

The Upcoming Revolution in Finance...

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Abstract

We highlight here how "fundamentalist" investors should, in principle, work to assess the economically justified value of major asset classes traded on financial markets. This modern financial theory of arbitrage is generally well understood. However, the concrete assessment of the required "risk premia" usually results from a rather superficial work due to the difficult access to necessary information. We argue that this is one of the main reasons of excessive volatility in financial markets.

But this situation is not inevitable. Sooner or later, a revolution will occur, based on a better assessment of the required risk premia and "fundamental" values. This will gradually lead to a significant improvement in the efficiency of financial markets. While waiting for the emergence of this "other world", understanding the mechanisms described in this note can help practitioners better navigate the financial instability with profit.

This note summarizes a recent, more academic paper, Davanne (2023). These reflections are based on over thirty years of intervention/observation of financial markets in a wide variety of public and private roles (fund management, consulting, research, teaching...).

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The evolution of financial valuations remains very mysterious. It is often difficult to explain the magnitude of the observed movements, both upwards and downwards. "Bubbles" and "crashes" follow one another in mysterious ways. It's tempting to attribute these disconnect phenomena to the irrationality of many investors who change their opinions without objective reasons related to the economic environment. While irrationality sometimes plays a role, in financial markets largely dominated by professional investors, this explanation seems somewhat superficial.

There must be something much more fundamental, in the complex functioning of the system, that for now produces this frequent disconnect between financial and real spheres, and this difficulty in explaining the observed prices and their day-to-day or hour-to-hour evolution.

This note explains one of the key mechanisms at play, which is generally not understood by market professionals and has never been identified by academic literature¹.

1/ Starting Point: A recap of "fundamentalist" valuation theories.

Fundamental valuation models differ mathematically depending on the types of assets considered, but they always rely on the projection into the future of the triptych "pay-off" (dividends, coupons...)/risk-free interest rate/risk premia.

The "right" current price is, of course, the one that allows one to expect, **over the lifetime of the asset in question**, a return equal to the cumulative risk-free rates steered by central banks, adjusted for the cumulative risk premia that investors will likely demand in the future.

In this area, anticipations play a key role. Current short-term rates are an important starting point, but what determines the fundamental value of assets is the anticipated future chronicle of short-term rates. An expected tightening of monetary policies in the future weighs in principle on asset prices from today. The same is true for the other component of discount rates, i.e., short-term risk premia: the outperformance required by investors to invest in risky assets in the coming weeks or months also constitutes an important starting point, like current short-term rates, but the fundamental value of assets depends on the entire future chronicle of anticipated risk premia.

The most telling example is the expected impact of "Quantitative Tightening" (reduction in the size of central banks' balance sheets) on government bond prices. The prospect of Quantitative Tightening, of course, raises long-term rates from its announcement, and the transmission channel is based on the future evolution of risk premia. Markets anticipate that in the future investors will demand a higher return to absorb a larger supply of securities, and this anticipated increase in anticipated risk premia logically raises long-term rates and lowers bond prices from today.

The fundamental relationship between current prices and their three determinants (expected pay-offs, expected short-term rates, and expected short-term risk premia) is not always easy to express mathematically due to non-linearities. In the appendix, we recall the exact formula applicable to a unique expected pay-off at a future date within a continuous-time framework that accurately addresses these non-linearities. This fundamental formula is notably at the basis of the valuation of zero-coupon bonds that offer only a unique pay-off when the bond matures. As for stocks that pay dividends at

¹ The difficulty in explaining financial valuation instability with dominant theories was recently highlighted by two eminent specialists on the subject. After a detailed analysis of the strange financial fluctuations during the COVID epidemic, Niels Gormsen and Ralph Koijen conclude: "we reiterate that the fluctuations are part of a broader pattern in which most fluctuations in prices are hard to tie back to fundamental news. Understanding the drivers of fluctuations in financial markets thus remains one of the key questions for asset pricing and macro-finance going forward" Gormsen and Koijen (2023).

regular intervals, Campbell and Shiller (2008) proposed an approximation widely used in academic literature. These brief theoretical reminders help to understand how fundamental analysis should ideally work.

The "fundamentalists" must make forecasts on the three main metrics.

Pay-offs: They must analyze future expected payments (dividends, coupons). This work is specific to the asset class in question. The simplest asset class in this respect consists of domestic government bonds when considered risk-free: the expected payments over time (coupons, capital repayment) are contractually fixed. In the case of stocks, the fundamentalists knows the current dividends but must construct a scenario based on future profits and the dividends that will arise from them. For a foreign currency, they start with the short-term interest rates offered by that currency and project the expected evolution of monetary policy in the relevant foreign country.

Short-term "risk-free" rates: Starting from current short-term rates (observable), they must construct a scenario on the evolution of future short-term rates set by their country's central bank.

Short-term risk premia: The fundamentalists face a challenging task. They must ideally try to evaluate current risk premia based on available information (what excess returns are demanded by investors to invest in the relevant securities in the coming weeks or months?) and construct a plausible scenario for the future evolution of these risk premia, taking into account the various key factors (e.g., for government bonds, future public securities offerings or inflationary risk trends).

Unlike current dividends, contractual coupons on bonds, or short-term interest rates (domestic or foreign), the specificity of current risk premia is that they are not observable.

This distinction is crucial. Fundamentalists do not know the starting point to construct their risk premia scenarios. Moreover, they do not have access to reliable historical series that allow statistical work to better understand the origin of fluctuations in these risk premia. They are working blindly.

However, this observation should be slightly nuanced. For some asset classes and during certain periods, fundamentalists have surveys from investors that sometimes allow assessing the returns these investors expect in the short term (varying horizons depending on the surveys, often 3 months or a year). So it sometimes seems possible to measure the required risk premia, at least for the responding investors. These risk premia are calculated as the difference between the expected short-term returns and the risk-free rates set by the central bank. Thus, these surveys seem to provide fundamentalists, to varying degrees depending on the periods and asset classes, with what is naturally obtained for pay-offs and monetary rates: the starting point for the medium and long-term scenario that needs to be built.

But in reality, in over 30 years of market experience, we have never encountered any fundamentalist analyst using these survey data in their valuation work. We will revisit this when discussing the future of finance, but the main reason seems to be, on the one hand, a lack of awareness of the value of the information available in these surveys, and on the other hand, more structurally, the difficulty of using this information. These surveys often involve limited samples, mostly economists, and sometimes seem to produce results far from the real risk premia demanded by investors. They also often vary greatly from one survey to another. Moreover, Davanne (2023) shows that the information available in these surveys depends heavily on market conditions. When markets malfunction, with prices deviating from fundamental values, the risk premia revealed by the surveys also deviate from the risk premia to be introduced into valuation models. It should not be a surprise that when investors become irrational

and simply extrapolate recently observed returns, their forecasts become extremely volatile and no longer provide any information about the risk premia that fundamentalist investors should use.

For all these reasons, fundamentalists do not use these surveys and generally rely on their intuition regarding the risk hierarchy between assets, with the help of returns observed over a long period in the past. It is indeed reasonable to think that an asset which consistently outperforms over several decades is considered riskier by investors. This observed outperformance seems to provide an objective assessment of the risk premium to be incorporated into a valuation model.

In the end, constrained by existing data, fundamental analysts thus provide a rather superficial work on risk premia. Past returns play a crucial role in their assessments, although, of course, on the margin, they sometimes try to refine their assumptions by discussing how current risks seem to deviate from those observed in the past.

The bulk of the fundamentalists' energy is devoted to analyzing monetary policies and pay-offs based on profits. Few practitioners will contest this diagnosis: Risk premium analysis is currently the poor relation of fundamental analysis.

2/ The consequences of the superficial work of fundamentalists on risk premia.

It is clear that risk premia vary over time, and that the outperformances observed in the past provide a very imprecise evaluation of the risk premia required at a specific moment and in the future.

On the one hand, when reasoning across all asset classes, investors' short-term risk appetite varies a lot. It depends on the nature and intensity of perceived risks (economic, geopolitical, etc.). It then depends on their wealth; wealthy households (or institutions like pension funds) have a greater capacity to absorb potential financial losses. Finally, it also seems to depend on the level of risk-free interest rates set by central banks. Very low interest rates can push investors to take more risks in the hope of boosting short-term risk-free returns deemed insufficient. This is the famous "TINA" mechanism (There Is No Alternative).

On the other hand, for a given risk appetite, the risk premia on different asset classes also vary significantly. In this area, a key variable highlighted in the CAPM (Capital Asset Pricing Model) is the famous beta. Assets whose return is highly correlated with that of other assets must offer high risk premia. Conversely, "safe haven" assets with a negative correlation serve as protection and can offer low returns to investors (historically, the case of gold). However, correlations, and therefore relative risk premia, vary over time, sometimes with structural changes in nature. For example, when inflation risks are high (1970s and early 1980s), the price of government bonds tends to move in parallel with that of stocks. But in times when growth fears dominate, bonds become safe havens, and their betas – and thus their risk premia – can become negative.

These risk premia movements are rarely quickly identified by fundamentalists. Using an original modeling of the interest rate curve, this observation is precisely documented in Davanne (2021) for bonds issued by the US Treasury.

Due to a lack of data, risk premia assumptions, based largely on the simple observation of past returns, are always wrong. There's no doubt about it, and the only question is the extent of these errors.

It might be tempting to downplay the importance of these errors and their specificity, noting that fundamentalists also make mistakes about other key variables. Of course, they cannot accurately predict future monetary policies, nor, concerning stocks, the dividends that will be paid. As Mark Twain (perhaps) said, "Predictions are hard, especially about the future"...

However, errors about risk premia are of a different nature. As already highlighted, fundamental analysts observe current short-term rates and current pay-offs (and even future pay-offs in the case of already issued risk-free government bonds). While it's always possible/probable that the future will gradually differ from the scenario they built, they can be (almost) right. In the case of risk premia, the scenario they built is necessarily wrong, to varying degrees, because current risk premia are not directly observable. So it's not just about the difficulty of predicting the future: even the initial points of the scenario chosen for risk premia are necessarily wrong!

Strangely, this observation regarding the existence of a fundamental market failure (the non-observability of risk premia which are private information) has not yet been identified by academic literature on asset valuation and market efficiency.

What do these errors mean for market dynamics?

This is a question extensively discussed by Davanne (1999) and Davanne (2023) on both a theoretical and empirical basis, and the conclusions are unsurprising. If fundamentalists are wrong about the price of assets (and again, they necessarily are, and the only question is by how much), markets cannot operate efficiently. If, by extrapolating from the past, fundamentalists overestimate the short-term risk premia required, it means they underestimate the demand for the asset in question. Prices will thus be higher than the prices they deem fundamentally justified. Conversely, if they underestimate the short-term risk premia demanded by investors, prices will be lower. The valuation gap may be quite small as long as these fundamentalists have a significant market weight. They sell assets that seem - mistakenly - too expensive and buy those that seem - also mistakenly - cheap. As long as they control the market, they thus limit the differences between observed prices and prices they deem consistent with fundamentals. But obviously, if the error on risk premia is significant and lasting, it's an unstable equilibrium. Investors see that the discount or premium doesn't decrease, and that the arbitrage positions apparently dictated by fundamental analysis are not winning. At some point, it is likely that fundamentalists will then capitulate and reduce these positions. Prices then deviate a little more from prices falsely deemed consistent with fundamentals, which increases the losses of fundamentalists and further encourages this capitulation movement.

This gradual capitulation movement will create a vicious circle and a trend in the markets, prices gradually deviating from the poorly evaluated equilibrium prices. This trend will, of course, be exploited by a whole class of non-fundamentalist investors (quants, chartists...) who have learned, without clearly relying on an underlying theory, to take advantage of the market's "momentum." And the intervention of these non-fundamentalist investors will make the position of the fundamentalists even harder and will also contribute to the capitulation movement.

In the worst-case scenario, fundamentalists will stop all arbitrage operations, and the market will be dominated by "technical" investors. Davanne (2023) then shows, unsurprisingly, that markets will eventually over-adjust: if fundamentalists underestimate equilibrium valuations, as their capitulation progresses, prices will rise. But there is no miraculous mechanism in a market dominated by "technical" methods that allows for convergence to the right price. It is very likely that once set on an upward trend, initially undervalued prices will eventually exceed the real equilibrium price, ultimately producing overvalued prices. Davanne (2023) explains how this mechanism of fundamentalist capitulation helps to explain the stock market "bubble" of the late 90s, the demand for stocks having initially been underestimated by fundamentalist investors in the mid-90s.

This chain of mispricing/capitulation/over-adjustment is well summed up in a stock market adage of the famous investor Sir John Templeton: "Bull markets are born on pessimism, grow on skepticism, mature on optimism, and die on euphoria."

This analysis of one of the main sources of financial instability is of course very original. Academic literature tends to oppose the "good" rational fundamentalists who search the fair value of financial assets to the "bad" irrational chartists who just feed existing trends. It's clear that this situation sometimes occurs. However, what we demonstrate, based on developments observed in several markets, is that as often in economics, appearances can be deceptive: fundamentalists often lose control of markets not because they are victims of a coalition of irrational investors, but simply because they produce incorrect estimates of asset values.

3/ Another world will eventually emerge...

This analysis could lead to some pessimism as it highlights the role of a fundamental market failure: the fact that short-term risk premia required by investors are essential information but not directly observable because they are private (everyone knows only their own assumptions about future returns on which their investments are based).

However, this pessimism should be tempered: most known key market failures (externalities, information asymmetry, etc.) lead to reactions from private and public stakeholders trying to limit their negative impact on collective well-being (sometimes with the help of economists!). What makes the market failure we discuss particularly detrimental is that it's not understood and fundamentalists haven't yet identified the alarming vulnerability of their estimates to risk premium errors.

This situation isn't inevitable: The realization of the need for a much deeper focus on risk premia will sooner or later lead to two structural changes in the functioning of financial markets.

On the one hand, fundamental analysts will probably learn to read the signals indicating that current risk premia differ from their estimates. They will thus be encouraged to review their assumptions, which will limit the risk of capitulation. These signals for anticipating valuation crises, sort of "canaries in the coal mine", are of two kinds:

Even if, as we said, existing surveys are imperfect, they still provide a glimpse of the returns anticipated by some investors. When these returns seem abnormal, a warning signal lights up. If expected returns seem particularly high, it may mean that investors demand abnormally strong short-term risk premia to invest in the asset concerned. This should lead to a thorough examination of the origin of the phenomenon (bias in surveys or surprising evolution of risk premia to be taken into account in valuation work?).

Another warning signal lights up when prices seem to persistently deviate from fundamental valuations, and fundamentalist arbitrages appear to be long-term losers. In the current functioning of the markets, fundamentalists tend to attribute this highly penalizing type of situation to the irrationality of certain investors, and to maintain their arbitrage positions, or even to reinforce them, until the strength of the movement forces them to capitulate. But as we said, the irrationality of some investors is certainly possible, but is not necessarily the main explanation for these situations. Risk premia errors also mechanically produce such "conundrum". It's therefore essential that before reinforcing their positions or capitulating, fundamentalist investors strive to better understand the origin of the apparent valuation errors (irrationality of a significant portion of investors or risk premia errors in the valuation models used?).

On the other hand, once analysts (and academics!) recognize the importance of warning signals to avoid valuation crises, it's very likely that significant improvements will be made to existing surveys, or even that new surveys will be initiated to better meet the needs of investors.

Current surveys have never been designed, in the context of market failure analysis, to measure short-term risk premia and meet the needs of fundamental analysts. They are generally conducted among economists to obtain their analysis of the economic and financial environment, with the idea that the opinion of these professionals may be useful to other investors. The reconstruction of risk premia (difference between expected returns and risk-free rates) is sometimes possible, but is generally a kind of by-product – more often used by academics – which faces many difficulties. We've already highlighted the issue of representativeness of the 30 or 40 often interviewed economists. Also worth mentioning is the fact that questions rarely focus directly on returns, but rather on future prices in a central scenario, with many difficulties to rigorously extract the associated average returns².

Surveys of investors on future returns have the potential to be more than just "canaries in the coal mine". They can address the market failures we identified. Well-designed, they can drastically reduce the difference in nature between risk premia (private information) and risk-free rates (totally public information). The emergence of well-designed new surveys on representative samples of investors could thus contribute to the emergence of much more robust fundamental analyses.

Another world is possible in which investors would make better use of available surveys and encourage the creation of better-designed new surveys to assess over time the risk premia demanded by investors. In this emerging world, fundamentalists would not lose investors' trust. Price volatility would not disappear, but excesses would be less frequent, and price developments would become much clearer, directly linked to new economic and financial information that objectively modifies the perception of fundamental variables.

Conclusion: What are the implications for investors today?

While waiting for this gradual revolution in finance to unfold, what can practitioners gain from these analyses? These considerations may seem primarily intended for scholars, but this is not the case.

On the one hand, fundamental analysts would benefit from delving deeper into the topics discussed in this note and reflecting on their use of available warning signals to identify risk premia errors.

On the other hand, non-fundamentalist professional investors are currently the big winners in a system disrupted by the mistakes of fundamentalists. This will likely continue to be the case until the anticipated revolution is complete... But understanding the mechanisms at play can help avoid certain pitfalls and make these profits even more resilient. Regarding the exploitation of apparent market trends, the most favorable moment occurs at the beginning of the fundamentalists' capitulation process (the pessimism/skepticism phases identified by John Templeton). The trend is then supported by a very powerful mechanism. When markets enter an over-adjustment phase (i.e., optimism or even euphoria), markets can become quite unstable, marked by other trend-playing investors taking profits. The "momentum" approach can then remain profitable, up to the potential bursting of the "bubble," but becomes much riskier.

What are the available warning signals to gauge the strength of the trend? Here too, available surveys regarding expectations and positions of different investor categories play a vital role. The effective non-fundamentalist is generally "contrarian" (as most professionals already know!): they play the bullish trend when it meets investor skepticism—selling positions of fundamentalists—and become much more cautious when markets are in an euphoria phase—neutral position of fundamentalists and buying positions of other players—indicating the transition into the over-adjustment phase.

² Particularly because in many surveys, we know the date of the survey within a few days, but we do not ask the respondents about the prices observed at the time they respond.

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Appendix: fundamental valuation relationships

What should be the price today at date t for an asset that will pay the sum D_{t+H} H years later?

Most financial assets do not pay a single amount at a future date but a stream of “payoffs.” Their fundamental value will thus be the sum of the value of each of the expected payoffs in the future.

In addition to the expected value of this payoff ($E_t(D_{t+H})$), the current price should depend on expectations concerning two key variables: the anticipated future evolution of short-term risk-free rates controlled by the central bank - $E_t(r_s)$ ($t \leq s \leq t + H$) - and the investors' anticipation regarding the future evolution of short-term risk premia required by investors for this asset - $E_t(\pi_s)$ ($t \leq s \leq t + H$). This sequence of expected short rates and risk premia determines the discount rate to apply, i.e., the present value of this expected payment in the future.

The precise calculation of this discount rate is somewhat complex in discrete time due to the presence of non-linearities in the mathematical computation, but it is particularly straightforward in continuous time, thanks to the simplifying power of the Ito Lemma, assuming the asset's price follows a simple diffusion process.

To satisfy investors, in an efficient market, the expected price of this asset should grow as the sum of the risk-free rate and the short-term risk premium, with random shocks diverting it from this expected scenario.

This can be written as:

$$\frac{dP_t}{P_t} = (r_t + \pi_t) dt + \sigma_t dz_t \quad (A1)$$

By applying Ito's Lemma to equation (A1), we get the equation which describes, in principle (in an efficient market), the process followed by the logarithm of the asset's price:

$$d\text{Log}(P_t) = \left(r_t + \pi_t - \frac{1}{2}\sigma_t^2 \right) dt + \sigma_t dz_t$$

For any horizon H , we have the following evolution of the asset's price:

$$\text{Log}(P_{t+H}) - \text{Log}(P_t) = \int_t^{t+H} (r_s + \pi_s - \frac{1}{2}\sigma_s^2) ds + \int_t^{t+H} \sigma_s dz_s$$

This must notably be true at horizon H where the asset pays D_{t+H} ($P_{t+H} = D_{t+H}$).

Thus:

$$\text{Log}(D_{t+H}) - \text{Log}(P_t) = \int_t^{t+H} (r_s + \pi_s - \frac{1}{2}\sigma_s^2) ds + \int_t^{t+H} \sigma_s dz_s$$

Or:

$$\text{Log}(P_t) = \text{Log}(D_{t+H}) - \int_t^{t+H} (r_s + \pi_s - \frac{1}{2}\sigma_s^2) ds - \int_t^{t+H} \sigma_s dz_s$$

Taking the mathematical expectation of this expression, we get the current price that allows anticipating the future return required on this asset (accumulation of expected short-term rates and risk premia):

$$\text{Log}(P_t) = E_t(\text{Log}(D_{t+H})) - E_t\left(\int_t^{t+H} (r_s + \pi_s - \frac{1}{2}\sigma_s^2) ds\right)$$

Or :

$$P_t = \exp\left(E_t(\text{Log}(D_{t+H}))\right) e^{-\int_t^{t+H} E_t(r_s + \pi_s - \frac{1}{2}\sigma_s^2) ds}$$

Finally, assuming the distribution of the future payment D_{t+H} is log-normal, with variance $\sigma_{t,H}^2$, we then obtain, due to the properties of log-normal distributions:

$$E_t(\text{Log}(D_{t+H})) = \text{Log}(E_t(D_{t+H})) - \frac{1}{2}\sigma_{t,H}^2$$

And :

$$P_t = E_t(D_{t+H}) e^{-\int_t^{t+H} E_t(r_s) ds} e^{-\int_t^{t+H} E_t(\pi_s^f) ds} e^{\int_t^{t+H} \frac{1}{2} E_t(\sigma_s^2) ds - \frac{1}{2}\sigma_{t,H}^2}$$

The current value of the expected payoff at date t+H has four components:

$E_t(D_{t+H})$: Obviously, the first term is the expected value for this payment on average.

$e^{-\int_t^{t+H} E_t(r_s) ds}$: This is the first discount factor. The current price should be low when short-term interest rates controlled by central banks are expected to remain high in the future.

$e^{-\int_t^{t+H} E_t(\pi_s^f) ds}$: This is the risk premium component of the discount factor. The current price should be low when the risk premia demanded by investors are likely to be high in the future.

$e^{\int_t^{t+H} \frac{1}{2} E_t(\sigma_s^2) ds - \frac{1}{2}\sigma_{t,H}^2}$: This last term, generally small, is less obvious and simply sums up in continuous time the non-linearities difficult to address in a discrete-time model. It results from the somewhat complex relationship between expected short-term and long-term returns. The problem can be illustrated using a simple two-period model, where x_1 is the return of the first period and x_2 is the return of the second period.

$$E((1 + x_1)(1 + x_2)) = 1 + E(x_1) + E(x_2) + E(x_1 x_2) = (1 + E(x_1))(1 + E(x_2)) + \text{Covar}(x_1, x_2)$$

In efficient markets, the covariance between returns at different dates is negative. When interest rates or risk premia unexpectedly rise, the price of assets drops, but the expected returns in the future increase. Therefore, the anticipated/required long-term return ($E((1 + x_1)(1 + x_2))$) is less than the geometric mean of the anticipated/required returns in the future $((1 + E(x_1))(1 + E(x_2)))^3$.

³ An interesting consequence is that risk premia cannot be zero at all horizons. If all short-term risk premia (π_s) are equal to 0, there will be a negative risk premium for the investor holding the asset long-term.

The term $e^{\int_t^{t+H} \frac{1}{2} E_t(\sigma_s^2) ds} - \frac{1}{2} \sigma_{t,H}^2$ is generally small but always positive⁴ and has a positive impact on the current price of the financial asset.

⁴ $\int_t^{t+H} E_t(\sigma_s^2) ds$ is the conditional variance of the asset price at horizon H due mechanically to all the shocks occurring between dates t and t+H. However, as explained, the shocks on interest rates and risk premia are corrected in the long term. Therefore, the true conditional variance ($\sigma_{t,H}^2$) is lower. The extreme case is that of assets, such as risk-free zero-coupon bonds, where the expected long-term payment is perfectly known ($\sigma_{t,H}^2=0$).