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homogeneous and homothetic functions are closely related but are used in different ways in economics we focus on four main areas starting with a look at homogeneity homogeneity and returns to scale page 2 homogeneity of derivatives mrs constant along rays euler s the orem wicksteed s theorem page 10 1 3 homothetic functions de nition 3 a function rn r is called homothetic if it is a mono tonic transformation of a homogenous function that is there exist a strictly increasing function g r r and a homogenous function u rn r such that g u it is clear that homothetiticy is ordinal property monotonic transforma if a utility function is homothethic u x tx u y ty u x x u y y u x t x u y t y u x x u y y in other words the mrs must be homogenous of degree zero hence for mrs tx ty 2 tx ty 2t x y tmrs x y m r s t x t y 2 t x t y 2 t a function is called homothetic if it can be written as a monotonic transformation of a homogeneous function i e a function f x y is homothetic if there is a monotonic function h ℝ ℝ and a homogeneous function g x y so that f x y h g x y in mathematics a homothetic function is a monotonic transformation of a function which is homogeneous however since ordinal utility functions are only defined up to an increasing monotonic transformation there is a small distinction between the two concepts in consumer theory 1 homogenous and homothetic functions rmi complex effects in large eddy simulations 2007 07 16 stavros kassinos the field of large eddy simulations is reaching a level of maturity that a function is monotone where assumption of homotheticity simplifies computation derived functions have homogeneous properties doubling prices and income doesn t change demand demand functions are homogenous of degree 0 the slope of the mrs is the same along rays through the origin homothetic functions recall that a real function f on a set e defines a complete or total ordering on e via the relation begin array ccc hfill x underset preceq prec y hfill hfill mathrm if mathrm and mathrm only mathrm if hfill hfill f x le f y hfill end array given a cone e in the euclidean space mathbb r n and an ordering on e i e a reflexive and transitive binary relation on e the ordering is said to be homothetic if for all pairs x y e x le y rightarrow lambda x le lambda y mathrm for mathrm all lambda 0 homothetic functions recall that a real function f on a set e defines a complete or total ordering on e via the relation x y if and only if fxðÞ fyðÞ by definition f is said to be homothetic if the ordering is homothetic implying that the domain e of f is a cone thus utility functions which represent a homothetic ordering are the generalized acms production function of n variables is given by f x1 x n γ β ρ 1x ρ 1 β px d ρ where ρ 6 0 ρ 1 d γ 0 and βi 0 for all i 1 n a homothetic function is a production function of the form f x1 xn f h x1 xn received november 5 1999 revised version october 31 2000 summary this paper examines the proposition that homotheticity is equivalent to the property that e g in the context of a production function the marginal rate of substitution is constant along any ray from the origin in this video we introduce the concept of homothetic functions and discuss their relevance in economic theory the production function f is said to be homothetic if there exists a monotone increasing transformation k y such that k f x g x is homogeneous of degree one or equivalently if there exists a monotone transformation h such that f x h g x where g x is homogeneous of degree one it describes the relationship between two figures of the same shape and orientation for example two russian dolls looking in the same direction can be considered homothetic homotheties are used to scale the contents of computer screens for example smartphones notebooks and laptops a function f rn r f r n r is homothetic if its marginal rate of substitution mrs between any two variables is constant along rays from the origin i e the mrs depends only on the ratio of the variables i e mrs is homogeneous of degree 0 using x k x k capital y l y l labour homothetic production functions of a firm article shared by the broad class of monotonic increasing functions of homogeneous production functions which includes also the underlying homogeneous functions is called homothetic this paper examines the proposition that homotheticity is equivalent to the property that e g in the context of a production function the marginal rate of substitution is constant along any ray from the origin are there any results in economics that require function to be homothetic the textbook i am using essential mathematics for economic analysis says that function is homothetic when f x f y and t 0 then f tx f ty it also mentions that there are homothetic functions which are not homogenous like f xy 1 a function is homogenous of order k if f tx ty t kf x y a function is homothetic if it is a monotonic transformation of a homogenous function note that this second function does not need to be homogenous itself

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if a utility function is homothethic u x tx u y ty u x x u y y u x t x u y t y u x x u y y in other words the mrs must be homogenous of degree zero hence for mrs tx ty 2 tx ty 2t x y tmrs x y m r s t x t y 2 t x t y 2 t

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a function is called homothetic if it can be written as a monotonic transformation of a homogeneous function i e a function f x y is homothetic if there is a monotonic function h ℝ ℝ and a homogeneous function g x y so that f x y h g x y

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in mathematics a homothetic function is a monotonic transformation of a function which is homogeneous however since ordinal utility functions are only defined up to an increasing monotonic transformation there is a small distinction between the two concepts in consumer theory

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a function is monotone where assumption of homotheticity simplifies computation derived functions have homogeneous properties doubling prices and income doesn t change demand demand functions are homogenous of degree 0 the slope of the mrs is the same along rays through the origin

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homothetic functions recall that a real function f on a set e defines a complete or total ordering on e via the relation begin array ccc hfill x underset preceq prec y hfill hfill mathrm if mathrm and mathrm only mathrm if hfill hfill f x le f y hfill end

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given a cone e in the euclidean space mathbb r n and an ordering on e i e a reflexive and transitive binary relation on e the ordering is said to be homothetic if for all pairs x y e x le y rightarrow lambda x le lambda y mathrm for mathrm all lambda 0

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homothetic functions recall that a real function f on a set e defines a complete or total ordering on e via the relation x y if and only if fxðÞ fyðÞ by definition f is said to be homothetic if the ordering is homothetic implying that the domain e of f is a cone thus utility functions which represent a homothetic ordering are

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the generalized acms production function of n variables is given by f x1 x n γ β p 1x p 1 β px d p where ρ 6 0 ρ 1 d γ 0 and βi 0 for all i 1 n a homothetic function is a production function of the form f x1 xn f h x1 xn

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the production function f is said to be homothetic if there exists a monotone increasing transformation k y such that k f x g x is homogeneous of degree one or equivalently if there exists a monotone transformation h such that f x h g x where g x is homogeneous of degree one

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it describes the relationship between two figures of the same shape and orientation for example two russian dolls looking in the same direction can be considered homothetic homotheties are used to scale the contents of computer screens for example smartphones notebooks and laptops

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a function f rn r f r n r is homothetic if its marginal rate of substitution mrs between any two variables is constant along rays from the origin i e the mrs depends only on the ratio of the variables i e mrs is homogeneous of degree 0 using x k x k

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homothetic production functions of a firm article shared by the broad class of monotonic increasing functions of homogeneous production functions which includes also the underlying homogeneous functions is called homothetic

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this paper examines the proposition that homotheticity is equivalent to the property that e g in the context of a production function the marginal rate of substitution is constant along any ray from the origin

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are there any results in economics that require function to be homothetic the textbook i am using essential mathematics for economic analysis says that function is homothetic when f x f y and t 0 then f tx f ty it also mentions that there are homothetic functions which are not homogenous like f xy 1

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a function is homogenous of order k if f tx ty t kf x y a function is homothetic if it is a monotonic transformation of a homogenous function note that this second function does not need to be homogenous itself

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