In order to keep the quality of the road networks at an acceptable level, large amount of investments for rehabilitation and maintenance activities are necessary in addition to investments in new and reconstructed roads. Therefore, an efficient allocation of road investment funds is of great economic importance. Decreasing the overall contractors’ bid prices and lowering the financial/technical risks imposed to the Swedish Transport Administration are two key strategies to achieve more value of money for the roads. An overall decrease in bid prices can be achieved either by lowering the risks involved in the contracts or by applying more effective hedging strategies. This Thesis aims at developing a framework to evaluate the financial and technical risks regarding asphalt pavement projects from the transport administration and contractors’ perspectives. Moreover, it enables valuation of different hedging strategies such as long term material/fuel contracts with suppliers.

A significant part of the costs associated with asphalt pavements is related to the cost of oil products such as bitumen, fuel oil and transportation fuel. Moreover, the cost of energy has been usually subjected to high fluctuations. However, the financial risk regarding the energy price is not reflected in the discount rate suggested by the Swedish transport administration. Therefore, application of the common range (i.e. 0-8%) for discount rate sensitivity analysis regarding road projects may lead to under-estimation of the financial risk. It is observed that the proper range for discount rate sensitivity analysis of asphalt pavement has to be between -20% and 30%. However, the financial risk regarding the cost of asphalt pavements, due to the presence of Price Adjustment Clauses (PACs) (for bitumen), is shared between the Swedish Transport Administration and contractors. Additionally, the presence of PACs, similar to other governmental support mechanisms such as loan and revenue guarantees, results in asymmetric project’s payoff function which cannot be assessed by traditional methods (e.g. NPV). In order to overcome this issue, an option pricing framework is suggested which can assess the project value and reflect the financial risks. Furthermore, the suggested framework can evaluate the project value under different features of highway projects such as limited liability of the public private partnership (PPP) firm and government revenue guarantees. It was observed that although the application of PACs significantly decreased the risk profile regarding the construction cost for the contractors it imposed a significant financial risk to the road administration and ultimately to the tax payers. Therefore, the value of PACs should be considered in the decision making process regarding large projects. As a general principle, a systematic risk should be borne by the party which either is best placed to manage it or has the possibility to minimize its impacts. Contractors and suppliers in large projects can sometimes be the best parties to minimize the financial and technical risks. They might have the possibility to depot the construction supply at the beginning of the project and by doing so hedge against the financial risk regarding the fuel/material cost escalations. Moreover, contractors may have the possibility to lower the financial and technical risks by implementing better solutions. For instance, application of preventive maintenance activities (i.e. thin asphalt layer) by smoothing the surface can lower the exerted dynamic loads and hence increase the pavement life span and decrease the technical and financial risk.
Keywords: Road & Highways, Life Cycle Cost, Options Pricing, Pavement Design, Risk Assessment, Maintenance.