosa akcije od njene cene. Jedinstvena vrednost opcije se ostvaruje na nivou koji dovodi cene akcije i opcije u ravnotežno stanje i u kome se ostvaruje prinos u visini nerizične kamatne stope (Vučković, 2004: 301-336).

Jednostavnost formule omogućuje brzo izračunavanje cene opcije - svi potrebni element su ili definisani ugovorom ili su poznati na tržištu. Teorijska razrada modela je izuzetno fleksibilna i našla je primenu u mnogim drugim aspektima korporativnih finansija. Primenljivost modela u praksi je radak primer uspešne implementacije vrhunskog teorijskog dostignuća u realnom svetu finansija.

Kasnije, teorija je poboljšavana korigovanjem

pojedinih nerealnih pretpostavki. Sami autori su razređivali osnovni model i dodatno ga približavali praksi. Prvobitni Mertonov model je dozvoljavao mogućnost isplate dividendi u periodu važenja opcionih ugovora, da bi, tri godine kasnije, u analizu uveo i promenljivost kamatnih stopa. Dalje, vršene su modifikacije uključivanjem transakcionih troškova, poreza, volatilnih cena akcija.

Doprinos Mertona i Šoulsa u ostalim oblastima ekonomske nauke zaostaje za revolucionarnim u segmentu finansijskih derivata. Merton je na početku karijere proučavao obrasce individualne potrošnje i investicionog odlučivanja u kontinuelnim vremenskim modelima. Generalizovao je poznati CAPM model za vrednovanje aktive (umesto statičke dao mu dinamičku komponentu). Šouls je proučavao uticaj dividende na cene akcije i problematiku informacione efikasnosti tržišta. Poslednjih godina Merton i Šouls se prevashodno bave problemima interakcije institucija i finansijskih tržišta. Šouls je pisao i o penzionim i poreskim planovima, dok je Merton istraživao uticaj inovacija na razvoj finansijskih institucija.

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movements of stock prices and their slight changes. Previous attempts of option pricing started from the assessment of the expected option value on the day of its execution (contract expiry), which, according to the definition, implied the discounting of future values in relation to the present one. The unfathomable problem was the assessment of risk premium to be used in the process of discounting. Given that it depends on the movements of stock prices, but also on the investors' risk appetite, its objective pricing was impossible. Black and Scholes solved this problem rather elegantly, simply by leaving the risk premium out of the calculation. This did not mean that the risk premium did not exist, but that it had been incorporated into the stock price.

Option value is the function of stock price, maturity time and variables (which are, according to the assumptions, constant). The key idea in this model is that it is possible to form such a portfolio of stock and put options that would fully neutralize the risk of changes in the underlying security's price, i.e. that would not depend on the stock price, but exclusively on the time and constants (returns would be at the level of risk-free short-term interest rate). If the stock price changes over time, the number of options that need to be sold/bought to cover long/short position in stock also changes. The continual adjustment of the number of shares and options fully eliminated the dependence of the stock return on its price. The unique option value is achieved at the level that brings the stock price and option price into equilibrium, and in which the return is achieved in the amount equal to the risk-free interest rate (Vučković, 2004: 301-336).

The simplicity of the formula enables quick

calculation of the option price - all required elements are either contractually defined or available at the market. Theoretical elaboration of this model is extremely flexible and has been applied in many other aspects of corporate finance. The model's applicability in practice is a rare example of successful implementation of an excellent theoretical achievement in the real world of finance.

Over time, the theory has been improved by the correction of certain unrealistic assumptions. The authors themselves elaborated on the basic model, thus additionally bringing it closer to the practice. The original Merton's model enables the possibility of dividend pay-outs during the validity of option-related contracts, only to introduce the volatility of interest rates into the analysis, three years later. Furthermore, some modifications have been made by integrating transaction costs, taxes and volatile stock prices.

Contribution of Merton and Scholes in other fields of economic science is not as revolutionary as in the segment of financial derivatives. At the beginning of his career, Merton investigated the patterns of individual consumption and investment decision-making within the continual time models. He generalized the famous CAPM model for asset pricing (by giving it a dynamic component instead of the static one). Scholes investigated the effects of dividends on stock prices and the issues concerning the information efficiency of the market. In recent years, Merton and Scholes predominantly deal with the issues related to the interaction between institutions and financial markets. Scholes wrote about pension and fiscal plans, whereas Merton researched the impact of innovations on the development of financial institutions.