This thesis investigates probabilistic copula models for bivariate random vectors and their applications to dependency modelling and Scarsini measures of concordance. The first part focuses on bivariate distributions with non-atomic (continuous) marginals, establishing key principles of classic copula theory. It demonstrates that copula functions preserve all scale-invariant characteristics of random vectors, fully describing their dependency structures. Key concepts such as counter- and co-monotonicity, as well as concordance ordering, are introduced. The study also examines Scarsini measures of concordance, establishing that copulae accurately capture these measures. Particular instances, including the population versions of Kendall's tau and Spearman's rho, are explored in depth. The second part focuses on arbitrary bivariate distributions. Issues arising from the presence of atoms in the marginals are outlined; ways to address the non-uniqueness of associated copulae are discussed. We introduce the concept of the standard extension copula, which generalises the unique copula of the non-atomic case and validates both analytical and synthetic copula models for arbitrary margins. The behaviour of Kendall's tau a Spearman's rho is explored and various re-normalisations for these coefficients are considered. A number of examples illustrate the theoretical concepts.