Abstract: The analysis and prediction of medical expenditures are of great interest to government policy makers and the health insurance industry. Data collected on medical expenditures have a number of features that are not adequately addressed by traditional statistical models, such as correlation between the expenditures from the same individual, non-linear unspecified relationships between the expenditure and risk factors, and unequal variances of random errors (referred to as heteroscedasticity). In this presentation, we propose a panel data semiparametric partially linear regression model with heteroscedastic errors to account for all these features. The model allows both parametric and nonparametric (nonlinear) components. We develop test procedures to detect heteroscedasticity and one-way error structure, and propose a weighted semiparametric least squares estimator (WSLSE) of the parametric component in the presence of heteroscedasticity and one-way error structure. This WSLSE is shown to be more efficient than the usual semiparametric least squares estimator in the literature, and its asymptotic properties are also derived. The nonparametric component of the model is estimated by the local polynomial method. Simulations are conducted to evaluate the performance of the proposed testing and estimation procedures. The models and procedure are applied to a set of medical expenditure data in Australia.