The Minsky Moment from a System Dynamics Perspective

A Concise Literature Review

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1. Introduction

In the aftermath of the financial crisis of 2007/08, many have criticized mainstream economic theory for lacking the ability to predict the crisis. For instance, (Kirman, 2010) argued that many economists thought they had a good grasp of the inner functioning of the economy, citing former US Federal Reserve chairman Ben Bernanke's "Great Moderation" and Robert Lucas' claim of solving the "central problem of depression prevention" as an example.

Kirman states that before 2007, banks acted in their own self-interest and that their unintended collective behavior resulted in an outcome not in the interest of any of them. In other words, the crisis was generated internally within the banking sector and not due to an external shock to the US economy. He continues by pointing out that the internal interactions of economic actors are the main contributing factor to these kinds of crises rather than external variables. Furthermore, Kirman asserts that current economic models wrongfully attribute crises to external shocks and that the economy is in some state of stable equilibrium.

Moreover, some even have called for a scientific revolution in economic thought (Bouchaud, 2008). Bouchaud argues that the economic discipline uses models founded on unrealistic, faulty, and untested axioms, such as the rational actor, invisible hand, and efficient markets. He calls for a more realistic and pragmatic approach to building economic models.

1.1. What is the Minsky Moment?

Hyman Minsky (b. 1919, d. 1996) was not a typical mainstream economist. Although he graduated with a Ph.D. in economics from Harvard University, he wasn't content with neoclassical economic questions such as "what is the market equilibrium price?" instead, he viewed the economy from a

disequilibrium state. He was more intrigued with questions such as “can an economic crisis happen again?”.

Minsky’s line of reasoning required the incorporation of recessions and depressions as possible economic outcomes, as opposed to mainstream theories of equilibrium-seeking economic behavior (Minsky, 1980). This has led him to argue that capitalist economies are inherently unstable, i.e., cyclical economic behavior is an endogenous feature of the economy and that economic crises due to debt accumulations are inevitable.

The financial crisis of 2007/08 was the Minsky Moment, as Minsky’s predictions materialized, albeit after his death. This realization brought Minsky’s theory, the Financial Instability Hypothesis (FIH), back into the spotlight.

1.2. The Financial Instability Hypothesis

Minsky’s theory of the FIH (Minsky, 1992) can be broken into two sub-theorems; First, the economy has financing regimes under which it is stable and financing regimes under which it is unstable. Second, over periods of prolonged prosperity, the economy transits from financial relations that make for a stable system to financial relations that make for an unstable system. In simple terms, Minsky viewed the overall state of the economy as either a stable state or an unstable state and that the stable state would lead eventually to the unstable state.

The FIH takes a rather unique view of the economy. Unlike conventional economic theories, FIH is based on the following core issues; (1) fundamental instability of capitalist economies, (2) endogenous money supply by the banking system, (3) debt deflation, (4) investors’ behavior during uncertainty (Minsky, 1980). These features of FIH allowed Minsky to view economic crises as a series of reinforcing cycles that exacerbates both inflation and debt deflation. This contrasts with mainstream economic theory, which assumes that economies are either in or seeking some steady state equilibrium (Minsky, 1992). Moreover, FIH incorporated the time factor to highlight the delayed causal effect of previous debt on the current economic situation.

Minsky’s FIH doesn’t only focus on the role of business firms’ in the economy from a financial standpoint; it also includes households, governments, banks, and even international lending actors in his hypothesis. He claims that these different actors, especially the government, exacerbate the

complexity of analyzing the financial structures in an economy (Minsky, 1992). He refers to these actors with a generic term as “economic units.”.

In an economic unit, assets and liabilities are both sources of cash flows. Assets generate profits, which are allocated depending on the liability structure of the economic unit. In FIH (Minsky, 1992), there are three types of debt-income classifications for the economic units; (1) Hedge, which are economic units that can repay all of their financial liabilities through their free cash flows. (2) Speculative, these economic units can only pay the interest on their debt but not the principal; they need to “roll over” their liabilities, i.e., get a new loan to pay the principal of the maturing loan. (3) Ponzi, these units’ cash flows are insufficient to repay neither the principal nor the interest due on outstanding debts. Therefore, they resort to additional debt to repay the interest portion of the current debt.

Minsky’s FIH can be summarized with the following flow of events. In a normal functioning economy, the debt accumulated is predominantly done by Hedge units, as the future profits expectations are high, interest rates are low, and default risk is minimal. The low-interest rate environment encourages many Hedge units to take on more and more debt, businesses engage in new investments, households acquire mortgages, governments spend on infrastructure, etc. As the economic units get more indebted and their debt-income ratio increases, any increase in interest rates or drop in realized future income would render many Hedge units into the Speculative or Ponzi category. The more Ponzi units in an economy, the more bankruptcies, and debt defaults will occur. This will lower the overall available liquidity due to elevated concerns in the banking sector. Feeding into a vicious downward cycle of lower liquidity, causing more Hedge units into Speculative or Ponzi categories.

The sequence of events Minsky hypothesized had a remarkable resemblance to what unfolded during the 2007/08 financial crisis, hence the Minsky Moment. According to (Keen, 2020), Minsky’s genius was that he perceived this crisis using his verbal theory, without the technology of “system dynamics”.

2. System Dynamics Literature on FIH

The original FIH was a mainly verbal theory, Minsky's hypothesis was developed before complex systems, and system dynamics were popularized (Minsky, 1957). While the Minsky Moment definitely increased the interest in the FIH, nonetheless, many researchers attempted to build dynamic models of FIH before and after the 2007/08 financial crises. Some even built a specialized system dynamics package for financial modeling and named it after Minsky[1].

But there is no agreement on the formal representation of Minsky's FIH (Nikolaidi & Stockhammer, 2017). However, according to Nikolaidi & Stockhammer, at least four features are present in all system dynamics models of Minsky's FIH. First, the debt ratio tends to increase with economic prosperity. This is where Minsky's categorizations of Hedge, Speculative, and Ponzi are evident. Second, asset inflation tends to increase with economic expansion. Third, the negative impact of debt has a delayed lag effect on the economy. Fourth, government intervention through raising interest rates to curb the vicious debt cycle becomes the trigger for economic collapse.

The literature can be grouped into two main categories. First, models that emphasize the role of debt. Second, models that include debt and incorporate asset prices into the dynamics.

2.1. Debt Level Dynamics Models

These models revolve around the idea that if profits are not sufficient for expenditure, for example, firm investments, then the difference is financed using a loan. In the long run, the rate at which debt is accumulated is negatively correlated with the investment level. Hence a negative cycle is created in the economy.

2.1.1. Kalecki-Minsky Models

The Kalecki-Minsky model uses a Kaleckian investment function that derives investment decisions from the interest rate. The firm would acquire debt if the investment expenditure couldn't be covered using the firm's free cash flow. The debt has a negative impact on the investment returns, hence increasing the risk of loss if the investments profits don't materialize. Examples of

[1] Minsky – Developed by Professor Steve Keen
http://www.profstevekeen.com/minsky/

these models include (Lima & Meirelles, 2007) (Charles, 2008) (Fazzari et al., 2008) and (Nishi, 2012).

2.1.2. Kaldor-Minsky Models

The Kaldor-Minsky model includes economic activity in the investment function of Kalecki-Minsky. Hence firms are more encouraged to invest when the economic activity is high. This is achieved either through the rate of profit or the firm's capacity utilization. On the other hand, investments are negatively correlated to debt accumulation.

The main objective of these models is that capacity investments typically overshoot. Leaving firms with underutilized capacity, high operating costs, and debt interest payments. For an example, see (Chiarella & di Guilmi, 2011).

2.1.3. Goodwin-Minsky Models

These models incorporate the labor market into the economy. In (Keen, 1995), a wage share equation represents the labor market dynamics. Keen extended the original idea of (Goodwin, 1982), relating wage share and employment rate. He links these dynamics to the overall economic activity, i.e., investments, profits, and debt levels. The wage share equation of Keen represents the demanded wage by workers during different economic conditions with a positive correlation. This equation links a higher debt ratio, which lowers investment and employment, with wage share.

2.2. Asset Valuations Dynamics Models

These models are more in line with Minsky's FIH, as they include asset valuations into the dynamics of the economic interactions. These models became even more popularized after the US housing market crashed and ultimately causing the financial crisis of 2007/08.

2.2.1. Equity Price Minsky Models

These models emphasize the effect of equity markets, i.e., stock markets, on the real economy. The households play a critical role in initiating the chain of events. Initially, households make decisions regarding the equity markets, which in turn influences the equity prices, resulting in different behavior of firms. In these models, the equity market is the primary source of instability in the economy. The earliest modeling attempt was made by (Taylor & O'connell, 1985). These are examples of more recent work (Ryoo, 2010) and (Ryoo, 2013).

2.2.2. Real Estate Price Minsky Models

Like the equity price models described earlier, housing prices play a similar role in stock markets. These models focus on the role of housing debt on economic activity. The emphasis is on the relationship effect of debt level on housing prices and the collateral. The dynamics in these models are represented by firms that take on investments financed by equity issuance or free cash flow and households that incur debt by investing in either real estate (mortgages) or equity assets to finance firms' investments (Ryoo, 2016).

2.3. Additional Contributions

After the financial crisis, there have been numerous implementations of FIH. The paper by (Keen, 2020) is noteworthy for multiple reasons. In his paper, he used a specialized system dynamics software that he developed specifically for modeling Minsky's FIH, as we pointed out earlier. Furthermore, his goal was to build a model in response to critics of Minsly's FIH on the basis of lacking sound economic foundations.

2.4. FIH in non-System Dynamics Models

There were attempts to incorporate Minsky's FIH into mainstream economic models. A common feature of these contributions is an optimization objective and exogenous shocks. In their paper (Bhattacharya et al., 2015), a Dynamic Stochastic General Equilibrium Model (DSGE) was used to model investor preference to risk with respect to previous economic performance.

An alternative way to model FIH with rational expectations was proposed by (Farmer, 2013). The goal was model labor supply shocks by incorporating a belief function of the economy's equilibrium state. Another approach was adopted by (Eggertsson & Krugman, 2012), who modeled two agents with different time preferences. The agents would engage in lending activities, and the patient lends the impatient. Their model showed that with an exogenous shock, the economy would exhibit the features of FIH, such as debt deflation and economic contraction.

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