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the maximum likelihood estimator for parameters in the generating operator of an infinite dimensional ornstein uhlenbeck process is shown to be consistent and asymptotically normal the generating operator of the process is assumed to be in the form of a finite linear combination of fixed commuting dissipating operators and the coefficients in the linear combination represent the unknown parameters author brownian motion calculus presents the basics of stochastic calculus with a focus on the valuation of financial derivatives it is intended as an accessible introduction to the technical literature a clear distinction has been made between the mathematics that is convenient for a first introduction and the more rigorous underpinnings which are best studied from the selected technical references the inclusion of fully worked out exercises makes the book attractive for self study standard probability theory and ordinary calculus are the prerequisites summary slides for revision and

teaching can be found on the book website this paper provides the derivation of the hitting time density of an ornstein uhlenbeck process to a flat boundary the derivation relies on a change of measure approach and delivers an explicit formula this formula is an amended expression of the result given in leblanc and scaillet 1998 it corresponds to the formula given by a time substitution approach when the boundary level coincides with the mean of the invariant measure it can for example be used to price digital up and in credit spread options when the logarithm of the credit spread is assumed to follow an ornstein uhlenbeck process the aim of this paper is to present the elemental equations we can use to calibrate through the maximum log likelihood method and to simulate under a risk neutral framework through the monte carlo simulation method the stochastic process known as the trending ornstein uhlenbeck process abstract in this research we develop innovative regression models for survival analysis that model time to event data using a latent health process which stabilizes around an equilibrium point a characteristic often observed in biological systems regression modeling in survival analysis is typically accomplished using cox regression which requires the assumption of proportional hazards an alternative model which does not require proportional hazards is the first hitting time fht model where a subject s health is modeled using a latent stochastic process in this modeling framework an event occurs once the process hits a predetermined boundary the parameters of the process are related to covariates through generalized link functions thereby providing regression coefficients with clinically meaningful interpretations in this dissertation we present an fht model based on the ornstein uhlenbeck ou process a modified wiener process which drifts from the starting value of the process toward a state of equilibrium or homeostasis present in many biological applications we extend previous ou process models to allow the process to change according to covariate values we also discuss extensions of our methodology to include random effects accounting for unmeasured covariates in addition we present a mixture model with a cure rate using the ou process to model the latent health status of those subjects susceptible to experiencing the event under study we apply these methods to survival data collected on melanoma patients and to another survival data set pertaining to carcinoma of the oropharynx a class of infinite dimensional ornstein uhlenbeck processes that arise as solutions of stochastic partial differential equations with noises generated by measure valued catalytic processes is investigated the first topic is the determination of the covariance structure of the processes and identification of the hilbert space in which the solutions live and have continuous paths example of catalysts which are singular measures or measure valued processes are given and results on the behavior of the corresponding catalytic ornstein uhlenbeck processes are obtained the second main topic is the study of the special case in which the catalyst is given by a super brownian motion continuity theorems are established and results on the regularity properties on and off the catalyst are obtained the third main topic is to prove that the catalytic ornstein uhlenbeck process with super brownian catalyst in one dimension arises as a high density fluctuation limit of a super brownian motion with a super brownian catalyst and with immigration using some of the techniques established before particularly those based on properties of sobolev spaces and laplace functionals the ornstein uhlenbeck ou process is a widely used model for stochastic processes where the value drifts towards a fixed stable value we examine how well the ou process fits the data by using likelihood ratio tests to compare models of temporal dynamics of otus then we derive the fisher information of the ou process and show how it can be used to maximize the temporal efficiency of sampling we apply this to parameters estimated from real data to determine optimal sampling schemes for human microbiomes we use simulations to show that the asymptotic theory applies to typical finite sample cases the models of random motions in random media rmrm have been shown to have fruitful applications in various scientific areas such as polymer physics statistical mechanics oceanography etc in this dissertation we consider a special model of rmrm the ornstein uhlenbeck process in a poisson random medium and investigate the long time evolution of its

random energy we give complete answers to the long time asymptotics of the exponential moments of the random energy with both positive and negative coefficients under both quenched and annealed regimes through these results we find out a dramatic difference between the long time behavior of the brownian motion dynamics and the ornstein uhlenbeck dynamics in the poisson random medium this master s thesis reviews the concepts behind a stochastic process known as the ornstein uhlenbeck process and then uses that process as a way to investigate neural decision making in particular matlab simulations suggest the usefulness of robustly integrating neural evidence to make a cognitive decision we propose in this paper a comparison study of models to fit vix data and therefore to prive vix derivatives the models considered are an asub 3 2 and levy ou process we find excellent fitting for the second process with error fitting results much better than the others the model levy ou process performs more than 10 times better than an asub 3 2 the thesis is devoted to the study of solutions to the following linear recursion beq x n 1 gamma x n xi n feq where gamma in 0 1 is a constant and xi n n in zz is a stationary and ergodic sequence of normal variables with emph random means and variances more precisely we assume that beq xi n mu n sigma n veps n feq where veps n in zz is an i i d sequence of standard normal variables and mu n sigma n n in zz is a stationary and ergodic process independent of veps n n in zz which serves as an exogenous dynamic environment for the model this is an example of a so called sv stands for stochastic variance or stochastic volatility time series model we refer to the stationary solution of this recursion as a discrete ornstein uhlenbeck process in a stationary dynamic environment par the solution to the above recursion is well understood in the classical case when xi n form an i i d sequence when the pairs mean and variance form a two component finite state markov process the recursion can be thought as a discrete time analogue of the langevin equation with regime switches a continuous time model of a type which is widely used in econometrics to analyze financial time series par in this thesis we mostly focus on the study of general features common for all solutions to the recursion with the innovation error term xi n modulated as above by a random environment mu n sigma n regardless the distribution of the environment in particular we study asymptotic behavior of the solution when gamma approaches 1 in addition we investigate the asymptotic behavior of the extreme values m n max 1 leq k leq n x k and the partial sums s n sum k 1 n x k the case of markov dependent environments will be studied in more detail elsewhere par the existence of general patterns in the long term behavior of x n independent of a particular choice of the environment is a manifestation of the u

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