DMP model in continuous time

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Introduction

Job finding process is characterized by the investment in information made by both the worker and firm in the hope of locating a fruitful long-term relationship. Therefore, searching and matching frictions are important to understand the labor market dynamics. As the future is never known with certainty, the evaluation of the prospective benefits requires the formation of expectations. An acceptable job, then, is one that offers an expected stream of future benefits that has a value in excess of the option to continue to search for an even better alternative.

In the standard models of markets available prior to 1970, all of these complications were ignored. The best known model is of perfect competition. However, this approach assumes exchange in a centralized market in which information about the services traded as well as the price are perfect. Besides, there is no dynamics in this approach such that only the current value of employment opportunity matters, not the future streams of wages and profit associated with the employment opportunity. Therefore, the unemployment is involuntary and can not be explained in the equilibrium concept.

Because of the search and matching costs associated with the heterogeneity of jobs, individuals, and homes, this form of centralized trading is simply not possible in labor. The need to gather information about the properties of the job as well as the ask and bid price is still present. In response to these questions, Peter Diamond, Dale Mortensen and Chris Pissarides jointly developed the theory of equilibrium unemployment (Nobel prize 2010). Referred to DMP model, this framework is a general equilibrium model with two-sided search and match between worker and firm. The advantage of DMP model is its tractability, but it relies on the reduced-form matching function to introduce the friction in the economy.

Related literature DMP framework starts from the one-sided search theory proposed which was fully formalized in D. Mortensen (1970). McCall (1970) provided a similar formulation at about the same time based on the mathematical analysis of the optimal stopping problem model borrowed from stochastic decision theory. The essential assumptions of the formal optimal stopping model as applied here are that the worker cares only about the expected discounted stream of future wages offered by a job, and that an offer is a random draw from the distribution of possible wage offers known to the worker. Given these assumptions, the decision to accept or not is analogous to the problem of exercising a stock option. And the agent will accept the job offer if the wage exceeds his reservation wage.

But, the one-sided search model does not provide a complete theory of employment and wage determination useful for dynamic and policy analysis. The demand side of the market was not explicitly modeled in most papers published in the 1970s. The model of wage setting adopted in the macro literature is based on bilateral bargaining theory. In that setting, neither worker nor employer has the power to set the wage. Instead, the wage must be mutually agreed to as the outcome of bargaining between worker and employer. The "pie" to be divided in the bargain is equal to the wedge between the marginal value of a worker to the employer and the worker's reservation wage. This wedge is positive precisely because time and resources are required to find an alternative match partner. The early contributions in this area include D. Mortensen (1978), D. Mortensen (1982a), D. Mortensen (1982b), Diamond and Maskin (1979),Diamond (1982a), Diamond (1982b), Pissarides (1979) and Pissarides (1985). These works were among the first to formulate two-sided search models and to deal explicitly with the dual issues of existence and efficiency of search equilibrium. And the first generation of the DMP model was fully articulated in Pissarides (1990), and D. T. Mortensen (2011) provides a comprehensive review of the DMP model.

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