Simple Agreements for Future Equity (SAFEs): The Not-so-Simple Search for Simplicity

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"Simple Agreements for Future Equity," or "SAFEs," have become a popular instrument for financing early-stage companies. In this note we explain how SAFEs are used and how different types of SAFEs function. Using an illustrative example, we also explain how they have evolved over time. The accompanying spreadsheet provides all the calculations discussed in this note. This note presumes familiarity with the structuring of early-stage equity financing. Readers can find a comprehensive introduction in Chapters 4 and 6 of our textbook, where we use analogous notation and develop all the foundational equations this note is based on.[1]

1. Priced rounds

A long time ago, in the Dark Ages before SAFEs, angel investors negotiated a valuation every time they made an investment. As this typically happened for seed-stage ventures, the question arose how to price such early-stage ventures, when their technologies, business models, and founder teams were still unproven? How could investors credibly put a valuation onto what was still just dreams and projections? Valuing a venture required awkward negotiations that could easily turn adversarial. Still, in the dark days, all this was considered necessary to establish the ownership stakes of investors and entrepreneurs.

To illustrate how priced rounds work, consider the fictional example of the MadCappers company, founded by the illustrious Carol Lewis. She had already elicited the interest of an angel investor, none less than the famous Alice van der Laandt. MadCappers was developing a novel and exciting time travel technology and needed the funding to prove the technical feasibility of using rabbit holes for time travel. Upon completion of this milestone, the company would be ready to scale up. This would require raising a (larger) VC round. For that, they planned to approach a venture capitalist called Chester Qaat. Throughout this note we associate the initial investment with an angel investor, and the subsequent round with a venture capitalist (VC henceforth).[2]

We denote founders (i.e., Carol) with the subscript 0, and the angel investor (i.e., Alice) with the subscript 1. We set the number of shares owned by founders at S_0=3M, where M stands for millions.

[1] Marco Da Rin and Thomas Hellmann, "Fundamentals of Entrepreneurial Finance," Oxford University Press, 2020.
[2] For simplicity, we assume that each round has a single investor and ignore other early-stage shareholders such as employees, consultants, or Technology Transfer Offices.

We assume that the angel invests a sum $\mathrm{I}_1 = \$0.4M$. In return she receives a number of shares denoted by S_1, for which she pays a price per share P_1. While we know that $\mathrm{P}_1 * \mathrm{S}_1 = \mathrm{I}_1$, the central question in this note is what determines P_1 and S_1. That is, what price/valuation does the angel pay? And how does that affect her ownership stake?

A priced round contractually fixes the price P_1. Suppose Alice agrees to pay a price of $\mathrm{P}_1 = \$2$, then:

$$\mathrm{S}_1 = \frac{\mathrm{I}_1}{\mathrm{P}_1} = \frac{\$0.4\mathrm{M}}{\$2} = 0.2M$$

What happens when the company achieves its business milestone and raises a larger VC round? We denote the VC (i.e., Chester) with the subscript Q.[3] We assume that the VC invests $\mathrm{I}_\mathrm{Q} = \$2M$. He receives S_Q shares and pays a price P_Q, so that $\mathrm{P}_\mathrm{Q} * \mathrm{S}_Q = \mathrm{I}_\mathrm{Q}$. Assume for now the VC pays $\mathrm{P}_\mathrm{Q} = \$2.50$. In that case the number of shares he receives are given by:

$$\mathrm{S}_\mathrm{Q} = \frac{\mathrm{I}_\mathrm{Q}}{\mathrm{P}_\mathrm{Q}} = \frac{\$2\mathrm{M}}{\$2.50} = 0.8M$$

The total number of shares, denoted by T_r evolves with each new round r, where $r = 0$ stands for the time of founding (before any funding round), $r = 1$ for the angel round, and $r = Q$ for VC round. T_r is given by:

$$\mathrm{T}_0 = \mathrm{S}_0 = 3M$$
$$\mathrm{T}_1 = \mathrm{S}_0 + \mathrm{S}_1 = 3M + 0.2M = 3.2M$$
$$\mathrm{T}_\mathrm{Q} = \mathrm{S}_0 + \mathrm{S}_1 + \mathrm{S}_\mathrm{Q} = 3M + 0.2M + 0.8M = 4M$$

The post-money valuation at the VC round is therefore:

$$\mathrm{V}_{\mathrm{POST}} = \mathrm{P}_\mathrm{Q} * \mathrm{T}_\mathrm{Q} = \$2.50 * 4M = \$10M$$

The corresponding pre-money valuation is then given by:

$$\mathrm{V}_{\mathrm{PRE}} = \mathrm{P}_\mathrm{Q} * \mathrm{T}_1 = \$2.50 * 3.2M = \$8M$$

We can equivalently derive this as the difference between post-money valuation and investment, so that:

$$\mathrm{V}_{\mathrm{PRE}} = \mathrm{V}_{\mathrm{POST}} - \mathrm{I}_1 = \$10M - \$2M = \$8M$$

We denote ownership stakes by:

$$\mathrm{F}_\mathrm{i}(\mathrm{r}) = \frac{\mathrm{S}_\mathrm{i}(\mathrm{r})}{\mathrm{T}_\mathrm{i}(\mathrm{r})}$$

[3] We use Q because, from Section 2.1, the VC round will be called the "qualifying" round.

where the subscript i denotes the shareholder type ($i = 0$ for founders, $i = 1$ for angels, and $i = Q$ for VCs), and where r denotes the round as explained above. For the founders ($i = 0$) we obtain:

$$\mathrm{F}_0(0) = \frac{\mathrm{S}_0}{\mathrm{T}_0} = \frac{3M}{3M} = 100\%$$

$$\mathrm{F}_0(1) = \frac{\mathrm{S}_0}{\mathrm{T}_1} = \frac{3M}{3.2M} = 93.8\%$$

$$\mathrm{F}_0(\mathrm{Q}) = \frac{\mathrm{S}_0}{\mathrm{T}_\mathrm{Q}} = \frac{3M}{4M} = 75\%$$

The ownership fractions of the angel investor are given by:

$$\mathrm{F}_1(1) = \frac{\mathrm{S}_1}{\mathrm{T}_1} = \frac{0.2M}{3.2M} = 6.3\%$$
$$\mathrm{F}_1(\mathrm{Q}) = \frac{\mathrm{S}_1}{\mathrm{T}_\mathrm{Q}} = \frac{0.2M}{4M} = 5\%$$

Finally, the VC's ownership fraction is given by:

$$\mathrm{F}_\mathrm{Q}(\mathrm{Q}) = \frac{\mathrm{S}_\mathrm{Q}}{\mathrm{T}_\mathrm{Q}} = \frac{0.8M}{4M} = 20\%$$

This example illustrates some key properties of a traditional equity financing structure where each round has its own price. It provides a comparison benchmark against which we are going to examine SAFEs. We show these results in Column 1 of the accompanying spreadsheet.

In summary, a priced round provides a transparent ownership structure in which each investor obtains a number of shares that only depends on the investment amount and the agreed share price. However, the determination of the initial price P_1, and the corresponding valuation, can be problematic. This is because early-stage ventures face extreme uncertainty that make valuations somewhat arbitrary and negotiations often difficult. Specifying the investment memorandum for a priced round also requires a non-trivial amount of legal work, which can be expensive.

2. SAFEs with price discounts

2.1. Convertible notes and SAFEs

The Dark Ages ended in 2011 when Yuri Milner's investment fund, SV Angels, offered every company in the Y-Combinator programme an investment of $0.15M using an investment security called convertible note.[4] Before long, this security was adopted and refined across Silicon Valley and beyond. Milner's aim was to use a standardized security that saved legal costs and eliminated the need for separate negotiations with each Y-Combinator company about valuation and other investment terms, leaving them to the next stage investors. Negotiations would take place once the company raises a "qualifying round," defined as a round involving an investment set to what venture investors usually pay in a so-called Series A round.

Milner's convertible note had a simple two-part structure. First, in case a company fails to raise a qualifying round, investors can get their money back via their debt claim. The note specifies how much time the company has to raise a qualifying round, an interest rate, and the seniority of its investors as debtholders. Second, in case a company does raise a qualifying round, the note defines the investment corresponding to a qualifying round, how many shares the initial investors would get, and what security the note converts into.

While more effective than a priced round, the convertible note had one shortcoming, too. Oftentimes, investors have little interest in owning a debt claim, and sometimes this even caused them some legal problems. Moreover, ventures who fail to raise a qualifying round typically fail altogether, with very little left for debt holders. Investors therefore replaced the convertible note with a new security called "Simple Agreement for Future Equity," or SAFE. This gives investors no claims if the company fails to raise qualifying round, i.e., it only gives them the right to convert their investment into equity in a qualifying round. SAFEs and convertible notes continue to develop along parallel lines, with SAFEs being more popular in the US, and convertible notes in many other countries. The rest of this note focuses on how SAFEs have been evolving into their current structure.[5]

The main developments of the SAFE concern the equity conversion formula: How much equity should initial SAFE investors get at the time of the qualifying round? Paying the same price as the VCs would be unfair. SAFE investors clearly bear much more risk and should expect some compensation for it. This can be achieved with a price discount. SAFE investors pay a lower share price than VC investors in the qualifying round. In practice discounts range between 10% and 30%, depending on market conditions.[6]

The remainder of this note delves into the analysis of alternative SAFE structures. We use our illustrative example to focus on two concerns that have been shaping the development of SAFEs. First,

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[4] See http://www.startupcompanylawyer.com/2011/01/31/what-are-the-terms-of-yuri-milnersv-angels-start-fund-150k-investment-into-y-combinator-companies. Early on the convertible note was called convertible debt. Neither of these terms should be confused with "convertible preferred equity" used in VC rounds (see section 6.2 of our textbook).

[5] See section 6.6 of our textbook for a broader analysis of convertible notes.

[6] If discount rates get too high, VC investors in the qualifying round may consider them unreasonable. They can always ask for them to be lowered before they are willing to invest in the round.

what happens if the company performs better, or worse, than the angel investor expected, and achieves a correspondingly higher, or lower, valuation at the qualifying round? Second, what happens to the first angel investor if the company raises additional rounds of SAFEs before reaching the qualifying round?

2.2. Discounts

Alice was glad when the Dark Ages ended. She had been an investor for some time and was definitely tired of haggling endlessly over valuations with founders. "We needed simplicity, and SAFEs promised exactly that," she explained to Ravid Safed, a close friend of hers.

Ravid was good with numbers and spreadsheets and helped Alice to structure a SAFE for the MadCappers deal. He recommended a discount rate of $D_1 = 30\%$. This was on the aggressive side, but Alice believed that once the milestone was reached, Chester would be keen to invest and accept that large discount. She expected Chester to come in at a $10M post-money valuation.

Alice noted one mathematical complexity. To find the share price that Chester needed to pay to generate a post-money valuation of $10M, one needed to know the total number of shares outstanding at the time of the deal. This included the shares issued to Alice, which in turn depended on the price paid by Chester. Alice gasped. "Confused?" Ravid inquired politely. "This is a circular argument, but it has a simple solution. "Many popular explanations of SAFEs available online avoid this circularity by fixing the price per share paid by the VC," continued Ravid, "This simplifies the calculations but is misleading." Alice interrupted him: "What is wrong with simplifying?" Ravid smile wryly: "You see, under a fixed price assumption, different SAFE structures generate different post-money valuations at the qualifying round." So what?" Alice interrupted again. "Well, there is no reason to believe that VCs would change their valuation just because angels used different SAFE structures earlier on. This is why we are going to compare different SAFE structures under a constant post-money valuation at the qualifying round. Don't worry, I solved it for you.[7] I put the solution in the accompanying spreadsheet."

Alice peered through her looking glass at Ravid's calculations in Column 2. The share price that generated a post-money valuation of $10M was $P_Q = \$2.48$. The 30% discount implied that Alice would pay a share price of $P_1 = \$1.73$, and that her $400K investment would convert into $S_1 = \frac{\$0.4M}{\$1.73} = 230{,}769$ shares. Chester would receive $S_Q = \frac{\$2M}{\$2.48} = 807{,}692$ shares, and the total number of shares after the VC round would amount to: $T_Q = S_0 + S_1 + S_Q = 4{,}038{,}462$.[8] "Fantastic, it's all squared away!" exclaimed Alice, feeling relieved.

Comparing Columns 1 and 2, Chester owns 20% of MadCappers, both with a priced round and with a SAFE. In the priced round Alice owns 5% and Carol, the founder, 75% (Column 1). With the SAFE, Alice owned 5.7% and Carol 74.3% (Column 2). Alice preferred the SAFE, Carol saw it the other way round.

[7] The mathematical proofs for all the new formulas derived in this note can be found in the accompanying teaching note.

[8] To confirm Ravid's calculations, one can compute post-money valuation as the share price times the total number of shares: $V_{POST} = P_Q * T_Q = \$2.48 * 4{,}038{,}462 = \$10\text{M}$.

2.3. Dilution from higher valuation

Alice was happy with her investment. MadCappers made rapid progress, achieved its key milestone ahead of time, and Chester was eager to invest. Then something unexpected happened. News of MadCappers success spread quickly, suddenly there was a lot of interest from other VCs. Carol received an offer from a competing VC at a $14M post-money valuation. Chester quickly agreed to a $15M post-money valuation and got the deal. This increased his share price to $4.14 and reduced his stake to 13.3%, as shown in Column 3.

Alice was chuffed with herself for having made such a brilliant investment in a company that was clearly performing better than expected. She basked in the glory until she peaked through her looking glass at Column 3 of the spreadsheet. To her horror, her share price had shot up from $1.73 to $2.90, and her ownership stake had correspondingly fallen from 5.7% to just 3.8%. How could this be? Why should angels get penalized for better company performance?

Ravid mentioned that even though her stake was lower, the company was also worth more. In fact, the 5.7% stake in a $10M company was worth $571K, exactly the same as the 3.8% stake of a $15M company. Alice, however, dismissed this line of argument, as she was focused on maintaining ownership stakes.

What Alice discovered was in fact one of the key flaws of the early SAFEs. Better company performance, reflected in higher valuation at the qualifying round, made angels who invested in the SAFE worse off. This can be viewed as a consequence of "kicking the can down the road." Precisely because angels make the investment without specifying a share price, they are exposed to price or dilution risk at the qualifying round. This arrangement can even become a hindrance because it creates a conflict of interest where the angels may not want the company to appear performing too well, so as to keep the valuation at the qualifying round down.[9]

[9] Another way of understanding the difference between priced rounds and SAFEs is to think of inside versus outside investors (we explain this distinction in section 9.2.4 of our textbook). Venture investors are outsiders (i.e., 'new' investors). With a priced round, angel investors are insiders (i.e., 'old' investors), and the VC round dilutes their ownership, similar to the founders. By contrast, with a SAFE, angels are outsiders, because the share prices they pay remains to be determined. Consequently, angels have the same pricing preferences as VCs at the qualifying round.

3. SAFEs with valuation caps

3.1. Pre-money valuation caps

"There must be a better solution to this." Alice exclaimed in frustration. "How can I find a way of undoing this injustice? If only I could go back in time to when I structured this SAFE!" "Indeed," her friend Ravid responded calmy, "all you need to do is to impose a valuation cap." "A cap, a cap for my investment! You are brilliant," she replied enthusiastically. But moments later she slumped again. "But what use now, I can't go back." "Why not?" Ravid replied. "Didn't MadCappers just prove the feasibility of time travel via rabbit holes? If we jump into this one, we can go right back to the start." Intrigued, Alice followed her friend into the rabbit hole. Before long she was back to the start, the time of structuring the SAFE.

Ravid explained how a pre-money valuation cap worked.[10] One confusing aspect of SAFEs is their terminology, and in particular the distinction between 'pre-money' versus '"post-money' valuation caps. This terminology is misleading because neither of these caps apply to the post-money valuation at the qualifying round. Instead, they pertain to two different versions of the pre-money valuation at the qualifying round.

The first is a pre-money valuation that *includes* the SAFE investors. It is computed using the T_1 number of shares. We call this the "pre-money, post-SAFE" valuation:[11]

$$V_{PRE}^{POST-SAFE} = P_Q * T_1 = \$2.48 * 3{,}230{,}769 = \$8M$$

The second type of pre-money money valuation *excludes* all SAFE investors. It is computed using the T_0 number of shares. We call this the "pre-money, pre-SAFE" valuation:

$$V_{PRE}^{PRE-SAFE} = P_Q * T_0 = \$2.48 * 3{,}000{,}000 = \$7{,}428{,}571$$

A "pre-money cap" is then defined as cap on the "pre-money, pre-SAFE" valuation. Specifically, the pre-money cap ensures that:

$$P_1 * T_0 \leq V_{CAP}^{PRE}.$$

The cap puts an upper limit to the valuation at the qualifying round, and therefore to the extent of dilution a SAFE investor can face. Note that a pre-money cap effectively fixes the price per share paid the angel investor, i.e., one can always obtain the capped price from:

$$P_1^{CAP} = \frac{V_{CAP}^{PRE}}{T_0}.$$

[10] The pre-money valuation cap emerged very early in the history of SAFEs, soon after 2011.

[11] This can also be obtained by subtracting the VC investment from the post-money valuation:

$$V_{PRE}^{POSTSAFE} = V_{POST} - I_Q = \$10M - \$2M = \$8M$$

Ravid suggested a pre-money cap of $4M for Alice's revised SAFE agreement. "Where does that number come from?" Alice asked. "This usually gets negotiated as part of the SAFE deal," Ravid replied. Alice looked confused: "How different is that from negotiating a valuation in the first place then?" "Good point," Ravid answered, "founders and investors effectively use very similar arguments negotiating a cap than negotiating a valuation." Alice briefly wondered what the advantage of a SAFE really was. The cap essentially brought back the entire hassle of negotiating a valuation... "No time to waste now," Ravid interrupted her thought, "we need to get going."

Alice thus closed her eyes to see what would happen next. She saw herself traveling forward in time. Once again MadCappers achieved its milestone early, and once again Chester offered a $15M post-money valuation. Alice held her breath: "Will the pre-money cap work?"

"Of course, it works!" Ravid replied indignantly, "I worked it all out for you in my spreadsheet." His calculations are shown in Column 4. At a $15M post-money valuation, the original SAFE reaches a "pre-money, pre-SAFE" valuation of $11.8M, well above the pre-money cap of $\mathrm{V}_{\mathrm{CAP},1}^{\mathrm{PRE}} = \$4\mathrm{M}$. The maximum price per share (denoted by $\mathrm{P}_{1,\mathrm{MAX}}^{\mathrm{PRE}}$) is given by:

$$\mathrm{P}_{1,\mathrm{MAX}}^{\mathrm{PRE}} * \mathrm{T}_0 = \mathrm{V}_{\mathrm{CAP}}^{\mathrm{PRE}}$$

which implies:

$$\mathrm{P}_{1,\mathrm{MAX}}^{\mathrm{PRE}} = \frac{\mathrm{V}_{\mathrm{CAP}}^{\mathrm{PRE}}}{\mathrm{T}_0} = \frac{\$4M}{3M} = \$1.33$$

Thus, the highest price Alice would have to pay was $1.33 per share, much less than the $2.90 with the SAFE with a discounted price shown in Column 3.

Pushing her luck, Alice asked if she could further apply her 30% discount to this price, but Ravid said that was not possible. SAFEs typically have both a discount and a cap, but investors can only exercise one, i.e., either they pick a price discount or a valuation cap. In this example, the capped price would be $\mathrm{P}_{1,\mathrm{MAX}}^{\mathrm{PRE}} = \$1.33$, while the discounted price would be $\mathrm{P}_1 = (1 - \mathrm{D}_1)\mathrm{P}_{\mathrm{Q}} = 0.7\mathrm{P}_{\mathrm{Q}} = 0.7 * \$4.14 = \$2.90$, as can be seen by comparing columns 3 and 5 in the spreadsheet.[12] "You can't have your cake and eat it too," Ravid explained, "it's either the capped price or the discounted price, but there is no discount on the capped price." "Too bad," Alice replied, "but did you just mention cake?"

Ravid duly went to fetch some cake which they finished in no time. Looking satisfied, Alice expressed how happy she was with the outcome of the pre-money cap. A better venture performance with a higher VC valuation no longer undermined her ownership. The world seemed back to normal.

Carol saw it differently. While Alice's stake rose to 7.3%, her founder stake was now down to 72.7%. 'Typical investors, they always forget the founders,' she thought to herself, 'they didn't even leave any of the cake for me.'

[12] See columns 2 and 4 for the same comparison under the baseline post-money valuation of $10M at the qualifying round.

3.2. Dilution from additional SAFE rounds

"Open your eyes, Alice! You are still dreaming; you haven't moved an inch." Ravid's voice startled Alice. As she opened her eyes, she realized she was still at the start. "You need to keep your eyes open when you move forward in time. Mind you, don't expect everything to be exactly the same as before," Ravid explained. Reluctantly, Alice moved forward. She had rather liked the outcome of Column 5. This time, however, the MadCappers story changed, but not for the better. The company struggled to achieve its milestone, delay followed delay, and the company was close to running out of money. Alice knew she had to do something. She contacted Bill Lizaard, a retired rapper who could easily afford to invest $0.6M, the amount of money needed to keep MadCappers going.

Keeping with our notation, we use the subscript 2 to denote a second angel investor, so that Bill's SAFE investment is $\mathrm{I}_2 = \$600{,}000$. Bill agreed to invest on the same terms as Alice. Thankfully, his investment helped MadCappers achieve their milestone, after which Chester provided the qualifying round at $10M post-money.

Peering through her looking glass at Columns 4 and 8 in the spreadsheet, Alice couldn't help but be disappointed. Without Bill's additional angel round, she would have held a 7.3% equity stake, but Bill's additional round diluted her down to 6.4%. This was true despite the fact that her investment was protected by a valuation cap, and despite the fact the share price she would pay was still $\mathrm{P}_1 = \$1.33$. Once again there was more dilution than she had anticipated. She didn't like that, and her face showed it clearly. "It's not as bad as it looks" Ravid tried to explain to her. "Consider what would happen without Bill's investment: you would have a higher share, but MadCappers would just go bust. Would you be happier with that?" "Not really," Alice countered, "but I still want to keep my share of MadCappers intact!"

What Alice discovered was in fact a shortcoming of the early valuation caps, specifically the pre-money caps. Entrepreneurs could easily raise several rounds of capital using SAFEs before raising a qualifying round. Each additional issuance of SAFE would dilute the earlier SAFE investors.[13] Many of them considered this unfair, complaining that entrepreneurs could all too easily raise multiple SAFE without them being able to object. This complaint led to the use of post-money caps.

3.3. Post-money valuation caps

"The pre-money cap was great at solving the dilution problem when MadCappers performed better than expected and reached higher valuations," Ravid noted, "but it didn't perform so well when MadCappers performed worse than expected and needed more money. Maybe we should try another rabbit hole, I have some ideas." Alice rejoiced at hearing her friend Ravid proposing to continue the adventure. "What I had in mind was the post-money cap," Ravid continued. "Would you like me to take you back to the start?" Alice liked that idea, so they jumped into the rabbit hole once more.

[13] For a discussion of dilution over multiple rounds, and its implications for entrepreneurs and investors, see section 4.1.5 our textbook.

Ravid explained how a post-money valuation cap would play out for Alice.[14] The logic is similar to that of the pre-money valuation cap, with one major difference: the cap is now computed on the total number of shares at the qualifying round, T_2, which includes all shares outstanding after SAFE rounds. Effectively, the post-money cap is based on the "pre-money, post-SAFE" valuation ($V_{PRE}^{POST-SAFE}$) defined in section 3.1. Ravid noted that it should really be called a "post-SAFE" cap, not "post-money" cap.

We denote the post-money valuation cap by V_{CAP}^{POST}. The cap ensures that:

$$P_1 * T_2 \leq V_{CAP}^{POST}$$

Similar to a pre-money cap, the angel pays the lower of the discounted price or the capped price. Unlike it, however, investments by subsequent angels do not affect the dilution of those angels who invested early on. Recall that that pre-money cap effectively fixes the price per share. By contrast, the post-money cap effectively guarantees a minimum equity stake to the SAFE holder. This guaranteed stake is not defined w.r.t. the ownership after the qualifying VC round, but just before. That is, a post-money cap carves out a minimum stake from the pre-money valuation of the VC round. This stake is protected against all subsequent SAFE issuances. It only gets diluted by the investment from qualifying round itself. This guaranteed equity stake can be directly calculated as follows:

$$F_1(2) = \frac{S_1}{T_2} = \frac{P_1 S_1}{P_1 T_2} = \frac{I_1}{V_{CAP}^{POST}}$$

Back at the start, Alice decided to include a post-money cap of \$4M to her SAFE. Ravid assured her that this guaranteed her a stake of $F_1 = \frac{I_1}{V_{CAP}^{POST}} = \frac{\$0.4M}{\$4M}$=10%. As she travelled forward in time, she kept her eyes open in anticipation. Once again MadCappers struggled and Bill had to provide the second SAFE investment, again asking for the same terms as Alice's initial SAFE investment. Once again Chester provided the qualifying round at a \$10M post-money valuation. Alice reached for her looking glass and examined Column 9. To her satisfaction the share price she would pay had fallen further to $\$1.00$. After the qualifying round, her equity stake would be exactly 8%. This confused her a little: "Didn't you promise me a guaranteed stake of 10%?" she asked Ravid. "I did," Ravid replied, "but I said it was a stake from a pre-money perspective. In the qualifying round, the VC stake dilutes everyone by 20%. So, your guaranteed 10% pre-money stake dilutes to an 8% post-money stake." This explanation satisfied Alice. Further comparing columns 8 and 9, she also noted that the post-money cap had given her a lower price per share than with the previous pre-money cap. All in all, this post-money cap looked like a good deal.

"What about Bill?" Alice inquired. "He is well protected too," Ravid replied, "he invested \$0.6M with a cap of \$4M, so he owns 15% before and 12% after the qualifying round." "But who got diluted then?" Alice inquired. "Good question," Ravid replied, "someone has to get diluted, and it's not Chester who always gets 20%. So, it must be Carol. She went from a 72% stake in Column 6 with a single angel

[14] The post-money valuation cap was introduced by the Y-Combinator in 2018, see https://www.ycombinator.com/blog/new-standard-deal.

investor, to a 60% stake in Column 9 with two angels." 'That's harsh', Alice thought to herself, but she wasn't going to argue about it.

By then, Alice was happy with her time travels. After the debacle of the SAFE with a discount, she was glad that she traveled back to add a pre-money cap. It solved the problem of getting diluted in case the venture outperformed and achieved higher valuations. However, it did not solve the problem of getting diluted if the venture underperformed and had to raise additional capital from further SAFE investors. For that she had to travel back a second time and use a post-money cap.

"Would you like to try another rabbit hole?" Ravid asked with a smile, ready for more adventures. "Not sure," Alice replied placidly. "I am not sure I want another adventure. What else did you have in mind?" "Oh, there are many more variants of SAFEs," Ravid replied full of hope. "Look at this rabbit hole, you can specify that the SAFE converts into common instead of preferred shares." "Yuck, I would never want that," Alice replied with disgust. "Point taken," Ravid replied, "but what about this one. Here you can add a whole bunch of side letters specifying further clauses that give SAFE investors additional rights. For example, you can add pro-rata rights that allow the SAFE investor to invest in the qualifying itself: very popular these days. Or look at this rabbit hole, it has an MFN clause, which stands for Most Favored Nation. And this one allows SAFE holders to have a seat on the board of directors. And with this one you can specify many more details about the qualifying round. And with this one, you…" Ravid stopped, noticing Alice's empty stare. "What's the matter, Alice? Isn't this game fun anymore?"[15]

"Fun for whom?" Alice countered sardonically. Ravid hesitated… "Well, it's fun to think through all the variants, one more intricate than the next. Lawyers love it too. Every time you add another clause, they have more to do and can charge you more." Alice frowned deeply. "Oh no," Ravid gasped, "I shouldn't have mentioned the lawyers…" "It's OK, my friend," Alice responded, "you actually just helped me understand what was bothering me. Remember why we set out on this journey?" "No idea!" he replied sheepishly. Alice gasped and reminded him: "It was to seek simplicity." Ravid looked confused, so she continued: "When we came out of the Dark Ages, we wanted to make angel financing easier: less negotiation, fewer legal fees, more transparency. Look where we ended up. We now have a really clever financial instrument, with discounts, post-money caps, and other bells and whistles. But I wouldn't call it simple anymore. Every time we make a SAFE investment, we have to negotiate discounts and caps. How much did we really simply seed financing? I still wonder if there are better ways?"

[15] For those still having fun, the appendix further derives the theoretical formulas for the cases where only one out of two post-money caps are binding. The numerical calculations for these cases are also shown in a separate tab of the accompanying spreadsheet.

4. Comparing SAFE structures

In this section we provide a comparison of the SAFE structures encountered so far. Our discussion focuses on comparing the prices paid by the initial angel investor, and the ownership stakes they receive at the time of the qualifying round. We focus on the case with a single angel investor. We illustrate these profiles by using the MadCappers example, examining how prices and ownership stakes vary as post-money valuations at the qualifying (VC) round range from $5M to $15M. In the accompanying spreadsheet we provide all the underlying calculations.

Figure 1: What share price does the angel pay?

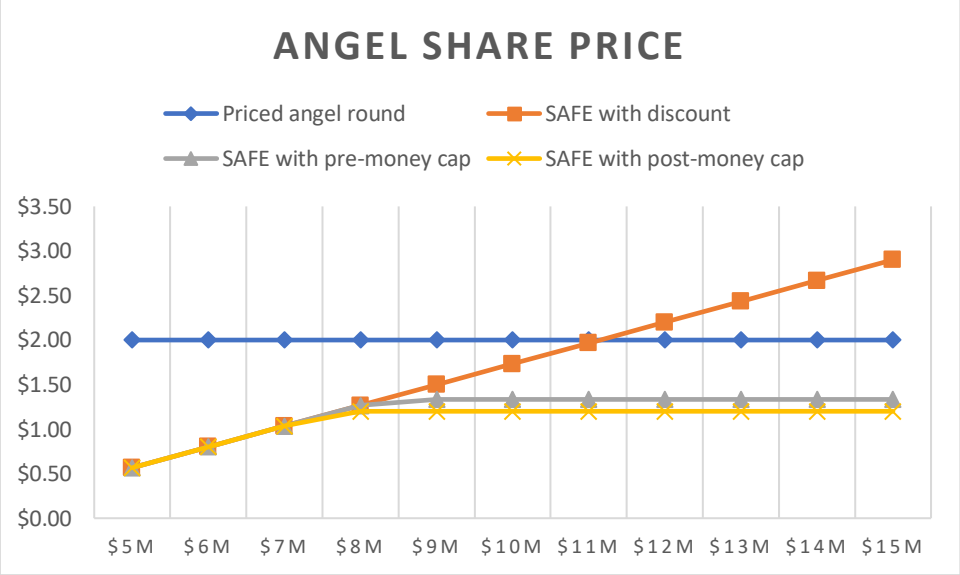


Figure 1 shows four profiles for the share price paid by the initial angel investor, as a function of the post-money valuation at the VC (qualifying) round. The first profile (in blue) represents a priced round. It is a horizontal line because the angel price is fixed upfront, and therefore does not vary with the post-money valuation. The second profile (in orange) is an increasing line that represents a SAFE with discount (but not caps). The final two lines represent capped SAFEs. As long as those caps are not binding, they share the same (increasing) line as the SAFE with discount. When the cap becomes binding, their profiles become flat. The profile for the SAFE with a pre-money cap (in grey) increases for post-money valuations up to $8M and becomes flat at $9M and higher. As shown in section 3.1, the pre-money cap becomes binding for an angel price of $1.33, corresponding to a VC price of $1.90. The profile for the SAFE with a post-money cap (in yellow) has the same increasing portion, and the cap becomes binding at a slightly lower valuation.

Overall, this graph shows that, compared to a priced round, the SAFE is beneficial to the angel for lower post-money valuations at the qualifying round, but lead to higher share price above a certain threshold. On the contrary, the capped SAFEs are effective in locking-in a certain target share price.

Figure 2: What ownership does the angel get?

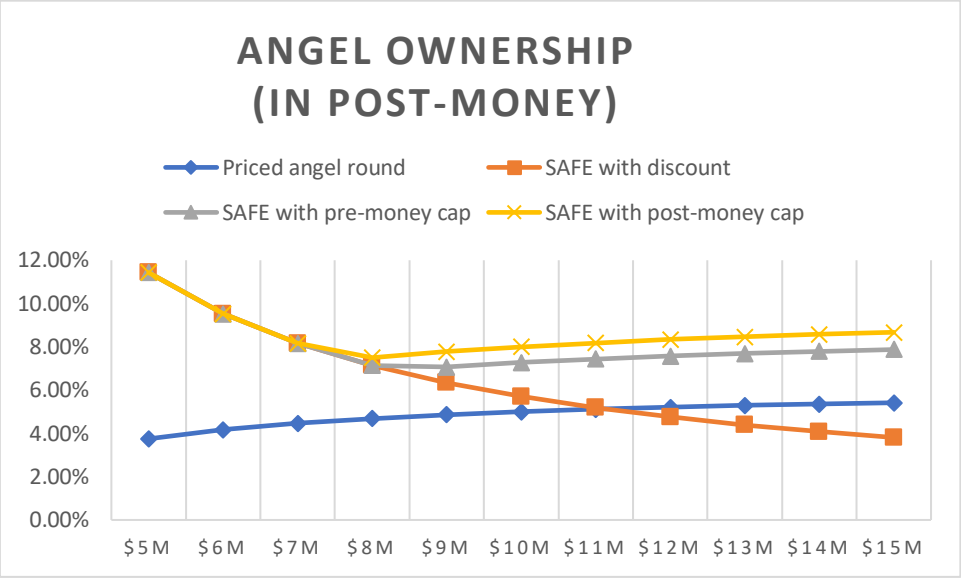
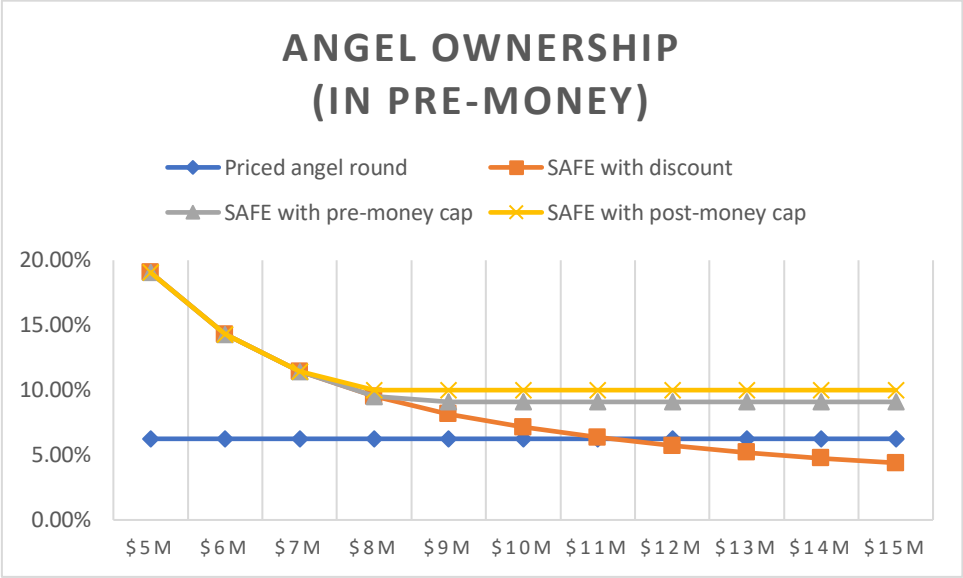


Figure 2 focuses on the ownership stakes of the initial angel investor at the time of the qualifying VC round. With a priced round (in blue), the angel's ownership stake increases with the post-money valuation at the VC round. This reflects the fact that the angel already has shares in the company, and therefore benefits from higher valuations. By contrast, using a SAFE with discount but no caps (in orange), the angel still has to purchase the shares, and therefore gets a smaller stake with a higher valuation. The final two profiles represent pre-money (in grey) and post-money (in yellow) caps. As long as those caps are not binding, they share the same (decreasing) line as a SAFE with discount. However, as the caps become binding, angels lock-in the share price they pay, and their stakes become (slightly) increasing in the VC post-money valuation. Therefore, with a cap, the angel's ownership profile is U-shaped, reaching its lowest point exactly at the point where the cap becomes binding.

Figure 2 shows that, compared to a priced round, the SAFE leads to a decrease in angel ownership as the post-money valuation at the qualifying round increases. On the contrary, the capped SAFEs are effective in locking-in a certain target ownership share, again with little difference between pre-money and post-money cap.

Figure 3 also consider the angel's ownership but looks at it from the perspective of the pre-money valuation of the VC round. Put differently, it looks at the ownership just before the VC round, thus excluding the VC ownership stake, only considering the angel and founder stakes.

Figure 3: What ownership does the angel get (excluding the VC stake)?



The key insight from Figure 3 is that from the pre-money perspective, a binding cap guarantees the angel a fixed ownership fraction, just like a priced round. Because we consider here only cases where there is a single SAFE round, this is equally true for pre- and post-caps.

5. Summary

We summarize the key insights that emerge from the analysis.

1. In a traditional setting without SAFEs, each investment round gets priced separately. Earlier investors (angels) get diluted by later investors (venture capitalists), the extent of which depends on the valuations offered by later investors. For a given angel investment size, higher post-money valuations at the qualifying round increase the ownership stake of the initial investors, but additional investments before the VC round dilute their ownership stakes.

2. When angel investors use SAFEs with discount but no caps, higher post-money valuations at the qualifying round decrease the ownership stake of the initial SAFE investors. Additional investments before the qualifying round reduce their ownership stakes.

3. If the SAFE has a binding pre-money cap, then higher post-money valuations at the qualifying round increase the ownership stake of the initial SAFE investors. Additional investments before the qualifying round dilute their ownership stakes.

4. If the SAFE has a binding post-money cap, then higher post-money valuations at the qualifying round increase the ownership stake of the initial SAFE investors. However, additional investments before the qualifying round do not affect their ownership stakes.

The following tables summarizes these key insights.

Effect on the ownership stake of the initial angel investors with:	Effect of higher post-money valuation at the qualifying round:	Effect of additional investments before the qualifying round:
Price round	Up	Down
SAFE with discount but no caps	Down	Down
SAFE with binding pre-money cap	U-shaped	Down
SAFE with binding post-money cap	U-shaped	Constant

This comparison helps to explain the recent popularity of the SAFE with a post-money cap. It protects the initial investors from two types of dilution risks, namely higher post-money valuations, and additional issuance of SAFEs before the qualifying round. However, one concern with post-money caps is that founders effectively bear the entire dilution burden of additional SAFEs. Moreover, the original motivation for using SAFE, to avoid valuations and complex negotiations, has been partly lost. This is because caps effectively set maximum valuations, and therefore require some negotiation. Finally, recall that since the VC stake should not be affected by alternative SAFEs, any increase in the angle stakes comes at the expense of the founder stake.