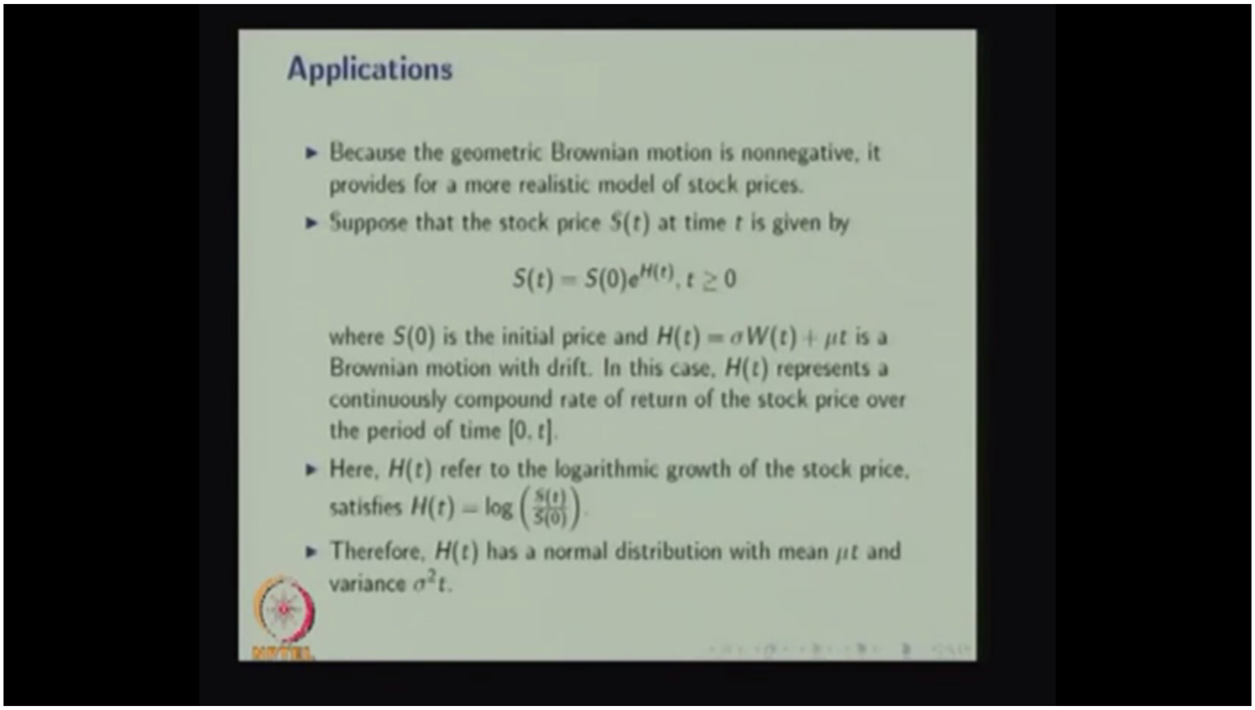
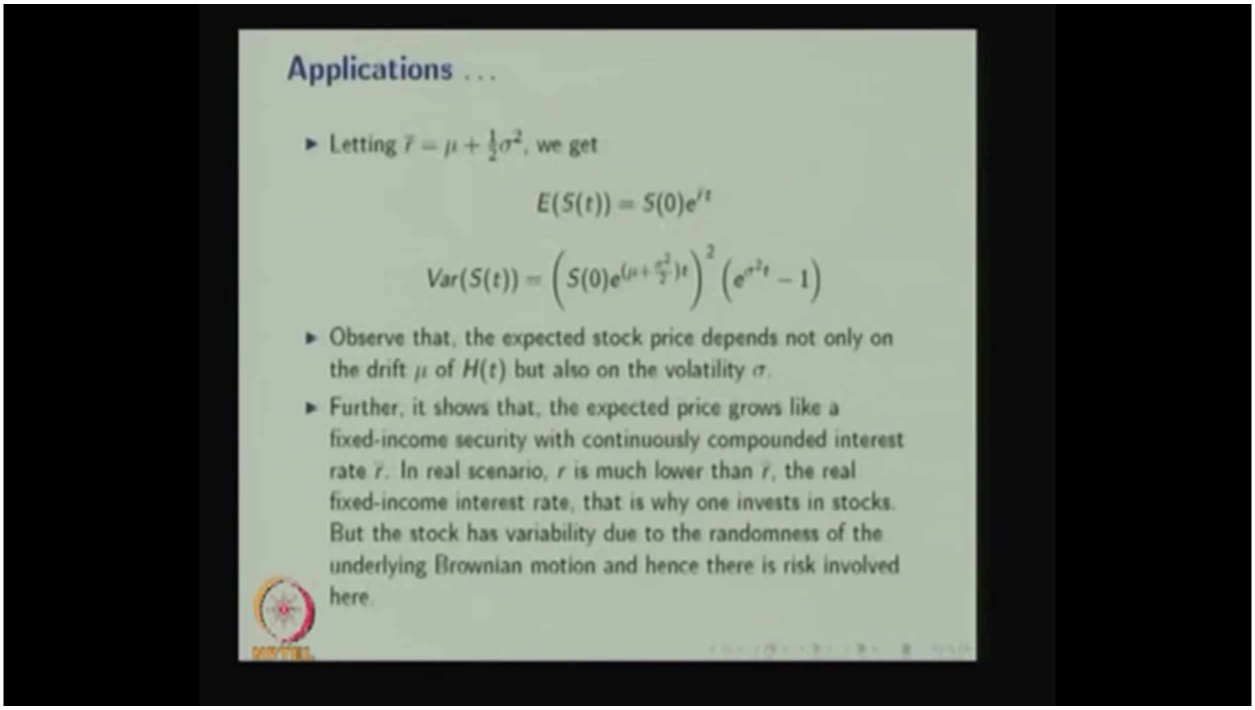


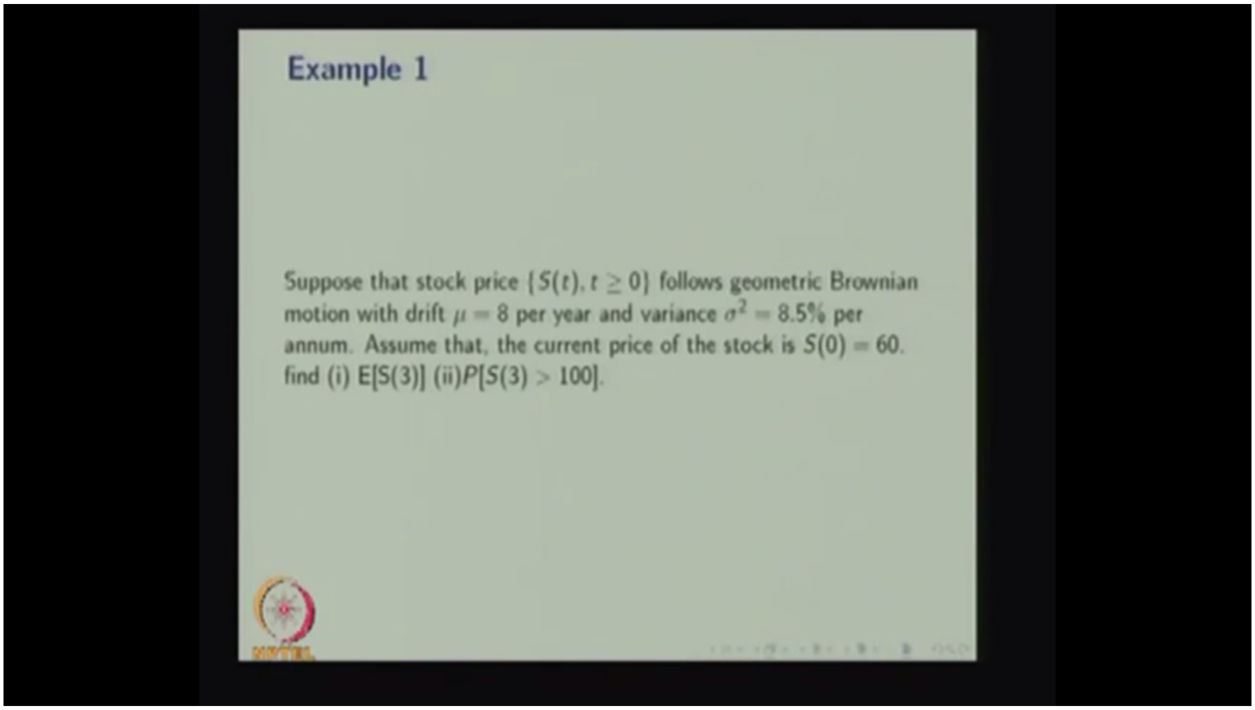
As application because the geometric Brownian motion is a non-negative because of the form Xt is equal to X naught e power Wt WT has a range minus infinity to infinity, the e power Wt therefore the range of Xt is 0 to infinity so the geometric Brownian motion is non-negative random variable for Xt. It provides more realistic model for stock prices whereas one cannot use he Brownian motion to model the stock prices. Suppose the stock price St at time t is given by St is equal to S naught e power Ht where t is greater or equal to 0 where S naught is initial price and Ht is of the form mu times t plus Sigma times Wt. We are going little generalized one the geometric Brownian motion is not the form Xt is equal to X naught e power Wt whereas K here we are considering more general setup S of t is equal to S of 0 e power Ht where Ht is having a new t term along with the Sigma times Wt. You make the mus equal to 0 Sigma is equal to 1 sigma square is equal to 1 you will get that standard geometric Brownian motion. [Indiscernible] [00:01:38] whereas here this is the the Ht is a Brownian motion with the [Indiscernible] [00:01:45]. In this case the Ht represents the continuously compound rate of return the stock price over the period of time 0. Wt is a standard Brownian motion. The Ht is equal to mu t plus Sigma times Wt is the Brownian motion with the [Indiscernible] [00:02:10] and it represents a continuous compound rate of return of the stock price over the period of time 0 to t. Here Ht refers to the logarithmic growth of the stock price because [Indiscernible] [00:02:29] t is equal to log of S of t by S of 0. S of t is equal S of 0 e power Ht so you can divide S of 0 so S of t by S of 0 is equal to e power Ht take logarithm both side therefore log of St by S0 is same as H of t. Hence it refers to the algorithmic growth of the stock price. Since it is S of t is equal to S of 0 e power Ht and Ht is Sigma times Wt plus mu t therefore Ht you know that the Wt is a normally distributed with the mean 0 variance t standard Brownian motion therefore Ht also normally distributed random variable [Indiscernible] [00:03:27] with mean you can find out the mean of Ht and mean of Ht this mean is 0 therefore mean of Ht is mu t find out the variance, variance will be 0 here. Here the variance will be Sigma square and the variance of Wt is t therefore the variance of Ht is Sigma square. So from this equation H of t is equal to Sigma times Wt plus mu t by finding mean and variance you can [Indiscernible] [00:03:57] the H of t is a normally distributed with the mean mu t mu times t and the variance Sigma square.



Already we have made these substituion. Mu plus half times half Sigma square [Indiscernible] [00:04:19] hence the expectation of S of t will be S of 0 e power r power e. Not only that you can find out the variance. The way we have derived mean and variance of geometric Brownian motion we can find out the mean and variance of S of t also. Observe that the expected stock price the expectation of t you can observe that the expected stock price depends not only on the drift mu of the H of t but also the volatility because the expectation of X of t is equal to X of 0 times e power r bar t where r bar is mu plus half Sigma square. So this r bar depend on the mu as well as Sigma square. Hence the expected stock price depends not only the drift but also the volatility Sigma. [Indiscernible] [00:05:23] the drift of H of t but also the volatility Sigma.

Further it shows that the expected price grows like a fixed income security with the continuously compounded interest rate r bar whers S of t is the stock price at time t the expected stock price at time t is s of 0 e power exponential of r bar t so it grows like a fixed income security with the continuously compound interest rate r bar [Indiscernible] [00:06:07]. in real scenario r is much lower than r bar where r is the real fixed income interest rate. That is why one invest in stocks but even though there is a risk attached to it. In the fixed income scenario the interest rate is r there is no risk whereas when you invest in stock the average or expected price growth in the form of S of t e power r bar t where r is much lower than r bar but there is a risk. That is the difference between the fixed income scenario with the investing in stocks but the stock has a variability due to the randomness of the underlying Brownian motion and hence there is a risk involved.

So we have taken one application of geometric Brownian motion. Through that we have explained, we have derived mean and variance of stock price through that we are discussing the risk over the investment in stock.



This is a very simple example. Suppose the stock price S of t follows a geometric Brownian motion with the drift some value here we make it 8% a year as well as a variance the Sigma square is the 8.5% per annum. Assume that the current price of the stock S naught is 16 the questions are what is the expected stock price at t 0.3 three years similarly what is the probability that the stock price at the time 0.3 will be greater than [Indiscernible] [00:08:31] so since you know the S of t you can find out the probability because S of t is of the form X naught times e power Ht. So you have to use the lognormal concept to find out the probability and the expectation of S of t we have already given the formula for expectation of S of T. you can use that to get the value.